SECTION EC
ENGINE CONTROL SYSTEM

CONTENTS

QG (WITH EURO-OBD)

INDEX FOR DTC 23
Alphabetical Index 23
DTC No. Index 27
PRECAUTIONS 33
Precautions for Supplemental Restraint System (SRS) “AIR BAG” and “SEAT BELT PRE-TENSIONER” 33
On Board Diagnostic (OBD) System of Engine and A/T 33
Precaution 33
Wiring Diagrams and Trouble Diagnosis 36
PREPARATION 37
Special Service Tools 37
Commercial Service Tools 37
ENGINE CONTROL SYSTEM 39
System Diagram - QG16DE Engine Models 39
System Diagram - QG18DE Engine Models 40
Vacuum Hose Drawing 41
System Chart 42
Multiport Fuel Injection (MFI) System 42
Electronic Ignition (EI) System 45
Air Conditioning Cut Control 45
Fuel Cut Control (at No Load and High Engine Speed) 46
CAN communication 46
BASIC SERVICE PROCEDURE 54
Idle Speed and Ignition Timing Check 54
Accelerator Pedal Released Position Learning 55
Throttle Valve Closed Position Learning 55
Idle Air Volume Learning 55
Fuel Pressure Check 58
ON BOARD DIAGNOSTIC (OBD) SYSTEM 60
Introduction 60
Two Trip Detection Logic 60
Emission-related Diagnostic Information 61
NATS (Nissan Anti-theft System) 75
Malfunction Indicator (MI) 75
OBD System Operation Chart 79
TROUBLE DIAGNOSIS 84
Trouble Diagnosis Introduction 84
DTC Inspection Priority Chart 88
Fail-safe Chart 90
Basic Inspection 92
Symptom Matrix Chart 97
Engine Control Component Parts Location 101
Circuit Diagram 105
ECM Harness Connector Terminal Layout 107
ECM Terminals and Reference Value 107
CONSULT-II Function 121
Generic Scan Tool (GST) Function 132
CONSULT-II Reference Value in Data Monitor Mode 133
Major Sensor Reference Graph in Data Monitor Mode 136
TROUBLE DIAGNOSIS - SPECIFICATION VALUE 139
Description 139
Testing Condition 139
Inspection Procedure 139
Diagnostic Procedure 140
TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT 143
Description 143
Diagnostic Procedure 143
POWER SUPPLY CIRCUIT FOR ECM 144
Wiring Diagram 144
Diagnostic Procedure 145
Component Inspection 149
DTC U1000, U1001 CAN COMMUNICATION LINE 150
Description 150
On Board Diagnosis Logic 150
DTC Confirmation Procedure 150
Wiring Diagram 151
Diagnostic Procedure 152
DTC P0011 IVT CONTROL 153
Description 153
CONSULT-II Reference Value in Data Monitor Mode 153
On Board Diagnosis Logic 154

DTC Confirmation Procedure 154
Diagnostic Procedure 154
DTC P0031, P0032 HO2S1 HEATER (QG16DE) .. 156
Description 156
CONSULT-II Reference Value in Data Monitor Mode 156
On Board Diagnosis Logic 156
DTC Confirmation Procedure 156
Wiring Diagram 158
Diagnostic Procedure 159
Component Inspection 161
Removal and Installation 161
DTC P0031, P0032, P0051, P0052 HO2S1 HEATER (QG18DE) 162
Description 162
CONSULT-II Reference Value in Data Monitor Mode 162
On Board Diagnosis Logic 162
DTC Confirmation Procedure 162
Wiring Diagram 164
Diagnostic Procedure 167
Component Inspection 169
Removal and Installation 169
DTC P0037, P0038 HO2S2 HEATER (QG16DE) .. 170
Description 170
CONSULT-II Reference Value in Data Monitor Mode 170
On Board Diagnosis Logic 170
DTC Confirmation Procedure 170
Wiring Diagram 172
Diagnostic Procedure 173
Component Inspection 174
Removal and Installation 174
DTC P0037, P0038, P0057, P0058 HO2S2 HEATER (QG18DE) 175
Description 175
CONSULT-II Reference Value in Data Monitor Mode 175
On Board Diagnosis Logic 175
DTC Confirmation Procedure 175
Wiring Diagram 177
Diagnostic Procedure 180
Component Inspection 181
Removal and Installation 182
DTC P0102, P0103 MAF SENSOR 183
Component Description 183
CONSULT-II Reference Value in Data Monitor Mode 183
On Board Diagnosis Logic 183
DTC Confirmation Procedure 183
Wiring Diagram 185
Diagnostic Procedure 186
Component Inspection 188
Removal and Installation 188
DTC P0112, P0113 IAT SENSOR 189
Component Description 189
On Board Diagnosis Logic 189
DTC Confirmation Procedure 189
Wiring Diagram 191
Diagnostic Procedure 192
Component Inspection 193
Removal and Installation 193
DTC P0117, P0118 ECT SENSOR 194
Component Description 194
On Board Diagnosis Logic 194
DTC Confirmation Procedure 195
Wiring Diagram 196
Diagnostic Procedure 197
Component Inspection 198
Removal and Installation 198
DTC P0132 HO2S1 (QG16DE) 199
Component Description 199
CONSULT-II Reference Value in Data Monitor Mode 199
On Board Diagnosis Logic 199
DTC Confirmation Procedure 200
Wiring Diagram 201
Diagnostic Procedure 202
Component Inspection 203
Removal and Installation 204
DTC P0132, P0152 HO2S1 (QG18DE) 205
Component Description 205
CONSULT-II Reference Value in Data Monitor Mode 205
On Board Diagnosis Logic 205
DTC Confirmation Procedure 206
Wiring Diagram 207
Diagnostic Procedure 210
Component Inspection 211
Removal and Installation 213
DTC P0133 HO2S1 (QG16DE) 214
Component Description 214
CONSULT-II Reference Value in Data Monitor Mode 214
On Board Diagnosis Logic 214
DTC Confirmation Procedure 215
Overall Function Check 216
Wiring Diagram 217
Diagnostic Procedure 218
Component Inspection 221
Removal and Installation 222
DTC P0133, P0153, HO2S1 (QG18DE) 223
Component Description 223
CONSULT-II Reference Value in Data Monitor Mode 223
On Board Diagnosis Logic 223
DTC Confirmation Procedure 224
Overall Function Check 225
Wiring Diagram 226
Diagnostic Procedure 229
Component Inspection 232
Removal and Installation 233
DTC P0134 HO2S1 (QG16DE) 234
Component Description 234
CONSULT-II Reference Value in Data Monitor Mode 234

On Board Diagnosis Logic 234
DTC Confirmation Procedure 235
Overall Function Check 235
Wiring Diagram 237
Diagnostic Procedure 238
Component Inspection 239
Removal and Installation 240
DTC P0134, P0154 HO2S1 (QG18DE) 241
Component Description 241
CONSULT-II Reference Value in Data Monitor Mode 241
On Board Diagnosis Logic 241
DTC Confirmation Procedure 242
Overall Function Check 243
Wiring Diagram 244
Diagnostic Procedure 247
Component Inspection 248
Removal and Installation 250
DTC P0138 HO2S2 (QG16DE) 251
Component Description 251
CONSULT-II Reference Value in Data Monitor Mode 251
On Board Diagnosis Logic 251
DTC Confirmation Procedure 251
Overall Function Check 252
Wiring Diagram 253
Diagnostic Procedure 254
Component Inspection 256
Removal and Installation 257
DTC P0138, P0158 HO2S2 (QG18DE) 258
Component Description 258
CONSULT-II Reference Value in Data Monitor Mode 258
On Board Diagnosis Logic 258
DTC Confirmation Procedure 258
Overall Function Check 259
Wiring Diagram 260
Diagnostic Procedure 263
Component Inspection 265
Removal and Installation 266
DTC P0139 HO2S2 (QG16DE) 267
Component Description 267
CONSULT-II Reference Value in Data Monitor Mode 267
On Board Diagnosis Logic 267
DTC Confirmation Procedure 267
Overall Function Check 269
Wiring Diagram 270
Diagnostic Procedure 271
Component Inspection 273
Removal and Installation 274
DTC P0139, P0159 HO2S2 (QG18DE) 275
Component Description 275
CONSULT-II Reference Value in Data Monitor Mode 275
On Board Diagnosis Logic 275
DTC Confirmation Procedure 275
Overall Function Check 277
Wiring Diagram 278
Diagnostic Procedure 281
Component Inspection 283
Removal and Installation 284
DTC P0171 FUEL INJECTION SYSTEM FUNCTION (QG16DE) 285
On Board Diagnosis Logic 285
DTC Confirmation Procedure 285
Wiring Diagram 287
Diagnostic Procedure 288
DTC P0171, P0174 FUEL INJECTION SYSTEM FUNCTION (QG18DE) 291
On Board Diagnosis Logic 291
DTC Confirmation Procedure 291
Wiring Diagram 293
Diagnostic Procedure 295
DTC P0172 FUEL INJECTION SYSTEM FUNCTION (QG16DE) 299
On Board Diagnosis Logic 299
DTC Confirmation Procedure 299
Wiring Diagram 301
Diagnostic Procedure 302
DTC P0172, P0175 FUEL INJECTION SYSTEM FUNCTION (QG18DE) 305
On Board Diagnosis Logic 305
DTC Confirmation Procedure 305
Wiring Diagram 307
Diagnostic Procedure 309
DTC P0221 TP SENSOR 312
Component Description 312
CONSULT-II Reference Value in Data Monitor Mode 312
On Board Diagnosis Logic 312
DTC Confirmation Procedure 312
Wiring Diagram 314
Diagnostic Procedure 315
Component Inspection 317
Remove and Installation 317
DTC P0222, P0223 TP SENSOR 318
Component Description 318
CONSULT-II Reference Value in Data Monitor Mode 318
On Board Diagnosis Logic 318
DTC Confirmation Procedure 318
Wiring Diagram 320
Diagnostic Procedure 321
Component Inspection 323
Remove and Installation 323
DTC P0226 APP SENSOR 324
Component Description 324
CONSULT-II Reference Value in Data Monitor Mode 324
On Board Diagnosis Logic 324
DTC Confirmation Procedure 324
Wiring Diagram 326
Diagnostic Procedure 327
Component Inspection 329
Remove and Installation 330

DTC P0227, P0228 APP SENSOR 331
Component Description 331
CONSULT-II Reference Value in Data Monitor Mode 331
On Board Diagnosis Logic 331
DTC Confirmation Procedure 331
Wiring Diagram 333
Diagnostic Procedure 334
Component Inspection 336
Remove and Installation 337
DTC P0300 - P0304 MULTIPLE CYLINDER MISFIRE, NO. 1 - 4 CYLINDER MISFIRE 338
On Board Diagnosis Logic 338
DTC Confirmation Procedure 338
Diagnostic Procedure 339
DTC P0327, P0328 KS 344
Component Description 344
On Board Diagnosis Logic 344
DTC Confirmation Procedure 344
Wiring Diagram 345
Diagnostic Procedure 346
Component Inspection 347
Removal and Installation 347
DTC P0335 CKP SENSOR (POS) 348
Component Description 348
CONSULT-II Reference Value in Data Monitor Mode 348
On Board Diagnosis Logic 348
DTC Confirmation Procedure 348
Wiring Diagram 350
Diagnostic Procedure 351
Component Inspection 353
Removal and Installation 354
DTC P0340 CMP SENSOR (PHASE) 355
Component Description 355
On Board Diagnosis Logic 355
DTC Confirmation Procedure 355
Wiring Diagram 356
Diagnostic Procedure 357
Component Inspection 359
Removal and Installation 360
DTC P0420 THREE WAY CATALYST FUNCTION (QG16DE) 361
On Board Diagnosis Logic 361
DTC Confirmation Procedure 361
Overall Function Check 362
Diagnostic Procedure 363
DTC P0420, P0430 THREE WAY CATALYST FUNCTION (QG18DE) 365
On Board Diagnosis Logic 365
DTC Confirmation Procedure 365
Overall Function Check 366
Diagnostic Procedure 367
DTC P0444, P0445 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE 369
Description 369
CONSULT-II Reference Value in Data Monitor Mode 369
On Board Diagnosis Logic 370
DTC Confirmation Procedure 370
Wiring Diagram 371
Diagnostic Procedure 372
Component Inspection 374
Removal and Installation 374
DTC P0500 VSS 375
Description 375
On Board Diagnosis Logic 375
DTC Confirmation Procedure 375
Overall Function Check 375
Diagnostic Procedure 376
DTC P0550 PSP SENSOR 377
Component Description 377
CONSULT-II Reference Value in Data Monitor Mode 377
On Board Diagnosis Logic 377
DTC Confirmation Procedure 377
Wiring Diagram 378
Diagnostic Procedure 379
Component Inspection 381
DTC P0605 ECM 382
Component Description 382
On Board Diagnosis Logic 382
DTC Confirmation Procedure 382
Diagnostic Procedure 384
DTC P1065 ECM POWER SUPPLY 385
Component Description 385
On Board Diagnosis Logic 385
DTC Confirmation Procedure 385
Wiring Diagram 386
Diagnostic Procedure 387
DTC P1102 MAF SENSOR 389
Component Description 389
CONSULT-II Reference Value in Data Monitor Mode 389
On Board Diagnosis Logic 389
DTC Confirmation Procedure 389
Wiring Diagram 391
Diagnostic Procedure 392
Component Inspection 394
Removal and Installation 394
DTC P1111 IVT CONTROL SOLENOID VALVE 395
Description 395
CONSULT-II Reference Value in Data Monitor Mode 395
On Board Diagnosis Logic 396
DTC Confirmation Procedure 396
Wiring Diagram 397
Diagnostic Procedure 398
Component Inspection 399
Removal and Installation 399
DTC P1121 ELECTRIC THROTTLE CONTROL ACTUATOR 400
Component Description 400
On Board Diagnosis Logic 400
DTC Confirmation Procedure 400

Diagnostic Procedure 401
Remove and Installation 401
DTC P1122 ELECTRIC THROTTLE CONTROL FUNCTION 402
Description 402
On Board Diagnosis Logic 402
DTC Confirmation Procedure 402
Wiring Diagram 403
Diagnostic Procedure 404
Component Inspection 408
Remove and Installation 408
DTC P1124, P1126 THROTTLE CONTROL MOTOR RELAY 409
Component Description 409
CONSULT-II Reference Value in Data Monitor Mode 409
On Board Diagnosis Logic 409
DTC Confirmation Procedure 409
Wiring Diagram 411
Diagnostic Procedure 412
Component Inspection 413
DTC P1128 THROTTLE CONTROL MOTOR 415
Component Description 415
On Board Diagnosis Logic 415
DTC Confirmation Procedure 415
Wiring Diagram 416
Diagnostic Procedure 417
Component Inspection 418
Remove and Installation 419
DTC P1143 HO2S1 (QG16DE) 420
Component Description 420
CONSULT-II Reference Value in Data Monitor Mode 420
On Board Diagnosis Logic 420
DTC Confirmation Procedure 421
Overall Function Check 422
Diagnostic Procedure 422
Component Inspection 424
Removal and Installation 425
DTC P1143, P1163 HO2S1 (QG18DE) 426
Component Description 426
CONSULT-II Reference Value in Data Monitor Mode 426
On Board Diagnosis Logic 426
DTC Confirmation Procedure 427
Overall Function Check 428
Diagnostic Procedure 428
Component Inspection 430
Removal and Installation 431
DTC P1144 HO2S1 (QG16DE) 432
Component Description 432
CONSULT-II Reference Value in Data Monitor Mode 432
On Board Diagnosis Logic 432
DTC Confirmation Procedure 433
Overall Function Check 433
Diagnostic Procedure 434
Component Inspection 436
Removal and Installation 437
DTC P1144, P1164 HO2S1 (QG18DE) 438
Component Description 438
CONSULT-II Reference Value in Data Monitor Mode 438
On Board Diagnosis Logic 438
DTC Confirmation Procedure 439
Overall Function Check 440
Diagnostic Procedure 440
Component Inspection 442
Removal and Installation 443
DTC P1146 HO2S2 (QG16DE) 444
Component Description 444
CONSULT-II Reference Value in Data Monitor Mode 444
On Board Diagnosis Logic 444
DTC Confirmation Procedure 444
Overall Function Check 446
Wiring Diagram 447
Diagnostic Procedure 448
Component Inspection 450
Removal and Installation 451
DTC P1146, P1166 HO2S2 (QG18DE) 452
Component Description 452
CONSULT-II Reference Value in Data Monitor Mode 452
On Board Diagnosis Logic 452
DTC Confirmation Procedure 452
Overall Function Check 454
Wiring Diagram 455
Diagnostic Procedure 458
Component Inspection 460
Removal and Installation 461
DTC P1147 HO2S2 (QG16DE) 462
Component Description 462
CONSULT-II Reference Value in Data Monitor Mode 462
On Board Diagnosis Logic 462
DTC Confirmation Procedure 462
Overall Function Check 464
Wiring Diagram 465
Diagnostic Procedure 466
Component Inspection 468
Removal and Installation 469
DTC P1147, P1167 HO2S2 (QG18DE) 470
Component Description 470
CONSULT-II Reference Value in Data Monitor Mode 470
On Board Diagnosis Logic 470
DTC Confirmation Procedure 470
Overall Function Check 472
Wiring Diagram 473
Diagnostic Procedure 476
Component Inspection 478
Removal and Installation 479
DTC P1217 ENGINE OVER TEMPERATURE 480
System Description 480

CONSULT-II Reference Value in Data Monitor Mode .480
On Board Diagnosis Logic .481
Overall Function Check .481
Wiring Diagram .483
Diagnostic Procedure .484
Main 12 Causes of Overheating .488
Component Inspection .489
DTC P1223, P1224 TP SENSOR .490
Component Description .490
CONSULT-II Reference Value in Data Monitor Mode .490
On Board Diagnosis Logic .490
DTC Confirmation Procedure .490
Wiring Diagram .492
Diagnostic Procedure .493
Component Inspection .495
Remove and Installation .495
DTC P1225 TP SENSOR .496
Component Description .496
On Board Diagnosis Logic .496
DTC Confirmation Procedure .496
Diagnostic Procedure .497
Remove and Installation .497
DTC P1226 TP SENSOR .498
Component Description .498
On Board Diagnosis Logic .498
DTC Confirmation Procedure .498
Diagnostic Procedure .499
Remove and Installation .499
DTC P1227, P1228 APP SENSOR .500
Component Description .500
CONSULT-II Reference Value in Data Monitor Mode .500
On Board Diagnosis Logic .500
DTC Confirmation Procedure .500
Wiring Diagram .502
Diagnostic Procedure .503
Component Inspection .505
Remove and Installation .506
DTC P1229 SENSOR POWER SUPPLY .507
On Board Diagnosis Logic .507
DTC Confirmation Procedure .507
Wiring Diagram .508
Diagnostic Procedure .509
DTC P1706 PNP SWITCH .511
Component Description .511
CONSULT-II Reference Value in Data Monitor Mode .511
On Board Diagnosis Logic .511
DTC Confirmation Procedure .511
Overall Function Check .512
Wiring Diagram .513
Diagnostic Procedure .514
DTC P1805 BRAKE SWITCH .515
Description .515
CONSULT-II Reference Value in Data Monitor Mode .515
On Board Diagnosis Logic .515
DTC Confirmation Procedure .515
Wiring Diagram .516
Diagnostic Procedure .517
Component Inspection .519
IGNITION SIGNAL .520
Component Description .520
Wiring Diagram .521
Diagnostic Procedure .524
Component Inspection .528
Removal and Installation .529
INJECTOR CIRCUIT .530
Component Description .530
CONSULT-II Reference Value in Data Monitor Mode .530
Wiring Diagram .531
Diagnostic Procedure .532
Component Inspection .535
Removal and Installation .535
FUEL PUMP CIRCUIT .536
Description .536
CONSULT-II Reference Value in Data Monitor Mode .536
Wiring Diagram .537
Diagnostic Procedure .538
Component Inspection .540
Removal and Installation .541
REFRIGERANT PRESSURE SENSOR .542
Component Description .542
Wiring Diagram .543
Diagnostic Procedure .544
Removal and Installation .546
ELECTRICAL LOAD SIGNAL .547
Description .547
CONSULT-II Reference Value in Data Monitor Mode .547
Wiring Diagram .548
Diagnostic Procedure .549
MI & DATA LINK CONNECTORS .552
Wiring Diagram—LHD Models .552
Wiring Diagram—RHD Models .553
EVAPORATIVE EMISSION SYSTEM .554
Description .554
Component Inspection .556
POSITIVE CRANKCASE VENTILATION .557
Description .557
Component Inspection .557
SERVICE DATA AND SPECIFICATIONS (SDS) .559
Fuel Pressure .559
Idle Speed and Ignition Timing .559
Calculated Load Value .559
Mass Air Flow Sensor .559
Intake Air Temperature Sensor .559
Engine Coolant Temperature Sensor .559
Heated Oxygen Sensor 1 Heater .559
Heated Oxygen sensor 2 Heater .559
Crankshaft Position Sensor (POS) .559
Camshaft Position Sensor (PHASE) .559

Throttle Control Motor 560
Injector 560
Fuel Pump 560

QG (WITHOUT EURO-OBD)

INDEX FOR DTC 561
Alphabetical Index 561
DTC No. Index 563
PRECAUTIONS 567
Precautions for Supplemental Restraint System (SRS) “AIR BAG” and “SEAT BELT PRE-TENSIONER” 567
On Board Diagnostic (OBD) System of Engine ... 567
Precaution 567
Wiring Diagrams and Trouble Diagnosis 570
PREPARATION 571
Special Service Tools 571
Commercial Service Tools 571
ENGINE CONTROL SYSTEM 573
System Diagram - QG16DE Engine Models 573
System Diagram - QG18DE Engine Models 574
Vacuum Hose Drawing 575
System Chart 576
Multiport Fuel Injection (MFI) System 576
Electronic Ignition (EI) System 579
Air Conditioning Cut Control 579
Fuel Cut Control (at No Load and High Engine Speed) 580
CAN communication 580
BASIC SERVICE PROCEDURE 588
Idle Speed and Ignition Timing Check 588
Accelerator Pedal Released Position Learning ... 589
Throttle Valve Closed Position Learning 589
Idle Air Volume Learning 589
Fuel Pressure Check 591
ON BOARD DIAGNOSTIC (OBD) SYSTEM 593
Introduction 593
Two Trip Detection Logic 593
Emission-related Diagnostic Information 593
NATS (Nissan Anti-theft System) 595
Malfunction Indicator (MI) 596
TROUBLE DIAGNOSIS 600
Trouble Diagnosis Introduction 600
DTC Inspection Priority Chart 604
Fail-safe Chart 605
Basic Inspection 607
Symptom Matrix Chart 612
Engine Control Component Parts Location 616
Circuit Diagram 620
ECM Harness Connector Terminal Layout 622
ECM Terminals and Reference Value 622
CONSULT-II Function 636
CONSULT-II Reference Value in Data Monitor Mode . 646
Major Sensor Reference Graph in Data Monitor Mode 649
TROUBLE DIAGNOSIS - SPECIFICATION VALUE 652
Description 652
Testing Condition 652
Inspection Procedure 652
Diagnostic Procedure 653
TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT 656
Description 656
Diagnostic Procedure 656
POWER SUPPLY CIRCUIT FOR ECM 657
Wiring Diagram 657
Diagnostic Procedure 658
Component Inspection 662
DTC U1000, U1001 CAN COMMUNICATION LINE 663
Description 663
On Board Diagnosis Logic 663
DTC Confirmation Procedure 663
Wiring Diagram 664
Diagnostic Procedure 665
DTC P0102, P0103 MAF SENSOR 666
Component Description 666
CONSULT-II Reference Value in Data Monitor Mode . 666
On Board Diagnosis Logic 666
DTC Confirmation Procedure 666
Wiring Diagram 668
Diagnostic Procedure 669
Component Inspection 671
Removal and Installation 671
DTC P0117, P0118 ECT SENSOR 672
Component Description 672
On Board Diagnosis Logic 672
DTC Confirmation Procedure 673
Wiring Diagram 674
Diagnostic Procedure 675
Component Inspection 676
Removal and Installation 676
DTC P0132 HO2S1 (QG16DE) 677
Component Description 677
CONSULT-II Reference Value in Data Monitor Mode . 677
On Board Diagnosis Logic 677
DTC Confirmation Procedure 678
Wiring Diagram 679
Diagnostic Procedure 680
Component Inspection 681
Removal and Installation 682
DTC P0132, P0152 HO2S1 (QG18DE) 683
Component Description 683
CONSULT-II Reference Value in Data Monitor Mode . 683
On Board Diagnosis Logic 683
DTC Confirmation Procedure 684
Wiring Diagram 685
Diagnostic Procedure 688
Component Inspection 689
Removal and Installation 691

DTC P0134 HO2S1 (QG16DE) 692
Component Description 692
CONSULT-II Reference Value in Data Monitor Mode 692
On Board Diagnosis Logic 692
Overall Function Check 693
Wiring Diagram 694
Diagnostic Procedure 695
Component Inspection 696
Removal and Installation 697
DTC P0134, P0154 HO2S1 (QG18DE) 698
Component Description 698
CONSULT-II Reference Value in Data Monitor Mode 698
On Board Diagnosis Logic 698
Overall Function Check 699
Wiring Diagram 700
Diagnostic Procedure 703
Component Inspection 704
Removal and Installation 706
DTC P0138 HO2S2 (QG16DE) 707
Component Description 707
CONSULT-II Reference Value in Data Monitor Mode 707
On Board Diagnosis Logic 707
DTC Confirmation Procedure 707
Overall Function Check 708
Wiring Diagram 709
Diagnostic Procedure 710
Component Inspection 712
Removal and Installation 713
DTC P0138, P0158 HO2S2 (QG18DE) 714
Component Description 714
CONSULT-II Reference Value in Data Monitor Mode 714
On Board Diagnosis Logic 714
DTC Confirmation Procedure 714
Overall Function Check 715
Wiring Diagram 716
Diagnostic Procedure 719
Component Inspection 721
Removal and Installation 722
DTC P0221 TP SENSOR 723
Component Description 723
CONSULT-II Reference Value in Data Monitor Mode 723
On Board Diagnosis Logic 723
DTC Confirmation Procedure 723
Wiring Diagram 725
Diagnostic Procedure 726
Component Inspection 728
Remove and Installation 728
DTC P0222, P0223 TP SENSOR 729
Component Description 729
CONSULT-II Reference Value in Data Monitor Mode 729
On Board Diagnosis Logic 729
DTC Confirmation Procedure 729
Wiring Diagram 731
Diagnostic Procedure 732
Component Inspection 734
Remove and Installation 734
DTC P0226 APP SENSOR 735
Component Description 735
CONSULT-II Reference Value in Data Monitor Mode 735
On Board Diagnosis Logic 735
DTC Confirmation Procedure 735
Wiring Diagram 737
Diagnostic Procedure 738
Component Inspection 740
Remove and Installation 741
DTC P0227, P0228 APP SENSOR 742
Component Description 742
CONSULT-II Reference Value in Data Monitor Mode 742
On Board Diagnosis Logic 742
DTC Confirmation Procedure 742
Wiring Diagram 744
Diagnostic Procedure 745
Component Inspection 747
Remove and Installation 748
DTC P0327, P0328 KS 749
Component Description 749
On Board Diagnosis Logic 749
DTC Confirmation Procedure 749
Wiring Diagram 750
Diagnostic Procedure 751
Component Inspection 752
Removal and Installation 752
DTC P0335 CKP SENSOR (POS) 753
Component Description 753
CONSULT-II Reference Value in Data Monitor Mode 753
On Board Diagnosis Logic 753
DTC Confirmation Procedure 753
Wiring Diagram 755
Diagnostic Procedure 756
Component Inspection 758
Removal and Installation 759
DTC P0340 CMP SENSOR (PHASE) 760
Component Description 760
On Board Diagnosis Logic 760
DTC Confirmation Procedure 760
Wiring Diagram 762
Diagnostic Procedure 763
Component Inspection 765
Removal and Installation 766
DTC P0605 ECM 767
Component Description 767
On Board Diagnosis Logic 767
DTC Confirmation Procedure 767
Diagnostic Procedure 769
DTC P1065 ECM POWER SUPPLY 770
Component Description 770
On Board Diagnosis Logic 770

DTC Confirmation Procedure 770
Wiring Diagram 771
Diagnostic Procedure 772
DTC P1102 MAF SENSOR 774
Component Description 774
CONSULT-II Reference Value in Data Monitor Mode 774
On Board Diagnosis Logic 774
DTC Confirmation Procedure 774
Wiring Diagram 776
Diagnostic Procedure 777
Component Inspection 779
Removal and Installation 779
DTC P1121 ELECTRIC THROTTLE CONTROL ACTUATOR 780
Component Description 780
On Board Diagnosis Logic 780
DTC Confirmation Procedure 780
Diagnostic Procedure 781
Remove and Installation 782
DTC P1122 ELECTRIC THROTTLE CONTROL FUNCTION 783
Description 783
On Board Diagnosis Logic 783
DTC Confirmation Procedure 783
Wiring Diagram 784
Diagnostic Procedure 785
Component Inspection 789
Remove and Installation 789
DTC P1124, P1126 THROTTLE CONTROL MOTOR RELAY 790
Component Description 790
CONSULT-II Reference Value in Data Monitor Mode 790
On Board Diagnosis Logic 790
DTC Confirmation Procedure 790
Wiring Diagram 792
Diagnostic Procedure 793
Component Inspection 794
DTC P1128 THROTTLE CONTROL MOTOR 796
Component Description 796
On Board Diagnosis Logic 796
DTC Confirmation Procedure 796
Wiring Diagram 797
Diagnostic Procedure 798
Component Inspection 799
Remove and Installation 800
DTC P1217 ENGINE OVER TEMPERATURE 801
System Description 801
CONSULT-II Reference Value in Data Monitor Mode 801
On Board Diagnosis Logic 802
Overall Function Check 802
Wiring Diagram 804
Diagnostic Procedure 805
Main 12 Causes of Overheating 809
Component Inspection 810
DTC P1223, P1224 TP SENSOR 811
Component Description 811
CONSULT-II Reference Value in Data Monitor Mode 811
On Board Diagnosis Logic 811
DTC Confirmation Procedure 811
Wiring Diagram 813
Diagnostic Procedure 814
Component Inspection 816
Remove and Installation 816
DTC P1225 TP SENSOR 817
Component Description 817
On Board Diagnosis Logic 817
DTC Confirmation Procedure 817
Diagnostic Procedure 818
Remove and Installation 818
DTC P1226 TP SENSOR 819
Component Description 819
On Board Diagnosis Logic 819
DTC Confirmation Procedure 819
Diagnostic Procedure 820
Remove and Installation 820
DTC P1227, P1228 APP SENSOR 821
Component Description 821
CONSULT-II Reference Value in Data Monitor Mode 821
On Board Diagnosis Logic 821
DTC Confirmation Procedure 821
Wiring Diagram 823
Diagnostic Procedure 824
Component Inspection 826
Remove and Installation 827
DTC P1229 SENSOR POWER SUPPLY 828
On Board Diagnosis Logic 828
DTC Confirmation Procedure 828
Wiring Diagram 829
Diagnostic Procedure 830
DTC P1805 BRAKE SWITCH 832
Description 832
CONSULT-II Reference Value in Data Monitor Mode 832
On Board Diagnosis Logic 832
DTC Confirmation Procedure 832
Wiring Diagram 833
Diagnostic Procedure 834
Component Inspection 836
HO2S1 HEATER (QG16DE) 837
Description 837
CONSULT-II Reference Value in Data Monitor Mode 837
Wiring Diagram 838
Diagnostic Procedure 839
Component Inspection 841
Removal and Installation 841
HO2S1 HEATER (QG18DE) 842
Description 842
CONSULT-II Reference Value in Data Monitor Mode 842

Wiring Diagram 843
Diagnostic Procedure 846
Component Inspection 848
Removal and Installation 848
HO2S2 HEATER (QG16DE) 849
Description 849
CONSULT-II Reference Value in Data Monitor Mode 849
Wiring Diagram 850
Diagnostic Procedure 851
Component Inspection 853
Removal and Installation 853
HO2S2 HEATER (QG18DE) 854
Description 854
CONSULT-II Reference Value in Data Monitor Mode 854
Wiring Diagram 855
Diagnostic Procedure 858
Component Inspection 860
Removal and Installation 860
IAT SENSOR 861
Component Description 861
Wiring Diagram 862
Diagnostic Procedure 863
Component Inspection 864
Removal and Installation 864
HO2S1 (QG16DE) 865
Component Description 865
CONSULT-II Reference Value in Data Monitor Mode 865
Wiring Diagram 866
Diagnostic Procedure 867
Component Inspection 870
Removal and Installation 871
HO2S1 (QG18DE) 872
Component Description 872
CONSULT-II Reference Value in Data Monitor Mode 872
Wiring Diagram 873
Diagnostic Procedure 876
Component Inspection 879
Removal and Installation 880
HO2S2 (QG16DE) 881
Component Description 881
CONSULT-II Reference Value in Data Monitor Mode 881
Wiring Diagram 882
Diagnostic Procedure 883
Component Inspection 885
Removal and Installation 886
HO2S2 (QG18DE) 887
Component Description 887
CONSULT-II Reference Value in Data Monitor Mode 887
Wiring Diagram 888
Diagnostic Procedure 891
Component Inspection 893
Removal and Installation 894
IGNITION SIGNAL 895
Component Description 895
Wiring Diagram 896
Diagnostic Procedure 899
Component Inspection 903
Removal and Installation 904
EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE 905
Description 905
CONSULT-II Reference Value in Data Monitor Mode 905
Wiring Diagram 906
Diagnostic Procedure 908
Component Inspection 911
Removal and Installation 911
VSS 912
Description 912
Diagnostic Procedure 912
POWER STEERING PRESSURE SENSOR 913
Component Description 913
CONSULT-II Reference Value in Data Monitor Mode 913
Wiring Diagram 914
Diagnostic Procedure 915
Component Inspection 917
IVT CONTROL SOLENOID VALVE 918
Description 918
CONSULT-II Reference Value in Data Monitor Mode 918
Wiring Diagram 920
Diagnostic Procedure 921
Component Inspection 923
Removal and Installation 923
PNP SWITCH 924
Component Description 924
CONSULT-II Reference Value in Data Monitor Mode 924
Wiring Diagram 925
Diagnostic Procedure 926
INJECTOR CIRCUIT 928
Component Description 928
CONSULT-II Reference Value in Data Monitor Mode 928
Wiring Diagram 929
Diagnostic Procedure 930
Component Inspection 933
Removal and Installation 933
FUEL PUMP CIRCUIT 934
Description 934
CONSULT-II Reference Value in Data Monitor Mode 934
Wiring Diagram 935
Diagnostic Procedure 936
Component Inspection 938
Removal and Installation 939
REFRIGERANT PRESSURE SENSOR 940
Component Description 940
Wiring Diagram 941

Diagnostic Procedure 942
Removal and Installation 944
ELECTRICAL LOAD SIGNAL 945
Description 945
CONSULT-II Reference Value in Data Monitor Mode 945
Wiring Diagram 946
Diagnostic Procedure 947
MI & DATA LINK CONNECTORS 950
Wiring Diagram—LHD Models 950
Wiring Diagram—RHD Models 951
EVAPORATIVE EMISSION SYSTEM 952
Description 952
Component Inspection 954
POSITIVE CRANKCASE VENTILATION 955
Description 955
Component Inspection 955
SERVICE DATA AND SPECIFICATIONS (SDS) ... 957
Fuel Pressure 957
Idle Speed and Ignition Timing 957
Calculated Load Value 957
Mass Air Flow Sensor 957
Intake Air Temperature Sensor 957
Engine Coolant Temperature Sensor 957
Heated Oxygen Sensor 1 Heater 957
Heated Oxygen sensor 2 Heater 957
Crankshaft Position Sensor (POS) 957
Camshaft Position Sensor (PHASE) 957
Throttle Control Motor 958
Injector 958
Fuel Pump 958

QR (WITH EURO-OBD)

INDEX FOR DTC 959
Alphabetical Index 959
DTC No. Index 961
PRECAUTIONS 964
Precautions for Supplemental Restraint System (SRS) “AIR BAG” and “SEAT BELT PRE-TENSIONER” 964
On Board Diagnostic (OBD) System of Engine and CVT 964
Precaution 964
Wiring Diagrams and Trouble Diagnosis 967
PREPARATION 968
Special Service Tools 968
Commercial Service Tools 968
ENGINE CONTROL SYSTEM 970
System Diagram 970
Vacuum Hose Drawing 971
System Chart 972
Multiport Fuel Injection (MFI) System 972
Electronic Ignition (EI) System 975
Air Conditioning Cut Control 975
Fuel Cut Control (at No Load and High Engine Speed) 976
CAN communication 976
BASIC SERVICE PROCEDURE 997
Idle Speed and Ignition Timing Check 997
Accelerator Pedal Released Position Learning ... 998
Throttle Valve Closed Position Learning 998
Idle Air Volume Learning 999
Fuel Pressure Check 1001
ON BOARD DIAGNOSTIC (OBD) SYSTEM 1004
Introduction 1004
Two Trip Detection Logic 1004
Emission-related Diagnostic Information 1005
NATS (Nissan Anti-theft System) 1016
Malfunction Indicator (MI) 1016
OBD System Operation Chart 1019
TROUBLE DIAGNOSIS 1025
Trouble Diagnosis Introduction 1025
DTC Inspection Priority Chart 1029
Fail-safe Chart 1030
Basic Inspection 1032
Symptom Matrix Chart 1037
Engine Control Component Parts Location 1041
Circuit Diagram 1045
ECM Harness Connector Terminal Layout 1047
ECM Terminals and Reference Value 1047
CONSULT-II Function 1054
Generic Scan Tool (GST) Function 1065
CONSULT-II Reference Value in Data Monitor Mode 1067
Major Sensor Reference Graph in Data Monitor Mode 1070
TROUBLE DIAGNOSIS - SPECIFICATION VALUE 1072
Description 1072
Testing Condition 1072
Inspection Procedure 1072
Diagnostic Procedure 1073
TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT 1076
Description 1076
Diagnostic Procedure 1076
POWER SUPPLY CIRCUIT FOR ECM 1077
Wiring Diagram 1077
Diagnostic Procedure 1078
Component Inspection 1082
DTC U1000, U1001 CAN COMMUNICATION LINE 1083
Description 1083
On Board Diagnosis Logic 1083
DTC Confirmation Procedure 1083
Wiring Diagram 1084
Diagnostic Procedure 1085
DTC P0011 IVT CONTROL 1087
Description 1087
CONSULT-II Reference Value in Data Monitor Mode 1087
On Board Diagnosis Logic 1088
DTC Confirmation Procedure 1088
Diagnostic Procedure 1088
DTC P0031, P0032 HO2S1 HEATER 1090
Description 1090
CONSULT-II Reference Value in Data Monitor Mode

1090
On Board Diagnosis Logic 1090
DTC Confirmation Procedure 1090
Wiring Diagram 1092
Diagnostic Procedure 1093
Component Inspection 1094
Removal and Installation 1094
DTC P0037, P0038 HO2S2 HEATER 1095
Description 1095
CONSULT-II Reference Value in Data Monitor Mode 1095
On Board Diagnosis Logic 1095
DTC Confirmation Procedure 1095
Wiring Diagram 1097
Diagnostic Procedure 1098
Component Inspection 1099
Removal and Installation 1099
DTC P0102, P0103 MAF SENSOR 1100
Component Description 1100
CONSULT-II Reference Value in Data Monitor Mode 1100
On Board Diagnosis Logic 1100
DTC Confirmation Procedure 1100
Wiring Diagram 1102
Diagnostic Procedure 1103
Component Inspection 1105
Removal and Installation 1105
DTC P0112, P0113 IAT SENSOR 1106
Component Description 1106
On Board Diagnosis Logic 1106
DTC Confirmation Procedure 1106
Wiring Diagram 1108
Diagnostic Procedure 1109
Component Inspection 1110
Removal and Installation 1110
DTC P0117, P0118 ECT SENSOR 1111
Component Description 1111
On Board Diagnosis Logic 1111
DTC Confirmation Procedure 1112
Wiring Diagram 1113
Diagnostic Procedure 1114
Component Inspection 1115
Removal and Installation 1115
DTC P0127 IAT SENSOR 1116
Component Description 1116
On Board Diagnosis Logic 1116
DTC Confirmation Procedure 1116
Diagnostic Procedure 1117
Component Inspection 1117
Removal and Installation 1118
DTC P0132 HO2S1 1119
Component Description 1119
CONSULT-II Reference Value in Data Monitor Mode 1119
On Board Diagnosis Logic 1119
DTC Confirmation Procedure 1120
Wiring Diagram 1121
Diagnostic Procedure 1122
Component Inspection 1123
Removal and Installation 1124
DTC P0133 HO2S1 1125
Component Description 1125
CONSULT-II Reference Value in Data Monitor Mode 1125
On Board Diagnosis Logic 1125
DTC Confirmation Procedure 1126
Overall Function Check 1127
Wiring Diagram 1128
Diagnostic Procedure 1129
Component Inspection 1132
Removal and Installation 1134
DTC P0134 HO2S1 1135
Component Description 1135
CONSULT-II Reference Value in Data Monitor Mode 1135
On Board Diagnosis Logic 1135
DTC Confirmation Procedure 1136
Overall Function Check 1136
Wiring Diagram 1138
Diagnostic Procedure 1139
Component Inspection 1140
Removal and Installation 1141
DTC P0138 HO2S2 1142
Component Description 1142
CONSULT-II Reference Value in Data Monitor Mode 1142
On Board Diagnosis Logic 1142
DTC Confirmation Procedure 1142
Overall Function Check 1143
Wiring Diagram 1144
Diagnostic Procedure 1145
Component Inspection 1147
Removal and Installation 1148
DTC P0139 HO2S2 1149
Component Description 1149
CONSULT-II Reference Value in Data Monitor Mode 1149
On Board Diagnosis Logic 1149
DTC Confirmation Procedure 1149
Overall Function Check 1151
Wiring Diagram 1152
Diagnostic Procedure 1153
Component Inspection 1155
Removal and Installation 1156
DTC P0171 FUEL INJECTION SYSTEM FUNCTION 1157
On Board Diagnosis Logic 1157
DTC Confirmation Procedure 1157
Wiring Diagram 1159
Diagnostic Procedure 1160
DTC P0172 FUEL INJECTION SYSTEM FUNCTION 1163
On Board Diagnosis Logic 1163
DTC Confirmation Procedure 1163
Wiring Diagram 1165
Diagnostic Procedure 1166
DTC P0221 TP SENSOR 1169
Component Description 1169

CONSULT-II Reference Value in Data Monitor Mode 1169
On Board Diagnosis Logic 1169
DTC Confirmation Procedure 1169
Wiring Diagram 1171
Diagnostic Procedure 1172
Component Inspection 1174
Remove and Installation 1174
DTC P0222, P0223 TP SENSOR 1175
Component Description 1175
CONSULT-II Reference Value in Data Monitor Mode 1175
On Board Diagnosis Logic 1175
DTC Confirmation Procedure 1175
Wiring Diagram 1177
Diagnostic Procedure 1178
Component Inspection 1180
Remove and Installation 1180
DTC P0226 APP SENSOR 1181
Component Description 1181
CONSULT-II Reference Value in Data Monitor Mode 1181
On Board Diagnosis Logic 1181
DTC Confirmation Procedure 1181
Wiring Diagram 1183
Diagnostic Procedure 1184
Component Inspection 1187
Remove and Installation 1187
DTC P0227, P0228 APP SENSOR 1188
Component Description 1188
CONSULT-II Reference Value in Data Monitor Mode 1188
On Board Diagnosis Logic 1188
DTC Confirmation Procedure 1188
Wiring Diagram 1190
Diagnostic Procedure 1191
Component Inspection 1193
Remove and Installation 1194
DTC P0300 - P0304 MULTIPLE CYLINDER MISFIRE, NO. 1 - 4 CYLINDER MISFIRE 1195
On Board Diagnosis Logic 1195
DTC Confirmation Procedure 1195
Diagnostic Procedure 1196
DTC P0327, P0328 KS 1201
Component Description 1201
On Board Diagnosis Logic 1201
DTC Confirmation Procedure 1201
Wiring Diagram 1202
Diagnostic Procedure 1203
Component Inspection 1204
Removal and Installation 1204
DTC P0335 CKP SENSOR (POS) 1205
Component Description 1205
CONSULT-II Reference Value in Data Monitor Mode 1205
On Board Diagnosis Logic 1205
DTC Confirmation Procedure 1205
Wiring Diagram 1207
Diagnostic Procedure 1208
Component Inspection 1210
Removal and Installation 1211
DTC P0340 CMP SENSOR (PHASE) 1212
Component Description 1212
On Board Diagnosis Logic 1212
DTC Confirmation Procedure 1212
Wiring Diagram 1213
Diagnostic Procedure 1214
Component Inspection 1216
Removal and Installation 1217
DTC P0420 THREE WAY CATALYST FUNCTION 1218
On Board Diagnosis Logic 1218
DTC Confirmation Procedure 1218
Overall Function Check 1219
Diagnostic Procedure 1220
DTC P0444, P0445 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE 1222
Description 1222
CONSULT-II Reference Value in Data Monitor Mode 1222
On Board Diagnosis Logic 1223
DTC Confirmation Procedure 1223
Wiring Diagram 1224
Diagnostic Procedure 1225
Component Inspection 1227
Removal and Installation 1227
DTC P0500 VSS 1228
Description 1228
On Board Diagnosis Logic 1228
DTC Confirmation Procedure 1228
Overall Function Check 1228
Diagnostic Procedure 1229
DTC P0550 PSP SENSOR 1230
Component Description 1230
CONSULT-II Reference Value in Data Monitor Mode 1230
On Board Diagnosis Logic 1230
DTC Confirmation Procedure 1230
Wiring Diagram 1231
Diagnostic Procedure 1232
Component Inspection 1234
DTC P0605 ECM 1235
Component Description 1235
On Board Diagnosis Logic 1235
DTC Confirmation Procedure 1235
Diagnostic Procedure 1237
DTC P1065 ECM POWER SUPPLY 1238
Component Description 1238
On Board Diagnosis Logic 1238
DTC Confirmation Procedure 1238
Wiring Diagram 1239
Diagnostic Procedure 1240
DTC P1111 IVT CONTROL SOLENOID VALVE ... 1242
Component Description 1242
CONSULT-II Reference Value in Data Monitor Mode 1242
On Board Diagnosis Logic 1242

DTC Confirmation Procedure 1242
Wiring Diagram 1243
Diagnostic Procedure 1244
Component Inspection 1245
Removal and Installation 1245
DTC P1121 ELECTRIC THROTTLE CONTROL ACTUATOR 1246
Component Description 1246
On Board Diagnosis Logic 1246
DTC Confirmation Procedure 1246
Diagnostic Procedure 1247
Removal and Installation 1247
DTC P1122 ELECTRIC THROTTLE CONTROL FUNCTION 1248
Description 1248
On Board Diagnosis Logic 1248
DTC Confirmation Procedure 1248
Wiring Diagram 1249
Diagnostic Procedure 1250
Component Inspection 1254
Remove and Installation 1254
DTC P1124, P1126 THROTTLE CONTROL MOTOR RELAY 1255
Component Description 1255
CONSULT-II Reference Value in Data Monitor Mode 1255
On Board Diagnosis Logic 1255
DTC Confirmation Procedure 1255
Wiring Diagram 1257
Diagnostic Procedure 1258
Component Inspection 1259
DTC P1128 THROTTLE CONTROL MOTOR 1261
Component Description 1261
On Board Diagnosis Logic 1261
DTC Confirmation Procedure 1261
Wiring Diagram 1262
Diagnostic Procedure 1263
Component Inspection 1264
Remove and Installation 1265
DTC P1143 HO2S1 1266
Component Description 1266
CONSULT-II Reference Value in Data Monitor Mode 1266
On Board Diagnosis Logic 1266
DTC Confirmation Procedure 1267
Overall Function Check 1268
Diagnostic Procedure 1268
Component Inspection 1270
Removal and Installation 1271
DTC P1144 HO2S1 1272
Component Description 1272
CONSULT-II Reference Value in Data Monitor Mode 1272
On Board Diagnosis Logic 1272
DTC Confirmation Procedure 1273
Overall Function Check 1273
Diagnostic Procedure 1274
Component Inspection 1276
Removal and Installation 1277
DTC P1146 HO2S2 1278
Component Description 1278
CONSULT-II Reference Value in Data Monitor Mode 1278
On Board Diagnosis Logic 1278
DTC Confirmation Procedure 1278
Overall Function Check 1280
Wiring Diagram 1281
Diagnostic Procedure 1282
Component Inspection 1284
Removal and Installation 1285
DTC P1147 HO2S2 1286
Component Description 1286
CONSULT-II Reference Value in Data Monitor Mode 1286
On Board Diagnosis Logic 1286
DTC Confirmation Procedure 1286
Overall Function Check 1288
Wiring Diagram 1289
Diagnostic Procedure 1290
Component Inspection 1292
Removal and Installation 1293
DTC P1212 ESP/TCS/ABS COMMUNICATION LINE 1294
Description 1294
On Board Diagnosis Logic 1294
DTC Confirmation Procedure 1294
Diagnostic Procedure 1294
DTC P1217 ENGINE OVER TEMPERATURE 1295
System Description 1295
CONSULT-II Reference Value in Data Monitor Mode 1295
On Board Diagnosis Logic 1296
Overall Function Check 1296
Wiring Diagram 1298
Diagnostic Procedure 1300
Main 12 Causes of Overheating 1310
Component Inspection 1311
DTC P1223, P1224 TP SENSOR 1312
Component Description 1312
CONSULT-II Reference Value in Data Monitor Mode 1312
On Board Diagnosis Logic 1312
DTC Confirmation Procedure 1312
Wiring Diagram 1314
Diagnostic Procedure 1315
Component Inspection 1317
Remove and Installation 1317
DTC P1225 TP SENSOR 1318
Component Description 1318
On Board Diagnosis Logic 1318
DTC Confirmation Procedure 1318
Diagnostic Procedure 1319
Remove and Installation 1319
DTC P1226 TP SENSOR 1320
Component Description 1320

On Board Diagnosis Logic 1320
DTC Confirmation Procedure 1320
Diagnostic Procedure 1321
Remove and Installation 1321
DTC P1227, P1228 APP SENSOR 1322
Component Description 1322
CONSULT-II Reference Value in Data Monitor Mode 1322
On Board Diagnosis Logic 1322
DTC Confirmation Procedure 1322
Wiring Diagram 1324
Diagnostic Procedure 1325
Component Inspection 1327
Remove and Installation 1328
DTC P1229 SENSOR POWER SUPPLY 1329
On Board Diagnosis Logic 1329
DTC Confirmation Procedure 1329
Wiring Diagram 1330
Diagnostic Procedure 1331
DTC P1564 ICC STEERING SWITCH 1333
Component Description 1333
CONSULT-II Reference Value in Data Monitor Mode 1333
On Board Diagnosis Logic 1333
DTC Confirmation Procedure 1333
Wiring Diagram 1335
Diagnostic Procedure 1337
Component Inspection 1339
DTC P1568 ICC FUNCTION 1340
On Board Diagnosis Logic 1340
DTC Confirmation Procedure 1340
Diagnostic Procedure 1340
DTC P1572 ICC BRAKE SWITCH 1341
Component Description 1341
CONSULT-II Reference Value in Data Monitor Mode 1341
On Board Diagnosis Logic 1341
DTC Confirmation Procedure 1341
Wiring Diagram 1343
Diagnostic Procedure 1344
Component Inspection 1349
DTC P1574 ICC VEHICLE SPEED SENSOR 1351
Component Description 1351
On Board Diagnosis Logic 1351
DTC Confirmation Procedure 1351
Diagnostic Procedure 1352
DTC P1706 PNP SWITCH 1353
Component Description 1353
CONSULT-II Reference Value in Data Monitor Mode 1353
On Board Diagnosis Logic 1353
DTC Confirmation Procedure 1353
Overall Function Check 1354
Wiring Diagram 1355
Diagnostic Procedure 1356
DTC P1720 VSS 1358
Description 1358
CONSULT-II Reference Value in Data Monitor Mode 1358
On Board Diagnosis Logic 1358
DTC Confirmation Procedure 1358
Diagnostic Procedure 1358
DTC P1805 BRAKE SWITCH 1360
Description 1360
CONSULT-II Reference Value in Data Monitor Mode 1360
On Board Diagnosis Logic 1360
DTC Confirmation Procedure 1360
Wiring Diagram 1361
Diagnostic Procedure 1362
Component Inspection 1363
IGNITION SIGNAL 1365
Component Description 1365
Wiring Diagram 1366
Diagnostic Procedure 1369
Component Inspection 1373
Removal and Installation 1374
INJECTOR CIRCUIT 1375
Component Description 1375
CONSULT-II Reference Value in Data Monitor Mode 1375
Wiring Diagram 1376
Diagnostic Procedure 1377
Component Inspection 1380
Removal and Installation 1380
FUEL PUMP CIRCUIT 1381
Description 1381
CONSULT-II Reference Value in Data Monitor Mode 1381
Wiring Diagram 1382
Diagnostic Procedure 1383
Component Inspection 1385
Removal and Installation 1386
REFRIGERANT PRESSURE SENSOR 1387
Component Description 1387
Wiring Diagram 1388
Diagnostic Procedure 1389
Removal and Installation 1391
ELECTRICAL LOAD SIGNAL 1392
Description 1392
CONSULT-II Reference Value in Data Monitor Mode 1392
Wiring Diagram 1393
Diagnostic Procedure 1394
ICC BRAKE SWITCH 1397
Component Description 1397
CONSULT-II Reference Value in Data Monitor Mode 1397
Wiring Diagram 1398
Diagnostic Procedure 1399
Component Inspection 1404
MI & DATA LINK CONNECTORS 1406
Wiring Diagram (LHD Models) 1406
Wiring Diagram (RHD Models) 1407

EVAPORATIVE EMISSION SYSTEM 1408
Description 1408
Component Inspection 1410
POSITIVE CRANKCASE VENTILATION 1411
Description 1411
Component Inspection 1411
SERVICE DATA AND SPECIFICATIONS (SDS) ..1413
Fuel Pressure 1413
Idle Speed and Ignition Timing 1413
Calculated Load Value 1413
Mass Air Flow Sensor 1413
Intake Air Temperature Sensor 1413
Engine Coolant Temperature Sensor 1413
Heated Oxygen Sensor 1 Heater 1413
Heated Oxygen sensor 2 Heater 1413
Crankshaft Position Sensor (POS) 1413
Camshaft Position Sensor (PHASE) 1413
Throttle Control Motor 1414
Injector 1414
Fuel Pump 1414

QR (WITHOUT EURO-OBD)

INDEX FOR DTC 1415
Alphabetical Index 1415
DTC No. Index 1416
PRECAUTIONS 1418
Precautions for Supplemental Restraint System (SRS) “AIR BAG” and “SEAT BELT PRE-TENSIONER” 1418
On Board Diagnostic (OBD) System of Engine ..1418
Precaution 1418
Wiring Diagrams and Trouble Diagnosis 1421
PREPARATION 1422
Special Service Tools 1422
Commercial Service Tools 1422
ENGINE CONTROL SYSTEM 1424
System Diagram 1424
Vacuum Hose Drawing 1425
System Chart 1426
Multiport Fuel Injection (MFI) System 1426
Electronic Ignition (EI) System 1429
Air Conditioning Cut Control 1429
Fuel Cut Control (at No Load and High Engine Speed) 1430
CAN communication 1430
BASIC SERVICE PROCEDURE 1439
Idle Speed and Ignition Timing Check 1439
Accelerator Pedal Released Position Learning ..1440
Throttle Valve Closed Position Learning 1440
Idle Air Volume Learning 1440
Fuel Pressure Check 1443
ON BOARD DIAGNOSTIC (OBD) SYSTEM 1445
Introduction 1445
Two Trip Detection Logic 1445
Emission-related Diagnostic Information 1445
NATS (Nissan Anti-theft System) 1447
Malfunction Indicator (MI) 1448
TROUBLE DIAGNOSIS 1451
Trouble Diagnosis Introduction 1451
DTC Inspection Priority Chart 1455
Fail-safe Chart 1456
Basic Inspection 1457
Symptom Matrix Chart 1462
Engine Control Component Parts Location 1466
Circuit Diagram 1470
ECM Harness Connector Terminal Layout 1472
ECM Terminals and Reference Value 1472
CONSULT-II Function 1479
CONSULT-II Reference Value in Data Monitor Mode 1489
Major Sensor Reference Graph in Data Monitor Mode 1492
TROUBLE DIAGNOSIS - SPECIFICATION VALUE 1494
Description 1494
Testing Condition 1494
Inspection Procedure 1494
Diagnostic Procedure 1495
TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT 1498
Description 1498
Diagnostic Procedure 1498
POWER SUPPLY CIRCUIT FOR ECM 1499
Wiring Diagram 1499
Diagnostic Procedure 1500
Component Inspection 1504
DTC U1000, U1001 CAN COMMUNICATION LINE 1505
Description 1505
On Board Diagnosis Logic 1505
DTC Confirmation Procedure 1505
Wiring Diagram 1506
Diagnostic Procedure 1507
DTC P0102, P0103 MAF SENSOR 1508
Component Description 1508
CONSULT-II Reference Value in Data Monitor Mode 1508
On Board Diagnosis Logic 1508
DTC Confirmation Procedure 1508
Wiring Diagram 1510
Diagnostic Procedure 1511
Component Inspection 1513
Removal and Installation 1513
DTC P0117, P0118 ECT SENSOR 1514
Component Description 1514
On Board Diagnosis Logic 1514
DTC Confirmation Procedure 1515
Wiring Diagram 1516
Diagnostic Procedure 1517
Component Inspection 1518
Removal and Installation 1518
DTC P0134 HO2S1 1519
Component Description 1519
CONSULT-II Reference Value in Data Monitor Mode 1519
On Board Diagnosis Logic 1519
Overall Function Check 1520

Wiring Diagram 1521
Diagnostic Procedure 1522
Component Inspection 1523
Removal and Installation 1524
DTC P0221 TP SENSOR 1525
Component Description 1525
CONSULT-II Reference Value in Data Monitor Mode 1525
On Board Diagnosis Logic 1525
DTC Confirmation Procedure 1525
Wiring Diagram 1527
Diagnostic Procedure 1528
Component Inspection 1530
Remove and Installation 1530
DTC P0222, P0223 TP SENSOR 1531
Component Description 1531
CONSULT-II Reference Value in Data Monitor Mode 1531
On Board Diagnosis Logic 1531
DTC Confirmation Procedure 1531
Wiring Diagram 1533
Diagnostic Procedure 1534
Component Inspection 1536
Remove and Installation 1536
DTC P0226 APP SENSOR 1537
Component Description 1537
CONSULT-II Reference Value in Data Monitor Mode 1537
On Board Diagnosis Logic 1537
DTC Confirmation Procedure 1537
Wiring Diagram 1539
Diagnostic Procedure 1540
Component Inspection 1543
Remove and Installation 1543
DTC P0227, P0228 APP SENSOR 1544
Component Description 1544
CONSULT-II Reference Value in Data Monitor Mode 1544
On Board Diagnosis Logic 1544
DTC Confirmation Procedure 1544
Wiring Diagram 1546
Diagnostic Procedure 1547
Component Inspection 1549
Remove and Installation 1550
DTC P0327, P0328 KS 1551
Component Description 1551
On Board Diagnosis Logic 1551
DTC Confirmation Procedure 1551
Wiring Diagram 1552
Diagnostic Procedure 1553
Component Inspection 1554
Removal and Installation 1554
DTC P0335 CKP SENSOR (POS) 1555
Component Description 1555
CONSULT-II Reference Value in Data Monitor Mode 1555
On Board Diagnosis Logic 1555
DTC Confirmation Procedure 1555
Wiring Diagram 1557
Diagnostic Procedure 1558
Component Inspection 1560
Removal and Installation 1561
DTC P0340 CMP SENSOR (PHASE) 1562
Component Description 1562
On Board Diagnosis Logic 1562
DTC Confirmation Procedure 1562
Wiring Diagram 1564
Diagnostic Procedure 1565
Component Inspection 1567
Removal and Installation 1568
DTC P0500 VSS 1569
Description 1569
On Board Diagnosis Logic 1569
DTC Confirmation Procedure 1569
Overall Function Check 1569
Diagnostic Procedure 1570
DTC P0550 PSP SENSOR 1571
Component Description 1571
CONSULT-II Reference Value in Data Monitor Mode 1571
On Board Diagnosis Logic 1571
DTC Confirmation Procedure 1571
Wiring Diagram 1572
Diagnostic Procedure 1573
Component Inspection 1575
DTC P0605 ECM 1576
Component Description 1576
On Board Diagnosis Logic 1576
DTC Confirmation Procedure 1576
Diagnostic Procedure 1578
DTC P1065 ECM POWER SUPPLY 1579
Component Description 1579
On Board Diagnosis Logic 1579
DTC Confirmation Procedure 1579
Wiring Diagram 1580
Diagnostic Procedure 1581
DTC P1121 ELECTRIC THROTTLE CONTROL ACTUATOR 1583
Component Description 1583
On Board Diagnosis Logic 1583
DTC Confirmation Procedure 1583
Diagnostic Procedure 1584
Removal and Installation 1584
DTC P1122 ELECTRIC THROTTLE CONTROL FUNCTION 1585
Description 1585
On Board Diagnosis Logic 1585
DTC Confirmation Procedure 1585
Wiring Diagram 1586
Diagnostic Procedure 1587
Component Inspection 1591
Remove and Installation 1591
DTC P1124, P1126 THROTTLE CONTROL MOTOR RELAY 1592
Component Description 1592
CONSULT-II Reference Value in Data Monitor Mode

1592
On Board Diagnosis Logic 1592
DTC Confirmation Procedure 1592
Wiring Diagram 1594
Diagnostic Procedure 1595
Component Inspection 1596
DTC P1128 THROTTLE CONTROL MOTOR 1598
Component Description 1598
On Board Diagnosis Logic 1598
DTC Confirmation Procedure 1598
Wiring Diagram 1599
Diagnostic Procedure 1600
Component Inspection 1601
Remove and Installation 1602
DTC P1217 ENGINE OVER TEMPERATURE 1603
System Description 1603
CONSULT-II Reference Value in Data Monitor Mode 1603
On Board Diagnosis Logic 1604
Overall Function Check 1604
Wiring Diagram 1606
Diagnostic Procedure 1608
Main 12 Causes of Overheating 1618
Component Inspection 1619
DTC P1223, P1224 TP SENSOR 1620
Component Description 1620
CONSULT-II Reference Value in Data Monitor Mode 1620
On Board Diagnosis Logic 1620
DTC Confirmation Procedure 1620
Wiring Diagram 1622
Diagnostic Procedure 1623
Component Inspection 1625
Remove and Installation 1625
DTC P1225 TP SENSOR 1626
Component Description 1626
On Board Diagnosis Logic 1626
DTC Confirmation Procedure 1626
Diagnostic Procedure 1627
Remove and Installation 1627
DTC P1226 TP SENSOR 1628
Component Description 1628
On Board Diagnosis Logic 1628
DTC Confirmation Procedure 1628
Diagnostic Procedure 1629
Remove and Installation 1629
DTC P1227, P1228 APP SENSOR 1630
Component Description 1630
CONSULT-II Reference Value in Data Monitor Mode 1630
On Board Diagnosis Logic 1630
DTC Confirmation Procedure 1630
Wiring Diagram 1632
Diagnostic Procedure 1633
Component Inspection 1635
Remove and Installation 1636
DTC P1229 SENSOR POWER SUPPLY 1637
On Board Diagnosis Logic 1637
DTC Confirmation Procedure 1637
Wiring Diagram 1638
Diagnostic Procedure 1639
DTC P1805 BRAKE SWITCH 1641
Description 1641
CONSULT-II Reference Value in Data Monitor Mode 1641
On Board Diagnosis Logic 1641
DTC Confirmation Procedure 1641
Wiring Diagram 1642
Diagnostic Procedure 1643
Component Inspection 1644
HO2S1 HEATER 1646
Description 1646
CONSULT-II Reference Value in Data Monitor Mode 1646
Wiring Diagram 1647
Diagnostic Procedure 1648
Component Inspection 1650
Removal and Installation 1650
HO2S2 HEATER 1651
Description 1651
CONSULT-II Reference Value in Data Monitor Mode 1651
Wiring Diagram 1652
Diagnostic Procedure 1653
Component Inspection 1655
Removal and Installation 1655
IAT SENSOR 1656
Component Description 1656
Wiring Diagram 1657
Diagnostic Procedure 1658
Component Inspection 1659
Removal and Installation 1659
HO2S1 1660
Component Description 1660
CONSULT-II Reference Value in Data Monitor Mode 1660
Wiring Diagram 1661
Diagnostic Procedure 1662
Component Inspection 1664
Removal and Installation 1665
HO2S2 1666
Component Description 1666
CONSULT-II Reference Value in Data Monitor Mode 1666
Wiring Diagram 1667
Diagnostic Procedure 1668
Component Inspection 1669
Removal and Installation 1671
IGNITION SIGNAL 1672
Component Description 1672
Wiring Diagram 1673
Diagnostic Procedure 1676
Component Inspection 1680
Removal and Installation 1681
EVAP CANISTER PURGE VOLUME CONTROL

SOLENOID VALVE 1682
Description 1682
CONSULT-II Reference Value in Data Monitor Mode 1682
Wiring Diagram 1683
Diagnostic Procedure 1685
Component Inspection 1688
Removal and Installation 1688
IVT CONTROL SOLENOID VALVE 1689
Description 1689
CONSULT-II Reference Value in Data Monitor Mode 1689
Wiring Diagram 1691
Diagnostic Procedure 1692
Component Inspection 1694
Removal and Installation 1694
PNP SWITCH 1695
Component Description 1695
CONSULT-II Reference Value in Data Monitor Mode 1695
Wiring Diagram 1696
Diagnostic Procedure 1697
INJECTOR CIRCUIT 1699
Component Description 1699
CONSULT-II Reference Value in Data Monitor Mode 1699
Wiring Diagram 1700
Diagnostic Procedure 1701
Component Inspection 1704
Removal and Installation 1704
FUEL PUMP CIRCUIT 1705
Description 1705
CONSULT-II Reference Value in Data Monitor Mode 1705
Wiring Diagram 1706
Diagnostic Procedure 1707
Component Inspection 1709
Removal and Installation 1710
REFRIGERANT PRESSURE SENSOR 1711
Component Description 1711
Wiring Diagram 1712
Diagnostic Procedure 1713
Removal and Installation 1715
ELECTRICAL LOAD SIGNAL 1716
Description 1716
CONSULT-II Reference Value in Data Monitor Mode 1716
Wiring Diagram 1717
Diagnostic Procedure 1718
MI & DATA LINK CONNECTORS 1721
Wiring Diagram (LHD Models) 1721
Wiring Diagram (RHD Models) 1722
EVAPORATIVE EMISSION SYSTEM 1723
Description 1723
Component Inspection 1725
POSITIVE CRANKCASE VENTILATION 1726
Description 1726
Component Inspection 1726
SERVICE DATA AND SPECIFICATIONS (SDS) ..1728
Fuel Pressure 1728
Idle Speed and Ignition Timing 1728
Calculated Load Value 1728
Mass Air Flow Sensor 1728
Intake Air Temperature Sensor 1728
Engine Coolant Temperature Sensor 1728
Heated Oxygen Sensor 1 Heater 1728
Heated Oxygen sensor 2 Heater 1728
Crankshaft Position Sensor (POS) 1728
Camshaft Position Sensor (PHASE) 1728
Throttle Control Motor 1729
Injector 1729
Fuel Pump 1729

YD

INDEX FOR DTC 1730
Alphabetical Index 1730
DTC No. Index 1730
PRECAUTIONS 1732
Precautions for Supplemental Restraint System (SRS) “AIR BAG” and “SEAT BELT PRE-TENSIONER” 1732
Precautions 1732
Wiring Diagrams and Trouble Diagnosis 1734
ENGINE CONTROL SYSTEM 1735
System Diagram 1735
Vacuum Hose Drawing 1736
System Chart 1737
Fuel Injection Control System 1737
Fuel Injection Timing Control System 1739
Air Conditioning Cut Control 1739
Fuel Cut Control (At No Load & High Engine Speed) 1739
Crankcase Ventilation System 1740
CAN communication 1740
BASIC SERVICE PROCEDURE 1745
Fuel Filter 1745
Accelerator Pedal Released Position Learning ..1745
Fuel Pressure Relief Valve 1746
ON BOARD DIAGNOSTIC (OBD) SYSTEM 1748
DTC and MI Detection Logic 1748
Diagnostic Trouble Code (DTC) 1748
NATS (Nissan Anti-theft System) 1748
Malfunction Indicator (MI) 1749
TROUBLE DIAGNOSIS 1751
Trouble Diagnosis Introduction 1751
Basic Inspection 1754
Symptom Matrix Chart 1758
Engine Control Component Parts Location 1762
Circuit Diagram 1765
ECM Harness Connector Terminal Layout 1767
ECM Terminals And Reference Value 1767
CONSULT-II Function 1773
CONSULT-II Reference Value in Data Monitor Mode 1779
Major Sensor Reference Graph in Data Monitor Mode 1781

TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT 1783
Description 1783
Diagnostic Procedure 1783
POWER SUPPLY CIRCUIT FOR ECM 1784
ECM Terminals and Reference Value 1784
Wiring Diagram 1785
Diagnostic Procedure 1786
Component Inspection 1789
DTC U1000 CAN COMMUNICATION LINE 1790
Description 1790
On Board Diagnosis Logic 1790
DTC Confirmation Procedure 1790
Wiring Diagram 1791
Diagnostic Procedure 1792
DTC P0100 MASS AIR FLOW SENSOR (MAFS) 1793
Component Description 1793
CONSULT-II Reference Value in Data Monitor Mode 1793
ECM Terminals and Reference Value 1793
On Board Diagnosis Logic 1794
DTC Confirmation Procedure 1794
Wiring Diagram 1795
Diagnostic Procedure 1796
Component Inspection 1797
Removal and Installation 1797
DTC P0115 ENGINE COOLANT TEMPERATURE (ECT) SENSOR (CIRCUIT) 1798
Description 1798
On Board Diagnosis Logic 1798
DTC Confirmation Procedure 1798
Wiring Diagram 1799
Diagnostic Procedure 1800
Component Inspection 1801
Removal and Installation 1801
DTC P0120 ACCELERATOR PEDAL POSITION SENSOR 1802
Description 1802
CONSULT-II Reference Value in Data Monitor Mode 1802
ECM Terminals and Reference Value 1802
On Board Diagnosis Logic 1803
DTC Confirmation Procedure 1803
Wiring Diagram 1804
Diagnostic Procedure 1805
Component Inspection 1809
Removal and Installation 1809
DTC P0190 COMMON RAIL FUEL PRESSURE SENSOR 1810
Description 1810
CONSULT-II Reference Value in Data Monitor Mode 1810
ECM Terminals and Reference Value 1810
On Board Diagnosis Logic 1810
DTC Confirmation Procedure 1810
Wiring Diagram 1811
Diagnostic Procedure 1812
Component Inspection 1813
Removal and Installation 1813
DTC P0201 - P0204 FUEL INJECTOR 1814
Description 1814
CONSULT-II Reference Value in Data Monitor Mode 1814
ECM Terminals and Reference Value 1814
On Board Diagnosis Logic 1815
DTC Confirmation Procedure 1816
Wiring Diagram 1817
Diagnostic Procedure 1819
Component Inspection 1820
Removal and Installation 1820
DTC P0235 CHARGE AIR PRESSURE SENSOR 1821
Component Description 1821
ECM Terminals and Reference Value 1821
On Board Diagnosis Logic 1821
DTC Confirmation Procedure 1821
Wiring Diagram 1823
Diagnostic Procedure 1824
Component Inspection 1826
Removal and Installation 1826
DTC P0335 CRANKSHAFT POSITION SENSOR (TDC) 1827
Description 1827
CONSULT-II Reference Value in Data Monitor Mode 1827
ECM Terminals and Reference Value 1827
On Board Diagnosis Logic 1828
DTC Confirmation Procedure 1828
Wiring Diagram 1829
Diagnostic Procedure 1830
Component Inspection 1830
Removal and Installation 1831
DTC P0340 CAMSHAFT POSITION SENSOR 1832
Description 1832
ECM Terminals and Reference Value 1832
On Board Diagnosis Logic 1832
DTC Confirmation Procedure 1832
Wiring Diagram 1834
Diagnostic Procedure 1835
Component Inspection 1835
Removal and Installation 1836
DTC P0500 VEHICLE SPEED SENSOR (VSS) ... 1837
Description 1837
On Board Diagnosis Logic 1837
Overall Function Check 1837
Diagnostic Procedure 1837
DTC P1107 ABSOLUTE PRESSURE SENSOR .. 1838
Description 1838
On Board Diagnosis Logic 1838
DTC Confirmation Procedure 1838
Diagnostic Procedure 1838
DTC P1180 FUEL TEMPERATURE SENSOR 1840
Description 1840
CONSULT-II Reference Value in Data Monitor Mode 1840
ECM Terminals and Reference Value 1840

On Board Diagnosis Logic 1840
DTC Confirmation Procedure 1840
Wiring Diagram 1841
Diagnostic Procedure 1842
Removal and Installation 1842
DTC P1216 EDU 1843
Description 1843
ECM Terminals and Reference Value 1843
On Board Diagnosis Logic 1844
DTC Confirmation Procedure 1844
Wiring Diagram 1845
Diagnostic Procedure 1847
Removal and Installation 1849
DTC P1217 OVERHEAT (COOLING SYSTEM) 1850
Description 1850
CONSULT-II Reference Value in Data Monitor Mode 1850
ECM Terminals and Reference Value 1850
On Board Diagnosis Logic 1851
Overall Function Check 1851
Wiring Diagram 1853
Diagnostic Procedure 1855
Main 12 Causes of Overheating 1863
Component Inspection 1864
DTC P1233 - P1234 SUCTION CONTROL VALVE 1865
Description 1865
CONSULT-II Reference Value in Data Monitor Mode 1865
ECM Terminals and Reference Value 1865
On Board Diagnosis Logic 1866
DTC Confirmation Procedure 1866
Wiring Diagram 1867
Diagnostic Procedure 1868
Component Inspection 1868
Removal and Installation 1869
DTC P1301 - P1304 FUEL INJECTOR ADJUSTMENT RESISTOR 1870
Description 1870
ECM Terminals and Reference Value 1870
On Board Diagnosis Logic 1870
DTC Confirmation Procedure 1870
Wiring Diagram 1871
Diagnostic Procedure 1872
Component Inspection 1873
Removal and Installation 1873
DTC P1305 FUEL LEAK 1874
On Board Diagnosis Logic 1874
DTC Confirmation Procedure 1874
Diagnostic Procedure 1874
Removal and Installation 1874
DTC P1510 ACCELERATOR PEDAL RELEASED POSITION SWITCH 1876
Description 1876
CONSULT-II Reference Value in Data Monitor Mode 1876
ECM Terminals and Reference Value 1876
On Board Diagnosis Logic 1877
DTC Confirmation Procedure 1877
Wiring Diagram 1878
Diagnostic Procedure 1879
Component Inspection 1880
Removal and Installation 1880
DTC P1606 ECM 1881
Description 1881
On Board Diagnosis Logic 1881
DTC Confirmation Procedure 1881
Diagnostic Procedure 1881
DTC P1621 ECM RELAY 1883
ECM Terminals and Reference valve 1883
On Board Diagnosis Logic 1883
DTC Confirmation Procedure 1883
Wiring Diagram 1884
Diagnostic Procedure 1885
Component Inspection 1886
DTC P1660 BATTERY VOLTAGE 1887
On Board Diagnosis Logic 1887
DTC Confirmation Procedure 1887
Diagnostic Procedure 1887
GLOW CONTROL SYSTEM 1889
Description 1889
ECM Terminals and Reference Value 1889
Wiring Diagram 1890
Diagnostic Procedure 1891
Component Inspection 1894
Removal and Installation 1895
EGR VOLUME CONTROL SYSTEM 1896
Description 1896
CONSULT-II Reference Value in Data Monitor Mode 1896
ECM Terminals and Reference Value 1897
Wiring Diagram 1898
Diagnostic Procedure 1899
Component Inspection 1901
Removal and Installation 1902
VARIABLE NOZZLE TURBOCHARGER CONTROL SOLENOID VALVE 1903
Description 1903
ECM Terminals and Reference Value 1903
Wiring Diagram 1904
Diagnostic Procedure 1905
Component Inspection 1907
Removal and Installation 1908
BRAKE SWITCH 1909
Description 1909
ECM Terminals and Reference Value 1909
Wiring Diagram 1910
Diagnostic Procedure 1911
Component Inspection 1912
PARK/NEUTRAL POSITION (PNP) SWITCH 1913
Description 1913
CONSULT-II Reference Value in Data Monitor Mode 1913
ECM Terminals and Reference Value 1913
Wiring Diagram 1914
Diagnostic Procedure 1915

START SIGNAL 1916
Wiring Diagram 1916
Diagnostic Procedure 1917
POWER STEERING OIL PRESSURE SWITCH ..1918
Component Description 1918
CONSULT-II Reference Value in Data Monitor Mode 1918
ECM Terminals and Reference Value 1918
Wiring Diagram 1919
Diagnostic Procedure 1920
Component Inspection 1921
Removal and Installation 1921
MI & DATA LINK CONNECTORS 1922
Wiring Diagram 1922
SERVICE DATA AND SPECIFICATIONS (SDS) .1923
General Specifications 1923
Mass Air Flow Sensor 1923
Engine Coolant Temperature Sensor 1923
Common Rail Fuel Pressure Sensor 1923
Crankshaft Position Sensor (TDC) 1923
Camshaft Position Sensor 1923
Glow Plug 1923
EGR Volume Control Valve 1923

INDEX FOR DTC

PFP:00024

Alphabetical Index

EBS00EL6

Check if the vehicle is a model with Euro-OBD (E-OBD) system or not by the “Type approval number” on the identification plate. Refer to GI-46, "IDENTIFICATION PLATE" .

NOTE:
If DTC U1000 or U1001 is displayed with other DTC, first perform the trouble diagnosis for DTC U1000, U1001. Refer to EC-150, "DTC U1000, U1001 CAN COMMUNICATION LINE" .

QG16DE ENGINE MODELS

Items (CONSULT-II screen terms)	DTC*1		Reference page
	CONSULT-II GST*2	ECM*3	
APP SEN 1/CIRC*5	P0227	0227	EC-331
APP SEN 1/CIRC*5	P0228	0228	EC-331
APP SEN 2/CIRC*5	P1227	1227	EC-500
APP SEN 2/CIRC*5	P1228	1228	EC-500
APP SENSOR*5	P0226	0226	EC-324
BRAKE SW/CIRCUIT	P1805	1805	EC-515
CAN COMM CIRCUIT	U1001	1001*6	EC-150
CKP SEN/CIRCUIT	P0335	0335	EC-348
CMP SEN/CIRC-B1	P0340	0340	EC-355
CTP LEARNING	P1225	1225	EC-496
CTP LEARNING	P1226	1226	EC-498
CYL 1 MISFIRE	P0301	0301	EC-338
CYL 2 MISFIRE	P0302	0302	EC-338
CYL 3 MISFIRE	P0303	0303	EC-338
CYL 4 MISFIRE	P0304	0304	EC-338
ECM	P0605	0605	EC-382
ECM BACK UP/CIRC	P1065	1065	EC-385
ECT SEN/CIRCUIT*5	P0117	0117	EC-194
ECT SEN/CIRCUIT*5	P0118	0118	EC-194
ENG OVER TEMP	P1217	1217	EC-480
ETC ACTR*5	P1121	1121	EC-400
ETC FUNCTION/CIRC*5	P1122	1122	EC-402
ETC MOT*5	P1128	1128	EC-415
ETC MOT PWR*5	P1124	1124	EC-409
ETC MOT PWR*5	P1126	1126	EC-409
FUEL SYS-LEAN-B1	P0171	0171	EC-285
FUEL SYS-RICH-B1	P0172	0172	EC-299
HO2S1 (B1)	P0132	0132	EC-199
HO2S1 (B1)	P0133	0133	EC-214
HO2S1 (B1)	P0134	0134	EC-234
HO2S1 (B1)	P1143	1143	EC-420
HO2S1 (B1)	P1144	1144	EC-432

Items (CONSULT-II screen terms)	DTC*1		Reference page
	CONSULT-II GST*2	ECM*3	
HO2S1 HTR (B1)	P0031	0031	EC-156
HO2S1 HTR (B1)	P0032	0032	EC-156
HO2S2 (B1)	P0138	0138	EC-251
HO2S2 (B1)	P0139	0139	EC-267
HO2S2 (B1)	P1146	1146	EC-444
HO2S2 (B1)	P1147	1147	EC-462
HO2S2 HTR (B1)	P0037	0037	EC-170
HO2S2 HTR (B1)	P0038	0038	EC-170
IAT SEN/CIRCUIT	P0112	0112	EC-189
IAT SEN/CIRCUIT	P0113	0113	EC-189
INT/V TIM CONT-B1	P0011	0011	EC-153
INT/V TIM V/CIR-B1	P1111	1111	EC-395
KNOCK SEN/CIRC-B1	P0327	0327	EC-344
KNOCK SEN/CIRC-B1	P0328	0328	EC-344
MAF SEN/CIRCUIT*5	P0102	0102	EC-183
MAF SEN/CIRCUIT*5	P0103	0103	EC-183
MAF SENSOR*5	P1102	1102	EC-389
MULTI CYL MISFIRE	P0300	0300	EC-338
NATS MALFUNCTION	P1610 - P1615	1610 - 1615	EC-75
NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	No DTC	Flashing*4	EC-76
NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	**P0000**	**0000**	**—**
P-N POS SW/CIRCUIT	P1706	1706	EC-511
PURG VOLUME CONT/V	P0444	0444	EC-369
PURG VOLUME CONT/V	P0445	0445	EC-369
PW ST P SEN/CIRC	P0550	0550	EC-377
SENSOR POWER/CIRC*5	P1229	1229	EC-507
TP SEN 1/CIRC*5	P0222	0222	EC-318
TP SEN 1/CIRC*5	P0223	0223	EC-318
TP SEN 2/CIRC*5	P1223	1223	EC-490
TP SEN 2/CIRC*5	P1224	1224	EC-490
TP SENSOR*5	P0221	0221	EC-312
TW CATALYST SYS-B1	P0420	0420	EC-361
VEH SPEED SEN/CIRC	P0500	0500	EC-375

*1: 1st trip DTC No. is the same as DTC No.
*2: These numbers are prescribed by ISO 15031-5.
*3: In Diagnostic Test Mode II (Self-diagnostic results), these numbers are controlled by NISSAN.
*4: When engine is running.
*5: When the fail-safe operation occurs, the MI illuminates.
*6: The troubleshooting for this DTC needs CONSULT-II.

QR18DE ENGINE MODELS

Items (CONSULT-II screen terms)	DTC*1		Reference page
	CONSULT-II GST*2	ECM*3	
A/T 1ST GR FNCTN	P0731	0731	AT-131
A/T 2ND GR FNCTN	P0732	0732	AT-138
A/T 3RD GR FNCTN	P0733	0733	AT-144
A/T 4TH GR FNCTN	P0734	0734	AT-150
APP SEN 1/CIRC*5	P0227	0227	EC-331
APP SEN 1/CIRC*5	P0228	0228	EC-331
APP SEN 2/CIRC*5	P1227	1227	EC-500
APP SEN 2/CIRC*5	P1228	1228	EC-500
APP SENSOR*5	P0226	0226	EC-324
ATF TEMP SEN/CIRC	P0710	0710	AT-116
BRAKE SW/CIRCUIT	P1805	1805	EC-515
CAN COMM CIRCUIT	U1000	1000*6	EC-150
CAN COMM CIRCUIT	U1001	1001*6	EC-150
CKP SEN/CIRCUIT	P0335	0335	EC-348
CMP SEN/CIRC-B1	P0340	0340	EC-355
CTP LEARNING	P1225	1225	EC-496
CTP LEARNING	P1226	1226	EC-498
CYL 1 MISFIRE	P0301	0301	EC-338
CYL 2 MISFIRE	P0302	0302	EC-338
CYL 3 MISFIRE	P0303	0303	EC-338
CYL 4 MISFIRE	P0304	0304	EC-338
ECM	P0605	0605	EC-382
ECM BACK UP/CIRC	P1065	1065	EC-385
ECT SEN/CIRCUIT*5	P0117	0117	EC-194
ECT SEN/CIRCUIT*5	P0118	0118	EC-194
ENG OVER TEMP	P1217	1217	EC-480
ENGINE SPEED SIG	P0725	0725	AT-127
ETC ACTR*5	P1121	1121	EC-400
ETC FUNCTION/CIRC*5	P1122	1122	EC-402
ETC MOT*5	P1128	1128	EC-415
ETC MOT PWR*5	P1124	1124	EC-409
ETC MOT PWR*5	P1126	1126	EC-409
FUEL SYS-LEAN-B1	P0171	0171	EC-291
FUEL SYS-LEAN-B2	P0174	0174	EC-291
FUEL SYS-RICH-B1	P0172	0172	EC-305
FUEL SYS-RICH-B2	P0175	0175	EC-305
HO2S1 (B1)	P0132	0132	EC-205
HO2S1 (B1)	P0133	0133	EC-223
HO2S1 (B1)	P0134	0134	EC-241

Items (CONSULT-II screen terms)	DTC*1		Reference page
	CONSULT-II GST*2	ECM*3	
HO2S1 (B1)	P1143	1143	EC-426
HO2S1 (B1)	P1144	1144	EC-438
HO2S1 (B2)	P0152	0152	EC-205
HO2S1 (B2)	P0153	0153	EC-223
HO2S1 (B2)	P0154	0154	EC-241
HO2S1 (B2)	P1163	1163	EC-426
HO2S1 (B2)	P1164	1164	EC-438
HO2S1 HTR (B1)	P0031	0031	EC-162
HO2S1 HTR (B1)	P0032	0032	EC-162
HO2S1 HTR (B2)	P0051	0051	EC-162
HO2S1 HTR (B2)	P0052	0052	EC-162
HO2S2 (B1)	P0138	0138	EC-258
HO2S2 (B1)	P0139	0139	EC-275
HO2S2 (B1)	P1146	1146	EC-452
HO2S2 (B1)	P1147	1147	EC-470
HO2S2 (B2)	P0158	0158	EC-258
HO2S2 (B2)	P0159	0159	EC-275
HO2S2 (B2)	P1166	1166	EC-452
HO2S2 (B2)	P1167	1167	EC-470
HO2S2 HTR (B1)	P0037	0037	EC-175
HO2S2 HTR (B1)	P0038	0038	EC-175
HO2S2 HTR (B2)	P0057	0057	EC-175
HO2S2 HTR (B2)	P0058	0058	EC-175
IAT SEN/CIRCUIT	P0112	0112	EC-189
IAT SEN/CIRCUIT	P0113	0113	EC-189
INT/V TIM CONT-B1	P0011	0011	EC-153
INT/V TIM V/CIR-B1	P1111	1111	EC-395
KNOCK SEN/CIRC-B1	P0327	0327	EC-344
KNOCK SEN/CIRC-B1	P0328	0328	EC-344
L/PRESS SOL/CIRC	P0745	0745	AT-163
MAF SEN/CIRCUIT*5	P0102	0102	EC-183
MAF SEN/CIRCUIT*5	P0103	0103	EC-183
MAF SENSOR*5	P1102	1102	EC-389
MULTI CYL MISFIRE	P0300	0300	EC-338
NATS MALFUNCTION	P1610 - P1615	1610 - 1615	EC-75
NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	No DTC	Flashing*4	EC-76
NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	**P0000**	**0000**	**—**
O/R CLTCH SOL/CIRC	P1760	1760	AT-185
P-N POS SW/CIRCUIT	P1706	1706	EC-511

Items (CONSULT-II screen terms)	DTC*1		Reference page
	CONSULT-II GST*2	ECM*3	
PNP SW/CIRC	P0705	0705	AT-110
PURG VOLUME CONT/V	P0444	0444	EC-369
PURG VOLUME CONT/V	P0445	0445	EC-369
PW ST P SEN/CIRC	P0550	0550	EC-377
SENSOR POWER/CIRC*5	P1229	1229	EC-507
SFT SOL A/CIRC*5	P0750	0750	AT-170
SFT SOL B/CIRC*5	P0755	0755	AT-175
TCC SOLENOID/CIRC	P0740	0740	AT-158
TP SEN 1/CIRC*5	P0222	0222	EC-318
TP SEN 1/CIRC*5	P0223	0223	EC-318
TP SEN 2/CIRC*5	P1223	1223	EC-490
TP SEN 2/CIRC*5	P1224	1224	EC-490
TP SENSOR*5	P0221	0221	EC-312
TPV SEN/CIRC A/T	P1705	1705	AT-180
TW CATALYST SYS-B1	P0420	0420	EC-365
TW CATALYST SYS-B2	P0430	0430	EC-365
VEH SPD SEN/CIR AT*7	P0720	0720	AT-122
VEH SPEED SEN/CIRC*7	P0500	0500	EC-375

*1: 1st trip DTC No. is the same as DTC No.
*2: These numbers are prescribed by ISO 15031-5.
*3: In Diagnostic Test Mode II (Self-diagnostic results), these numbers are controlled by NISSAN.
*4: When engine is running.
*5: When the fail-safe operation occurs, the MI illuminates.
*6: The trouble shooting for these DTCs needs CONSULT-II.
*7: When the fail-safe operations for both self-diagnoses occur, the MI illuminates.

NOTE:
Regarding P12 models with QG18DE engine, “B1” indicates bank 1, “B2” indicates bank 2.

DTC No. Index

EBS00EL7

Check if the vehicle is a model with Euro-OBD (E-OBD) system or not by the “Type approval number” on the identification plate. Refer to GI-46, "IDENTIFICATION PLATE" .

NOTE:
If DTC U1000 or U1001 is displayed with other DTC, first perform the trouble diagnosis for DTC U1000, U1001. Refer to EC-150, "DTC U1000, U1001 CAN COMMUNICATION LINE" .

QG16DE ENGINE MODELS

DTC*1		Items (CONSULT-II screen terms)	Reference page
CONSULT-II GST*2	ECM*3		
No DTC	Flashing*4	NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	EC-76
U1001	1001*6	CAN COMM CIRCUIT	EC-150
P0000	**0000**	**NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.**	—

DTC*1		Items (CONSULT-II screen terms)	Reference page
CONSULT-II GST*2	ECM*3		
P0011	0011	INT/V TIM CONT-B1	EC-153
P0031	0031	HO2S1 HTR (B1)	EC-156
P0032	0032	HO2S1 HTR (B1)	EC-156
P0037	0037	HO2S2 HTR (B1)	EC-170
P0038	0038	HO2S2 HTR (B1)	EC-170
P0102	0102	MAF SEN/CIRCUIT*5	EC-183
P0103	0103	MAF SEN/CIRCUIT*5	EC-183
P0112	0112	IAT SEN/CIRCUIT	EC-189
P0113	0113	IAT SEN/CIRCUIT	EC-189
P0117	0117	ECT SEN/CIRCUIT*5	EC-194
P0118	0118	ECT SEN/CIRCUIT*5	EC-194
P0132	0132	HO2S1 (B1)	EC-199
P0133	0133	HO2S1 (B1)	EC-214
P0134	0134	HO2S1 (B1)	EC-234
P0138	0138	HO2S2 (B1)	EC-251
P0139	0139	HO2S2 (B1)	EC-267
P0171	0171	FUEL SYS-LEAN-B1	EC-285
P0172	0172	FUEL SYS-RICH-B1	EC-299
P0221	0221	TP SENSOR*5	EC-312
P0222	0222	TP SEN 1/CIRC*5	EC-318
P0223	0223	TP SEN 1/CIRC*5	EC-318
P0226	0226	APP SENSOR*5	EC-324
P0227	0227	APP SEN 1/CIRC*5	EC-331
P0228	0228	APP SEN 1/CIRC*5	EC-331
P0300	0300	MULTI CYL MISFIRE	EC-338
P0301	0301	CYL 1 MISFIRE	EC-338
P0302	0302	CYL 2 MISFIRE	EC-338
P0303	0303	CYL 3 MISFIRE	EC-338
P0304	0304	CYL 4 MISFIRE	EC-338
P0327	0327	KNOCK SEN/CIRC-B1	EC-344
P0328	0328	KNOCK SEN/CIRC-B1	EC-344
P0335	0335	CKP SEN/CIRCUIT	EC-348
P0340	0340	CMP SEN/CIRC-B1	EC-355
P0420	0420	TW CATALYST SYS-B1	EC-361
P0444	0444	PURG VOLUME CONT/V	EC-369
P0445	0445	PURG VOLUME CONT/V	EC-369
P0500	0500	VEH SPEED SEN/CIRC	EC-375
P0550	0550	PW ST P SEN/CIRC	EC-377
P0605	0605	ECM	EC-382
P1065	1065	ECM BACK UP/CIRC	EC-385

DTC*1		Items (CONSULT-II screen terms)	Reference page
CONSULT-II GST*2	ECM*3		
P1102	1102	MAF SENSOR*5	EC-389
P1111	1111	INT/V TIM V/CIR-B1	EC-395
P1121	1121	ETC ACTR*5	EC-400
P1122	1122	ETC FUNCTION/CIRC*5	EC-402
P1124	1124	ETC MOT PWR*5	EC-409
P1126	1126	ETC MOT PWR*5	EC-409
P1128	1128	ETC MOT*5	EC-415
P1143	1143	HO2S1 (B1)	EC-420
P1144	1144	HO2S1 (B1)	EC-432
P1146	1146	HO2S2 (B1)	EC-444
P1147	1147	HO2S2 (B1)	EC-462
P1217	1217	ENG OVER TEMP	EC-480
P1223	1223	TP SEN 2/CIRC*5	EC-490
P1224	1224	TP SEN 2/CIRC*5	EC-490
P1225	1225	CTP LEARNING	EC-496
P1226	1226	CTP LEARNING	EC-498
P1227	1227	APP SEN 2/CIRC*5	EC-500
P1228	1228	APP SEN 2/CIRC*5	EC-500
P1229	1229	SENSOR POWER/CIRC*5	EC-507
P1610 - P1615	1610 - 1615	NATS MALFUNCTION	EC-75
P1706	1706	P-N POS SW/CIRCUIT	EC-511
P1805	1805	BRAKE SW/CIRCUIT	EC-515

*1: 1st trip DTC No. is the same as DTC No.
*2: These numbers are prescribed by ISO 15031-5.
*3: In Diagnostic Test Mode II (Self-diagnostic results), these numbers are controlled by NISSAN.
*4: When engine is running.
*5: When the fail-safe operation occurs, the MI illuminates.
*6: The trouble shooting for this DTC needs CONSULT-II.

QG18DE ENGINE MODELS

DTC*1		Items (CONSULT-II screen terms)	Reference page
CONSULT-II GST*2	ECM*3		
No DTC	Flashing*4	NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	EC-76
U1000	1000*6	CAN COMM CIRCUIT	EC-150
U1001	1001*6	CAN COMM CIRCUIT	EC-150
P0000	**0000**	**NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.**	—
P0011	0011	INT/V TIM CONT-B1	EC-153
P0031	0031	HO2S1 HTR (B1)	EC-162

DTC*1		Items (CONSULT-II screen terms)	Reference page
CONSULT-II GST*2	ECM*3		
P0032	0032	HO2S1 HTR (B1)	EC-162
P0037	0037	HO2S2 HTR (B1)	EC-175
P0038	0038	HO2S2 HTR (B1)	EC-175
P0051	0051	HO2S1 HTR (B2)	EC-162
P0052	0052	HO2S1 HTR (B2)	EC-162
P0057	0057	HO2S2 HTR (B2)	EC-175
P0058	0058	HO2S2 HTR (B2)	EC-175
P0102	0102	MAF SEN/CIRCUIT*5	EC-183
P0103	0103	MAF SEN/CIRCUIT*5	EC-183
P0112	0112	IAT SEN/CIRCUIT	EC-189
P0113	0113	IAT SEN/CIRCUIT	EC-189
P0117	0117	ECT SEN/CIRCUIT*5	EC-194
P0118	0118	ECT SEN/CIRCUIT*5	EC-194
P0132	0132	HO2S1 (B1)	EC-205
P0133	0133	HO2S1 (B1)	EC-223
P0134	0134	HO2S1 (B1)	EC-241
P0138	0138	HO2S2 (B1)	EC-258
P0139	0139	HO2S2 (B1)	EC-275
P0152	0152	HO2S1 (B2)	EC-205
P0153	0153	HO2S1 (B2)	EC-223
P0154	0154	HO2S1 (B2)	EC-241
P0158	0158	HO2S2 (B2)	EC-258
P0159	0159	HO2S2 (B2)	EC-275
P0171	0171	FUEL SYS-LEAN-B1	EC-291
P0172	0172	FUEL SYS-RICH-B1	EC-305
P0174	0174	FUEL SYS-LEAN-B2	EC-291
P0175	0175	FUEL SYS-RICH-B2	EC-305
P0221	0221	TP SENSOR*5	EC-312
P0222	0222	TP SEN 1/CIRC*5	EC-318
P0223	0223	TP SEN 1/CIRC*5	EC-318
P0226	0226	APP SENSOR*5	EC-324
P0227	0227	APP SEN 1/CIRC*5	EC-331
P0228	0228	APP SEN 1/CIRC*5	EC-331
P0300	0300	MULTI CYL MISFIRE	EC-338
P0301	0301	CYL 1 MISFIRE	EC-338
P0302	0302	CYL 2 MISFIRE	EC-338
P0303	0303	CYL 3 MISFIRE	EC-338
P0304	0304	CYL 4 MISFIRE	EC-338
P0327	0327	KNOCK SEN/CIRC-B1	EC-344
P0328	0328	KNOCK SEN/CIRC-B1	EC-344

DTC*1		Items (CONSULT-II screen terms)	Reference page
CONSULT-II GST*2	ECM*3		
P0335	0335	CKP SEN/CIRCUIT	EC-348
P0340	0340	CMP SEN/CIRC-B1	EC-355
P0420	0420	TW CATALYST SYS-B1	EC-365
P0430	0430	TW CATALYST SYS-B2	EC-365
P0444	0444	PURG VOLUME CONT/V	EC-369
P0445	0445	PURG VOLUME CONT/V	EC-369
P0500	0500	VEH SPEED SEN/CIRC*7	EC-375
P0550	0550	PW ST P SEN/CIRC	EC-377
P0605	0605	ECM	EC-382
P0705	0705	PNP SW/CIRC	AT-110
P0710	0710	ATF TEMP SEN/CIRC	AT-116
P0720	0720	VEH SPD SEN/CIRC AT*7	AT-122
P0725	0725	ENGINE SPEED SIG	AT-127
P0731	0731	A/T 1ST GR FNCTN	AT-131
P0732	0732	A/T 2ND GR FNCTN	AT-138
P0733	0733	A/T 3RD GR FNCTN	AT-144
P0734	0734	A/T 4TH GR FNCTN	AT-150
P0740	0740	TCC SOLENOID/CIRC	AT-158
P0745	0745	L/PRESS SOL/CIRC	AT-163
P0750	0750	SFT SOL A/CIRC*5	AT-170
P0755	0755	SFT SOL B/CIRC*5	AT-175
P1065	1065	ECM BACK UP/CIRC	EC-385
P1102	1102	MAF SENSOR*5	EC-389
P1111	1111	INT/V TIM V/CIR-B1	EC-395
P1121	1121	ETC ACTR*5	EC-400
P1122	1122	ETC FUNCTION/CIRC*5	EC-402
P1124	1124	ETC MOT PWR*5	EC-409
P1126	1126	ETC MOT PWR*5	EC-409
P1128	1128	ETC MOT*5	EC-415
P1143	1143	HO2S1 (B1)	EC-426
P1144	1144	HO2S1 (B1)	EC-438
P1146	1146	HO2S2 (B1)	EC-452
P1147	1147	HO2S2 (B1)	EC-470
P1163	1163	HO2S1 (B2)	EC-426
P1164	1164	HO2S1 (B2)	EC-438
P1166	1166	HO2S2 (B2)	EC-452
P1167	1167	HO2S2 (B2)	EC-470
P1217	1217	ENG OVER TEMP	EC-480
P1223	1223	TP SEN 2/CIRC*5	EC-490
P1224	1224	TP SEN 2/CIRC*5	EC-490

DTC*1		Items (CONSULT-II screen terms)	Reference page
CONSULT-II GST*2	ECM*3		
P1225	1225	CTP LEARNING	EC-496
P1226	1226	CTP LEARNING	EC-498
P1227	1227	APP SEN 2/CIRC*5	EC-500
P1228	1228	APP SEN 2/CIRC*5	EC-500
P1229	1229	SENSOR POWER/CIRC*5	EC-507
P1610 - P1615	1610 - 1615	NATS MALFUNCTION	EC-75
P1705	1705	TPV SEN/CIRC A/T	AT-180
P1706	1706	P-N POS SW/CIRCUIT	EC-511
P1760	1760	O/R CLTCH SOL/CIRC	AT-185
P1805	1805	BRAKE SW/CIRCUIT	EC-515

*1: 1st trip DTC No. is the same as DTC No.
*2: These numbers are prescribed by ISO 15031-5.
*3: In Diagnostic Test Mode II (Self-diagnostic results), these numbers are controlled by NISSAN.
*4: When engine is running.
*5: When the fail-safe operation occurs, the MI illuminates.
*6: The trouble shooting for these DTCs need CONSULT-II.
*7: When the fail-safe operations for both self-diagnoses occur at the same time, the MI illuminates.

NOTE:
Regarding P12 models with QG18DE engine, “B1” indicates bank 1, “B2” indicates bank 2.

PRECAUTIONS

PFP:00001

Precautions for Supplemental Restraint System (SRS) “AIR BAG” and “SEAT BELT PRE-TENSIONER”

EBS00EL8

The Supplemental Restraint System such as "AIR BAG" and "SEAT BELT PRE-TENSIONER", used along with a front seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. Information necessary to service the system safely is included in the SRS and SB section of this Service Manual.

WARNING:

- **To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance must be performed by an authorized NISSAN/INFINITI dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system. For removal of Spiral Cable and Air Bag Module, see the SRS section.**
- **Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses can be identified by yellow and/or orange harness connectors.**

On Board Diagnostic (OBD) System of Engine and A/T

EBS00EL9

The ECM has an on board diagnostic system. It will light up the malfunction indicator (MI) to warn the driver of a malfunction causing emission deterioration.

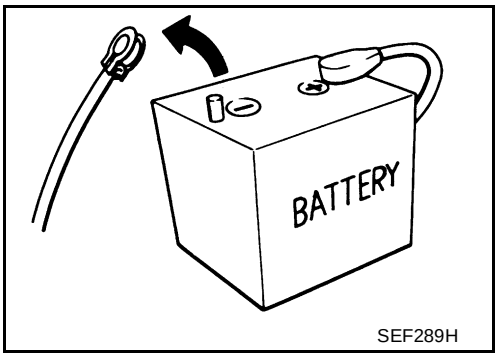
CAUTION:

- **Be sure to turn the ignition switch OFF and disconnect the battery ground cable before any repair or inspection work. The open/short circuit of related switches, sensors, solenoid valves, etc. will cause the MI to light up.**
- **Be sure to connect and lock the connectors securely after work. A loose (unlocked) connector will cause the MI to light up due to the open circuit. (Be sure the connector is free from water, grease, dirt, bent terminals, etc.)**
- **Certain systems and components, especially those related to OBD, may use a new style slide-locking type harness connector. For description and how to disconnect, refer to PG-86, "HARNESS CONNECTOR" .**
- **Be sure to route and secure the harnesses properly after work. The interference of the harness with a bracket, etc. may cause the MI to light up due to the short circuit.**
- **Be sure to connect rubber tubes properly after work. A misconnected or disconnected rubber tube may cause the MI to light up due to the malfunction of the fuel injection system, etc.**
- **Be sure to erase the unnecessary malfunction information (repairs completed) from the ECM and TCM (Transmission control module) before returning the vehicle to the customer.**

Precaution

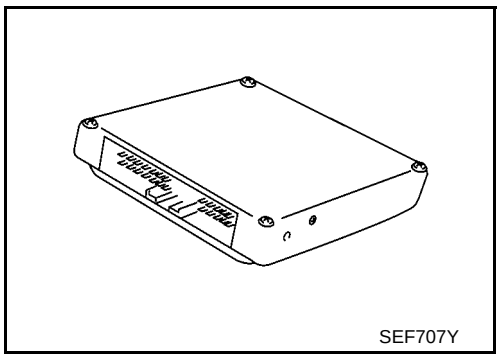
EBS00ELA

- **Always use a 12 volt battery as power source.**
- **Do not attempt to disconnect battery cables while engine is running.**
- **Before connecting or disconnecting the ECM harness connector, turn ignition switch OFF and disconnect battery ground cable. Failure to do so may damage the ECM because battery voltage is applied to ECM even if ignition switch is turned off.**
- **Before removing parts, turn ignition switch OFF and then disconnect battery ground cable.**

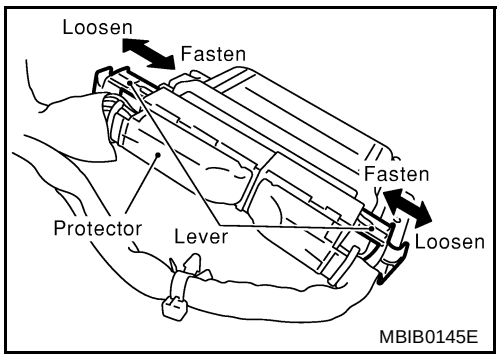


SEF289H

- **Do not disassemble ECM.**
- **If battery cable is disconnected, the memory will return to the initial ECM values.**
  The ECM will now start to self-control at its initial values. Engine operation can vary slightly when the cable is disconnected. However, this is not an indication of a problem. Do not replace parts because of a slight variation.

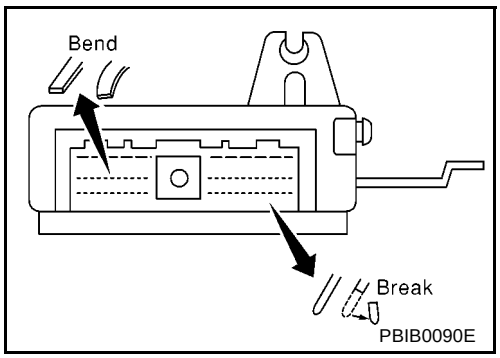

SEF707Y

- **When connecting ECM harness connector, fasten it securely with levers as far as they will go as shown at right.**



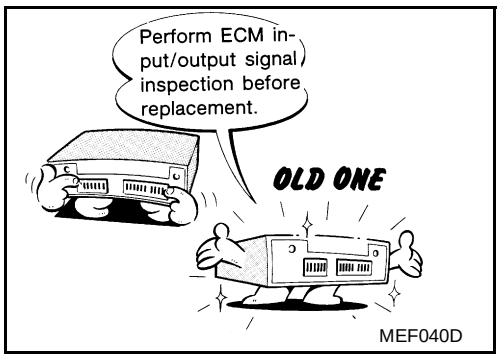
MBIB0145E

- **When connecting or disconnecting pin connectors into or from ECM, take care not to damage pin terminals (bend or break).**
  Make sure that there are not any bends or breaks on ECM pin terminal, when connecting pin connectors.
- **Securely connect ECM harness connectors.**
  A poor connection can cause an extremely high (surge) voltage to develop in coil and condenser, thus resulting in damage to ICs.
- **Keep engine control system harness at least 10 cm (4 in) away from adjacent harness, to prevent engine control system malfunctions due to receiving external noise, degraded operation of ICs, etc.**
- **Keep engine control system parts and harness dry.**



PBIB0090E

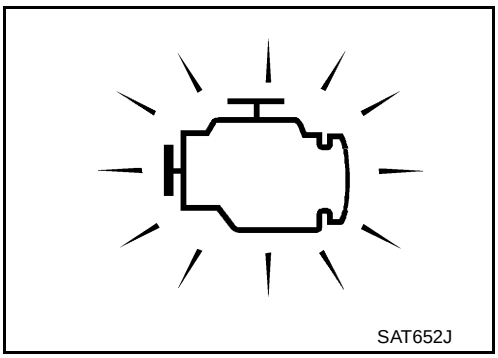
- **Before replacing ECM, perform “ECM Terminals and Reference Value” inspection and make sure ECM functions properly. Refer to EC-107, "ECM Terminals and Reference Value".**
- **Handle mass air flow sensor carefully to avoid damage.**
- **Do not disassemble mass air flow sensor.**
- **Do not clean mass air flow sensor with any type of detergent.**
- **Do not disassemble electric throttle control actuator.**
- **Even a slight leak in the air intake system can cause serious problems.**



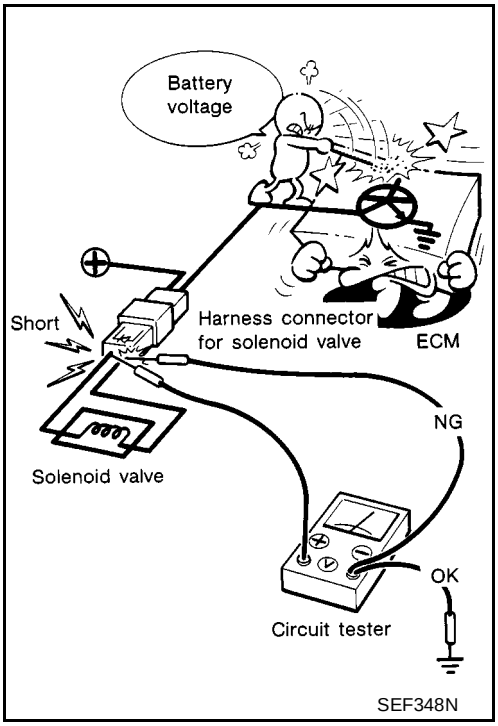
MEF040D

- **Do not shock or jar the camshaft position sensor (PHASE), crankshaft position sensor (POS).**

- **After performing each TROUBLE DIAGNOSIS, perform "DTC Confirmation Procedure" or "Overall Function Check".**
  The DTC should not be displayed in the "DTC Confirmation Procedure" if the repair is completed. The "Overall Function Check" should be a good result if the repair is completed.

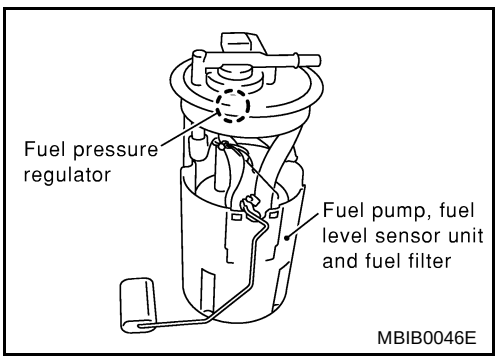

SAT652J

- **When measuring ECM signals with a circuit tester, connect a break-out box (SST) and Y-cable adapter (SST) between the ECM and ECM harness connector.**
- **When measuring ECM signals with a circuit tester, never allow the two tester probes to contact.**
  Accidental contact of probes will cause a short circuit and damage the ECM power transistor.
- **Do not use ECM ground terminals when measuring input/ output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**



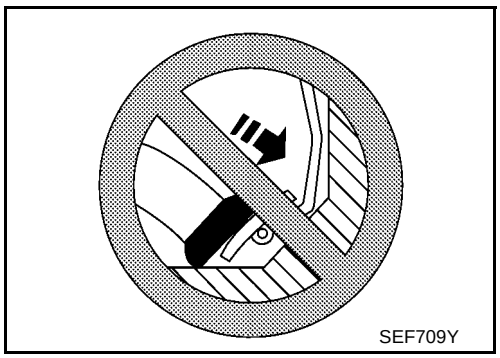
SEF348N

- **Do not operate fuel pump when there is no fuel in lines.**
- **Tighten fuel hose clamps to the specified torque.**

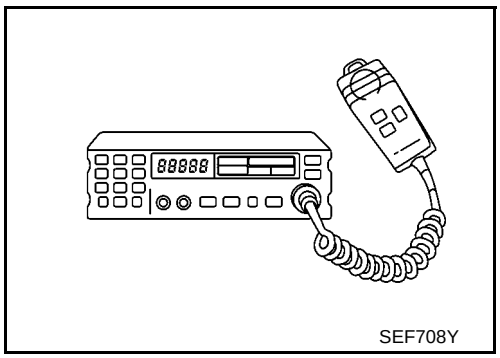


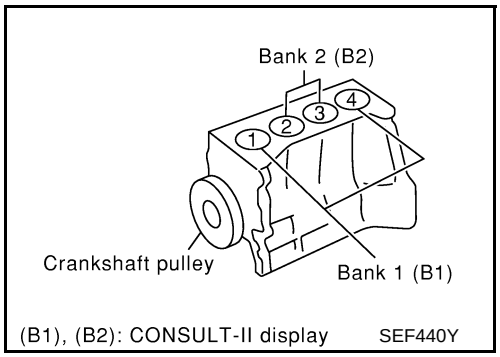
MBIB0046E

- **Do not depress accelerator pedal when starting.**
- **Immediately after starting, do not rev up engine unnecessarily.**
- **Do not rev up engine just prior to shutdown.**


SEF709Y

- **When installing C.B. ham radio or a mobile phone, be sure to observe the following as it may adversely affect electronic control systems depending on installation location.**
  - **Keep the antenna as far as possible from the electronic control units.**
  - **Keep the antenna feeder line more than 20 cm (8 in) away from the harness of electronic controls.**
    Do not let them run parallel for a long distance.
  - **Adjust the antenna and feeder line so that the standing-wave radio can be kept smaller.**
  - **Be sure to ground the radio to vehicle body.**
- **Regarding P12 models with QG18DE engine, “B1” indicates bank 1 (cylinders number 1 and 4), “B2” indicates bank 2 (cylinders number 2 and 3).**


SEF708Y



(B1), (B2): CONSULT-II display SEF440Y

Wiring Diagrams and Trouble Diagnosis

EBS00ELB

When you read wiring diagrams, refer to the following:

- GI-14, "How to Read Wiring Diagrams"
- PG-3, "POWER SUPPLY ROUTING" for power distribution circuit

When you perform trouble diagnosis, refer to the following:

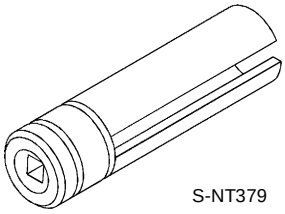
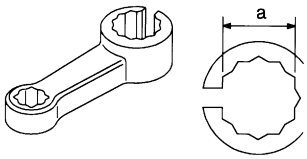
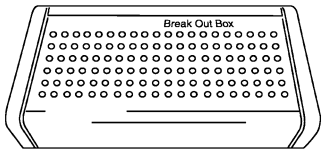
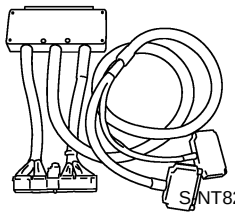
- GI-11, "HOW TO FOLLOW TEST GROUPS IN TROUBLE DIAGNOSES"
- GI-24, "How to Perform Efficient Diagnosis for an Electrical Incident"

PREPARATION

PFP:00002

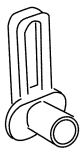
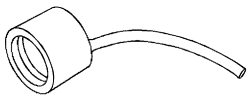
Special Service Tools

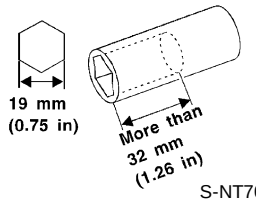
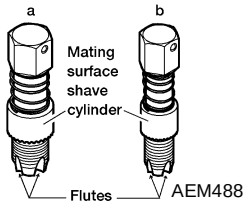
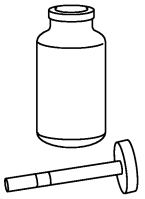
EBS00ELC

Tool number Tool name	Description	
KV10117100 Heated oxygen sensor wrench	 S-NT379	Loosening or tightening heated oxygen sensors with 22 mm (0.87 in) hexagon nut
KV10114400 Heated oxygen sensor wrench	 S-NT636	Loosening or tightening heated oxygen sensors **a: 22 mm (0.87 in)**
KV109E0010 Break-out box	 S-NT825	Measuring the ECM signals with a circuit tester
KV109E0080 Y-cable adapter	 S-NT826	Measuring the ECM signals with a circuit tester

Commercial Service Tools

EBS00ELD

Tool name	Description	
Quick connector release	 PBIC0198E	Removing fuel tube quick connectors in engine room (Available in SEC. 164 of PARTS CATALOG: Part No. 16441 6N210)
Fuel filler cap adapter	 S-NT653	Checking fuel tank vacuum relief valve opening pressure

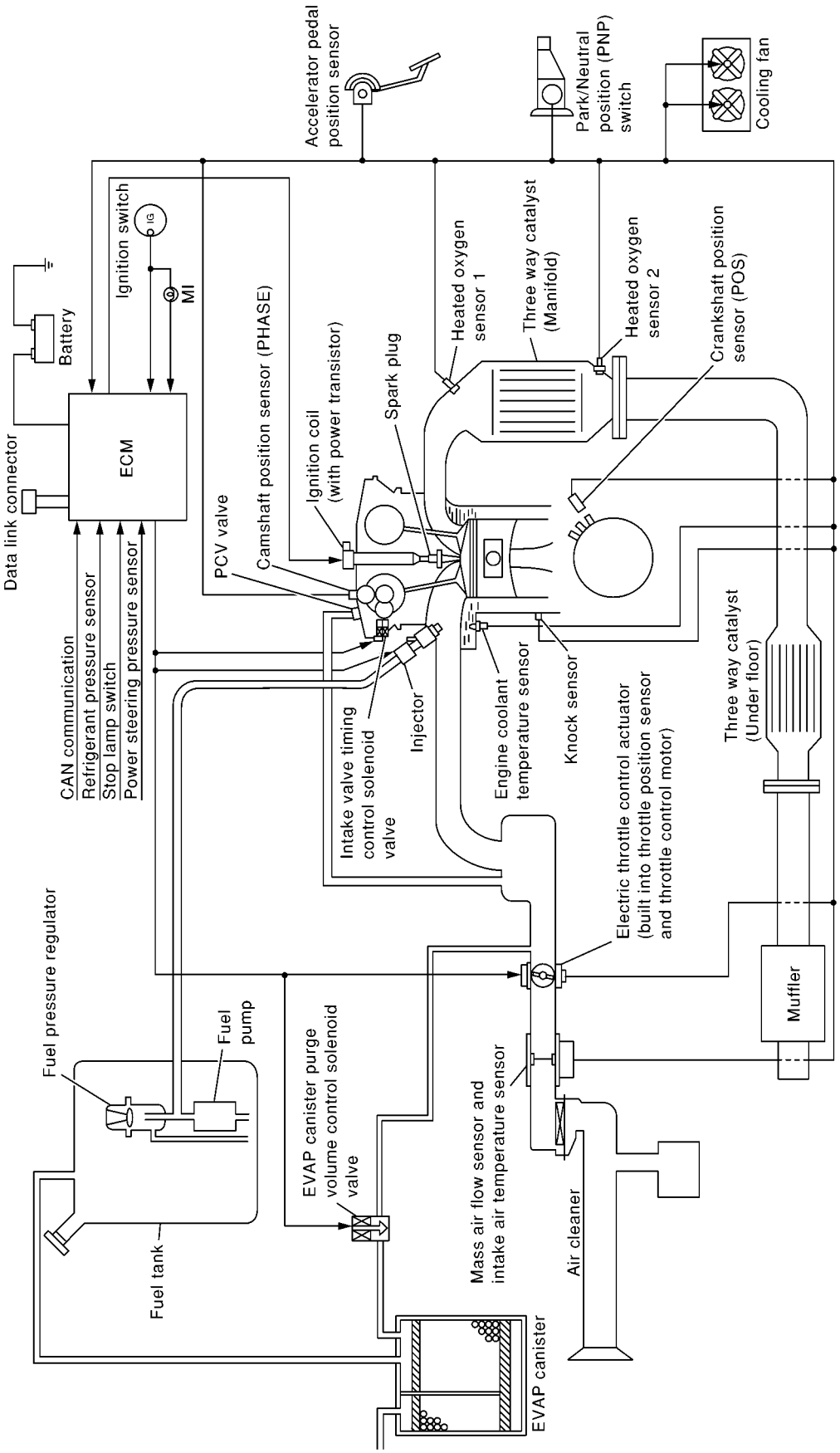
Tool name	Description	
Socket wrench	 S-NT705	Removing and installing engine coolant temperature sensor
Oxygen sensor thread cleaner ie: (J-43897-18) (J-43897-12)	 AEM488	Reconditioning the exhaust system threads before installing a new oxygen sensor. Use with anti-seize lubricant shown below. **a: 18 mm diameter with pitch 1.5 mm for Zirconia Oxygen Sensor** **b: 12 mm diameter with pitch 1.25 mm for Titania Oxygen Sensor**
Anti-seize lubricant ie: (Permatex™ 133AR or equivalent meeting MIL specification MIL-A-907)	 S-NT779	Lubricating oxygen sensor thread cleaning tool when reconditioning exhaust system threads.

ENGINE CONTROL SYSTEM

PFP:23710

System Diagram - QG16DE Engine Models

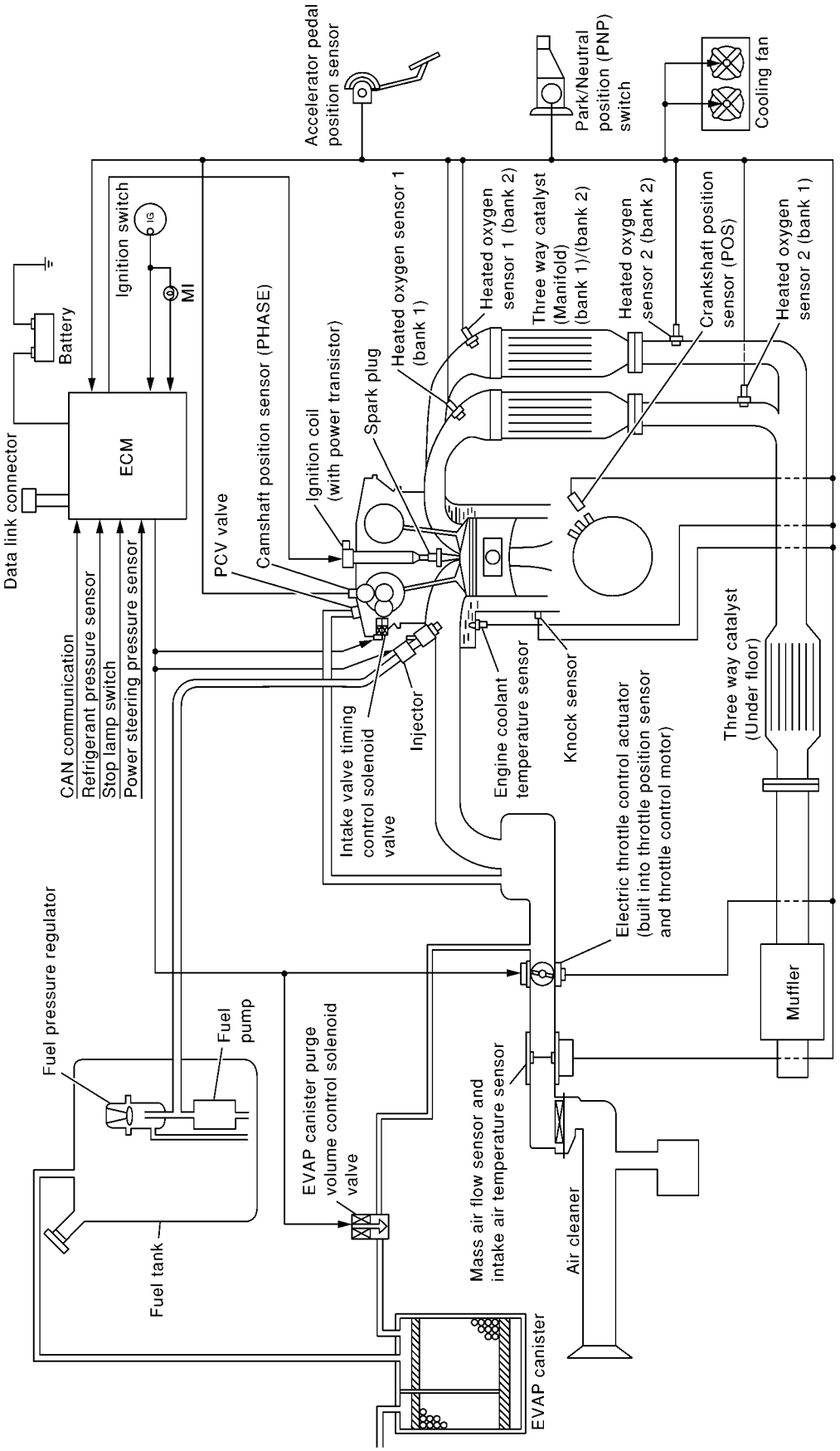
EBS00ELE



MBIB0011E

System Diagram - QG18DE Engine Models

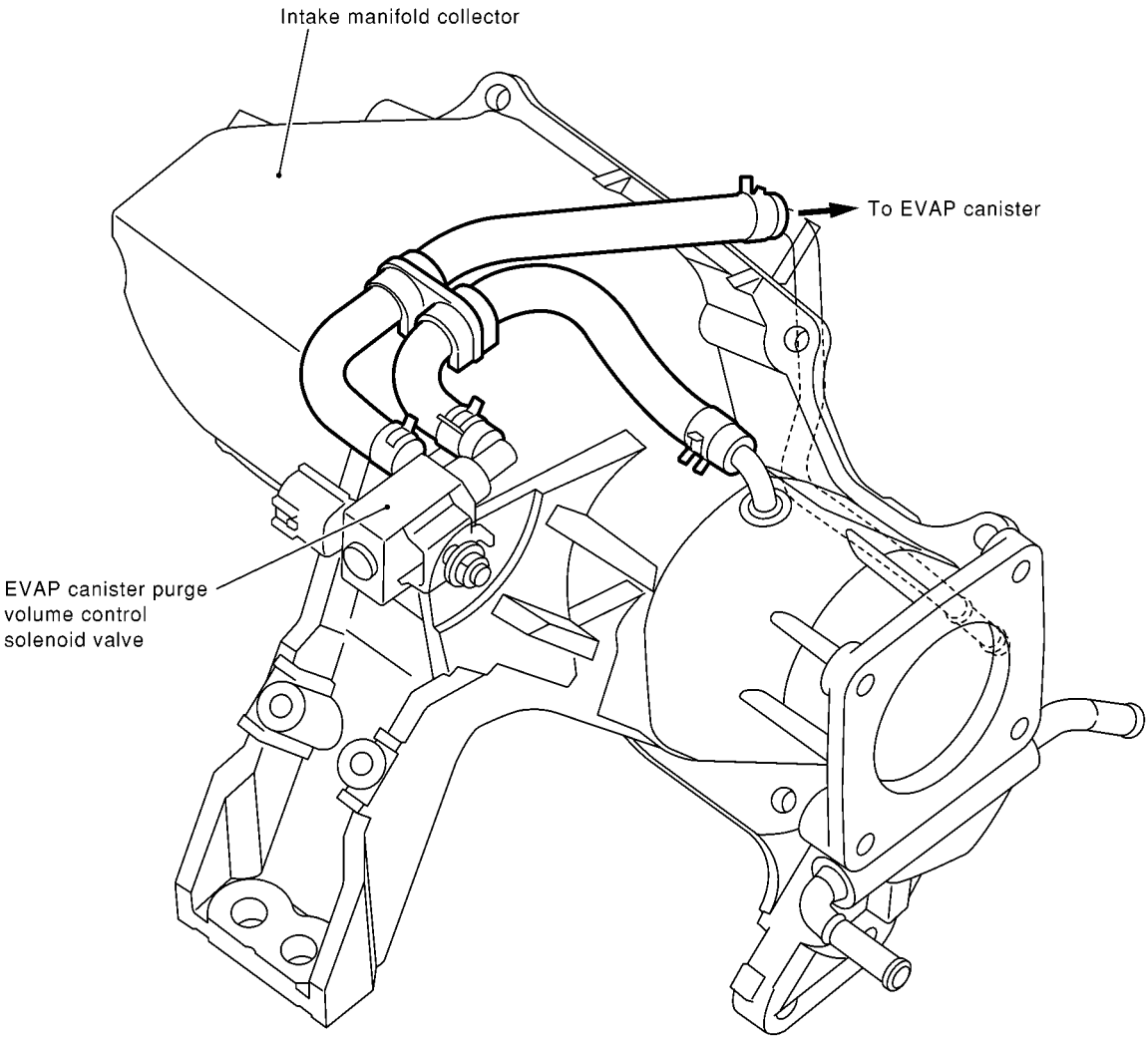
EBS00GBC



MBIB0012E

Vacuum Hose Drawing

EBS00ELF



NOTE: Do not use soapy water or any type of solvent while installing vacuum hose or purge hoses.

MBIB0013E

Refer to EC-39, "System Diagram - QG16DE Engine Models" or EC-40, "System Diagram - QG18DE Engine Models" for Vacuum Control System.

System Chart

EBS00ELG

Input (Sensor)	ECM Function	Output (Actuator)
● Camshaft position sensor (PHASE) ● Crankshaft position sensor (POS) ● Mass air flow sensor ● Engine coolant temperature sensor ● Heated oxygen sensor 1 ● Throttle position sensor ● Accelerator pedal position sensor ● Park/neutral position (PNP) switch ● Intake air temperature sensor ● Power steering pressure sensor ● Ignition switch ● Stop lamp switch ● Battery voltage ● Knock sensor ● Refrigerant pressure sensor ● Heated oxygen sensor 2*1 ● TCM (Transmission control module)*2 ● Air conditioner switch*2 ● Vehicle speed signal*2 ● Electrical load signal*2	Fuel injection & mixture ratio control	Fuel injectors
	Electronic ignition system	Power transistor
	Fuel pump control	Fuel pump relay
	On board diagnostic system	MI (On the instrument panel)*3
	Intake valve timing control	Intake valve timing control solenoid valve
	Heated oxygen sensor 1 heater control	Heated oxygen sensor 1 heater
	Heated oxygen sensor 2 heater control	Heated oxygen sensor 2 heater
	EVAP canister purge flow control	EVAP canister purge volume control solenoid valve
	Air conditioning cut control	Air conditioner relay*3
	Cooling fan control	Cooling fan relay*3

*1: This sensor is not used to control the engine system under normal conditions.
*2: The signals are sent to the ECM through CAN communication line.
*3: The output signals are sent from the ECM through CAN communication line.

Multiport Fuel Injection (MFI) System

EBS00ELH

INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM Function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*3 and piston position	Fuel injection & mixture ratio control	Fuel injectors
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Heated oxygen sensor 1	Density of oxygen in exhaust gas		
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Accelerator pedal position		
Park/neutral position (PNP) switch	Gear position		
Knock sensor	Engine knocking condition		
Battery	Battery voltage*3		
Power steering pressure sensor	Power steering operation		
Heated oxygen sensor 2*2	Density of oxygen in exhaust gas		
Vehicle speed signal*2	Vehicle speed		
Air conditioner switch*2	Air conditioner operation		

*1: Under normal conditions, this sensor is not for engine control operation.
*2: This signal is sent to the ECM through CAN communication line.
*3: ECM determines the start signal status by the signals of engine speed and battery voltage.

SYSTEM DESCRIPTION

The amount of fuel injected from the fuel injector is determined by the ECM. The ECM controls the length of time the valve remains open (injection pulse duration). The amount of fuel injected is a program value in the ECM memory. The program value is preset by engine operating conditions. These conditions are determined by input signals (for engine speed and intake air) from the crankshaft position sensor (POS), the camshaft position sensor (PHASE) and the mass air flow sensor.

VARIOUS FUEL INJECTION INCREASE/DECREASE COMPENSATION

In addition, the amount of fuel injected is compensated to improve engine performance under various operating conditions as listed below.

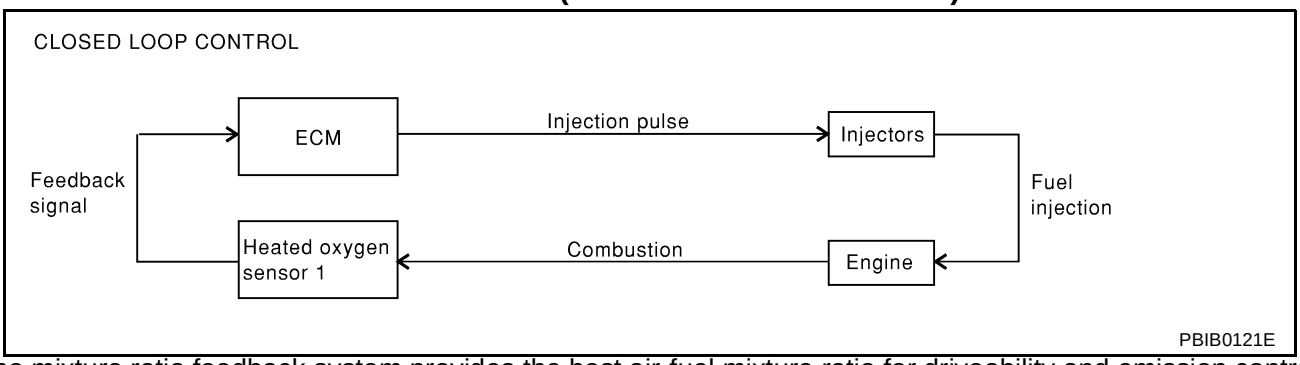
<Fuel increase>

- During warm-up
- When starting the engine
- During acceleration
- Hot-engine operation
- When selector lever is changed from “N” to “D” (A/T models)
- High-load, high-speed operation

<Fuel decrease>

- During deceleration
- During high engine speed operation

MIXTURE RATIO FEEDBACK CONTROL (CLOSED LOOP CONTROL)



The mixture ratio feedback system provides the best air-fuel mixture ratio for driveability and emission control. The three way catalyst (manifold) can then better reduce CO, HC and NOx emissions. This system uses heated oxygen sensor 1 in the exhaust manifold to monitor if the engine operation is rich or lean. The ECM adjusts the injection pulse width according to the sensor voltage signal. For more information about heated oxygen sensor 1, refer to EC-214 (QG16DE engine models) or EC-223 (QG18DE engine models). This maintains the mixture ratio within the range of stoichiometric (ideal air-fuel mixture).
This stage is referred to as the closed loop control condition.
Heated oxygen sensor 2 is located downstream of the three way catalyst (manifold). Even if the switching characteristics of heated oxygen sensor 1 shift, the air-fuel ratio is controlled to stoichiometric by the signal from heated oxygen sensor 2.

Open Loop Control

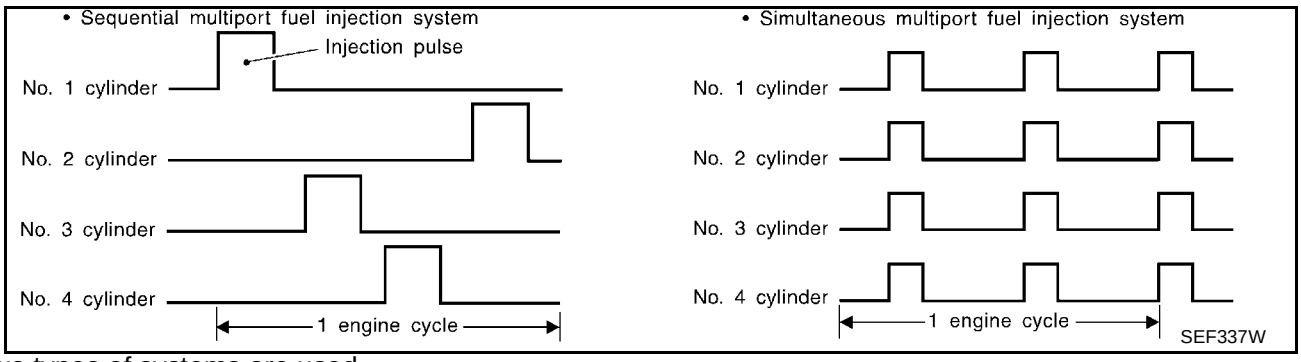
The open loop system condition refers to when the ECM detects any of the following conditions. Feedback control stops in order to maintain stabilized fuel combustion.

- Deceleration and acceleration
- High-load, high-speed operation
- Malfunction of heated oxygen sensor 1 or its circuit
- Insufficient activation of heated oxygen sensor 1 at low engine coolant temperature
- High engine coolant temperature
- During warm-up
- After shifting from “N” to “D” (A/T models)
- When starting the engine

MIXTURE RATIO SELF-LEARNING CONTROL

The mixture ratio feedback control system monitors the mixture ratio signal transmitted from heated oxygen sensor 1. This feedback signal is then sent to the ECM. The ECM controls the basic mixture ratio as close to the theoretical mixture ratio as possible. However, the basic mixture ratio is not necessarily controlled as originally designed. Both manufacturing differences (i.e., mass air flow sensor hot film) and characteristic changes during operation (i.e., injector clogging) directly affect mixture ratio.
Accordingly, the difference between the basic and theoretical mixture ratios is monitored in this system. This is then computed in terms of “injection pulse duration” to automatically compensate for the difference between the two ratios.
“Fuel trim” refers to the feedback compensation value compared against the basic injection duration. Fuel trim includes short term fuel trim and long term fuel trim.
“Short term fuel trim” is the short-term fuel compensation used to maintain the mixture ratio at its theoretical value. The signal from heated oxygen sensor 1 indicates whether the mixture ratio is RICH or LEAN compared to the theoretical value. The signal then triggers a reduction in fuel volume if the mixture ratio is rich, and an increase in fuel volume if it is lean.
“Long term fuel trim” is overall fuel compensation carried out long-term to compensate for continual deviation of the short term fuel trim from the central value. Such deviation will occur due to individual engine differences, wear over time and changes in the usage environment.

FUEL INJECTION TIMING



Two types of systems are used.

Sequential Multiport Fuel Injection System

Fuel is injected into each cylinder during each engine cycle according to the firing order. This system is used when the engine is running.

Simultaneous Multiport Fuel Injection System

Fuel is injected simultaneously into all four cylinders twice each engine cycle. In other words, pulse signals of the same width are simultaneously transmitted from the ECM.
The four injectors will then receive the signals two times for each engine cycle.
This system is used when the engine is being started and/or if the fail-safe system (CPU) is operating.

FUEL SHUT-OFF

Fuel to each cylinder is cut off during deceleration or operation of the engine at excessively high speeds.

Electronic Ignition (EI) System

EBS00ELI

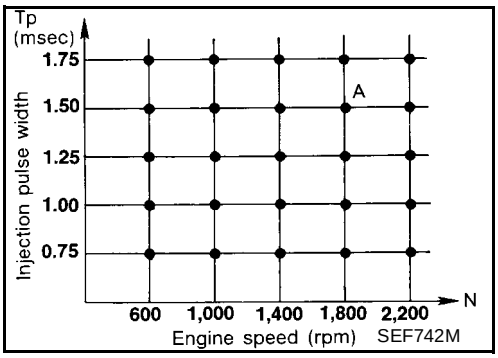
INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM Function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*2 and piston position	Ignition timing control	Power transistor
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Accelerator pedal position		
Knock sensor	Engine knocking		
Park/neutral position (PNP) switch	Gear position		
Battery	Battery voltage*2		
Vehicle speed signal*1	Vehicle speed		

*1: This signal is sent to the ECM through CAN communication line.
*2: ECM determines the start signal status by the signals of engine speed and battery voltage.

SYSTEM DESCRIPTION

The ignition timing is controlled by the ECM to maintain the best air-fuel ratio for every running condition of the engine. The ignition timing data is stored in the ECM. This data forms the map shown.
The ECM receives information such as the injection pulse width and camshaft position sensor signal. Computing this information, ignition signals are transmitted to the power transistor.
e.g., N: 1,800 rpm, Tp: 1.50 msec
A °BTDC
During the following conditions, the ignition timing is revised by the ECM according to the other data stored in the ECM.



- At starting
- During warm-up
- At idle
- At low battery voltage
- During acceleration

The knock sensor retard system is designed only for emergencies. The basic ignition timing is programmed within the anti-knocking zone, if recommended fuel is used under dry conditions. The retard system does not operate under normal driving conditions. If engine knocking occurs, the knock sensor monitors the condition. The signal is transmitted to the ECM. The ECM retards the ignition timing to eliminate the knocking condition.

Air Conditioning Cut Control

EBS00ELJ

INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM Function	Actuator
Air conditioner switch*1	Air conditioner “ON” signal	Air conditioner cut control	Air conditioner relay
Throttle position sensor	Throttle valve opening angle		
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*2		
Engine coolant temperature sensor	Engine coolant temperature		
Battery	Battery voltage*2		
Refrigerant pressure sensor	Refrigerant pressure		
Power steering pressure sensor	Power steering operation		
Vehicle speed signal*1	Vehicle speed		

*1: These signals are sent to the ECM through CAN communication line.
*2: ECM determines the start signal status by the signals of engine speed and battery voltage.

SYSTEM DESCRIPTION

This system improves engine operation when the air conditioner is used.
Under the following conditions, the air conditioner is turned off.

- When the accelerator pedal is fully depressed.
- When cranking the engine.
- At high engine speeds.
- When the engine coolant temperature becomes excessively high.
- When operating power steering during low engine speed or low vehicle speed.
- When engine speed is excessively low.
- When refrigerant pressure is excessively low or high.

Fuel Cut Control (at No Load and High Engine Speed)

EBS00ELK

INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM Function	Actuator
Park/neutral position (PNP) switch	Neutral position	Fuel cut control	Fuel injectors
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Accelerator pedal position		
Engine coolant temperature sensor	Engine coolant temperature		
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed		
Vehicle speed signal*1	Vehicle speed		

*1: This signal is sent to the ECM through CAN communication line.

SYSTEM DESCRIPTION

If the engine speed is above 3,950 rpm with no load (for example, in neutral and engine speed over 3,950 rpm) fuel will be cut off after some time. The exact time when the fuel is cut off varies based on engine speed. Fuel cut will operate until the engine speed reaches 1,500 rpm, then fuel cut is cancelled.

NOTE:
This function is different from deceleration control listed under “Multiport Fuel Injection (MFI) System”, EC-42 .

CAN communication

EBS00ELL

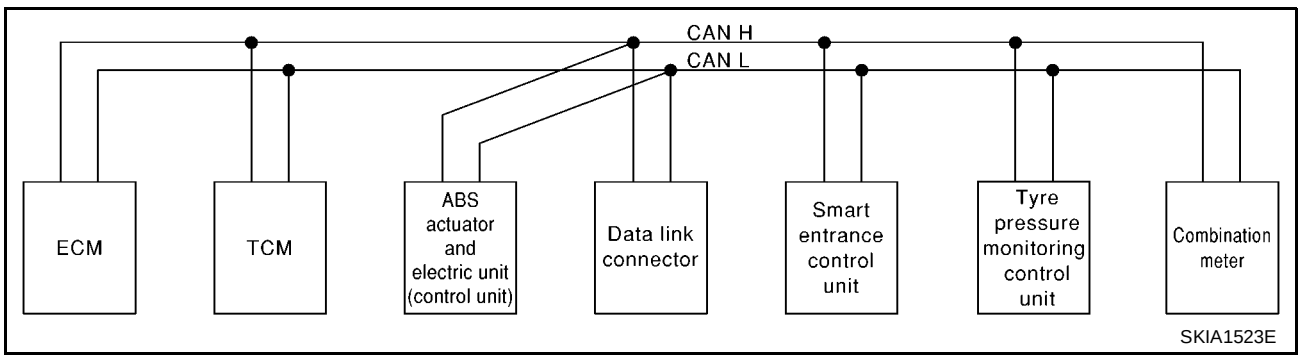
SYSTEM DESCRIPTION

CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent error detection ability. Many electronic control units are equipped onto a vehicle, and each control unit shares information and links with other control units during operation (not independent). In CAN communication, control units are connected with 2 communication lines (CAN H line, CAN L line) allowing a high rate of information transmission with less wiring. Each control unit transmits/receives data but selectively reads required data only.

LHD MODELS WITH TYRE PRESSURE MONITORING SYSTEM

A/T Models

System diagram



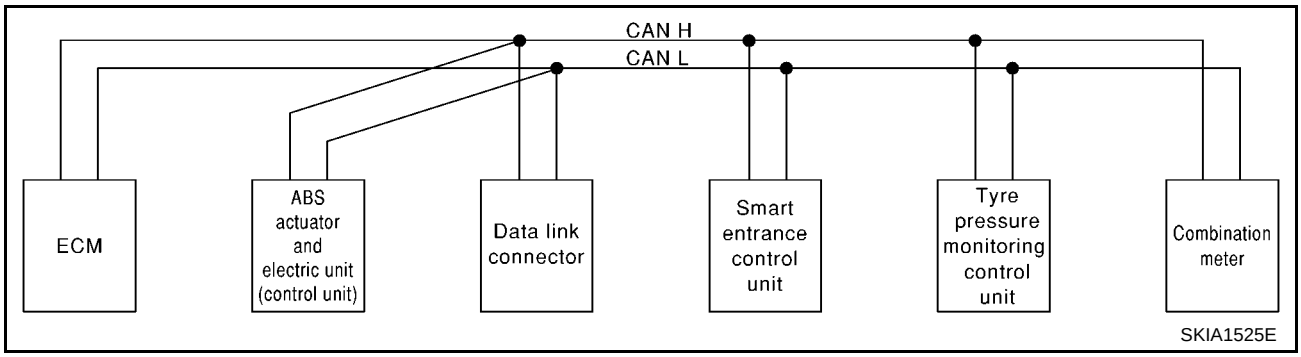
Input/output signal chart

T: Transmit R: Receive

Signals	ECM	TCM	ABS actuator and electric unit (control unit)	Smart entrance control unit	Tyre pressure monitoring control unit	Combination meter
Engine speed signal	T	R				R
Stop lamp switch signal		R	T			
Rear window defogger signal	R			T		
Heater fan switch signal	R					T
Air conditioner switch signal	R					T
MI signal	T					R
Current gear position signal		T				R
Engine coolant temperature signal	T					R
Fuel consumption signal	T					R
Vehicle speed signal			T			R
	R					T
Seat belt reminder signal				R		T
Headlamp switch signal				T		R
Flashing indicator signal				T		R
Engine cooling fan speed signal	T			R		
Child lock indicator signal				T		R
Door switches state signal				T		R
Key ID signal	R			T		
	T			R		
A/C compressor signal	T			R		
Tire pressure signal					T	R

M/T Models

System diagram



Input/output signal chart

T: Transmit R: Receive

Signals	ECM	ABS actuator and electric unit (control unit)	Smart entrance control unit	Tyre pressure monitoring control unit	Combination meter
Engine speed signal	T				R
Rear window defogger signal	R*1		T		
Heater fan switch signal	R*1				T
Air conditioner switch signal	R				T

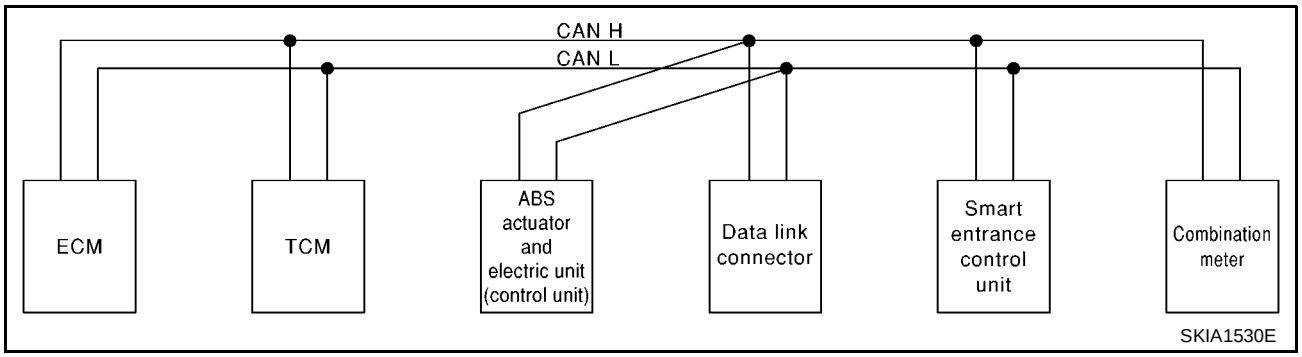
Signals	ECM	ABS actuator and electric unit (control unit)	Smart entrance control unit	Tyre pressure monitoring control unit	Combination meter
MI signal	T				R
Glow lamp signal*2	T				R
Engine coolant temperature signal	T				R
Fuel consumption signal	T				R
Vehicle speed signal		T			R
	R				T
Seat belt reminder signal			R		T
Headlamp switch signal			T		R
Flashing indicator signal			T		R
Engine cooling fan speed signal	T		R		
Child lock indicator signal			T		R
Door switches state signal			T		R
Key ID signal	R		T		
	T		R		
A/C compressor signal	T		R		
Tire pressure signal				T	R

*1: Except YD22DDTi engine model
*2: YD22DDTi engine model only

LHD MODELS WITHOUT TYRE PRESSURE MONITORING SYSTEM

A/T Models

System diagram



Input/output signal chart

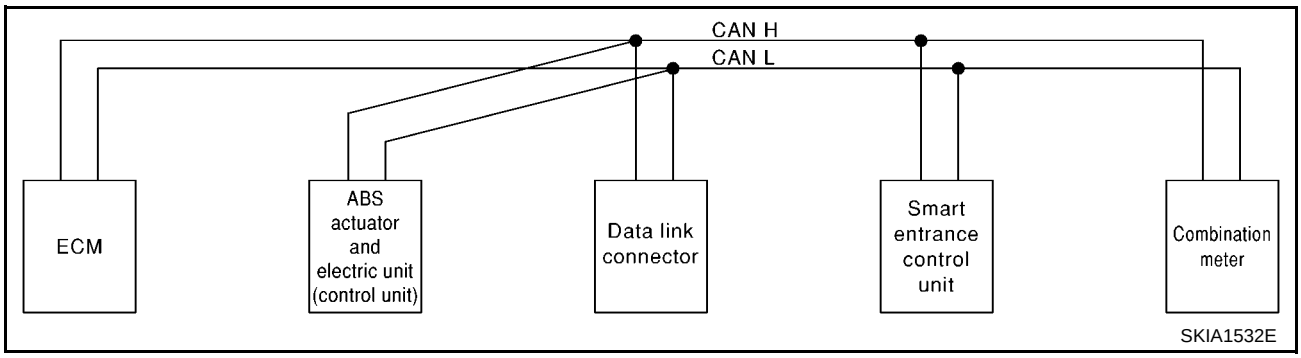
T: Transmit R: Receive

Signals	ECM	TCM	ABS actuator and electric unit (control unit)	Smart entrance control unit	Combination meter
Engine speed signal	T	R			R
Stop lamp switch signal		R	T		
Rear window defogger signal	R			T	
Heater fan switch signal	R				T
Air conditioner switch signal	R				T
MI signal	T				R
Current gear position signal		T			R
Engine coolant temperature signal	T				R

Signals	ECM	TCM	ABS actuator and electric unit (control unit)	Smart entrance control unit	Combination meter
Fuel consumption signal	T				R
Vehicle speed signal			T		R
	R				T
Seat belt reminder signal				R	T
Headlamp switch signal				T	R
Flashing indicator signal				T	R
Engine cooling fan speed signal	T			R	
Child lock indicator signal				T	R
Door switches state signal				T	R
Key ID signal	R			T	
	T			R	
A/C compressor signal	T			R	

M/T Models

System diagram



Input/output signal chart

T: Transmit R: Receive

Signals	ECM	ABS actuator and electric unit (control unit)	Smart entrance control unit	Combination meter
Engine speed signal	T			R
Rear window defogger signal	R*1		T	
Heater fan switch signal	R*1			T
Air conditioner switch signal	R			T
MI signal	T			R
Glow lamp signal*2	T			R
Engine coolant temperature signal	T			R
Fuel consumption signal	T			R
Vehicle speed signal		T		R
	R			T
Seat belt reminder signal			R	T
Headlamp switch signal			T	R
Flashing indicator signal			T	R
Engine cooling fan speed signal	T		R	
Child lock indicator signal			T	R

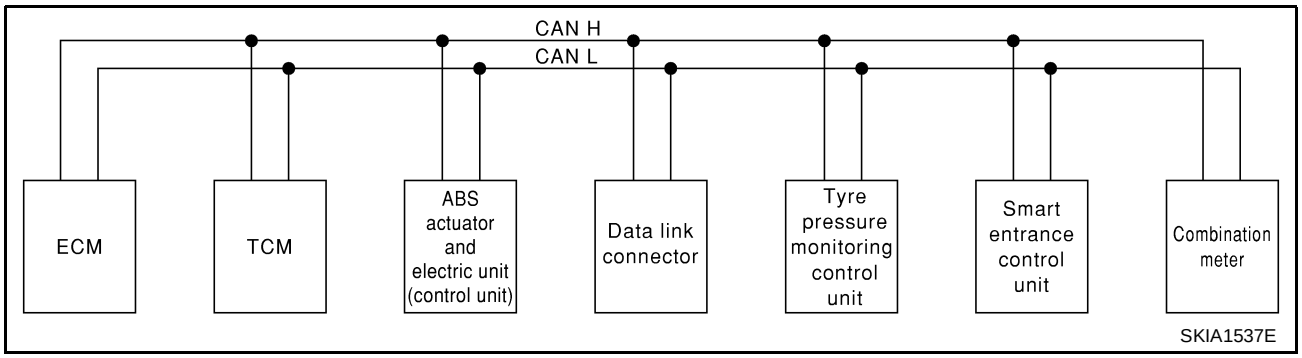
Signals	ECM	ABS actuator and electric unit (control unit)	Smart entrance control unit	Combination meter
Door switches state signal			T	R
Key ID signal	R		T	
	T		R	
A/C compressor signal	T		R	

*1: Except YD22DDTi engine model
*2:YD22DDTi engine model only

RHD MODELS WITH TYRE PRESSURE MONITORING SYSTEM

A/T Models

System diagram



Input/output signal chart

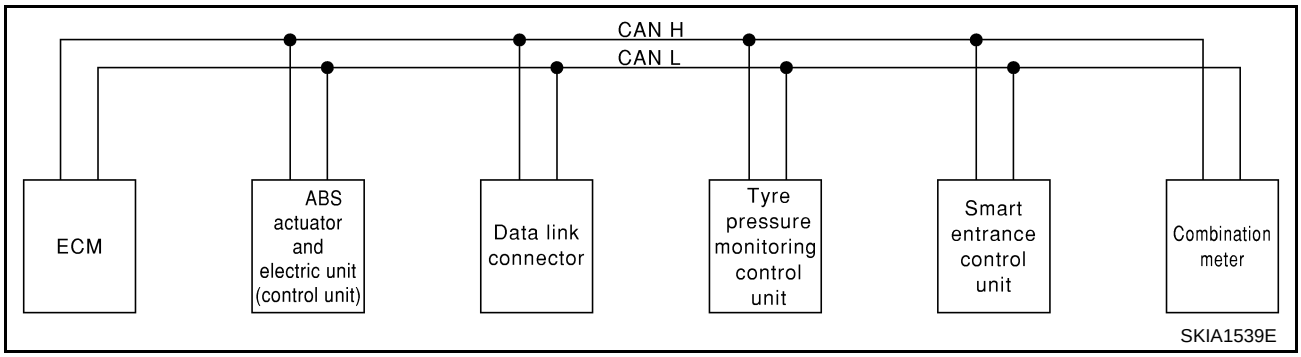
T: Transmit R: Receive

Signals	ECM	TCM	ABS actuator and electric unit (control unit)	Tyre pressure monitoring control unit	Smart entrance control unit	Combination meter
Engine speed signal	T	R				R
Stop lamp switch signal		R	T			
Rear window defogger signal	R				T	
Heater fan switch signal	R					T
Air conditioner switch signal	R					T
MI signal	T					R
Current gear position signal		T				R
Engine coolant temperature signal	T					R
Fuel consumption signal	T					R
Vehicle speed signal			T			R
	R					T
Seat belt reminder signal					R	T
Headlamp switch signal					T	R
Flashing indicator signal					T	R
Engine cooling fan speed signal	T				R	
Child lock indicator signal					T	R
Door switches state signal					T	R
Key ID signal	R				T	
	T				R	

Signals	ECM	TCM	ABS actuator and electric unit (control unit)	Tyre pressure monitoring control unit	Smart entrance control unit	Combination meter
A/C compressor signal	T				R	
Tire pressure signal				T		R

M/T Models

System diagram



Input/output signal chart

T: Transmit R: Receive

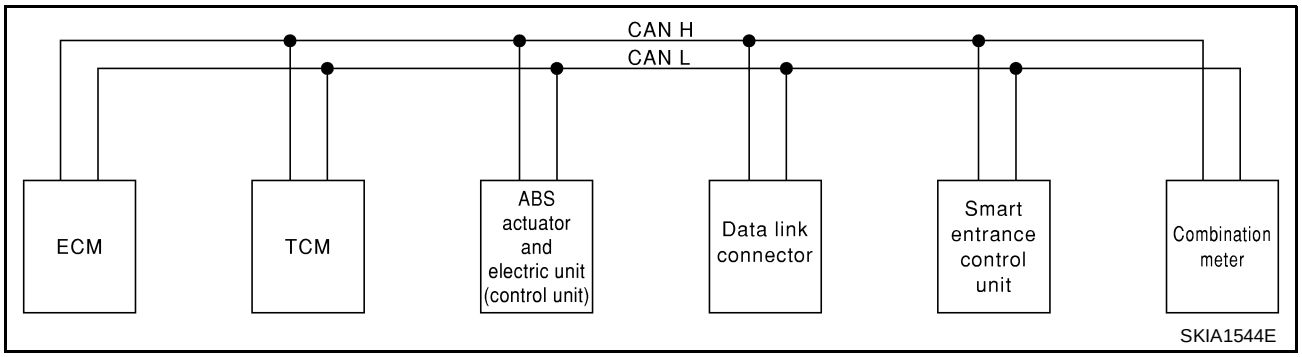
Signals	ECM	ABS actuator and electric unit (control unit)	Tyre pressure monitoring control unit	Smart entrance control unit	Combination meter
Engine speed signal	T				R
Rear window defogger signal	R*1			T	
Heater fan switch signal	R*1				T
Air conditioner switch signal	R				T
MI signal	T				R
Glow lamp signal*2	T				R
Engine coolant temperature signal	T				R
Fuel consumption signal	T				R
Vehicle speed signal		T			R
	R				T
Seat belt reminder signal				R	T
Headlamp switch signal				T	R
Flashing indicator signal				T	R
Engine cooling fan speed signal	T			R	
Child lock indicator signal				T	R
Door switches state signal				T	R
Key ID signal	R			T	
	T			R	
A/C compressor signal	T			R	
Tire pressure signal			T		R

*1: Except YD22DDTi engine model
*2: YD22DDTi engine model only

RHD MODELS WITHOUT TYRE PRESSURE MONITORING SYSTEM

A/T Models

System diagram



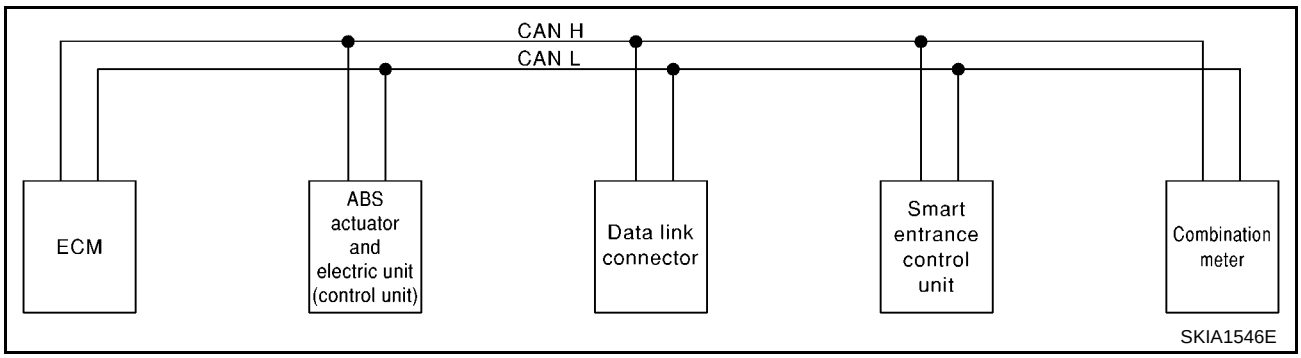
Input/output signal chart

T: Transmit R: Receive

Signals	ECM	TCM	ABS actuator and electric unit (control unit)	Smart entrance control unit	Combination meter
Engine speed signal	T	R			R
Stop lamp switch signal		R	T		
Rear window defogger signal	R			T	
Heater fan switch signal	R				T
Air conditioner switch signal	R				T
MI signal	T				R
Current gear position signal		T			R
Engine coolant temperature signal	T				R
Fuel consumption signal	T				R
Vehicle speed signal			T		R
	R				T
Seat belt reminder signal				R	T
Headlamp switch signal				T	R
Flashing indicator signal				T	R
Engine cooling fan speed signal	T			R	
Child lock indicator signal				T	R
Door switches state signal				T	R
Key ID signal	R			T	
	T			R	
A/C compressor signal	T			R	

M/T Models

System diagram



Input/output signal chart

T: Transmit R: Receive

Signals	ECM	ABS actuator and electric unit (control unit)	Smart entrance control unit	Combination meter
Engine speed signal	T			R
Rear window defogger signal	R*1		T	
Heater fan switch signal	R*1			T
Air conditioner switch signal	R			T
MI signal	T			R
Glow lamp signal*2	T			R
Engine coolant temperature signal	T			R
Fuel consumption signal	T			R
Vehicle speed signal		T		R
	R			T
Seat belt reminder signal			R	T
Headlamp switch signal			T	R
Flashing indicator signal			T	R
Engine cooling fan speed signal	T		R	
Child lock indicator signal			T	R
Door switches state signal			T	R
Key ID signal	R		T	
	T		R	
A/C compressor signal	T		R	

*1: Except YD22DDTi engine model
*2: YD22DDTi engine model only

BASIC SERVICE PROCEDURE

PFP:00018

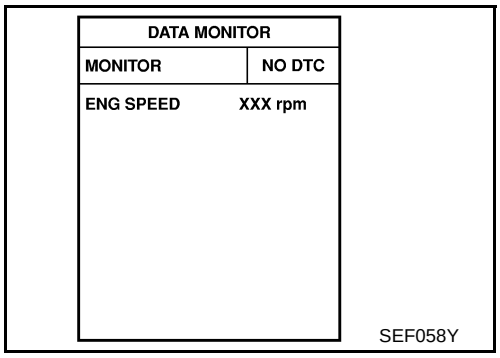
Idle Speed and Ignition Timing Check

EBS00ELM

IDLE SPEED

With CONSULT-II

Check idle speed in “DATA MONITOR” mode with CONSULT-II.



With GST

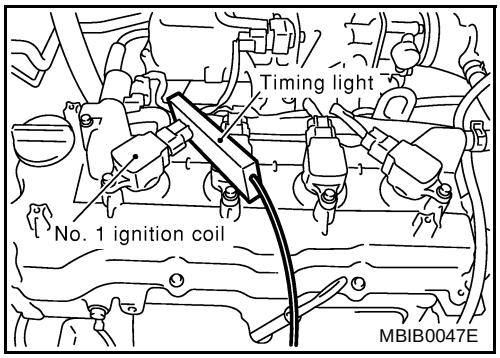
Check idle speed in “MODE 1” with GST.

IGNITION TIMING

Any of following two methods may be used.

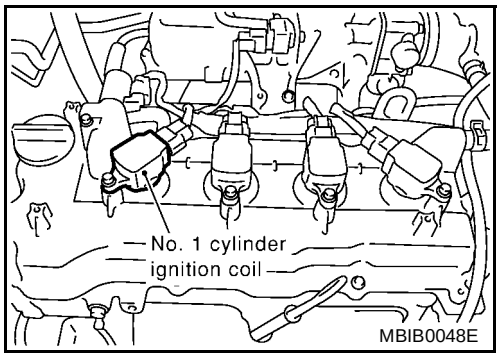
Method A

1. Slide the harness protector of ignition coil No. 1 to clear the wires.
2. Attach timing light to the wires as shown.
3. Check ignition timing.

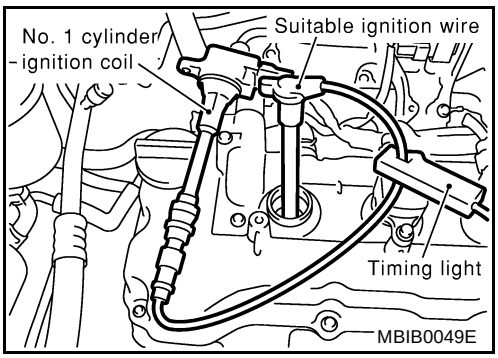


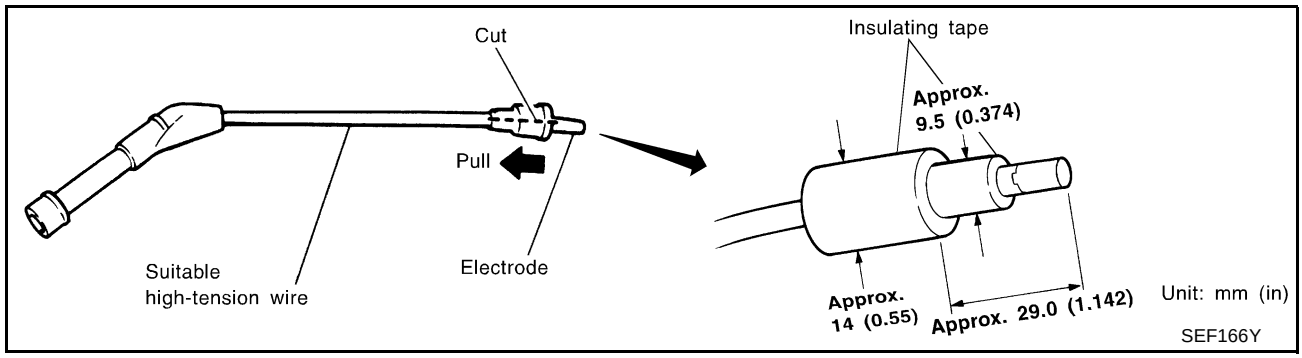
Method B

1. Remove No. 1 ignition coil.



2. Connect No. 1 ignition coil and No. 1 spark plug with suitable high-tension wire as shown, and attach timing light clamp to this wire.





3. Check ignition timing.

Accelerator Pedal Released Position Learning

EBS00ELO

DESCRIPTION

"Accelerator Pedal Released Position Learning" is an operation to learn the fully released position of the accelerator pedal by monitoring the accelerator pedal position sensor output signal. It must be performed each time harness connector of accelerator pedal position sensor or ECM is disconnected.

OPERATION PROCEDURE

1. Make sure that accelerator pedal is fully released.
2. Turn ignition switch "ON" and wait at least 2 seconds.
3. Turn ignition switch "OFF" wait at least 10 seconds.
4. Turn ignition switch "ON" and wait at least 2 seconds.
5. Turn ignition switch "OFF" wait at least 10 seconds.

Throttle Valve Closed Position Learning

EBS00ELP

DESCRIPTION

"Throttle Valve Closed Position Learning" is an operation to learn the fully closed position of the throttle valve by monitoring the throttle position sensor output signal. It must be performed each time harness connector of electric throttle control actuator or ECM is disconnected.

OPERATION PROCEDURE

1. Make sure that accelerator pedal is fully released.
2. Turn ignition switch "ON".
3. Turn ignition switch "OFF" wait at least 10 seconds.
   Make sure that throttle valve moves during above 10 seconds by confirming the operating sound.

Idle Air Volume Learning

EBS00ELQ

DESCRIPTION

"Idle Air Volume Learning" is an operation to learn the idle air volume that keeps each engine within the specific range. It must be performed under any of the following conditions:

- Each time electric throttle control actuator or ECM is replaced.
- Idle speed or ignition timing is out of specification.

PREPARATION

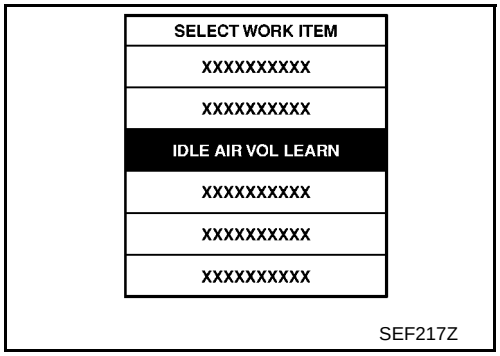
Before performing “Idle Air Volume Learning”, make sure that all of the following conditions are satisfied. Learning will be cancelled if any of the following conditions are missed for even a moment.

- Battery voltage: More than 12.9V (At idle)
- Engine coolant temperature: 70 - 95°C (158 - 203°F)
- PNP switch: ON
- Electric load switch: OFF
  (Air conditioner, headlamp, rear window defogger)
  On vehicles equipped with daytime light systems, set lighting switch to the 1st position to light only small lamps.
- Steering wheel: Neutral (Straight-ahead position)
- Vehicle speed: Stopped
- Transmission: Warmed-up
  For A/T models with CONSULT-II, drive vehicle until “FLUID TEMP SE” in “DATA MONITOR” mode of “A/T” system indicates less than 0.9V.
  For A/T models without CONSULT-II and M/T models, drive vehicle for 10 minutes.

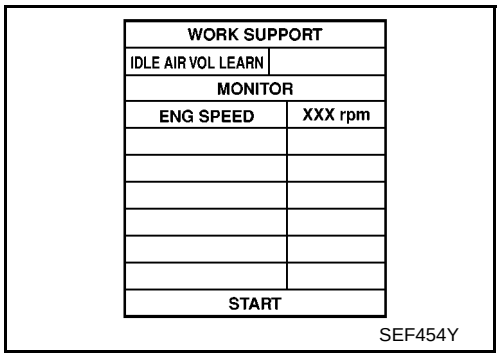
OPERATION PROCEDURE

With CONSULT-II

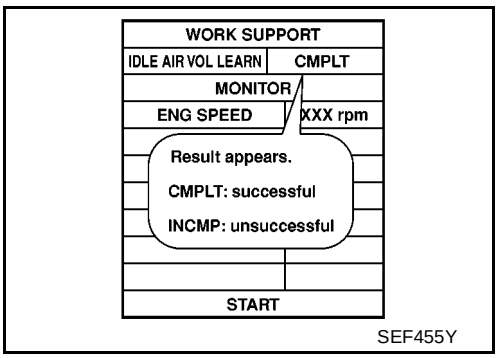
1. Perform EC-55, "Accelerator Pedal Released Position Learning" .
2. Perform EC-55, "Throttle Valve Closed Position Learning" .
3. Start engine and warm it up to normal operating temperature.
4. Check that all items listed under the topic “PRE-CONDITIONING” (previously mentioned) are in good order.
5. Select “IDLE AIR VOL LEARN” in “WORK SUPPORT” mode.



6. Touch “START” and wait 20 seconds.



7. Make sure that “CMPLT” is displayed on CONSULT-II screen. If “INCMP” is displayed, “Idle Air Volume Learning” will not be carried out successfully. In this case, find the cause of the problem by referring to the “Diagnostic Procedure” below.
8. Rev up the engine two or three times and make sure that idle speed and ignition timing are within the specifications.



ITEM	SPECIFICATION
Idle speed	M/T: 700±50 rpm A/T: 800±50 rpm (in “P” or “N” position)
Ignition timing	M/T: 8±5° BTDC A/T: 10±5° BTDC (in “P” or “N” position)

Without CONSULT-II

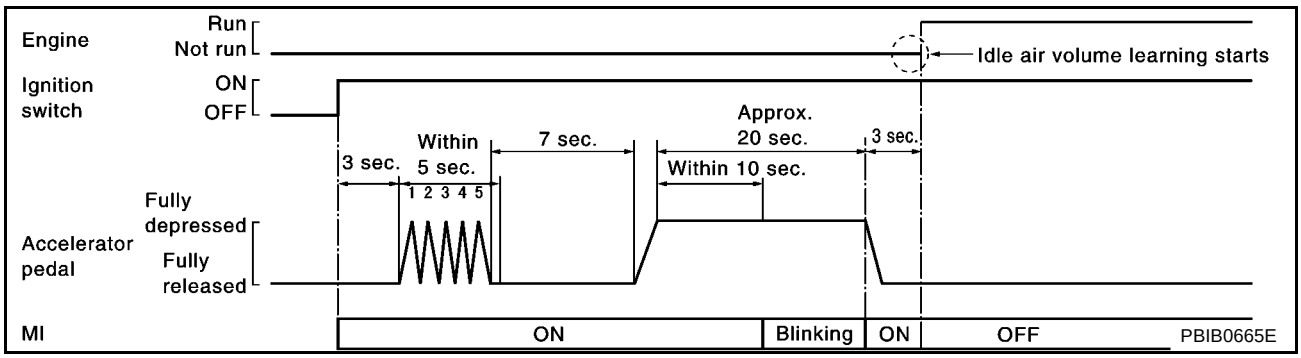
NOTE:

- **It is better to count the time accurately with a clock.**
- **It is impossible to switch the diagnostic mode when an accelerator pedal position sensor circuit has a malfunction.**

1. Perform EC-55, "Accelerator Pedal Released Position Learning" .
2. Perform EC-55, "Throttle Valve Closed Position Learning" .
3. Start engine and warm it up to normal operating temperature.
4. Check that all items listed under the topic “PRE-CONDITIONING” (previously mentioned) are in good order.
5. Turn ignition switch “OFF” and wait at least 10 seconds.
6. Confirm that accelerator pedal is fully released, turn ignition switch “ON” and wait 3 seconds.
7. Repeat the following procedure quickly five times within 5 seconds.

a. Fully depress the accelerator pedal.
b. Fully release the accelerator pedal.

8. Wait 7 seconds, fully depress the accelerator pedal and keep it for approx. 20 seconds until the MI stops blinking and turned ON.
9. Fully release the accelerator pedal within 3 seconds after the MI turned ON.
10. Start engine and let it idle.
11. Wait 20 seconds.



12. Rev up the engine two or three times and make sure that idle speed and ignition timing are within the specifications.

ITEM	SPECIFICATION
Idle speed	M/T: 700±50 rpm A/T: 800±50 rpm (in “P” or “N” position)
Ignition timing	M/T: 8±5° BTDC A/T: 10±5° BTDC (in “P” or “N” position)

13. If idle speed and ignition timing are not within the specification, the result will be incomplete. In this case, find the cause of the problem by referring to the “Diagnostic Procedure” below.

DIAGNOSTIC PROCEDURE

If idle air volume learning cannot be performed successfully, proceed as follows:

1. **Check that throttle valve is fully closed.**
2. **Check PCV valve operation.**
3. **Check that downstream of throttle valve is free from air leakage.**
4. **When the above three items check out OK, engine component parts and their installation condition are questionable. Check and eliminate the cause of the problem.**
   It is useful to perform EC-139, "TROUBLE DIAGNOSIS - SPECIFICATION VALUE" .
5. **If any of the following conditions occur after the engine has started, eliminate the cause of the problem and perform "Idle air volume learning" all over again:**

- **Engine stalls.**
- **Erroneous idle.**

Fuel Pressure Check

EBS00ELR

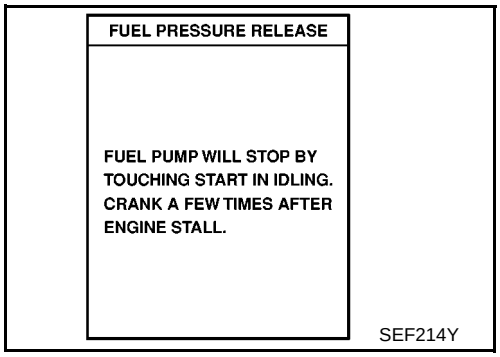
FUEL PRESSURE RELEASE

Before disconnecting fuel line, release fuel pressure from fuel line to eliminate danger.

NOTE:
Prepare pans or saucers under the disconnected fuel line because the fuel may spill out. The fuel pressure cannot be completely released because P12 models do not have fuel return system.

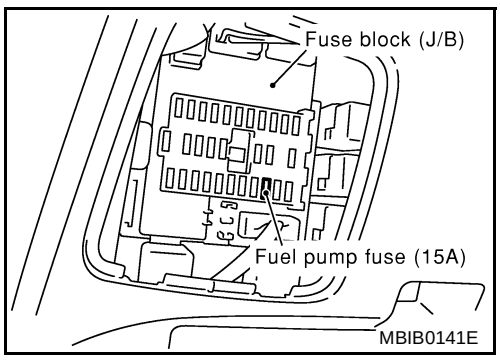
With CONSULT-II

1. Turn ignition switch "ON".
2. Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode with CONSULT-II.
3. Start engine.
4. After engine stalls, crank it two or three times to release all fuel pressure.
5. Turn ignition switch "OFF".



Without CONSULT-II

1. Remove fuel pump fuse located in fuse box.
2. Start engine.
3. After engine stalls, crank it two or three times to release all fuel pressure.
4. Turn ignition switch "OFF".
5. Reinstall fuel pump fuse after servicing fuel system.



FUEL PRESSURE CHECK

NOTE:

- **When reconnecting fuel line, always use new clamps.**
- **Make sure that clamp screw does not contact adjacent parts.**
- **Use a torque driver to tighten clamps.**
- **Use Pressure Gauge to check fuel pressure.**
- **Do not perform fuel pressure check with system operating. Fuel pressure gauge may indicate false readings.**

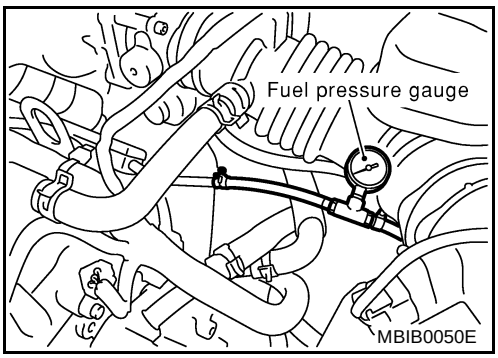
1. Release fuel pressure to zero. Refer to EC-58, "FUEL PRESSURE RELEASE" .

2. Install the fuel pressure gauge into the fuel line as shown in the figure.
3. Turn ignition switch “ON”, and check for fuel leakage.
4. Start engine and check for fuel leakage.
5. Read the indication of fuel pressure gauge.

At idling: **Approximately 350 kPa (3.7 kg/cm^2 , 51 psi)**

6. If result is unsatisfactory, go to next step.
7. Check the following.
   - Fuel hoses and fuel tubes for clogging
   - Fuel filter for clogging
   - Fuel pump
   - Fuel pressure regulator for clogging

   If OK, replace fuel pressure regulator.
   If NG, repair or replace.



ON BOARD DIAGNOSTIC (OBD) SYSTEM

PFP:00028

Introduction

EBS00ELS

The ECM has an on board diagnostic system, which detects malfunctions related to engine sensors or actuators. The ECM also records various emission-related diagnostic information including:

Emission-related diagnostic information	ISO Standard
Diagnostic Trouble Code (DTC)	Mode 3 of ISO 15031-5
Freeze Frame data	Mode 2 of ISO 15031-5
System Readiness Test (SRT) code	Mode 1 of ISO 15031-5
1st Trip Diagnostic Trouble Code (1st Trip DTC)	Mode 7 of ISO 15031-5
1st Trip Freeze Frame data	
Test values and Test limits	Mode 6 of ISO 15031-5
Calibration ID	Mode 9 of ISO 15031-5

The above information can be checked using procedures listed in the table below.

×: Applicable —: Not applicable

	DTC	1st trip DTC	Freeze Frame data	1st trip Freeze Frame data	SRT code	Test value
CONSULT-II	×	×	×	×	×	—
GST	×	×*1	×	—	×	×
ECM	×	×*2	—	—	—	—

*1: 1st trip DTCs for self-diagnoses concerning SRT items cannot be shown on the GST display.
*2: When DTC and 1st trip DTC simultaneously appear on the display, they cannot be clearly distinguished from each other.

The malfunction indicator (MI) on the instrument panel lights up when the same malfunction is detected in two consecutive trips (Two trip detection logic), or when the ECM enters fail-safe mode. (Refer to EC-90 .)

Two Trip Detection Logic

EBS00ELT

When a malfunction is detected for the first time, 1st trip DTC and 1st trip Freeze Frame data are stored in the ECM memory. The MI will not light up at this stage. <1st trip>
If the same malfunction is detected again during the next drive, the DTC and Freeze Frame data are stored in the ECM memory, and the MI lights up. The MI lights up at the same time when the DTC is stored. <2nd trip>
The “trip” in the “Two Trip Detection Logic” means a driving mode in which self-diagnosis is performed during vehicle operation. Specific on board diagnostic items will cause the ECM to light up or blink the MI, and store DTC and Freeze Frame data, even in the 1st trip, as shown below.

×: Applicable —: Not applicable

Items	MI				DTC		1st trip DTC	
	1st trip		2nd trip		1st trip displaying	2nd trip displaying	1st trip displaying	2nd trip displaying
	Blinking	Lighting up	Blinking	Lighting up				
Misfire (Possible three way catalyst damage) — DTC: P0300 - P0304 is being detected	×	—	—	—	—	—	×	—
Misfire (Possible three way catalyst damage) — DTC: P0300 - P0304 is being detected	—	—	×	—	—	×	—	—
Fail-safe items (Refer to EC-90 .)	—	×	—	—	×*1	—	×*1	—
Except above	—	—	—	×	—	×	×	—

*1: Except “ECM”

Emission-related Diagnostic Information

EBS00ELU

EMISSION-RELATED DIAGNOSTIC INFORMATION ITEMS

QG16DE Engine Models

Items (CONSULT-II screen terms)	DTC*1		SRT code	Test Valve/ Test Limit (GST only)	1st trip DTC	Reference page
	CONSULT-II GST*2	ECM				
CAN COMM CIRCUIT	U1001	1001*4	—	—	×	EC-150
NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	**P0000**	**0000**	—	—	—	—
INT/V TIM CONT-B1	P0011	0011	—	—	×	EC-153
HO2S1 HTR (B1)	P0031	0031	×	×	×*5	EC-156
HO2S1 HTR (B1)	P0032	0032	×	×	×*5	EC-156
HO2S2 HTR (B1)	P0037	0037	×	×	×*5	EC-170
HO2S2 HTR (B1)	P0038	0038	×	×	×*5	EC-170
MAF SEN/CIRCUIT*3	P0102	0102	—	—	—	EC-183
MAF SEN/CIRCUIT*3	P0103	0103	—	—	—	EC-183
IAT SEN/CIRCUIT	P0112	0112	—	—	×	EC-189
IAT SEN/CIRCUIT	P0113	0113	—	—	×	EC-189
ECT SEN/CIRCUIT*3	P0117	0117	—	—	—	EC-194
ECT SEN/CIRCUIT*3	P0118	0118	—	—	—	EC-194
HO2S1 (B1)	P0132	0132	×	×	×*5	EC-199
HO2S1 (B1)	P0133	0133	×	×	×*5	EC-214
HO2S1 (B1)	P0134	0134	×	×	×*5	EC-234
HO2S2 (B1)	P0138	0138	×	×	×*5	EC-251
HO2S2 (B1)	P0139	0139	×	×	×*5	EC-267
FUEL SYS-LEAN-B1	P0171	0171	—	—	×	EC-285
FUEL SYS-RICH-B1	P0172	0172	—	—	×	EC-299
TP SENSOR*3	P0221	0221	—	—	—	EC-312
TP SEN 1/CIRC*3	P0222	0222	—	—	—	EC-318
TP SEN 1/CIRC*3	P0223	0223	—	—	—	EC-318
APP SENSOR*3	P0226	0226	—	—	—	EC-324
APP SEN 1/CIRC*3	P0227	0227	—	—	—	EC-331
APP SEN 1/CIRC*3	P0228	0228	—	—	—	EC-331
MULTI CYL MISFIRE	P0300	0300	—	—	×	EC-338
CYL 1 MISFIRE	P0301	0301	—	—	×	EC-338
CYL 2 MISFIRE	P0302	0302	—	—	×	EC-338
CYL 3 MISFIRE	P0303	0303	—	—	×	EC-338
CYL 4 MISFIRE	P0304	0304	—	—	×	EC-338
KNOCK SEN/CIRC-B1	P0327	0327	—	—	×	EC-344
KNOCK SEN/CIRC-B1	P0328	0328	—	—	×	EC-344
CKP SEN/CIRCUIT	P0335	0335	—	—	×	EC-348
CMP SEN/CIRC-B1	P0340	0340	—	—	×	EC-355

Items (CONSULT-II screen terms)	DTC*1		SRT code	Test Valve/ Test Limit (GST only)	1st trip DTC	Reference page
	CONSULT-II GST*2	ECM				
TW CATALYST SYS-B1	P0420	0420	×	×	×*5	EC-361
PURG VOLUME CONT/V	P0444	0444	—	—	×	EC-369
PURG VOLUME CONT/V	P0445	0445	—	—	×	EC-369
VEH SPEED SEN/CIRC	P0500	0500	—	—	×	EC-375
PW ST P SEN/CIRC	P0550	0550	—	—	×	EC-377
ECM	P0605	0605	—	—	×	EC-382
ECM BACK UP/CIRC	P1065	1065	—	—	×	EC-385
MAF SENSOR*3	P1102	1102	—	—	—	EC-389
INT/V TIM V/CIR-B1	P1111	1111	—	—	×	EC-395
ETC ACTR*3	P1121	1121	—	—	—	EC-400
ETC FUNCTION/CIRC*3	P1122	1122	—	—	—	EC-402
ETC MOT PWR*3	P1124	1124	—	—	—	EC-409
ETC MOT PWR*3	P1126	1126	—	—	—	EC-409
ETC MOT*3	P1128	1128	—	—	—	EC-415
HO2S1 (B1)	P1143	1143	×	×	×*5	EC-420
HO2S1 (B1)	P1144	1144	×	×	×*5	EC-432
HO2S2 (B1)	P1146	1146	×	×	×*5	EC-444
HO2S2 (B1)	P1147	1147	×	×	×*5	EC-462
ENG OVER TEMP	P1217	1217	—	—	×	EC-480
TP SEN 2/CIRC*3	P1223	1223	—	—	—	EC-490
TP SEN 2/CIRC*3	P1224	1224	—	—	—	EC-490
CTP LEARNING	P1225	1225	—	—	×	EC-496
CTP LEARNING	P1226	1226	—	—	×	EC-498
APP SEN 2/CIRC*3	P1227	1227	—	—	—	EC-500
APP SEN 2/CIRC*3	P1228	1228	—	—	—	EC-500
SENSOR POWER/CIRC*3	P1229	1229	—	—	—	EC-507
NATS MALFUNCTION	P1610 - P1615	1610 - 1615	—	—	×	EC-75
P-N POS SW/CIRCUIT	P1706	1706	—	—	×	EC-511
BRAKE SW/CIRCUIT	P1805	1805	—	—	×	EC-515

*1: 1st trip DTC No. is the same as DTC No.
*2: These numbers are prescribed by ISO 15031-5.
*3: When the fail-safe operation occurs, the MI illuminates.
*4: The trouble shooting for this DTC needs CONSULT-II.
*5: These are not displayed with GST.

QG18DE Engine Models

Items (CONSULT-II screen terms)	DTC*1		SRT code	Test Valve/ Test Limit (GST only)	1st trip DTC	Reference page
	CONSULT-II GST*2	ECM				
CAN COMM CIRCUIT	U1000	1000*4	—	—	×	EC-150
CAN COMM CIRCUIT	U1001	1001*4	—	—	×	EC-150

Items (CONSULT-II screen terms)	DTC*1		SRT code	Test Valve/ Test Limit (GST only)	1st trip DTC	Reference page
	CONSULT-II GST*2	ECM				
NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	**P0000**	**0000**	—	—	—	—
INT/V TIM CONT-B1	P0011	0011	—	—	×	EC-153
HO2S1 HTR (B1)	P0031	0031	×	×	×*5	EC-162
HO2S1 HTR (B1)	P0032	0032	×	×	×*5	EC-162
HO2S2 HTR (B1)	P0037	0037	×	×	×*5	EC-175
HO2S2 HTR (B1)	P0038	0038	×	×	×*5	EC-175
HO2S1 HTR (B2)	P0051	0051	×	×	×*5	EC-162
HO2S1 HTR (B2)	P0052	0052	×	×	×*5	EC-162
HO2S2 HTR (B2)	P0057	0057	×	×	×*5	EC-175
HO2S2 HTR (B2)	P0058	0058	×	×	×*5	EC-175
MAF SEN/CIRCUIT*3	P0102	0102	—	—	—	EC-183
MAF SEN/CIRCUIT*3	P0103	0103	—	—	—	EC-183
IAT SEN/CIRCUIT	P0112	0112	—	—	×	EC-189
IAT SEN/CIRCUIT	P0113	0113	—	—	×	EC-189
ECT SEN/CIRCUIT*3	P0117	0117	—	—	—	EC-194
ECT SEN/CIRCUIT*3	P0118	0118	—	—	—	EC-194
HO2S1 (B1)	P0132	0132	×	×	×*5	EC-205
HO2S1 (B1)	P0133	0133	×	×	×*5	EC-223
HO2S1 (B1)	P0134	0134	×	×	×*5	EC-241
HO2S2 (B1)	P0138	0138	×	×	×*5	EC-258
HO2S2 (B1)	P0139	0139	×	×	×*5	EC-275
HO2S1 (B2)	P0152	0152	×	×	×*5	EC-205
HO2S1 (B2)	P0153	0153	×	×	×*5	EC-223
HO2S1 (B2)	P0154	0154	×	×	×*5	EC-241
HO2S2 (B2)	P0158	0158	×	×	×*5	EC-258
HO2S2 (B2)	P0159	0159	×	×	×*5	EC-275
FUEL SYS-LEAN-B1	P0171	0171	—	—	×	EC-291
FUEL SYS-RICH-B1	P0172	0172	—	—	×	EC-305
FUEL SYS-LEAN-B2	P0174	0174	—	—	×	EC-291
FUEL SYS-RICH-B2	P0175	0175	—	—	×	EC-305
TP SENSOR*3	P0221	0221	—	—	—	EC-312
TP SEN 1/CIRC*3	P0222	0222	—	—	—	EC-318
TP SEN 1/CIRC*3	P0223	0223	—	—	—	EC-318
APP SENSOR*3	P0226	0226	—	—	—	EC-324
APP SEN 1/CIRC*3	P0227	0227	—	—	—	EC-331
APP SEN 1/CIRC*3	P0228	0228	—	—	—	EC-331

Items (CONSULT-II screen terms)	DTC*1		SRT code	Test Valve/ Test Limit (GST only)	1st trip DTC	Reference page
	CONSULT-II GST*2	ECM				
MULTI CYL MISFIRE	P0300	0300	—	—	×	EC-338
CYL 1 MISFIRE	P0301	0301	—	—	×	EC-338
CYL 2 MISFIRE	P0302	0302	—	—	×	EC-338
CYL 3 MISFIRE	P0303	0303	—	—	×	EC-338
CYL 4 MISFIRE	P0304	0304	—	—	×	EC-338
KNOCK SEN/CIRC-B1	P0327	0327	—	—	×	EC-344
KNOCK SEN/CIRC-B1	P0328	0328	—	—	×	EC-344
CKP SEN/CIRCUIT	P0335	0335	—	—	×	EC-348
CMP SEN/CIRC-B1	P0340	0340	—	—	×	EC-355
TW CATALYST SYS-B1	P0420	0420	×	×	×*5	EC-365
TW CATALYST SYS-B2	P0430	0430	×	×	×*5	EC-365
PURG VOLUME CONT/V	P0444	0444	—	—	×	EC-369
PURG VOLUME CONT/V	P0445	0445	—	—	×	EC-369
VEH SPEED SEN/CIRC*6	P0500	0500	—	—	×	EC-375
PW ST P SEN/CIRC	P0550	0550	—	—	×	EC-377
ECM	P0605	0605	—	—	×	EC-382
PNP SW/CIRC	P0705	0705	—	—	×	AT-110
ATF TEMP SEN/CIRC	P0710	0710	—	—	×	AT-116
VEH SPD SEN/CIRC AT*6	P0720	0720	—	—	×	AT-122
ENGINE SPEED SIG	P0725	0725	—	—	×	AT-127
A/T 1ST GR FNCTN	P0731	0731	—	—	×	AT-131
A/T 2ND GR FNCTN	P0732	0732	—	—	×	AT-138
A/T 3RD GR FNCTN	P0733	0733	—	—	×	AT-144
A/T 4TH GR FNCTN	P0734	0734	—	—	×	AT-150
TCC SOLENOID/CIRC	P0740	0740	—	—	×	AT-158
L/PRESS SOL/CIRC	P0745	0745	—	—	×	AT-163
SFT SOL A/CIRC*3	P0750	0750	—	—	—	AT-170
SFT SOL B/CIRC*3	P0755	0755	—	—	—	AT-175
ECM BACK UP/CIRC	P1065	1065	—	—	×	EC-385
MAF SENSOR*3	P1102	1102	—	—	—	EC-389
INT/V TIM V/CIR-B1	P1111	1111	—	—	×	EC-395
ETC ACTR*3	P1121	1121	—	—	—	EC-400
ETC FUNCTION/CIRC*3	P1122	1122	—	—	—	EC-402
ETC MOT PWR*3	P1124	1124	—	—	—	EC-409
ETC MOT PWR*3	P1126	1126	—	—	—	EC-409
ETC MOT*3	P1128	1128	—	—	—	EC-415
HO2S1 (B1)	P1143	1143	×	×	×*5	EC-426
HO2S1 (B1)	P1144	1144	×	×	×*5	EC-438
HO2S2 (B1)	P1146	1146	×	×	×*5	EC-452

Items (CONSULT-II screen terms)	DTC*1		SRT code	Test Valve/ Test Limit (GST only)	1st trip DTC	Reference page
	CONSULT-II GST*2	ECM				
HO2S2 (B1)	P1147	1147	×	×	×*5	EC-470
HO2S1 (B2)	P1163	1163	×	×	×*5	EC-426
HO2S1 (B2)	P1164	1164	×	×	×*5	EC-438
HO2S2 (B2)	P1166	1166	×	×	×*5	EC-452
HO2S2 (B2)	P1167	1167	×	×	×*5	EC-470
ENG OVER TEMP	P1217	1217	—	—	×	EC-480
TP SEN 2/CIRC*3	P1223	1223	—	—	—	EC-490
TP SEN 2/CIRC*3	P1224	1224	—	—	—	EC-490
CTP LEARNING	P1225	1225	—	—	×	EC-496
CTP LEARNING	P1226	1226	—	—	×	EC-498
APP SEN 2/CIRC*3	P1227	1227	—	—	—	EC-500
APP SEN 2/CIRC*3	P1228	1228	—	—	—	EC-500
SENSOR POWER/CIRC*3	P1229	1229	—	—	—	EC-507
NATS MALFUNCTION	P1610 - P1615	1610 - 1615	—	—	×	EC-75
TPV SEN/CIRC A/T	P1705	1705	—	—	×	AT-180
P-N POS SW/CIRCUIT	P1706	1706	—	—	×	EC-511
O/R CLTCH SOL/CIRC	P1760	1760	—	—	×	AT-185
BRAKE SW/CIRCUIT	P1805	1805	—	—	×	EC-515

*1: 1st trip DTC No. is the same as DTC No.
*2: These numbers are prescribed by ISO 15031-5.
*3: When the fail-safe operation occurs, the MI illuminates.
*4: The trouble shooting for these DTCs need CONSULT-II.
*5: These are not displayed with GST.
*6: When the fail-safe operations for both self-diagnoses occur at the same time, the MI illuminates.

NOTE:
Regarding P12 models with QG18DE engine, “B1” indicates bank 1, “B2” indicates bank 2.

DTC AND 1ST TRIP DTC

The 1st trip DTC (whose number is the same as the DTC number) is displayed for the latest self-diagnostic result obtained. If the ECM memory was cleared previously, and the 1st trip DTC did not reoccur, the 1st trip DTC will not be displayed.
If a malfunction is detected during the 1st trip, the 1st trip DTC is stored in the ECM memory. The MI will not light up (two trip detection logic). If the same malfunction is not detected in the 2nd trip (meeting the required driving pattern), the 1st trip DTC is cleared from the ECM memory. If the same malfunction is detected in the 2nd trip, both the 1st trip DTC and DTC are stored in the ECM memory and the MI lights up. In other words, the DTC is stored in the ECM memory and the MI lights up when the same malfunction occurs in two consecutive trips. If a 1st trip DTC is stored and a non-diagnostic operation is performed between the 1st and 2nd trips, only the 1st trip DTC will continue to be stored. For malfunctions that blink or light up the MI during the 1st trip, the DTC and 1st trip DTC are stored in the ECM memory.
Procedures for clearing the DTC and the 1st trip DTC from the ECM memory are described in EC-73, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
For malfunctions in which 1st trip DTCs are displayed, refer to EC-61, "EMISSION-RELATED DIAGNOSTIC INFORMATION ITEMS" . These items are required by legal regulations to continuously monitor the system/component. In addition, the items monitored non-continuously are also displayed on CONSULT-II.
1st trip DTC is specified in Mode 7 of ISO 15031-5. 1st trip DTC detection occurs without lighting up the MI and therefore does not warn the driver of a problem. However, 1st trip DTC detection will not prevent the vehicle from being tested, for example during Inspection/Maintenance (I/M) tests.

When a 1st trip DTC is detected, check, print out or write down and erase (1st trip) DTC and Freeze Frame data as specified in “Work Flow” procedure Step II, refer to EC-85, "WORK FLOW" . Then perform “DTC Confirmation Procedure” or “Overall Function Check” to try to duplicate the problem. If the malfunction is duplicated, the item requires repair.

How to Read DTC and 1st Trip DTC

DTC and 1st trip DTC can be read by the following methods.

With CONSULT-II

With GST

CONSULT-II or GST (Generic Scan Tool) Examples: P0340, P0705, P0750, etc.
These DTCs are prescribed by ISO 15031-5.
(CONSULT-II also displays the malfunctioning component or system.)

No Tools

The number of blinks of the MI in the Diagnostic Test Mode II (Self-Diagnostic Results) indicates the DTC. Example: 0102, 0340 etc.
These DTCs are controlled by NISSAN.

- **1st trip DTC No. is the same as DTC No.**
- **Output of a DTC indicates a malfunction. However, GST or the Diagnostic Test Mode II do not indicate whether the malfunction is still occurring or has occurred in the past and has returned to normal. CONSULT-II can identify malfunction status as shown below. Therefore, using CONSULT-II (if available) is recommended.**

A sample of CONSULT-II display for DTC and 1st trip DTC is shown below. DTC or 1st trip DTC of a malfunction is displayed in SELF-DIAGNOSTIC RESULTS mode of CONSULT-II. Time data indicates how many times the vehicle was driven after the last detection of a DTC.
If the DTC is being detected currently, the time data will be “0”.
If a 1st trip DTC is stored in the ECM, the time data will be “[1t]”.

DTC display

SELF DIAG RESULTS	
DTC RESULTS	TIME
CKP SEN/CIRCUIT [P0335]	0

1st trip DTC display

SELF DIAG RESULTS	
DTC RESULTS	TIME
CKP SEN/CIRCUIT [P0335]	1t

PBIB0911E

FREEZE FRAME DATA AND 1ST TRIP FREEZE FRAME DATA

The ECM records the driving conditions such as fuel system status, calculated load value, engine coolant temperature, short term fuel trim, long term fuel trim, engine speed, vehicle speed, base fuel schedule and intake air temperature at the moment a malfunction is detected.
Data which are stored in the ECM memory, along with the 1st trip DTC, are called 1st trip freeze frame data. The data, stored together with the DTC data, are called freeze frame data and displayed on CONSULT-II or GST. The 1st trip freeze frame data can only be displayed on the CONSULT-II screen, not on the GST. For details, see EC-124, "Freeze Frame Data and 1st Trip Freeze Frame Data" .
Only one set of freeze frame data (either 1st trip freeze frame data or freeze frame data) can be stored in the ECM. 1st trip freeze frame data is stored in the ECM memory along with the 1st trip DTC. There is no priority for 1st trip freeze frame data and it is updated each time a different 1st trip DTC is detected. However, once freeze frame data (2nd trip detection/MI on) is stored in the ECM memory, 1st trip freeze frame data is no longer stored. Remember, only one set of freeze frame data can be stored in the ECM. The ECM has the following priorities to update the data.

Priority	Items	
1	Freeze frame data	Misfire — DTC: P0300 - P0304 Fuel Injection System Function — DTC: P0171, P0172, P0174* , P0175*
2		Except the above items (Includes A/T related items)
3	1st trip freeze frame data	

*: For QG18DE engine models

For example, the EGR malfunction (Priority: 2) was detected and the freeze frame data was stored in the 2nd trip. After that when the misfire (Priority: 1) is detected in another trip, the freeze frame data will be updated from the EGR malfunction to the misfire. The 1st trip freeze frame data is updated each time a different malfunction is detected. There is no priority for 1st trip freeze frame data. However, once freeze frame data is stored in the ECM memory, 1st trip freeze data is no longer stored (because only one freeze frame data or 1st trip freeze frame data can be stored in the ECM). If freeze frame data is stored in the ECM memory and freeze frame data with the same priority occurs later, the first (original) freeze frame data remains unchanged in the ECM memory.
Both 1st trip freeze frame data and freeze frame data (along with the DTCs) are cleared when the ECM memory is erased. Procedures for clearing the ECM memory are described in EC-73, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .

SYSTEM READINESS TEST (SRT) CODE

System Readiness Test (SRT) code is specified in Mode 1 of ISO 15031-5.
As part of an enhanced emissions test for Inspection & Maintenance (I/M), certain states require the status of SRT be used to indicate whether the ECM has completed self-diagnosis of major emission systems and components. Completion must be verified in order for the emissions inspection to proceed.
If a vehicle is rejected for a State emissions inspection due to one or more SRT items indicating “INCMP”, use the information in this Service Manual to set the SRT to “CMPLT”.
In most cases the ECM will automatically complete its self-diagnosis cycle during normal usage, and the SRT status will indicate “CMPLT” for each application system. Once set as “CMPLT”, the SRT status remains “CMPLT” until the self-diagnosis memory is erased.
Occasionally, certain portions of the self-diagnostic test may not be completed as a result of the customer's normal driving pattern; the SRT will indicate “INCMP” for these items.

NOTE:
The SRT will also indicate “INCMP” if the self-diagnosis memory is erased for any reason or if the ECM memory power supply is interrupted for several hours.
If, during the state emissions inspection, the SRT indicates “CMPLT” for all test items, the inspector will continue with the emissions test. However, if the SRT indicates “INCMP” for one or more of the SRT items the vehicle is returned to the customer untested.

NOTE:
If MI is “ON” during the state emissions inspection, the vehicle is also returned to the customer untested even though the SRT indicates “CMPLT” for all test items. Therefore, it is important to check SRT (“CMPLT”) and DTC (No DTCs) before the inspection.

SRT Item

The table below shows required self-diagnostic items to set the SRT to “CMPLT”.

SRT item (CONSULT-II indication)	Performance Priority*1	Required self-diagnostic items to set the SRT to “CMPLT”	Corresponding DTC No.	
			QG16DE	QG18DE
CATALYST	2	Three way catalyst function	P0420	P0420, P0430
HO2S	1	Heated oxygen sensor 1	P0132	P0132, P0152
		Heated oxygen sensor 1	P0133	P0133, P0153
		Heated oxygen sensor 1	P0134	P0134, P0154
		Heated oxygen sensor 1	P1143	P1143, P1163
		Heated oxygen sensor 1	P1144	P1144, P1164
		Heated oxygen sensor 2	P0138	P0138, P0158
		Heated oxygen sensor 2	P0139	P0139, P0159
		Heated oxygen sensor 2	P1146	P1146, P1166
		Heated oxygen sensor 2	P1147	P1147, P1167

SRT item (CONSULT-II indication)	Performance Priority*1	Required self-diagnostic items to set the SRT to "CMPLT"	Corresponding DTC No.	
			QG16DE	QG18DE
HO2S HTR	1	Heated oxygen sensor 1 heater	P0031, P0032	P0031, P0032, P0051, P0052
		Heated oxygen sensor 2 heater	P0037, P0038	P0037, P0038, P0057, P0058

*1: If completion of several SRTs is required, perform driving patterns (DTC confirmation procedure), one by one based on the priority for models with CONSULT-II.

SRT Set Timing

SRT is set as "CMPLT" after self-diagnosis has been performed one or more times. Completion of SRT is done regardless of whether the result is OK or NG. The set timing is different between OK and NG results and is shown in the table below.

Self-diagnosis result		Example				
		Diagnosis	Ignition cycle ← ON →	OFF ← ON →	OFF ← ON →	OFF ← ON →
All OK	Case 1	P0400	OK (1)	— (1)	OK (2)	— (2)
		P0402	OK (1)	— (1)	— (1)	OK (2)
		P1402	OK (1)	OK (2)	— (2)	— (2)
		SRT of EGR	"CMPLT"	"CMPLT"	"CMPLT"	"CMPLT"
	Case 2	P0400	OK (1)	— (1)	— (1)	— (1)
		P0402	— (0)	— (0)	OK (1)	— (1)
		P1402	OK (1)	OK (2)	— (2)	— (2)
		SRT of EGR	"INCMP"	"INCMP"	"CMPLT"	"CMPLT"
NG exists	Case 3	P0400	OK	OK	—	—
		P0402	—	—	—	—
		P1402	NG	—	NG	NG (Consecutive NG)
		(1st trip) DTC	1st trip DTC	—	1st trip DTC	DTC (= MI "ON")
		SRT of EGR	"INCMP"	"INCMP"	"INCMP"	"CMPLT"

OK: Self-diagnosis is carried out and the result is OK.
NG: Self-diagnosis is carried out and the result is NG.
—: Self-diagnosis is not carried out.

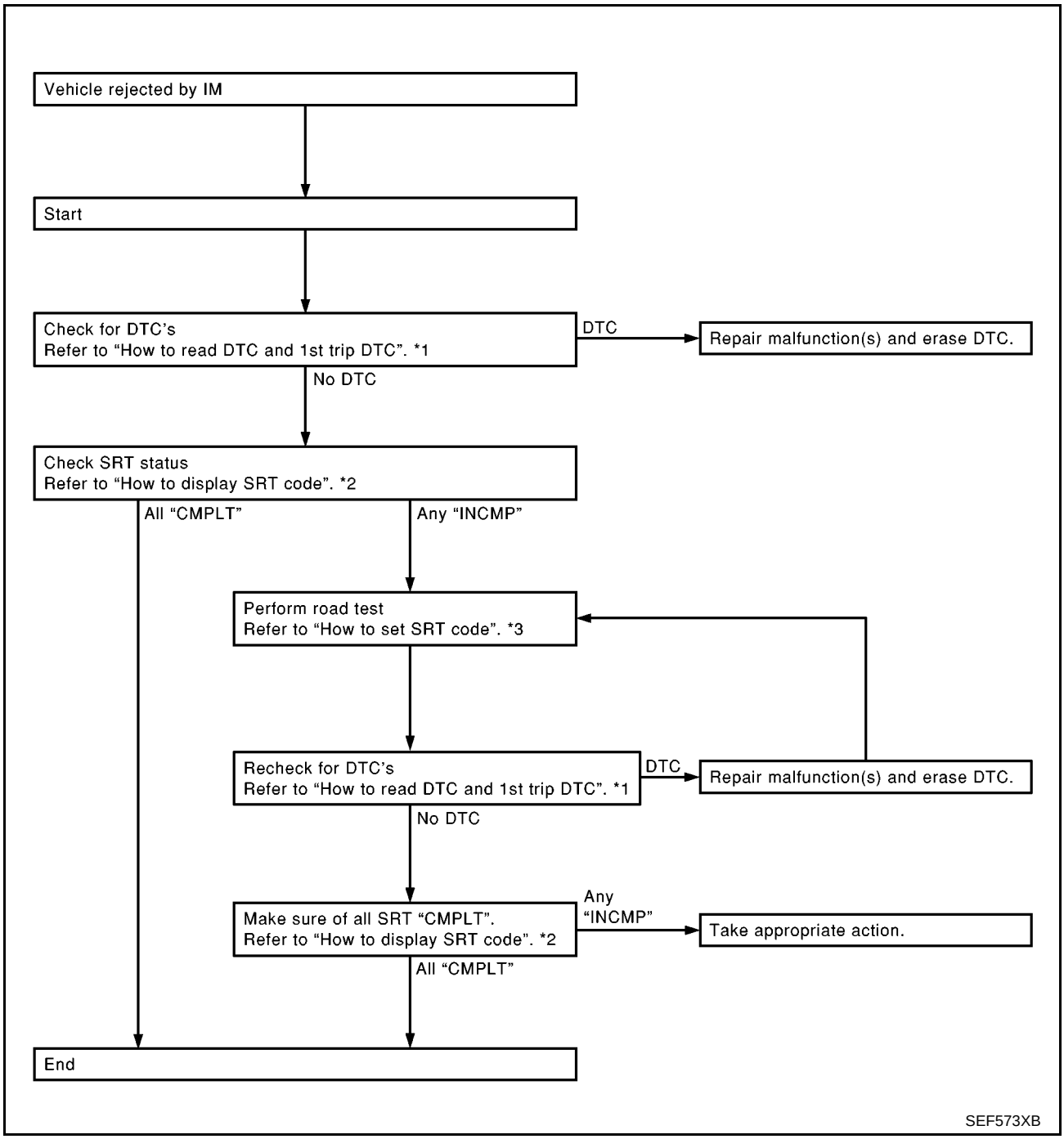
When all SRT related self-diagnoses showed OK results in a single cycle (Ignition OFF-ON-OFF), the SRT will indicate "CMPLT". → Case 1 above
When all SRT related self-diagnoses showed OK results through several different cycles, the SRT will indicate "CMPLT" at the time the respective self-diagnoses have at least one OK result. → Case 2 above
If one or more SRT related self-diagnoses showed NG results in 2 consecutive cycles, the SRT will also indicate "CMPLT". → Case 3 above
The table above shows that the minimum number of cycles for setting SRT as "INCMP" is one (1) for each self-diagnosis (Case 1 & 2) or two (2) for one of self-diagnoses (Case 3). However, in preparation for the state emissions inspection, it is unnecessary for each self-diagnosis to be executed twice (Case 3) for the following reasons:

- The SRT will indicate "CMPLT" at the time the respective self-diagnoses have one (1) OK result.
- The emissions inspection requires "CMPLT" of the SRT only with OK self-diagnosis results.
- When, during SRT driving pattern, 1st trip DTC (NG) is detected prior to "CMPLT" of SRT, the self-diagnosis memory must be erased from ECM after repair.
- If the 1st trip DTC is erased, all the SRT will indicate "INCMP".

NOTE:
SRT can be set as “CMPLT” together with the DTC(s). Therefore, DTC check must always be carried out prior to the state emission inspection even though the SRT indicates “CMPLT”.

SRT Service Procedure

If a vehicle has failed the state emissions inspection due to one or more SRT items indicating “INCMP”, review the flowchart diagnostic sequence on the next page.



*1 EC-66 *2 EC-70 *3 EC-70

How to Display SRT Code

WITH CONSULT-II

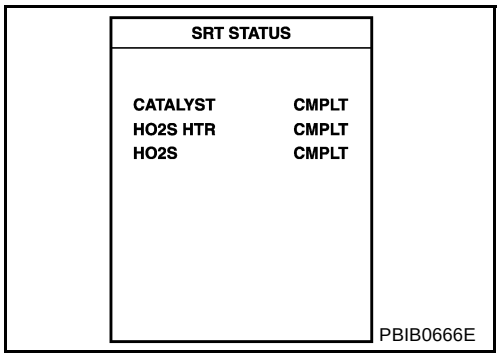
Selecting “SRT STATUS” in “DTC CONFIRMATION” mode with CONSULT-II.

For items whose SRT codes are set, a “CMPLT” is displayed on the CONSULT-II screen; for items whose SRT codes are not set, “INCMP” is displayed.

A sample of CONSULT-II display for SRT code is shown at right.

“INCMP” means the self-diagnosis is incomplete and SRT is not set.

“CMPLT” means the self-diagnosis is complete and SRT is set.



WITH GST

Selecting Mode 1 with GST (Generic Scan Tool)

How to Set SRT Code

To set all SRT codes, self-diagnosis for the items indicated above must be performed one or more times. Each diagnosis may require a long period of actual driving under various conditions.

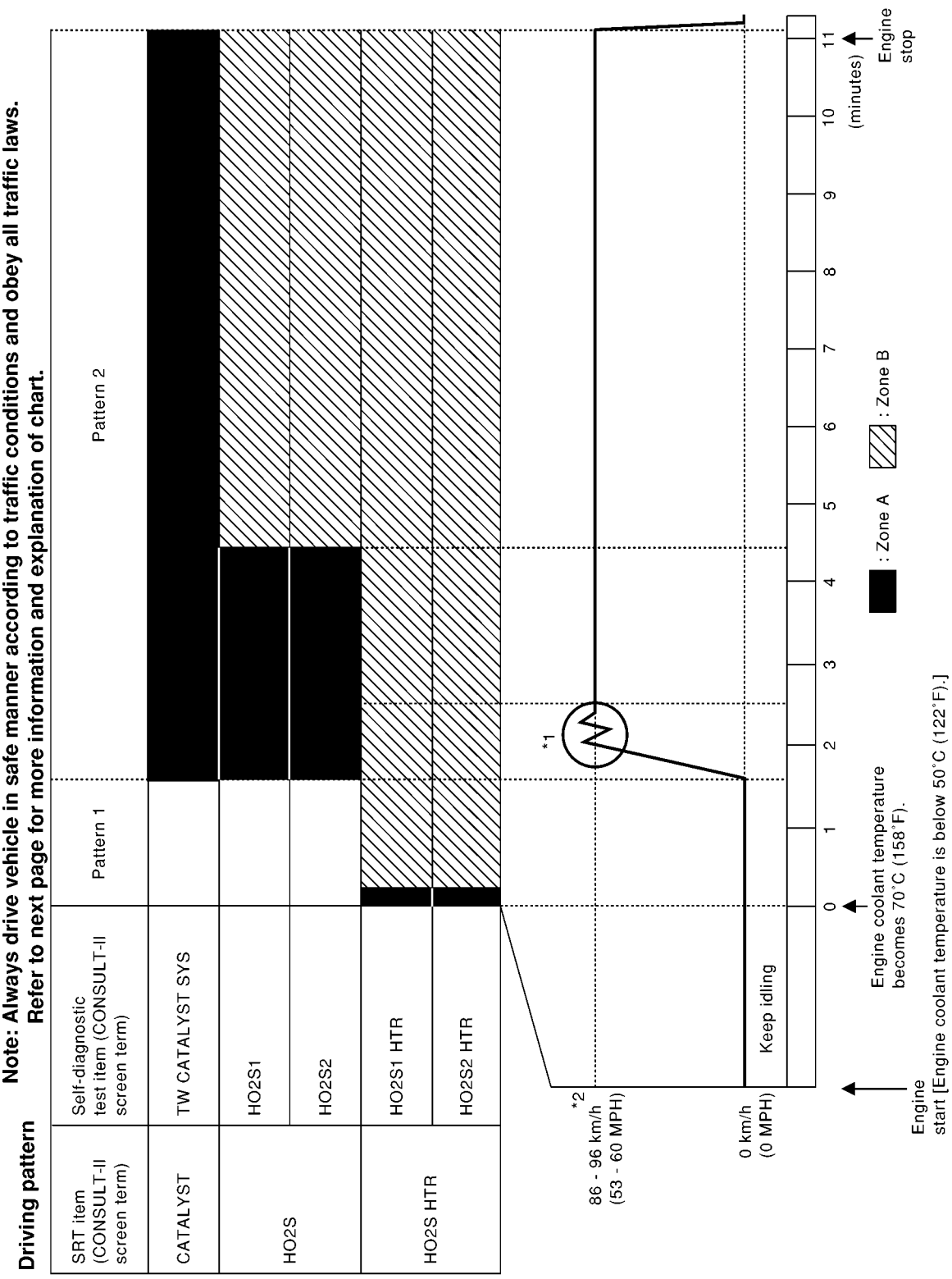
WITH CONSULT-II

Perform corresponding DTC Confirmation Procedure one by one based on “Performance Priority” in the table on EC-67, "SRT Item" .

WITHOUT CONSULT-II

The most efficient driving pattern in which SRT codes can be properly set is explained on the next page. The driving pattern should be performed one or more times to set all SRT codes.

Driving Pattern



MBIB0044E

- The time required for each diagnosis varies with road surface conditions, weather, altitude, individual driving habits, etc.
  Zone A refers to the range where the time, required for the diagnosis under normal conditions*, is the shortest.
  Zone B refers to the range where the diagnosis can still be performed if the diagnosis is not completed within zone A.

*: Normal conditions refer to the following:

- Sea level
- Flat road
- Ambient air temperature: 20 - 30°C (68 - 86°F)
- Diagnosis is performed as quickly as possible under normal conditions.
  Under different conditions [For example: ambient air temperature other than 20 - 30°C (68 - 86°F)], diagnosis may also be performed.

Pattern 1:

- **The engine is started at the engine coolant temperature of −10 to 35°C (14 to 95°F) (where the voltage between the ECM terminal 72 and ground is 3.0 - 4.3V).**
- **The engine must be operated at idle speed until the engine coolant temperature is greater than 70°C (158°F) (where the voltage between the ECM terminal 72 and ground is lower than 1.4V).**

Pattern 2:

- When steady-state driving is performed again even after it is interrupted, each diagnosis can be conducted. In this case, the time required for diagnosis may be extended.

*1: Depress the accelerator pedal until vehicle speed is 90 km/h (56 MPH), then release the accelerator pedal and keep it released for more than 10 seconds. Depress the accelerator pedal until vehicle speed is 90 km/h (56 MPH) again.
*2: Checking the vehicle speed with GST is advised.
Suggested Transmission Gear Position for A/T Models
Set the selector lever in the “D” position with the overdrive switch turned ON.

TEST VALUE AND TEST LIMIT (GST ONLY — NOT APPLICABLE TO CONSULT-II)

The following is the information specified in Mode 6 of ISO 15031-5.
The test value is a parameter used to determine whether a system/circuit diagnostic test is “OK” or “NG” while being monitored by the ECM during self-diagnosis. The test limit is a reference value which is specified as the maximum or minimum value and is compared with the test value being monitored.
Items for which these data (test value and test limit) are displayed are the same as SRT code items.
These data (test value and test limit) are specified by Test ID (TID) and Component ID (CID) and can be displayed on the GST screen.

QG16DE Engine Models

×: Applicable —: Not applicable

SRT item	Self-diagnostic test item	Test value (GST display)		Test limit	Application
		TID	CID		
CATALYST	Three way catalyst function	01H	01H	Max.	×
HO2S	Heated oxygen sensor 1	09H	04H	Max.	×
		0AH	84H	Min.	×
		0BH	04H	Max.	×
		0CH	04H	Max.	×
		0DH	04H	Max.	×
	Heated oxygen sensor 2	19H	86H	Min.	×
		1AH	86H	Min.	×
		1BH	06H	Max.	×
		1CH	06H	Max.	×

SRT item	Self-diagnostic test item	Test value (GST display)		Test limit	Application
		TID	CID		
HO2S HTR	Heated oxygen sensor 1 heater	29H	08H	Max.	×
		2AH	88H	Min.	×
	Heated oxygen sensor 2 heater	2DH	0AH	Max.	×
		2EH	8AH	Min.	×

QG18DE Engine Models

×: Applicable —: Not applicable

SRT item	Self-diagnostic test item	Test value (GST display)		Test limit	Application
		TID	CID		
CATALYST	Three way catalyst function (Bank1)	01H	01H	Max.	×
		02H	81H	Min.	×
	Three way catalyst function (Bank2)	03H	02H	Max.	×
		04H	82H	Min.	×
HO2S	Heated oxygen sensor 1 (Bank 1)	09H	04H	Max.	×
		0AH	84H	Min.	×
		0BH	04H	Max.	×
		0CH	04H	Max.	×
		0DH	04H	Max.	×
	Heated oxygen sensor 1 (Bank 2)	11H	05H	Max.	×
		12H	85H	Min.	×
		13H	05H	Max.	×
		14H	05H	Max.	×
		15H	05H	Max.	×
	Heated oxygen sensor 2 (Bank 1)	19H	86H	Min.	×
		1AH	86H	Min.	×
		1BH	06H	Max.	×
		1CH	06H	Max.	×
	Heated oxygen sensor 2 (Bank 2)	21H	87H	Min.	×
		22H	87H	Min.	×
		23H	07H	Max.	×
		24H	07H	Max.	×
HO2S HTR	Heated oxygen sensor 1 heater (Bank 1)	29H	08H	Max.	×
		2AH	88H	Min.	×
	Heated oxygen sensor 1 heater (Bank 2)	2BH	09H	Max.	×
		2CH	89H	Min.	×
	Heated oxygen sensor 2 heater (Bank 1)	2DH	0AH	Max.	×
		2EH	8AH	Min.	×
	Heated oxygen sensor 2 heater (Bank 2)	2FH	0BH	Max.	×
		30H	8BH	Min.	×

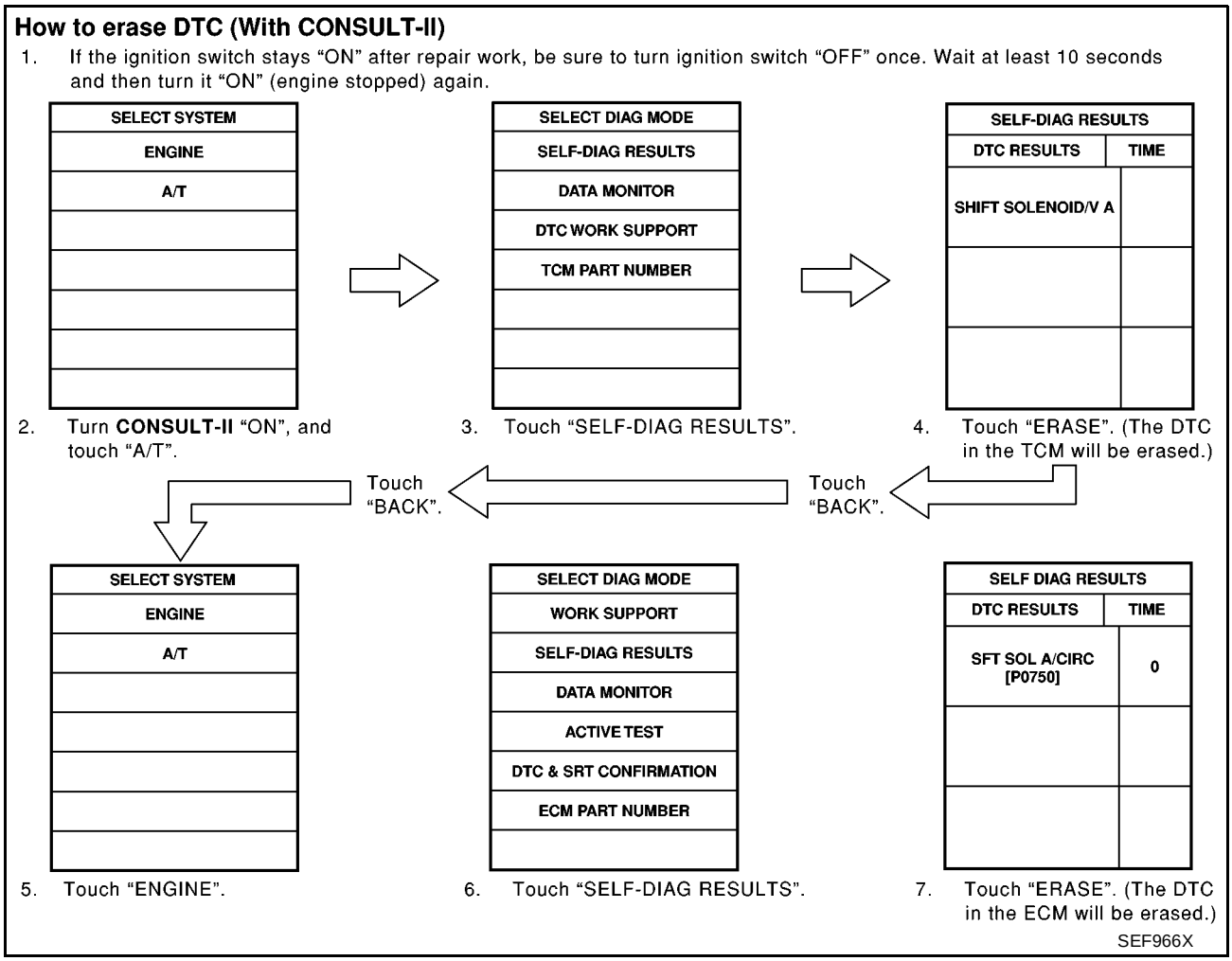
HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION

How to Erase DTC (With CONSULT-II)

The emission related diagnostic information in the ECM can be erased by selecting “ERASE” in the “SELF-DIAG RESULTS” mode with CONSULT-II.
If DTCs are displayed for both ECM and TCM (Transmission control module), they need to be erased individually from the ECM and TCM (Transmission control module).

NOTE:
If the DTC is not for A/T related items (see EC-23, "INDEX FOR DTC"), skip steps 2 through 4.

1. If the ignition switch stays “ON” after repair work, be sure to turn ignition switch “OFF” once. Wait at least 10 seconds and then turn it “ON” (engine stopped) again.
2. Turn CONSULT-II “ON” and touch “A/T”.
3. Touch “SELF-DIAG RESULTS”.
4. Touch “ERASE”. [The DTC in the TCM (Transmission control module) will be erased.] Then touch “BACK” twice.
5. Touch “ENGINE”.
6. Touch “SELF-DIAG RESULTS”.
7. Touch “ERASE”. (The DTC in the ECM will be erased.)



How to Erase DTC (With GST)

The emission related diagnostic information in the ECM can be erased by selecting Mode 4 with GST.

NOTE:
If the DTC is not for A/T related items (see EC-23, "INDEX FOR DTC"), skip step 2.

1. If the ignition switch stays “ON” after repair work, be sure to turn ignition switch “OFF” once. Wait at least 10 seconds and then turn it “ON” (engine stopped) again.
2. Perform “SELF-DIAGNOSTIC PROCEDURE (Without CONSULT-II)” in AT section titled “TROUBLE DIAGNOSIS”, “Self-diagnosis”. (The engine warm-up step can be skipped when performing the diagnosis only to erase the DTC.)
3. Select Mode 4 with GST (Generic Scan Tool).

How to Erase DTC (No Tools)

1. If the ignition switch stays “ON” after repair work, be sure to turn ignition switch OFF” once.

2. Wait at least 10 seconds and then turn it “ON” (engine stopped) again.
3. Change the diagnostic test mode from Mode II to Mode I by depressing the accelerator pedal. Refer to EC-76, "HOW TO SWITCH DIAGNOSTIC TEST MODE" .

- **If the battery is disconnected, the emission-related diagnostic information will be lost after approx. 24 hours.**
- **The following data are cleared when the ECM memory is erased.**

1. Diagnostic trouble codes
2. 1st trip diagnostic trouble codes
3. Freeze frame data
4. 1st trip freeze frame data
5. System readiness test (SRT) codes
6. Test values
7. Others

Actual work procedures are explained using a DTC as an example. Be careful so that not only the DTC, but all of the data listed above, are cleared from the ECM memory during work procedures.

NATS (Nissan Anti-theft System)

EBS00ELV

- **If the security indicator lights up with the ignition switch in the “ON” position or “NATS MALFUNCTION” is displayed on “SELF-DIAG RESULTS” screen, perform self-diagnostic results mode with CONSULT-II using NATS program card. Refer to BL-156, "NATS (NISSAN ANTI-THEFT SYSTEM)" .**
- **Confirm no self-diagnostic results of NATS is displayed before touching “ERASE” in “SELF-DIAG RESULTS” mode with CONSULT-II.**
- **When replacing ECM, initialization of NATS system and registration of all NATS ignition key IDs must be carried out with CONSULT-II using NATS program card. Therefore, be sure to receive all keys from vehicle owner. Regarding the procedures of NATS initialization and NATS ignition key ID registration, refer to CONSULT-II operation manual, NATS.**

SELF DIAG RESULTS	
DTC RESULTS	TIME
NATS MALFUNCTION [P1610]	0

SEF515Y

Malfunction Indicator (MI)

EBS00ELW

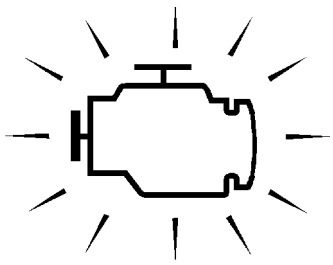
DESCRIPTION

The MI is located on the instrument panel.

1. The MI will light up when the ignition switch is turned ON without the engine running. This is a bulb check.

- If the MI does not light up, refer to DI-95, "WARNING LAMPS" , or see EC-552 .

2. When the engine is started, the MI should go off.
   If the MI remains on, the on board diagnostic system has detected an engine system malfunction.



SAT652J

ON BOARD DIAGNOSTIC SYSTEM FUNCTION

The on board diagnostic system has the following four functions.

Diagnostic Test Mode	KEY and ENG. Status	Function	Explanation of Function
Mode I	Ignition switch in “ON” position  Engine stopped 	BULB CHECK	This function checks the MI bulb for damage (blown, open circuit, etc.). If the MI does not come on, check MI circuit.
	Engine running 	MALFUNCTION WARNING	This is a usual driving condition. When a malfunction is detected twice in two consecutive driving cycles (two trip detection logic), the MI will light up to inform the driver that a malfunction has been detected. The following malfunctions will light up or blink the MI in the 1st trip. ● “Misfire (Possible three way catalyst damage)” ● Fail-safe mode
Mode II	Ignition switch in “ON” position  Engine stopped 	SELF-DIAGNOSTIC RESULTS	This function allows DTCs and 1st trip DTCs to be read.
	Engine running 	HEATED OXYGEN SENSOR 1 MONITOR	This function allows the fuel mixture condition (lean or rich), monitored by heated oxygen sensor 1, to be read.

MI Flashing without DTC

If the ECM is in Diagnostic Test Mode II, MI may flash when engine is running. In this case, check ECM diagnostic test mode, EC-76, "HOW TO SWITCH DIAGNOSTIC TEST MODE" .
How to switch the diagnostic test (function) modes, and details of the above functions are described later, EC-76, "HOW TO SWITCH DIAGNOSTIC TEST MODE" .
The following emission-related diagnostic information is cleared when the ECM memory is erased.

1. Diagnostic trouble codes
2. 1st trip diagnostic trouble codes
3. Freeze frame data
4. 1st trip freeze frame data
5. System readiness test (SRT) codes
6. Test values
7. Others

HOW TO SWITCH DIAGNOSTIC TEST MODE

NOTE:

- **It is better to count the time accurately with a clock.**
- **It is impossible to switch the diagnostic mode when an accelerator pedal position sensor circuit has a malfunction.**
- **Always ECM returns to Diagnostic Test Mode I after ignition switch is turned “OFF”.**

How to Set Diagnostic Test Mode II (Self-diagnostic Results)

1. Confirm that accelerator pedal is fully released, turn ignition switch “ON” and wait 3 seconds.

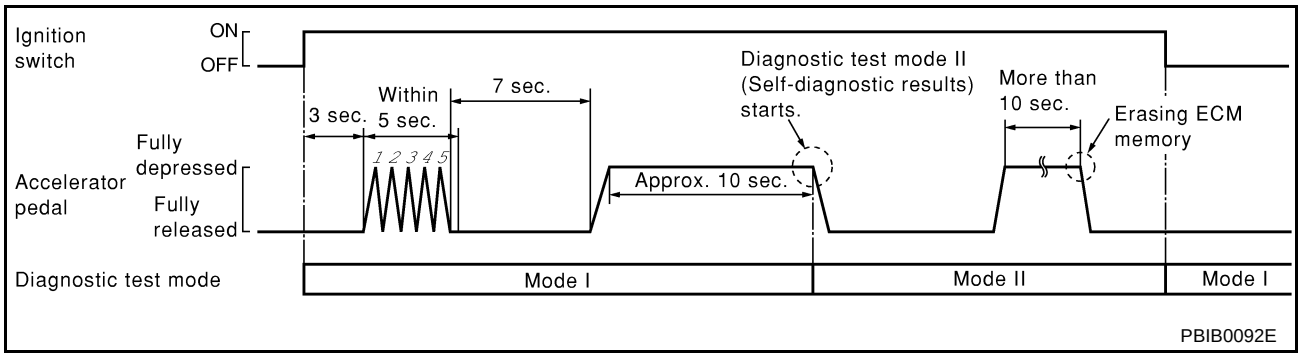
2. Repeat the following procedure quickly five times within 5 seconds.

a. Fully depress the accelerator pedal.

b. Fully release the accelerator pedal.

3. Wait 7 seconds, fully depress the accelerator pedal and keep it for approx. 10 seconds until the MI starts blinking.

4. Fully release the accelerator pedal.
ECM has entered to Diagnostic Test Mode II (Self-diagnostic results).



How to Set Diagnostic Test Mode II (Heated Oxygen Sensor 1 Monitor)

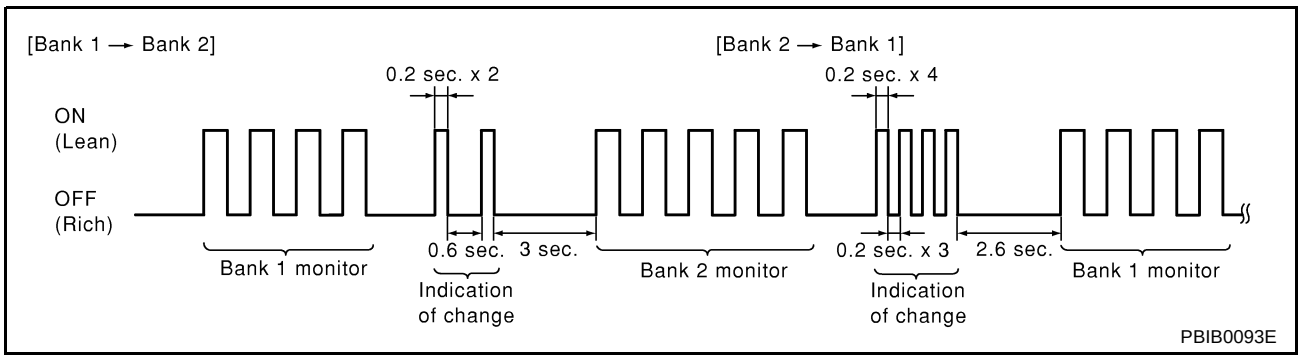
1. Set the ECM in Diagnostic Test Mode II (Self-diagnostic results). Refer to EC-76, "How to Set Diagnostic Test Mode II (Self-diagnostic Results)" .

2. Start Engine.
ECM has entered to Diagnostic Test Mode II (Heated oxygen sensor 1 monitor).
ECM will start heated oxygen sensor 1 monitoring from the bank 1 sensor for QG18DE engine models.

How to Switch Monitored Sensor From Bank 1 to Bank 2 or Vice Versa

1. Fully depress the accelerator pedal quickly and then release it immediately.

2. Make sure that monitoring sensor has changed by MI blinking as follows.



How to Erase Diagnostic Test Mode II (Self-diagnostic Results)

1. Set ECM in Diagnostic Test Mode II (Self-diagnostic results). Refer to EC-76, "How to Set Diagnostic Test Mode II (Self-diagnostic Results)" .

2. Fully depress the accelerator pedal and keep it for more than 10 seconds.
The emission-related diagnostic information has been erased from the backup memory in the ECM.

3. Fully release the accelerator pedal, and confirm the DTC 0000 is displayed.

DIAGNOSTIC TEST MODE I — BULB CHECK

In this mode, the MI on the instrument panel should stay ON. If it remains OFF, check the bulb. Refer to DI-95, "WARNING LAMPS" or see EC-552 .

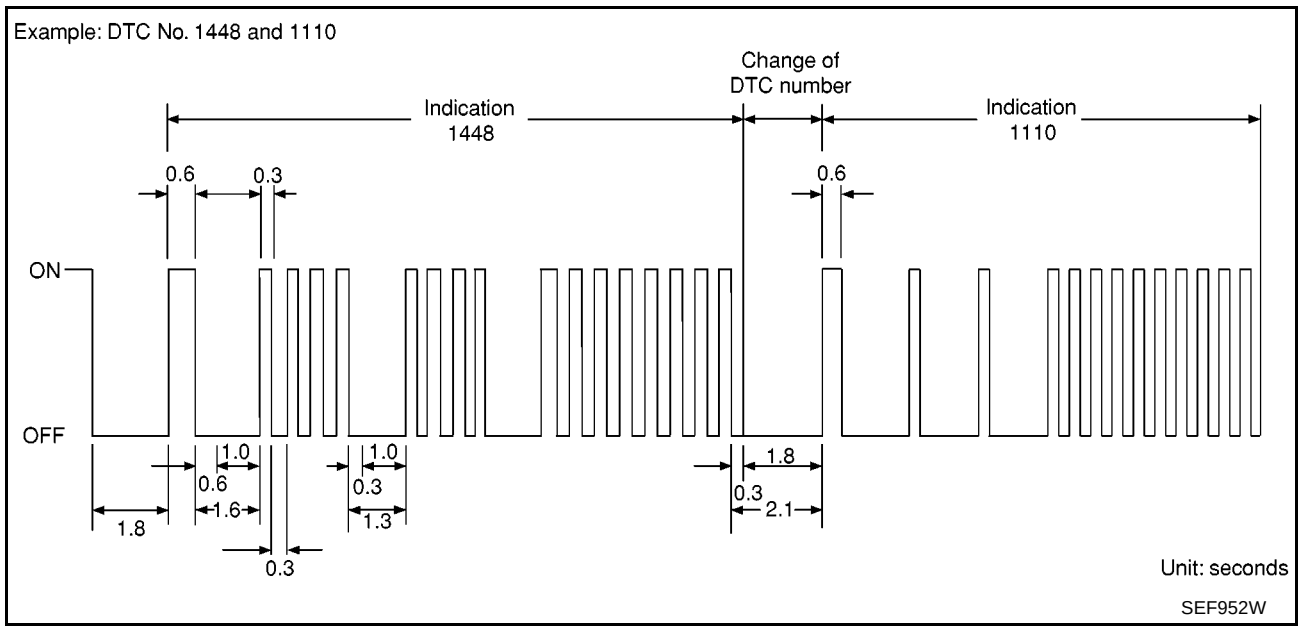
DIAGNOSTIC TEST MODE I — MALFUNCTION WARNING

MI	Condition
ON	When the malfunction is detected.
OFF	No malfunction.

- These DTC numbers are clarified in Diagnostic Test Mode II (SELF-DIAGNOSTIC RESULTS)

DIAGNOSTIC TEST MODE II — SELF-DIAGNOSTIC RESULTS

In this mode, the DTC and 1st trip DTC are indicated by the number of blinks of the MI as shown below.
The DTC and 1st trip DTC are displayed at the same time. If the MI does not illuminate in diagnostic test mode I (Malfunction warning), all displayed items are 1st trip DTCs. If only one code is displayed when the MI illuminates in diagnostic test mode II (SELF-DIAGNOSTIC RESULTS), it is a DTC; if two or more codes are displayed, they may be either DTCs or 1st trip DTCs. DTC No. is same as that of 1st trip DTC. These unidentified codes can be identified by using the CONSULT-II or GST. A DTC will be used as an example for how to read a code.



A particular trouble code can be identified by the number of four-digit numeral flashes. The “zero” is indicated by the number of ten flashes. The length of time the 1,000th-digit numeral flashes on and off is 1.2 seconds consisting of an ON (0.6-second) - OFF (0.6-second) cycle.
The 100th-digit numeral and lower digit numerals consist of a 0.3-second ON and 0.3-second OFF cycle.
A change from one digit numeral to another occurs at an interval of 1.0-second OFF. In other words, the later numeral appears on the display 1.3 seconds after the former numeral has disappeared.
A change from one trouble code to another occurs at an interval of 1.8-second OFF.
In this way, all the detected malfunctions are classified by their DTC numbers. The DTC “0000” refers to no malfunction. (See EC-23, "INDEX FOR DTC")

How to Erase Diagnostic Test Mode II (Self-diagnostic Results)

The DTC can be erased from the back up memory in the ECM by depressing accelerator pedal. Refer to EC-76, "HOW TO SWITCH DIAGNOSTIC TEST MODE" .

- **If the battery is disconnected, the DTC will be lost from the backup memory after approx 24 hours.**
- **Be careful not to erase the stored memory before starting trouble diagnoses.**

DIAGNOSTIC TEST MODE II — HEATED OXYGEN SENSOR 1 MONITOR

In this mode, the MI displays the condition of the fuel mixture (lean or rich) which is monitored by the heated oxygen sensor 1.

MI	Fuel mixture condition in the exhaust gas	Air fuel ratio feedback control condition
ON	Lean	Closed loop system
OFF	Rich	
*Remains ON or OFF	Any condition	Open loop system

*: Maintains conditions just before switching to open loop.

To check the heated oxygen sensor 1 function, start engine in the Diagnostic Test Mode II and warm it up until engine coolant temperature indicator points to the middle of the gauge.
Next run engine at about 2,000 rpm for about 2 minutes under no-load conditions. Then make sure that the MI comes ON more than 5 times within 10 seconds with engine running at 2,000 rpm under no-load.

OBD System Operation Chart

EBS00ELX

RELATIONSHIP BETWEEN MI, 1ST TRIP DTC, DTC, AND DETECTABLE ITEMS

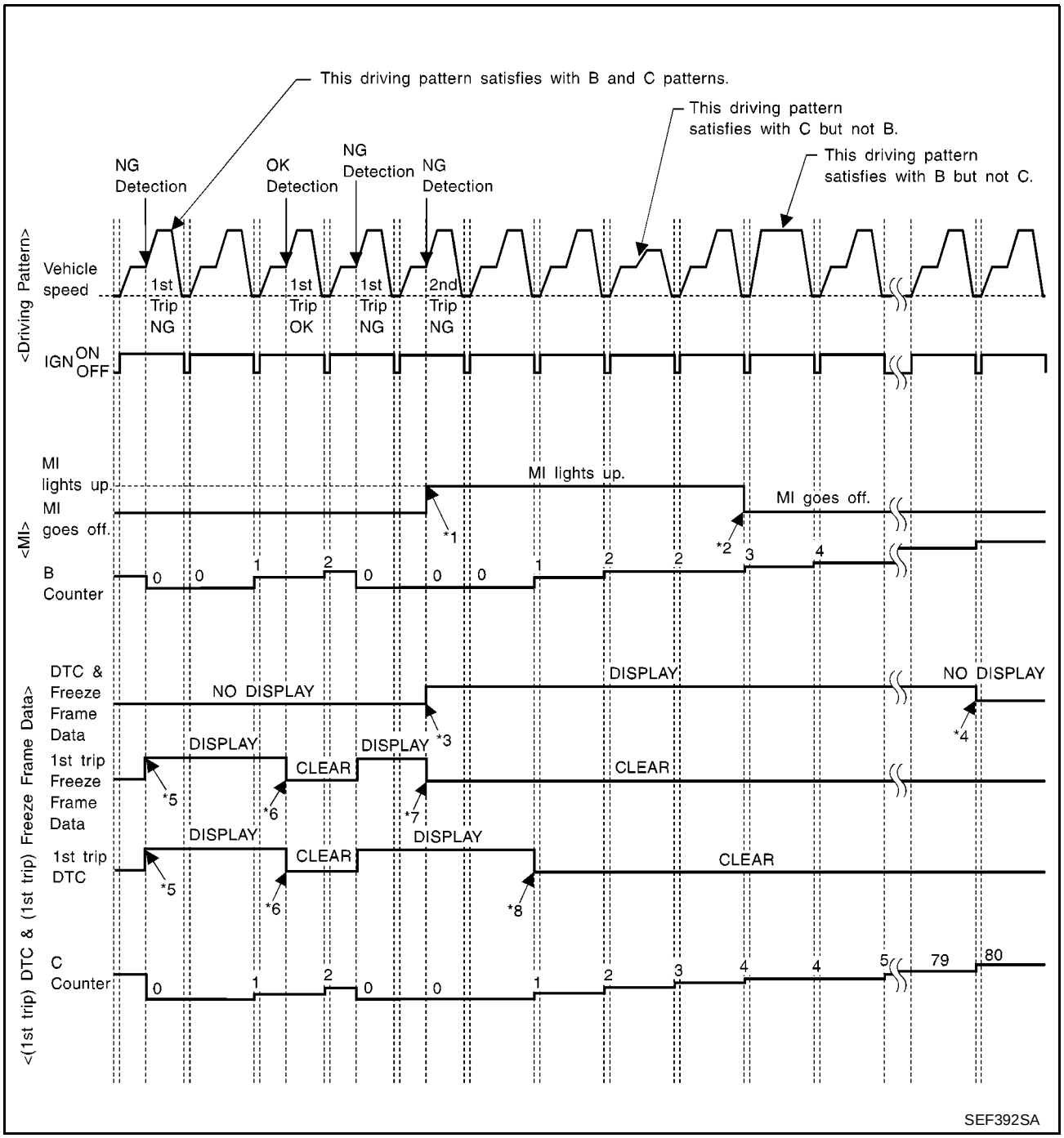
- When a malfunction is detected for the first time, the 1st trip DTC and the 1st trip freeze frame data are stored in the ECM memory.
- When the same malfunction is detected in two consecutive trips, the DTC and the freeze frame data are stored in the ECM memory, and the MI will come on. For details, refer to EC-60, "Two Trip Detection Logic" .
- The MI will go off after the vehicle is driven 3 times with no malfunction. The drive is counted only when the recorded driving pattern is met (as stored in the ECM). If another malfunction occurs while counting, the counter will reset.
- The DTC and the freeze frame data will be stored until the vehicle is driven 40 times (driving pattern A) without the same malfunction recurring (except for Misfire and Fuel Injection System). For Misfire and Fuel Injection System, the DTC and freeze frame data will be stored until the vehicle is driven 80 times (driving pattern C) without the same malfunction recurring. The “TIME” in “SELF-DIAGNOSTIC RESULTS” mode of CONSULT-II will count the number of times the vehicle is driven.
- The 1st trip DTC is not displayed when the self-diagnosis results in “OK” for the 2nd trip.

SUMMARY CHART

Items	Fuel Injection System	Misfire	Other
MI (goes off)	3 (pattern B)	3 (pattern B)	3 (pattern B)
DTC, Freeze Frame Data (no display)	80 (pattern C)	80 (pattern C)	40 (pattern A)
1st Trip DTC (clear)	1 (pattern C), *1	1 (pattern C), *1	1 (pattern B)
1st Trip Freeze Frame Data (clear)	*1, *2	*1, *2	1 (pattern B)

For details about patterns “B” and “C” under “Fuel Injection System” and “Misfire”, see EC-81 .
For details about patterns “A” and “B” under “Other”, see EC-83 .
*1: Clear timing is at the moment OK is detected.
*2: Clear timing is when the same malfunction is detected in the 2nd trip.

RELATIONSHIP BETWEEN MI, DTC, 1ST TRIP DTC AND DRIVING PATTERNS FOR "MISFIRE" <EXHAUST QUALITY DETERIORATION>, "FUEL INJECTION SYSTEM"



*1: When the same malfunction is detected in two consecutive trips, MI will light up.

*2: MI will go off after vehicle is driven 3 times (pattern B) without any malfunctions.

*3: When the same malfunction is detected in two consecutive trips, the DTC and the freeze frame data will be stored in ECM.

*4: The DTC and the freeze frame data will not be displayed any longer after vehicle is driven 80 times (pattern C) without the same malfunction. (The DTC and the freeze frame data still remain in ECM.)

*5: When a malfunction is detected for the first time, the 1st trip DTC and the 1st trip freeze frame data will be stored in ECM.

*6: The 1st trip DTC and the 1st trip freeze frame data will be cleared at the moment OK is detected.

*7: When the same malfunction is detected in the 2nd trip, the 1st trip freeze frame data will be cleared.

*8: 1st trip DTC will be cleared when vehicle is driven once (pattern C) without the same malfunction after DTC is stored in ECM.

EXPLANATION FOR DRIVING PATTERNS FOR “MISFIRE <EXHAUST QUALITY DETERIORATION>”, “FUEL INJECTION SYSTEM”

<Driving Pattern B>

Driving pattern B means the vehicle operation as follows:
All components and systems should be monitored at least once by the OBD system.

- The B counter will be cleared when the malfunction is detected once regardless of the driving pattern.
- The B counter will be counted up when driving pattern B is satisfied without any malfunction.
- The MI will go off when the B counter reaches 3. (*2 in “OBD SYSTEM OPERATION CHART”)

<Driving Pattern C>

Driving pattern C means the vehicle operation as follows:

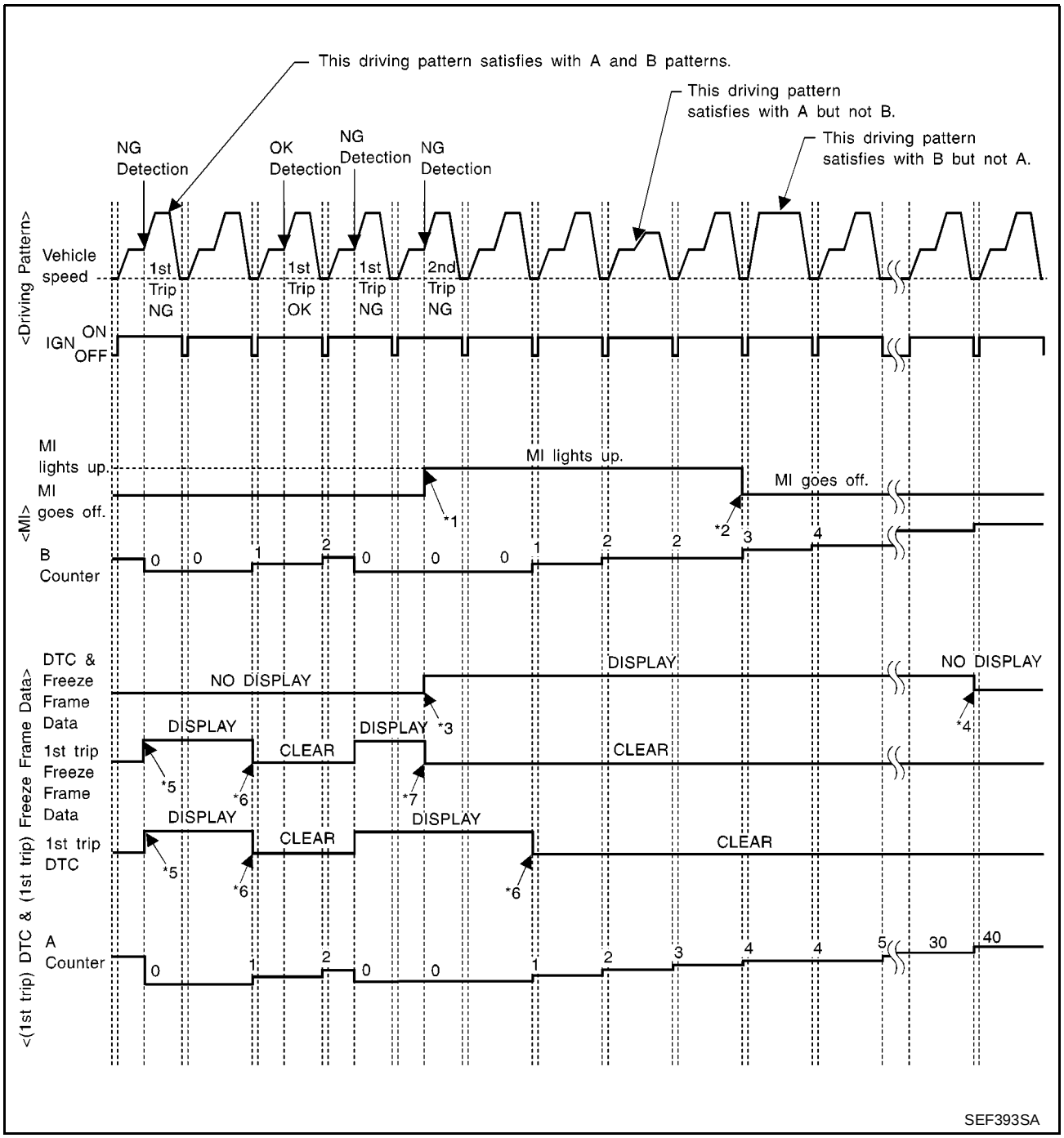
1. The following conditions should be satisfied at the same time:
   Engine speed: (Engine speed in the freeze frame data) ±375 rpm
   Calculated load value: (Calculated load value in the freeze frame data) x (1±0.1) [%]
   Engine coolant temperature (T) condition:

- When the freeze frame data shows lower than 70°C (158°F), “T” should be lower than 70°C (158°F).
- When the freeze frame data shows higher than or equal to 70°C (158°F), “T” should be higher than or equal to 70°C (158°F).

Example:
If the stored freeze frame data is as follows:
Engine speed: 850 rpm, Calculated load value: 30%, Engine coolant temperature: 80°C (176°F)
To be satisfied with driving pattern C, the vehicle should run under the following conditions:
Engine speed: 475 - 1,225 rpm, Calculated load value: 27 - 33%, Engine coolant temperature: more than 70°C (158°F)

- The C counter will be cleared when the malfunction is detected regardless of (1).
- The C counter will be counted up when (1) is satisfied without the same malfunction.
- The DTC will not be displayed after C counter reaches 80.
- The 1st trip DTC will be cleared when C counter is counted once without the same malfunction after DTC is stored in ECM.

RELATIONSHIP BETWEEN MI, DTC, 1ST TRIP DTC AND DRIVING PATTERNS EXCEPT FOR "MISFIRE <EXHAUST QUALITY DETERIORATION>", "FUEL INJECTION SYSTEM"



*1: When the same malfunction is detected in two consecutive trips, MI will light up.

*2: MI will go off after vehicle is driven 3 times (pattern B) without any malfunctions.

*3: When the same malfunction is detected in two consecutive trips, the DTC and the freeze frame data will be stored in ECM.

*4: The DTC and the freeze frame data will not be displayed any longer after vehicle is driven 40 times (pattern A) without the same malfunction. (The DTC and the freeze frame data still remain in ECM.)

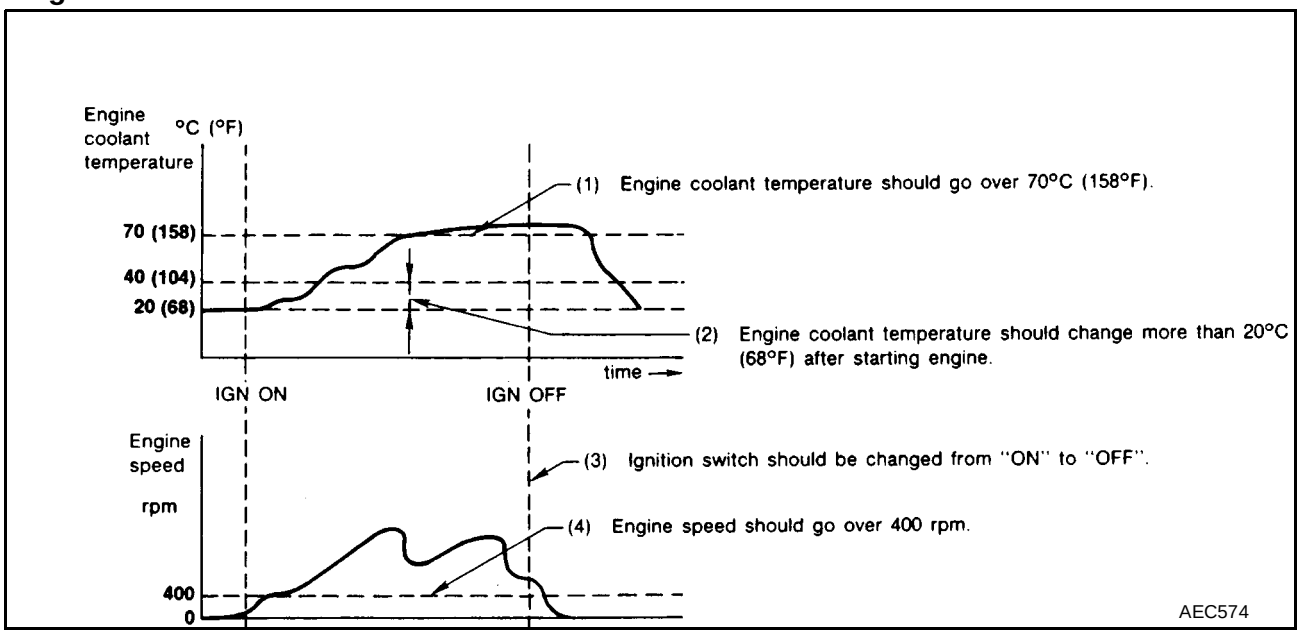
*5: When a malfunction is detected for the first time, the 1st trip DTC and the 1st trip freeze frame data will be stored in ECM.

*6: 1st trip DTC will be cleared after vehicle is driven once (pattern B) without the same malfunction.

*7: When the same malfunction is detected in the 2nd trip, the 1st trip freeze frame data will be cleared.

EXPLANATION FOR DRIVING PATTERNS EXCEPT FOR "MISFIRE <EXHAUST QUALITY DETERIORATION>", "FUEL INJECTION SYSTEM"

<Driving Pattern A>



- The A counter will be cleared when the malfunction is detected regardless of (1) - (4).
- The A counter will be counted up when (1) - (4) are satisfied without the same malfunction.
- The DTC will not be displayed after the A counter reaches 40.

<Driving Pattern B>

Driving pattern B means the vehicle operation as follows:
All components and systems should be monitored at least once by the OBD system.

- The B counter will be cleared when the malfunction is detected once regardless of the driving pattern.
- The B counter will be counted up when driving pattern B is satisfied without any malfunctions.
- The MI will go off when the B counter reaches 3 (*2 in "OBD SYSTEM OPERATION CHART").

TROUBLE DIAGNOSIS

PFP:00004

Trouble Diagnosis Introduction

EBS00ELY

INTRODUCTION

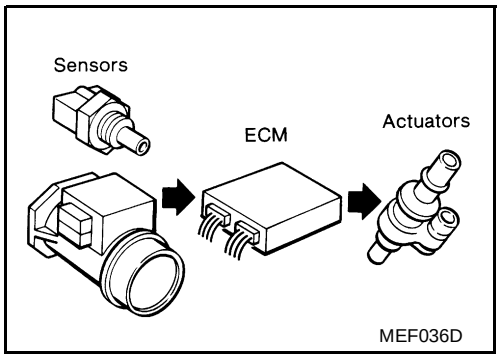
The engine has an ECM to control major systems such as fuel control, ignition control, idle air control system, etc. The ECM accepts input signals from sensors and instantly drives actuators. It is essential that both input and output signals are proper and stable. At the same time, it is important that there are no problems such as vacuum leaks, fouled spark plugs, or other problems with the engine.

It is much more difficult to diagnose a problem that occurs intermittently rather than continuously. Most intermittent problems are caused by poor electric connections or improper wiring. In this case, careful checking of suspected circuits may help prevent the replacement of good parts.

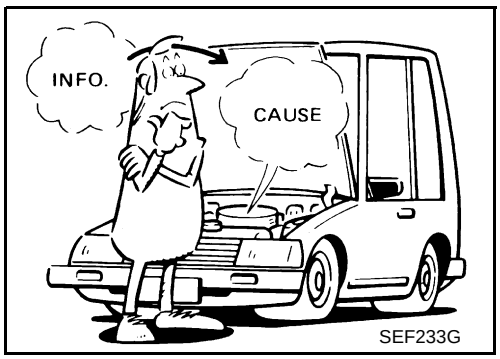
A visual check only may not find the cause of the problems. A road test with CONSULT-II (or GST) or a circuit tester connected should be performed. Follow the “Work Flow” on EC-85 .

Before undertaking actual checks, take a few minutes to talk with a customer who approaches with a driveability complaint. The customer can supply good information about such problems, especially intermittent ones. Find out what symptoms are present and under what conditions they occur. A “Diagnostic Worksheet” like the example on EC-88 should be used.

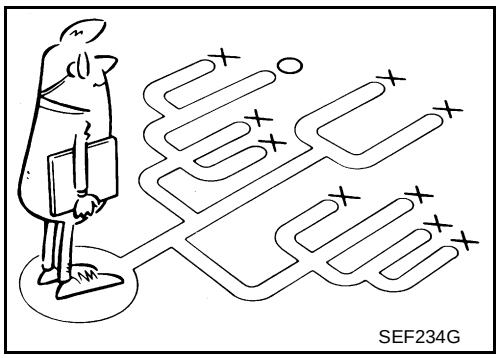
Start your diagnosis by looking for “conventional” problems first. This will help troubleshoot driveability problems on an electronically controlled engine vehicle.



MEF036D

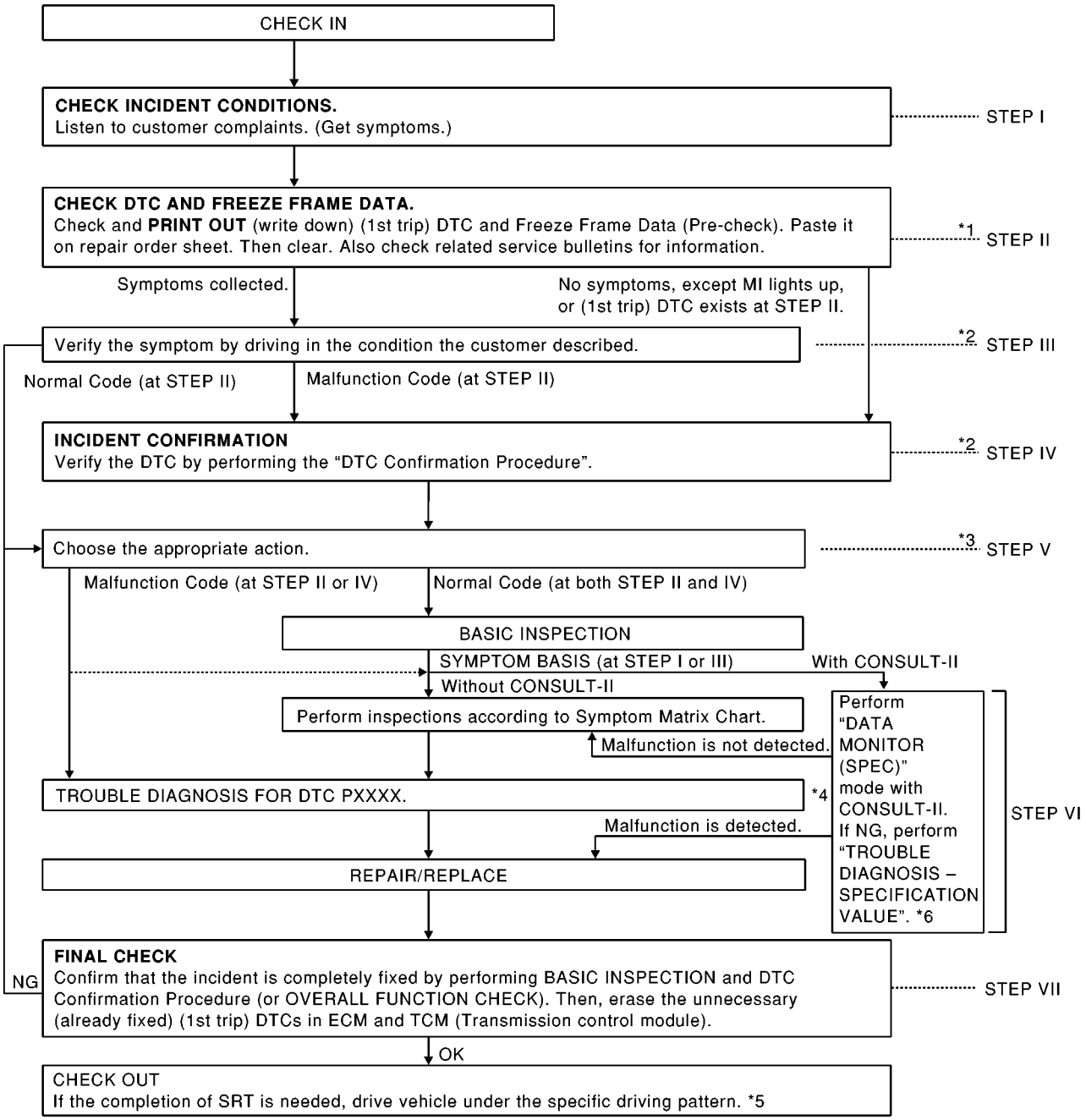


SEF233G


SEF234G

WORK FLOW

Flow Chart



MBIB0159E

*1: If time data of "SELF-DIAG RESULTS" is other than "0" or "[1t]", perform EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

*2: If time data of "SELF-DIAG RESULTS" is other than "0" or "[1t]", perform EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

*3: If the on board diagnostic system cannot be performed, check main power supply and ground circuit. Refer to EC-144, "POWER SUPPLY CIRCUIT FOR ECM" .

*4: If malfunctioning part cannot be detected, perform EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

*5: EC-71, "Driving Pattern"

*6: EC-139, "TROUBLE DIAGNOSIS - SPECIFICATION VALUE"

Description for Work Flow

STEP	DESCRIPTION
STEP I	Get detailed information about the conditions and the environment when the incident/symptom occurred using the “DIAGNOSTIC WORK SHEET”, EC-87 .
STEP II	Before confirming the concern, check and write down (print out using CONSULT-II or GST) the (1st trip) DTC and the (1st trip) freeze frame data, then erase the DTC and the data. (Refer toEC-73, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .) The (1st trip) DTC and the (1st trip) freeze frame data can be used when duplicating the incident at STEP III & IV. If the incident cannot be verified, perform EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" . Study the relationship between the cause, specified by (1st trip) DTC, and the symptom described by the customer. (The “Symptom Matrix Chart” will be useful. See EC-97 .) Also check related service bulletins for information.
STEP III	Try to confirm the symptom and under what conditions the incident occurs. The “DIAGNOSTIC WORK SHEET” and the freeze frame data are useful to verify the incident. Connect CONSULT-II to the vehicle in DATA MONITOR (AUTO TRIG) mode and check real time diagnosis results. If the incident cannot be verified, perform EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" . If the malfunction code is detected, skip STEP IV and perform STEP V.
STEP IV	Try to detect the (1st trip) DTC by driving in (or performing) the “DTC Confirmation Procedure”. Check and read the (1st trip) DTC and (1st trip) freeze frame data by using CONSULT-II or GST. During the (1st trip) DTC verification, be sure to connect CONSULT-II to the vehicle in DATA MONITOR (AUTO TRIG) mode and check real time diagnosis results. If the incident cannot be verified, perform EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" . In case the “DTC Confirmation Procedure” is not available, perform the “Overall Function Check” instead. The (1st trip) DTC cannot be displayed by this check, however, this simplified “check” is an effective alternative. The “NG” result of the “Overall Function Check” is the same as the (1st trip) DTC detection.
STEP V	Take the appropriate action based on the results of STEP I through IV. If the malfunction code is indicated, proceed to TROUBLE DIAGNOSIS FOR DTC PXXXX. If the normal code is indicated, proceed to the BASIC INSPECTION. (Refer to EC-92 .) If COSULT-II is available, perform “DATA MONITOR (SPEC)” mode with CONSULT-II and proceed to the “TOROUBLE DIAGNOSIS – SPECIFICATION VALUE”. (Refer to EC-139 .) (If malfunction is detected, proceed to “PERAIR/REPLACE”.) Then perform inspections according to the Symptom Matrix Chart. (Refer to EC-97 .)
STEP VI	Identify where to begin diagnosis based on the relationship study between symptom and possible causes. Inspect the system for mechanical binding, loose connectors or wiring damage using (tracing) “Harness Layouts”. Gently shake the related connectors, components or wiring harness with CONSULT-II set in “DATA MONITOR (AUTO TRIG)” mode. Check the voltage of the related ECM terminals or monitor the output data from the related sensors with CONSULT-II. Refer to EC-107 , EC-133 . The “Diagnostic Procedure” in EC section contains a description based on open circuit inspection. A short circuit inspection is also required for the circuit check in the Diagnostic Procedure. For details, refer to “Circuit Inspection” in GI-24, "How to Perform Efficient Diagnosis for an Electrical Incident" . Repair or replace the malfunction parts. If malfunctioning part cannot be detected, perform EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .
STEP VII	Once you have repaired the circuit or replaced a component, you need to run the engine in the same conditions and circumstances which resulted in the customer's initial complaint. Perform the “DTC Confirmation Procedure” and confirm the normal code [DTC No. P0000] is detected. If the incident is still detected in the final check, perform STEP VI by using a method different from the previous one. Before returning the vehicle to the customer, be sure to erase the unnecessary (already fixed) (1st trip) DTC in ECM and TCM (Transmission control module). (Refer toEC-73, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" and AT-37, "HOW TO ERASE DTC" .)

DIAGNOSTIC WORKSHEET

Description

There are many operating conditions that lead to the malfunction of engine components. A good grasp of such conditions can make troubleshooting faster and more accurate.
In general, each customer feels differently about a problem. It is important to fully understand the symptoms or conditions for a customer complaint.
Utilize a diagnostic worksheet like the one on the next page in order to organize all the information for troubleshooting.
Some conditions may cause the MI to come on steady or blink and DTC to be detected. Examples:

- Vehicle ran out of fuel, which caused the engine to misfire.
- Fuel filler cap was left off or incorrectly screwed on, allowing fuel to evaporate into the atmosphere.

KEY POINTS

WHAT ..... Vehicle & engine model
WHEN ..... Date, Frequencies
WHERE..... Road conditions
HOW ..... Operating conditions, Weather conditions, Symptoms

SEF907L

Worksheet Sample

Customer name MR/MS		Model & Year	VIN
Engine #		Trans.	Mileage
Incident Date		Manuf. Date	In Service Date
Fuel and fuel filler cap		☐ Vehicle ran out of fuel causing misfire ☐ Fuel filler cap was left off or incorrectly screwed on.	
Symptoms	☐ Startability	☐ Impossible to start ☐ No combustion ☐ Partial combustion ☐ Partial combustion affected by throttle position ☐ Partial combustion NOT affected by throttle position ☐ Possible but hard to start ☐ Others [ ]	
	☐ Idling	☐ No fast idle ☐ Unstable ☐ High idle ☐ Low idle ☐ Others [ ]	
	☐ Driveability	☐ Stumble ☐ Surge ☐ Knock ☐ Lack of power ☐ Intake backfire ☐ Exhaust backfire ☐ Others [ ]	
	☐ Engine stall	☐ At the time of start ☐ While idling ☐ While accelerating ☐ While decelerating ☐ Just after stopping ☐ While loading	
Incident occurrence		☐ Just after delivery ☐ Recently ☐ In the morning ☐ At night ☐ In the daytime	
Frequency		☐ All the time ☐ Under certain conditions ☐ Sometimes	
Weather conditions		☐ Not affected	
	Weather	☐ Fine ☐ Raining ☐ Snowing ☐ Others [ ]	
	Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold ☐ Humid ˚F	
Engine conditions		☐ Cold ☐ During warm-up ☐ After warm-up Engine speed 0 2,000 4,000 6,000 8,000 rpm	
Road conditions		☐ In town ☐ In suburbs ☐ Highway ☐ Off road (up/down)	
Driving conditions		☐ Not affected ☐ At starting ☐ While idling ☐ At racing ☐ While accelerating ☐ While cruising ☐ While decelerating ☐ While turning (RH/LH) Vehicle speed 0 10 20 30 40 50 60 MPH	
Malfunction indicator lamp		☐ Turned on ☐ Not turned on	

MTBL0017

DTC Inspection Priority Chart

EBS00ELZ

If some DTCs are displayed at the same time, perform inspections one by one based on the following priority chart.

NOTE:
If DTC U1000 and/or U1001 is displayed with other DTC, first perform the trouble diagnosis for DTC U1000 and U1001. Refer to EC-150, "DTC U1000, U1001 CAN COMMUNICATION LINE" .

QG16DE ENGINE

Priority	Detected items (DTC)
1	● U1001 CAN communication line ● P0102 P0103 P1102 Mass air flow sensor ● P0112 P0113 Intake air temperature sensor ● P0117 P0118 Engine coolant temperature sensor ● P0221 P0222 P0223 P1223 P1224 P1225 P1226 P1229 Throttle position sensor ● P0226 P0227 P0228 P1227 P1228 Accelerator pedal position sensor ● P0327 P0328 Knock sensor ● P0335 Crankshaft position sensor (POS) ● P0340 Camshaft position sensor (PHASE) ● P0500 Vehicle speed sensor ● P0605 ECM ● P1610-P1615 NATS ● P1706 Park/Neutral position (PNP) switch
2	● P0031 P0032 Heated oxygen sensor 1 heater ● P0037 P0038 Heated oxygen sensor 2 heater ● P0132 P0133 P0134 P1143 P1144 Heated oxygen sensor 1 ● P0138 P0139 P1146 P1147 Heated oxygen sensor 2 ● P0550 Power steering pressure sensor ● P1065 ECM power supply ● P1111 Intake valve timing control solenoid valve ● P1122 Electric throttle control function ● P1124 P1126 P1128 Electric throttle control actuator ● P1805 Brake switch
3	● P0011 Intake valve timing control ● P0171 P0172 Fuel injection system function ● P0300 - P0304 Misfire ● P0420 Three way catalyst function ● P0444 P0445 EVAP canister purge volume control solenoid valve ● P1121 Electric throttle control actuator ● P1217 Engine over temperature (OVERHEAT)

QG18DE ENGINE

Priority	Detected items (DTC)
1	● U1000 U1001 CAN communication line ● P0102 P0103 P1102 Mass air flow sensor ● P0112 P0113 Intake air temperature sensor ● P0117 P0118 Engine coolant temperature sensor ● P0221 P0222 P0223 P1223 P1224 P1225 P1226 P1229 Throttle position sensor ● P0226 P0227 P0228 P1227 P1228 Accelerator pedal position sensor ● P0327 P0328 Knock sensor ● P0335 Crankshaft position sensor (POS) ● P0340 Camshaft position sensor (PHASE) ● P0500 Vehicle speed sensor ● P0605 ECM ● P0705 Park/Neutral position (PNP) switch ● P1610-P1615 NATS ● P1706 Park/Neutral position (PNP) switch
2	● P0031 P0032 P0051 P0052 Heated oxygen sensor 1 heater ● P0037 P0038 P0057 P0058 Heated oxygen sensor 2 heater ● P0132 P0133 P0134 P0152 P0153 P0154 P1143 P1144 P1163 P1164 Heated oxygen sensor 1 ● P0138 P0139 P0158 P0159 P1146 P1147 P1166 P1167 Heated oxygen sensor 2 ● P0550 Power steering pressure sensor ● P0710-P0725, P0740-P0755, P1705 P1760 A/T related sensors and solenoid valves ● P1065 ECM power supply ● P1111 Intake valve timing control solenoid valve ● P1122 Electric throttle control function ● P1124 P1126 P1128 Electric throttle control actuator ● P1805 Brake switch
3	● P0011 Intake valve timing control ● P0171 P0172 P0174 P0175 Fuel injection system function ● P0300 - P0304 Misfire ● P0420 P0430 Three way catalyst function ● P0444 P0445 EVAP canister purge volume control solenoid valve ● P0731-P0734 A/T function ● P1121 Electric throttle control actuator ● P1217 Engine over temperature (OVERHEAT)

Fail-safe Chart

EBS00EM0

When the DTC listed below is detected, the ECM enters fail-safe mode and the MI lights up.

DTC No.	Detected items	Engine operating condition in fail-safe mode
P0102 P0103 P1102	Mass air flow sensor circuit	Engine speed will not rise more than 2,400 rpm due to the fuel cut.

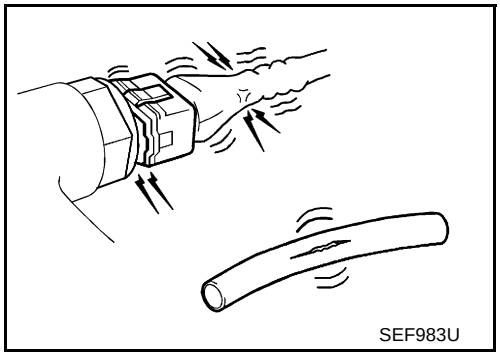
<table>
<tr><th>DTC No.</th><th>Detected items</th><th colspan="2">Engine operating condition in fail-safe mode</th></tr>
<tr><td rowspan="6">P0117
P0118</td><td rowspan="6">Engine coolant temperature sensor circuit</td><td colspan="2">Engine coolant temperature will be determined by ECM based on the time after turning ignition switch “ON” or “START”.
CONSULT-II displays the engine coolant temperature decided by ECM.</td></tr>
<tr><td>Condition</td><td>Engine coolant temperature decided (CONSULT-II display)</td></tr>
<tr><td>Just as ignition switch is turned ON or Start</td><td>40°C (104°F)</td></tr>
<tr><td>More than approx. 4 minutes after ignition ON or Start</td><td>80°C (176°F)</td></tr>
<tr><td>Except as shown above</td><td>40 - 80°C (104 - 176°F)
(Depends on the time)</td></tr>
<tr><td colspan="2">When the fail-safe system for engine coolant temperature sensor is activated, the cooling fan operates while engine is running.</td></tr>
<tr><td>P0221
P0222
P0223
P1223
P1224</td><td>Throttle position sensor</td><td colspan="2">The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees.
The ECM regulates the opening speed of the throttle valve to be slower than the normal condition.
So, the acceleration will be poor.</td></tr>
<tr><td>P0226
P0227
P0228
P1227
P1228</td><td>Accelerator pedal position sensor</td><td colspan="2">The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees.
The ECM regulates the opening speed of the throttle valve to be slower than the normal condition.
So, the acceleration will be poor.</td></tr>
<tr><td>P1121</td><td>Electric throttle control actuator
(ECM detect the throttle valve is stuck open.)</td><td colspan="2">While the vehicle is driving, it slows down gradually by fuel cut. After the vehicle stops, the engine stalls.
The engine can restart in “N” or “P” position, and engine speed will not exceed 1,000 rpm or more.</td></tr>
<tr><td>P1122</td><td>Electric throttle control function</td><td colspan="2">ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.</td></tr>
<tr><td>P1124
P1126</td><td>Throttle control motor relay</td><td colspan="2">ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.</td></tr>
<tr><td>P1128</td><td>Throttle control motor</td><td colspan="2">ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring</td></tr>
<tr><td>P1229</td><td>Sensor power supply</td><td colspan="2">ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.</td></tr>
</table>

Basic Inspection

EBS00EM1

1. INSPECTION START

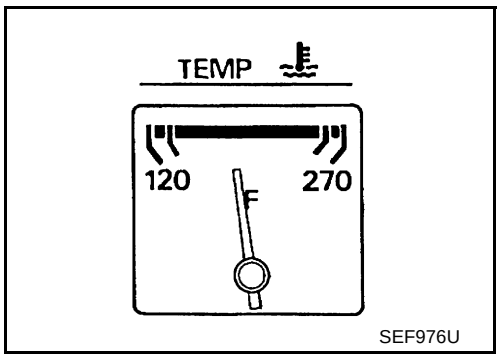
1. Check service records for any recent repairs that may indicate a related problem, or a current need for scheduled maintenance.
2. Open engine hood and check the following:


SEF983U

- Harness connectors for improper connections
- Wiring harness for improper connections, pinches and cut
- Vacuum hoses for splits, kinks and improper connections
- Hoses and ducts for leaks
- Air cleaner clogging
- Gasket

3. Confirm that electrical or mechanical loads are not applied.
- Headlamp switch is OFF.
- Air conditioner switch is OFF.
- Rear window defogger switch is OFF.
- Steering wheel is in the straight-ahead position, etc.

4. Start engine and warm it up until engine coolant temperature indicator points the middle of gauge.
Ensure engine stays below 1,000 rpm.

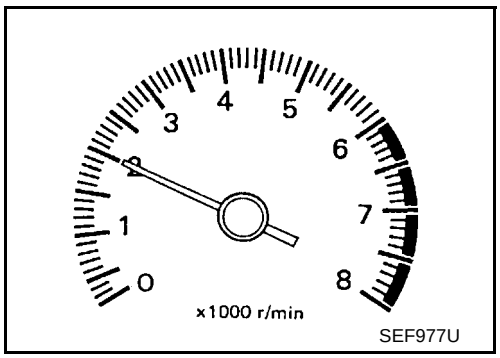


SEF976U

5. Run engine at about 2,000 rpm for about 2 minutes under no-load.
6. Make sure that no DTC is displayed with CONSULT-II or GST.

OK or NG

OK >> GO TO 3.
NG >> GO TO 2.



SEF977U

2. REPAIR OR REPLACE

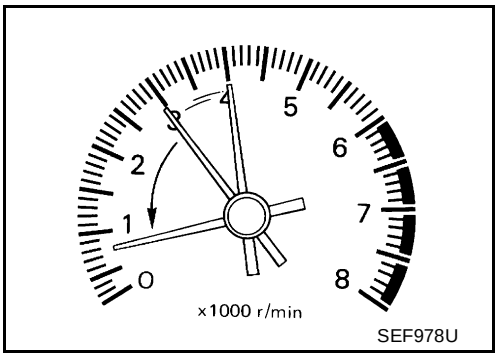
Repair or replace components as necessary according to corresponding “Diagnostic Procedure”.

>> GO TO 3.

3. CHECK TARGET IDLE SPEED

With CONSULT-II

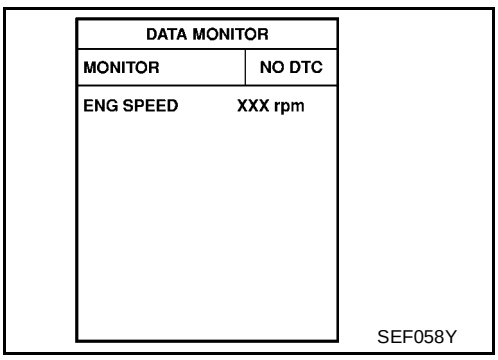
1. Run engine at about 2,000 rpm for about 2 minutes under no-load.
2. Rev engine (2,000 to 3,000 rpm) two or three times under no-load, then run engine at idle speed for about 1 minute.



SEF978U

3. Read idle speed in “DATA MONITOR” mode with CONSULT-II.

M/T: 700 ± 50 rpm
A/T: 800 ± 50 rpm (in “P” or “N” position)



SEF058Y

Without CONSULT-II

1. Run engine at about 2,000 rpm for about 2 minutes under no-load.
2. Rev engine (2,000 to 3,000 rpm) two or three times under no-load, then run engine at idle speed for about 1 minute.
3. Check idle speed.

M/T: 700 ± 50 rpm
A/T: 800 ± 50 rpm (in “P” or “N” position)

OK or NG

OK >> GO TO 10.
NG >> GO TO 4.

4. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

1. Stop engine.
2. Perform EC-55, "Accelerator Pedal Released Position Learning" .

>> GO TO 5.

5. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform EC-55, "Throttle Valve Closed Position Learning" .

>> GO TO 6.

6. PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-55, "Idle Air Volume Learning" .

Which is the result CMPLT or INCMP?

CMPLT or INCMP

CMPLT >> GO TO 7.
INCMP >> 1. Follow the construction of “Idle Air Volume Learning”.
2. GO TO 4.

7. CHECK TARGET IDLE SPEED AGAIN

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Read idle speed in “DATA MONITOR” mode with CONSULT-II.

M/T: 700 ± 50 rpm
A/T: 800 ± 50 rpm (in “P” or “N” position)

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Check idle speed.

M/T: 700 ± 50 rpm
A/T: 800 ± 50 rpm (in “P” or “N” position)

OK or NG

OK >> GO TO 10.
NG >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the following.

- Check camshaft position sensor (PHASE) and circuit. Refer to EC-355 .
- Check crankshaft position sensor (POS) and circuit. Refer to EC-348 .

OK or NG

OK >> GO TO 9.
NG >> 1. Repair or replace.
2. GO TO 4.

9. CHECK ECM FUNCTION

1. Substitute another known-good ECM to check ECM function. (ECM may be the cause of a problem, but this is the rarely the case.)
2. Perform initialization of NATS system and registration of NATS ignition key IDs. Refer to EC-75, "NATS (Nissan Anti-theft System)" .

>> GO TO 4.

10. CHECK IGNITION TIMING

1. Run engine at idle.
2. Check ignition timing with a timing light.

M/T: 8 ± 5° BTDC
A/T: 10 ± 5° BTDC (in “P” or “N” position)

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 11.

11. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

1. Stop engine.
2. Perform EC-55, "Accelerator Pedal Released Position Learning" .

>> GO TO 12.

12. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform EC-55, "Throttle Valve Closed Position Learning" .

>> GO TO 13.

13. PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-55, "Idle Air Volume Learning" .

Which is the result CMPLT or INCMP?

CMPLT or INCMP

CMPLT >> GO TO 14.
INCMP >> 1. Follow the construction of “Idle Air Volume Learning”.
2. GO TO 4.

14. CHECK TARGET IDLE SPEED AGAIN

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Read idle speed in “DATA MONITOR” mode with CONSULT-II.

M/T: 700 ± 50 rpm
A/T: 800 ± 50 rpm (in “P” or “N” position)

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Check idle speed.

M/T: 700 ± 50 rpm
A/T: 800 ± 50 rpm (in “P” or “N” position)

OK or NG

OK >> GO TO 15.
NG >> GO TO 17.

15. CHECK IGNITION TIMING AGAIN

1. Run engine at idle.
2. Check ignition timing with a timing light.

M/T: 8 ± 5° BTDC
A/T: 10 ± 5° BTDC (in “P” or “N” position)

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 16.

16. CHECK TIMING CHAIN INSTALLATION

Check timing chain installation. Refer to EM-49, "TIMING CHAIN" .

OK or NG

OK >> GO TO 17.
NG >> 1. Repair the timing chain installation.
2. GO TO 4.

17. DETECT MALFUNCTIONING PART

Check the following.

- Check camshaft position sensor (PHASE) and circuit. Refer to EC-355 .
- Check crankshaft position sensor (POS) and circuit. Refer to EC-348 .

OK or NG

OK >> GO TO 18.
NG >> 1. Repair or replace.
2. GO TO 4.

18. CHECK ECM FUNCTION

1. Substitute another known-good ECM to check ECM function. (ECM may be the cause of a problem, but this is the rarely the case.)
2. Perform initialization of NATS system and registration of NATS ignition key IDs. Refer to EC-75, "NATS (Nissan Anti-theft System)" .

>> GO TO 4.

Symptom Matrix Chart

EBS00EM2

SYSTEM — BASIC ENGINE CONTROL SYSTEM

		SYMPTOM													Reference page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Fuel	Fuel pump circuit	1	1	2	3	2		2	2			3		2	EC-536
	Fuel pressure regulator system	3	3	4	4	4	4	4	4	4		4			EC-58
	Injector circuit	1	1	2	3	2		2	2			2			EC-530
	Evaporative emission system	3	3	4	4	4	4	4	4	4		4			EC-369, EC-554
Air	Positive crankcase ventilation system	3	3	4	4	4	4	4	4	4		4	1		EC-557
	Incorrect idle speed adjustment	3	3				1	1	1	1		1			EC-92
	Electric throttle control actuator	1	1	2	3	3	2	2	2	2		2		2	EC-400, EC-402 , EC-409 , EC-415
Ignition	Incorrect ignition timing adjustment	3	3	1	1	1		1	1			1			EC-92
	Ignition circuit	1	1	2	2	2		2	2			2			EC-520
Main power supply and ground circuit		2	2	3	3	3		3	3		2	3			EC-144
Mass air flow sensor circuit		1	1	2	2	2		2	2			2			EC-183, EC-389
Engine coolant temperature sensor circuit		1	1	2	2	2	3	2	2	3	1	2			EC-194
Throttle position sensor circuit			1	2		2	2	2	2	2		2			EC-312, EC-318 , EC-490 , EC-496 , EC-498 , EC-507
Accelerator pedal position sensor circuit				3	2	1	2			2					EC-324, EC-331 , EC-500

	SYMPTOM													Reference page
	HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code	AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Heated oxygen sensor 1 circuit		1	2	3	2		2	2			2			EC-199, EC-205 , EC-214 , EC-223 , EC-234 , EC-241 , EC-420 , EC-426 , EC-432 , EC-438
Knock sensor circuit			2	2							3			EC-344
Crankshaft position sensor (POS) circuit	2	2												EC-348
Camshaft position sensor (PHASE) circuit	2	2												EC-355
Vehicle speed signal circuit		2	3		3						3			EC-375
Power steering pressure sensor circuit		2				3	3	3	3					EC-377
ECM	2	2	3	3	3	3	3	3	3	3	3			EC-382, EC-385
Intake valve timing control solenoid valve circuit	3	3	2		1	3	2	2	3		3			EC-395
PNP switch circuit			3		3	3	3	3	3		3			EC-511
Refrigerant pressure sensor circuit		2				3	3	3	3		4			EC-542
Electrical load signal circuit						3	3	3	3					EC-547
Air conditioner circuit	2	2	3	3	3	3	3	3	3		3		2	ATC-30

1 - 6: The numbers refer to the order of inspection.
(continued on next page)

SYSTEM — ENGINE MECHANICAL & OTHER

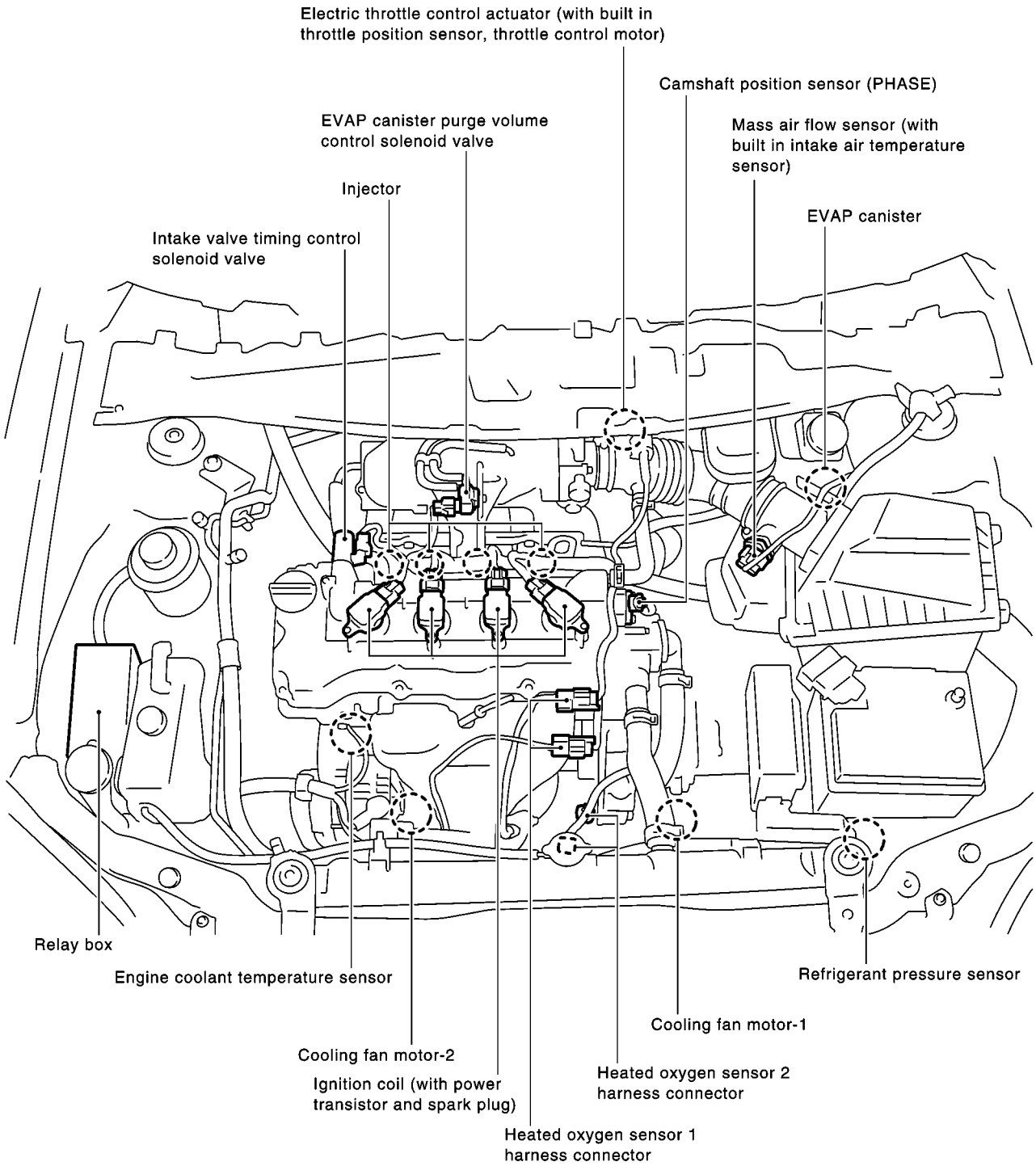
		SYMPTOM													Reference page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Fuel	Fuel tank	5	5												FL-13
	Fuel piping			5	5	5		5	5			5			FL-3, MA-23
	Vapor lock														—
	Valve deposit	5		5	5	5		5	5			5			—
	Poor fuel (Heavy weight gasoline, Low octane)														—
Air	Air duct	5	5	5	5	5	5	5	5	5		5			EM-17
	Air cleaner														EM-17
	Air leakage from air duct (Mass air flow sensor —electric throttle control actuator)														EM-17
	Electric throttle control actuator														EM-19
	Air leakage from intake manifold/ Collector/Gasket														EM-19
Cranking	Battery	1	1	1		1		1	1			1		1	SC-3
	Alternator circuit														SC-12
	Starter circuit	3													SC-22
	Signal plate/Flywheel/Drive plate	6													EM-70
	PNP switch	4													MT-14, MT-62 or AT-115
Engine	Cylinder head	5	5	5	5	5		5	5			5			EM-57
	Cylinder head gasket										4		3		
	Cylinder block	6	6	6	6	6		6	6			6	4		EM-70
	Piston														
	Piston ring														
	Connecting rod														
	Bearing														
	Crankshaft														

		SYMPTOM													Reference page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Valve mechanism	Timing chain	5	5	5	5	5		5	5			5			EM-49
	Camshaft														EM-36
	Intake valve timing control														EM-49
	Intake valve												3		EM-57
	Exhaust valve														
Exhaust	Exhaust manifold/Tube/Muffler/Gasket	5	5	5	5	5		5	5			5			EM-23, EX-3
	Three way catalyst														
Lubrication	Oil pan/Oil strainer/Oil pump/Oil filter/Oil gallery	5	5	5	5	5		5	5			5	2		EM-27, LU-8 , LU-9 , LU-5
	Oil level (Low)/Filthy oil														LU-6
Cooling	Radiator/Hose/Radiator filler cap	5	5	5	5	5		5	5		2	5			CO-11
	Thermostat									5					CO-20
	Water pump														CO-18
	Water gallery														CO-7
	Cooling fan									5					CO-11
	Coolant level (low)/Contaminated coolant														CO-8
NATS (Nissan Anti-Theft System)		1	1												EC-75 or BL-156

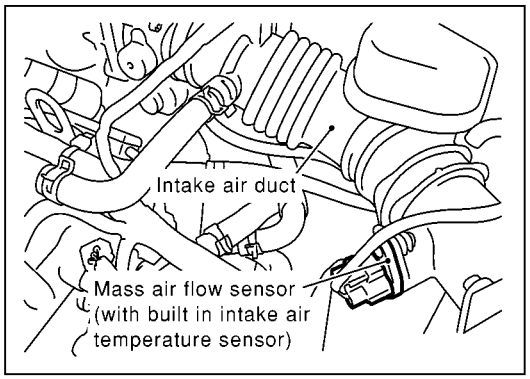
1 - 6: The numbers refer to the order of inspection.

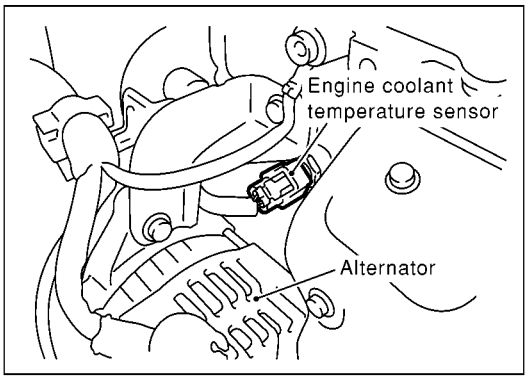
Engine Control Component Parts Location

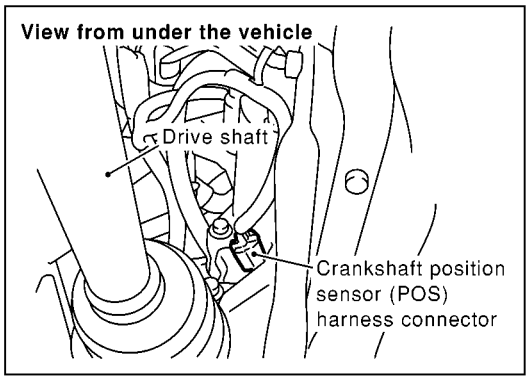
EBS00EM3

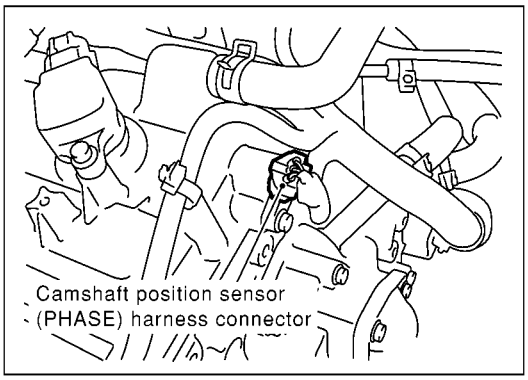


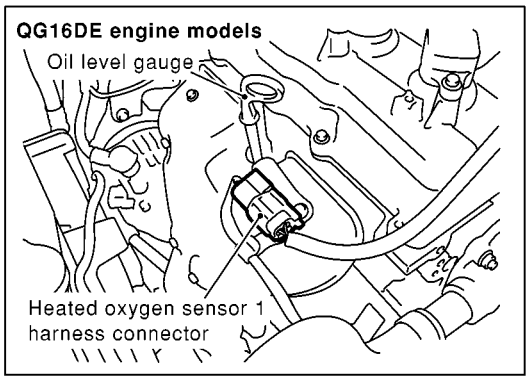
MBIB0117E

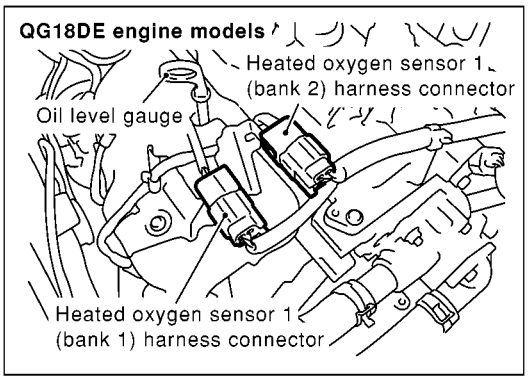

Intake air duct
Mass air flow sensor
(with built in intake air
temperature sensor)

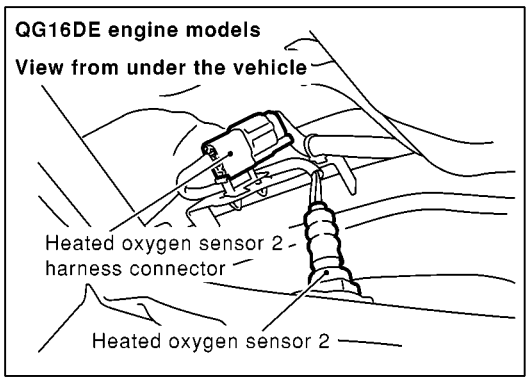

Engine coolant
temperature sensor
Alternator

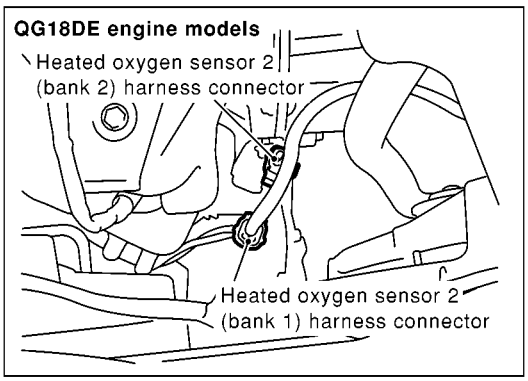

View from under the vehicle
Drive shaft
Crankshaft position
sensor (POS)
harness connector


Camshaft position sensor
(PHASE) harness connector

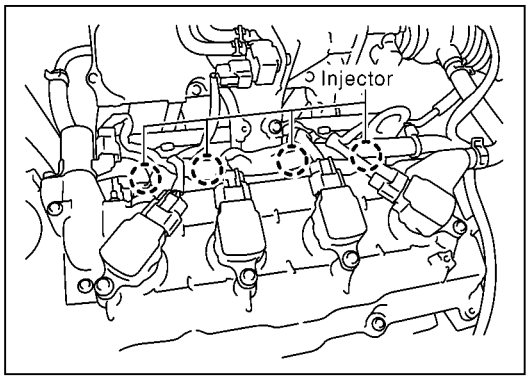

QG16DE engine models
Oil level gauge
Heated oxygen sensor 1
harness connector

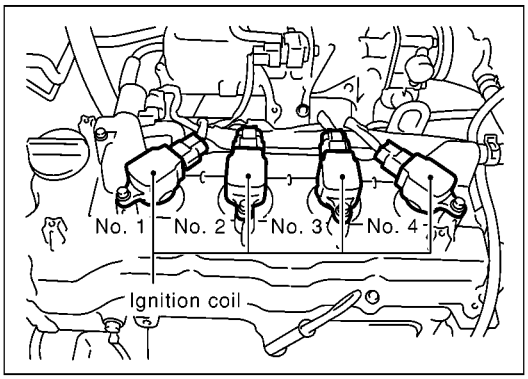

QG18DE engine models
Heated oxygen sensor 1
(bank 2) harness connector
Oil level gauge
Heated oxygen sensor 1
(bank 1) harness connector

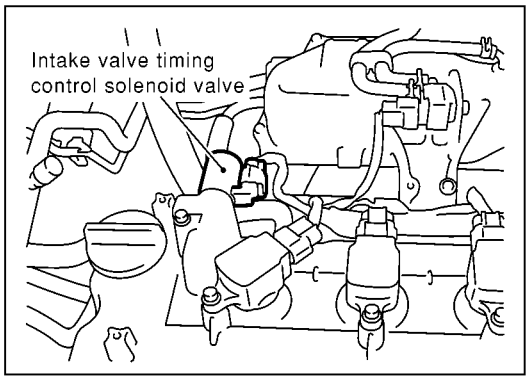

QG16DE engine models
View from under the vehicle
Heated oxygen sensor 2
harness connector
Heated oxygen sensor 2

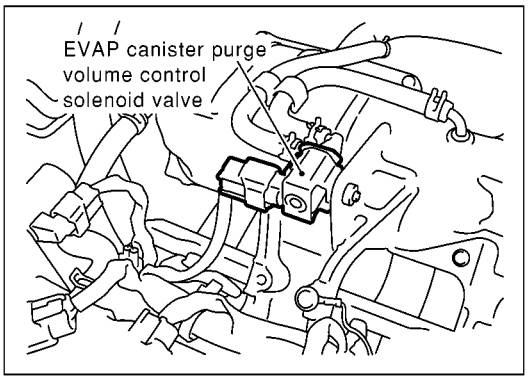

QG18DE engine models
Heated oxygen sensor 2
(bank 2) harness connector
Heated oxygen sensor 2
(bank 1) harness connector

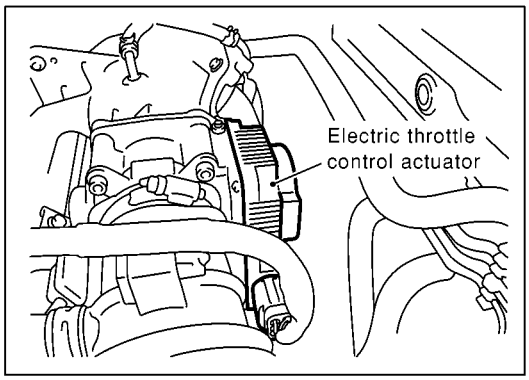
MBIB0118E

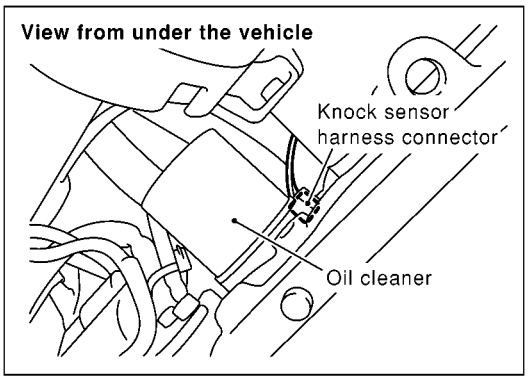

Injector

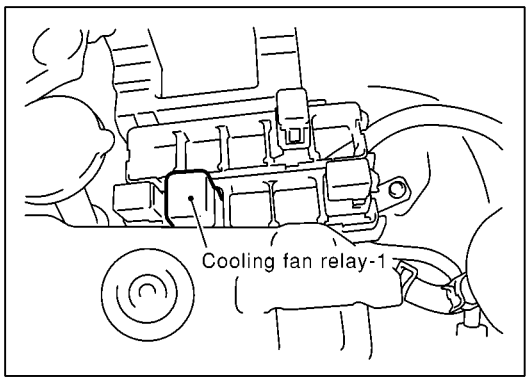

No. 1
No. 2
No. 3
No. 4
Ignition coil

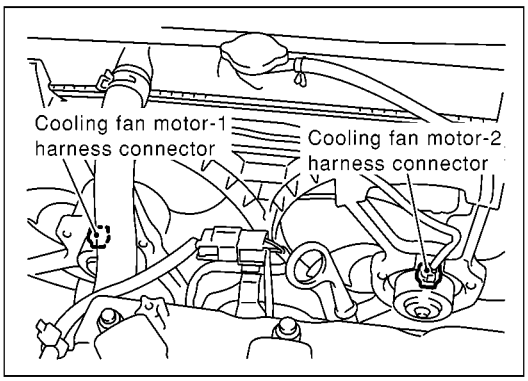

Intake valve timing
control solenoid valve


EVAP canister purge
volume control
solenoid valve

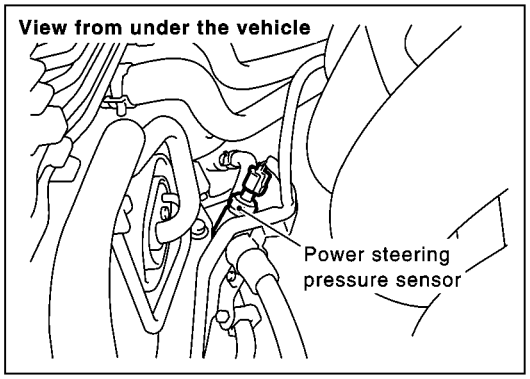

Electric throttle
control actuator

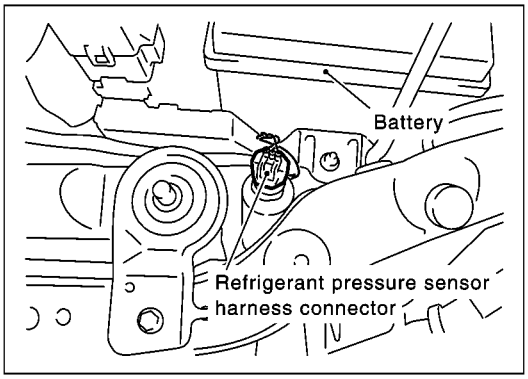

View from under the vehicle
Knock sensor
harness connector
Oil cleaner

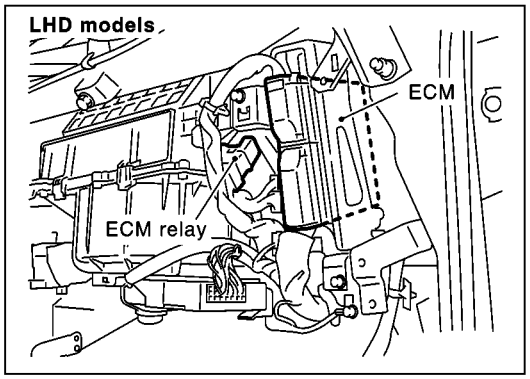

Cooling fan relay-1

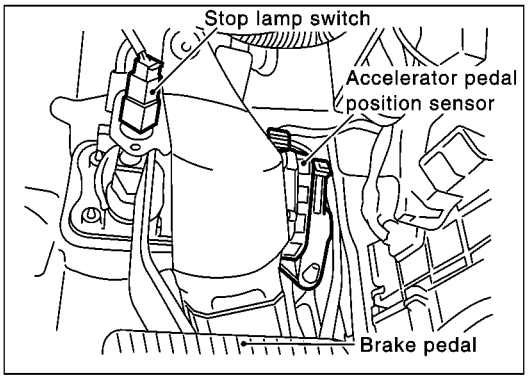

Cooling fan motor-1
harness connector
Cooling fan motor-2
harness connector

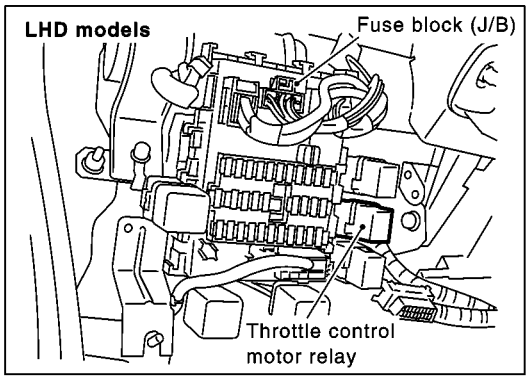
MBIB0119E

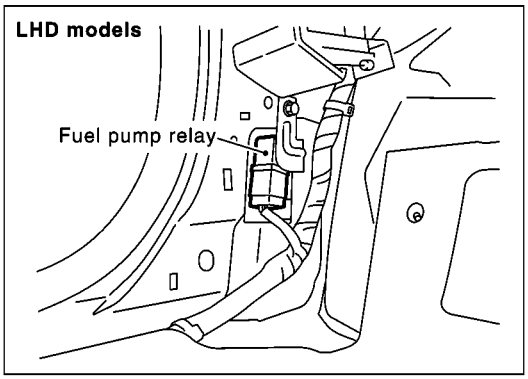

View from under the vehicle
Power steering
pressure sensor

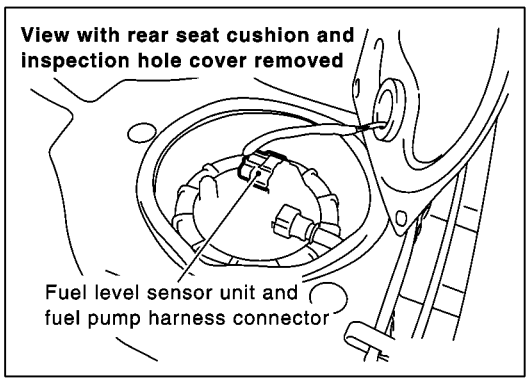

Battery
Refrigerant pressure sensor
harness connector

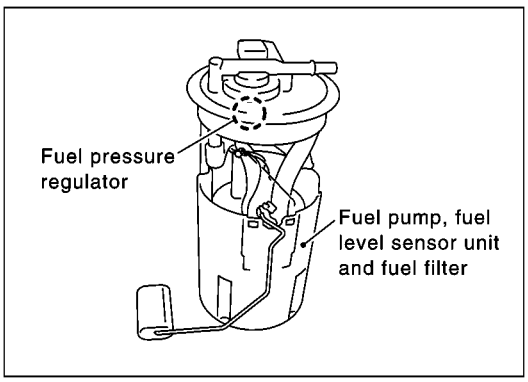

LHD models
ECM
ECM relay


Stop lamp switch
Accelerator pedal
position sensor
Brake pedal


LHD models
Fuse block (J/B)
Throttle control
motor relay


LHD models
Fuel pump relay

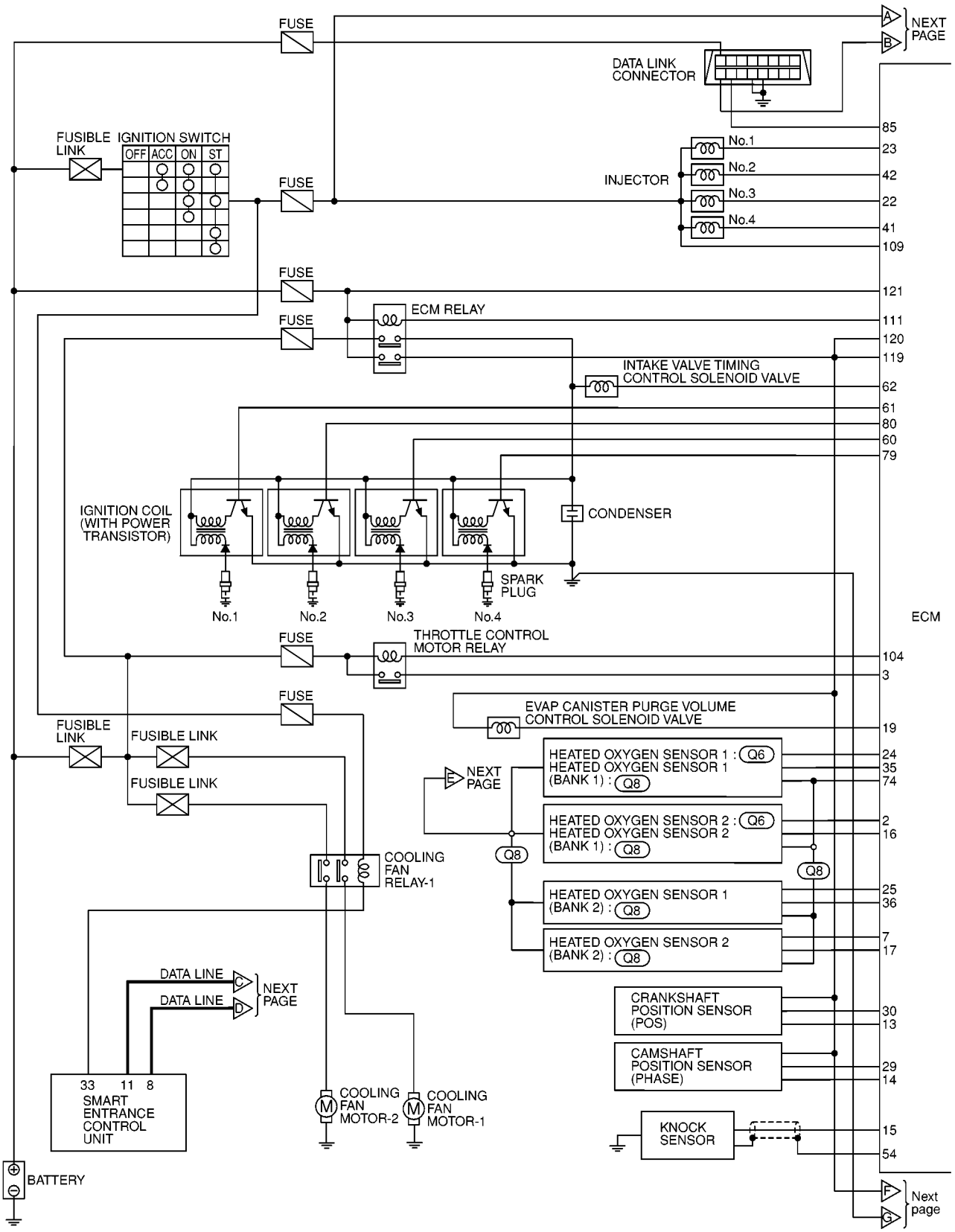

View with rear seat cushion and
inspection hole cover removed
Fuel level sensor unit and
fuel pump harness connector


Fuel pressure
regulator
Fuel pump, fuel
level sensor unit
and fuel filter

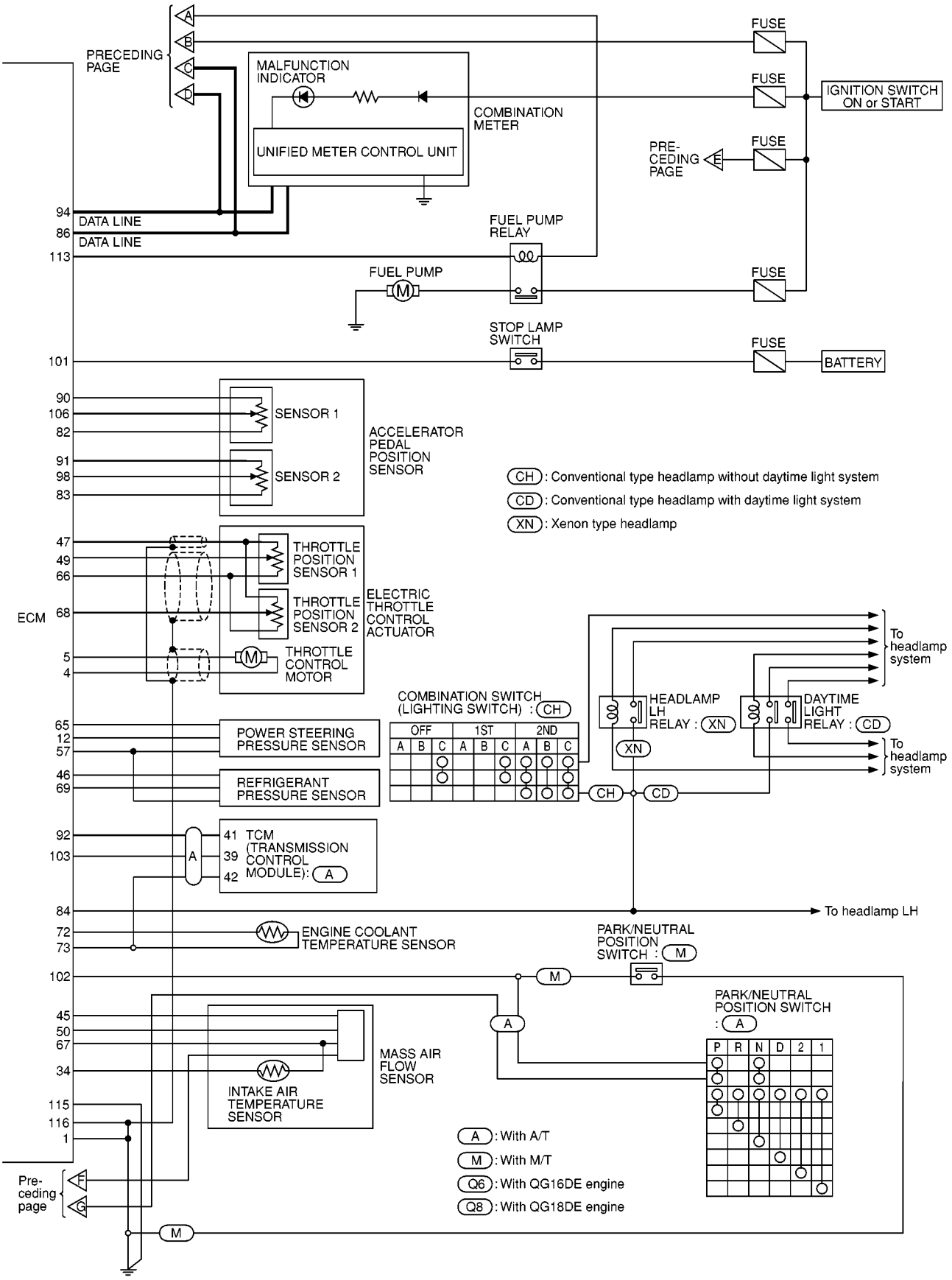
MBIB0120E

Circuit Diagram

EBS00EM4



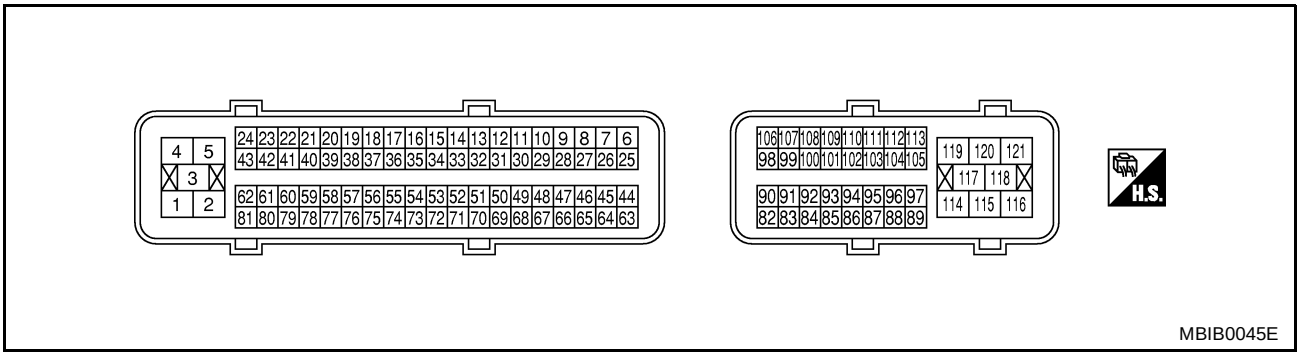
MBWA0042E


PRECEDING PAGE
A
B
C
D
MALFUNCTION INDICATOR
COMBINATION METER
UNIFIED METER CONTROL UNIT
FUSE
IGNITION SWITCH ON or START
PRE-CEDING PAGE
E
94 DATA LINE
86 DATA LINE
FUEL PUMP RELAY
113
FUEL PUMP
M
STOP LAMP SWITCH
101
BATTERY
90
106
82
SENSOR 1
91
98
83
SENSOR 2
ACCELERATOR PEDAL POSITION SENSOR
CH : Conventional type headlamp without daytime light system
CD : Conventional type headlamp with daytime light system
XN : Xenon type headlamp
47
49
66
THROTTLE POSITION SENSOR 1
ECM
68
THROTTLE POSITION SENSOR 2
ELECTRIC THROTTLE CONTROL ACTUATOR
5
4
THROTTLE CONTROL MOTOR
COMBINATION SWITCH (LIGHTING SWITCH) : CH
OFF 1ST 2ND
A B C A B C A B C
HEADLAMP LH RELAY : XN
DAYTIME LIGHT RELAY : CD
To headlamp system
65
12
57
POWER STEERING PRESSURE SENSOR
46
69
REFRIGERANT PRESSURE SENSOR
92
103
A
41 TCM (TRANSMISSION CONTROL MODULE): A
39
42
84
To headlamp LH
72
73
ENGINE COOLANT TEMPERATURE SENSOR
PARK/NEUTRAL POSITION SWITCH : M
102
M
PARK/NEUTRAL POSITION SWITCH : A
P R N D 2 1
45
50
67
34
MASS AIR FLOW SENSOR
INTAKE AIR TEMPERATURE SENSOR
115
116
1
A : With A/T
M : With M/T
Q6 : With QG16DE engine
Q8 : With QG18DE engine
Pre-ceding page
F
G
M

MBWA0043E

ECM Harness Connector Terminal Layout

EBS00EM5

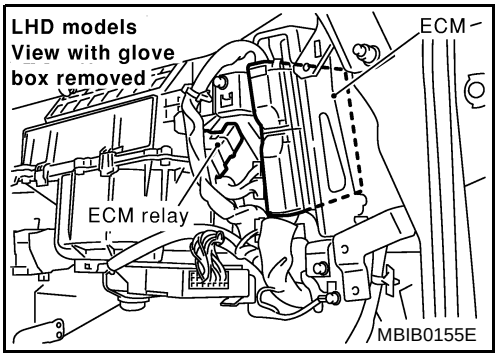


ECM Terminals and Reference Value

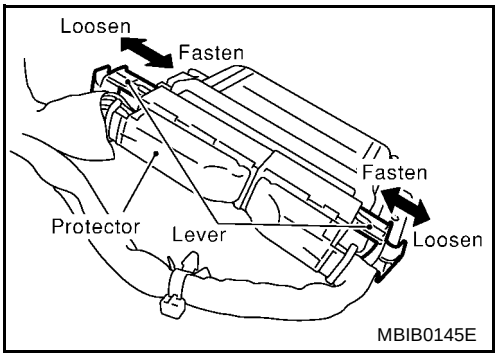
EBS00EM6

PREPARATION

1. ECM is located behind the glove box. For this inspection, remove glove box.
2. Remove ECM harness protector.



3. When disconnecting ECM harness connector, loosen it with levers as far as they will go as shown at right.
4. Connect a break-out box (SST) and Y-cable adapter (SST) between the ECM and ECM harness connector.
   - Use extreme care not to touch 2 pins at one time.
   - Data is for comparison and may not be exact.



ECM INSPECTION TABLE

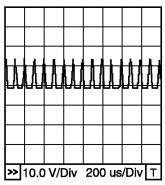
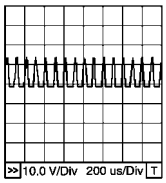
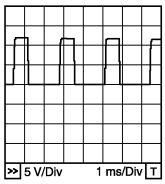
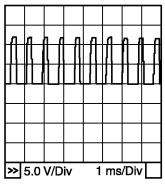
Specification data are reference values and are measured between each terminal and ground.

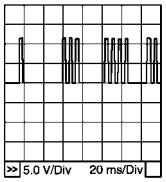
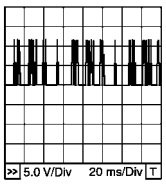
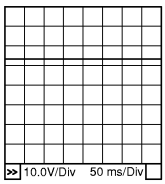
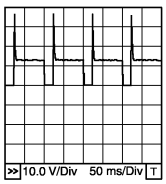
CAUTION:

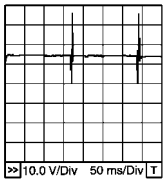
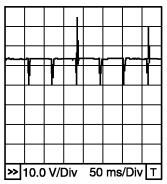
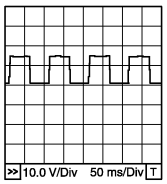
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

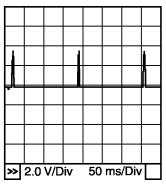
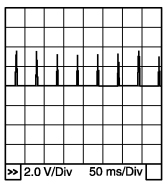
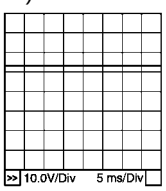
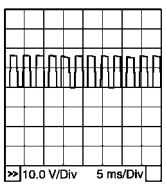
QG16DE Engine Models

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
1	B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
2	R/B	Heated oxygen sensor 2 heater	**[Engine is running]** ● Engine speed is below 3,600 rpm. ● After driving for 2 minutes at a speed of 70 km/h (43 MPH) or more	0 - 1.0V
			[Ignition switch "ON"] ● Engine stopped **[Engine is running]** ● Engine speed is above 3,600 rpm	BATTERY VOLTAGE (11 - 14V)
3	R	Throttle control motor power supply	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)
4	BR	Throttle control motor (Close)	**[Ignition switch "ON"]** ● Shift lever position is "1st" ● Accelerator pedal is releasing	0 - 14V★  PBIB0534E
5	Y	Throttle control motor (Open)	**[Ignition switch "ON"]** ● Shift lever position is "1st" ● Accelerator pedal is depressing	0 - 14V★  PBIB0533E
12	L	Power steering pressure sensor	**[Engine is running]** ● Steering wheel is being turned	0.5 - 4.0V
			[Engine is running] ● Steering wheel is not being turned	0.4 - 0.8V
13	R	Crankshaft position sensor (POS)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 3.0V★  PBIB0527E
			[Engine is running] ● Engine speed is 2,000 rpm	Approximately 3.0V★  PBIB0528E

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
14	R	Camshaft position sensor (PHASE)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.0 - 4.0V★  PBIB0525E
			[Engine is running] ● Engine speed is 2,000 rpm.	1.0 - 4.0V★  PBIB0526E
15	W	Knock sensor	**[Engine is running]** ● Idle speed	Approximately 2.5V
16	W	Heated oxygen sensor 2	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V
19	GY/L	EVAP canister purge volume control solenoid valve	**[Engine is running]** ● Idle speed	BATTERY VOLTAGE (11 - 14V)★  PBIB0050E
			[Engine is running] ● Engine speed is about 2,000 rpm (More than 100 seconds after starting engine)	Approximately 10V★  PBIB0520E

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
22 23 41 42	G/B R/B L/B Y/B	Injector No. 3 Injector No. 1 Injector No. 4 Injector No. 2	**[Engine is running]** ● **Warm-up condition** ● Idle speed	BATTERY VOLTAGE (11 - 14V)★  PBIB0529E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	BATTERY VOLTAGE (11 - 14V)★  PBIB0530E
24	G	Heated oxygen sensor 1 heater	**[Engine is running]** ● **Warm-up condition** ● Engine speed is below 3,600 rpm.	Approximately 7.0V★  PBIB0519E
			[Ignition switch "ON"] ● Engine stopped. **[Engine is running]** ● Engine speed is above 3,600 rpm.	BATTERY VOLTAGE (11 - 14V)
29	B	Camshaft position sensor (PHASE) ground	**[Engine is running]** ● Idle speed	Approximately 0V
30	B	Camshaft position sensor (POS) ground	**[Engine is running]** ● Idle speed	Approximately 0V
34	BR	Intake air temperature sensor	**[Engine is running]**	Approximately 0 - 4.8V Output voltage varies with intake air temperature.
35	W	Heated oxygen sensor 1	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm	0 - Approximately 1.0V (Periodically change)
45	R	Sensor power supply (Mass air flow sensor)	**[Ignition switch "ON"]**	Approximately 5V
46	R	Sensor power supply (Refrigerant pressure sensor)	**[Ignition switch "ON"]**	Approximately 5V
47	G	Sensor power supply (Throttle position sensor)	**[Ignition switch "ON"]**	Approximately 5V

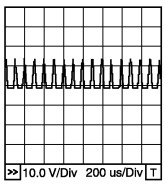
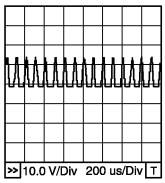
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
49	W	Throttle position sensor 1	**[Ignition switch "ON"]** ● Shift lever position is "1st" ● Accelerator pedal fully released	More than 0.36V
			[Ignition switch "ON"] ● Shift lever position is "1st" ● Accelerator pedal fully depressed	Less than 4.75V
50	Y	Mass air flow sensor	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.0 - 1.7V
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,500 rpm.	1.5 - 2.1V
54	-	Sensor ground (Knock sensor shield circuit)	**[Engine is running]** ● Idle speed	Approximately 0V
57	B	Sensor ground (Power steering pressure sensor/Refrigerant pressure sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
60 61 79 80	L/R BR GY/R PU	Ignition signal No. 3 Ignition signal No. 1 Ignition signal No. 4 Ignition signal No. 2	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0 - 0.1V★  PBIB0521E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - 0.2V★  PBIB0522E
62	Y/R	Intake valve timing control solenoid valve	**[Engine is running]** ● **Warm-up condition** ● Idle speed	BATTERY VOLTAGE (11 - 14V)★  MBIB0052E
			[Engine is running] ● **Warm-up condition** ● Engine speed 2,500 rpm	7 - 10V★  PBIB0532E

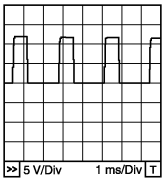
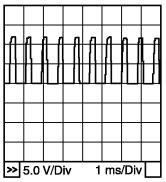
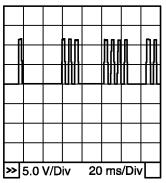
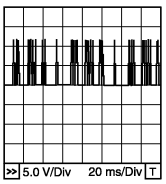
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
65	G	Sensor power supply (Power steering pressure sensor)	**[Ignition switch "ON"]**	Approximately 5V
66	B	Sensor ground (Throttle position sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
67	B	Sensor ground (Mass air flow sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
68	R	Throttle position sensor 2	**[Ignition switch "ON"]** ● Shift lever position is "1st" ● Accelerator pedal fully released	Less than 4.75V
			[Ignition switch "ON"] ● Shift lever position is "1st" ● Accelerator pedal fully depressed	More than 0.36V
69	R/L	Refrigerant pressure sensor	**[Engine is running]** ● **Warm-up condition** ● Both A/C switch and blower switch are "ON" (Compressor operates.)	1.0 - 4.0V
72	BR/W	Engine coolant temperature sensor	**[Engine is running]**	Approximately 0 - 4.8V Output voltage varies with engine coolant temperature.
73	B	Sensor ground (Engine coolant temperature sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
74	B	Sensor ground (Heated oxygen sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
82	B	Sensor ground (Accelerator pedal position sensor 1)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
83	B	Sensor ground (Accelerator pedal position sensor 2)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
85	LG	DATA link connector	**[Ignition switch "ON"]** ● CONSULT-II or GST is disconnected.	BATTERY VOLTAGE (11 - 14V)
86	R	CAN communication line	**[Ignition switch "ON"]**	Approximately 2.3V
90	R	Sensor power supply (Accelerator pedal position sensor 1)	**[Ignition switch "ON"]**	Approximately 5V
91	G	Sensor power supply (Accelerator pedal position sensor 2)	**[Ignition switch "ON"]**	Approximately 5V
94	L	CAN communication line	**[Ignition switch "ON"]**	Approximately 2.8V

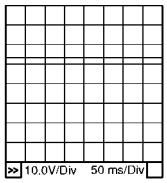
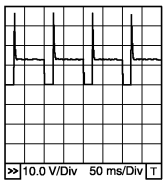
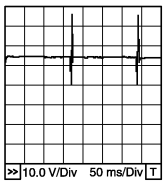
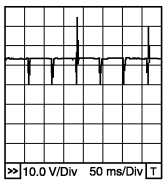
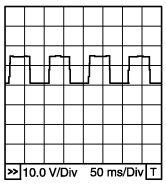
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
98	LG	Accelerator pedal position sensor 2	**[Ignition switch "ON"]** ● Shift lever position is "1st" ● Accelerator pedal fully released	0.175 - 0.335V
			[Ignition switch "ON"] ● Shift lever position is "1st" ● Accelerator pedal fully depressed	More than 1.95V
101	R/G	Stop lamp switch	**[Ignition switch "ON"]** ● Brake pedal fully released	Approximately 0V
			[Ignition switch "ON"] ● Brake pedal fully depressed	BATTERY VOLTAGE (11 - 14V)
102	G/OR	PNP switch	**[Ignition switch "ON"]** ● Gear position is neutral	Approximately 0V
			[Ignition switch "ON"] ● Except the above gear position	Approximately 5V
104	OR	Throttle control motor relay	**[Ignition switch "OFF"]**	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"]	0 - 1.0V
106	L	Accelerator pedal position sensor 1	**[Ignition switch "ON"]** ● Shift lever position is "1st" ● Accelerator pedal fully released	0.35 - 0.67V
			[Ignition switch "ON"] ● Shift lever position is "1st" ● Accelerator pedal fully depressed	More than 3.9V
109	B/R	Ignition switch	**[Ignition switch "OFF"]**	0V
			[Ignition switch "ON"]	BATTERY VOLTAGE (11 - 14V)
111	W/G	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch "OFF"]** ● For 5 seconds after turning ignition switch "OFF"	0 - 1.0V
			[Ignition switch "OFF"] ● 5 seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
113	B/P	Fuel pump relay	**[Ignition switch "ON"]** ● For 1 second after turning ignition switch "ON" **[Engine is running]**	0 - 1.0V
			[Ignition switch "ON"] ● More than 1 second after turning ignition switch "ON".	BATTERY VOLTAGE (11 - 14V)
115 116	B B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
119 120	W W	Power supply for ECM	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)
121	W/L	Power supply for ECM (Buck-up)	**[Ignition switch "OFF"]**	BATTERY VOLTAGE (11 - 14V)

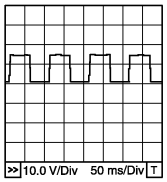
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

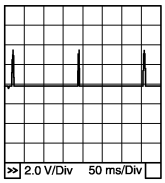
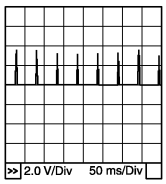
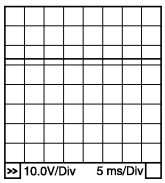
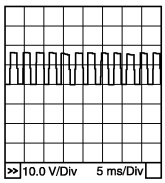
QG18DE Engine Models

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
1	B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
2	L	Heated oxygen sensor 2 heater (bank 1)	**[Engine is running]** ● Engine speed is below 3,600 rpm. ● After driving for 2 minutes at a speed of 70 km/h (43 MPH) or more	0 - 1.0V
			[Ignition switch "ON"] ● Engine stopped **[Engine is running]** ● Engine speed is above 3,600 rpm	BATTERY VOLTAGE (11 - 14V)
3	R	Throttle control motor power supply	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)
4	BR	Throttle control motor (Close)	**[Ignition switch "ON"]** ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal is releasing	0 - 14V★  PBIB0534E
5	Y	Throttle control motor (Open)	**[Ignition switch "ON"]** ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal is depressing	0 - 14V★  PBIB0533E
7	W/R	Heated oxygen sensor 2 heater (bank 2)	**[Engine is running]** ● Engine speed is below 3,600 rpm ● After driving for 2 minutes at a speed of 70 km/h (43 MPH) or more	0 - 1.0V
			[Ignition switch "ON"] ● Engine stopped **[Engine is running]** ● Engine speed is above 3,600 rpm	BATTERY VOLTAGE (11 - 14)
12	L	Power steering pressure sensor	**[Engine is running]** ● Steering wheel is being turned	Approximately 3.6V
			[Engine is running] ● Steering wheel is not being turned	Approximately 0.6V

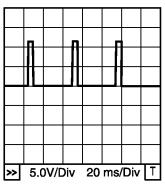
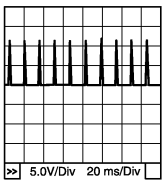
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
13	R	Crankshaft position sensor (POS)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 3.0V★  PBIB0527E
			[Engine is running] ● Engine speed is 2,000 rpm	Approximately 3.0V★  PBIB0528E
14	R	Camshaft position sensor (PHASE)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.0 - 4.0V★  PBIB0525E
			[Engine is running] ● Engine speed is 2,000 rpm.	1.0 - 4.0V★  PBIB0526E
15	W	Knock sensor	**[Engine is running]** ● Idle speed	Approximately 2.5V
16	Y	Heated oxygen sensor 2 (bank 1)	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V
17	L	Heated oxygen sensor 2 (bank 2)	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
19	GY/L	EVAP canister purge volume control solenoid valve	**[Engine is running]** ● Idle speed	BATTERY VOLTAGE (11 - 14V)★  PBIB0050E
			[Engine is running] ● Engine speed is about 2,000 rpm (More than 100 seconds after starting engine)	Approximately 10V★  PBIB0520E
22 23 41 42	G/B R/B L/B Y/B	Injector No. 3 Injector No. 1 Injector No. 4 Injector No. 2	**[Engine is running]** ● **Warm-up condition** ● Idle speed	BATTERY VOLTAGE (11 - 14V)★  PBIB0529E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	BATTERY VOLTAGE (11 - 14V)★  PBIB0530E
24	G	Heated oxygen sensor 1 heater (bank 1)	**[Engine is running]** ● **Warm-up condition** ● Engine speed is below 3,600 rpm (M/T model) ● Engine speed is below 3,200 rpm (A/T model)	Approximately 7.0V★  PBIB0519E
			[Ignition switch "ON"] ● Engine stopped **[Engine is running]** ● Engine speed is above 3,200 rpm (M/T model) ● Engine speed is above 3,200 rpm (A/T model)	BATTERY VOLTAGE (11 - 14V)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
25	R/B	Heated oxygen sensor 1 heater (bank 2)	**[Engine is running]** ● **Warm-up condition** ● Engine speed is below 3,600 rpm (M/T model) ● Engine speed is below 3,200 rpm (A/T model)	Approximately 7.0V★  PBIB0519E
			[Ignition switch "ON"] ● Engine stopped **[Engine is running]** ● Engine speed is above 3,600 rpm (M/T model) ● Engine speed is above 3,200 rpm (A/T model)	BATTERY VOLTAGE (11 - 14V)
29	B	Camshaft position sensor (PHASE) ground	**[Engine is running]** ● Idle speed	Approximately 0V
30	B	Camshaft position sensor (POS) ground	**[Engine is running]** ● Idle speed	Approximately 0V
34	BR	Intake air temperature sensor	**[Engine is running]**	Approximately 0 - 4.8V Output voltage varies with intake air temperature.
35	W	Heated oxygen sensor 1 (bank 1)	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V (Periodically change)
36	W	Heated oxygen sensor 1 (bank 2)	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V (Periodically change)
45	R	Sensor power supply (Mass air flow sensor)	**[Ignition switch "ON"]**	Approximately 5V
46	R	Sensor power supply (Refrigerant pressure sensor)	**[Ignition switch "ON"]**	Approximately 5V
47	G	Sensor power supply (Throttle position sensor)	**[Ignition switch "ON"]**	Approximately 5V
49	W	Throttle position sensor 1	**[Ignition switch "ON"]** ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully released	More than 0.36V
			[Ignition switch "ON"] ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully depressed	Less than 4.75V
50	Y	Mass air flow sensor	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.0 - 1.7V
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,500 rpm	1.5 - 2.1V

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
54	-	Sensor ground (Knock sensor shield circuit)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
57	B	Sensor ground (Power steering pressure sensor/Refrigerant pressure sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
60 61 79 80	L/R BR GY/R PU	Ignition signal No. 3 Ignition signal No. 1 Ignition signal No. 4 Ignition signal No. 2	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0 - 0.1V★  PBIB0521E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	0 - 0.2V★  PBIB0522E
62	Y/R	Intake valve timing control solenoid valve	**[Engine is running]** ● **Warm-up condition** ● Idle speed	BATTERY VOLTAGE (11 - 14V)★  MBIB0052E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,500 rpm	7 - 10V★  PBIB0532E
65	G	Sensor power supply (Power steering pressure sensor)	**[Ignition switch "ON"]**	Approximately 5V
66	B	Sensor ground (Throttle position sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
67	B	Sensor ground (Mass air flow sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
68	R	Throttle position sensor 2	**[Ignition switch “ON”]** ● Shift lever position is “D” (A/T model) ● Shift lever position is “1st” (M/T model) ● Accelerator pedal fully released	Less than 4.75V
			[Ignition switch “ON”] ● Shift lever position is “D” (A/T model) ● Shift lever position is “1st” (M/T model) ● Accelerator pedal fully depressed	More than 0.36V
69	R/L	Refrigerant pressure sensor	**[Engine is running]** ● **Warm-up condition** ● Both A/C switch and blower switch are “ON” (Compressor operates.)	1.0 - 4.0V
72	BR/W	Engine coolant temperature sensor	**[Engine is running]**	Approximately 0 - 4.8V Output voltage varies with engine coolant temperature.
73	B	Sensor ground (Engine coolant temperature sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
74	B	Sensor ground (Heated oxygen sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
82	B	Sensor ground (Accelerator pedal position sensor 1)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
83	B	Sensor ground (Accelerator pedal position sensor 2)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
85	LG	DATA link connector	**[Ignition switch “ON”]** ● CONSULT-II or GST is disconnected.	BATTERY VOLTAGE (11 - 14V)
86	R	CAN communication line	**[Ignition switch “ON”]**	Approximately 2.3V
90	R	Sensor power supply (Accelerator pedal position sensor 1)	**[Ignition switch “ON”]**	Approximately 5V
91	G	Sensor power supply (Accelerator pedal position sensor 2)	**[Ignition switch “ON”]**	Approximately 5V
92		Accelerator pedal position sensor signal output	**[Ignition switch “ON”]** ● Shift lever position is “D” (A/T models) ● Shift lever position is “1st” (M/T models) ● Accelerator pedal fully released	0.35 - 0.67V
			[Ignition switch “ON”] ● Shift lever position is “D” (A/T models) ● Shift lever position is “1st” (M/T models) ● Accelerator pedal fully depressed	More than 3.9V
94	L	CAN communication line	**[Ignition switch “ON”]**	Approximately 2.8V

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
98	LG	Accelerator pedal position sensor 2	**[Ignition switch "ON"]** ● Shift lever position is "D" (A/T models) ● Shift lever position is "1st" (M/T models) ● Accelerator pedal fully released	0.175 - 0.335V
			[Ignition switch "ON"] ● Shift lever position is "D" (A/T models) ● Shift lever position is "1st" (M/T models) ● Accelerator pedal fully depressed	More than 1.95V
101	R/G	Stop lamp switch	**[Ignition switch "ON"]** ● Brake pedal fully released	Approximately 0V
			[Ignition switch "ON"] ● Brake pedal fully depressed	BATTERY VOLTAGE (11 - 14V)
102	P (A/T) G/OR (M/T)	PNP switch	**[Ignition switch "ON"]** ● Gear position is "P" or "N"	Approximately 0V
			[Ignition switch "ON"] ● Except the above gear position	**A/T models** BATTERY VOLTAGE (11 - 14V) **M/T models** Approximately 5V
103		Tachometer signal output	**[Engine is running]** ● **Warm-up condition** ● Idle speed	10 - 11V★  MBIB0053E
			[Engine is running] ● Engine speed is 2,000 rpm	10 - 11V★  MBIB0054E
104	OR	Throttle control motor relay	**[Ignition switch "OFF"]**	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"]	0 - 1.0V
106	L	Accelerator pedal position sensor 1	**[Ignition switch "ON"]** ● Shift lever position is "D" (A/T models) ● Shift lever position is "1st" (M/T models) ● Accelerator pedal fully released	More than 0.36V
			[Ignition switch "ON"] ● Shift lever position is "D" (A/T models) ● Shift lever position is "1st" (M/T models) ● Accelerator pedal fully depressed	Less than 4.75V
109	B/R	Ignition switch	**[Ignition switch "OFF"]**	0V
			[Ignition switch "ON"]	BATTERY VOLTAGE (11 - 14V)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
111	W/G	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch "OFF"]** ● For 5 seconds after turning ignition switch "OFF"	0 - 1.0V
			[Ignition switch "OFF"] ● 5 seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
113	B/P	Fuel pump relay	**[Ignition switch "ON"]** ● For 1 second after turning ignition switch "ON" **[Engine is running]**	0 - 1.0V
			[Ignition switch "ON"] ● More than 1 second after turning ignition switch "ON".	BATTERY VOLTAGE (11 - 14V)
115 116	B B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
119 120	W W	Power supply for ECM	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)
121	W/L	Power supply for ECM (Buck-up)	**[Ignition switch "OFF"]**	BATTERY VOLTAGE (11 - 14V)

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

CONSULT-II Function

EBS00EM7

FUNCTION

Diagnostic test mode	Function
Work support	This mode enables a technician to adjust some devices faster and more accurately by following the indications on the CONSULT-II unit.
Self-diagnostic results	Self-diagnostic results such as 1st trip DTC, DTCs and 1st trip freeze frame data or freeze frame data can be read and erased quickly.*1
Data monitor	Input/Output data in the ECM can be read.
Data monitor (SPEC)	Input/Output of the specification for Basic fuel schedule, AFM, A/F feedback control value and the other data monitor items can be read.
Active test	Diagnostic Test Mode in which CONSULT-II drives some actuators apart from the ECMs and also shifts some parameters in a specified range.
Function test	This mode is used to inform customers when their vehicle condition requires periodic maintenance.
DTC & SRT confirmation	The status of system monitoring tests and the self-diagnosis status/result can be confirmed.
ECM part number	ECM part number can be read.

*1: The following emission-related diagnostic information is cleared when the ECM memory is erased.

1. Diagnostic trouble codes
2. 1st trip diagnostic trouble codes
3. Freeze frame data
4. 1st trip freeze frame data
5. System readiness test (SRT) codes
6. Test values
7. Others

ENGINE CONTROL COMPONENT PARTS/CONTROL SYSTEMS APPLICATION

		Item	DIAGNOSTIC TEST MODE							
			WORK SUP-PORT	SELF-DIAGNOSTIC RESULTS		DATA MONI-TOR	DATA MONI-TOR (SPEC)	ACTIVE TEST	DTC & SRT CONFIRMATION	
				DTC*1	FREEZE FRAME DATA*2				SRT STATUS	DTC WORK SUP-PORT
ENGINE CONTROL COMPONENT PARTS	INPUT	Crankshaft position sensor (POS)		×	×	×	×			
		Camshaft position sensor (PHASE)		×	×	×	×			
		Mass air flow sensor		×		×	×			
		Engine coolant temperature sensor		×	×	×	×	×		
		Heated oxygen sensor 1		×		×	×		×	×
		Heated oxygen sensor 2		×		×	×		×	×
		Vehicle speed signal		×	×	×	×			
		Accelerator pedal position sensor		×		×	×			
		Throttle position sensor		×		×	×			
		Intake air temperature sensor		×		×	×			
		Knock sensor		×						
		Refrigerant pressure sensor				×	×			
		Closed throttle position switch (accelerator pedal position sensor signal)				×	×			
		Air conditioner switch				×	×			
		Park/neutral position (PNP) switch		×		×	×			
		Stop lamp switch		×		×	×			
		Power steering pressure sensor		×		×	×			
		Battery voltage				×	×			
		Electrical load signal				×	×			
	OUTPUT	Injectors				×	×	×		
		Power transistor (Ignition timing)				×	×	×		
		Throttle control motor relay		×		×	×			
		Throttle control motor		×						
		EVAP canister purge volume control solenoid valve		×		×	×	×		
		Air conditioner relay				×	×			
		Fuel pump relay	×			×	×	×		
		Cooling fan relay		×		×	×	×		
		Heated oxygen sensor 1 heater		×		×	×		×	
		Heated oxygen sensor 2 heater		×		×	×		×	
		Intake valve timing control solenoid valve		×		×	×	×		
		Calculated load value			×	×	×			

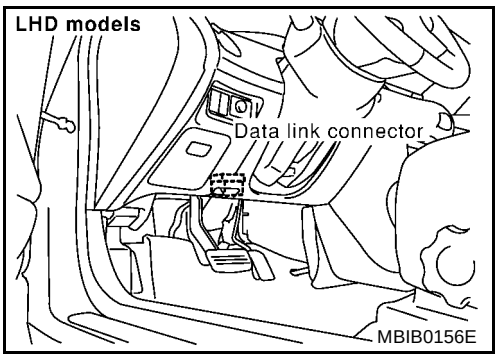
X: Applicable

*1: This item includes 1st trip DTCs.

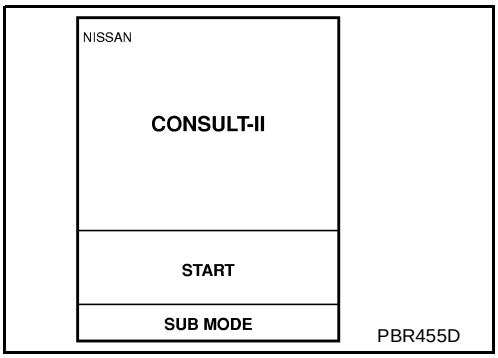
*2: This mode includes 1st trip freeze frame data or freeze frame data. The items appear on CONSULT-II screen in freeze frame data mode only if a 1st trip DTC or DTC is detected. For details, refer to EC-66, "FREEZE FRAME DATA AND 1ST TRIP FREEZE FRAME DATA" .

CONSULT-II INSPECTION PROCEDURE

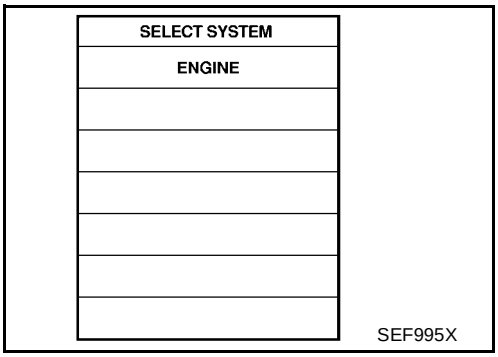
1. Turn ignition switch OFF.
2. Connect “CONSULT-II” to data link connector, which is located under the drivers side dash panel.
3. Turn ignition switch ON.



4. Touch “START”.

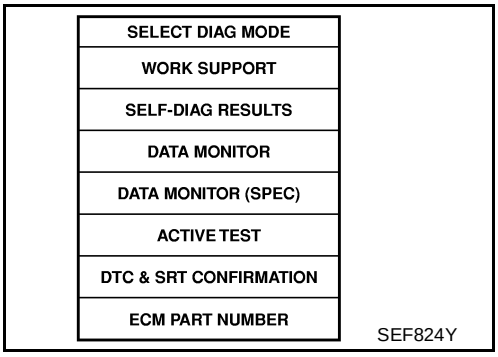


5. Touch “ENGINE”.



6. Perform each diagnostic test mode according to each service procedure.

For further information, see the CONSULT-II Operation Manual.



WORK SUPPORT MODE

Work Item

WORK ITEM	CONDITION	USAGE
FUEL PRESSURE RELEASE	● FUEL PUMP WILL STOP BY TOUCHING “START” DURING IDLING. CRANK A FEW TIMES AFTER ENGINE STALLS.	When releasing fuel pressure from fuel line
IDLE AIR VOL LEARN	● THE IDLE AIR VOLUME THAT KEEPS THE ENGINE WITHIN THE SPECIFIED RANGE IS MEMORIZED IN ECM.	When learning the idle air volume
SELF-LEARNING CONT	● THE COEFFICIENT OF SELF-LEARNING CONTROL MIXTURE RATIO RETURNS TO THE ORIGINAL COEFFICIENT.	When clearing the coefficient of self-learning control value
TARGET IDLE RPM ADJ*	● IDLE CONDITION	When setting target idle speed
TARGET IGN TIM ADJ*	● IDLE CONDITION	When adjusting target ignition timing After adjustment, confirm target ignition timing with a timing light.

*: This function is not necessary in the usual service procedure.

SELF-DIAG RESULTS MODE

Self Diagnostic Item

Regarding items of “DTC and 1st trip DTC”, refer to EC-23, "INDEX FOR DTC" .)

Freeze Frame Data and 1st Trip Freeze Frame Data

Freeze frame data item*1	Description
DIAG TROUBLE CODE [PXXXX]	● The engine control component part/control system has a trouble code, it is displayed as “PXXXX”. (Refer to EC-23, "INDEX FOR DTC" .)
FUEL SYS-B1	● “Fuel injection system status” at the moment a malfunction is detected is displayed. ● One mode in the following is displayed. “MODE 2”: Open loop due to detected system malfunction “MODE 3”: Open loop due to driving conditions (power enrichment, deceleration enrichment) “MODE 4”: Closed loop - using oxygen sensor(s) as feedback for fuel control “MODE 5”: Open loop - has not yet satisfied condition to go to closed loop
CAL/LD VALUE [%]	● The calculated load value at the moment a malfunction is detected is displayed.
COOLANT TEMP [°C] or [°F]	● The engine coolant temperature at the moment a malfunction is detected is displayed.
L-FUEL TRIM-B1 [%]	● “Long-term fuel trim” at the moment a malfunction is detected is displayed. ● The long-term fuel trim indicates much more gradual feedback compensation to the base fuel schedule than short-term fuel trim.
S-FUEL TRIM-B1 [%]	● “Short-term fuel trim” at the moment a malfunction is detected is displayed. ● The short-term fuel trim indicates dynamic or instantaneous feedback compensation to the base fuel schedule.
ENGINE SPEED [rpm]	● The engine speed at the moment a malfunction is detected is displayed.
VHCL SPEED [km/h] or [mph]	● The vehicle speed at the moment a malfunction is detected is displayed.
B/FUEL SCHDL [msec]	● The base fuel schedule at the moment a malfunction is detected is displayed.
INT/A TEMP SE [°C] or [°F]	● The intake air temperature at the moment a malfunction is detected is displayed.

*1: The items are the same as those of 1st trip freeze frame data.

DATA MONITOR MODE
Monitored Item

×: Applicable

Monitored item [Unit]	ECM INPUT SIGNALS	MAIN SIGNALS	CAN DIAG SUPPORT MNTR	Description	Remarks
ENG SPEED [rpm]	×	×		● Indicates the engine speed computed from the signals of the crankshaft position sensor (POS) and camshaft position sensor (PHASE).	● Accuracy becomes poor if engine speed drops below the idle rpm. ● If the signal is interrupted while the engine is running, an abnormal value may be indicated.
MAS A/F SE-B1 [V]	×	×		● The signal voltage of the mass air flow sensor is displayed.	● When the engine is stopped, a certain value is indicated.
B/FUEL SCHDL [msec]		×		● “Base fuel schedule” indicates the fuel injection pulse width programmed into ECM, prior to any learned on board correction.	
A/F ALPHA-B1 [%]		×		● The mean value of the air-fuel ratio feedback correction factor per cycle is indicated.	● When the engine is stopped, a certain value is indicated. ● This data also includes the data for the air-fuel ratio learning control.
A/F ALPHA-B2 [%]*1		×			
COOLAN TEMP/S [°C] or [°F]	×	×		● The engine coolant temperature (determined by the signal voltage of the engine coolant temperature sensor) is displayed.	● When the engine coolant temperature sensor is open or short-circuited, ECM enters fail-safe mode. The engine coolant temperature determined by the ECM is displayed.
HO2S1 (B1) [V]	×	×		● The signal voltage of the heated oxygen sensor 1 is displayed.	
HO2S1 (B2) [V]*1	×				
HO2S2 (B1) [V]	×	×		● The signal voltage of the heated oxygen sensor 2 is displayed.	
HO2S2 (B2) [V]*1	×				
HO2S1 MNTR (B1) [RICH/LEAN]	×	×		● Display of heated oxygen sensor 1 signal during air-fuel ratio feedback control: RICH ... means the mixture became “rich”, and control is being affected toward a leaner mixture. LEAN ... means the mixture became “lean”, and control is being affected toward a rich mixture.	● After turning ON the ignition switch, “RICH” is displayed until air-fuel mixture ratio feedback control begins. ● When the air-fuel ratio feedback is clamped, the value just before the clamping is displayed continuously.
HO2S1 MNTR (B2) [RICH/LEAN]*1	×				
HO2S2 MNTR (B1) [RICH/LEAN]	×			● Display of heated oxygen sensor 2 signal: RICH ... means the amount of oxygen after three way catalyst is relatively small. LEAN ... means the amount of oxygen after three way catalyst is relatively large.	● When the engine is stopped, a certain value is indicated.
HO2S2 MNTR (B2) [RICH/LEAN]*1	×				
VHCL SPEED SE [km/h] or [mph]	×	×		● The vehicle speed computed from the vehicle speed signal is displayed.	
BATTERY VOLT [V]	×	×		● The power supply voltage of ECM is displayed.	

Monitored item [Unit]	ECM INPUT SIG-NALS	MAIN SIG-NALS	CAN DIAG SUP-PORT MNTR	Description	Remarks
ACCEL SEN 1 [V]	×	×		● The accelerator pedal position sensor signal voltage is displayed.	
ACCEL SEN 2 [V]	×				
THRTL SEN 1 [V]	×	×		● The throttle position sensor signal voltage is displayed.	
THRTL SEN 2 [V]	×				
INT/A TEMP SE [°C] or [°F]	×	×		● The intake air temperature (determined by the signal voltage of the intake air temperature sensor) is indicated.	
START SIGNAL [ON/OFF]	×	×		● Indicates [ON/OFF] condition of the starter signal computed from the signals of the crankshaft position sensor (POS), camshaft position sensor (PHASE) and battery voltage.	● After starting the engine, [OFF] is displayed regardless of the starter signal.
CLSD THL POS [ON/OFF]	×	×		● Indicates idle position [ON/OFF] computed by ECM according to the accelerator pedal position sensor signal.	
AIR COND SIG [ON/OFF]	×	×		● Indicates [ON/OFF] condition of the air conditioner switch as determined by the air conditioner signal.	
P/N POSI SW [ON/OFF]	×	×		● Indicates [ON/OFF] condition from the park/neutral position (PNP) switch signal.	
PW/ST SIGNAL [ON/OFF]	×	×		● [ON/OFF] condition of the power steering oil pressure switch as determined by the power steering oil pressure signal is indicated.	
LOAD SIGNAL [ON/OFF]	×	×		● Indicates [ON/OFF] condition from the electrical load signal. ON ... Rear window defogger switch is ON and/or lighting switch is in 2nd position. OFF ... Both rear window defogger switch and lighting switch are OFF.	
IGNITION SW [ON/OFF]	×			● Indicates [ON/OFF] condition from ignition switch.	
HEATER FAN SW [ON/OFF]	×			● Indicates [ON/OFF] condition from the heater fan switch signal.	
BRAKE SW [ON/OFF]	×			● Indicates [ON/OFF] condition from the stop lamp switch signal.	
INJ PULSE-B1 [msec]		×		● Indicates the actual fuel injection pulse width compensated by ECM according to the input signals.	● When the engine is stopped, a certain computed value is indicated.
INJ PULSE-B2 [msec]*1					
IGN TIMING [BTDC]		×		● Indicates the ignition timing computed by ECM according to the input signals.	● When the engine is stopped, a certain value is indicated.
CAL/LD VALUE [%]				● “Calculated load value” indicates the value of the current airflow divided by peak airflow.	
MASS AIRFLOW [g·m/s]				● Indicates the mass airflow computed by ECM according to the signal voltage of the mass air flow sensor.	

Monitored item [Unit]	ECM INPUT SIG-NALS	MAIN SIG-NALS	CAN DIAG SUP-PORT MNTR	Description	Remarks
PURG VOL C/V [%]				● Indicates the EVAP canister purge volume control solenoid valve control value computed by the ECM according to the input signals. ● The opening becomes larger as the value increases.	
INT/V TIM (B1) [°CA]				● Indicates [°CA] of intake camshaft advanced angle.	
INT/V SOL (B1) [%]				● The control condition of the intake valve timing control solenoid valve (determined by ECM according to the input signals) is indicated. ON ... intake valve timing control is operating. OFF ... Intake valve timing control is not operating.	
AIR COND RLY [ON/OFF]		×		● The air conditioner relay control condition (determined by ECM according to the input signals) is indicated.	
FUEL PUMP RLY [ON/OFF]		×		● Indicates the fuel pump relay control condition determined by ECM according to the input signals.	
THRTL RELAY [ON/OFF]		×*2		● Indicates the throttle control motor relay control condition determined by the ECM according to the input signals.	
COOLING FAN [ON/OFF]				● Indicates the condition of the cooling fan (determined by ECM according to the input signals). ON ... Operation OFF ... Stop	
HO2S1 HTR (B1) [ON/OFF]				● Indicates [ON/OFF] condition of heated oxygen sensor 1 heater determined by ECM according to the input signals.	
HO2S1 HTR (B2) [ON/OFF]*1					
HO2S2 HTR (B1) [ON/OFF]				● Indicates [ON/OFF] condition of heated oxygen sensor 2 heater determined by ECM according to the input signals.	
HO2S2 HTR (B2) [ON/OFF]*1					
VEHICLE SPEED [km/h] or [mph]	×			● The vehicle speed computed from the vehicle speed signal sent from TCM is displayed.	
IDL A/V LEARN [YET/CMPLT/ INCMP]				● Display the condition of idle air volume learning YET ... Idle air volume learning has not been performed yet. CMPLT ... Idle air volume learning has already been performed successfully. INCMP ... Idle air volume learning has not been performed successfully.	
TRVL AFTER MIL [km] or [mile]				● Distance traveled while MI is activated.	

Monitored item [Unit]	ECM INPUT SIG-NALS	MAIN SIG-NALS	CAN DIAG SUP-PORT MNTR	Description	Remarks
O2SEN HTR DTY [%]				● Indicates the heated oxygen sensor 1 heater control value computed by the ECM according to the input signals.	
AC PRESS SEN [V]	×*2			● The signal voltage from the refrigerant pressure sensor is displayed.	
Voltage [V]				● Voltage, frequency, duty cycle or pulse width measured by the probe.	● Only "#" is displayed if item is unable to be measured. ● Figures with "#"s are temporary ones. They are the same figures as an actual piece of data which was just previously measured.
Frequency [msec], [Hz] or [%]					
DUTY-HI					
DUTY-LOW					
PLS WIDTH-HI					
PLS WIDTH-LOW					
CAN COMM [OK/NG]			×	● Indicates the communication condition of CAN communication line.	● These items are not displayed in "SELECTION FROM MENU" mode.
CAN CIRC 1 [OK/UNKWN]			×		
CAN CIRC 2 [OK/UNKWN]			×		
CAN CIRC 3 [OK/UNKWN]			×		
CAN CIRC 4 [OK/UNKWN]			×		
CAN CIRC 5 [OK/UNKWN]			×		
CAN CIRC 6 [OK/UNKWN]			×		
CAN CIRC 7 [OK/UNKWN]			×		

*1: For QG18 engine models.
*2: For QG16 engine models.

NOTE:
- Any monitored item that does not match the vehicle being diagnosed is deleted from the display automatically.

DATA MONITOR (SPEC) MODE

Monitored Item

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
ENG SPEED [rpm]	×	×	● Indicates the engine speed computed from the signal of the crankshaft position sensor (POS).	
MAS A/F SE-B1 [V]	×	×	● The signal voltage of the mass air flow sensor specification is displayed.	● When engine is running specification range is indicated.
B/FUEL SCHDL [msec]		×	● "Base fuel schedule" indicates the fuel injection pulse width programmed into ECM, prior to any learned on board correction.	● When engine is running specification range is indicated.

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
A/F ALPHA-B1 [%]		×	● The mean value of the air-fuel ratio feedback correction factor per cycle is indicated.	● When engine is running specification range is indicated. ● This data also includes the data for the air-fuel ratio learning control.
A/F ALPHA-B2 [%]*1		×		

*1: For QG18 engine models

NOTE:

- Any monitored item that does not match the vehicle being diagnosed is deleted from the display automatically.

ACTIVE TEST MODE

Test Item

TEST ITEM	CONDITION	JUDGEMENT	CHECK ITEM (REMEDY)
FUEL INJECTION	● Engine: Return to the original trouble condition ● Change the amount of fuel injection using CONSULT-II.	If trouble symptom disappears, see CHECK ITEM.	● Harness and connectors ● Fuel injectors ● Heated oxygen sensor 1
IGNITION TIMING	● Engine: Return to the original trouble condition ● Timing light: Set ● Retard the ignition timing using CONSULT-II.	If trouble symptom disappears, see CHECK ITEM.	● Perform “Idle Air Volume Learning”.
POWER BALANCE	● Engine: After warming up, idle the engine. ● A/C switch “OFF” ● Shift lever “N” ● Cut off each injector signal one at a time using CONSULT-II.	Engine runs rough or dies.	● Harness and connectors ● Compression ● Fuel injectors ● Power transistor ● Spark plugs ● Ignition coils
COOLING FAN	● Ignition switch: ON ● Turn the cooling fan “ON” and “OFF” with CONSULT-II.	Cooling fan moves and stops.	● Harness and connectors ● Cooling fan relay ● Cooling fan motor
ENG COOLANT TEMP	● Engine: Return to the original trouble condition ● Change the engine coolant temperature using CONSULT-II.	If trouble symptom disappears, see CHECK ITEM.	● Harness and connectors ● Engine coolant temperature sensor ● Fuel injectors
FUEL PUMP RELAY	● Ignition switch: ON (Engine stopped) ● Turn the fuel pump relay “ON” and “OFF” using CONSULT-II and listen to operating sound.	Fuel pump relay makes the operating sound.	● Harness and connectors ● Fuel pump relay
PURG VOL CONT/V	● Engine: After warming up, run engine at 1,500 rpm. ● Change the EVAP canister purge volume control solenoid valve opening percent using CONSULT-II.	Engine speed changes according to the opening percent.	● Harness and connectors ● Solenoid valve
V/T ASSIGN ANGLE	● Engine: Return to the original trouble condition ● Change intake valve timing using CONSULT-II.	If trouble symptom disappears, see CHECK ITEM.	● Harness and connectors ● Intake valve timing control solenoid valve

DTC & SRT CONFIRMATION MODE

SRT STATUS Mode

For details, refer to EC-67, "SYSTEM READINESS TEST (SRT) CODE" .

SRT Work Support Mode

This mode enables a technician to drive a vehicle to set the SRT while monitoring the SRT status.

DTC Work Support Mode

QG16 engine models

Test mode	Test item	Condition	Reference page
HO2S1	HO2S1 (B1) P0133	Refer to corresponding trouble diagnosis for DTC.	EC-214
	HO2S1 (B1) P0134		EC-234
	HO2S1 (B1) P1143		EC-420
	HO2S1 (B1) P1144		EC-432
H02S2	HO2S2 (B1) P0139		EC-267
	HO2S2 (B1) P1146		EC-444
	HO2S2 (B1) P1147		EC-462

QG18 engine models

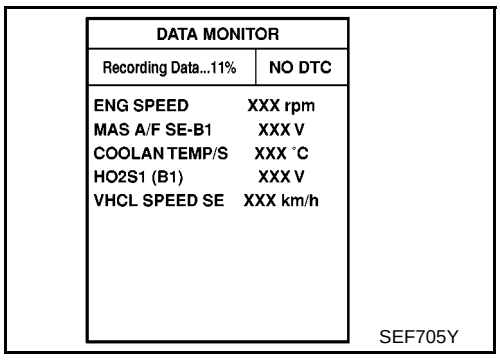
Test mode	Test item	Condition	Reference page
HO2S1	HO2S1 (B1) P0133, P0153	Refer to corresponding trouble diagnosis for DTC.	EC-223
	HO2S1 (B1) P0134, P0154		EC-241
	HO2S1 (B1) P1143, P1163		EC-426
	HO2S1 (B1) P1144, P1164		EC-438
H02S2	HO2S2 (B1) P0139, P0159		EC-275
	HO2S2 (B1) P1146, P1166		EC-452
	HO2S2 (B1) P1147, P1167		EC-470

REAL TIME DIAGNOSIS IN DATA MONITOR MODE (RECORDING VEHICLE DATA)

Description

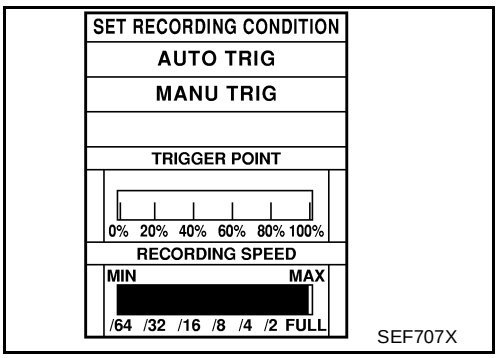
CONSULT-II has two kinds of triggers and they can be selected by touching “SETTING” in “DATA MONITOR” mode.

1. “AUTO TRIG” (Automatic trigger):
   - The malfunction will be identified on the CONSULT-II screen in real time.
     In other words, DTC/1st trip DTC and malfunction item will be displayed if the malfunction is detected by ECM.
     At the moment a malfunction is detected by ECM, “MONITOR” in “DATA MONITOR” screen is changed to “Recording Data ... xx%” as shown at right, and the data after the malfunction detection is recorded. Then when the percentage reached 100%, “REAL-TIME DIAG” screen is displayed. If “STOP” is touched on the screen during “Recording Data ... xx%”, “REAL-TIME DIAG” screen is also displayed.
     The recording time after the malfunction detection and the



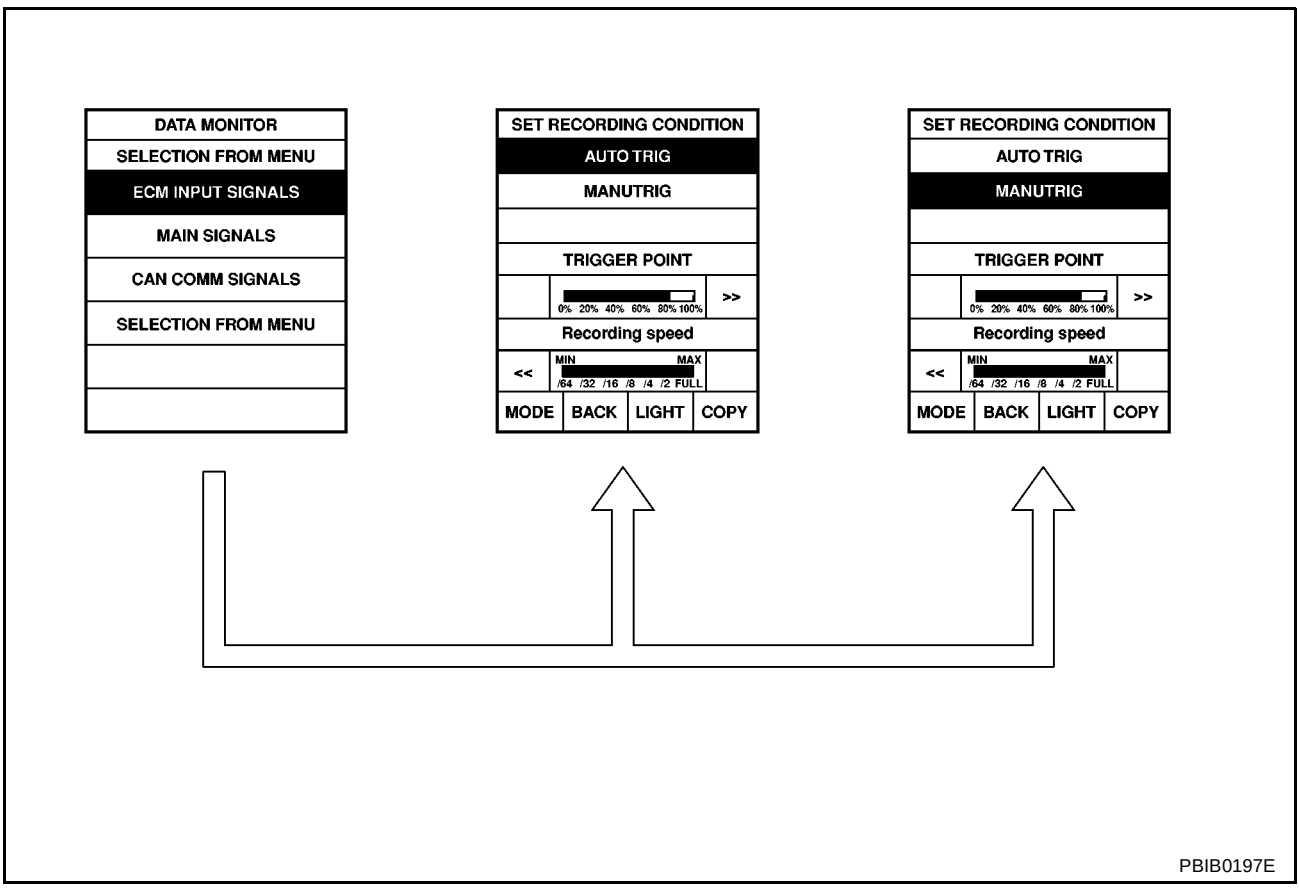
recording speed can be changed by “TRIGGER POINT” and “Recording Speed”. Refer to CONSULT-II OPERATION MANUAL.

2. “MANU TRIG” (Manual trigger):
   - DTC/1st trip DTC and malfunction item will not be displayed automatically on CONSULT-II screen even though a malfunction is detected by ECM.
     DATA MONITOR can be performed continuously even though a malfunction is detected.



Operation

1. “AUTO TRIG”
   - While trying to detect the DTC/1st trip DTC by performing the “DTC Confirmation Procedure”, be sure to select to “DATA MONITOR (AUTO TRIG)” mode. You can confirm the malfunction at the moment it is detected.
   - While narrowing down the possible causes, CONSULT-II should be set in “DATA MONITOR (AUTO TRIG)” mode, especially in case the incident is intermittent.
     When you are inspecting the circuit by gently shaking (or twisting) the suspicious connectors, components and harness in the “DTC Confirmation Procedure”, the moment a malfunction is found the DTC/1st trip DTC will be displayed. (Refer to “Incident Simulation Tests” in GI-24, "How to Perform Efficient Diagnosis for an Electrical Incident" .)
2. “MANU TRIG”
   - If the malfunction is displayed as soon as “DATA MONITOR” is selected, reset CONSULT-II to “MANU TRIG”. By selecting “MANU TRIG” you can monitor and store the data. The data can be utilized for further diagnosis, such as a comparison with the value for the normal operating condition.

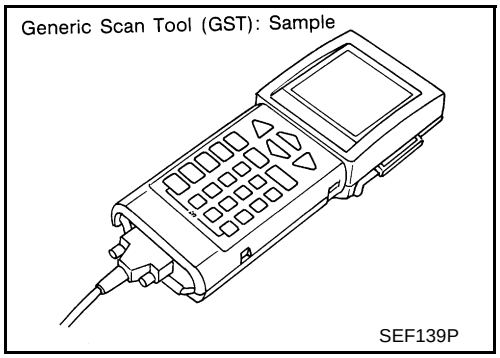


Generic Scan Tool (GST) Function

EBS00EM8

DESCRIPTION

Generic Scan Tool (OBDII scan tool) complying with ISO 15031-4 has 8 different functions explained below.
ISO9141 is used as the protocol.
The name “GST” or “Generic Scan Tool” is used in this service manual.

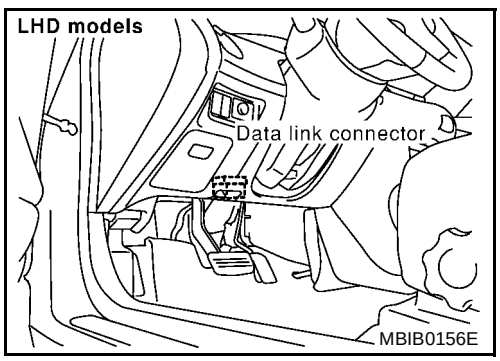


FUNCTION

Diagnostic test mode		Function
MODE 1	READINESS TESTS	This mode gains access to current emission-related data values, including analog inputs and outputs, digital inputs and outputs, and system status information.
MODE 2	(FREEZE DATA)	This mode gains access to emission-related data value which were stored by ECM during the freeze frame. For details, refer to EC-66, "FREEZE FRAME DATA AND 1ST TRIP FREEZE FRAME DATA" .
MODE 3	DTCs	This mode gains access to emission-related power train trouble codes which were stored by ECM.
MODE 4	CLEAR DIAG INFO	This mode can clear all emission-related diagnostic information. This includes: ● Clear number of diagnostic trouble codes (MODE 1) ● Clear diagnostic trouble codes (MODE 3) ● Clear trouble code for freeze frame data (MODE 1) ● Clear freeze frame data (MODE 2) ● Reset status of system monitoring test (MODE 1) ● Clear on board monitoring test results (MODE 6 and 7)
MODE 6	(ON BOARD TESTS)	This mode accesses the results of on board diagnostic monitoring tests of specific components/systems that are not continuously monitored.
MODE 7	(ON BOARD TESTS)	This mode enables the off board test drive to obtain test results for emission-related powertrain components/systems that are continuously monitored during normal driving conditions.
MODE 8	—	This mode is not applicable on this vehicle.
MODE 9	(CALIBRATION ID)	This mode enables the off-board test device to request specific vehicle information such as Vehicle Identification Number (VIN) and Calibration IDs.

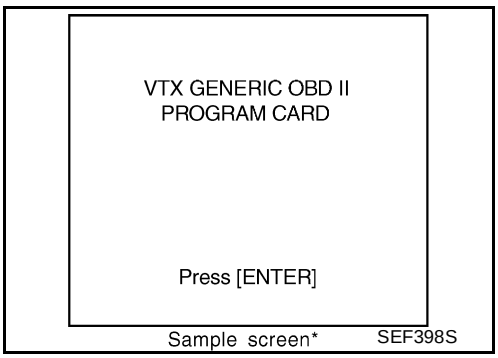
GST INSPECTION PROCEDURE

1. Turn ignition switch OFF.
2. Connect “GST” to data link connector, which is located under the driver side dash panel near the fuse box cover.
3. Turn ignition switch ON.



4. Enter the program according to instruction on the screen or in the operation manual.

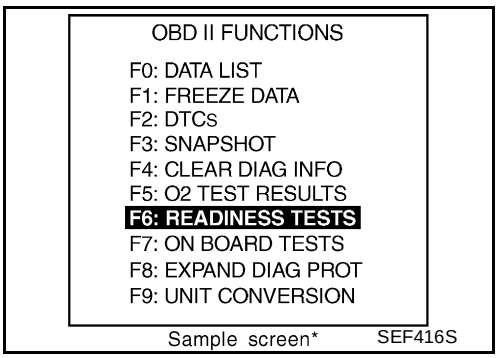
(*: Regarding GST screens in this section, sample screens are shown.)



Sample screen* SEF398S

5. Perform each diagnostic mode according to each service procedure.

For further information, see the GST Operation Manual of the tool maker.



Sample screen* SEF416S

CONSULT-II Reference Value in Data Monitor Mode

EBS00EM9

Remarks:
- Specification data are reference values.
- Specification data are output/input values which are detected or supplied by the ECM at the connector.
  * Specification data may not be directly related to their components signals/values/operations.
  i.e. Adjust ignition timing with a timing light before monitoring IGN TIMING, because the monitor may show the specification data in spite of the ignition timing not being adjusted to the specification data. This IGN TIMING monitors the data calculated by the ECM according to the signals input from the camshaft position sensor and other ignition timing related sensors.

MONITOR ITEM	CONDITION		SPECIFICATION
ENG SPEED	● Tachometer: Connect ● Run engine and compare tachometer indication with the CONSULT-II value.		Almost the same speed as the CONSULT-II value.
MAS A/F SE-B1	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: N ● No-load	Idle	Approx. 1.0 - 1.7V
		2,500 rpm	Approx. 1.5 - 2.1V
B/FUEL SCHDL	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	1.5 - 3.0 msec
		2,000 rpm	1.2 - 3.0 msec
A/F ALPHA-B1 A/F ALPHA-B2*	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	75% - 125%
COOLAN TEMP/S	● Engine: After warming up		More than 70°C (158°F)
HO2S1 (B1) HO2S1 (B2)*	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S2 (B1) HO2S2 (B2)*	● Engine: After warming up	Revving engine from idle to 3,000 rpm quickly.	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S1 MNTR (B1) HO2S1 MNTR (B2)*	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	LEAN ←→ RICH Changes more than 5 times during 10 seconds.
HO2S2 MNTR (B1) HO2S2 MNTR (B2)*	● Engine: After warming up	Revving engine from idle to 3,000 rpm quickly.	LEAN ←→ RICH

MONITOR ITEM	CONDITION		SPECIFICATION
VEH SPEED SE	● Turn drive wheels and compare speedometer indication with the CONSULT-II value.		Almost the same speed as the CONSULT-II value
BATTERY VOLT	● Ignition switch: ON (Engine stopped)		11 - 14V
ACCEL SEN1 ACCEL SEN2	● Ignition switch: ON (engine stopped)	Accelerator pedal: Fully released	0.35 - 0.67V
		Accelerator pedal: Fully depressed	More than 3.9V
THRTL SEN1 THRTL SEN2	● Ignition switch: ON (Engine stopped) ● Shift lever: D (A/T model) 1st (M/T model)	Accelerator pedal: Fully released	More than 0.36V
		Accelerator pedal: Fully depressed	Less than 4.75V
START SIGNAL	● Ignition switch: ON → START → ON		OFF → ON → OFF
CLSD THL POS	● Ignition switch: ON	Accelerator pedal: Fully released	ON
		Accelerator pedal: Slightly depressed	OFF
AIR COND SIG	● Engine: After warming up, idle the engine	Air conditioner switch: OFF	OFF
		Air conditioner switch: ON (Compressor operates.)	ON
P/N POSI SW	● Ignition switch: ON	Shift lever: P or N (A/T model) Neutral (M/T model)	ON
		Shift lever: Except above	OFF
PW/ST SIGNAL	● Engine: After warming up, idle the engine	Steering wheel is in neutral position. (Forward direction)	OFF
		Steering wheel is turned.	ON
LOAD SIGNAL	● Ignition switch: ON	Rear window defogger switch is ON and/or lighting switch is in 2nd.	ON
		Rear window defogger switch is OFF and lighting switch is OFF.	OFF
IGNITION SW	● Ignition switch: ON → OFF → ON		ON → OFF → ON
HEATER FAN SW	● Engine: After warming up, idle the engine	Heater fan is operating.	ON
		Heater fan is not operating	OFF
BRAKE SW	● Ignition switch: ON	Brake pedal: Fully released	OFF
		Brake pedal: Slightly depressed	ON
INJ PULSE-B1 INJ PULSE-B2*	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	2.0 - 3.5 msec
		2,000 rpm	1.5 - 3.5 msec
IGN TIMING	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	M/T: 8°±5° BTDC A/T: 10°±5° BTDC
		2,000 rpm	25° - 45° BTDC
CAL/LD VALUE	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	10% - 35%
		2,500 rpm	10% - 35%
MASS AIRFLOW	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	1.0 - 4.0 g·m/s
		2,500 rpm	5.0 - 10.0 g·m/s

MONITOR ITEM	CONDITION		SPECIFICATION
PURG VOL C/V	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	0%
		2,000 rpm	15 - 30%
INT/V TIM (B1)	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	–5° - 5°CA
		2,000 rpm	Approx. 0° - 30°CA
INT/V SOL (B1)	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	0% - 2%
		2,000 rpm	Approx. 0% - 60%
AIR COND RLY	● Engine: After warming up, idle the engine	Air conditioner switch: OFF	OFF
		Air conditioner switch: ON (Compressor operates)	ON
FUEL PUMP RLY	● For 1 seconds after turning ignition switch ON ● Engine running or cranking		ON
	● Except above conditions		OFF
THRTL RELAY	● Ignition switch: ON		ON
COOLING FAN	● Engine: After warming up, idle the engine ● Air conditioner switch: OFF	Engine coolant temperature is 99°C (210°F) or less	OFF
		Engine coolant temperature is 100°C (212°F) or more	ON
HO2S1 HTR (B1) HO2S1 HTR (B2)*	● Engine: After warming up ● Engine speed: Below 3,600 rpm (M/T models) Below 3,200 rpm (A/T models)		ON
	● Engine speed: Above 3,600 rpm (M/T models) Above 3,200 rpm (A/T models)		OFF
HO2S2 HTR (B1) HO2S2 HTR (B2)*	● Engine speed: Below 3,600 rpm [After driving for 2 minutes at a speed of 70 km/h (43 MPH) or more]		ON
	● Engine speed: Above 3,600 rpm		OFF
TRVL AFTER MIL	● Ignition switch: ON	Vehicle has traveled after MI has turned ON.	0 - 65,280 km (0 - 40,565 mile)
O2SEN HTR DTY	● Engine coolant temperature when engine started: More than 80° (176°F) ● Engine speed: Below 3,600 rpm (M/T models) Below 3,200 rpm (A/T models)		Approx. 50%
AC PRESS SEN	● Ignition switch: ON (Engine stopped)		Approx. 0V
	● Engine: Idle ● Air conditioner switch: OFF		1.0 - 4.0V
VEH SPEED SE	● Turn drive wheels and compare speedometer indication with the CONSULT-II value.		Almost the same speed as the CONSULT-II value

MONITOR ITEM	CONDITION	SPECIFICATION
CAN COMM	● Ignition switch: ON	OK
CAN CIRC 1		OK
CAN CIRC 2		OK or UNKWN
CAN CIRC 3		UNKWN
CAN CIRC 4		OK
CAN CIRC 5		UNKWN
CAN CIRC 6		OK
CAN CIRC 7		UNKWN

*: These items are displayed with QG18DE engine models

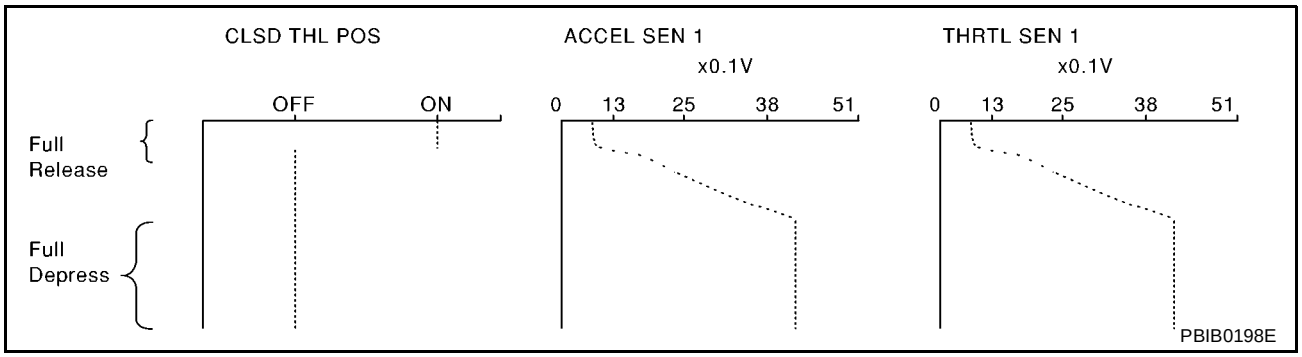
Major Sensor Reference Graph in Data Monitor Mode

EBS00EMA

The following are the major sensor reference graphs in “DATA MONITOR” mode.

CLSD THL POS, ACCEL SEN 1, THRTL SEN 1

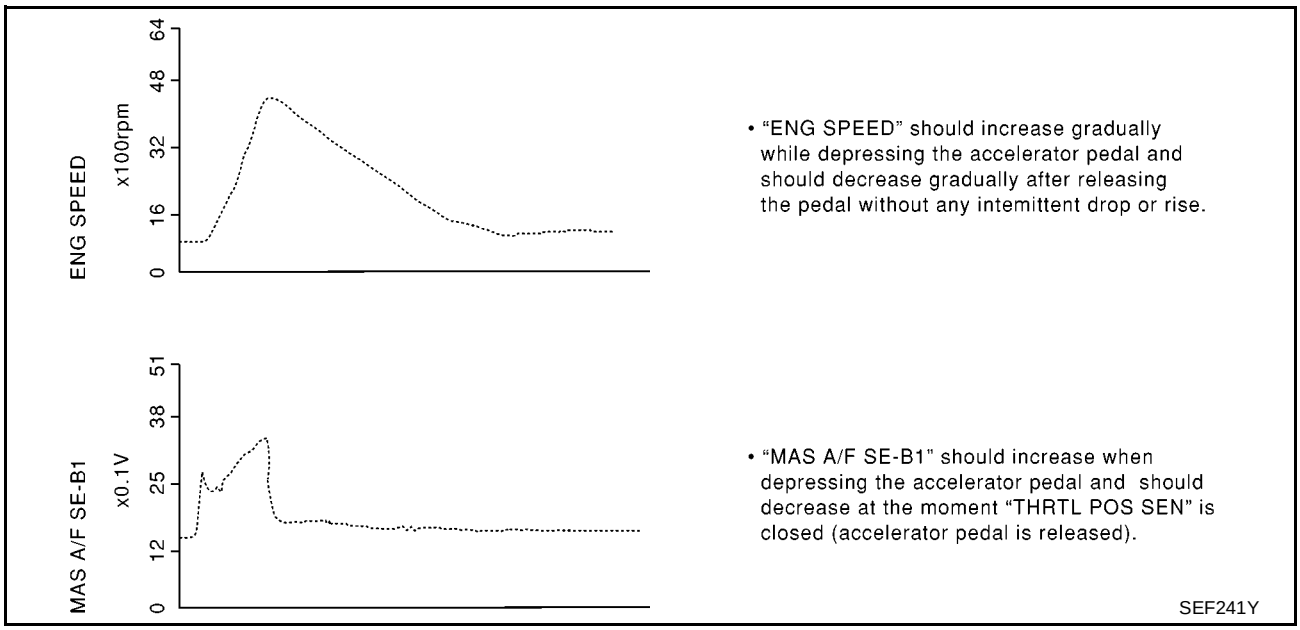
Below is the data for “CLSD THL POS”, “ACCEL SEN 1” and “THRTL SEN 1” when depressing the accelerator pedal with the ignition switch “ON” and with selector lever in “D” position (A/T models) or with shift lever in “1st” position (M/T models).
The signal of “ACCEL SEN 1” and “THRTL SEN 1” should rise gradually without any intermittent drop or rise after “CLSD THL POS” is changed from “ON” to “OFF”.

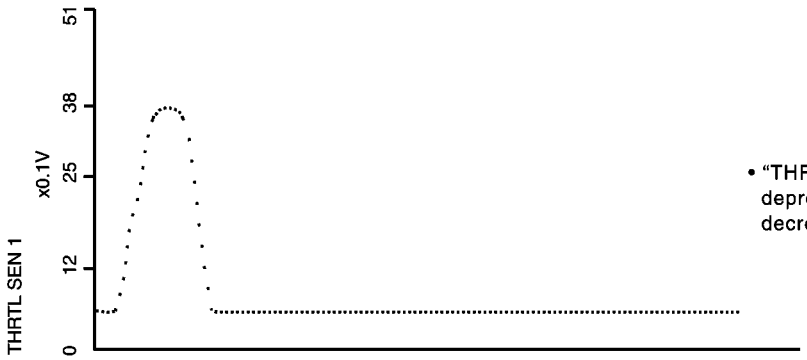


ENG SPEED, MAS A/F SE-B1, THRTL SEN 1, HO2S2 (B1), HO2S1 (B1), INJ PULSE-B1

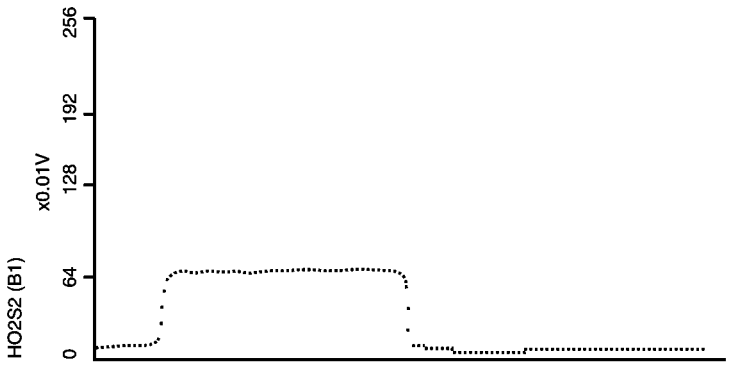
Below is the data for “ENG SPEED”, “MAS A/F SE-B1”, “THRTL SEN 1”, “HO2S2 (B1)”, “HO2S1 (B1)” and “INJ PULSE-B1” when revving engine quickly up to 4,800 rpm under no load after warming up engine sufficiently.

Each value is for reference, the exact value may vary.

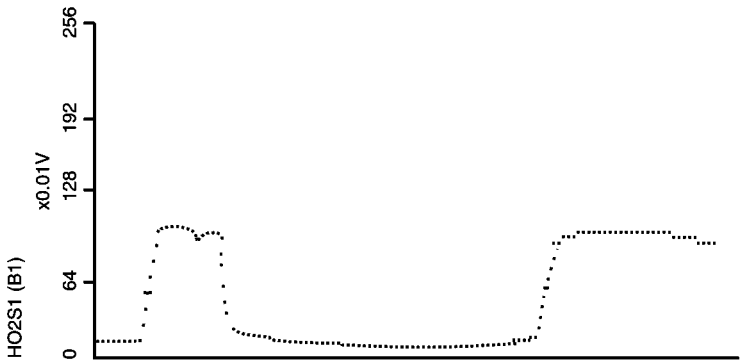




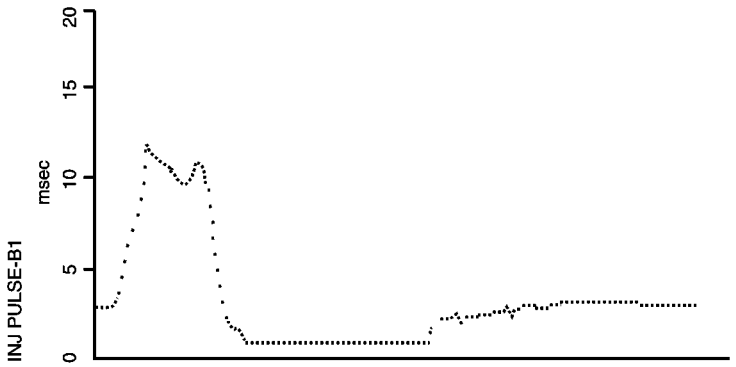
• "THRTL SEN 1" should increase while depressing the accelerator pedal and should decrease while releasing it.



• "HO2S2 (B1)" may increase immediately after depressing the accelerator pedal and may decrease after releasing the pedal.



• "HO2S1 (B1)" may increase immediately after depressing the accelerator pedal and may decrease after releasing the pedal.



• "INJ PULSE-B1" should increase when depressing the accelerator pedal and should decrease when the pedal is released.

PBIB0668E

TROUBLE DIAGNOSIS - SPECIFICATION VALUE

PFP:00031

Description

EBS00EMB

The specification (SP) value indicates the tolerance of the value that is displayed in “DATA MONITOR (SPEC)” mode of CONSULT-II during normal operation of the Engine Control System. When the value in “DATA MONITOR (SPEC)” mode is within the SP value, the Engine Control System is confirmed OK. When the value in “DATA MONITOR (SPEC)” mode is NOT within the SP value, the Engine Control System may have one or more malfunctions.
The SP value is used to detect malfunctions that may affect the Engine Control System, but will not light the MIL.
The SP value will be displayed for the following three items:

- B/FUEL SCHDL (The fuel injection pulse width programmed into ECM prior to any learned on board correction)
- A/F ALPHA-B1/B2 (The mean value of air-fuel ratio feedback correction factor per cycle)
- MAS A/F SE-B1 (The signal voltage of the mass air flow sensor)

Testing Condition

EBS00EMC

- Vehicle driven distance: More than 5,000 km (3,017 miles)
- Barometric pressure: 98.3 - 104.3 kPa (1.003 - 1.064 kg/cm^2 , 14.25 - 15.12 psi)
- Atmospheric temperature: 20 - 30°C (68 - 86°F)
- Engine coolant temperature: 75 - 95°C (167 - 203°F)
- Transmission: Warmed-up*1
- Electrical load: Not applied*2
- Engine speed: Idle

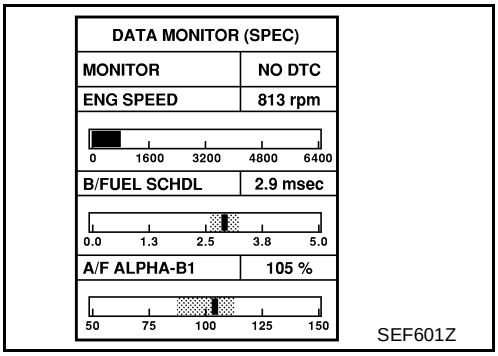
*1: For A/T models with CONSULT-II, after the engine is warmed up to normal operating temperature, drive vehicle until “FLUID TEMP SE” (A/T fluid temperature sensor signal) indicates more than 60°C (140°F).
For A/T models without CONSUT-II and M/T models, after the engine is warmed up to normal operating temperature, drive vehicle for 5 minutes.
*2: Rear window defogger switch, air conditioner switch, lighting switch are “OFF”. Steering wheel is straight ahead.

Inspection Procedure

EBS00EMD

NOTE:
Perform “DATA MONITOR (SPEC)” mode in maximum scale display.

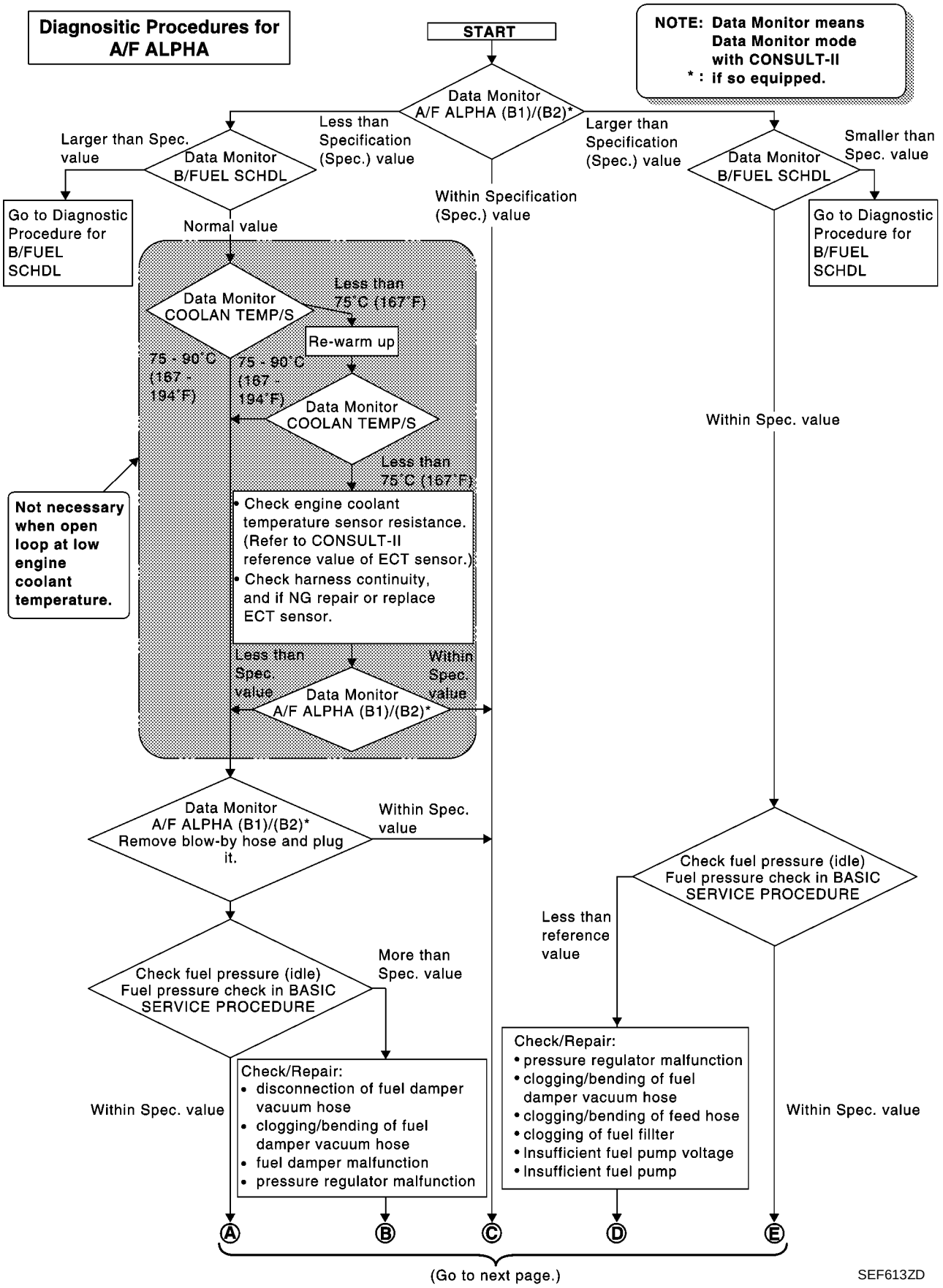
1. Perform EC-92, "Basic Inspection" .
2. Confirm that the testing conditions indicated above are met.
3. Select “B/FUEL SCHDL”, “A/F ALPHA-B1/B2” and “MAS A/F SE-B1” in “DATA MONITOR (SPEC)” mode with CONSULT-II.
4. Make sure that monitor items are within the SP value.
5. If NG, go to EC-140, "Diagnostic Procedure" .

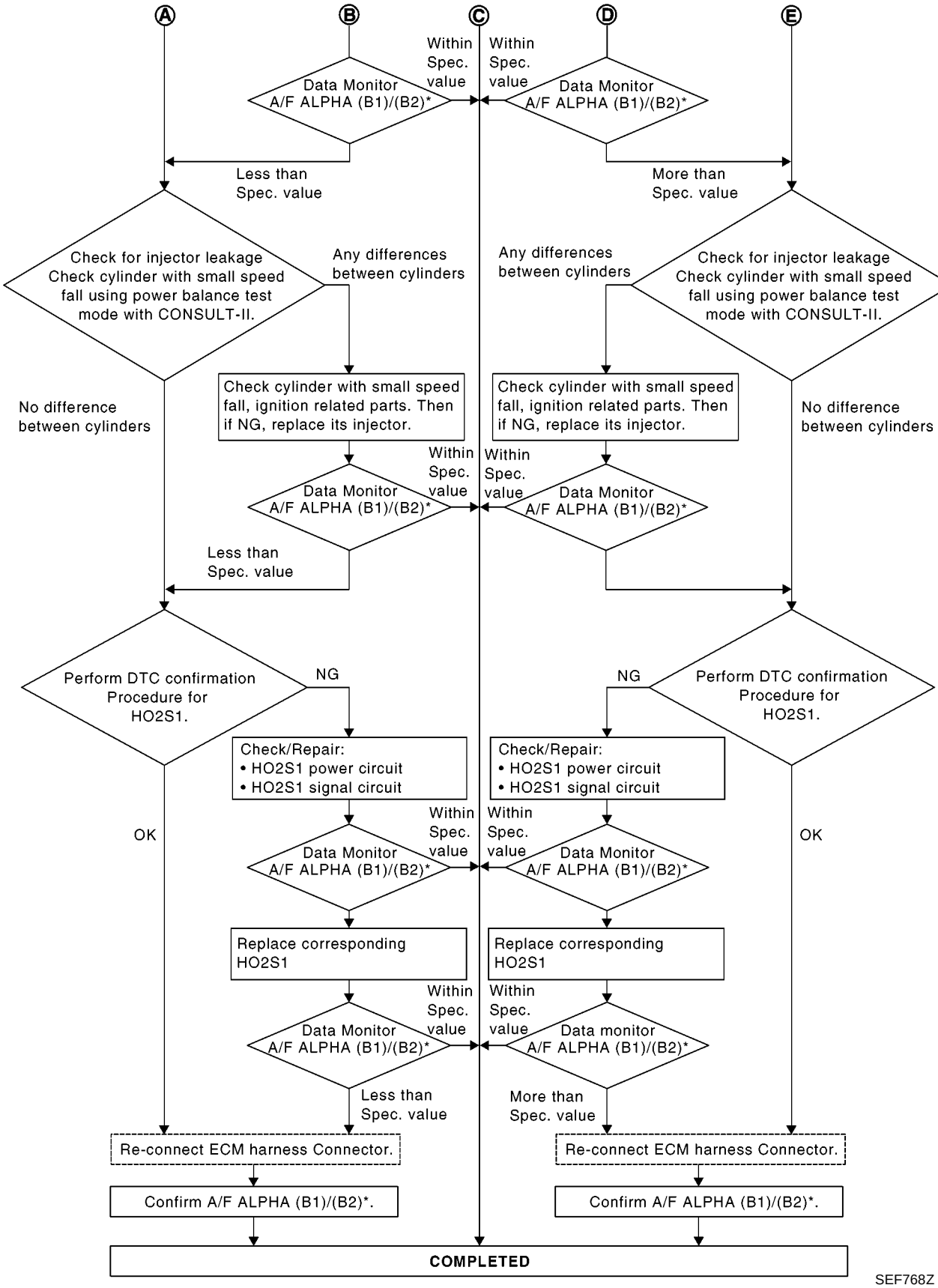


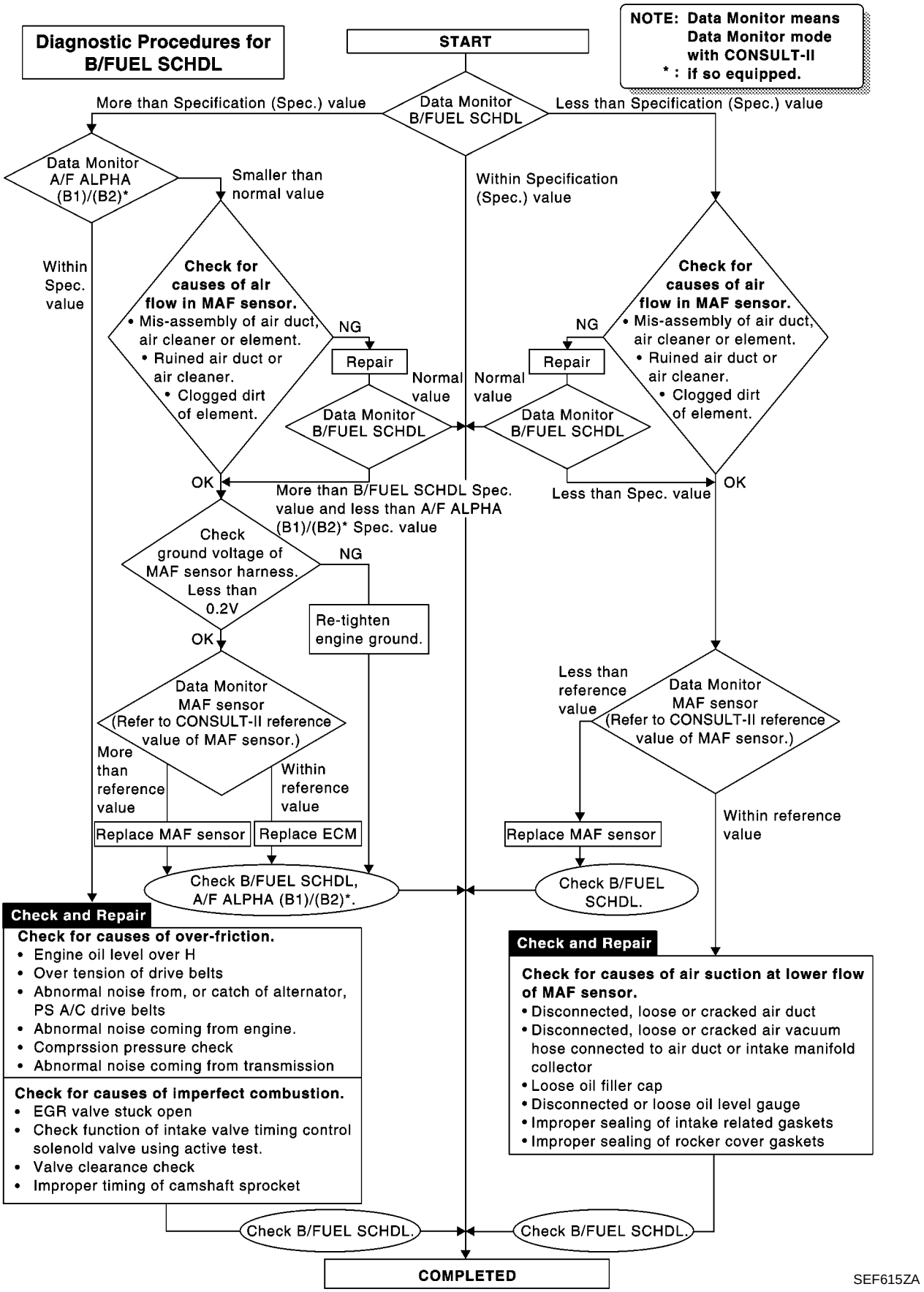
SEF601Z

Diagnostic Procedure

EBS00EME




Ⓐ
Ⓑ
Ⓒ
Ⓓ
Ⓔ
Within Spec. value
Data Monitor A/F ALPHA (B1)/(B2)*
Less than Spec. value
More than Spec. value
Check for injector leakage Check cylinder with small speed fall using power balance test mode with CONSULT-II.
Any differences between cylinders
No difference between cylinders
Check cylinder with small speed fall, ignition related parts. Then if NG, replace its injector.
Perform DTC confirmation Procedure for HO2S1.
NG
OK
Check/Repair:
• HO2S1 power circuit
• HO2S1 signal circuit
Replace corresponding HO2S1
Data monitor A/F ALPHA (B1)/(B2)*
Re-connect ECM harness Connector.
Confirm A/F ALPHA (B1)/(B2)*.
COMPLETED
SEF768Z


Diagnostic Procedures for B/FUEL SCHDL
START
NOTE: Data Monitor means Data Monitor mode with CONSULT-II
* : if so equipped.
Data Monitor B/FUEL SCHDL
More than Specification (Spec.) value
Less than Specification (Spec.) value
Within Specification (Spec.) value
Data Monitor A/F ALPHA (B1)/(B2)*
Smaller than normal value
Within Spec. value
Check for causes of air flow in MAF sensor.
• Mis-assembly of air duct, air cleaner or element.
• Ruined air duct or air cleaner.
• Clogged dirt of element.
NG
Repair
Normal value
Data Monitor B/FUEL SCHDL
OK
More than B/FUEL SCHDL Spec. value and less than A/F ALPHA (B1)/(B2)* Spec. value
Check ground voltage of MAF sensor harness. Less than 0.2V
NG
Re-tighten engine ground.
OK
Data Monitor MAF sensor (Refer to CONSULT-II reference value of MAF sensor.)
More than reference value
Within reference value
Replace MAF sensor
Replace ECM
Check B/FUEL SCHDL, A/F ALPHA (B1)/(B2)*.
Check and Repair
Check for causes of over-friction.
• Engine oil level over H
• Over tension of drive belts
• Abnormal noise from, or catch of alternator, PS A/C drive belts
• Abnormal noise coming from engine.
• Comprssion pressure check
• Abnormal noise coming from transmission
Check for causes of imperfect combustion.
• EGR valve stuck open
• Check function of intake valve timing control solenold valve using active test.
• Valve clearance check
• Improper timing of camshaft sprocket
Check B/FUEL SCHDL.
Less than Specification (Spec.) value
Check for causes of air flow in MAF sensor.
• Mis-assembly of air duct, air cleaner or element.
• Ruined air duct or air cleaner.
• Clogged dirt of element.
NG
Repair
Normal value
Data Monitor B/FUEL SCHDL
Less than Spec. value
OK
Less than reference value
Data Monitor MAF sensor (Refer to CONSULT-II reference value of MAF sensor.)
Within reference value
Replace MAF sensor
Check B/FUEL SCHDL.
Check and Repair
Check for causes of air suction at lower flow of MAF sensor.
• Disconnected, loose or cracked air duct
• Disconnected, loose or cracked air vacuum hose connected to air duct or intake manifold collector
• Loose oil filler cap
• Disconnected or loose oil level gauge
• Improper sealing of intake related gaskets
• Improper sealing of rocker cover gaskets
Check B/FUEL SCHDL.
COMPLETED
SEF615ZA

TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT

PFP:00006

Description

EBS00EMF

Intermittent incidents (I/I) may occur. In many cases, the problem resolves itself (the part or circuit function returns to normal without intervention). It is important to realize that the symptoms described in the customer's complaint often do not recur on (1st trip) DTC visits. Realize also that the most frequent cause of I/I occurrences is poor electrical connections. Because of this, the conditions under which the incident occurred may not be clear. Therefore, circuit checks made as part of the standard diagnostic procedure may not indicate the specific problem area.

Common I/I Report Situations

STEP in Work Flow	Situation
II	The CONSULT-II is used. The SELF-DIAG RESULTS screen shows time data other than “0” or “[1t]”.
III	The symptom described by the customer does not recur.
IV	(1st trip) DTC does not appear during the DTC Confirmation Procedure.
VI	The Diagnostic Procedure for PXXXX does not indicate the problem area.

Diagnostic Procedure

EBS00EMG

1. INSPECTION START

Erase (1st trip) DTCs. Refer to EC-73, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .

>> GO TO 2.

2. CHECK GROUND TERMINALS

Check ground terminals for corroding or loose connection.
Refer to GI-24, "How to Perform Efficient Diagnosis for an Electrical Incident" , “Incident Simulation Tests”.

OK or NG

OK >> GO TO 3.
NG >> Repair or replace.

3. SEARCH FOR ELECTRICAL INCIDENT

Perform GI-24, "How to Perform Efficient Diagnosis for an Electrical Incident" , “Incident Simulation Tests”.

OK or NG

OK >> **INSPECTION END**
NG >> Repair or replace.

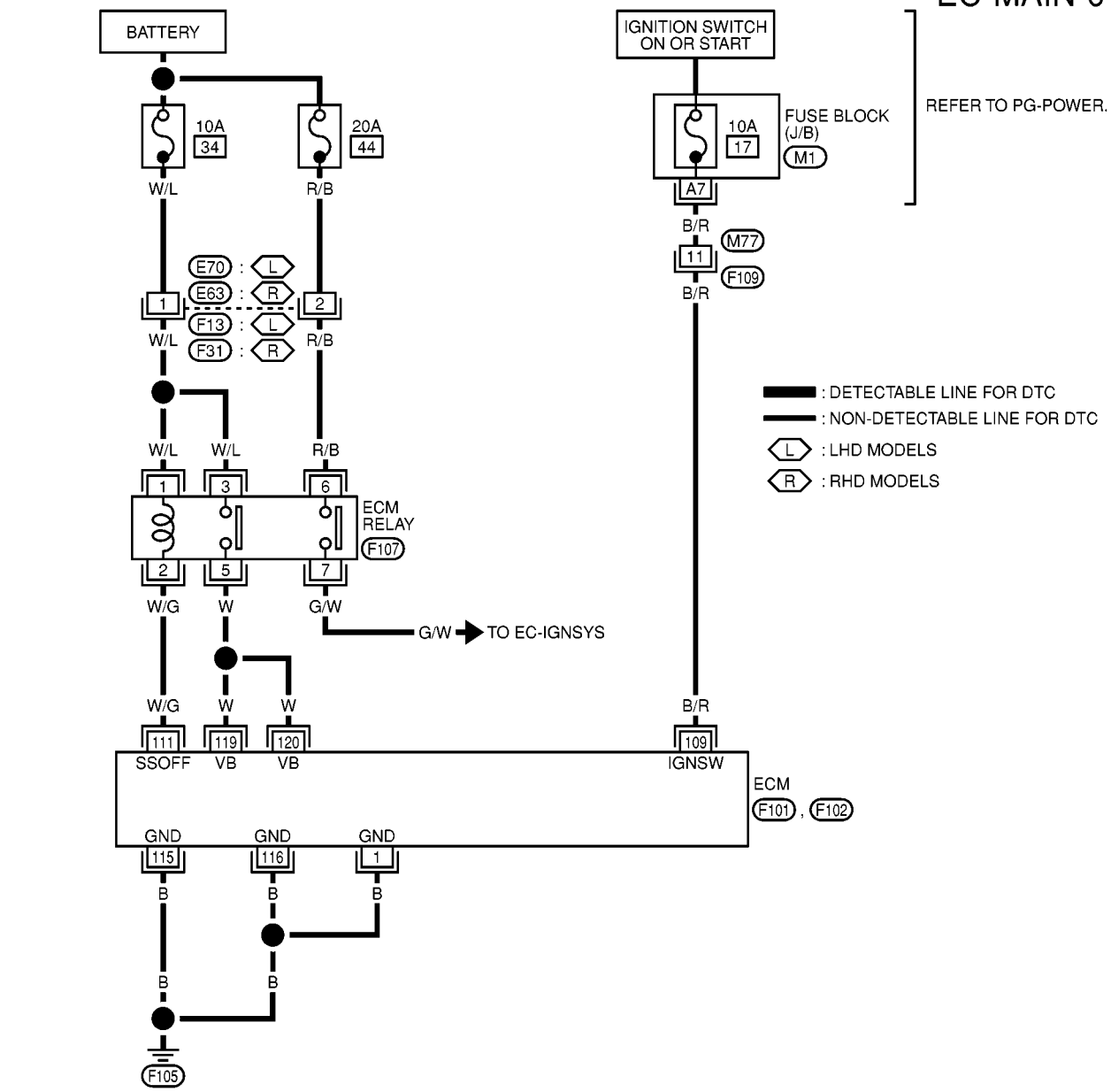
POWER SUPPLY CIRCUIT FOR ECM

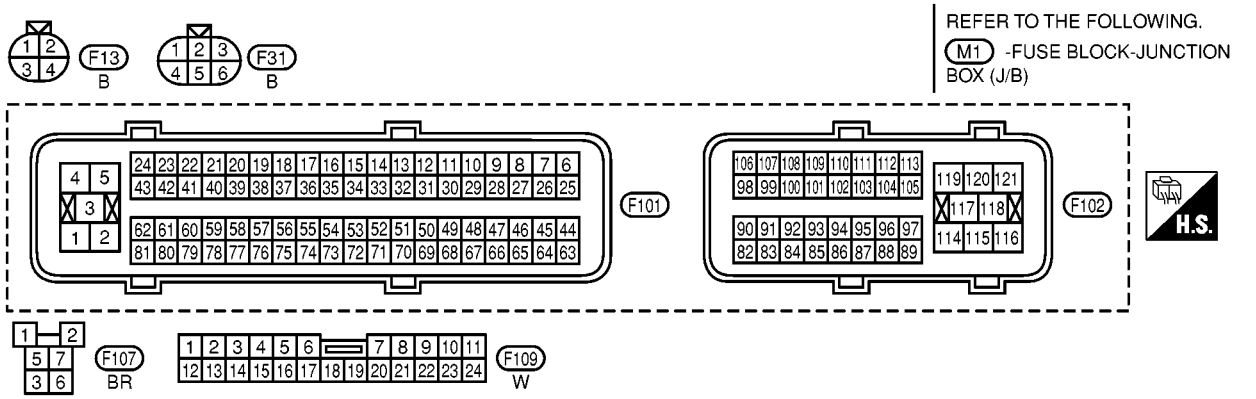
PFP:24110

Wiring Diagram

EBS00EMH

EC-MAIN-01





MBWA0044E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
1	B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
109	B/R	Ignition switch	**[Ignition switch "OFF"]**	0V
			[Ignition switch "ON"]	BATTERY VOLTAGE (11 - 14V)
111	W/G	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch "OFF"]** ● For 3 seconds after turning ignition switch "OFF"	0 - 1.0V
			[Ignition switch "OFF"] ● 3 seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
115 116	B B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
119 120	W W	Power supply for ECM	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

EBS00EMI

1. INSPECTION START

Start engine.
Is engine running?

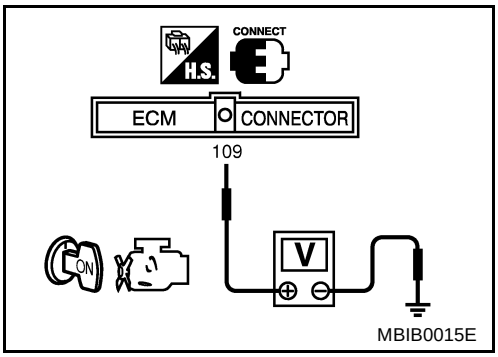
Yes or No

Yes >> GO TO 8.
No >> GO TO 2.

2. CHECK ECM POWER SUPPLY CIRCUIT-I

1. Turn ignition switch "OFF" and then "ON".
2. Check voltage between ECM terminal 109 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M77, F109
- Fuse block (J/B) connector M1
- 10A fuse
- Harness for open or short between ECM and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK ECM GROUND CIRCUIT FOR OPEN AND SHORT-I

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminals 1, 115, 116 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

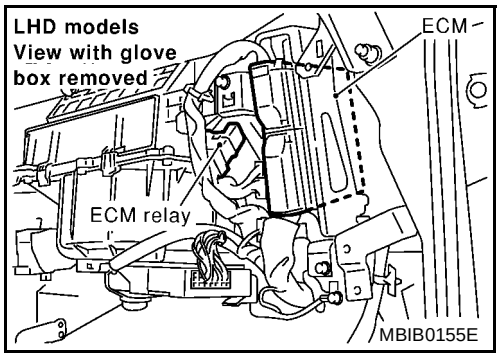
4. Also check harness for short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to power in harness or connectors.

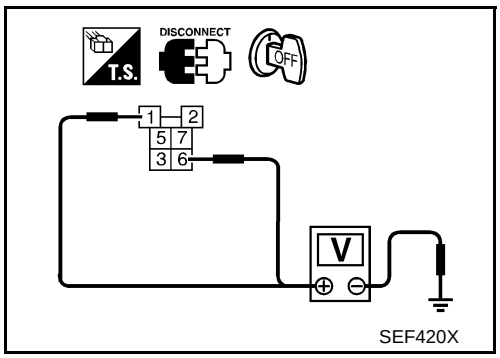
5. CHECK ECM POWER SUPPLY CIRCUIT-II

1. Disconnect ECM relay.



2. Check voltage between ECM relay terminals 1 and 6 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E70, F13 (LHD models)
- Harness connectors E63, F31 (RHD models)
- 10A fuse
- 20A fuse
- Harness for open or short between ECM relay and battery

>> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 111 and ECM relay terminal 2.
   Refer to Wiring Diagram.

   Continuity should exist.

2. Also check harness for short to ground and short to power.

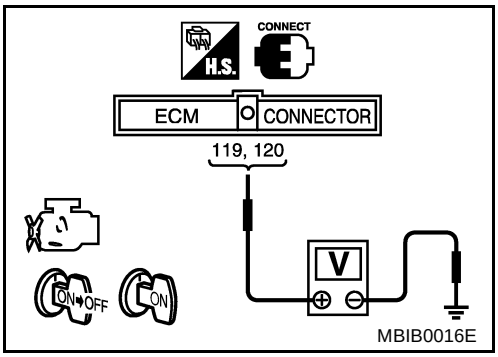
OK or NG

OK >> Go to EC-520, "IGNITION SIGNAL" .
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK ECM POWER SUPPLY CIRCUIT-III

1. Stop engine and wait at least 10 seconds.
2. Turn ignition switch “ON” and then “OFF”.
3. Check voltage between ECM terminals 119, 120 and ground with CONSULT-II or tester.

   Voltage: After turning ignition switch “OFF”, battery voltage will exist for a few seconds, then drop approximately 0V.

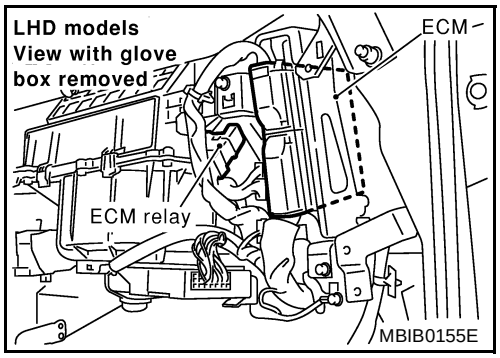


OK or NG

OK >> GO TO 13.
NG (Battery voltage does not exist.)>>GO TO 9.
NG (Battery voltage exists for more than a few seconds.)>>GO TO 11.

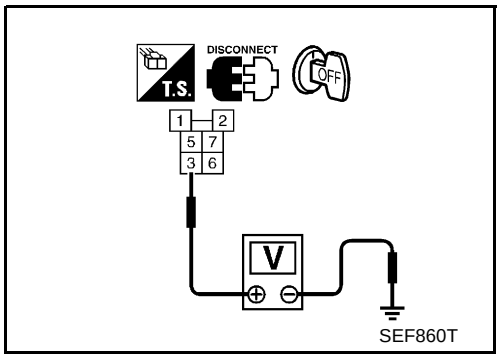
9. CHECK ECM POWER SUPPLY CIRCUIT-IV

1. Disconnect ECM relay.



2. Check voltage between ECM relay terminal 3 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 11.
NG >> GO TO 10.

10. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between ECM relay and E70, F13 (LHD models)
- Harness for open or short between ECM relay and E63, F31 (RHD models)

>> Repair open circuit or short to ground or short to power in harness or connectors.

11. CHECK ECM POWER SUPPLY CIRCUIT-V

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminals 119, 120 and ECM relay terminal 5. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 12.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

12. CHECK ECM RELAY

Refer to EC-149, "Component Inspection" .

OK or NG

OK >> GO TO 13.
NG >> Replace ECM relay.

13. CHECK ECM GROUND CIRCUIT FOR OPEN AND SHORT-II

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminals 1, 115, 116 and engine ground.
   Refer to Wiring Diagram.

   Continuity should exist.

4. Also check harness for short to power.

OK or NG

OK >> GO TO 14.
NG >> Repair open circuit or short to power in harness or connectors.

14. CHECK INTERMITTENT INCIDENT

Refer to EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

OK or NG

OK >> **INSPECTION END**

Component Inspection

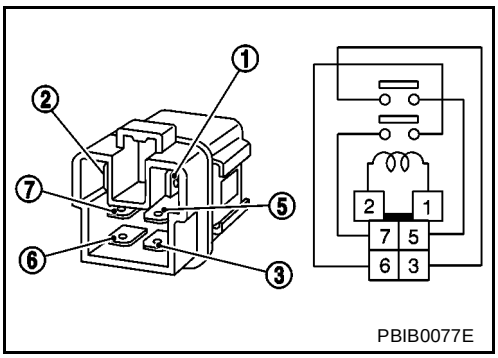
EBS00G9A

ECM RELAY

1. Apply 12V direct current between ECM relay terminals 1 and 2.
2. Check continuity between relay terminals 3 and 5, 6 and 7.

Condition	Continuity
12V direct current supply between terminals 1 and 2	Yes
OFF	No

3. If NG, replace ECM relay.



PBIB0077E

DTC U1000, U1001 CAN COMMUNICATION LINE

PFP:23710

Description

EBS00G8M

CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent error detection ability. Many electronic control units are equipped onto a vehicle, and each control unit shares information and links with other control units during operation (not independent). In CAN communication, control units are connected with 2 communication lines (CAN H line, CAN L line) allowing a high rate of information transmission with less wiring. Each control unit transmits/receives data but selectively reads required data only.

On Board Diagnosis Logic

EBS00G8N

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
U1000 1000	CAN communication line	● ECM can not communicate to other control unit. ● ECM can not communicate for more than the specified time.	● Harness or connectors (CAN communication line is open or shorted).
U1001 1001			

DTC Confirmation Procedure

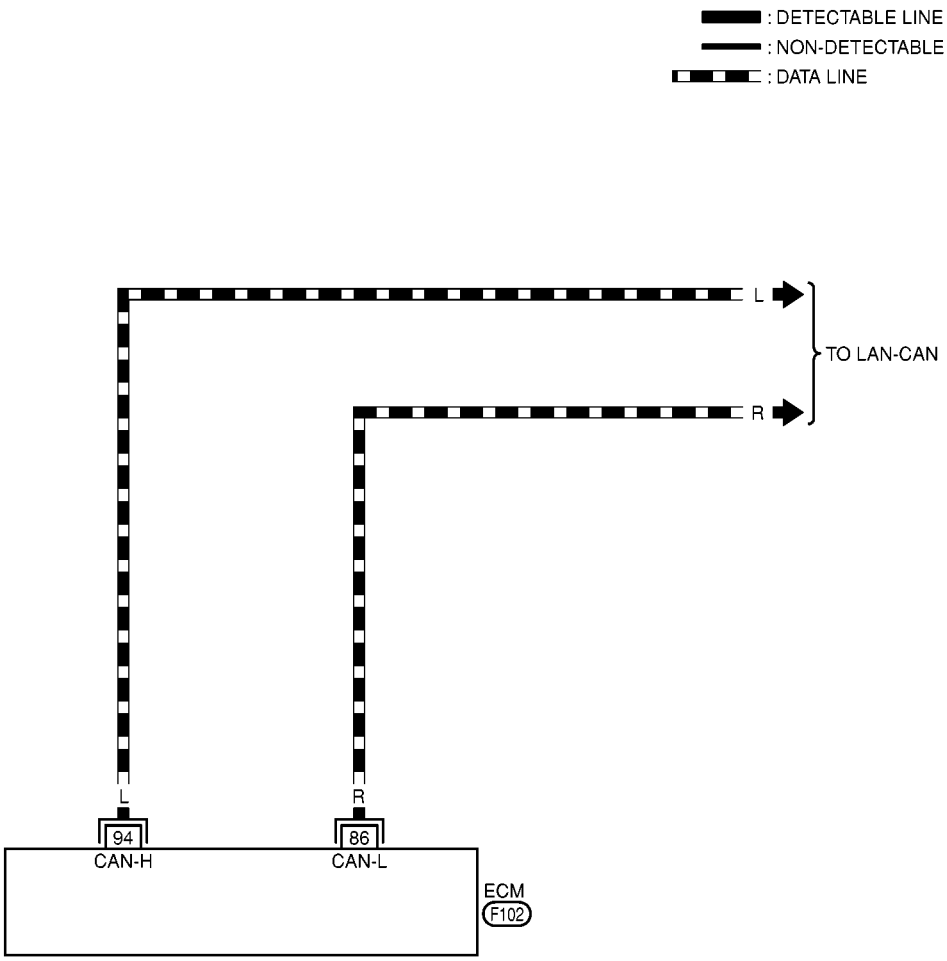
EBS00G8O

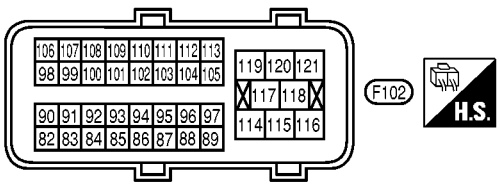
1. Turn ignition switch “ON” and wait at least 3 seconds.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. If 1st trip DTC is detected, go to EC-152, "Diagnostic Procedure" .

Wiring Diagram

EBS00G8P

EC-CAN-01





MBWA0038E

Diagnostic Procedure

EBS00G8Q

1. INSPECTION START

1. Turn ignition switch “ON”.
2. Select “CAN DIAG SUPPORT MNTR” in “DATA MONITOR” mode with CONSULT-II.
3. Print out the CONSULT-II screen.

A/T models

OK data

DATA MONITOR	
MONITOR	NO DTC
CAN COMM	OK
CAN CIRC 1	OK
CAN CIRC 2	OK
CAN CIRC 3	UNKWN
CAN CIRC 4	OK
CAN CIRC 5	UNKWN
CAN CIRC 6	OK
CAN CIRC 7	UNKWN

NG data

DATA MONITOR	
MONITOR	NO DTC
CAN COMM	OK
CAN CIRC 1	UNKWN
CAN CIRC 2	UNKWN
CAN CIRC 3	UNKWN
CAN CIRC 4	UNKWN
CAN CIRC 5	UNKWN
CAN CIRC 6	UNKWN
CAN CIRC 7	UNKWN

MBIB0180E

M/T models

OK data

DATA MONITOR	
MONITOR	NO DTC
CAN COMM	OK
CAN CIRC 1	OK
CAN CIRC 2	UNKWN
CAN CIRC 3	UNKWN
CAN CIRC 4	OK
CAN CIRC 5	UNKWN
CAN CIRC 6	OK
CAN CIRC 7	UNKWN

NG data

DATA MONITOR	
MONITOR	NO DTC
CAN COMM	OK
CAN CIRC 1	UNKWN
CAN CIRC 2	UNKWN
CAN CIRC 3	UNKWN
CAN CIRC 4	UNKWN
CAN CIRC 5	UNKWN
CAN CIRC 6	UNKWN
CAN CIRC 7	UNKWN

MBIB0179E

>> Go to LAN-8, "CAN COMMUNICATION" .

DTC P0011 IVT CONTROL

PFP:23796

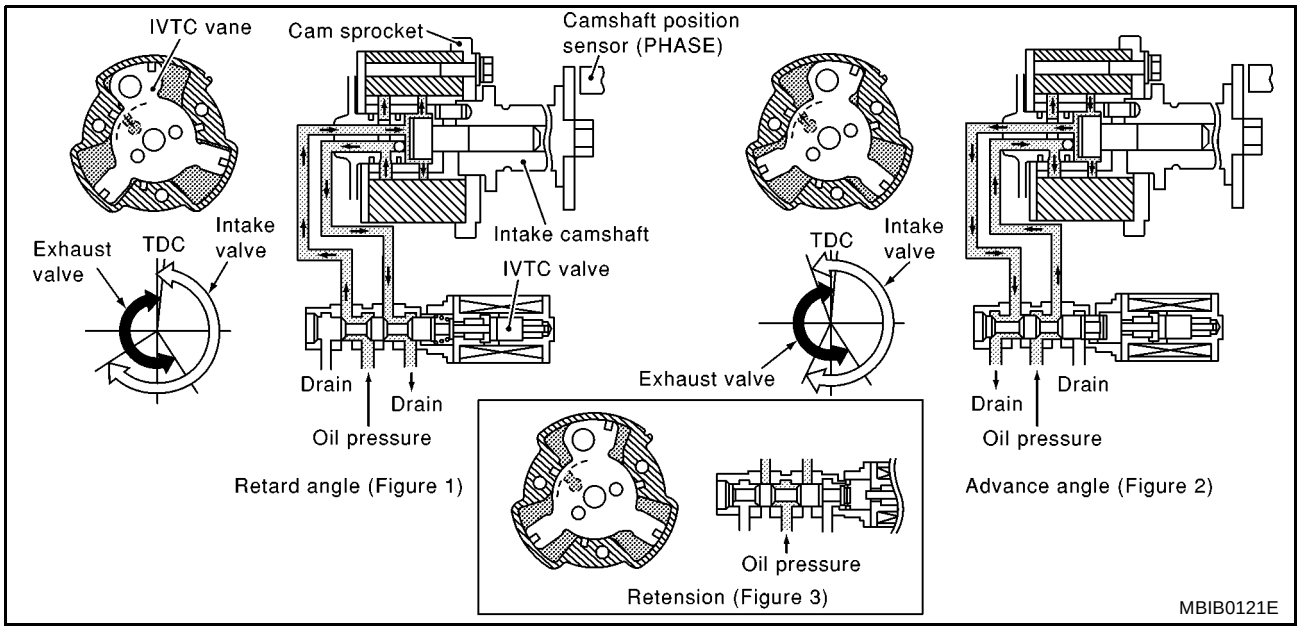
Description

EBS00GW1

SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM Function	Actuator
Crankshaft position sensor (POS)	Engine speed	Intake valve timing control	Intake valve timing control solenoid valve
Camshaft position sensor (PHASE)			
Engine coolant temperature sensor	Engine coolant temperature		
Vehicle speed signal*	Vehicle speed		

*: This signal is sent to the ECM through CAN communication line.



This mechanism hydraulically controls cam phases continuously with the fixed operating angle of the intake valve.

The ECM receives signals such as crankshaft position, camshaft position, engine speed, and engine coolant temperature. Then, the ECM sends ON/OFF pulse duty signals to the intake valve timing control solenoid valve depending on driving status. This makes it possible to control the shut/open timing of the intake valve to increase engine torque in low/mid speed range and output in high-speed range.

CONSULT-II Reference Value in Data Monitor Mode

EBS00GW2

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
INT/V TIM (B1)	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	–5° - 5°CA
		When revving engine up to 2,000 rpm quickly	Approx. 0° - 30°CA
INT/V SOL (B1)	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	0% - 2%
		When revving engine up to 2,000 rpm quickly	Approx. 0% - 60%

On Board Diagnosis Logic

EBS00GW4

DTC No.	Trouble diagnosis name	Detecting condition	Possible cause
P0011 0011	Intake valve timing control performance	There is a gap between angle of target and phase-control angle degree.	● Crankshaft position sensor (POS) ● Camshaft position sensor (PHASE) ● Accumulation of debris to the signal pick-up portion of the camshaft

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode.

Detected items	Engine operating condition in fail-safe mode
Intake valve timing control	The signal is not energized to the solenoid valve and the valve control does not function

DTC Confirmation Procedure

EBS00GW5

CAUTION:
Always drive at a safe speed.

NOTE:

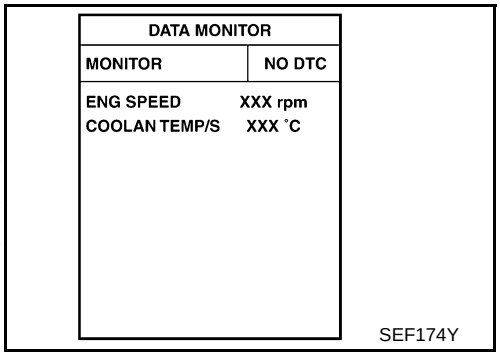
- **If DTC P0011 is displayed with DTC P1111, first perform trouble diagnosis for “DTC P1111”. See EC-395, "DTC P1111 IVT CONTROL SOLENOID VALVE" .**
- If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is between 10V and 16V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Maintain the following conditions for at least 20 consecutive seconds.

ENG SPEED	1,700 - 3,175 rpm (A constant rotation is maintained.)
COOLANT TEMPS	70 - 105°C (176 - 194°F)
Selector lever	1st or 2nd position
Driving location uphill	Driving vehicle uphill (Increased engine load will help maintain the driving conditions required for this test.)



4. If 1st trip DTC is detected, go to EC-154, "Diagnostic Procedure" .

WITH GST

Follow the procedure “WITH CONSULT-II” above.

Diagnostic Procedure

EBS00GW6

1. CHECK CRANKSHAFT POSITION SENSOR (POS)

Refer to EC-353, "Component Inspection" .

OK or NG

OK >> GO TO 2.
NG >> Replace crankshaft position sensor (POS).

2. CHECK CAMSHAFT POSITION SENSOR (PHASE)

Refer to EC-359, "Component Inspection" .

OK or NG

OK >> GO TO 3.
NG >> Replace camshaft position sensor (PHASE).

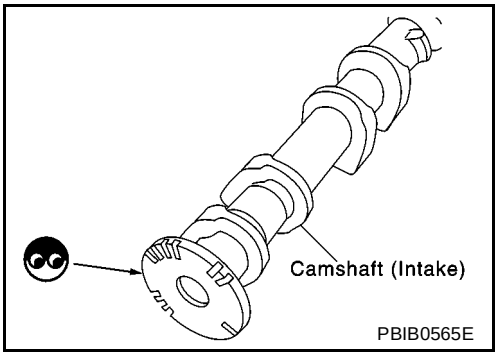
3. CHECK CAMSHAFT (INTAKE)

Check the following.

- Accumulation of debris to the signal plate of camshaft rear end
- Chipping signal plate of camshaft rear end

OK or NG

OK >> GO TO 4.
NG >> Remove debris and clean the signal plate of camshaft rear end or replace camshaft.



4. CHECK INTERMITTENT INCIDENT

Refer to EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .
For wiring diagram refer to EC-350, "Wiring Diagram" for CKP sensor (POS) and EC-356, "Wiring Diagram" for CMP sensor (PHASE).

>> **INSPECTION END**

DTC P0031, P0032 HO2S1 HEATER (QG16DE)

PFP:22690

Description

EBS00FO4

SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM Function	Actuator
Camshaft position sensor (PHASE) Crankshaft position sensor (POS)	Engine speed	Heated oxygen sensor 1 heater control	Heated oxygen sensor 1 heater
Engine coolant temperature sensor	Engine coolant temperature		

The ECM performs ON/OFF duty control of the heated oxygen sensor 1 heater corresponding to the engine speed and engine coolant temperature. The duty percent varies with engine coolant temperature when engine is started.

OPERATION

Engine speed rpm	Heated oxygen sensor 1 heater
Above 3,600	OFF
Below 3,600	ON

CONSULT-II Reference Value in Data Monitor Mode

EBS00FO5

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
HO2S1 HTR (B1)	● Engine: After warming up ● Engine speed: Below 3,600 rpm	ON
	● Engine speed: Above 3,600 rpm	OFF

On Board Diagnosis Logic

EBS00FO6

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0031 0031	Heated oxygen sensor 1 heater control circuit low	The current amperage in the heated oxygen sensor 1 heater circuit is out of the normal range. (An excessively low voltage signal is sent to ECM through the heated oxygen sensor 1 heater.)	● Harness or connectors (The heated oxygen sensor 1 heater circuit is open or shorted.) ● Heater oxygen sensor 1 heater
P0032 0032	Heated oxygen sensor 1 heater control circuit high	The current amperage in the heated oxygen sensor 1 heater circuit is out of the normal range. (An excessively high voltage signal is sent to ECM through the heated oxygen sensor 1 heater.)	● Harness or connectors (The heated oxygen sensor 1 heater circuit is shorted.) ● Heater oxygen sensor 1 heater

DTC Confirmation Procedure

EBS00FO7

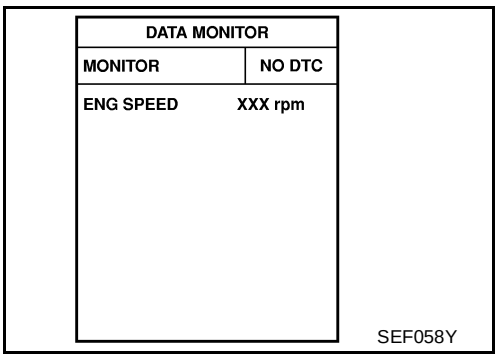
NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is between 10.5V and 16V at idle.

WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.

3. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
4. Start engine and run it for at least 6 seconds at idle speed.
5. If 1st trip DTC is detected, go to EC-159, "Diagnostic Procedure" .



WITH GST

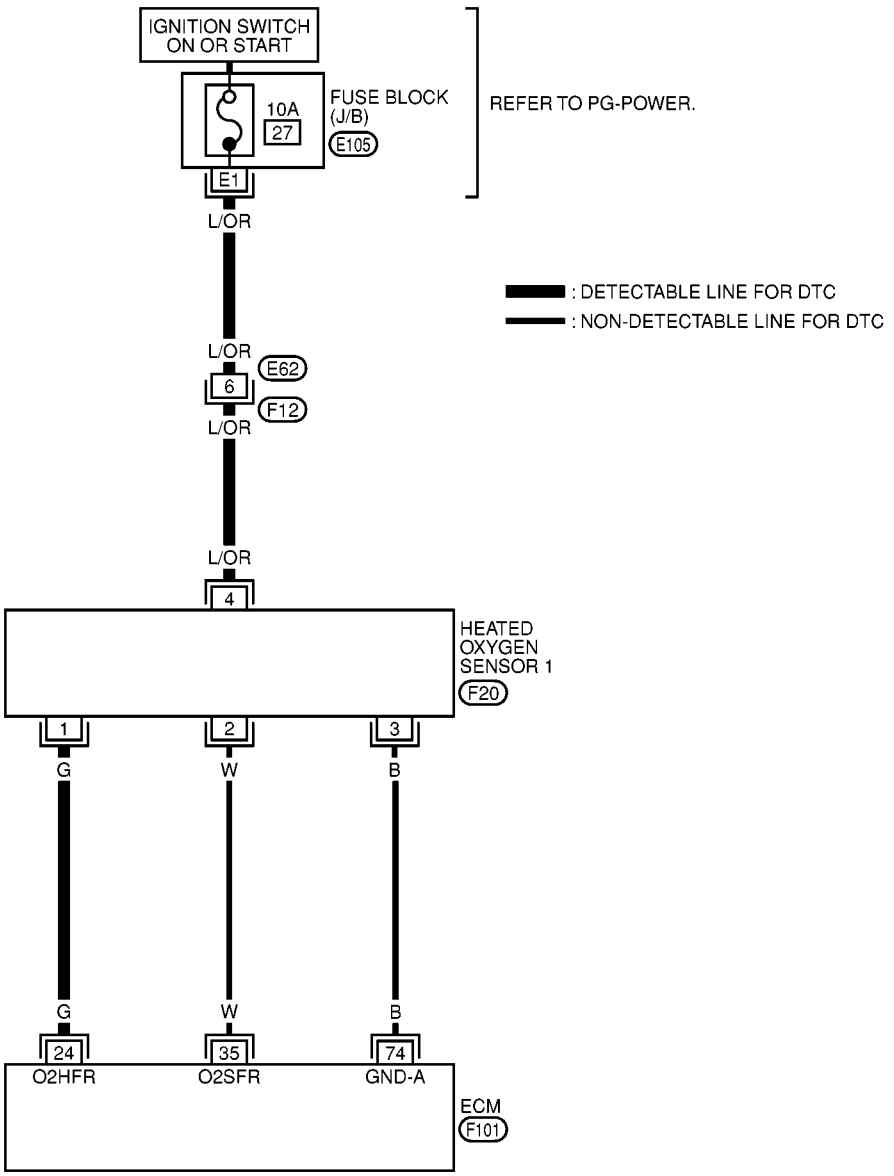
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Start engine and run it for at least 6 seconds at idle speed.
4. Turn ignition switch “OFF” and wait at least 10 seconds.
5. Start engine and run it for at least 6 seconds at idle speed.
6. Select “MODE 3” with GST.
7. If DTC is detected, go to EC-159, "Diagnostic Procedure" .

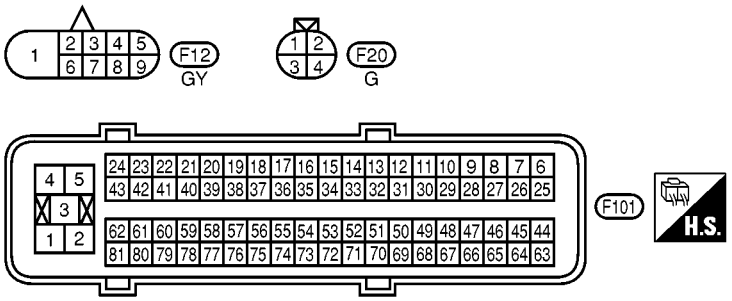
- **When using GST, “DTC Confirmation Procedure” should be performed twice as much as when using CONSULT-II because GST cannot display MODE 7 (1st trip DTC) concerning this diagnosis. Therefore, using CONSULT-II is recommended.**

Wiring Diagram

EBS00FO8

EC-HO2S1H-01





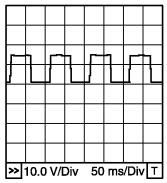
REFER TO THE FOLLOWING.
E105 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0049E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
24	G	Heated oxygen sensor 1 heater	**[Engine is running]** ● **Warm-up condition.** ● Engine speed is below 3,600 rpm.	Approximately 7.0V★  PBIB0519E
			[Ignition switch "ON"] ● Engine stopped. **[Engine is running]** ● Engine speed is above 3,600 rpm.	BATTERY VOLTAGE (11 - 14V)

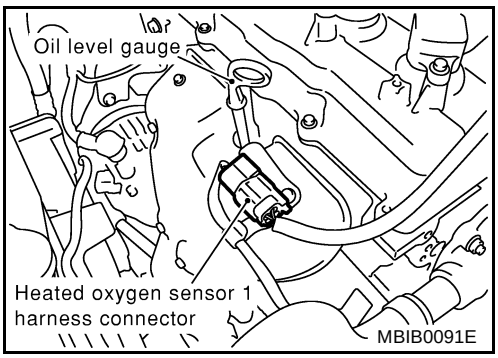
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnostic Procedure

EBS00FO9

1. CHECK HO2S1 POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect heated oxygen sensor 1 harness connector.
3. Turn ignition switch "ON".



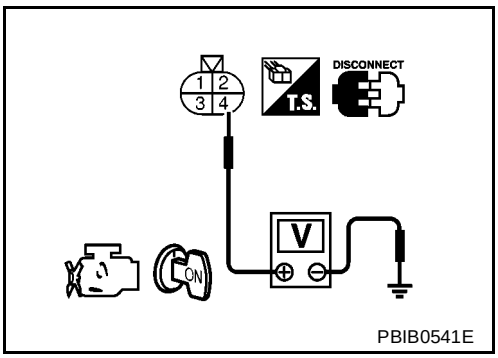
MBIB0091E

4. Check voltage between HO2S1 terminal 4 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 3.
NG >> GO TO 2.



PBIB0541E

2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E62, F12
- Fuse block (J/B) connector E105
- 10A fuse
- Harness for open or short between heated oxygen sensor 1 and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK HO2S1 OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 24 and HO2S1 terminal 1.
   Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK HEATED OXYGEN SENSOR 1 HEATER

Refer to EC-161, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace heated oxygen sensor 1.

5. CHECK INTERMITTENT INCIDENT

Refer to EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

EBS00FOA

HEATED OXYGEN SENSOR 1 HEATER

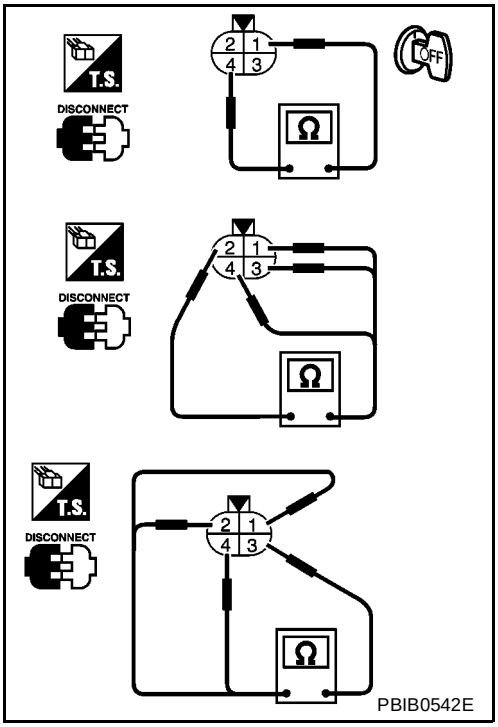
1. Check resistance between HO2S1 terminals as follows.

Terminal No.	Resistance
1 and 4	8 - 10 Ω at 20°C (68°F)
2 and 1, 3, 4	∞ Ω (Continuity should not exist)
3 and 1, 2, 4	

2. If NG, replace heated oxygen sensor 1.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**



Removal and Installation

EBS00FOB

HEATED OXYGEN SENSOR 1

Refer to EM-23, "EXHAUST MANIFOLD AND CATALYTIC CONVERTER" .

DTC P0031, P0032, P0051, P0052 HO2S1 HEATER (QG18DE)

PFP:22690

Description

EBS00FOC

SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM Function	Actuator
Camshaft position sensor (PHASE) Crankshaft position sensor (POS)	Engine speed	Heated oxygen sensor 1 heater control	Heated oxygen sensor 1 heater
Engine coolant temperature sensor	Engine coolant temperature		

The ECM performs ON/OFF duty control of the heated oxygen sensor 1 heater corresponding to the engine speed and engine coolant temperature. The duty percent varies with engine coolant temperature when engine is started.

OPERATION

Engine speed rpm	Heated oxygen sensor 1 heater
Above 3,200 (A/T models) Above 3,600 (M/T models)	OFF
Below 3,200 (A/T models) Below 3,600 (M/T models)	ON

CONSULT-II Reference Value in Data Monitor Mode

EBS00FOD

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
HO2S1 HTR (B1) HO2S1 HTR (B2)	● Engine: After warming up ● Engine speed: Below 3,200 rpm (A/T models) Below 3,600 rpm (M/T models)	ON
	● Engine speed: Above 3,200 rpm (A/T models) Above 3,600 rpm (M/T models)	OFF

On Board Diagnosis Logic

EBS00FOE

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0031 0031 (Bank 1) P0051 0051 (Bank 2)	Heated oxygen sensor 1 heater control circuit low	The current amperage in the heated oxygen sensor 1 heater circuit is out of the normal range. (An excessively low voltage signal is sent to ECM through the heated oxygen sensor 1 heater.)	● Harness or connectors (The heated oxygen sensor 1 heater circuit is open or shorted.) ● Heater oxygen sensor 1 heater
P0032 0032 (Bank 1) P0052 0052 (Bank 2)	Heated oxygen sensor 1 heater control circuit high	The current amperage in the heated oxygen sensor 1 heater circuit is out of the normal range. (An excessively high voltage signal is sent to ECM through the heated oxygen sensor 1 heater.)	● Harness or connectors (The heated oxygen sensor 1 heater circuit is shorted.) ● Heater oxygen sensor 1 heater

DTC Confirmation Procedure

EBS00FOF

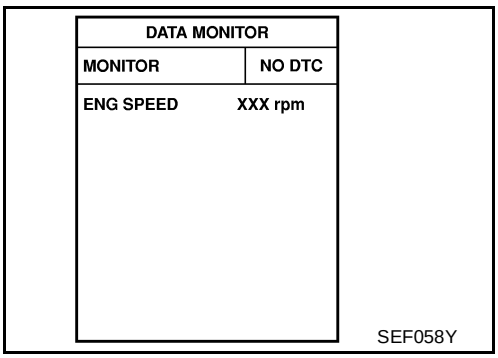
NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is between 10.5V and 16V at idle.

WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.

3. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
4. Start engine and run it for at least 6 seconds at idle speed.
5. If 1st trip DTC is detected, go to EC-167, "Diagnostic Procedure" .



WITH GST

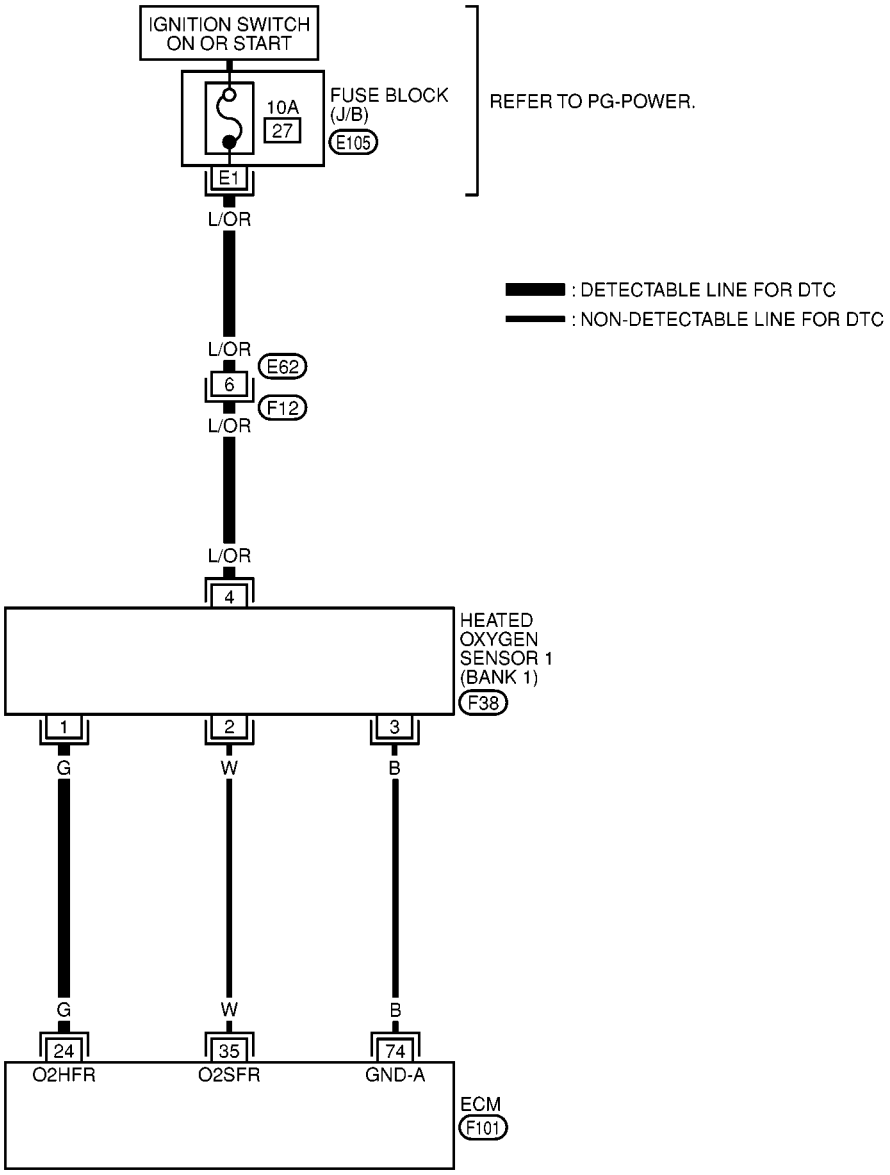
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Start engine and run it for at least 6 seconds at idle speed.
4. Turn ignition switch “OFF” and wait at least 10 seconds.
5. Start engine and run it for at least 6 seconds at idle speed.
6. Select “MODE 3” with GST.
7. If DTC is detected, go to EC-167, "Diagnostic Procedure" .

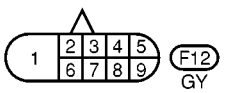
- **When using GST, “DTC Confirmation Procedure” should be performed twice as much as when using CONSULT-II because GST cannot display MODE 7 (1st trip DTC) concerning this diagnosis. Therefore, using CONSULT-II is recommended.**

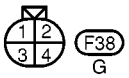
Wiring Diagram
BANK 1

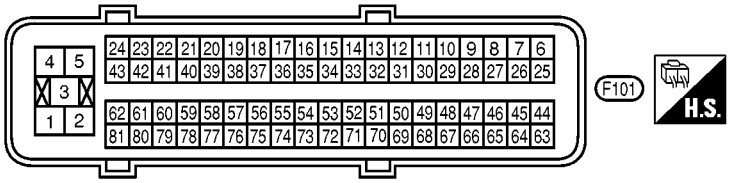
EBS00FOG

EC-O2H1B1-01









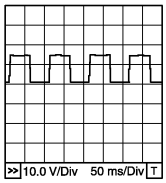
REFER TO THE FOLLOWING.
E105 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0053E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

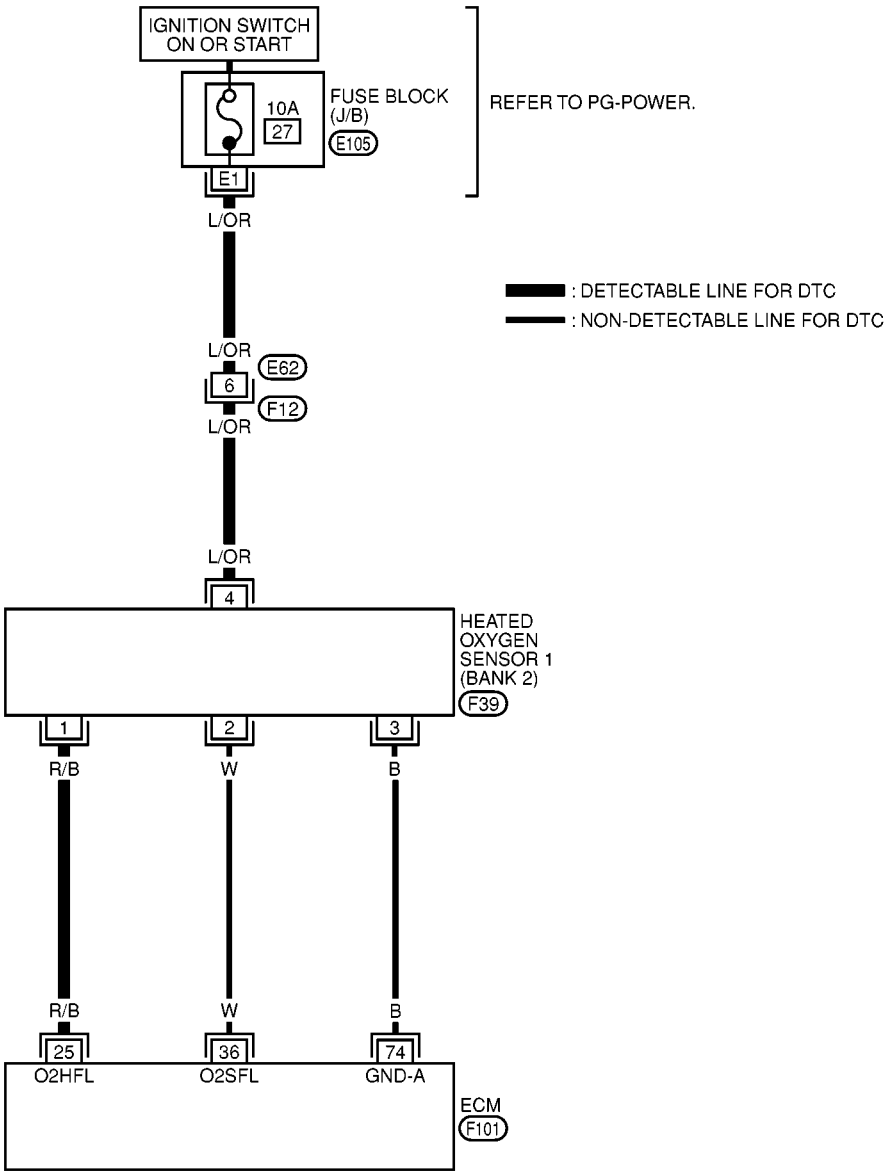
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

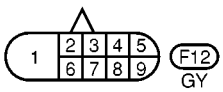
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
24	G	Heated oxygen sensor 1 heater (bank 1)	**[Engine is running]** ● **Warm-up condition.** ● Engine speed is below 3,200 rpm (A/T models). ● Engine speed is below 3,600 rpm (M/T models).	Approximately 7.0V★  PBIB0519E
			[Ignition switch "ON"] ● Engine stopped. **[Engine is running]** ● Engine speed is above 3,200 rpm (A/T models). ● Engine speed is above 3,600 rpm (M/T models).	BATTERY VOLTAGE (11 - 14V)

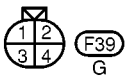
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

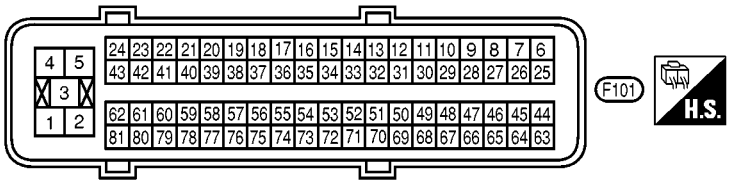
BANK 2

EC-O2H1B2-01









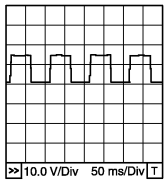
REFER TO THE FOLLOWING.
E105 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0055E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
25	R/B	Heated oxygen sensor 1 heater (bank 2)	**[Engine is running]** ● **Warm-up condition.** ● Engine speed is below 3,200 rpm (A/T models). ● Engine speed is below 3,600 rpm (M/T models).	Approximately 7.0V★  PBIB0519E
			[Ignition switch "ON"] ● Engine stopped. **[Engine is running]** ● Engine speed is above 3,200 rpm (A/T models). ● Engine speed is above 3,600 rpm (M/T models).	BATTERY VOLTAGE (11 - 14V)

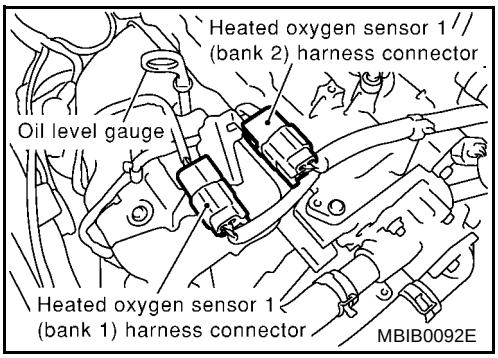
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnostic Procedure

EBS00FOH

1. CHECK HO2S1 POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect heated oxygen sensor 1 harness connector.
3. Turn ignition switch "ON".



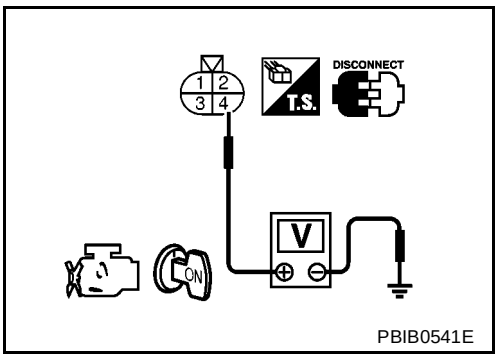
MBIB0092E

4. Check voltage between HO2S1 terminal 4 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 3.
NG >> GO TO 2.



PBIB0541E

2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E62, F12
- Fuse block (J/B) connector E105
- 10A fuse
- Harness for open or short between heated oxygen sensor 1 and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK HO2S1 OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal and HO2S1 terminal as follows. Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM	Sensor	
P0031, P0032	24	1	1
P0051, P0052	25	1	2

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK HEATED OXYGEN SENSOR 1 HEATER

Refer to EC-169, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace malfunctioning heated oxygen sensor 1.

5. CHECK INTERMITTENT INCIDENT

Refer to EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

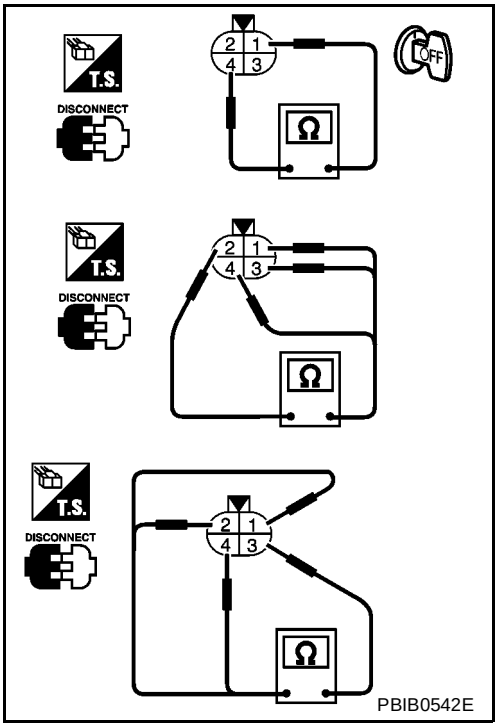
Component Inspection

EBS00FOI

HEATED OXYGEN SENSOR 1 HEATER

1. Check resistance between HO2S1 terminals as follows.

Terminal No.	Resistance
1 and 4	8 - 10 Ω at 20°C (68°F)
2 and 1, 3, 4	∞ Ω (Continuity should not exist)
3 and 1, 2, 4	



2. If NG, replace heated oxygen sensor 1.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

EBS00FOJ

HEATED OXYGEN SENSOR 1

Refer to EM-23, "EXHAUST MANIFOLD AND CATALYTIC CONVERTER" .

DTC P0037, P0038 HO2S2 HEATER (QG16DE)

PFP:226A0

Description

EBS00FOK

SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM Function	Actuator
Camshaft position sensor (PHASE)	Engine speed	Heated oxygen sensor 2 heater control	Heated oxygen sensor 2 heater
Crankshaft position sensor (POS)			

The ECM performs ON/OFF control of the heated oxygen sensor 2 heater corresponding to the engine speed.

OPERATION

Engine speed rpm	Heated oxygen sensor 2 heater
Above 3,600	OFF
Below 3,600	ON

CONSULT-II Reference Value in Data Monitor Mode

EBS00FOL

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
HO2S2 HTR (B1)	● Engine speed: Below 3,600 rpm [After driving for 2 minutes at a speed of 70 km/h (43 MPH) or more]	ON
	● Engine speed: Above 3,600 rpm	OFF

On Board Diagnosis Logic

EBS00FOM

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0037 0037	Heated oxygen sensor 2 heater control circuit low	The current amperage in the heated oxygen sensor 2 heater circuit is out of the normal range. (An excessively low voltage signal is sent to ECM through the heated oxygen sensor 2 heater.)	● Harness or connectors (The heated oxygen sensor 2 heater circuit is open or shorted.) ● Heater oxygen sensor 2 heater
P0038 0038	Heated oxygen sensor 2 heater control circuit high	The current amperage in the heated oxygen sensor 2 heater circuit is out of the normal range. (An excessively high voltage signal is sent to ECM through the heated oxygen sensor 2 heater.)	● Harness or connectors (The heated oxygen sensor 2 heater circuit is shorted.) ● Heater oxygen sensor 2 heater

DTC Confirmation Procedure

EBS00FON

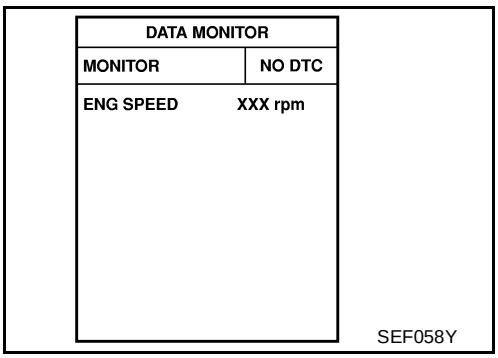
NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is between 10.5V and 16V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2. Start engine.
3. Drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.

4. Stop vehicle and let engine idle for at least 6 seconds.
5. If 1st trip DTC is detected, go to EC-173, "Diagnostic Procedure" .



WITH GST

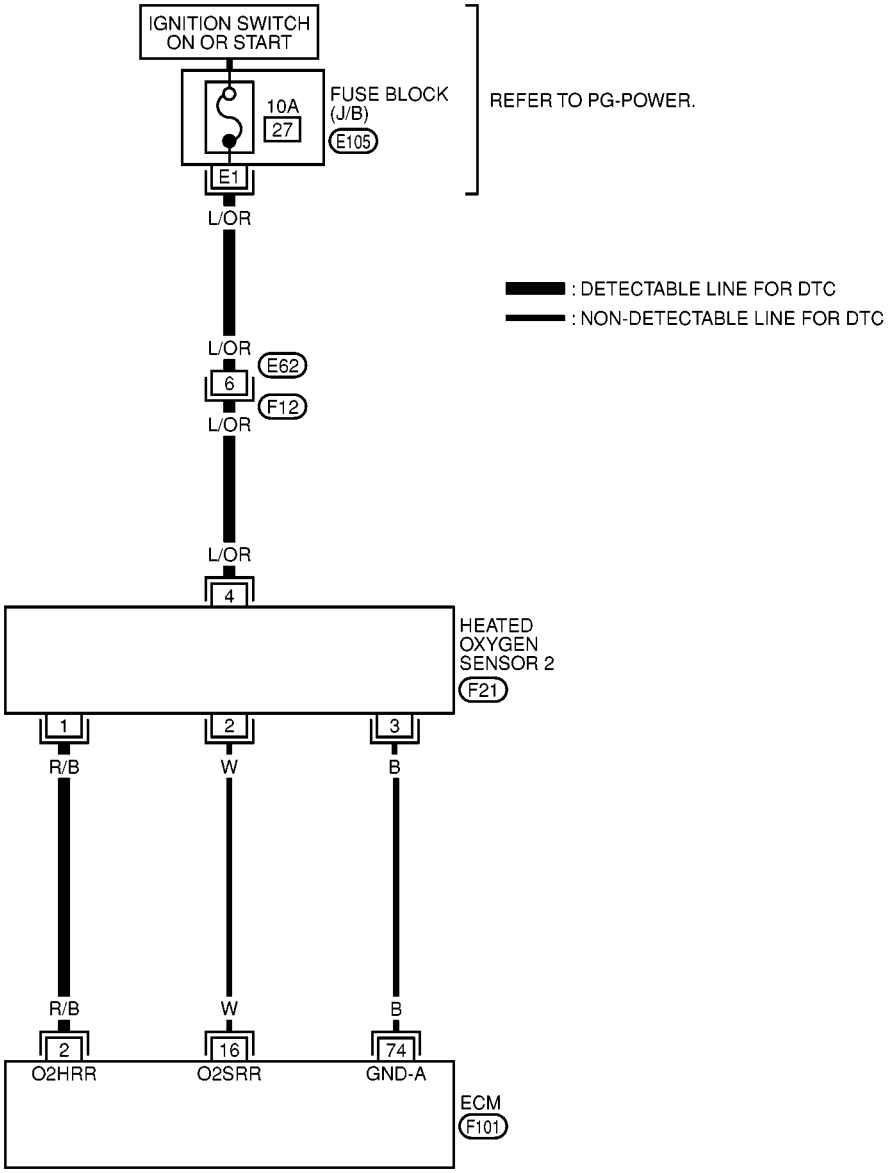
1. Start engine.
2. Drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
3. Stop vehicle and let engine idle for at least 6 seconds.
4. Turn ignition switch “OFF” and wait at least 10 seconds.
5. Start engine.
6. Drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
7. Stop vehicle and let engine idle for at least 6 seconds.
8. Select “MODE 3” with GST.
9. If DTC is detected, go to EC-173, "Diagnostic Procedure" .

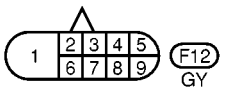
- **When using GST, “DTC Confirmation Procedure” should be performed twice as much as when using CONSULT-II because GST cannot display MODE 7 (1st trip DTC) concerning this diagnosis. Therefore, using CONSULT-II is recommended.**

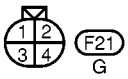
Wiring Diagram

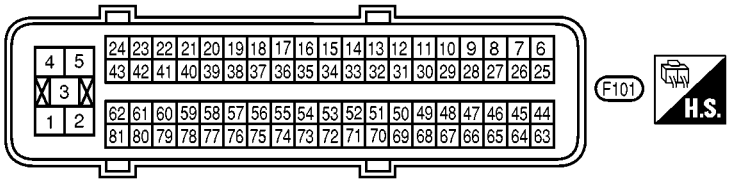
EBS00FOO

EC-HO2S2H-01









REFER TO THE FOLLOWING.
E105 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0051E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

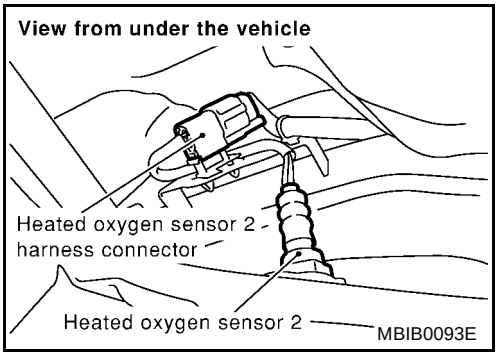
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
2	R/B	Heated oxygen sensor 2 heater	**[Engine is running]** ● Engine speed is below 3,600 rpm. ● After driving for 2 minutes at a speed of 70 km/h (43 MPH) or more.	0 - 1.0V
			[Ignition switch "ON"] ● Engine stopped **[Engine is running]** ● Engine speed is above 3,600 rpm.	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

EBS00FOP

1. CHECK HO2S2 POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect heated oxygen sensor 2 harness connector.
3. Turn ignition switch "ON".

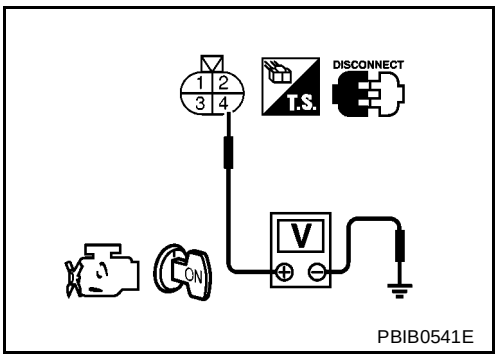


4. Check voltage between HO2S2 terminal 4 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 3.
NG >> GO TO 2.



2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E62, F12
- Fuse block (J/B) connector E105
- 10A fuse
- Harness for open or short between heated oxygen sensor 2 and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK HO2S2 OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 2 and HO2S2 terminal 1.
   Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK HEATED OXYGEN SENSOR 2 HEATER

Refer to EC-174, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace heated oxygen sensor 2.

5. CHECK INTERMITTENT INCIDENT

Refer to EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

EBS00FOQ

HEATED OXYGEN SENSOR 2 HEATER

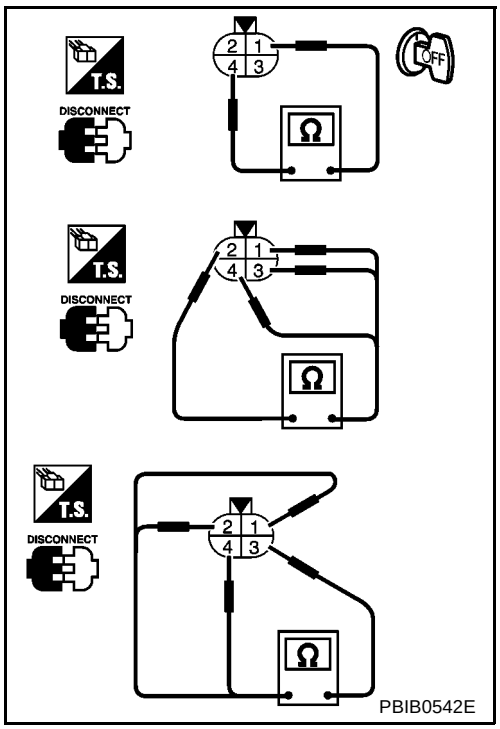
1. Check resistance between HO2S2 terminals as follows.

Terminal No.	Resistance
1 and 4	2.3 - 4.3 Ω at 25°C (77°F)
2 and 1, 3, 4	∞ Ω (Continuity should not exist)
3 and 1, 2, 4	

2. If NG, replace heated oxygen sensor 2.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**



Removal and Installation

EBS00FOR

HEATED OXYGEN SENSOR 2

Refer to EM-23, "EXHAUST MANIFOLD AND CATALYTIC CONVERTER" .

DTC P0037, P0038, P0057, P0058 HO2S2 HEATER (QG18DE)

PFP:226A0

Description

EBS00FOS

SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM Function	Actuator
Camshaft position sensor (PHASE)	Engine speed	Heated oxygen sensor 2 heater control	Heated oxygen sensor 2 heater
Crankshaft position sensor (POS)			

The ECM performs ON/OFF control of the heated oxygen sensor 2 heater corresponding to the engine speed.

OPERATION

Engine speed rpm	Heated oxygen sensor 2 heater
Above 3,600	OFF
Below 3,600	ON

CONSULT-II Reference Value in Data Monitor Mode

EBS00FOT

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
HO2S2 HTR (B1) HO2S2 HTR (B2)	● Engine speed: Below 3,600 rpm [After driving for 2 minutes at a speed of 70 km/h (43 MPH) or more]	ON
	● Engine speed: Above 3,600 rpm	OFF

On Board Diagnosis Logic

EBS00FOU

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0037 0037 (Bank 1) P0057 0057 (Bank 2)	Heated oxygen sensor 2 heater control circuit low	The current amperage in the heated oxygen sensor 2 heater circuit is out of the normal range. (An excessively low voltage signal is sent to ECM through the heated oxygen sensor 2 heater.)	● Harness or connectors (The heated oxygen sensor 2 heater circuit is open or shorted.) ● Heater oxygen sensor 2 heater
P0038 0038 (Bank 1) P0058 0058 (Bank 2)	Heated oxygen sensor 2 heater control circuit high	The current amperage in the heated oxygen sensor 2 heater circuit is out of the normal range. (An excessively high voltage signal is sent to ECM through the heated oxygen sensor 2 heater.)	● Harness or connectors (The heated oxygen sensor 2 heater circuit is shorted.) ● Heater oxygen sensor 2 heater

DTC Confirmation Procedure

EBS00FOV

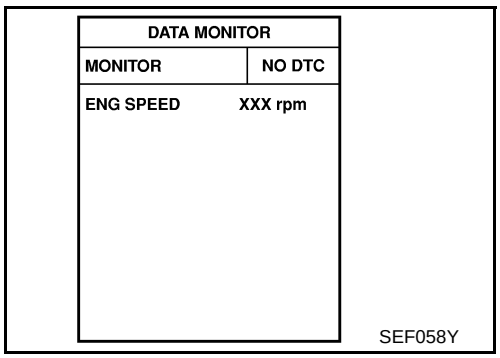
NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is between 10.5V and 16V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2. Start engine.
3. Drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.

4. Stop vehicle and let engine idle for at least 6 seconds.
5. If 1st trip DTC is detected, go to EC-180, "Diagnostic Procedure" .



WITH GST

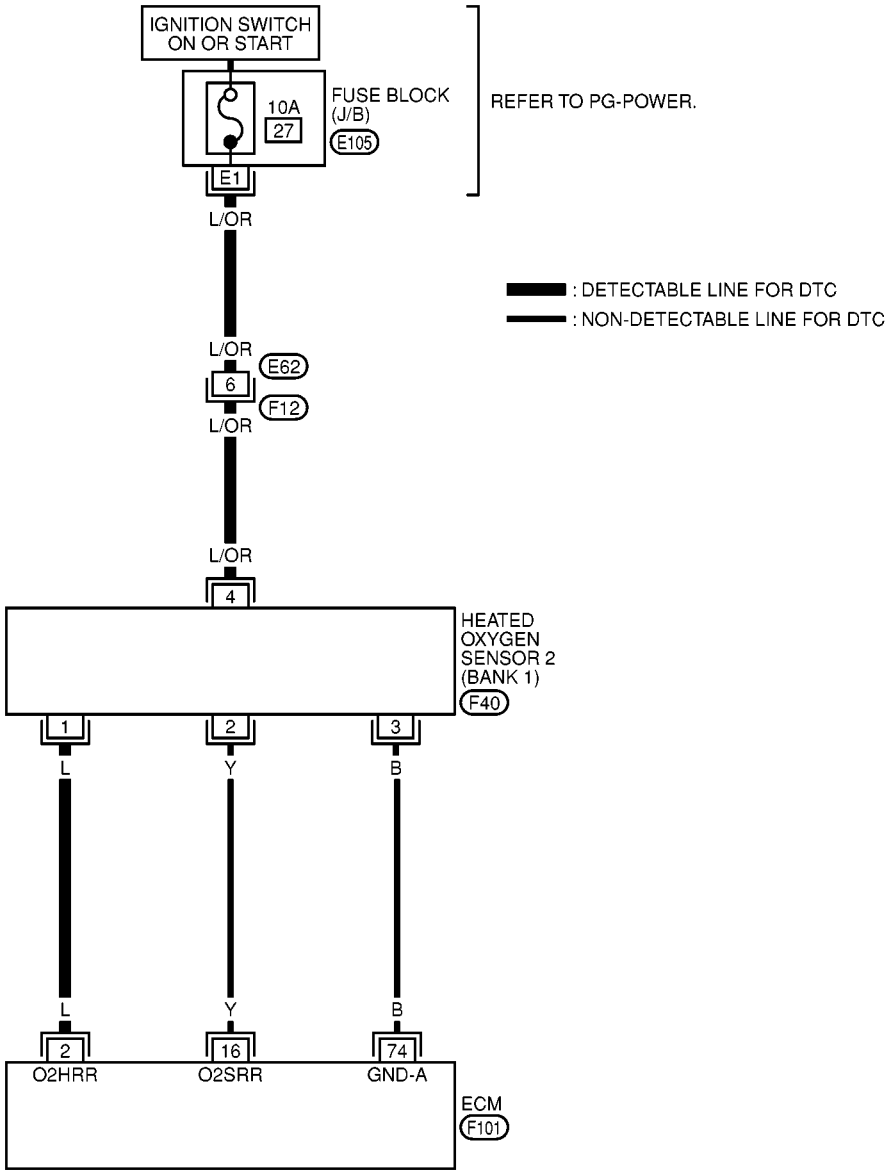
1. Start engine.
2. Drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
3. Stop vehicle and let engine idle for at least 6 seconds.
4. Turn ignition switch “OFF” and wait at least 10 seconds.
5. Start engine.
6. Drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
7. Stop vehicle and let engine idle for at least 6 seconds.
8. Select “MODE 3” with GST.
9. If DTC is detected, go to EC-180, "Diagnostic Procedure" .

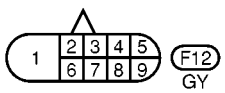
- **When using GST, “DTC Confirmation Procedure” should be performed twice as much as when using CONSULT-II because GST cannot display MODE 7 (1st trip DTC) concerning this diagnosis. Therefore, using CONSULT-II is recommended.**

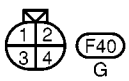
Wiring Diagram
BANK 1

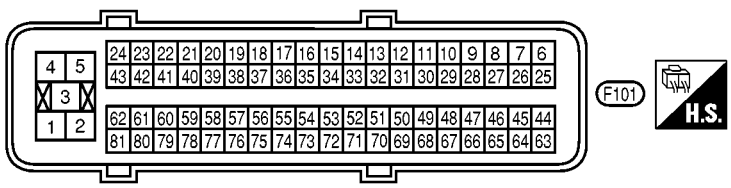
EBS00FOW

EC-O2H2B1-01









REFER TO THE FOLLOWING.
E105 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0057E

Specification data are reference values and are measured between each terminal and ground.

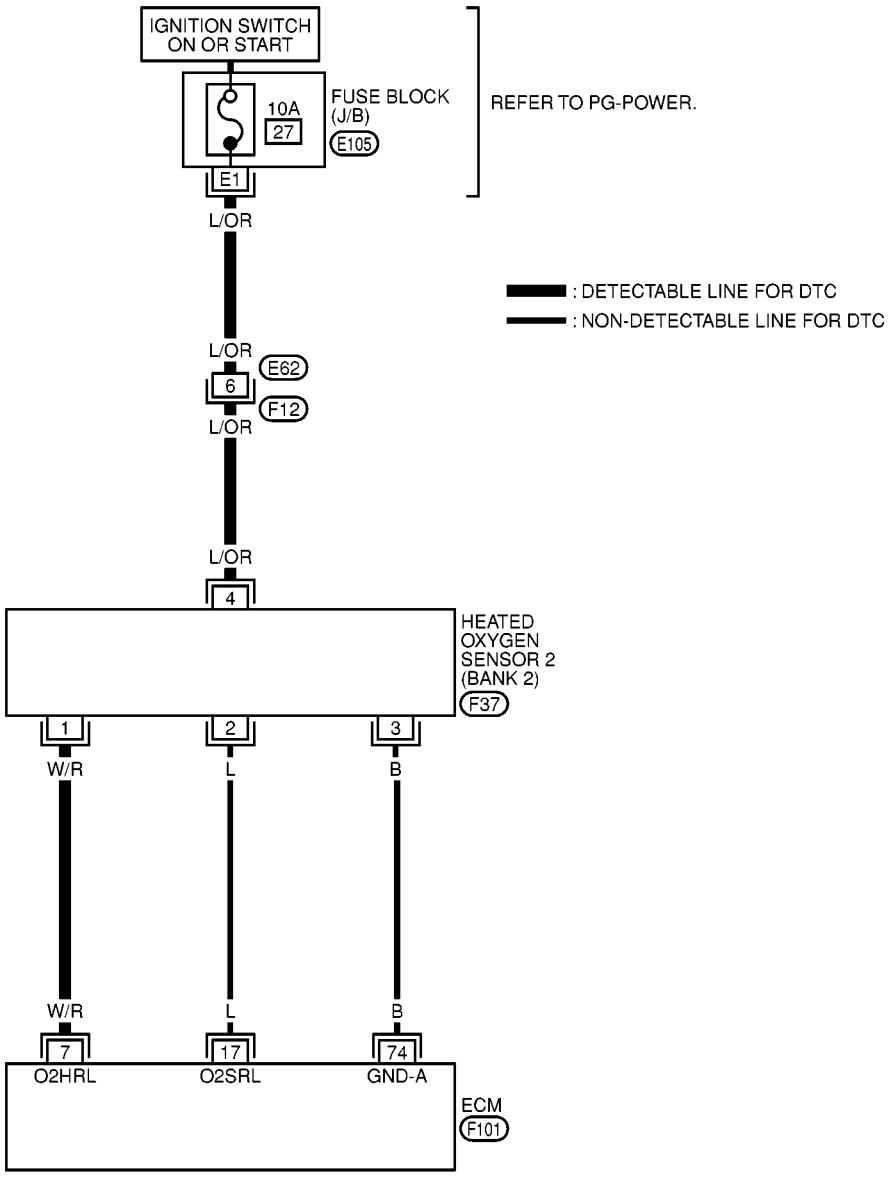
CAUTION:

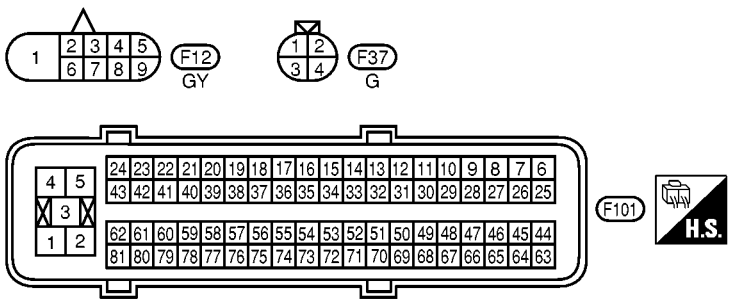
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
2	L	Heated oxygen sensor 2 heater (bank 1)	**[Engine is running]** ● Engine speed is below 3,600 rpm. ● After driving for 2 minutes at a speed of 70 km/h (43 MPH) or more.	0 - 1.0V
			[Ignition switch "ON"] ● Engine stopped **[Engine is running]** ● Engine speed is above 3,600 rpm.	BATTERY VOLTAGE (11 - 14V)

BANK 2

EC-O2H2B2-01





REFER TO THE FOLLOWING.
E105 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0059E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

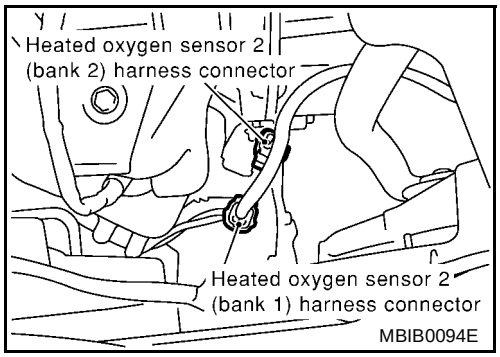
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
7	W/R	Heated oxygen sensor 2 heater (bank 2)	**[Engine is running]** ● Engine speed is below 3,600 rpm. ● After driving for 2 minutes at a speed of 70 km/h (43 MPH) or more.	0 - 1.0V
			[Ignition switch "ON"] ● Engine stopped **[Engine is running]** ● Engine speed is above 3,600 rpm.	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

EBS00FOX

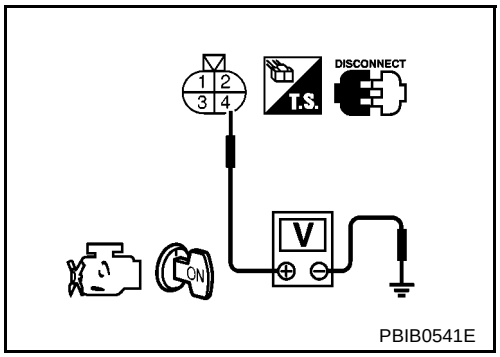
1. CHECK HO2S2 POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect heated oxygen sensor 2 harness connector.
3. Turn ignition switch "ON".



4. Check voltage between HO2S2 terminal 4 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E62, F12
- Fuse block (J/B) connector E105
- 10A fuse
- Harness for open or short between heated oxygen sensor 2 and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK HO2S2 OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal and HO2S2 terminal as follows. Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM	Sensor	
P0037, P0038	2	1	1
P0057, P0058	7	1	2

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK HEATED OXYGEN SENSOR 2 HEATER

Refer to EC-181, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace malfunctioning heated oxygen sensor 2.

5. CHECK INTERMITTENT INCIDENT

Refer to EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

EBS00FOY

HEATED OXYGEN SENSOR 2 HEATER

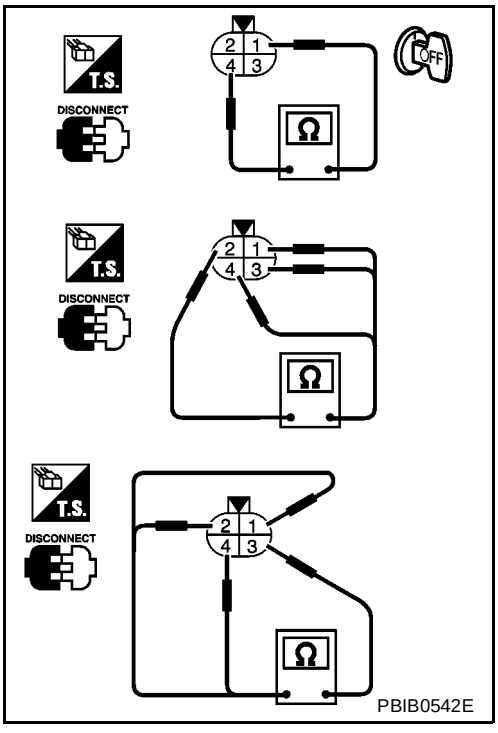
1. Check resistance between HO2S2 terminals as follows.

Terminal No.	Resistance
1 and 4	2.3 - 4.3 Ω at 25°C (77°F)
2 and 1, 3, 4	∞ Ω (Continuity should not exist)
3 and 1, 2, 4	

2. If NG, replace heated oxygen sensor 2.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**



Removal and Installation

EBS00FOZ

HEATED OXYGEN SENSOR 2

Refer to EM-23, "EXHAUST MANIFOLD AND CATALYTIC CONVERTER" .

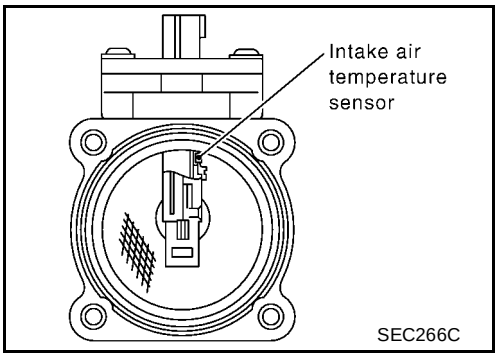
DTC P0102, P0103 MAF SENSOR

PFP:22680

Component Description

EBS00EMO

The mass air flow sensor is placed in the stream of intake air. It measures the intake flow rate by measuring a part of the entire intake flow. It consists of a hot film that is supplied with electric current from the ECM. The temperature of the hot film is controlled by the ECM a certain amount. The heat generated by the hot film is reduced as the intake air flows around it. The more air, the greater the heat loss.
Therefore, the ECM must supply more electric current to maintain the temperature of the hot film as air flow increases. The ECM detects the air flow by means of this current change.



CONSULT-II Reference Value in Data Monitor Mode

EBS00EMP

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
MAS A/F SE-B1	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: N ● No-load	Idle	Approx. 1.0 - 1.7V
		2,500 rpm	Approx. 1.5 - 2.1V
CAL/LD VALUE	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	10% - 35%
		2,500 rpm	10% - 35%
MASS AIRFLOW	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	1.0 - 4.0 g·m/s
		2,500 rpm	5.0 - 10.0 g·m/s

On Board Diagnosis Logic

EBS00EMQ

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0102 0102	Mass air flow sensor circuit low input	An excessively low voltage from the sensor is sent to ECM when engine is running.	● Harness or connectors (The sensor circuit is open or shorted.) ● Intake air leaks ● Mass air flow sensor
P0103 0103	Mass air flow sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Mass air flow sensor

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MI lights up.

Detected items	Engine operating condition in fail-safe mode
Mass air flow sensor circuit	Engine speed will not rise more than 2,400 rpm due to the fuel cut.

DTC Confirmation Procedure

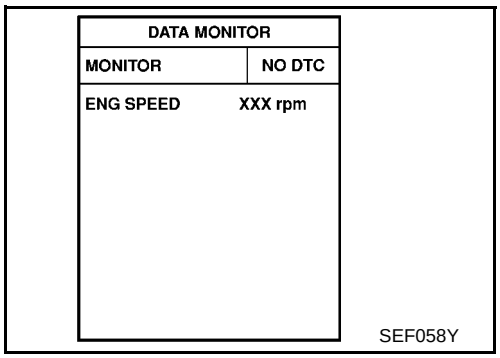
EBS00EMR

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

PROCEDURE FOR DTC P0102

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and wait 5 seconds at most.
4. If DTC is detected, go to EC-186, "Diagnostic Procedure" .



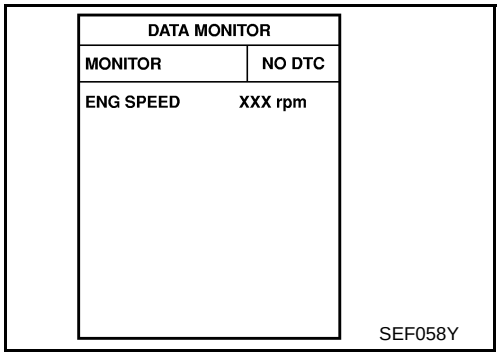
With GST

Follow the procedure “With CONSULT-II” above.

PROCEDURE FOR DTC P0103

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Wait at least 5 seconds.
4. If DTC is detected, go to EC-186, "Diagnostic Procedure" .
   If DTC is not detected, go to next step.
5. Start engine and wait at least 5 seconds.
6. If DTC is detected, go to EC-186, "Diagnostic Procedure" .



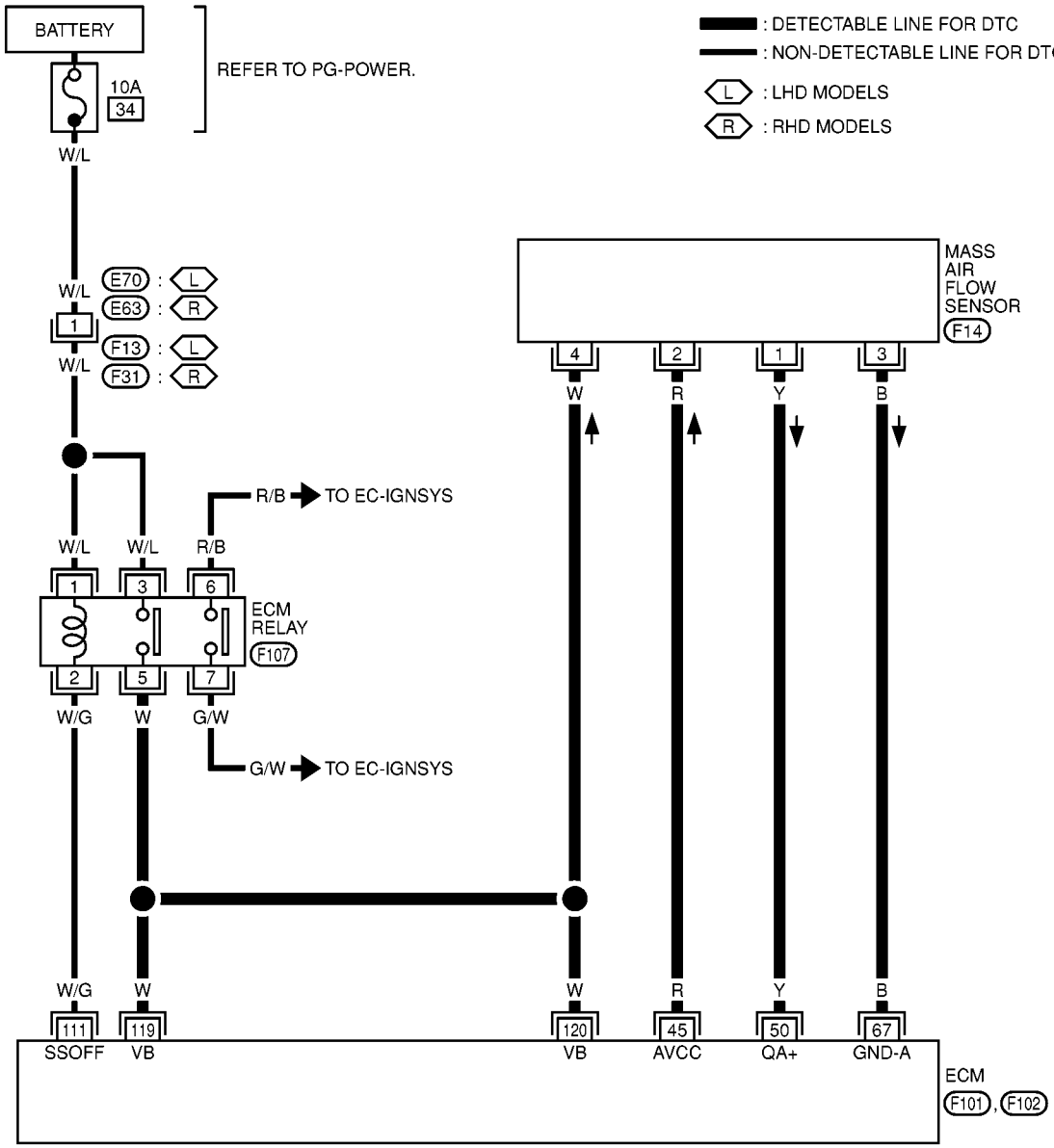
With GST

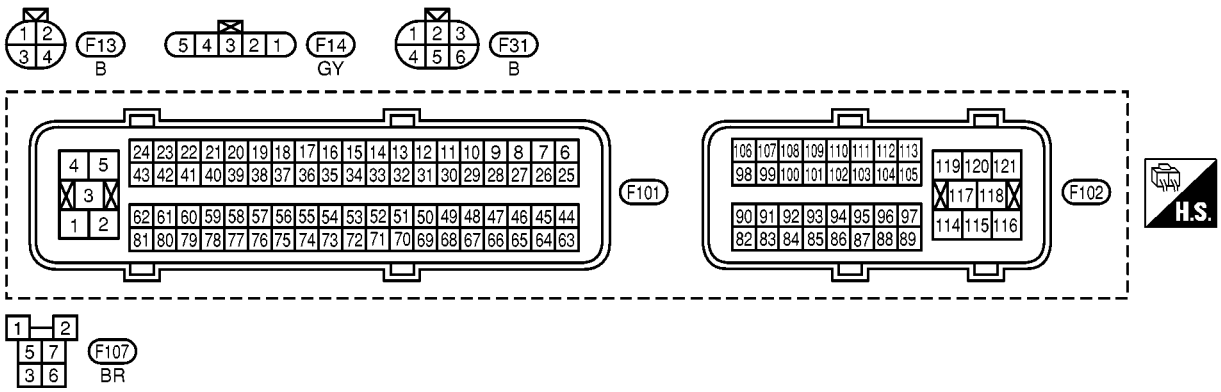
Follow the procedure “With CONSULT-II” above.

Wiring Diagram

EBS00EMS

EC-MAFS-01





MBWA0045E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
45	R	Sensor power supply (Mass air flow sensor)	**[Ignition switch "ON"]**	Approximately 5V
50	Y	Mass air flow sensor	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.0 - 1.7V
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,500 rpm.	1.5 - 2.1V
67	B	Sensor ground (Mass air flow sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V

Diagnostic Procedure

EBS00EMT

1. INSPECTION START

Which malfunction (P0102 or P0103) is duplicated?

P0102 or P0103

P0102 >> GO TO 2.
P0103 >> GO TO 3.

2. CHECK INTAKE SYSTEM

Check the following for connection.

- Air duct
- Vacuum hoses
- Intake air passage between air duct to intake manifold

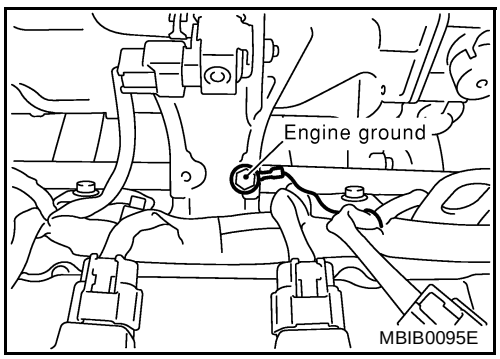
OK or NG

OK >> GO TO 3.
NG >> Reconnect the parts.

3. RETIGHTEN GROUND SCREWS

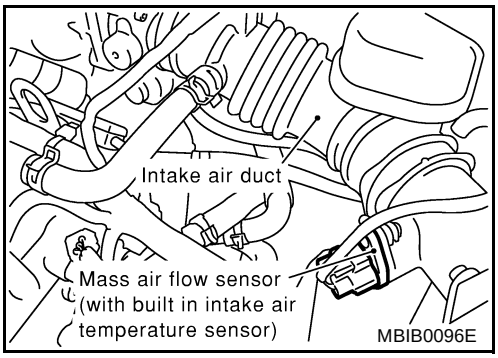
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 4.



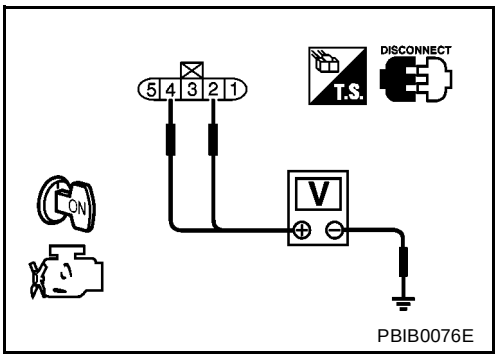
4. CHECK MAF SENSOR POWER SUPPLY CIRCUIT

1. Disconnect MAF sensor harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between MAF sensor terminals 2, 4 and ground with CONSULT-II or tester.

Terminal	Voltage
2	Approximately 5V
4	Battery voltage



OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between mass air flow sensor and ECM
- Harness for open or short between mass air flow sensor and ECM relay

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK MAF SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between MAF sensor terminal 3 and ECM terminal 67. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK MAF SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between MAF sensor terminal 1 and ECM terminal 50. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK MASS AIR FLOW SENSOR

Refer to EC-188, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> Replace mass air flow sensor.

9. CHECK INTERMITTENT INCIDENT

Refer to EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

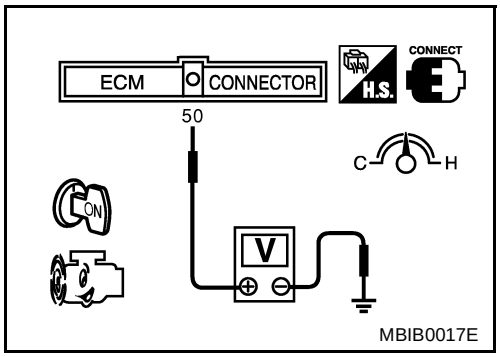
EBS00EMU

MASS AIR FLOW SENSOR

1. Reconnect harness connectors disconnected.
2. Start engine and warm it up to normal operating temperature.
3. Check voltage between ECM terminal 50 (Mass air flow sensor signal) and ground.

Condition	Voltage V
Ignition switch “ON” (Engine stopped.)	Approx. 1.0
Idle (Engine is warmed-up to normal operating temperature.)	1.0 - 1.7
2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.5 - 2.1
Idle to about 4,000 rpm*	1.0 - 1.7 to Approx. 4.0

*: Check for liner voltage rise in response to engine being increased to about 4,000 rpm.



4. If the voltage is out of specification, proceed the following.

a. Turn ignition switch “OFF”.
b. Disconnect mass air flow sensor harness connector and reconnect it again.
c. Perform steps 2 and 3 again.

5. If NG, remove mass air flow sensor from air duct. Check hot film for damage or dust.
6. If NG, clean or replace mass air flow sensor.

Removal and Installation

EBS00EMV

MASS AIR FLOW SENSOR

Refer to EM-17, "AIR CLEANER AND AIR DUCT" .

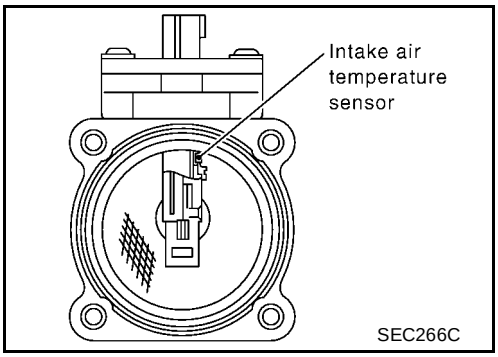
DTC P0112, P0113 IAT SENSOR

PFP:22630

Component Description

EBS00EMW

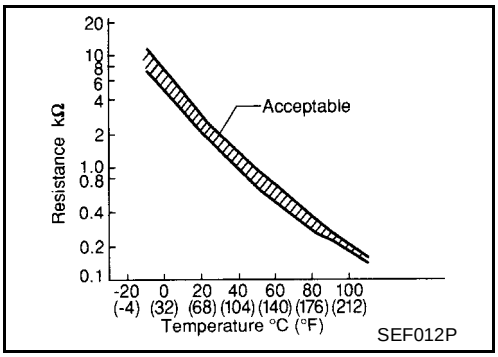
The intake air temperature sensor is built into mass air flow sensor. The sensor detects intake air temperature and transmits a signal to the ECM.
The temperature sensing unit uses a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the temperature rise.



<Reference data>

Intake air temperature °C (°F)	Voltage* V	Resistance kΩ
–10 (14)	4.43	7.9 - 9.3
25 (77)	3.32	1.9 - 2.1
80 (176)	1.23	0.31 - 0.37

*: These data are reference values and are measured between ECM terminal 34 (Intake air temperature sensor) and ground.



CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

On Board Diagnosis Logic

EBS00EMX

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0112 0112	Intake air temperature sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Intake air temperature sensor
P0113 0113	Intake air temperature sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	

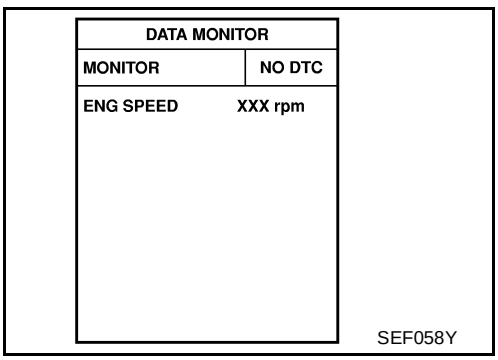
DTC Confirmation Procedure

EBS00EMY

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Wait at least 5 seconds.
4. If 1st trip DTC is detected, go to EC-192, "Diagnostic Procedure"
.



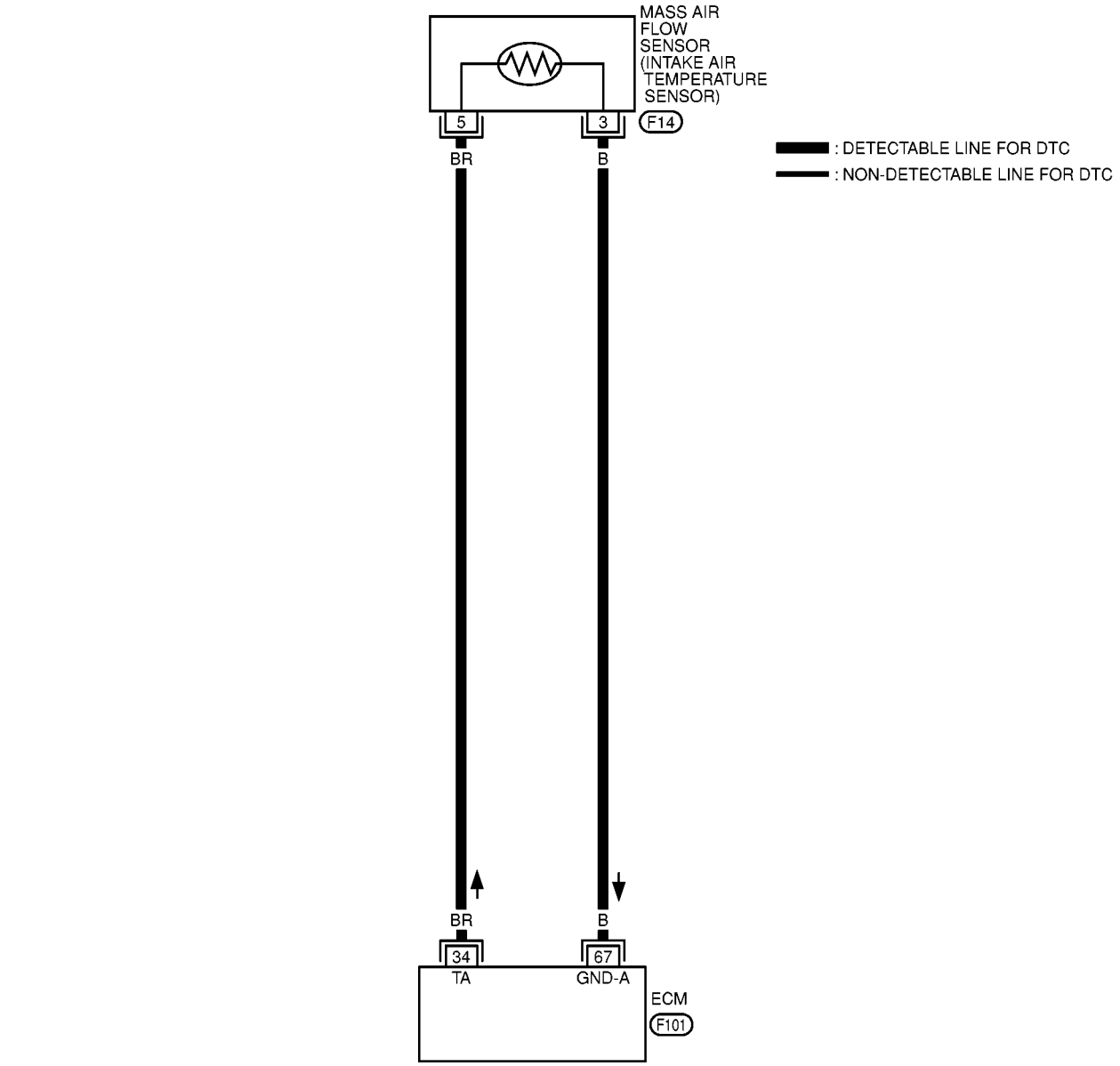
WITH GST

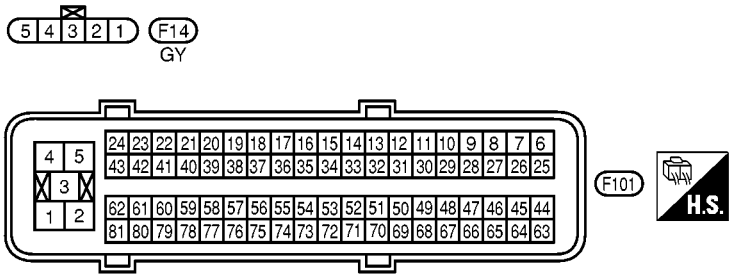
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

EBS00EMZ

EC-IATS-01





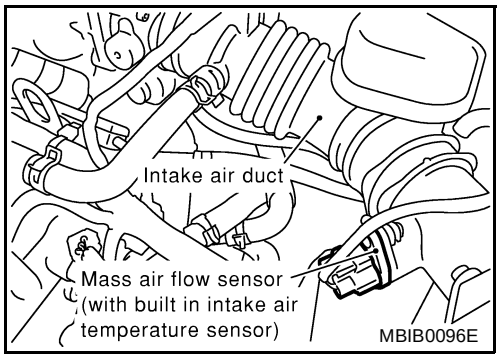
MBWA0046E

Diagnostic Procedure

EBS00EN0

1. CHECK INTAKE AIR TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect mass air flow sensor (intake air temperature sensor is built-into) harness connector.
3. Turn ignition switch “ON”.

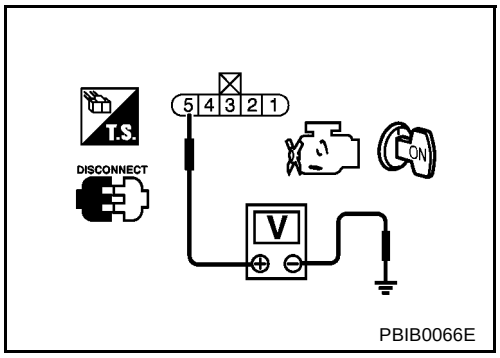


4. Check voltage between MAF sensor terminal 5 and ground.

Voltage: Approximately 5V

OK or NG

OK >> GO TO 2.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.



2. CHECK INTAKE AIR TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between MAF sensor terminal 3 and ECM terminal 67. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK INTAKE AIR TEMPERATURE SENSOR

Refer to EC-193, "Component Inspection" .

OK or NG

OK >> GO TO 4.
NG >> Replace mass air flow sensor (with intake air temperature sensor).

4. CHECK INTERMITTENT INCIDENT

Refer to EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

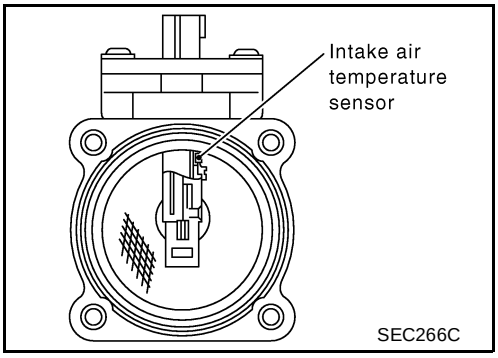
EBS00EN1

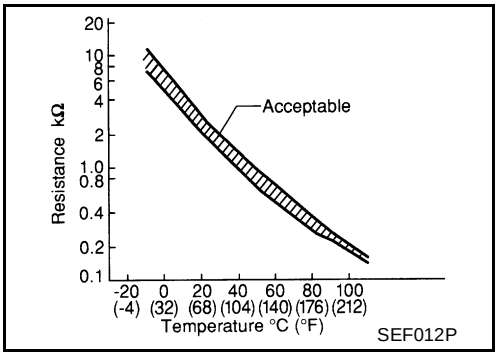
INTAKE AIR TEMPERATURE SENSOR

1. Check resistance between mass air flow sensor terminals 3 and 5 under the following conditions.

Intake air temperature °C (°F)	Resistance kΩ
25 (77)	1.9 - 2.1

2. If NG, replace mass air flow sensor (with intake air temperature sensor).





Removal and Installation

EBS00EN2

MASS AIR FLOW SENSOR

Refer to EM-17, "AIR CLEANER AND AIR DUCT" .

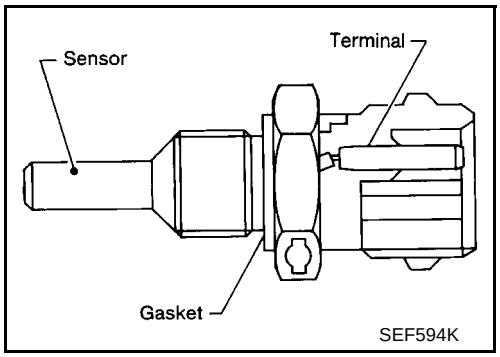
DTC P0117, P0118 ECT SENSOR

PFP:22630

Component Description

EBS00EN3

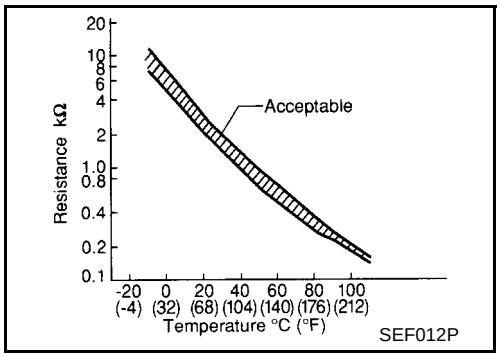
The engine coolant temperature sensor is used to detect the engine coolant temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine coolant temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.



<Reference data>

Engine coolant temperature °C (°F)	Voltage* V	Resistance kΩ
–10 (14)	4.4	7.0 - 11.4
20 (68)	3.5	2.1 - 2.9
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260

*: These data are reference values and are measured between ECM terminal 72 (Engine coolant temperature sensor) and ground.



CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

On Board Diagnosis Logic

EBS00EN4

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P0117 0117	Engine coolant temperature sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Engine coolant temperature sensor
P0118 0118	Engine coolant temperature sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	

FAIL-SAFE MODE

When this malfunction is detected, the ECM enters fail-safe mode and the MI lights up.

Detected items	Engine operating condition in fail-safe mode	
Engine coolant temperature sensor circuit	Engine coolant temperature will be determined by ECM based on the time after turning ignition switch “ON” or “START”. CONSULT-II displays the engine coolant temperature decided by ECM.	
	Condition	Engine coolant temperature decided (CONSULT-II display)
	Just as ignition switch is turned ON or Start	40°C (104°F)
	More than approx. 4 minutes after ignition ON or Start	80°C (176°F)
	Except as shown above	40 - 80°C (104 - 176°F) (Depends on the time)
	When the fail-safe system for engine coolant temperature sensor is activated, the cooling fan operates while engine is running.	

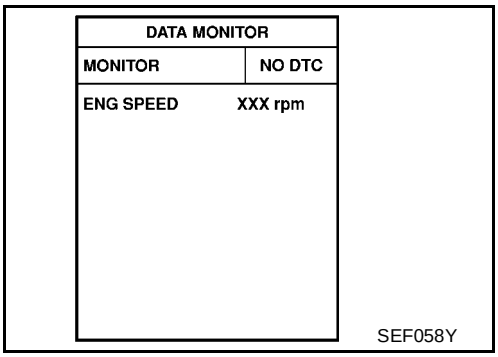
DTC Confirmation Procedure

EBS00EN5

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Wait at least 5 seconds.
4. If DTC is detected, go to EC-197, "Diagnostic Procedure" .



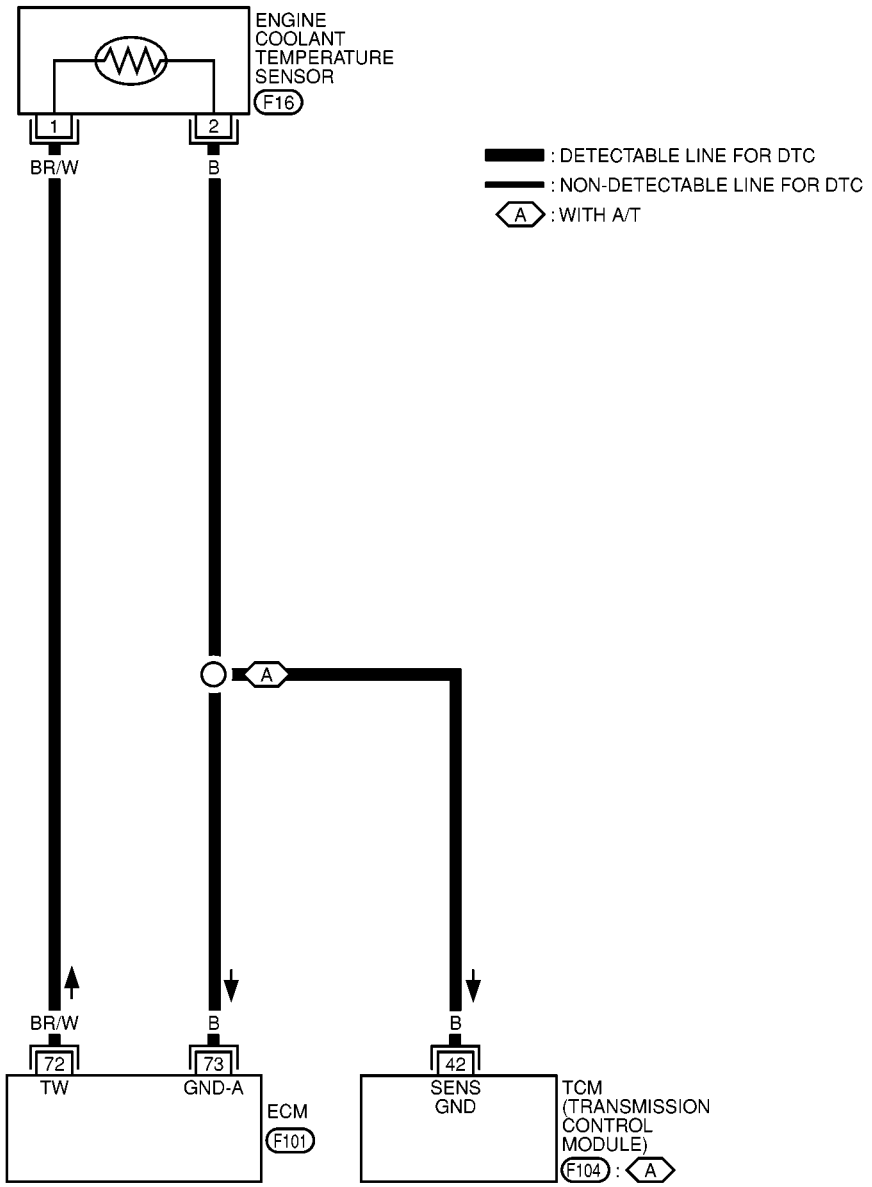
WITH GST

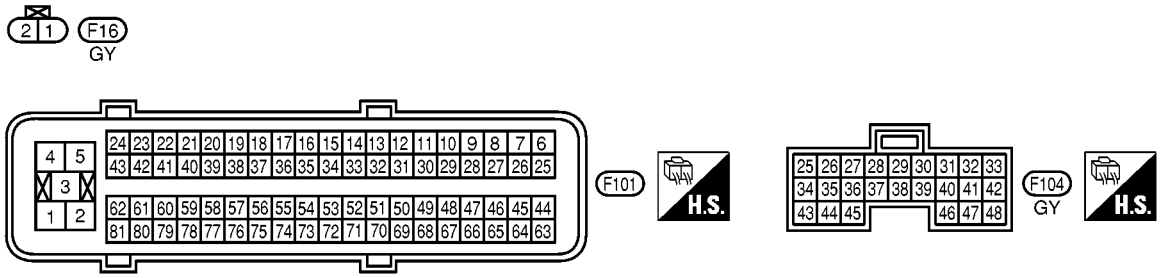
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

EBS00EN6

EC-ECTS-01





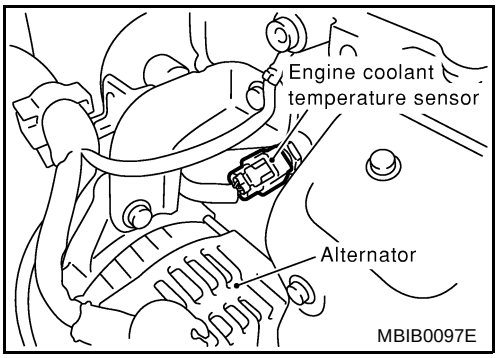
MBWA0047E

Diagnostic Procedure

EBS00EN7

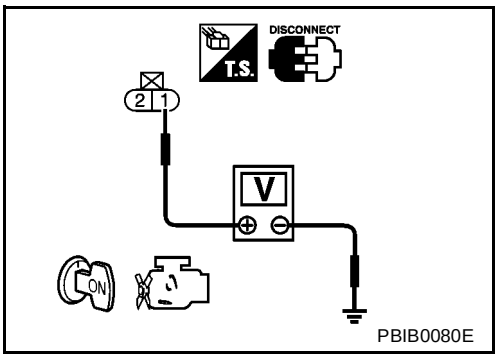
1. CHECK ECT SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect engine coolant temperature (ECT) sensor harness connector.
3. Turn ignition switch “ON”.



4. Check voltage between ECT sensor terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 2.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

2. CHECK ECT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between ECT sensor terminal 2 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between engine coolant temperature sensor and ECM
- Harness for open or short between engine coolant temperature sensor and TCM

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-198, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace engine coolant temperature sensor.

5. CHECK INTERMITTENT INCIDENT

Refer to EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

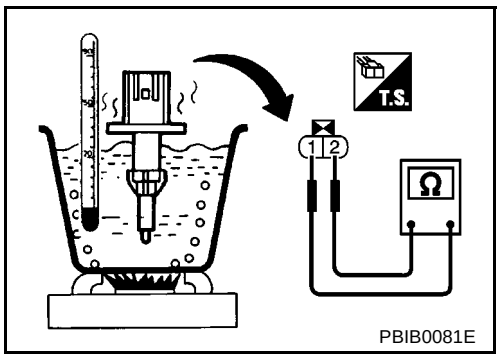
>> **INSPECTION END**

Component Inspection

EBS00EN8

ENGINE COOLANT TEMPERATURE SENSOR

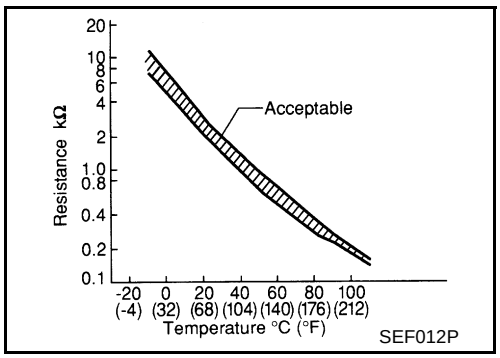
1. Check resistance between engine coolant temperature sensor terminals 1 and 2 as shown in the figure.



<Reference data>

Engine coolant temperature °C (°F)	Voltage* V	Resistance kΩ
–10 (14)	4.4	7.0 - 11.4
20 (68)	3.5	2.1 - 2.9
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260

*: These data are reference values and are measured between ECM terminal 72 (Engine coolant temperature sensor) and ground.



2. If NG, replace engine coolant temperature sensor.

Removal and Installation

EBS00EN9

ENGINE COOLANT TEMPERATURE SENSOR

Refer to CO-20, "THERMOSTAT AND THERMOSTAT HOUSING" .

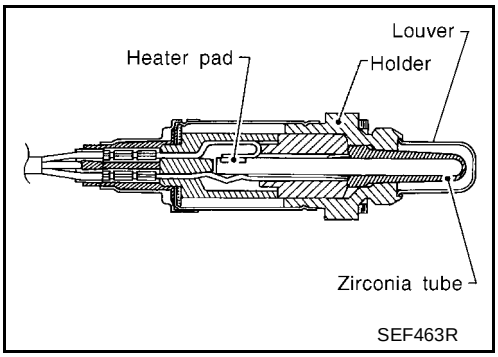
DTC P0132 HO2S1 (QG16DE)

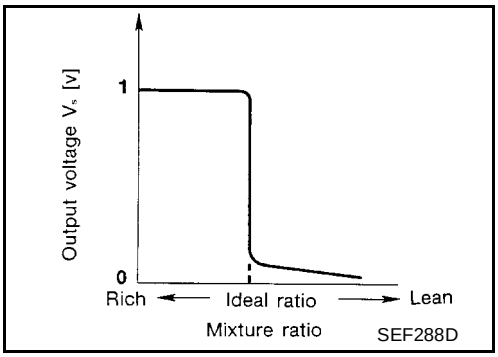
PFP:22690

Component Description

EBS00FP0

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.





CONSULT-II Reference Value in Data Monitor Mode

EBS00FP1

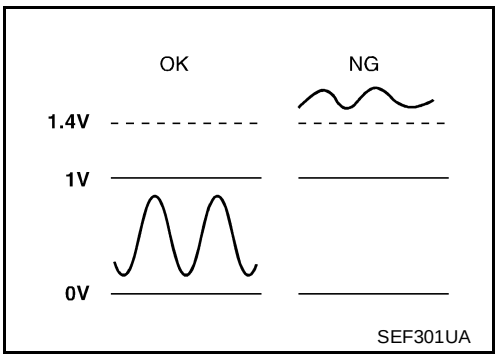
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S1 (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S1 MNTR (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	LEAN ←→ RICH Changes more than 5 times during 10 seconds.

On Board Diagnosis Logic

EBS00FP2

To judge the malfunction, the diagnosis checks that the heated oxygen sensor 1 output is not inordinately high.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0132 0132	Heated oxygen sensor 1 circuit high voltage	An excessively high voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Heated oxygen sensor 1

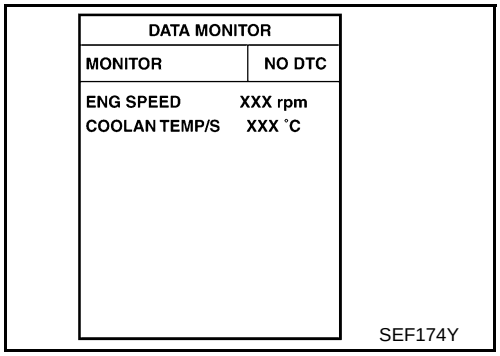
DTC Confirmation Procedure

EBS00FP3

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Turn ignition switch “ON”.
4. Select “DATA MONITOR” mode with CONSULT-II.
5. Restart engine and let it idle for 2 minutes.
6. If 1st trip DTC is detected, go to EC-202, "Diagnostic Procedure" .



WITH GST

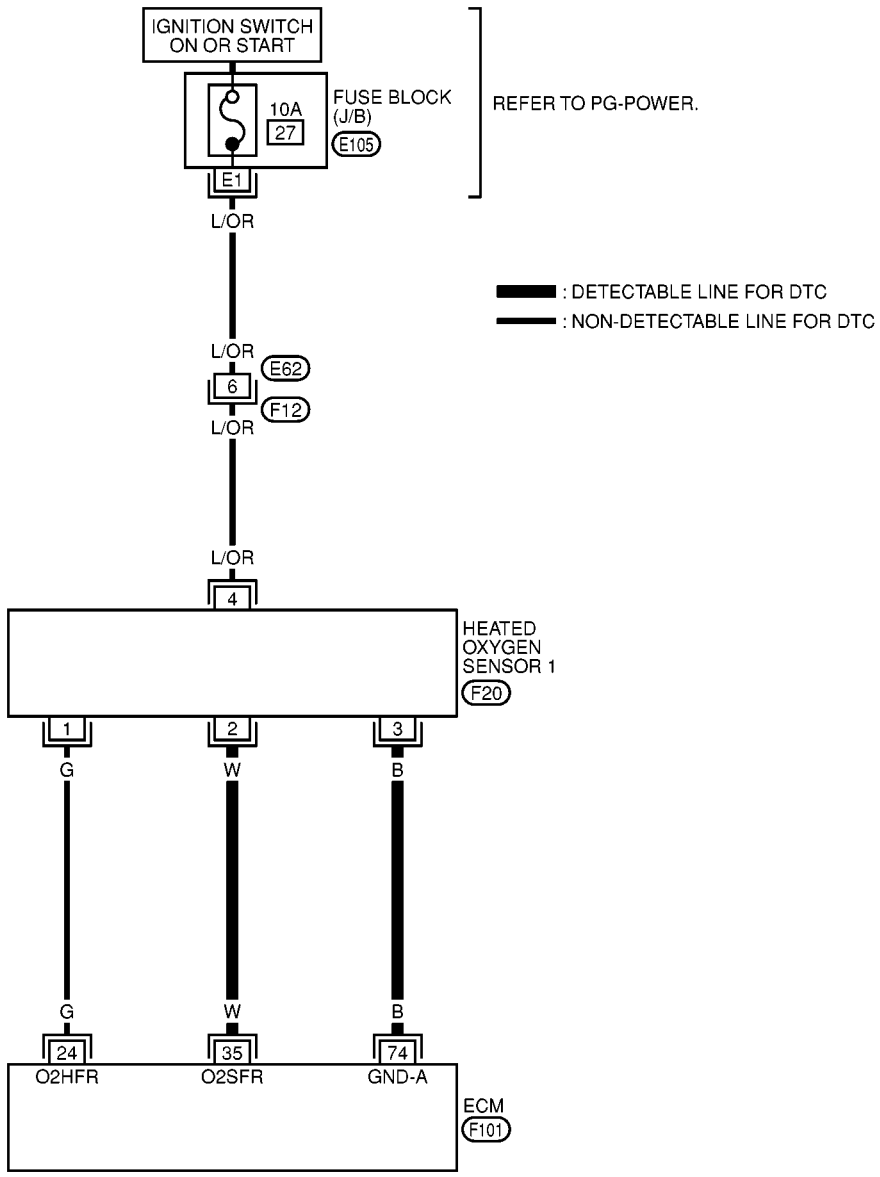
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Restart engine and let it idle for 2 minutes.
4. Turn ignition switch “OFF” and wait at least 10 seconds.
5. Restart engine and let it idle for 2 minutes.
6. Select “MODE 3” with GST.
7. If DTC is detected, go to EC-202, "Diagnostic Procedure" .

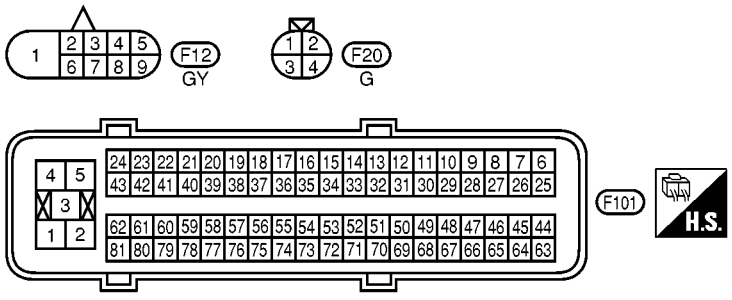
- **When using GST, “DTC Confirmation Procedure” should be performed twice as much as when using CONSULT-II because GST cannot display MODE 7 (1st trip DTC) concerning this diagnosis. Therefore, using CONSULT-II is recommended.**

Wiring Diagram

EBS00FP4

EC-HO2S1-01





REFER TO THE FOLLOWING.
E105 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0048E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
35	W	Heated oxygen sensor 1	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V (Periodically change)
74	B	Heated oxygen sensor ground	**[Engine is running]** ● Idle speed	Approximately 0V

Diagnostic Procedure

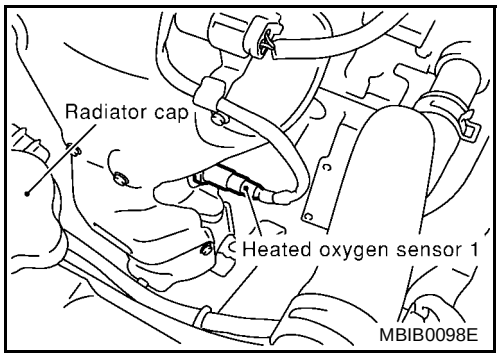
EBS00FP5

1. RETIGHTEN HEATED OXYGEN SENSOR 1

1. Turn ignition switch “OFF”.
2. Loosen and retighten heated oxygen sensor 1.

Tightening torque: 40 - 60 N·m (4.1 - 6.2 kg-m, 30 - 44 ft-lb)

>> GO TO 2.



2. CHECK HO2S1 GROUND CIRCUIT FOR OPEN AND SHORT

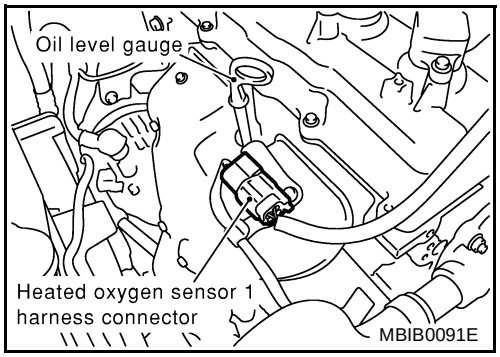
1. Disconnect heated oxygen sensor 1 harness connector.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 74 and HO2S1 terminal 3.
   Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.



3. CHECK HO2S1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 35 and HO2S1 terminal 2. Refer to Wiring Diagram.

Continuity should exist.

2. Check harness continuity between ECM terminal 35 or HO2S1 terminal 2 and ground. Refer to Wiring Diagram.

Continuity should not exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK HO2S1 CONNECTOR FOR WATER

Check heated oxygen sensor 1 connectors for water.

Water should not exist.

OK or NG

OK >> GO TO 5.
NG >> Repair or replace harness or connectors.

5. CHECK HEATED OXYGEN SENSOR 1

Refer to EC-203, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace heated oxygen sensor 1.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

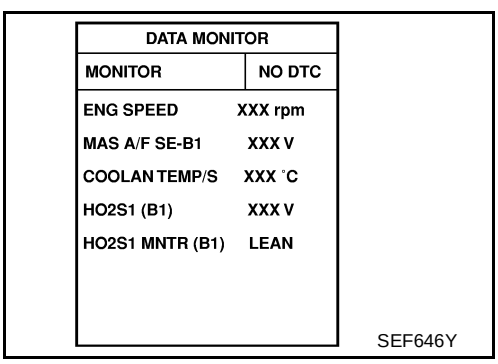
Component Inspection

EBS00FP6

HEATED OXYGEN SENSOR 1

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “MANU TRIG” and adjust “TRIGGER POINT” to 100% in “DATA MONITOR” mode with CONSULT-II.
3. Select “HO2S1 (B1)” and “HO2S1 MNTR (B1)”.
4. Hold engine speed at 2,000 rpm under no load during the following steps.
5. Touch “RECORD” on CONSULT-II screen.



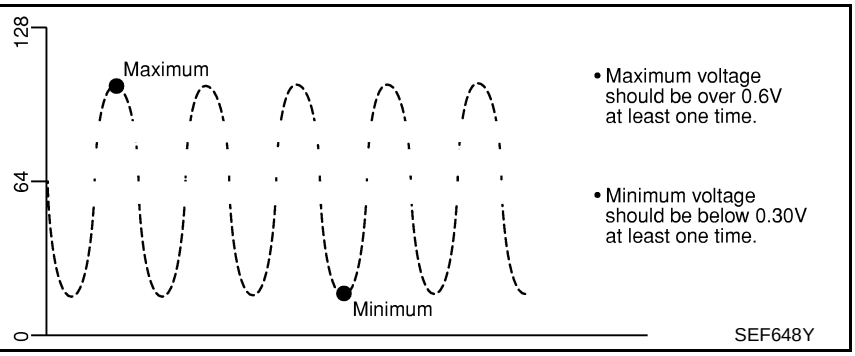
6. Check the following.
   - “HO2S1 MNTR (B1)” in “DATA MONITOR” mode changes from “RICH” to “LEAN” to “RICH” 5 times in 10 seconds.
     5 times (cycles) are counted as shown at right.
   - “HO2S1 (B1)” voltage goes above 0.6V at least once.
   - “HO2S1 (B1)” voltage goes below 0.3V at least once.
   - “HO2S1 (B1)” voltage never exceeds 1.0V.

cycle	1	2	3	4	5
HO2S1 MNTR (B1)	R-L-R-L-R-L-R-L-R-L-R				

R means HO2S1 MNTR (B1) indicates RICH
L means HO2S1 MNTR (B1) indicates LEAN

SEF217YA

Trigger	ENG SPEED	HO2S1 (B1)
	rpm	V
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX

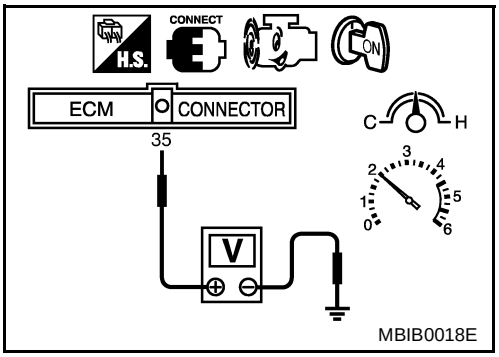


CAUTION:
- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 (HO2S1 signal) and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no load.
   - The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds.
   - The maximum voltage is over 0.6V at least one time.
   - The minimum voltage is below 0.3V at least one time.
   - The voltage never exceeds 1.0V.

   1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V
   2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V



CAUTION:
- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

EBS00FP7

HEATED OXYGEN SENSOR 1

Refer to EM-23, "EXHAUST MANIFOLD AND CATALYTIC CONVERTER" .

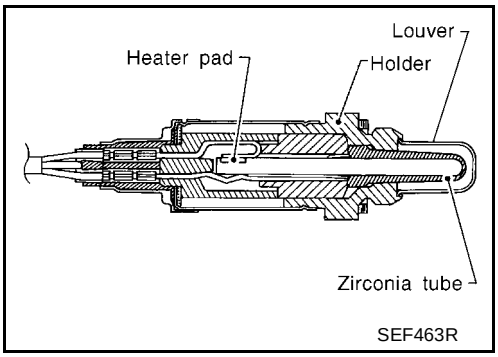
DTC P0132, P0152 HO2S1 (QG18DE)

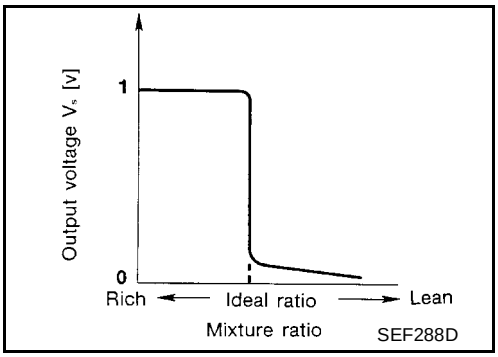
PFP:22690

Component Description

EBS00FP8

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.





CONSULT-II Reference Value in Data Monitor Mode

EBS00FP9

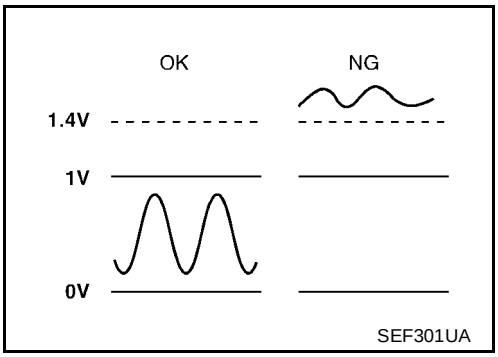
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S1 (B1) HO2S1 (B2)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ⟷ Approx. 0.6 - 1.0V
HO2S1 MNTR (B1) HO2S1 MNTR (B2)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	LEAN ⟷ RICH Changes more than 5 times during 10 seconds.

On Board Diagnosis Logic

EBS00FPA

To judge the malfunction, the diagnosis checks that the heated oxygen sensor 1 output is not inordinately high.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0132 0132 (Bank 1)	Heated oxygen sensor 1 circuit high voltage	An excessively high voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted). ● Heated oxygen sensor 1
P0152 0152 (Bank 2)			

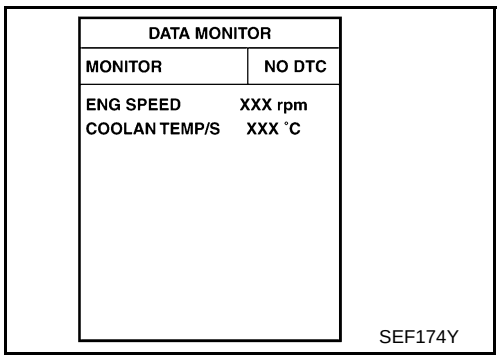
DTC Confirmation Procedure

EBS00FPB

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Turn ignition switch “ON”.
4. Select “DATA MONITOR” mode with CONSULT-II.
5. Restart engine and let it idle for 2 minutes.
6. If 1st trip DTC is detected, go to EC-210, "Diagnostic Procedure" .



WITH GST

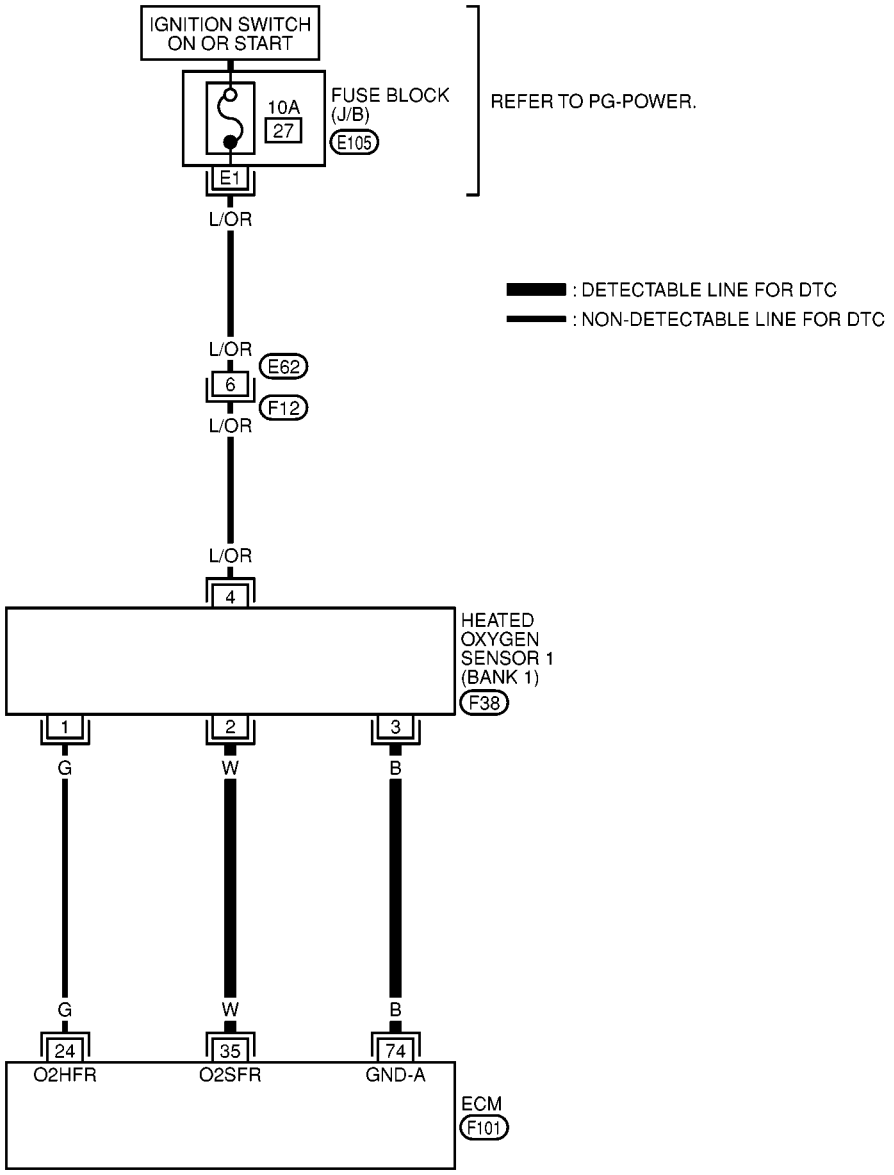
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Restart engine and let it idle for 2 minutes.
4. Turn ignition switch “OFF” and wait at least 10 seconds.
5. Restart engine and let it idle for 2 minutes.
6. Select “MODE 3” with GST.
7. If DTC is detected, go to EC-210, "Diagnostic Procedure" .

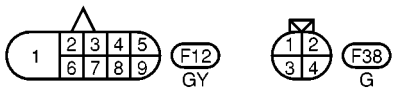
- **When using GST, “DTC Confirmation Procedure” should be performed twice as much as when using CONSULT-II because GST cannot display MODE 7 (1st trip DTC) concerning this diagnosis. Therefore, using CONSULT-II is recommended.**

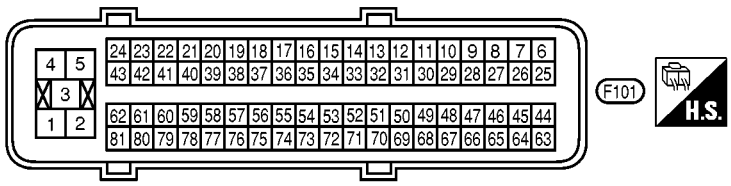
Wiring Diagram
BANK 1

EBS00FPC

EC-O2S1B1-01







REFER TO THE FOLLOWING.
E105 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0052E

Specification data are reference values and are measured between each terminal and ground.

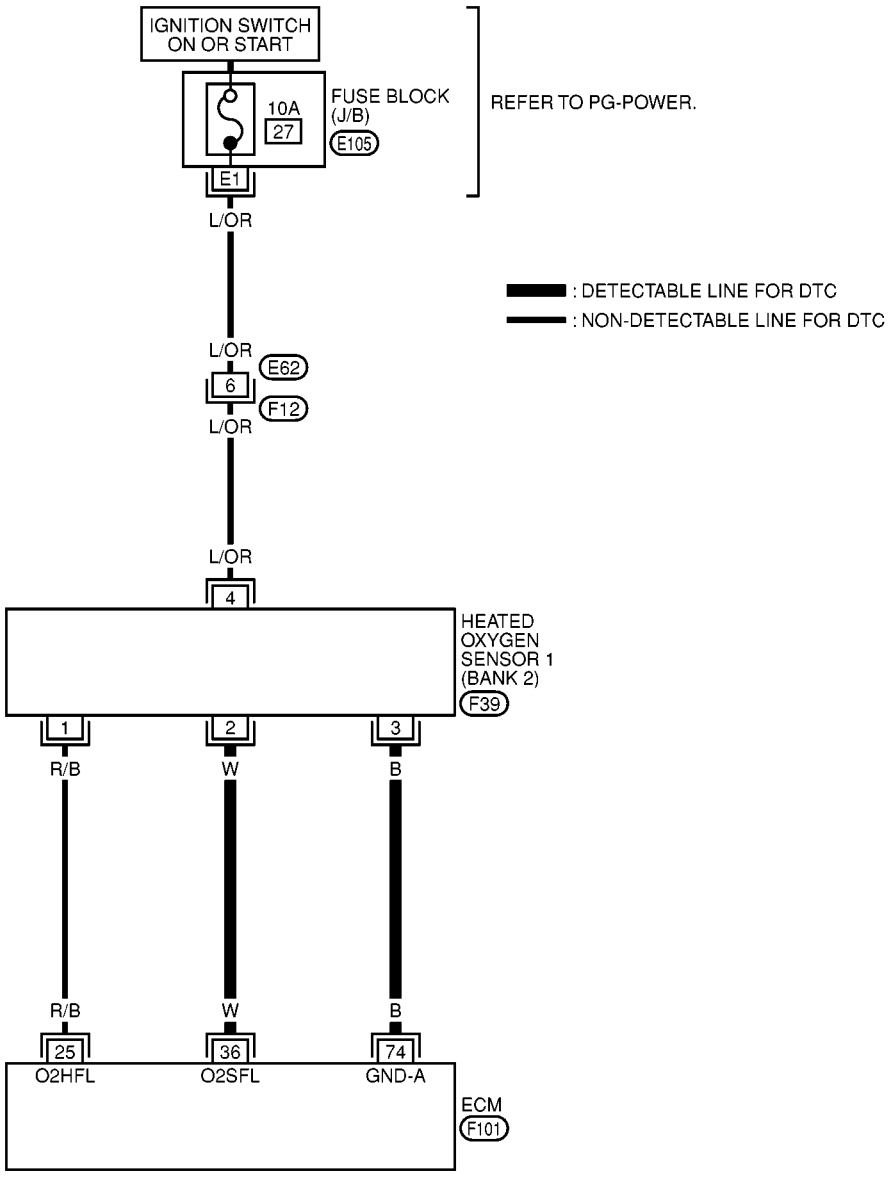
CAUTION:

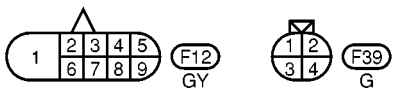
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

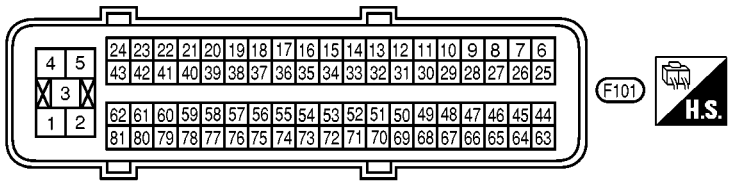
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
35	W	Heated oxygen sensor 1 (bank 1)	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V (Periodically change)
74	B	Heated oxygen sensor ground	**[Engine is running]** ● Idle speed	Approximately 0V

BANK 2

EC-O2S1B2-01







REFER TO THE FOLLOWING.
E105 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0054E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
36	W	Heated oxygen sensor 1 (bank 2)	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V (Periodically change)
74	B	Heated oxygen sensor ground	**[Engine is running]** ● Idle speed	Approximately 0V

Diagnostic Procedure

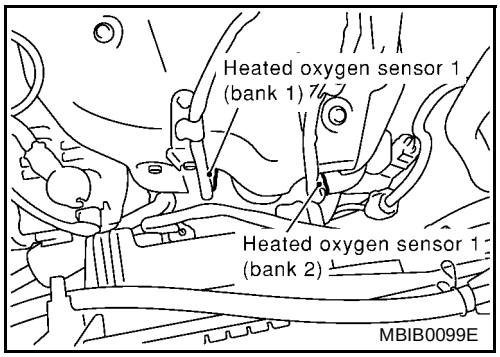
EBS00FPD

1. RETIGHTEN HEATED OXYGEN SENSOR 1

1. Turn ignition switch “OFF”.
2. Loosen and retighten corresponding heated oxygen sensor 1.

Tightening torque: 40 - 60 N·m (4.1 - 6.2 kg-m, 30 - 44 ft-lb)

>> GO TO 2.



2. CHECK HO2S1 GROUND CIRCUIT FOR OPEN AND SHORT

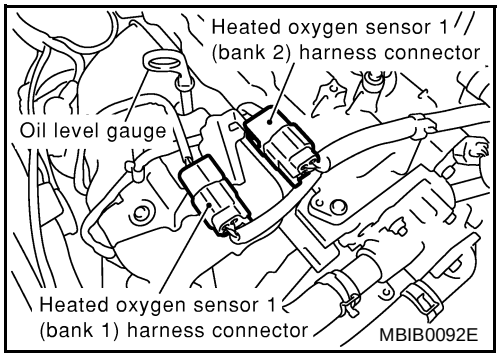
1. Disconnect heated oxygen sensor 1 harness connector.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 74 and HO2S1 terminal 3.
   Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.



3. CHECK HO2S1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal and HO2S1 terminal as follows. Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM	Sensor	
P0132	35	2	1
P0152	36	2	2

Continuity should exist.

2. Check harness continuity between the following terminals and ground. Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM	Sensor	
P0132	35	2	1
P0152	36	2	2

Continuity should not exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK HO2S1 CONNECTOR FOR WATER

Check heated oxygen sensor 1 connectors for water.

Water should not exist.

OK or NG

OK >> GO TO 5.
NG >> Repair or replace harness or connectors.

5. CHECK HEATED OXYGEN SENSOR 1

Refer to EC-211, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace malfunctioning heated oxygen sensor 1.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

EBS00FPE

HEATED OXYGEN SENSOR 1

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “MANU TRIG” and adjust “TRIGGER POINT” to 100% in “DATA MONITOR” mode with CONSULT-II.
3. Select “HO2S1 (B1)/(B2)” and “HO2S1 MNTR (B1)/(B2)”.
4. Hold engine speed at 2,000 rpm under no load during the following steps.

5. Touch “RECORD” on CONSULT-II screen.

DATA MONITOR	
MONITOR	NO DTC
ENG SPEED	XXX rpm
MAS A/F SE-B1	XXX V
COOLAN TEMP/S	XXX °C
HO2S1 (B1)	XXX V
HO2S1 MNTR (B1)	LEAN

SEF646Y

6. Check the following.
   - “HO2S1 MNTR (B1)/(B2)” in “DATA MONITOR” mode changes from “RICH” to “LEAN” to “RICH” 5 times in 10 seconds.
     5 times (cycles) are counted as shown at right.
   - “HO2S1 (B1)/(B2)” voltage goes above 0.6V at least once.
   - “HO2S1 (B1)/(B2)” voltage goes below 0.3V at least once.
   - “HO2S1 (B1)/(B2)” voltage never exceeds 1.0V.

Bank 1										
cycle		1	2	3	4	5				
HO2S1 MNTR (B1)	R	L	R	L	R	L	R	L	R	L

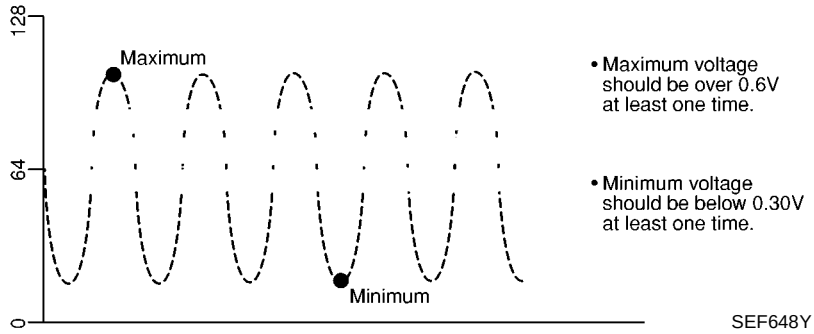
Bank 2										
cycle		1	2	3	4	5				
HO2S1 MNTR (B2)	R	L	R	L	R	L	R	L	R	L

R means HO2S1 MNTR (B1)/(B2) indicates RICH

L means HO2S1 MNTR (B1)/(B2) indicates LEAN

SEF647Y

Trigger	ENG SPEED	HO2S1 (B1)
	rpm	V
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX



SEF648Y

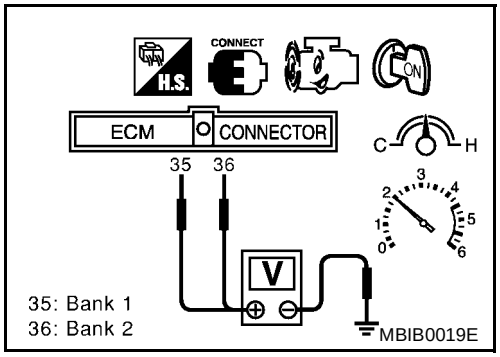
CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 [HO2S1 (B1) signal] or 36 [HO2S1 (B2) signal] and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no load.
   - The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds.
   - The maximum voltage is over 0.6V at least one time.
   - The minimum voltage is below 0.3V at least one time.
   - The voltage never exceeds 1.0V.

   1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V
   2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V



MBIB0019E

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

EBS00FPF

HEATED OXYGEN SENSOR 1

Refer to EM-23, "EXHAUST MANIFOLD AND CATALYTIC CONVERTER" .

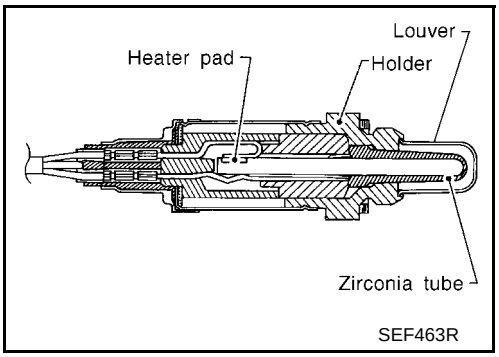
DTC P0133 HO2S1 (QG16DE)

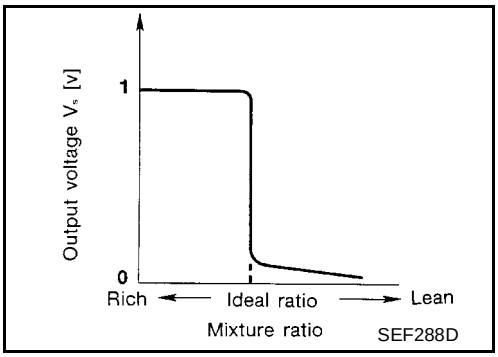
PFP:22690

Component Description

EBS00FPG

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.





CONSULT-II Reference Value in Data Monitor Mode

EBS00FPH

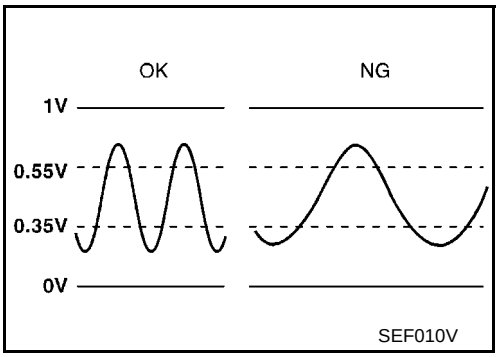
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S1 (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ⟷ Approx. 0.6 - 1.0V
HO2S1 MNTR (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	LEAN ⟷ RICH Changes more than 5 times during 10 seconds.

On Board Diagnosis Logic

EBS00FPI

To judge the malfunction of heated oxygen sensor 1, this diagnosis measures response time of heated oxygen sensor 1 signal. The time is compensated by engine operating (speed and load), fuel feedback control constant, and heated oxygen sensor 1 temperature index. Judgment is based on whether the compensated time (heated oxygen sensor 1 cycling time index) is inordinately long or not.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0133 0133	Heated oxygen sensor 1 circuit slow response	The response of the voltage signal from the sensor takes more than the specified time.	● Harness or connectors (The sensor circuit is open or shorted.) ● Heated oxygen sensor 1 ● Heated oxygen sensor 1 heater ● Fuel pressure ● Injectors ● Intake air leaks ● Exhaust gas leaks ● PCV valve ● Mass air flow sensor

DTC Confirmation Procedure

EBS00FPJ

CAUTION:
Always drive vehicle at a safe speed.

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

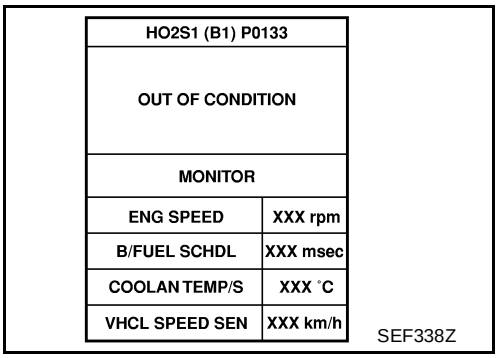
TESTING CONDITION:

- **Always perform at a temperature above −10°C (14°F).**
- **Before performing the following procedure, confirm that battery voltage is more than 11V at idle.**

WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Stop engine and wait at least 10 seconds.
3. Turn ignition switch “ON” and select “HO2S1 (B1) P0133” of “HO2S1” in “DTC WORK SUPPORT” mode with CONSULT-II.
4. Touch “START”.
5. Start engine and let it idle for at least 3 minutes.

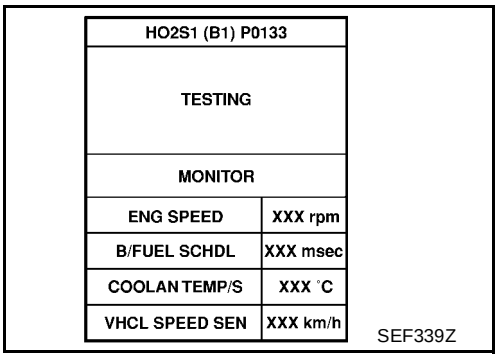
   NOTE:
   Never raise engine speed above 3,600 rpm after this step. If the engine speed limit is exceeded, return to step 5.



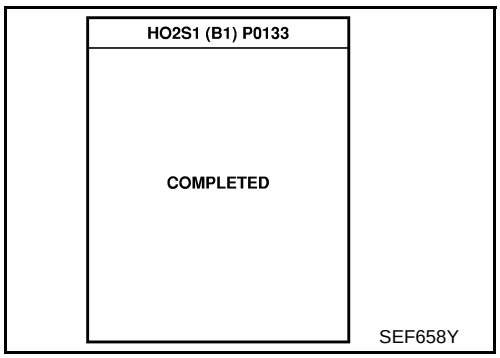
6. When the following conditions are met, “TESTING” will be displayed on the CONSULT-II screen. Maintain the conditions continuously until “TESTING” changes to “COMPLETED”. (It will take approximately 20 to 50 seconds.)

ENG SPEED	More than 2,100 rpm
Vehicle speed	More than 80 km/h (50 MPH)
B/FUEL SCHDL	3.2 - 6.7 msec
Selector lever	Suitable position

If “TESTING” is not displayed after 5 minutes, retry from step 2.



7. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”. If “NG” is displayed, refer to EC-218, "Diagnostic Procedure" .



Overall Function Check

EBS00FPK

Use this procedure to check the overall function of the heated oxygen sensor 1 circuit. During this check, a 1st trip DTC might not be confirmed.

WITH GST

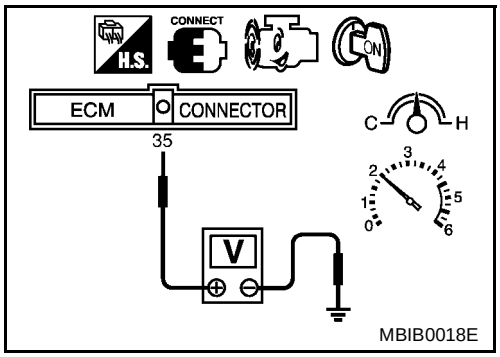
1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 (HO2S1 signal) and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no load.

- The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds.

1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V

2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V

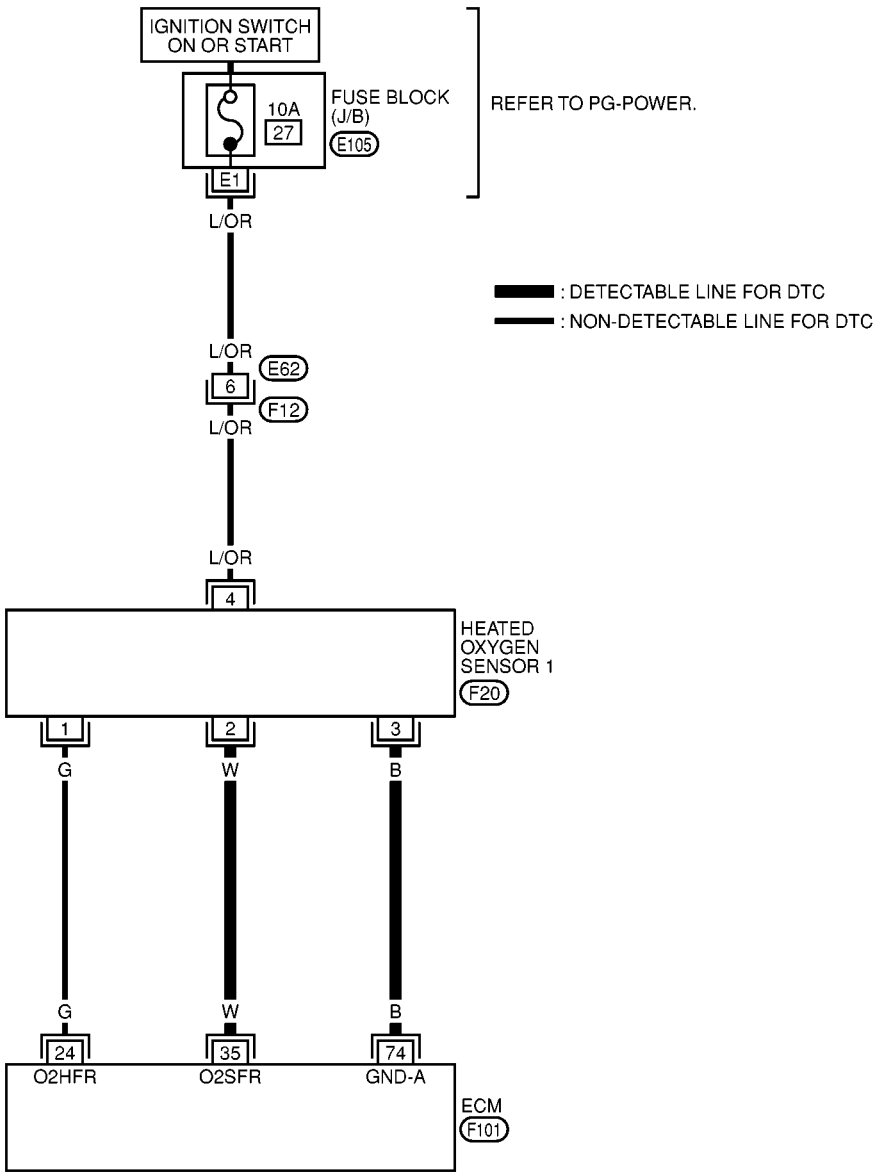
4. If NG, go to EC-218, "Diagnostic Procedure" .

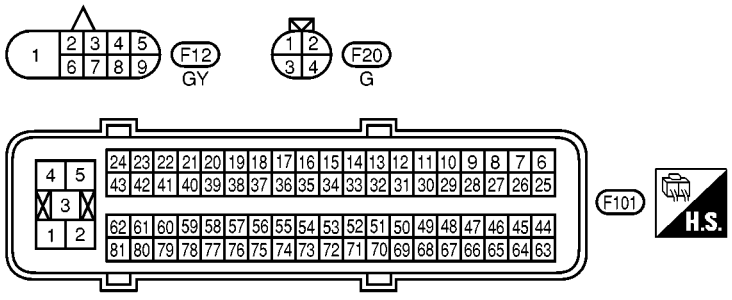


Wiring Diagram

EBS00FPL

EC-HO2S1-01





REFER TO THE FOLLOWING.
E105 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0048E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
35	W	Heated oxygen sensor 1	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V (Periodically change)
74	B	Heated oxygen sensor ground	**[Engine is running]** ● Idle speed	Approximately 0V

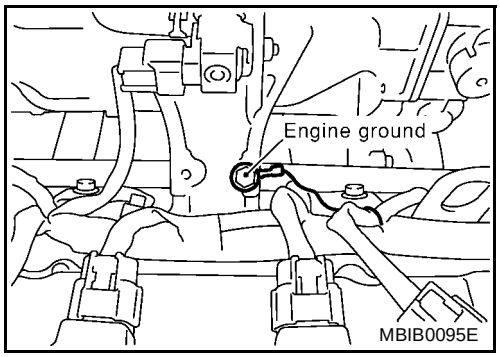
Diagnostic Procedure

EBS00FPM

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

>> GO TO 2.

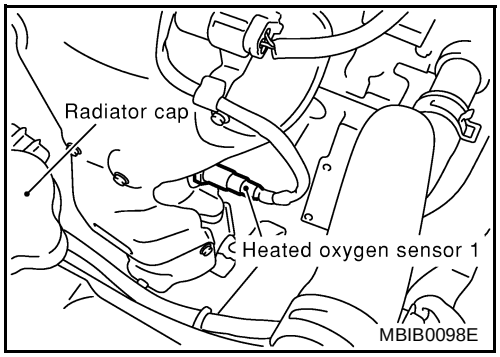


2. RETIGHTEN HEATED OXYGEN SENSOR 1

Loosen and retighten heated oxygen sensor 1.

Tightening torque: 40 - 60 N·m (4.1 - 6.2 kg-m, 30 - 44 ft-lb)

>> GO TO 3.

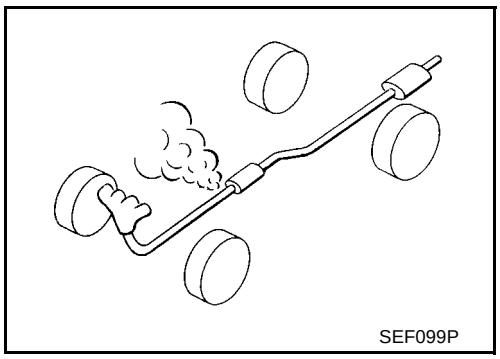


3. CHECK FOR EXHAUST AIR LEAK

1. Start engine and run it at idle.
2. Listen for an exhaust air leak before three way catalyst (Manifold).

OK or NG

OK >> GO TO 4.
NG >> Repair or replace.



4. CHECK FOR INTAKE AIR LEAK

Listen for an intake air leak after the mass air flow sensor.

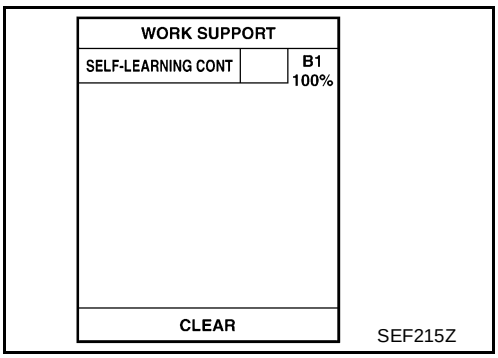
OK or NG

OK >> GO TO 5.
NG >> Repair or replace.

5. CLEAR THE SELF-LEARNING DATA

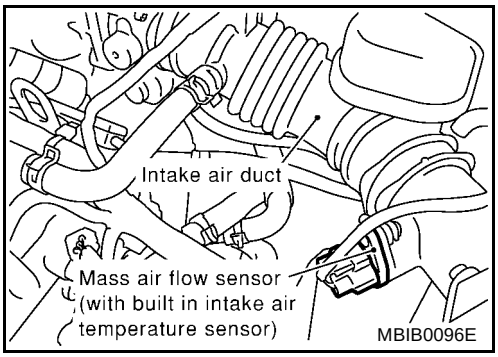
With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching “CLEAR”.
4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 or P0172 detected?
   Is it difficult to start engine?



Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF”.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure that DTC P0102 is displayed.
6. Erase the DTC memory. Refer to EC-73, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
7. Make sure that DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 or P0172 detected?
   Is it difficult to start engine?



Yes or No

Yes >> Perform trouble diagnosis for DTC P0171 or DTC P0172 (Refer to EC-285 or EC-299).
No >> GO TO 6.

6. CHECK HO2S1 GROUND CIRCUIT FOR OPEN AND SHORT

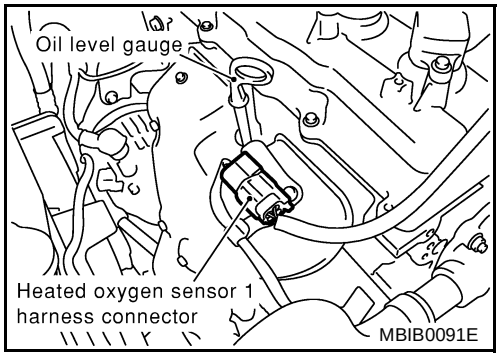
1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 1 harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminal 74 and HO2S1 terminal 3. Refer to Wiring Diagram.

Continuity should exist.

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.



7. CHECK HO2S1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 35 and HO2S1 terminal 2. Refer to Wiring Diagram.

Continuity should exist.

2. Check harness continuity between ECM terminal 35 or HO2S1 terminal 2 and ground. Refer to Wiring Diagram.

Continuity should not exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 8.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK HEATED OXYGEN SENSOR 1 HEATER

Refer to EC-161, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> Replace malfunctioning heated oxygen sensor 1.

9. CHECK MASS AIR FLOW SENSOR

Refer to EC-188, "Component Inspection" .

OK or NG

OK >> GO TO 10.
NG >> Replace mass air flow sensor.

10. CHECK PCV VALVE

Refer to EC-557, "Component Inspection" .

OK or NG

OK >> GO TO 11.
NG >> Replace PCV valve.

11. CHECK HEATED OXYGEN SENSOR 1

Refer to EC-221, "Component Inspection" .

OK or NG

OK >> GO TO 12.
NG >> Replace heated oxygen sensor 1.

12. CHECK INTERMITTENT INCIDENT

Refer to EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

EBS00FPN

HEATED OXYGEN SENSOR 1

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “MANU TRIG” and adjust “TRIGGER POINT” to 100% in “DATA MONITOR” mode with CONSULT-II.
3. Select “HO2S1 (B1)” and “HO2S1 MNTR (B1)”.
4. Hold engine speed at 2,000 rpm under no load during the following steps.
5. Touch “RECORD” on CONSULT-II screen.

DATA MONITOR	
MONITOR	NO DTC
ENG SPEED	XXX rpm
MAS A/F SE-B1	XXX V
COOLAN TEMP/S	XXX °C
HO2S1 (B1)	XXX V
HO2S1 MNTR (B1)	LEAN

SEF646Y

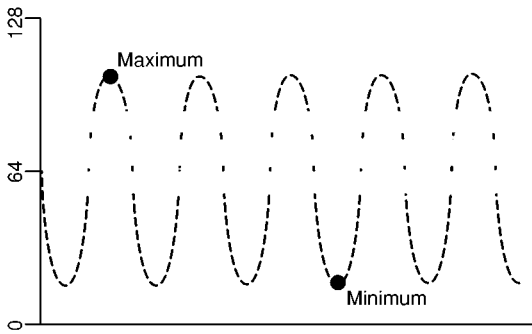
6. Check the following.
   - “HO2S1 MNTR (B1)” in “DATA MONITOR” mode changes from “RICH” to “LEAN” to “RICH” 5 times in 10 seconds.
     5 times (cycles) are counted as shown at right.
   - “HO2S1 (B1)” voltage goes above 0.6V at least once.
   - “HO2S1 (B1)” voltage goes below 0.3V at least once.
   - “HO2S1 (B1)” voltage never exceeds 1.0V.

cycle	1	2	3	4	5
HO2S1 MNTR (B1)	R-L	R-L	R-L	R-L	R-L

R means HO2S1 MNTR (B1) indicates RICH
L means HO2S1 MNTR (B1) indicates LEAN

SEF217YA

Trigger	ENG SPEED	HO2S1 (B1)
	rpm	V
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX



- Maximum voltage should be over 0.6V at least one time.
- Minimum voltage should be below 0.30V at least one time.

SEF648Y

CAUTION:

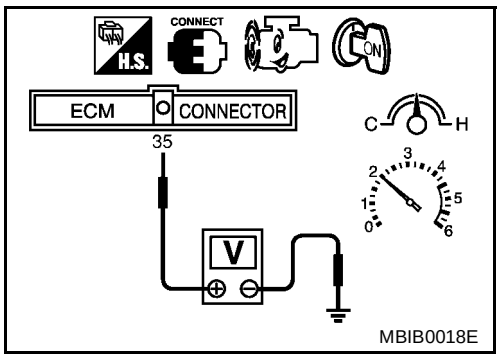
- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**

- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 (HO2S1 signal) and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no load.
   - The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds.
   - The maximum voltage is over 0.6V at least one time.
   - The minimum voltage is below 0.3V at least one time.
   - The voltage never exceeds 1.0V.

   1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V
   2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V



CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

EBS00FPO

HEATED OXYGEN SENSOR 1

Refer to EM-23, "EXHAUST MANIFOLD AND CATALYTIC CONVERTER" .

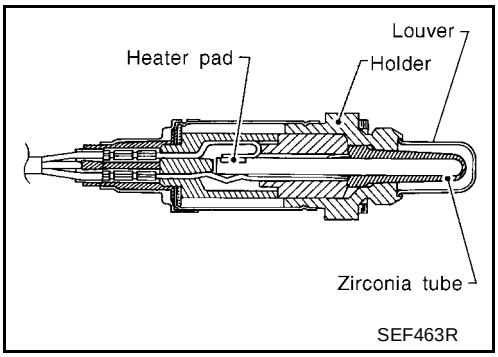
DTC P0133, P0153, HO2S1 (QG18DE)

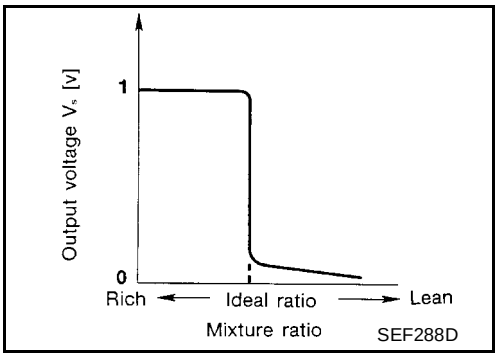
PFP:22690

Component Description

EBS00FPP

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.





CONSULT-II Reference Value in Data Monitor Mode

EBS00FPQ

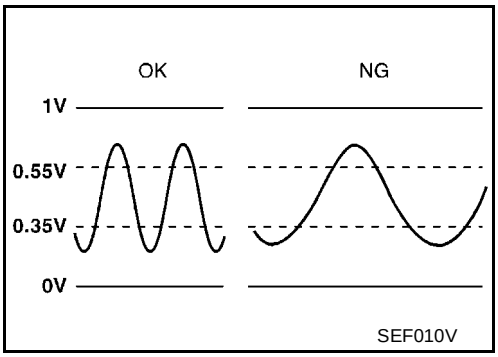
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S1 (B1) HO2S1 (B2)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ⟷ Approx. 0.6 - 1.0V
HO2S1 MNTR (B1) HO2S1 MNTR (B2)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	LEAN ⟷ RICH Changes more than 5 times during 10 seconds.

On Board Diagnosis Logic

EBS00FPR

To judge the malfunction of heated oxygen sensor 1, this diagnosis measures response time of heated oxygen sensor 1 signal. The time is compensated by engine operating (speed and load), fuel feedback control constant, and heated oxygen sensor 1 temperature index. Judgment is based on whether the compensated time (heated oxygen sensor 1 cycling time index) is inordinately long or not.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0133 0133 (Bank 1)	Heated oxygen sensor 1 circuit slow response	The response of the voltage signal from the sensor takes more than the specified time.	● Harness or connectors (The sensor circuit is open or shorted.) ● Heated oxygen sensor 1 ● Heated oxygen sensor 1 heater ● Fuel pressure ● Injectors ● Intake air leaks ● Exhaust gas leaks ● PCV valve ● Mass air flow sensor
P0153 0153 (Bank 2)			

DTC Confirmation Procedure

EBS00FPS

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

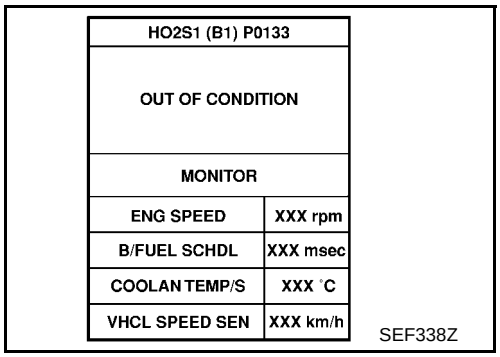
- **Always perform at a temperature above −10°C (14°F).**
- **Before performing the following procedure, confirm that battery voltage is more than 11V at idle.**

WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Stop engine and wait at least 10 seconds.
3. Turn ignition switch “ON” and select “HO2S1 (B1) P0133” or “HO2S1 (B2) P0153” of “HO2S1” in “DTC WORK SUPPORT” mode with CONSULT-II.
4. Touch “START”.
5. Start engine and let it idle for at least 3 minutes.

   NOTE:

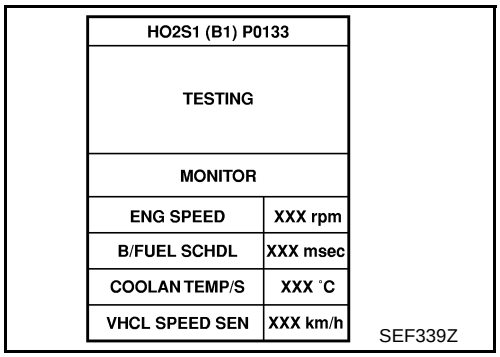
   Never raise engine speed above 3,600 rpm (M/T models) or 3,200 rpm (A/T models) after this step. If the engine speed limit is exceeded, return to step 5.



SEF338Z

6. When the following conditions are met, “TESTING” will be displayed on the CONSULT-II screen. Maintain the conditions continuously until “TESTING” changes to “COMPLETED”. (It will take approximately 20 to 50 seconds.)

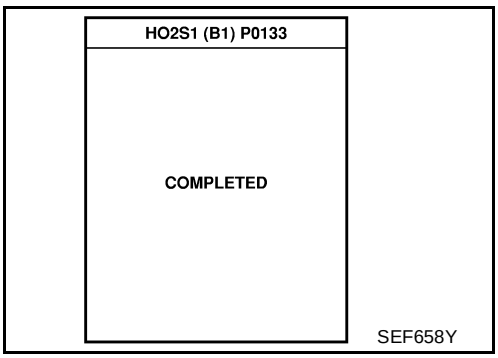
ENG SPEED	More than 1,900 rpm (A/T models) More than 2,100 rpm (M/T models)
Vehicle speed	More than 80 km/h (50 MPH)
B/FUEL SCHDL	3.7 - 7.8 msec (A/T models) 3.2 - 6.7 msec (M/T models)
Selector lever	Suitable position



SEF339Z

If “TESTING” is not displayed after 5 minutes, retry from step 2.

7. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”. If “NG” is displayed, refer to EC-229, "Diagnostic Procedure" .



Overall Function Check

EBS00FPT

Use this procedure to check the overall function of the heated oxygen sensor 1 circuit. During this check, a 1st trip DTC might not be confirmed.

WITH GST

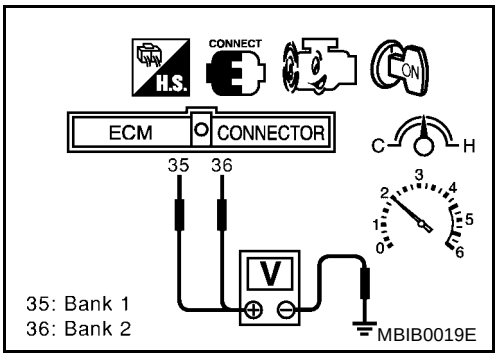
1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 [HO2S1(B1) signal] or 36 [HO2S1(B2) signal] and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no load.

– The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds.

1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V

2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V

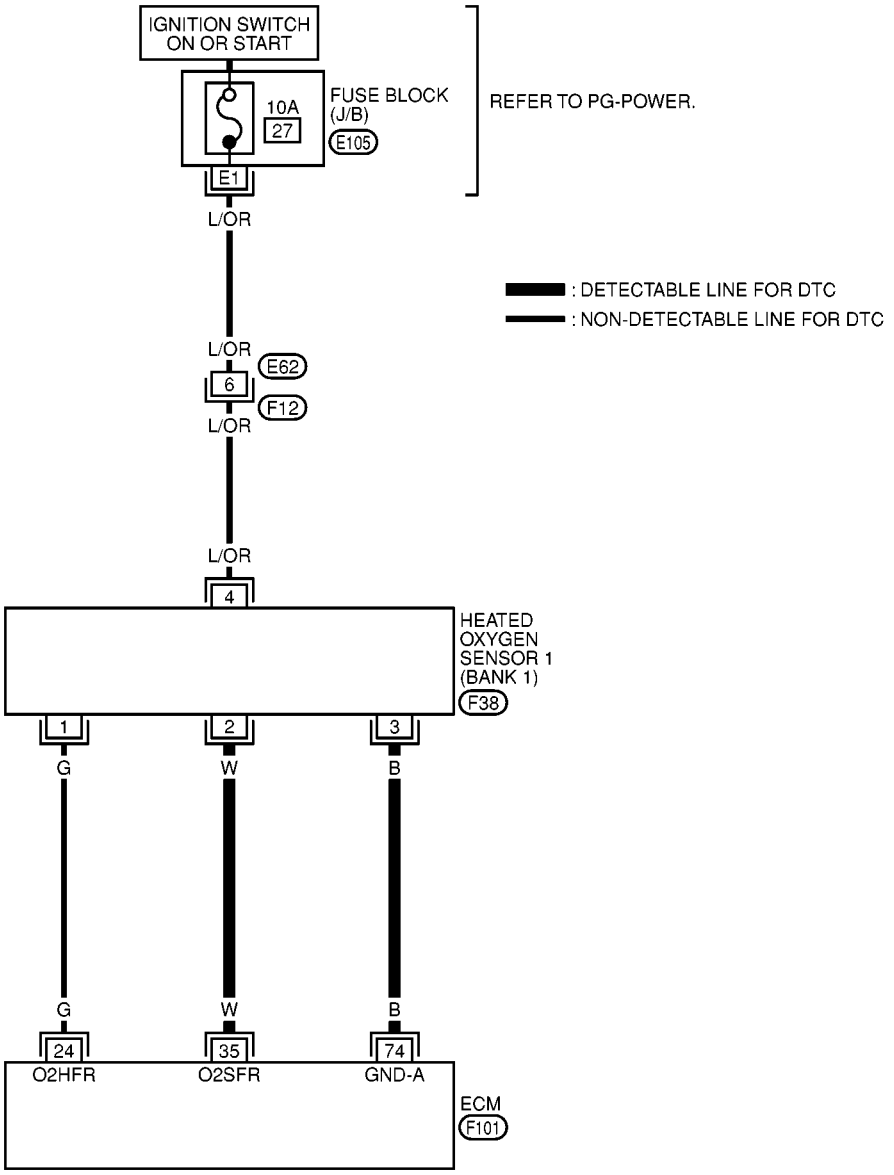
4. If NG, go to EC-229, "Diagnostic Procedure" .

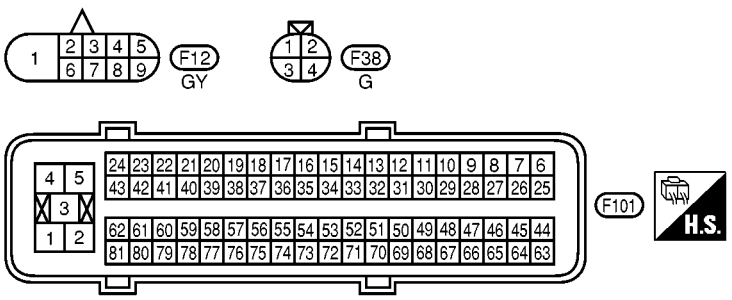


Wiring Diagram
BANK 1

EBS00FPU

EC-O2S1B1-01





REFER TO THE FOLLOWING.
E105 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0052E

Specification data are reference values and are measured between each terminal and ground.

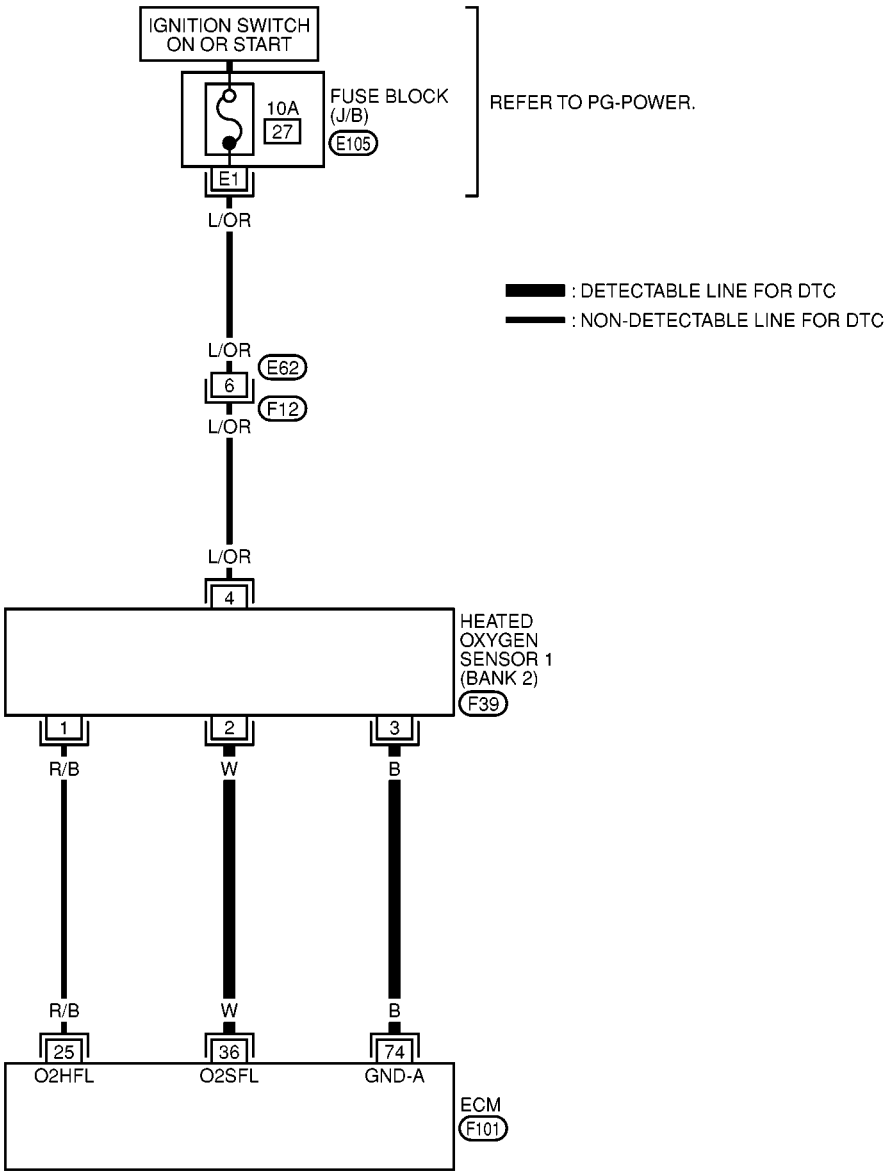
CAUTION:

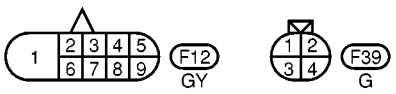
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

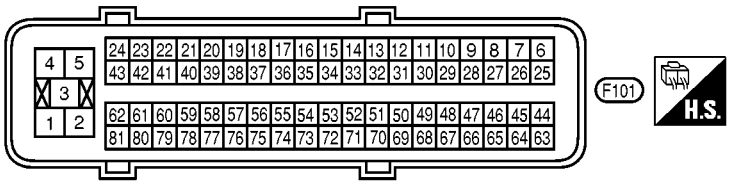
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
35	W	Heated oxygen sensor 1 (bank 1)	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V (Periodically change)
74	B	Heated oxygen sensor ground	**[Engine is running]** ● Idle speed	Approximately 0V

BANK 2

EC-O2S1B2-01







REFER TO THE FOLLOWING.
E105 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0054E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
36	W	Heated oxygen sensor 1 (bank 2)	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V (Periodically change)
74	B	Heated oxygen sensor ground	**[Engine is running]** ● Idle speed	Approximately 0V

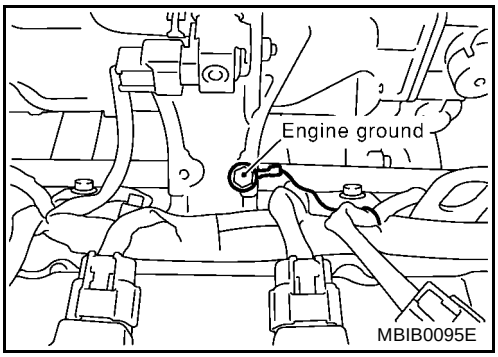
Diagnostic Procedure

EBS00FPV

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

>> GO TO 2.

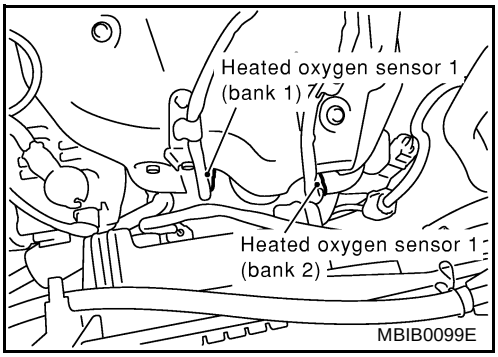


2. RETIGHTEN HEATED OXYGEN SENSOR 1

Loosen and retighten heated oxygen sensor 1.

Tightening torque: 40 - 60 N·m (4.1 - 6.2 kg-m, 30 - 44 ft-lb)

>> GO TO 3.

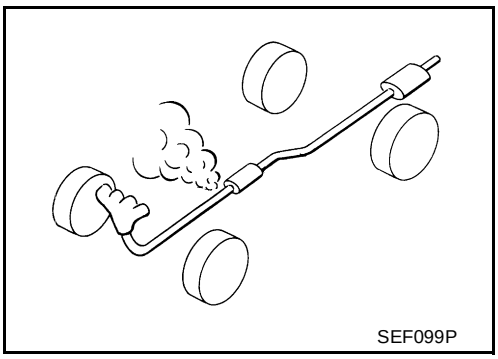


3. CHECK FOR EXHAUST AIR LEAK

1. Start engine and run it at idle.
2. Listen for an exhaust air leak before three way catalyst (Manifold).

OK or NG

OK >> GO TO 4.
NG >> Repair or replace.



4. CHECK FOR INTAKE AIR LEAK

Listen for an intake air leak after the mass air flow sensor.

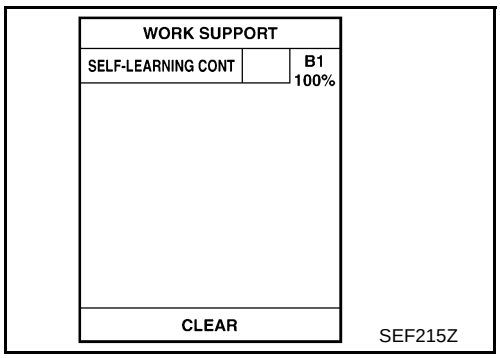
OK or NG

OK >> GO TO 5.
NG >> Repair or replace.

5. CLEAR THE SELF-LEARNING DATA

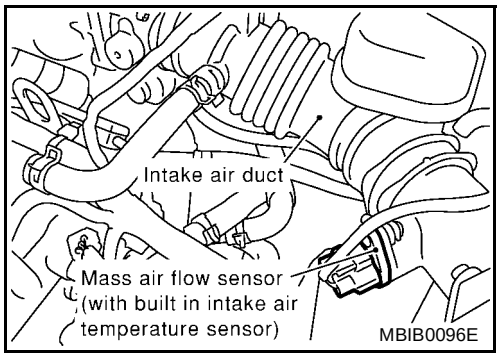
With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching “CLEAR”.
4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171, P0172, P0174 or P0175 detected?
   Is it difficult to start engine?



Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF”.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure that DTC P0102 is displayed.
6. Erase the DTC memory. Refer to EC-73, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
7. Make sure that DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171, P0172, P0174 or P0175 detected?
   Is it difficult to start engine?



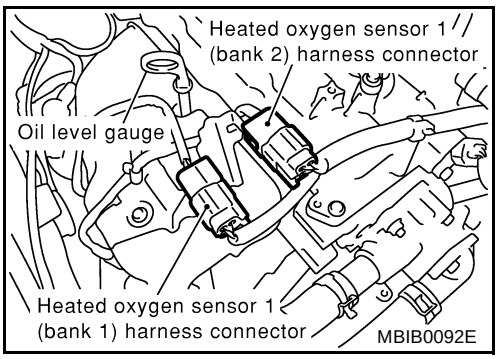
Yes or No

Yes >> Perform trouble diagnosis for DTC P0171, P0174 or DTC P0172, P0175 (Refer to EC-291 or EC-305).
No >> GO TO 6.

6. CHECK HO2S1 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 1 harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminal 74 and HO2S1 terminal 3.
   Refer to Wiring Diagram.

Continuity should exist.



5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK HO2S1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal and HO2S1 terminal as follows.
   Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM	Sensor	
P0133	35	2	1
P0153	36	2	2

Continuity should exist.

2. Check harness continuity between the following terminals and ground.
   Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM	Sensor	
P0133	35	2	1
P0153	36	2	2

Continuity should not exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 8.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK HEATED OXYGEN SENSOR 1 HEATER

Refer to EC-169, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> Replace malfunctioning heated oxygen sensor 1.

9. CHECK MASS AIR FLOW SENSOR

Refer to EC-188, "Component Inspection" .

OK or NG

OK >> GO TO 10.
NG >> Replace mass air flow sensor.

10. CHECK PCV VALVE

Refer to EC-557, "Component Inspection" .

OK or NG

OK >> GO TO 11.
NG >> Replace PCV valve.

11. CHECK HEATED OXYGEN SENSOR 1

Refer to EC-232, "Component Inspection" .

OK or NG

OK >> GO TO 12.
NG >> Replace malfunctioning heated oxygen sensor 1.

12. CHECK INTERMITTENT INCIDENT

Refer to EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

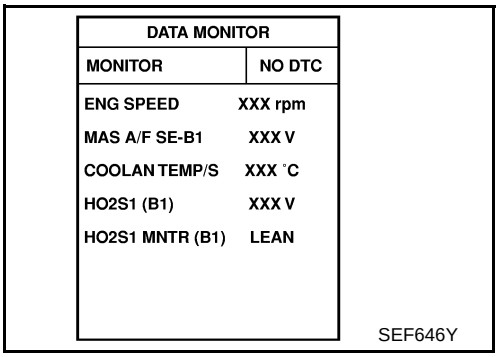
Component Inspection

EBS00FPW

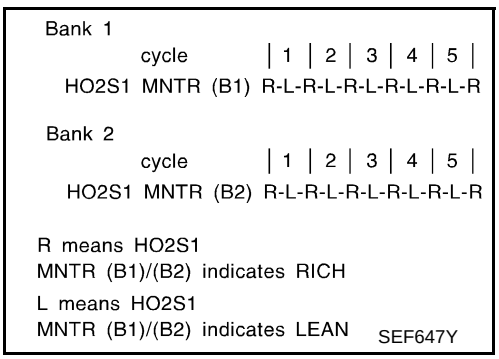
HEATED OXYGEN SENSOR 1

With CONSULT-II

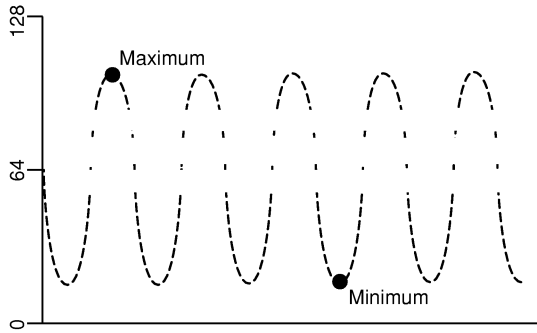
1. Start engine and warm it up to normal operating temperature.
2. Select “MANU TRIG” and adjust “TRIGGER POINT” to 100% in “DATA MONITOR” mode with CONSULT-II.
3. Select “HO2S1 (B1)/(B2)” and “HO2S1 MNTR (B1)/(B2)”.
4. Hold engine speed at 2,000 rpm under no load during the following steps.
5. Touch “RECORD” on CONSULT-II screen.



6. Check the following.
   - “HO2S1 MNTR (B1)/(B2)” in “DATA MONITOR” mode changes from “RICH” to “LEAN” to “RICH” 5 times in 10 seconds.
     5 times (cycles) are counted as shown at right.
   - “HO2S1 (B1)/(B2)” voltage goes above 0.6V at least once.
   - “HO2S1 (B1)/(B2)” voltage goes below 0.3V at least once.
   - “HO2S1 (B1)/(B2)” voltage never exceeds 1.0V.



Trigger	ENG SPEED	HO2S1 (B1)
	rpm	V
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX



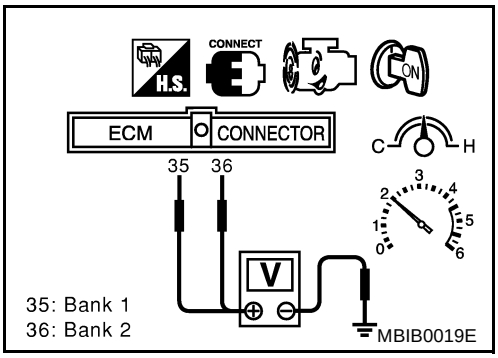
CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 [HO2S1 (B1) signal] or 36 [HO2S1 (B2) signal] and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no load.
   - The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds.
   - The maximum voltage is over 0.6V at least one time.
   - The minimum voltage is below 0.3V at least one time.
   - The voltage never exceeds 1.0V.

   1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V
   2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V



CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

EBS00FPX

HEATED OXYGEN SENSOR 1

Refer to EM-23, "EXHAUST MANIFOLD AND CATALYTIC CONVERTER" .

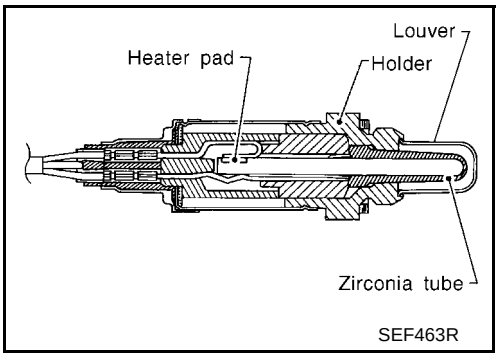
DTC P0134 HO2S1 (QG16DE)

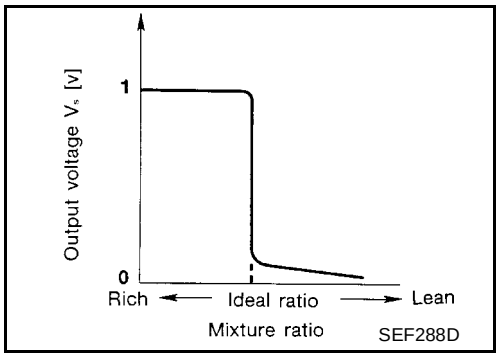
PFP:22690

Component Description

EBS00FPY

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.





CONSULT-II Reference Value in Data Monitor Mode

EBS00FPZ

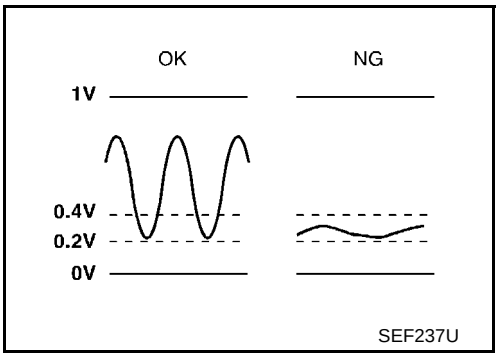
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S1 (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S1 MNTR (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	LEAN ←→ RICH Changes more than 5 times during 10 seconds.

On Board Diagnosis Logic

EBS00FQ0

Under the condition in which the heated oxygen sensor 1 signal is not input, the ECM circuits will read a continuous approximately 0.3V. Therefore, for this diagnosis, the time that output voltage is within 200 to 400 mV range is monitored, and the diagnosis checks that this time is not inordinately long.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0134 0134	Heated oxygen sensor 1 circuit no activity detected	The voltage from the sensor is constantly approx. 0.3V.	● Harness or connectors (The sensor circuit is open or shorted.) ● Heated oxygen sensor 1

DTC Confirmation Procedure

EBS00FQ1

CAUTION:
Always drive vehicle at a safe speed.

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 11V at idle.

WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “HO2S1 (B1) P0134” of “HO2S1” in “DTC WORK SUPPORT” mode with CONSULT-II.
3. Touch “START”.
4. Let it idle for at least 3 minutes.

   NOTE:
   Never raise engine speed above 3,600 rpm after this step. If the engine speed limit is exceeded, return to step 4.

HO2S1 (B1) P0134	
OUT OF CONDITION	
MONITOR	
ENG SPEED	XXX rpm
B/FUEL SCHDL	XXX msec
COOLAN TEMP/S	XXX °C
VHCL SPEED SEN	XXX km/h

PBIB0544E

5. When the following conditions are met, “TESTING” will be displayed on the CONSULT-II screen. Maintain the conditions continuously until “TESTING” changes to “COMPLETED”. (It will take approximately 10 to 60 seconds.)

ENG SPEED	1,700 - 3,800 rpm
Vehicle speed	More than 64 km/h (40 MPH)
B/FUEL SCHDL	2.9 - 7.3 msec
Selector lever	Suitable position

HO2S1 (B1) P0134	
TESTING	
MONITOR	
ENG SPEED	XXX rpm
B/FUEL SCHDL	XXX msec
COOLAN TEMP/S	XXX °C
VHCL SPEED SEN	XXX km/h

PBIB0545E

   If “TESTING” is not displayed after 5 minutes, retry from step 2.
6. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”. If “NG” is displayed, refer to EC-238, "Diagnostic Procedure" .

HO2S1 (B1) P0134
COMPLETED

SEC750C

Overall Function Check

EBS00FQ2

Use this procedure to check the overall function of the heated oxygen sensor 1 circuit. During this check, a 1st trip DTC might not be confirmed.

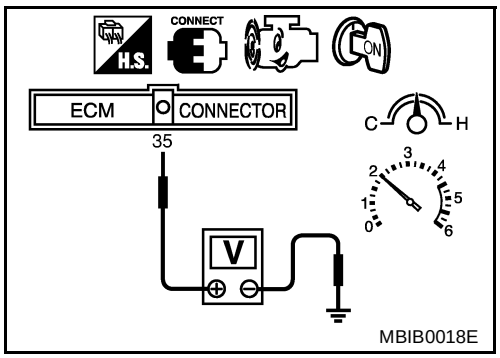
WITH GST

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 (HO2S1 signal) and engine ground.

3. Check the following with engine speed held at 2,000 rpm constant under no load.

- The voltage does not remain in the range of 0.2 - 0.4V.

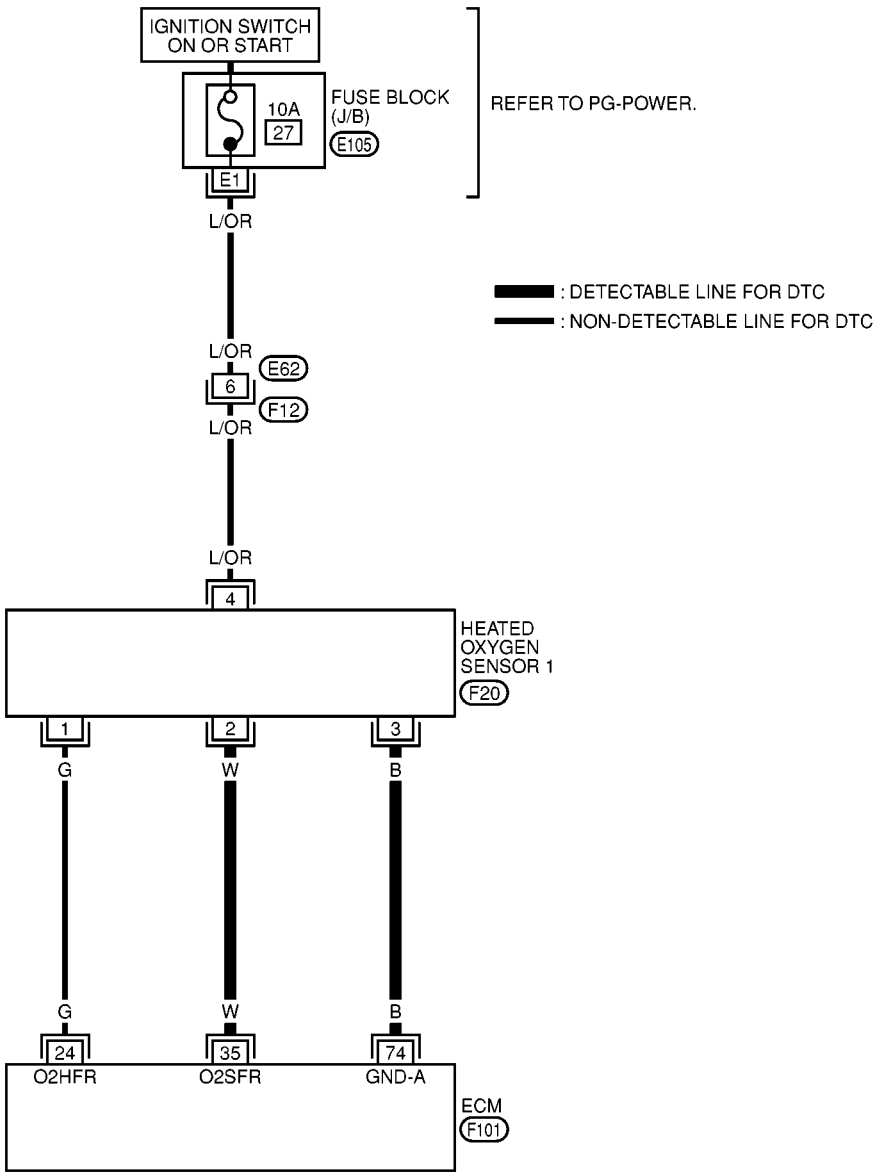
4. If NG, go to EC-238, "Diagnostic Procedure" .

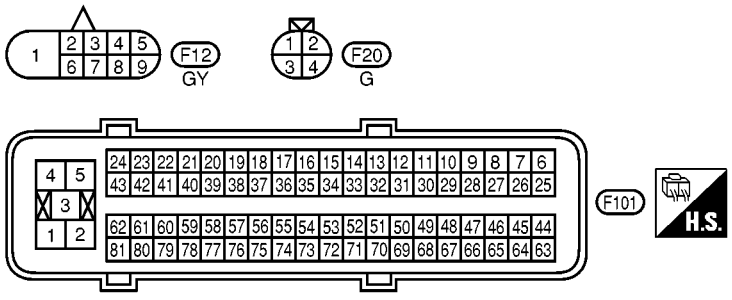


Wiring Diagram

EBS00FQ3

EC-HO2S1-01





REFER TO THE FOLLOWING.
E105 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0048E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
35	W	Heated oxygen sensor 1	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V (Periodically change)
74	B	Heated oxygen sensor ground	**[Engine is running]** ● Idle speed	Approximately 0V

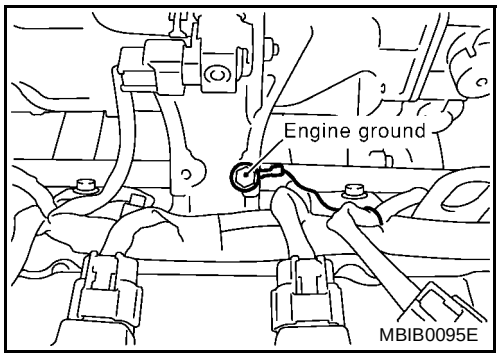
Diagnostic Procedure

EBS00FQ4

1. INSPECTION START

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

>> GO TO 2.



2. CHECK HO2S1 GROUND CIRCUIT FOR OPEN AND SHORT

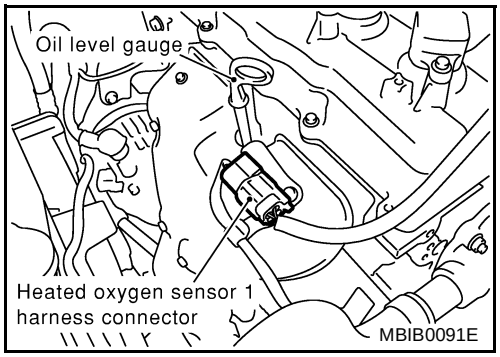
1. Disconnect heated oxygen sensor 1 harness connector.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 74 and HO2S1 terminal 3. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.



3. CHECK HO2S1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 35 and HO2S1 terminal 2. Refer to Wiring Diagram.

   Continuity should exist.

2. Check harness continuity between ECM terminal 35 or HO2S1 terminal 2 and ground. Refer to Wiring Diagram.

   Continuity should not exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK HEATED OXYGEN SENSOR 1

Refer to EC-239, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace heated oxygen sensor 1.

5. CHECK INTERMITTENT INCIDENT

Refer to EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

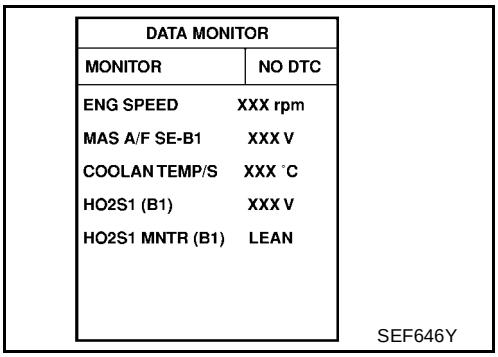
Component Inspection

EBS00FQ5

HEATED OXYGEN SENSOR 1

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “MANU TRIG” and adjust “TRIGGER POINT” to 100% in “DATA MONITOR” mode with CONSULT-II.
3. Select “HO2S1 (B1)” and “HO2S1 MNTR (B1)”.
4. Hold engine speed at 2,000 rpm under no load during the following steps.
5. Touch “RECORD” on CONSULT-II screen.



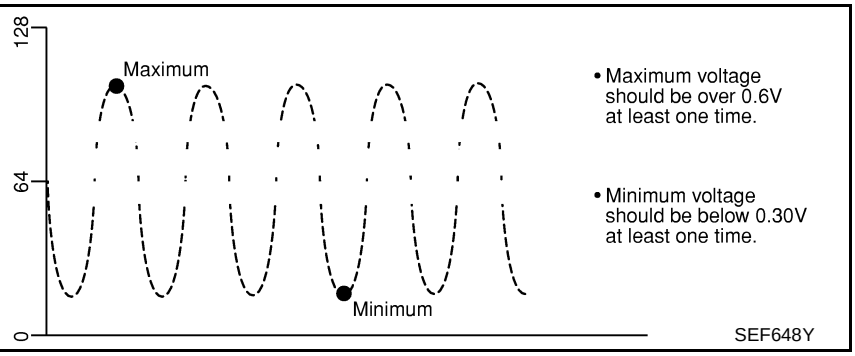
6. Check the following.
   - “HO2S1 MNTR (B1)” in “DATA MONITOR” mode changes from “RICH” to “LEAN” to “RICH” 5 times in 10 seconds.
     5 times (cycles) are counted as shown at right.
   - “HO2S1 (B1)” voltage goes above 0.6V at least once.
   - “HO2S1 (B1)” voltage goes below 0.3V at least once.
   - “HO2S1 (B1)” voltage never exceeds 1.0V.

cycle	1	2	3	4	5
HO2S1 MNTR (B1)	R-L-R-L-R-L-R-L-R-L-R				

R means HO2S1 MNTR (B1) indicates RICH
L means HO2S1 MNTR (B1) indicates LEAN

SEF217YA

Trigger	ENG SPEED	HO2S1 (B1)
	rpm	V
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX

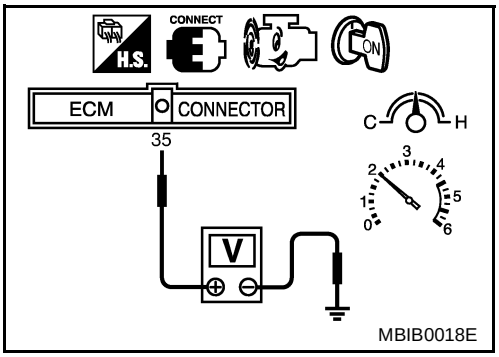


CAUTION:
- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 (HO2S1 signal) and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no load.
   - The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds.
   - The maximum voltage is over 0.6V at least one time.
   - The minimum voltage is below 0.3V at least one time.
   - The voltage never exceeds 1.0V.

   1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V
   2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V



CAUTION:
- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

EBS00FQ6

HEATED OXYGEN SENSOR 1

Refer to EM-23, "EXHAUST MANIFOLD AND CATALYTIC CONVERTER" .

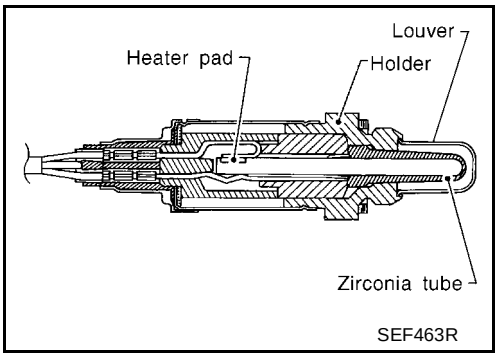
DTC P0134, P0154 HO2S1 (QG18DE)

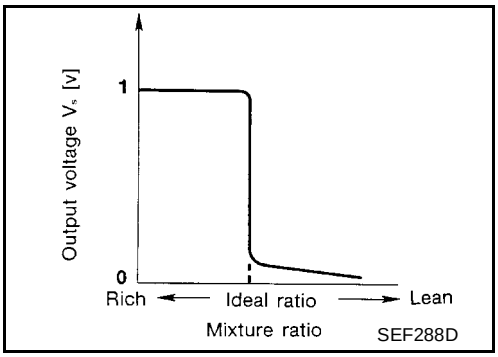
PFP:22690

Component Description

EBS00FQ7

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.





CONSULT-II Reference Value in Data Monitor Mode

EBS00FQ8

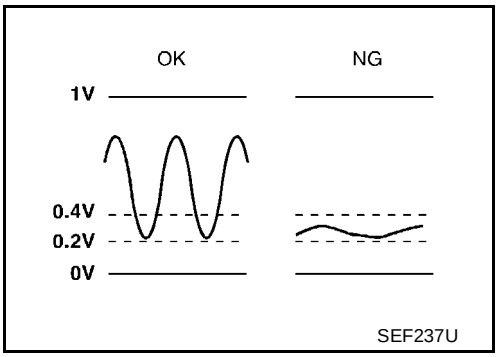
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S1 (B1) HO2S1 (B2)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ⟷ Approx. 0.6 - 1.0V
HO2S1 MNTR (B1) HO2S1 MNTR (B2)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	LEAN ⟷ RICH Changes more than 5 times during 10 seconds.

On Board Diagnosis Logic

EBS00FQ9

Under the condition in which the heated oxygen sensor 1 signal is not input, the ECM circuits will read a continuous approximately 0.3V. Therefore, for this diagnosis, the time that output voltage is within 200 to 400 mV range is monitored, and the diagnosis checks that this time is not inordinately long.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0134 0134 (Bank 1)	Heated oxygen sensor 1 circuit no activity detected	The voltage from the sensor is constantly approx. 0.3V.	● Harness or connectors (The sensor circuit is open or shorted.) ● Heated oxygen sensor 1
P0154 0154 (Bank 2)			

DTC Confirmation Procedure

EBS00FQA

CAUTION:
Always drive vehicle at a safe speed.

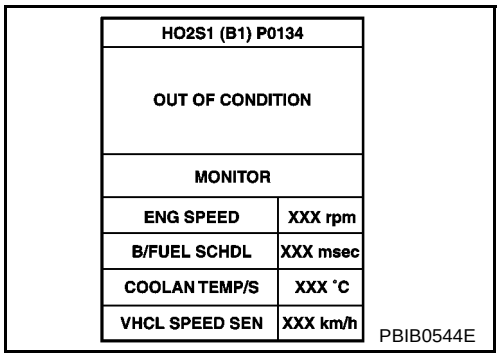
NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 11V at idle.

WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “HO2S1 (B1) P0134” or “HO2S1 (B2) P0154” of “HO2S1” in “DTC WORK SUPPORT” mode with CONSULT-II.
3. Touch “START”.
4. Let it idle for at least 3 minutes.

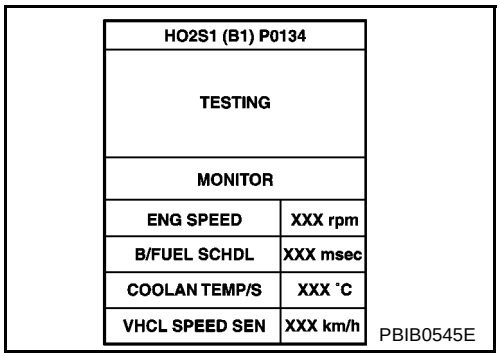
   NOTE:
   Never raise engine speed above 3,600 rpm (M/T models) or 3,200 rpm (A/T models) after this step. If the engine speed limit is exceeded, return to step 4.



PBIB0544E

5. When the following conditions are met, “TESTING” will be displayed on the CONSULT-II screen. Maintain the conditions continuously until “TESTING” changes to “COMPLETED”. (It will take approximately 10 to 60 seconds.)

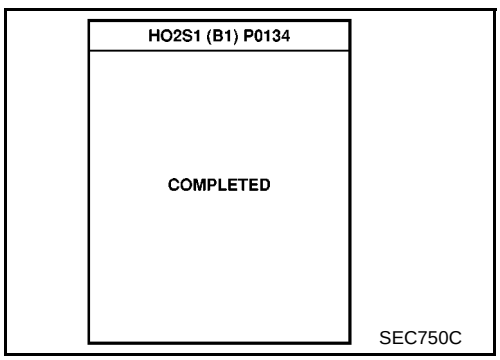
ENG SPEED	1,500 - 3,400 rpm (A/T models) 1,700 - 3,800 rpm (M/T models)
Vehicle speed	More than 64 km/h (40 MPH)
B/FUEL SCHDL	3.3 - 8.7 msec (A/T models) 2.9 - 7.3 msec (M/T models)
Selector lever	Suitable position



PBIB0545E

If “TESTING” is not displayed after 5 minutes, retry from step 2.

6. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”. If “NG” is displayed, refer to EC-247, "Diagnostic Procedure" .



SEC750C

Overall Function Check

EBS00FQB

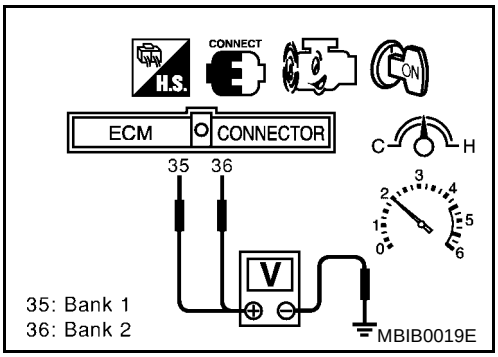
Use this procedure to check the overall function of the heated oxygen sensor 1 circuit. During this check, a 1st trip DTC might not be confirmed.

WITH GST

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 [HO2S1 (B1) signal] or 36 [HO2S1 (B2) signal] and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no load.

– The voltage does not remain in the range of 0.2 - 0.4V.

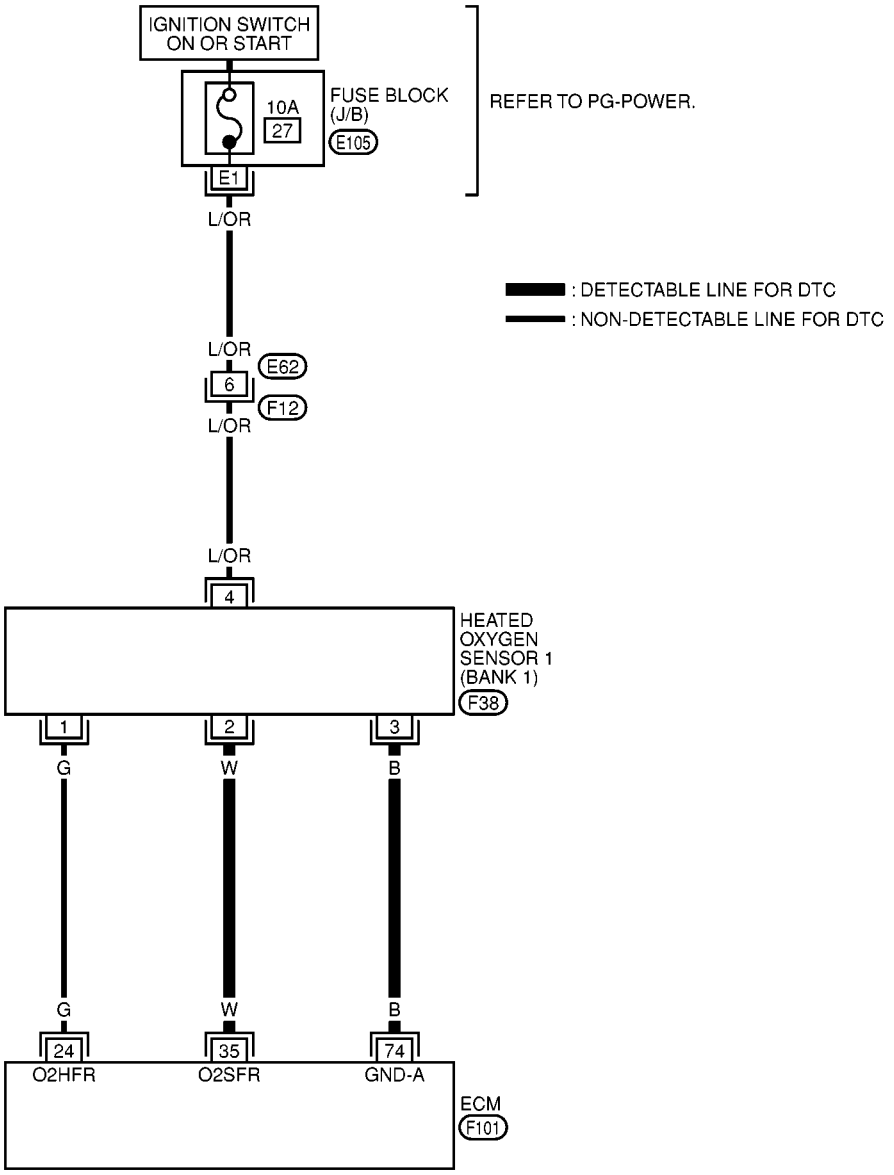
4. If NG, go to EC-247, "Diagnostic Procedure" .

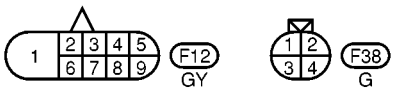


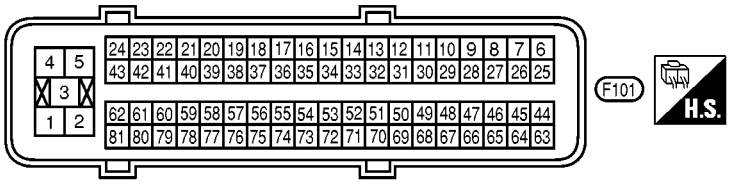
Wiring Diagram
BANK 1

EBS00FQC

EC-O2S1B1-01







REFER TO THE FOLLOWING.
E105 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0052E

Specification data are reference values and are measured between each terminal and ground.

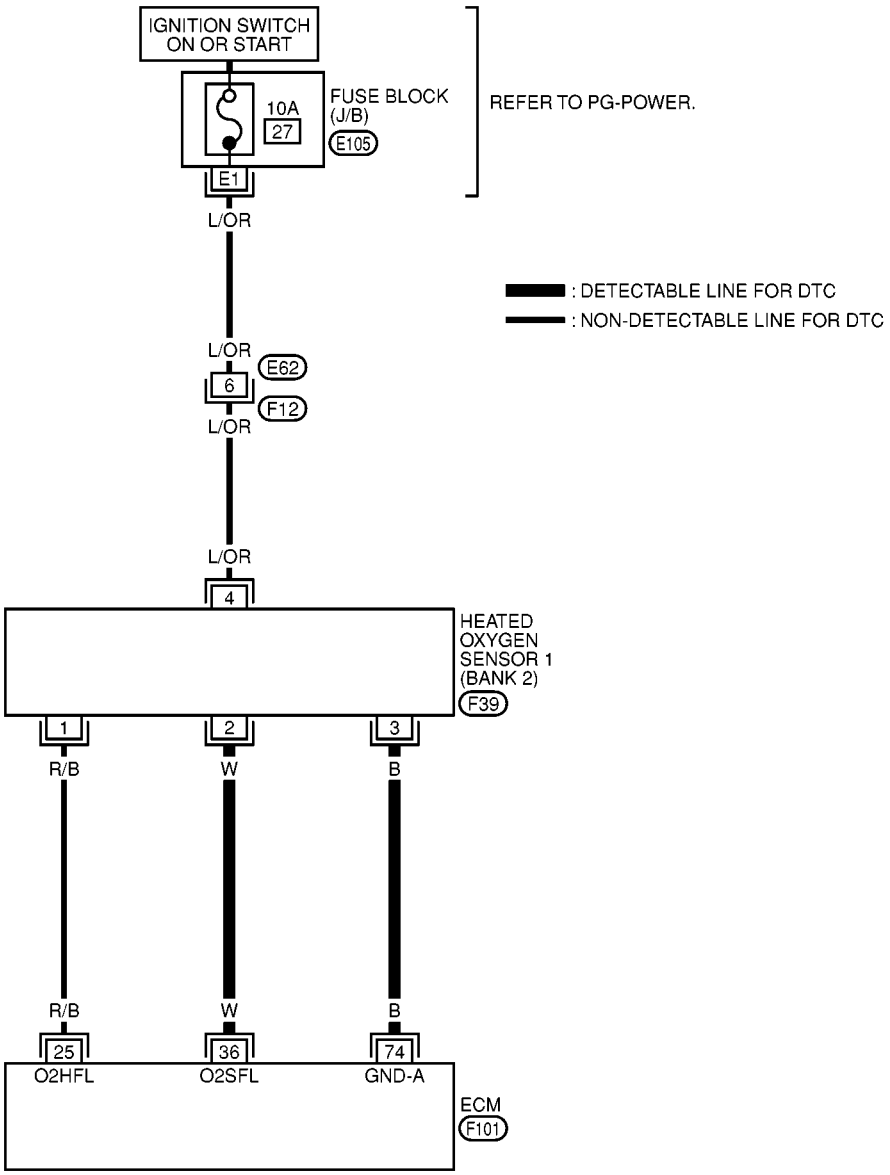
CAUTION:

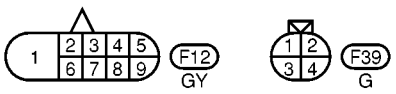
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

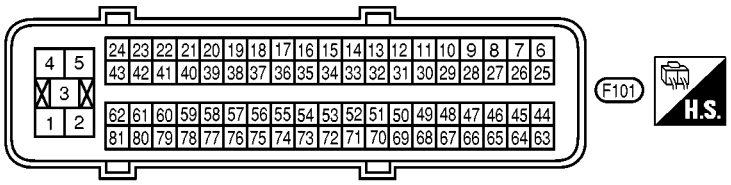
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
35	W	Heated oxygen sensor 1 (bank 1)	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V (Periodically change)
74	B	Heated oxygen sensor ground	**[Engine is running]** ● Idle speed	Approximately 0V

BANK 2

EC-O2S1B2-01







REFER TO THE FOLLOWING.
E105 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0054E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
36	W	Heated oxygen sensor 1 (bank 2)	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V (Periodically change)
74	B	Heated oxygen sensor ground	**[Engine is running]** ● Idle speed	Approximately 0V

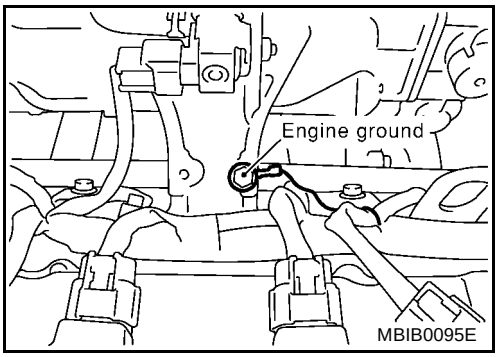
Diagnostic Procedure

EBS00FQD

1. INSPECTION START

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

>> GO TO 2.



2. CHECK HO2S1 GROUND CIRCUIT FOR OPEN AND SHORT

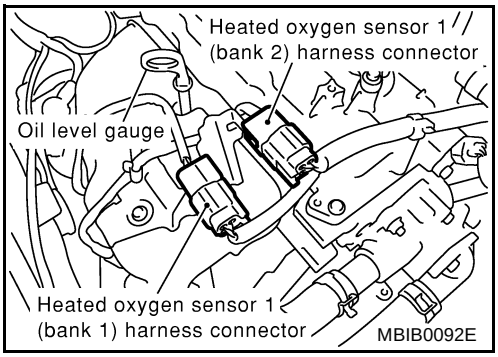
1. Disconnect heated oxygen sensor 1 harness connector.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 74 and HO2S1 terminal 3.
   Refer to Wiring Diagram.

   Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.



3. CHECK HO2S1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal and HO2S1 terminal as follows. Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM	Sensor	
P0134	35	2	1
P0154	36	2	2

Continuity should exist.

2. Check harness continuity between the following terminals and ground. Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM	Sensor	
P0134	35	2	1
P0154	36	2	2

Continuity should not exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK HEATED OXYGEN SENSOR 1

Refer to EC-248, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace malfunctioning heated oxygen sensor 1.

5. CHECK INTERMITTENT INCIDENT

Refer to EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

EBS00FQE

HEATED OXYGEN SENSOR 1

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “MANU TRIG” and adjust “TRIGGER POINT” to 100% in “DATA MONITOR” mode with CONSULT-II.
3. Select “HO2S1 (B1)/(B2)” and “HO2S1 MNTR (B1)/(B2)”.
4. Hold engine speed at 2,000 rpm under no load during the following steps.

5. Touch “RECORD” on CONSULT-II screen.

DATA MONITOR	
MONITOR	NO DTC
ENG SPEED	XXX rpm
MAS A/F SE-B1	XXX V
COOLAN TEMP/S	XXX °C
HO2S1 (B1)	XXX V
HO2S1 MNTR (B1)	LEAN

SEF646Y

6. Check the following.
   - “HO2S1 MNTR (B1)/(B2)” in “DATA MONITOR” mode changes from “RICH” to “LEAN” to “RICH” 5 times in 10 seconds.
     5 times (cycles) are counted as shown at right.
   - “HO2S1 (B1)/(B2)” voltage goes above 0.6V at least once.
   - “HO2S1 (B1)/(B2)” voltage goes below 0.3V at least once.
   - “HO2S1 (B1)/(B2)” voltage never exceeds 1.0V.

Bank 1

cycle	1	2	3	4	5
HO2S1 MNTR (B1)	R-L	R-L	R-L	R-L	R-L

Bank 2

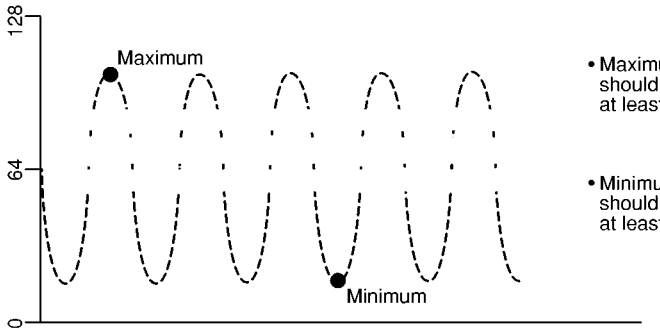
cycle	1	2	3	4	5
HO2S1 MNTR (B2)	R-L	R-L	R-L	R-L	R-L

R means HO2S1 MNTR (B1)/(B2) indicates RICH

L means HO2S1 MNTR (B1)/(B2) indicates LEAN

SEF647Y

Trigger	ENG SPEED	HO2S1 (B1)
	rpm	V
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX



SEF648Y

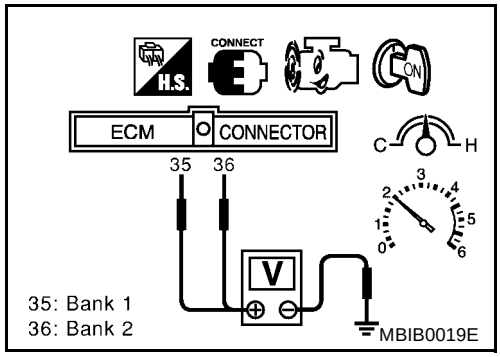
CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 [HO2S1 (B1) signal] or 36 [HO2S1 (B2) signal] and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no load.
   - The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds.
   - The maximum voltage is over 0.6V at least one time.
   - The minimum voltage is below 0.3V at least one time.
   - The voltage never exceeds 1.0V.

   1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V
   2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V



CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

EBS00FQF

HEATED OXYGEN SENSOR 1

Refer to EM-23, "EXHAUST MANIFOLD AND CATALYTIC CONVERTER" .

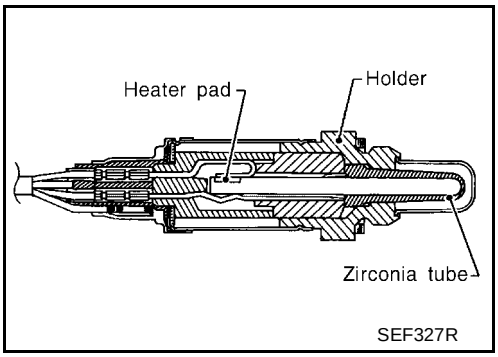
DTC P0138 HO2S2 (QG16DE)

PFP:226A0

Component Description

EBS00FQG

The heated oxygen sensor 2, after three way catalyst, monitors the oxygen level in the exhaust gas.
Even if switching characteristics of the heated oxygen sensor 1 are shifted, the air fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.
This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.
Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.



CONSULT-II Reference Value in Data Monitor Mode

EBS00FQH

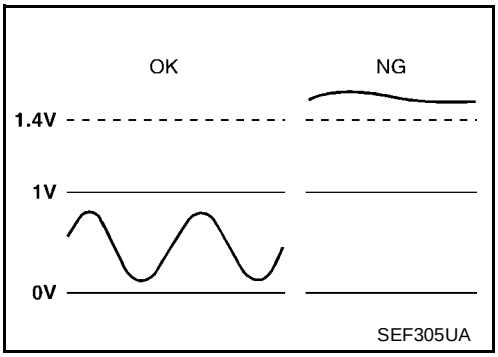
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S2 (B1)	● Engine: After warming up	Revving engine from idle to 3,000 rpm quickly.	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S2 MNTR (B1)	● Engine: After warming up	Revving engine from idle to 3,000 rpm quickly.	LEAN ←→ RICH

On Board Diagnosis Logic

EBS00FQJ

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the heated oxygen sensor 1. The oxygen storage capacity before the three way catalyst causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the voltage is unusually high during the various driving condition such as fuel-cut.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0138 0138	Heated oxygen sensor 2 circuit high voltage	An excessively high voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Heated oxygen sensor 2

DTC Confirmation Procedure

EBS00FQK

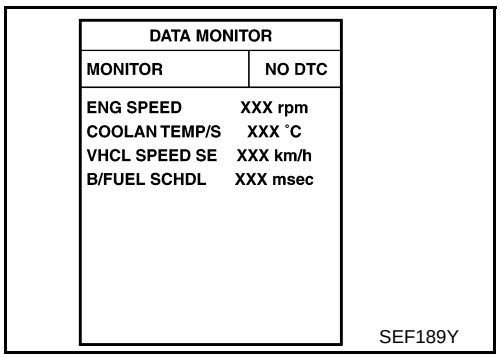
CAUTION:
Always drive vehicle at a safe speed.

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
3. Stop vehicle with engine running.

4. Let engine idle for 1 minute.
5. If 1st trip DTC is detected, go to EC-254, "Diagnostic Procedure" .



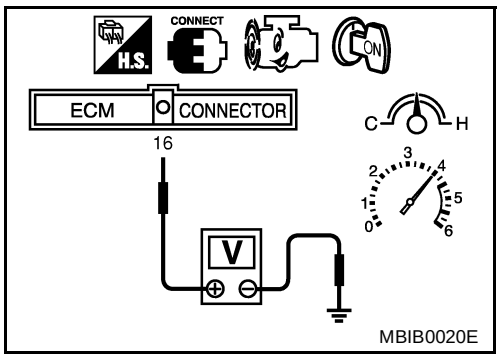
Overall Function Check

EBS00FQL

Use this procedure to check the overall function of the heated oxygen sensor 2 circuit. During this check, a 1st trip DTC might not be confirmed.

WITH GST

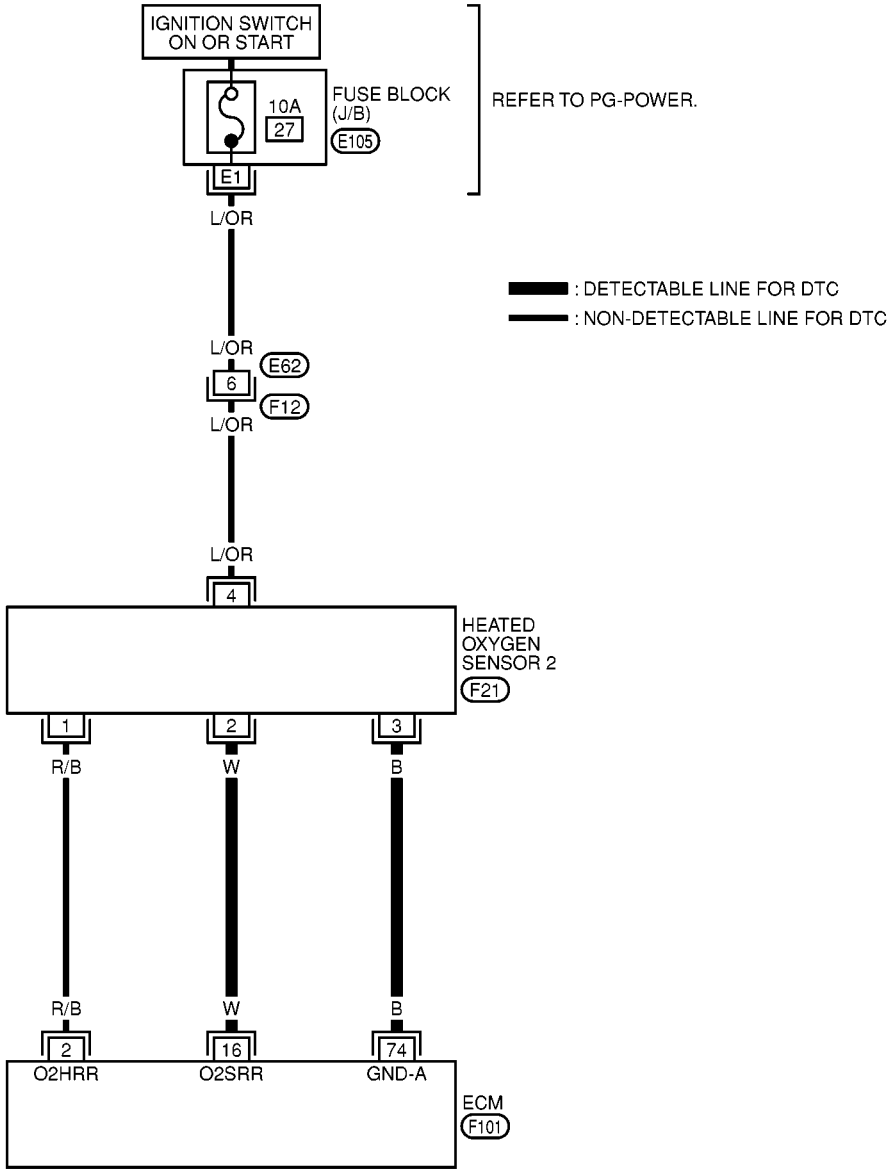
1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Set voltmeter probes between ECM terminal 16 (HO2S2 signal) and engine ground.
4. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be below 1.4V during this procedure.
5. If NG, go to EC-254, "Diagnostic Procedure" .

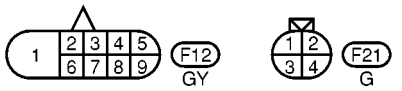


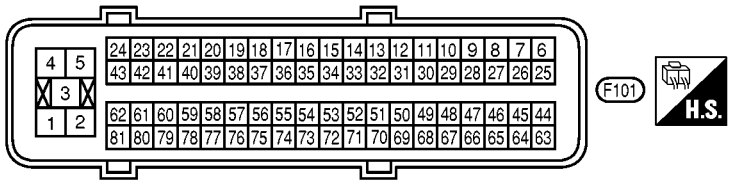
Wiring Diagram

EBS00FQM

EC-HO2S2-01







REFER TO THE FOLLOWING.
E105 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0050E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
16	W	Heated oxygen sensor 2	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V
74	B	Heated oxygen sensor ground	**[Engine is running]** ● Idle speed	Approximately 0V

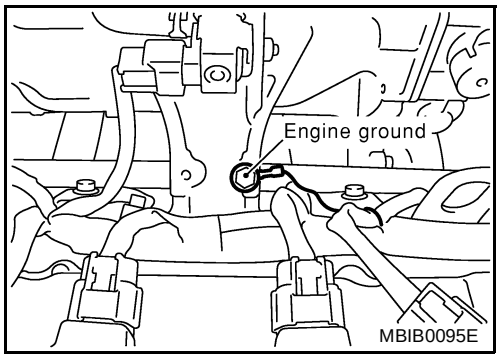
Diagnostic Procedure

EBS00FQN

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

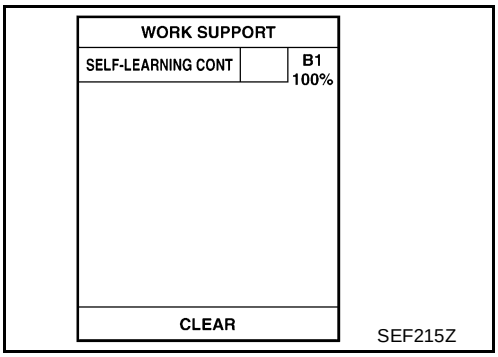
>> GO TO 2.



2. CLEAR THE SELF-LEARNING DATA

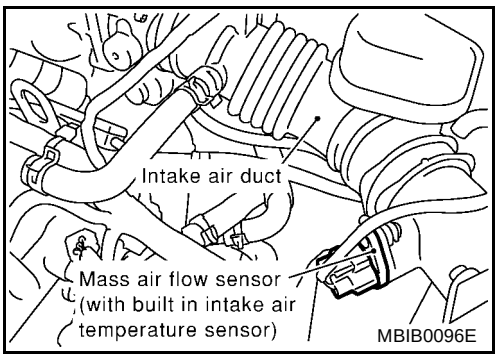
With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching “CLEAR”.
4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0172 detected?
   Is it difficult to start engine?



Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF”.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure that DTC P0102 is displayed.
6. Erase the DTC memory. Refer to EC-73, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
7. Make sure that DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0172 detected?
   Is it difficult to start engine?



Yes or No

Yes >> Perform trouble diagnosis for DTC P0172. Refer to EC-299 .
No >> GO TO 3.

3. CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

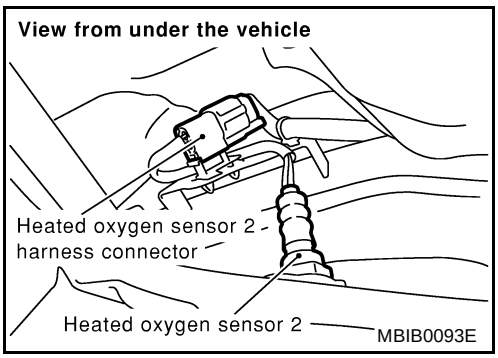
1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 2 harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminal 74 and HO2S2 terminal 3.
   Refer to Wiring Diagram.

   Continuity should exist.

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.



4. CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 16 and HO2S2 terminal 2.
   Refer to Wiring Diagram.

   Continuity should exist.

2. Check harness continuity between ECM terminal 16 or HO2S2 terminal 2 and ground.
   Refer to Wiring Diagram.

   Continuity should not exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK HEATED OXYGEN SENSOR 2

Refer to EC-256, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace heated oxygen sensor 2.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

EBS00FQO

HEATED OXYGEN SENSOR 2

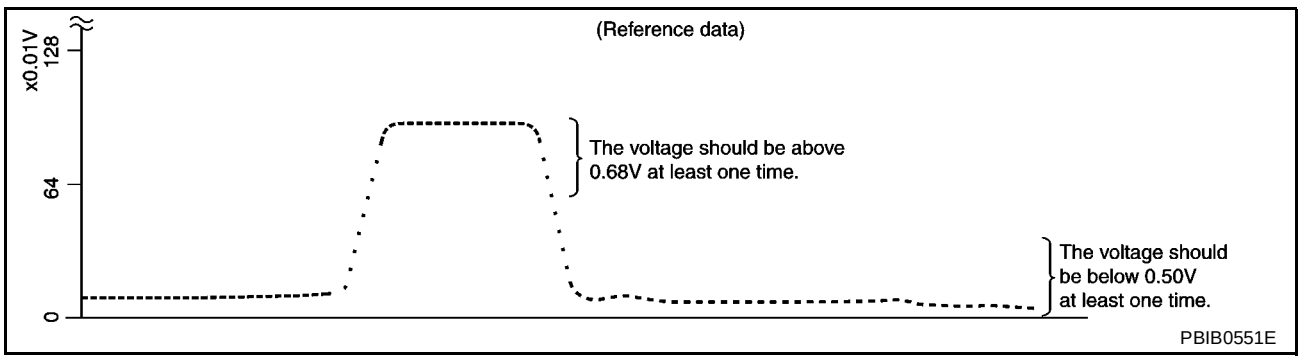
With CONSULT-II

1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)” as the monitor item with CONSULT-II.

ACTIVE TEST	
FUEL INJECTION	25 %
MONITOR	
ENG SPEED	XXX rpm
HO2S1 (B1)	XXX V
HO2S2 (B1)	XXX V
HO2S1 MNTR (B1)	RICH
HO2S2 MNTR (B1)	RICH

SEF662Y

4. Check “HO2S2 (B1)” at idle speed when adjusting “FUEL INJECTION” to ±25%.



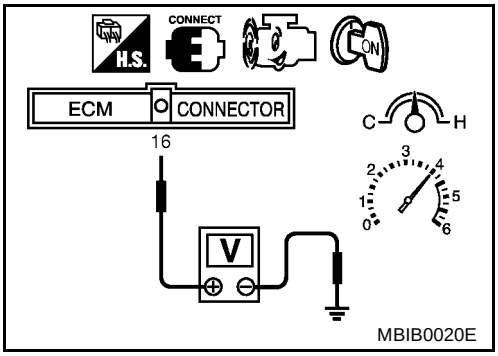
"HO2S2 (B1)" should be above 0.68V at least once when the "FUEL INJECTION" is +25%.
"HO2S2 (B1)" should be below 0.50V at least once when the "FUEL INJECTION" is −25%.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Set voltmeter probes between ECM terminal 16 (HO2S2 signal) and engine ground.
4. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be above 0.68V at least once during this procedure.
   If the voltage is above 0.68V at step 4, step 5 is not necessary.
5. Keep vehicle idling for 10 minutes, then check voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in 3rd gear position.
   The voltage should be below 0.50V at least once during this procedure.
6. If NG, replace heated oxygen sensor 2.



CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

EBS00FQP

HEATED OXYGEN SENSOR 2

Refer to EX-3, "EXHAUST SYSTEM" .

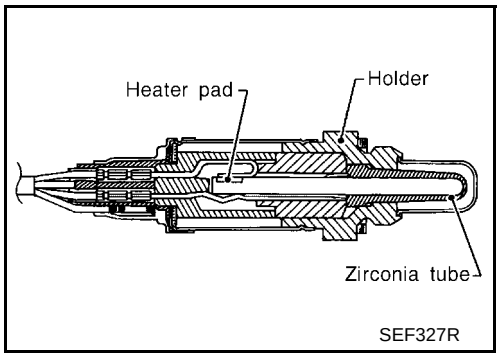
DTC P0138, P0158 HO2S2 (QG18DE)

PFP:226A0

Component Description

EBS00FQQ

The heated oxygen sensor 2, after three way catalyst, monitors the oxygen level in the exhaust gas on each bank.
Even if switching characteristics of the heated oxygen sensor 1 are shifted, the air fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.
This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.
Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.



CONSULT-II Reference Value in Data Monitor Mode

EBS00FQR

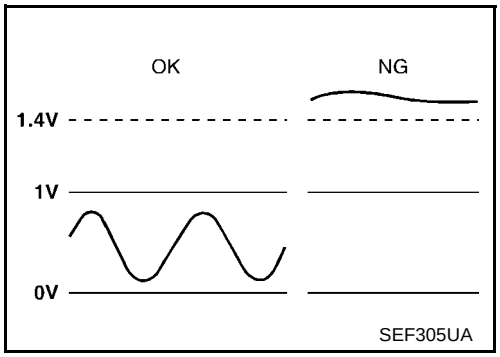
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S2 (B1) HO2S2 (B2)	● Engine: After warming up	Revving engine from idle to 3,000 rpm quickly.	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S2 MNTR (B1) HO2S2 MNTR (B2)	● Engine: After warming up	Revving engine from idle to 3,000 rpm quickly.	LEAN ←→ RICH

On Board Diagnosis Logic

EBS00FQT

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the heated oxygen sensor 1. The oxygen storage capacity before the three way catalyst causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the voltage is unusually high during the various driving condition such as fuel-cut.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0138 0138 (Bank 1)	Heated oxygen sensor 2 circuit high voltage	An excessively high voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Heated oxygen sensor 2
P0158 0158 (Bank 2)			

DTC Confirmation Procedure

EBS00FQU

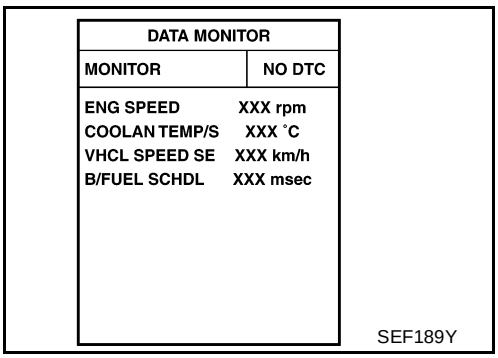
CAUTION:
Always drive vehicle at a safe speed.

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
3. Stop vehicle with engine running.

4. Let engine idle for 1 minute.
5. If 1st trip DTC is detected, go to EC-263, "Diagnostic Procedure" .



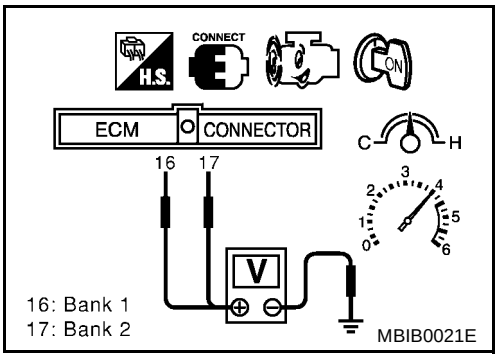
Overall Function Check

EBS00FQV

Use this procedure to check the overall function of the heated oxygen sensor 2 circuit. During this check, a 1st trip DTC might not be confirmed.

WITH GST

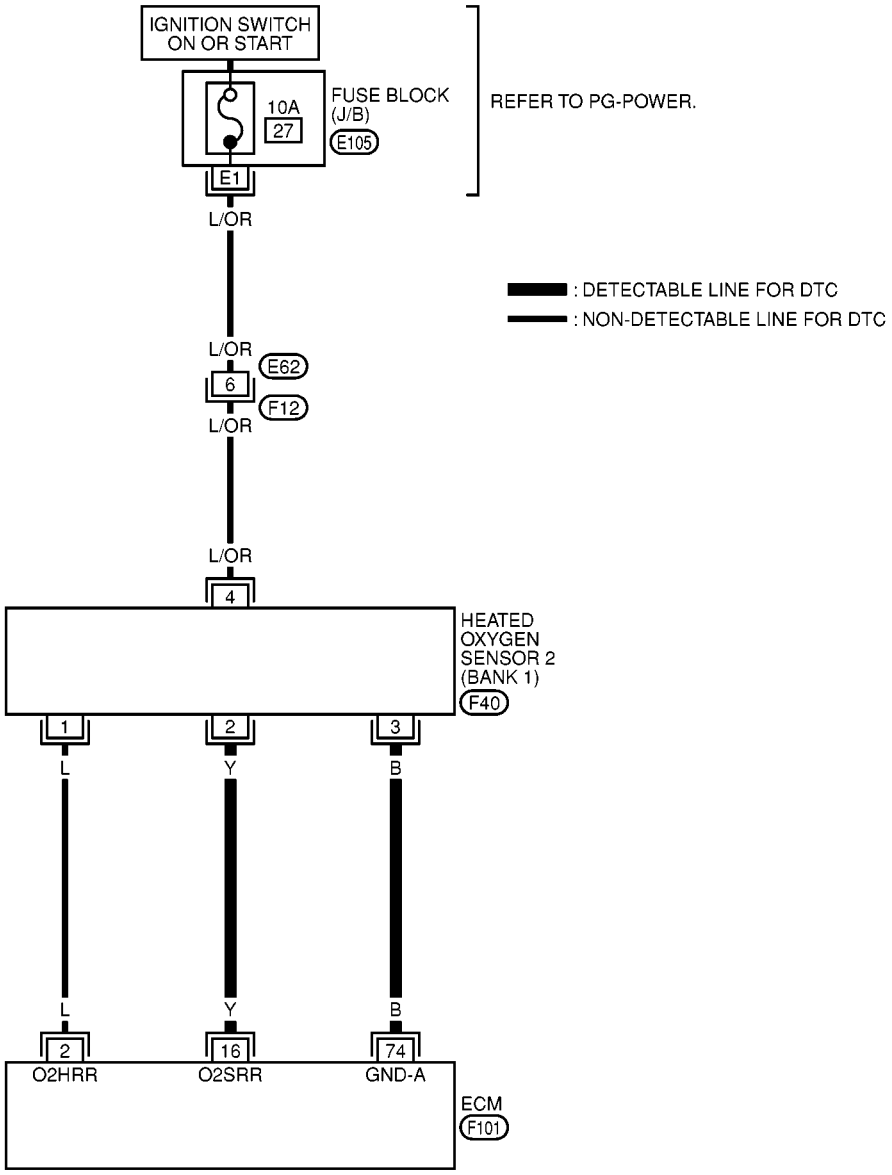
1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Set voltmeter probes between ECM terminal 16 [HO2S2 (B1) signal] or 17 [HO2S2 (B2) signal] and engine ground.
4. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be below 1.4V during this procedure.
5. If NG, go to EC-263, "Diagnostic Procedure" .

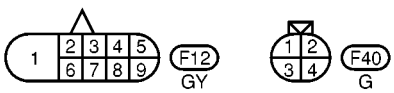


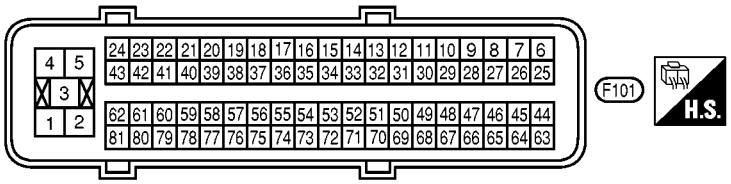
Wiring Diagram
BANK 1

EBS00FQW

EC-O2S2B1-01







REFER TO THE FOLLOWING.
E105 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0056E

Specification data are reference values and are measured between each terminal and ground.

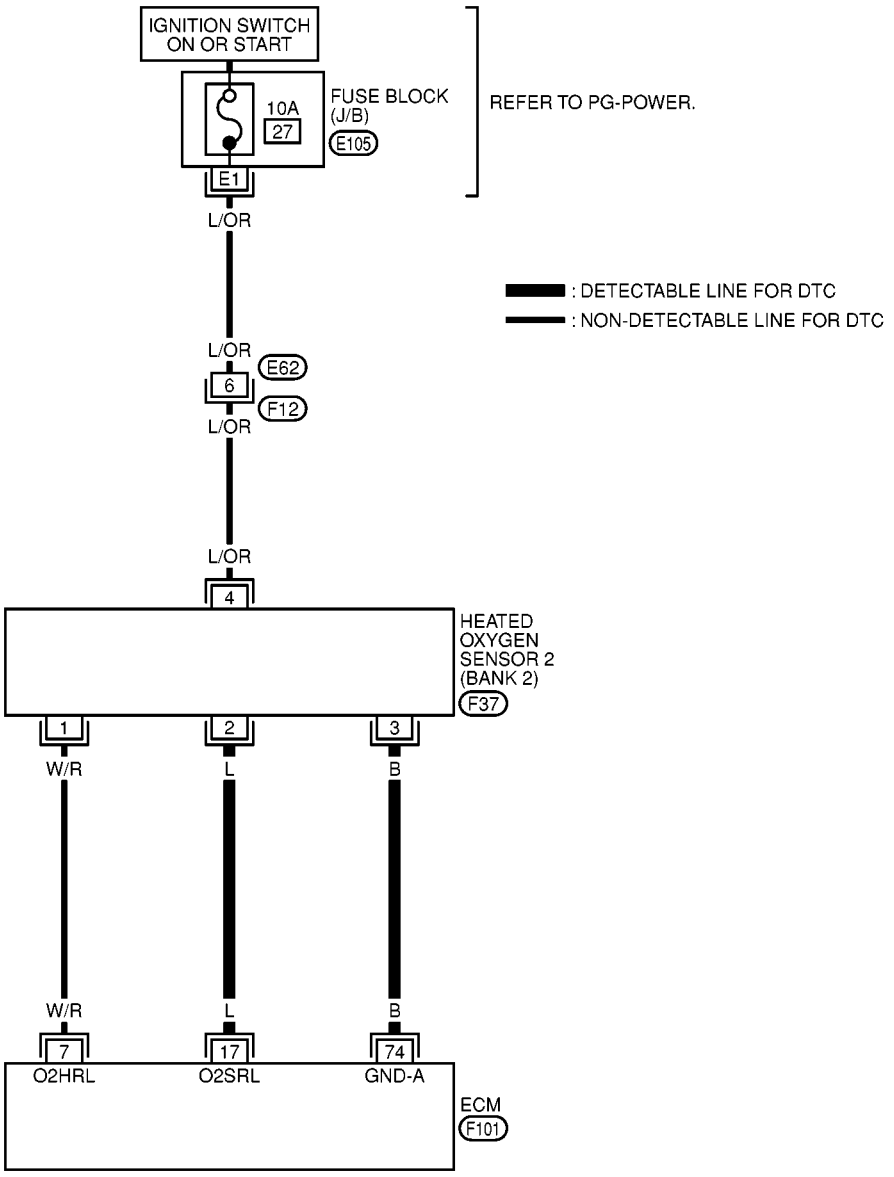
CAUTION:

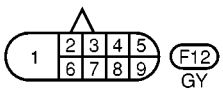
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

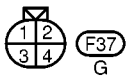
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
16	Y	Heated oxygen sensor 2 (bank 1)	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V
74	B	Heated oxygen sensor ground	**[Engine is running]** ● Idle speed	Approximately 0V

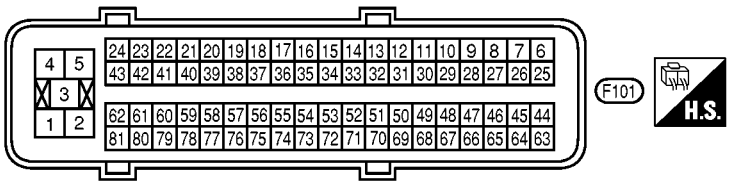
BANK 2

EC-O2S2B2-01









REFER TO THE FOLLOWING.
E105 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0058E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
17	L	Heated oxygen sensor 2 (bank 2)	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V
74	B	Heated oxygen sensor ground	**[Engine is running]** ● Idle speed	Approximately 0V

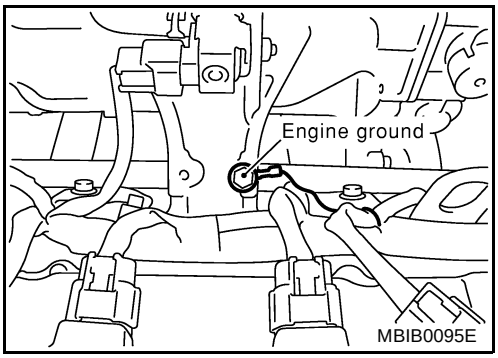
Diagnostic Procedure

EBS00FQX

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

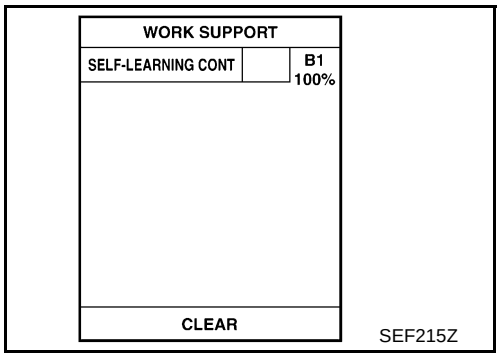
>> GO TO 2.



2. CLEAR THE SELF-LEARNING DATA

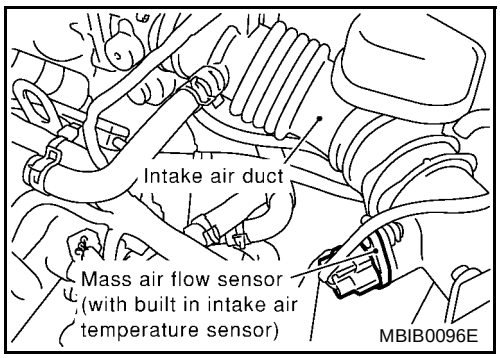
With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching “CLEAR”.
4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0172 or P0175 detected?
   Is it difficult to start engine?



Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF”.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure that DTC P0102 is displayed.
6. Erase the DTC memory. Refer to EC-73, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
7. Make sure that DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0172 or P0175 detected?
   Is it difficult to start engine?



Yes or No

Yes >> Perform trouble diagnosis for DTC P0172, P0175. Refer to EC-305 .
No >> GO TO 3.

3. CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

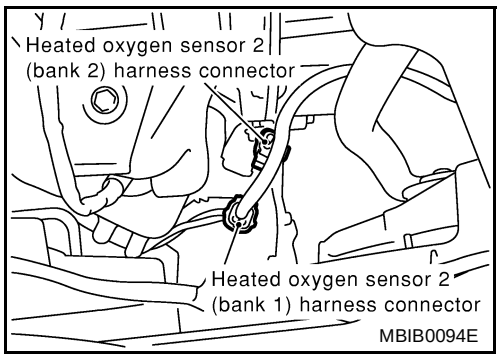
1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 2 harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminal 74 and HO2S2 terminal 3.
   Refer to Wiring Diagram.

   Continuity should exist.

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.



4. CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal and HO2S2 terminal as follows. Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM	Sensor	
P0138	16	2	1
P0158	17	2	2

Continuity should exist.

2. Check harness continuity between the following terminals and ground. Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM	Sensor	
P0138	16	2	1
P0158	17	2	2

Continuity should not exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK HEATED OXYGEN SENSOR 2

Refer to EC-265, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace heated oxygen sensor 2.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

EBS00FQY

HEATED OXYGEN SENSOR 2

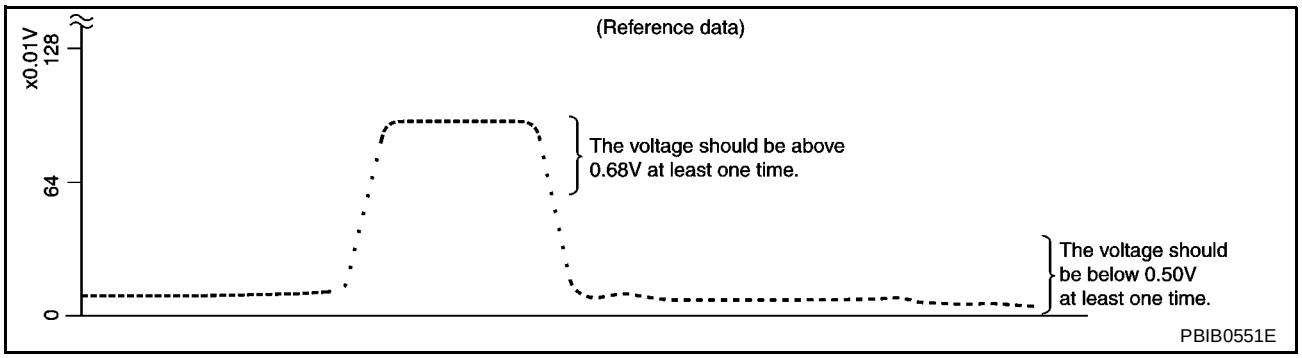
With CONSULT-II

1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)/(B2)” as the monitor item with CONSULT-II.

ACTIVE TEST	
FUEL INJECTION	25 %
MONITOR	
ENG SPEED	XXX rpm
HO2S1 (B1)	XXX V
HO2S2 (B1)	XXX V
HO2S1 MNTR (B1)	RICH
HO2S2 MNTR (B1)	RICH

SEF662Y

4. Check “HO2S2 (B1)/(B2)” at idle speed when adjusting “FUEL INJECTION” to ±25%.



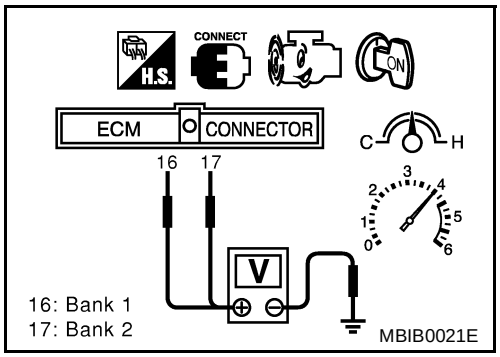
“HO2S2 (B1)/(B2)” should be above 0.68V at least once when the “FUEL INJECTION” is +25%.
“HO2S2 (B1)/(B2)” should be below 0.50V at least once when the “FUEL INJECTION” is −25%.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Set voltmeter probes between ECM terminal 16 [HO2S2 (B1) signal] or 17 [HO2S2 (B2) signal] and engine ground.
4. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be above 0.68V at least once during this procedure.
   If the voltage is above 0.68V at step 4, step 5 is not necessary.
5. Keep vehicle idling for 10 minutes, then check voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in “D” position with “OD” OFF (A/T), 3rd gear position (M/T).
   The voltage should be below 0.50V at least once during this procedure.
6. If NG, replace heated oxygen sensor 2.



CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

EBS00FQZ

HEATED OXYGEN SENSOR 2

Refer to EX-3, "EXHAUST SYSTEM" .

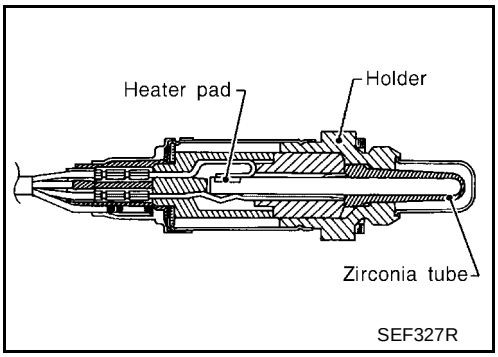
DTC P0139 HO2S2 (QG16DE)

PFP:226A0

Component Description

EBS00FR0

The heated oxygen sensor 2, after three way catalyst, monitors the oxygen level in the exhaust gas.
Even if switching characteristics of the heated oxygen sensor 1 are shifted, the air fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.
This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.
Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.



CONSULT-II Reference Value in Data Monitor Mode

EBS00FR1

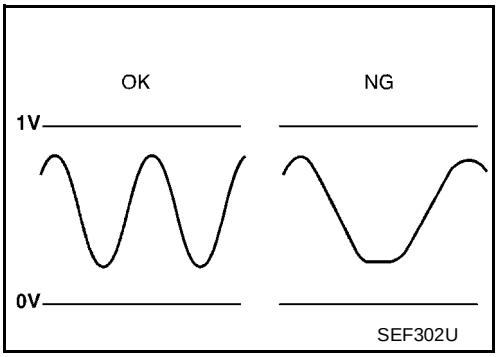
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S2 (B1)	● Engine: After warming up	Revving engine from idle to 3,000 rpm quickly.	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S2 MNTR (B1)	● Engine: After warming up	Revving engine from idle to 3,000 rpm quickly.	LEAN ←→ RICH

On Board Diagnosis Logic

EBS00FR3

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the heated oxygen sensor 1. The oxygen storage capacity before the three way catalyst causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the switching response of the sensor's voltage is faster than specified during the various driving condition such as fuel-cut.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0139 0139	Heated oxygen sensor 2 circuit slow response	It takes more time for the sensor to respond between rich and lean than the specified time.	● Harness or connectors (The sensor circuit is open or shorted.) ● Heated oxygen sensor 2 ● Fuel pressure ● Injectors ● Intake air leaks

DTC Confirmation Procedure

EBS00FR4

CAUTION:
Always drive vehicle at a safe speed.

NOTE:

- **“COMPLETED” will appear on CONSULT-II screen when all tests “COND1”, “COND2” and “COND3” are completed.**
- If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

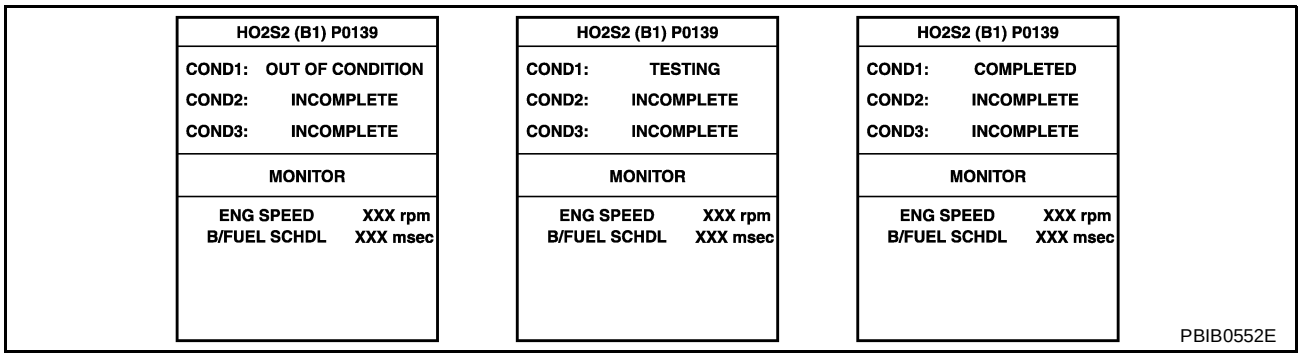
TESTING CONDITION:
Never stop engine during this procedure. If the engine is stopped, retry this procedure from step 2 in “Procedure for COND1”.

WITH CONSULT-II

Procedure for COND1

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Turn ignition switch “ON” and select “HO2S2 (B1) P0139” of “HO2S2” in “DTC WORK SUPPORT” mode with CONSULT-II.
4. Touch “START”.
5. Start engine and let it idle for at least 30 seconds.
6. Rev engine up to 2,000 rpm 2 or 3 times quickly under no load.
   If “COMPLETED” appears on CONSULT-II screen, go to step 2 in “Procedure for COND3”.
   If “COMPLETED” does not appear on CONSULT-II screen, go to the following step.
7. Drive vehicle at a speed of more than 70km/h (43 MPH) for 2 consecutive minutes.
8. When the following conditions are met, “TESTING” will be displayed at “COND1” on the CONSULT-II screen. Maintain the conditions continuously until “TESTING” changes to “COMPLETED”. (It will take approximately 60 seconds.)

ENG SPEED	More than 1,000 rpm
B/FUEL SCHDL	More than 1.0 msec
COOLANT TEMP/S	70 - 105 °C
Selector level	Suitable position



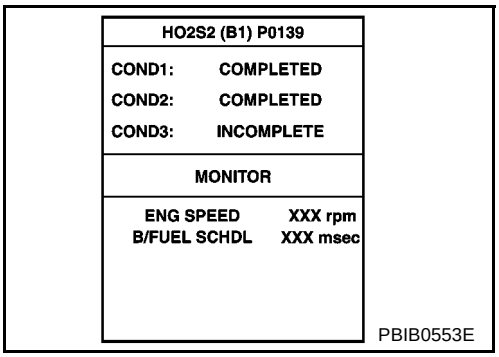
NOTE:

- **If “TESTING” is not displayed after 5 minutes, retry from step 2 in “Procedure for COND1”.**
- **If “COMPLETED” already appears at “COND2” on CONSULT-II screen before “Procedure for COND2” is conducted, it is unnecessary to conduct step 1 in “Procedure for COND2”.**

Procedure for COND2

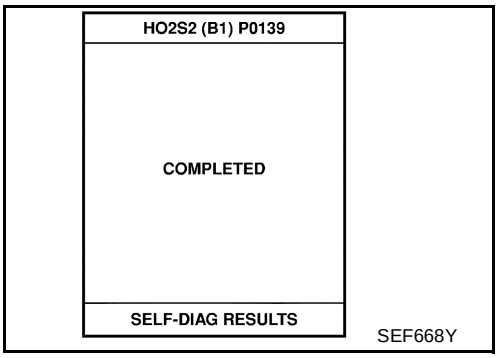
1. While driving, release accelerator pedal completely from the above condition [step 8] until “INCOMPLETE” at “COND2” on CONSULT-II screen has turned to “COMPLETED”. (It will take approximately 4 seconds.)

NOTE:
If “COMPLETED” already appears at “COND3” on CONSULT-II screen before “Procedure for COND3” is conducted, it is unnecessary to conduct step 1 in “Procedure for COND3”.



Procedure for COND3

1. Stop vehicle and let it idle until “INCOMPLETE” of “COND3” on CONSULT-II screen has turned to “COMPLETED”. (It will take a maximum of approximately 6 minutes.)
2. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”.
   If “NG” is displayed, refer to EC-271, "Diagnostic Procedure" .



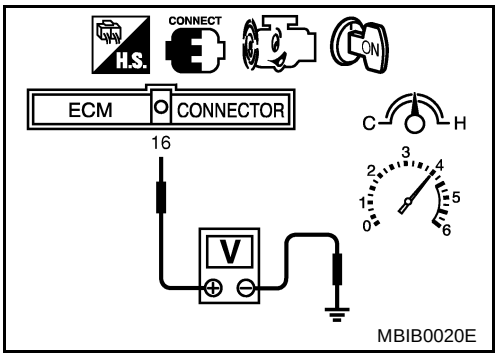
Overall Function Check

EBS00FR5

Use this procedure to check the overall function of the heated oxygen sensor 2 circuit. During this check, a 1st trip DTC might not be confirmed.

WITH GST

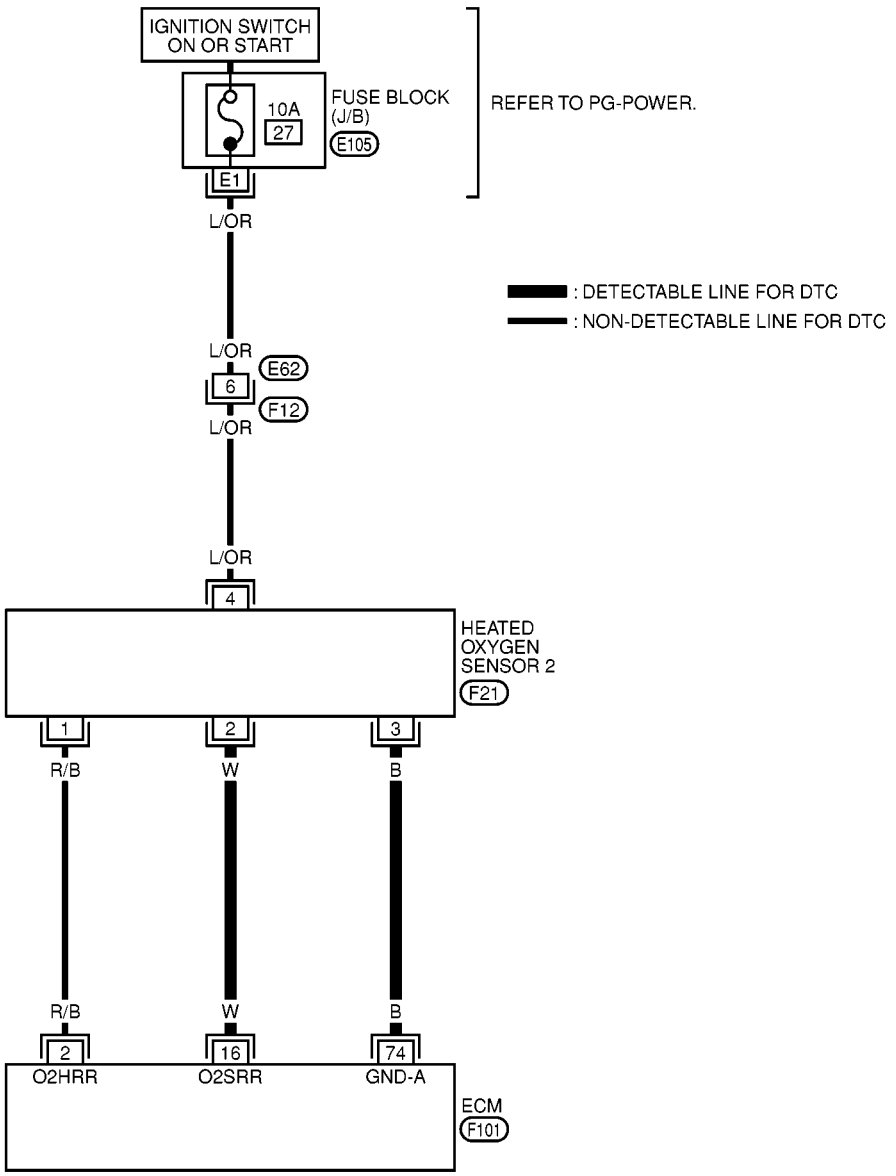
1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Set voltmeter probes between ECM terminal 16 (HO2S2 signal) and engine ground.
4. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should change at more than 0.06V for 1 second during this procedure.
   If the voltage can be confirmed in step 4, step 5 is not necessary.
5. Keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in 3rd gear position.
   The voltage should change at more than 0.06V for 1 second during this procedure.
6. If NG, go to EC-271, "Diagnostic Procedure" .

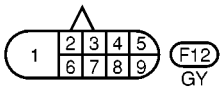


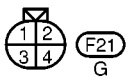
Wiring Diagram

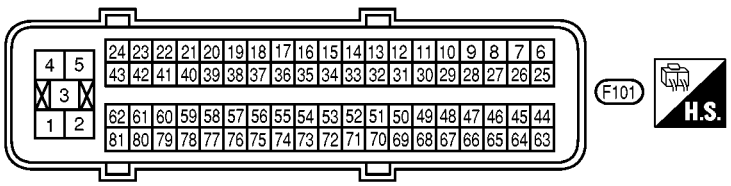
EBS00FR6

EC-HO2S2-01









REFER TO THE FOLLOWING.
E105 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0050E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
16	W	Heated oxygen sensor 2	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V
74	B	Heated oxygen sensor ground	**[Engine is running]** ● Idle speed	Approximately 0V

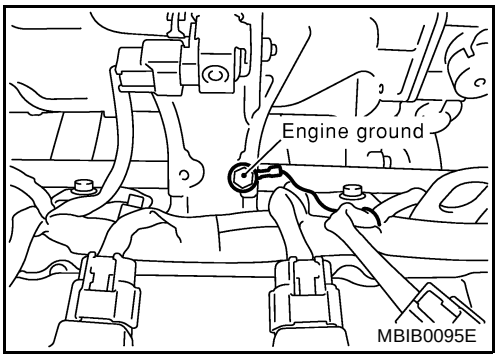
Diagnostic Procedure

EBS00FR7

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

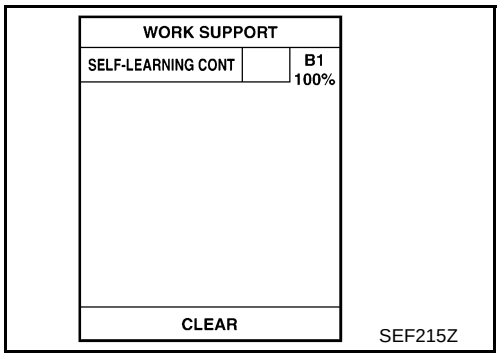
>> GO TO 2.



2. CLEAR THE SELF-LEARNING DATA

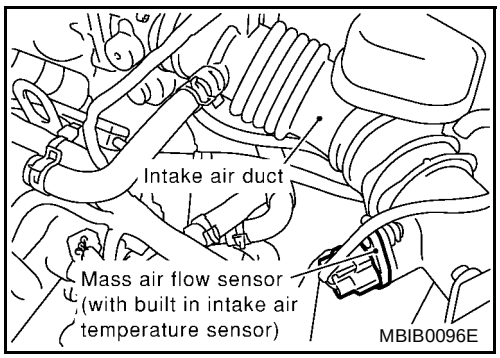
With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching “CLEAR”.
4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 or P0172 detected?
   Is it difficult to start engine?



Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF”.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure that DTC P0102 is displayed.
6. Erase the DTC memory. Refer to EC-73, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
7. Make sure that DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 or P0172 detected?
   Is it difficult to start engine?



Yes or No

Yes >> Perform trouble diagnosis for DTC P0171 or P0172. Refer to EC-285 or EC-299 .
No >> GO TO 3.

3. CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

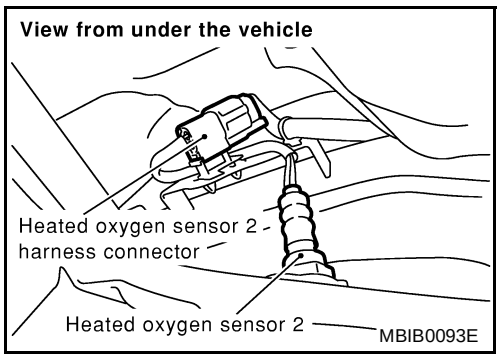
1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 2 harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminal 74 and HO2S2 terminal 3.
   Refer to Wiring Diagram.

   Continuity should exist.

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.



4. CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 16 and HO2S2 terminal 2.
   Refer to Wiring Diagram.

   Continuity should exist.

2. Check harness continuity between ECM terminal 16 or HO2S2 terminal 2 and ground.
   Refer to Wiring Diagram.

   Continuity should not exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK HEATED OXYGEN SENSOR 2

Refer to EC-273, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace heated oxygen sensor 2.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

EBS00FR8

HEATED OXYGEN SENSOR 2

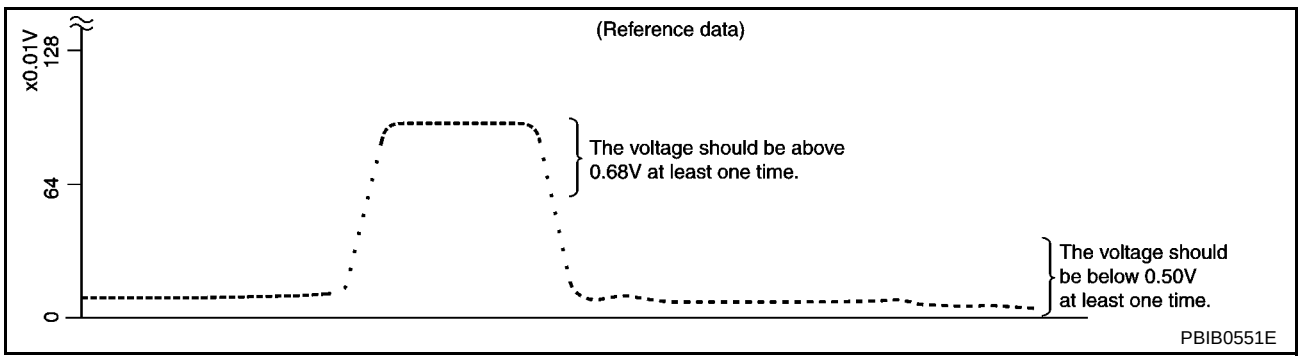
With CONSULT-II

1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)” as the monitor item with CONSULT-II.

ACTIVE TEST	
FUEL INJECTION	25 %
MONITOR	
ENG SPEED	XXX rpm
HO2S1 (B1)	XXX V
HO2S2 (B1)	XXX V
HO2S1 MNTR (B1)	RICH
HO2S2 MNTR (B1)	RICH

SEF662Y

4. Check “HO2S2 (B1)” at idle speed when adjusting “FUEL INJECTION” to ±25%.



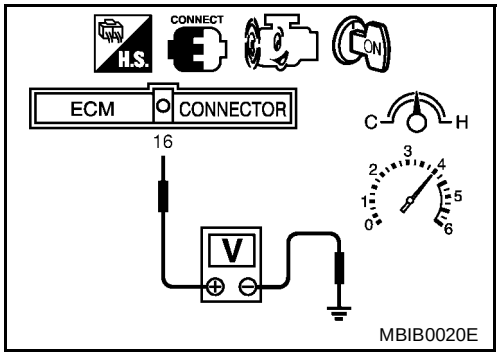
"HO2S2 (B1)" should be above 0.68V at least once when the "FUEL INJECTION" is +25%.
"HO2S2 (B1)" should be below 0.50V at least once when the "FUEL INJECTION" is −25%.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Set voltmeter probes between ECM terminal 16 (HO2S2 signal) and engine ground.
4. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be above 0.68V at least once during this procedure.
   If the voltage is above 0.68V at step 4, step 5 is not necessary.
5. Keep vehicle idling for 10 minutes, then check voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in 3rd gear position.
   The voltage should be below 0.50V at least once during this procedure.
6. If NG, replace heated oxygen sensor 2.



CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

EBS00FR9

HEATED OXYGEN SENSOR 2

Refer to EX-3, "EXHAUST SYSTEM" .

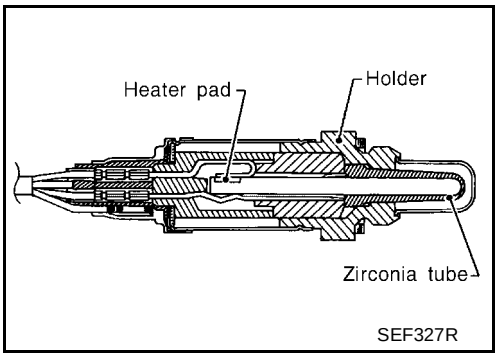
DTC P0139, P0159 HO2S2 (QG18DE)

PFP:226A0

Component Description

EBS00FRA

The heated oxygen sensor 2, after three way catalyst, monitors the oxygen level in the exhaust gas on each bank.
Even if switching characteristics of the heated oxygen sensor 1 are shifted, the air fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.
This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.
Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.



CONSULT-II Reference Value in Data Monitor Mode

EBS00FRB

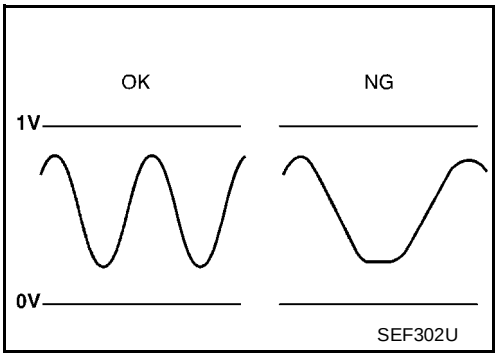
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S2 (B1) HO2S2 (B2)	● Engine: After warming up	Revving engine from idle to 3,000 rpm quickly.	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S2 MNTR (B1) HO2S2 MNTR (B2)	● Engine: After warming up	Revving engine from idle to 3,000 rpm quickly.	LEAN ←→ RICH

On Board Diagnosis Logic

EBS00FRD

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the heated oxygen sensor 1. The oxygen storage capacity before the three way catalyst causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the switching response of the sensor's voltage is faster than specified during the various driving condition such as fuel-cut.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0139 0139 (Bank 1) P0159 0159 (Bank 2)	Heated oxygen sensor 2 circuit slow response	It takes more time for the sensor to respond between rich and lean than the specified time.	● Harness or connectors (The sensor circuit is open or shorted.) ● Heated oxygen sensor 2 ● Fuel pressure ● Injectors ● Intake air leaks

DTC Confirmation Procedure

EBS00FRE

CAUTION:
Always drive vehicle at a safe speed.

NOTE:

- **“COMPLETED” will appear on CONSULT-II screen when all tests “COND1”, “COND2” and “COND3” are completed.**
- If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

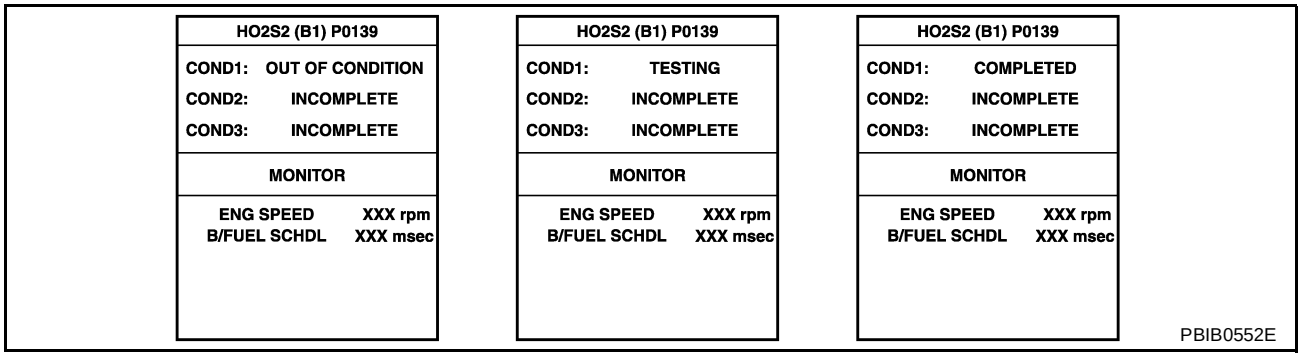
Never stop engine during this procedure. If the engine is stopped, retry this procedure from step 2 in "Procedure for COND1".

WITH CONSULT-II

Procedure for COND1

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch "OFF" and wait at least 10 seconds.
3. Turn ignition switch "ON" and select "HO2S2 (B1) P0139" or "HO2S2 (B2) P0159" of "HO2S2" in "DTC WORK SUPPORT" mode with CONSULT-II.
4. Touch "START".
5. Start engine and let it idle for at least 30 seconds.
6. Rev engine up to 2,000 rpm 2 or 3 times quickly under no load.
   If "COMPLETED" appears on CONSULT-II screen, go to step 2 in "Procedure for COND3".
   If "COMPLETED" does not appear on CONSULT-II screen, go to the following step.
7. Drive vehicle at a speed of more than 70km/h (43 MPH) for 2 consecutive minutes.
8. When the following conditions are met, "TESTING" will be displayed at "COND1" on the CONSULT-II screen. Maintain the conditions continuously until "TESTING" changes to "COMPLETED". (It will take approximately 60 seconds.)

ENG SPEED	More than 1,000 rpm
B/FUEL SCHDL	More than 1.0 msec
COOLANT TEMP/S	70 - 105 °C
Selector level	Suitable position



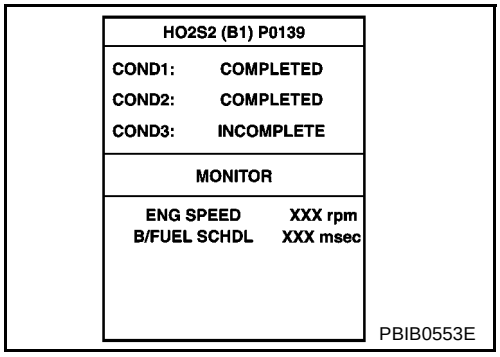
NOTE:

- **If "TESTING" is not displayed after 5 minutes, retry from step 2 in "Procedure for COND1".**
- **If "COMPLETED" already appears at "COND2" on CONSULT-II screen before "Procedure for COND2" is conducted, it is unnecessary to conduct step 1 in "Procedure for COND2".**

Procedure for COND2

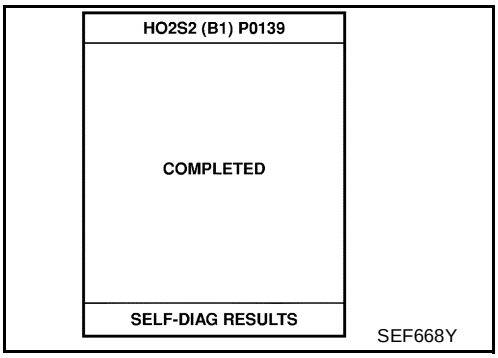
1. While driving, release accelerator pedal completely with "OD" OFF (A/T models only) from the above condition [step 8] until "INCOMPLETE" at "COND2" on CONSULT-II screen has turned to "COMPLETED". (It will take approximately 4 seconds.)

NOTE:
If "COMPLETED" already appears at "COND3" on CONSULT-II screen before "Procedure for COND3" is conducted, it is unnecessary to conduct step 1 in "Procedure for COND3".



Procedure for COND3

1. Stop vehicle and let it idle until “INCOMPLETE” of “COND3” on CONSULT-II screen has turned to “COMPLETED”. (It will take a maximum of approximately 6 minutes.)
2. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”.
   If “NG” is displayed, refer to EC-281, "Diagnostic Procedure" .



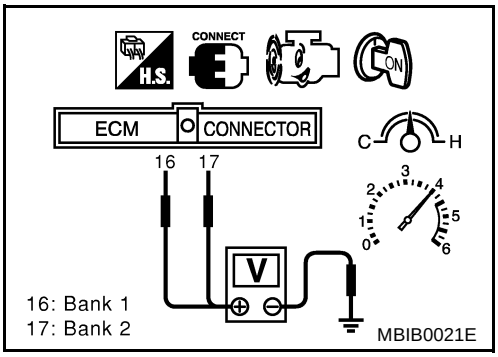
Overall Function Check

EBS00FRF

Use this procedure to check the overall function of the heated oxygen sensor 2 circuit. During this check, a 1st trip DTC might not be confirmed.

WITH GST

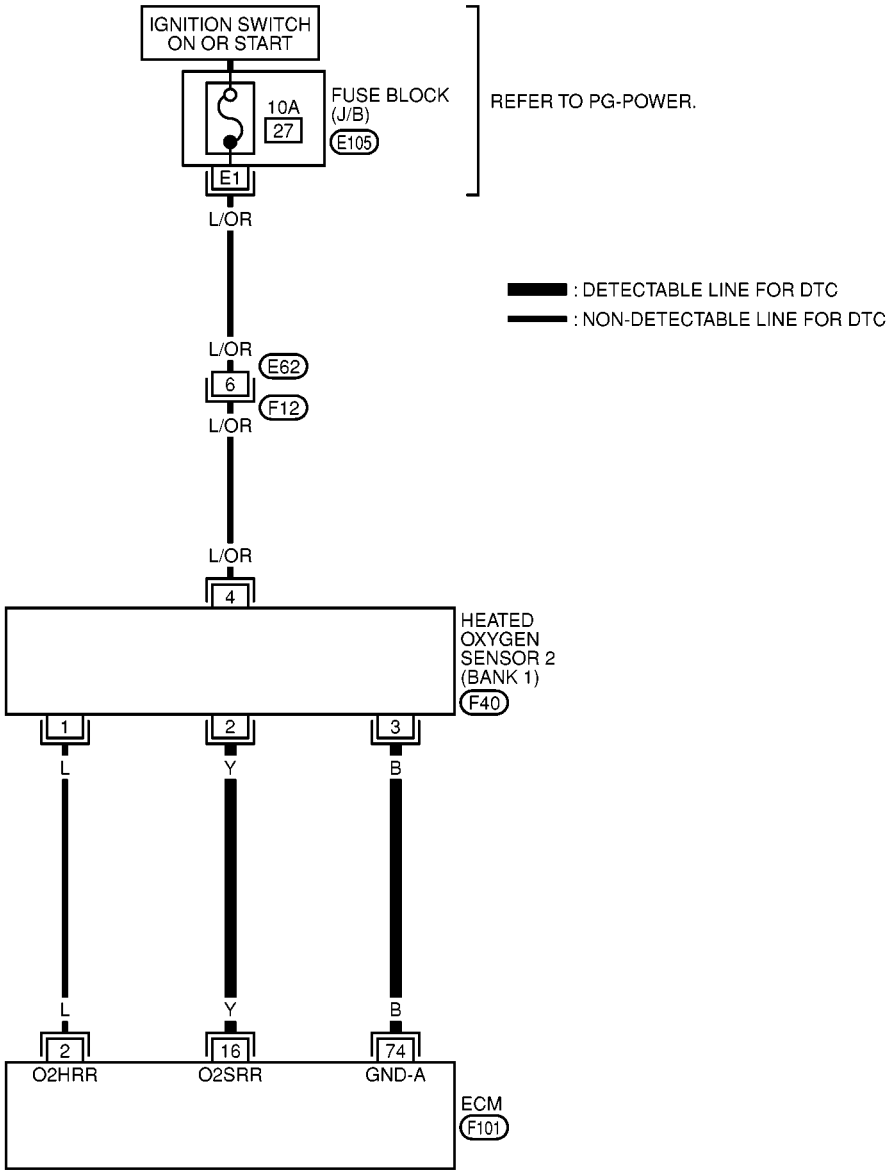
1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Set voltmeter probes between ECM terminal 16 [HO2S2 (B1) signal] or 17 [HO2S2 (B2) signal] and engine ground.
4. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should change at more than 0.06V for 1 second during this procedure.
   If the voltage can be confirmed in step 4, step 5 is not necessary.
5. Keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in “D” position with “OD” OFF (A/T), 3rd gear position (M/T).
   The voltage should change at more than 0.06V for 1 second during this procedure.
6. If NG, go to EC-281, "Diagnostic Procedure" .

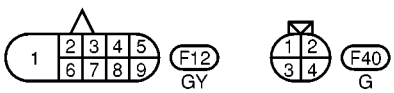


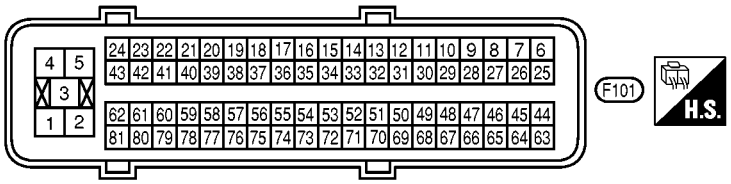
Wiring Diagram
BANK 1

EBS00FRG

EC-O2S2B1-01







REFER TO THE FOLLOWING.
E105 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0056E

Specification data are reference values and are measured between each terminal and ground.

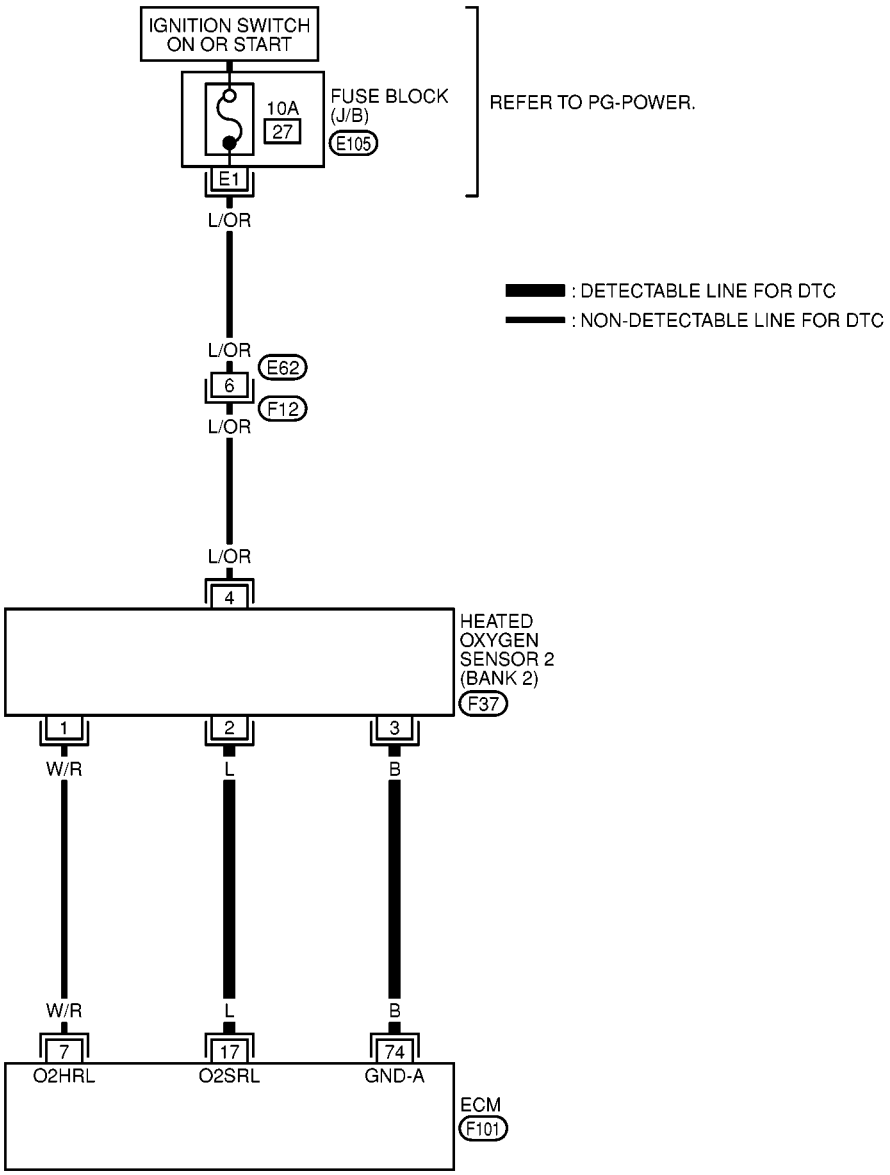
CAUTION:

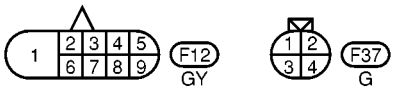
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

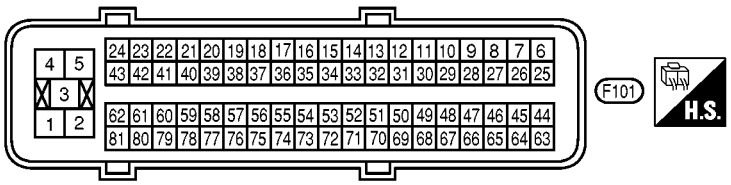
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
16	Y	Heated oxygen sensor 2 (bank 1)	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V
74	B	Heated oxygen sensor ground	**[Engine is running]** ● Idle speed	Approximately 0V

BANK 2

EC-O2S2B2-01







REFER TO THE FOLLOWING.
E105 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0058E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
17	L	Heated oxygen sensor 2 (bank 2)	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V
74	B	Heated oxygen sensor ground	**[Engine is running]** ● Idle speed	Approximately 0V

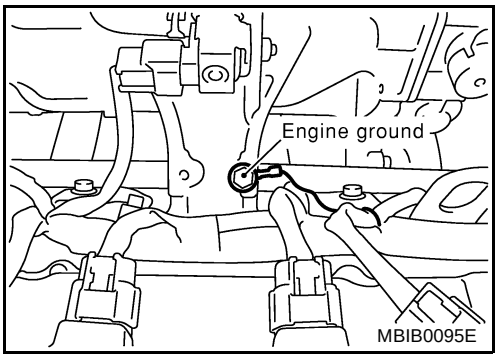
Diagnostic Procedure

EBS00FRH

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

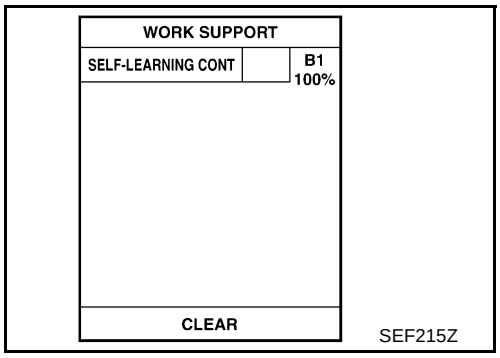
>> GO TO 2.



2. CLEAR THE SELF-LEARNING DATA

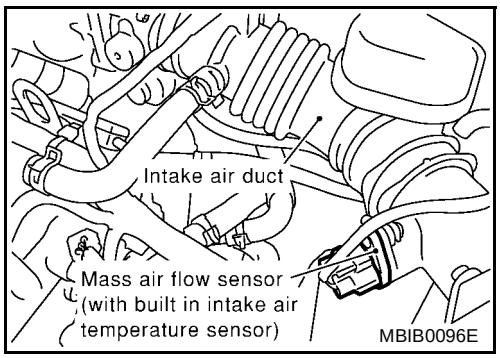
With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching “CLEAR”.
4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171, P0172, P0174 or P0175 detected?
   Is it difficult to start engine?



Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF”.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure that DTC P0102 is displayed.
6. Erase the DTC memory. Refer toEC-73, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
7. Make sure that DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171, P0172, P0174 or P0175 detected?
   Is it difficult to start engine?



Yes or No

Yes >> Perform trouble diagnosis for DTC P0171, P0174 or P0172, P0175. Refer to EC-291 or EC-305 .
No >> GO TO 3.

3. CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

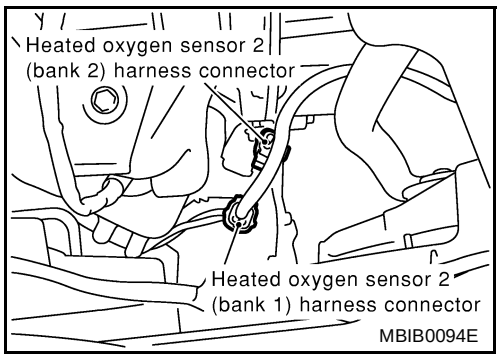
1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 2 harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminal 74 and HO2S2 terminal 3.
   Refer to Wiring Diagram.

   Continuity should exist.

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.



4. CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal and HO2S2 terminal as follows. Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM	Sensor	
P0139	16	2	1
P0159	17	2	2

Continuity should exist.

2. Check harness continuity between the following terminals and ground. Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM	Sensor	
P0139	16	2	1
P0159	17	2	2

Continuity should not exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK HEATED OXYGEN SENSOR 2

Refer to EC-283, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace heated oxygen sensor 2.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

EBS00FRI

HEATED OXYGEN SENSOR 2

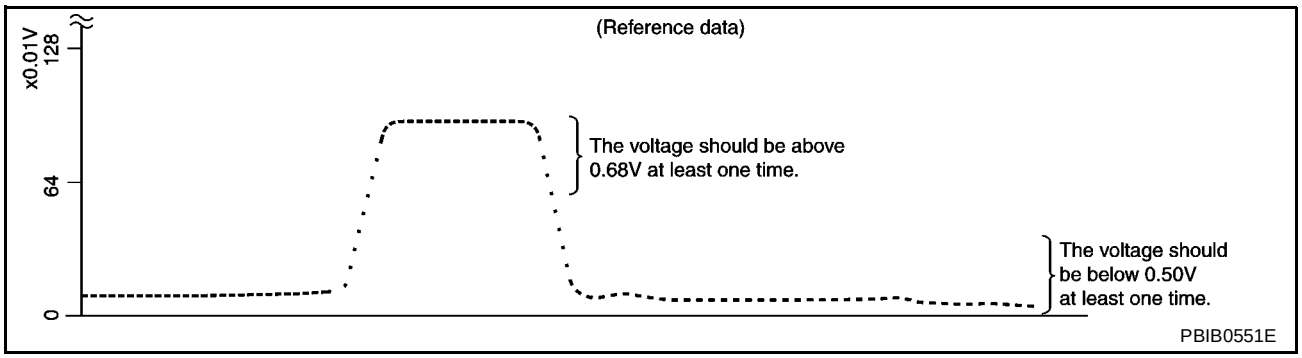
With CONSULT-II

1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)/(B2)” as the monitor item with CONSULT-II.

ACTIVE TEST	
FUEL INJECTION	25 %
MONITOR	
ENG SPEED	XXX rpm
HO2S1 (B1)	XXX V
HO2S2 (B1)	XXX V
HO2S1 MNTR (B1)	RICH
HO2S2 MNTR (B1)	RICH

SEF662Y

4. Check “HO2S2 (B1)/(B2)” at idle speed when adjusting “FUEL INJECTION” to ±25%.



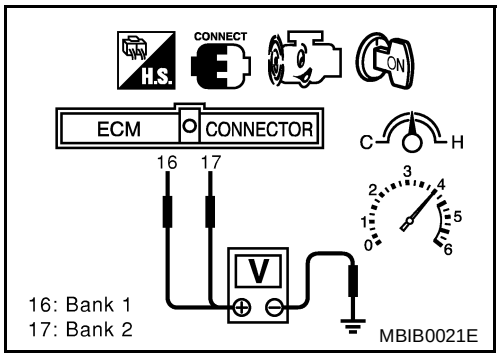
“HO2S2 (B1)/(B2)” should be above 0.68V at least once when the “FUEL INJECTION” is +25%.
“HO2S2 (B1)/(B2)” should be below 0.50V at least once when the “FUEL INJECTION” is −25%.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Set voltmeter probes between ECM terminal 16 [HO2S2 (B1) signal] or 17 [HO2S2 (B2) signal] and engine ground.
4. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be above 0.68V at least once during this procedure.
   If the voltage is above 0.68V at step 4, step 5 is not necessary.
5. Keep vehicle idling for 10 minutes, then check voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in “D” position with “OD” OFF (A/T), 3rd gear position (M/T).
   The voltage should be below 0.50V at least once during this procedure.
6. If NG, replace heated oxygen sensor 2.



CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

EBS00FRJ

HEATED OXYGEN SENSOR 2

Refer to EX-3, "EXHAUST SYSTEM" .

DTC P0171 FUEL INJECTION SYSTEM FUNCTION (QG16DE)

PFP:16600

On Board Diagnosis Logic

EBS00ENA

With the Air/Fuel Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought closely to the theoretical mixture ratio based on the mixture ratio feedback signal from the heated oxygen sensor 1. The ECM calculates the necessary compensation to correct the offset between the actual and the theoretical ratios.
In case the amount of the compensation value is extremely large (The actual mixture ratio is too lean.), the ECM judges the condition as the fuel injection system malfunction and light up the MI (2 trip detection logic).

Sensor	Input Signal to ECM	ECM function	Actuator
Heated oxygen sensors 1	Density of oxygen in exhaust gas (Mixture ratio feedback signal)	Fuel injection control	Fuel injectors

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0171 0171	Fuel injection system too lean	● Fuel injection system does not operate properly. ● The amount of mixture ratio compensation is too large. (The mixture ratio is too lean.)	● Intake air leaks ● Heated oxygen sensor 1 ● Injectors ● Exhaust gas leaks ● Incorrect fuel pressure ● Lack of fuel ● Mass air flow sensor ● Incorrect PCV hose connection

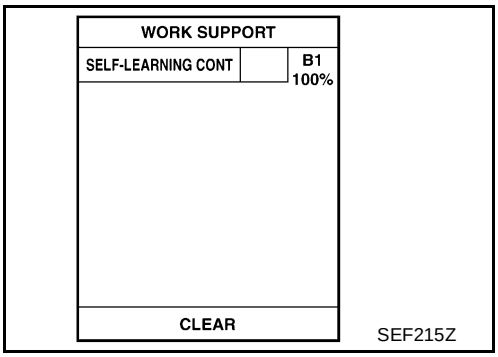
DTC Confirmation Procedure

EBS00ENB

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Turn ignition switch “ON” and select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
4. Clear the self-learning control coefficient by touching “CLEAR”.
5. Select “DATA MONITOR” mode with CONSULT-II.
6. Start engine again and let it idle for at least 10 minutes.
   The 1st trip DTC P0171 should be detected at this stage, if a malfunction exists. If so, go to EC-288, "Diagnostic Procedure" .
7. If it is difficult to start engine at step 6, the fuel injection system has a malfunction, too.
8. Crank engine while depressing accelerator pedal. If engine starts, go to EC-288, "Diagnostic Procedure" . If engine does not start, check exhaust and intake air leak visually.

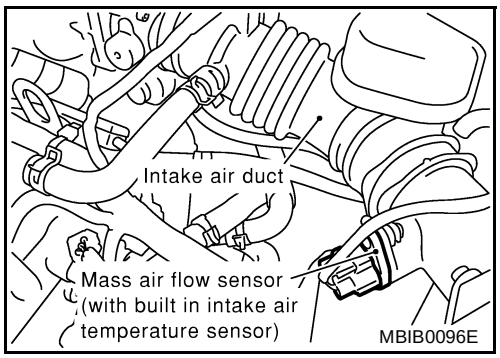


SEF215Z

WITH GST

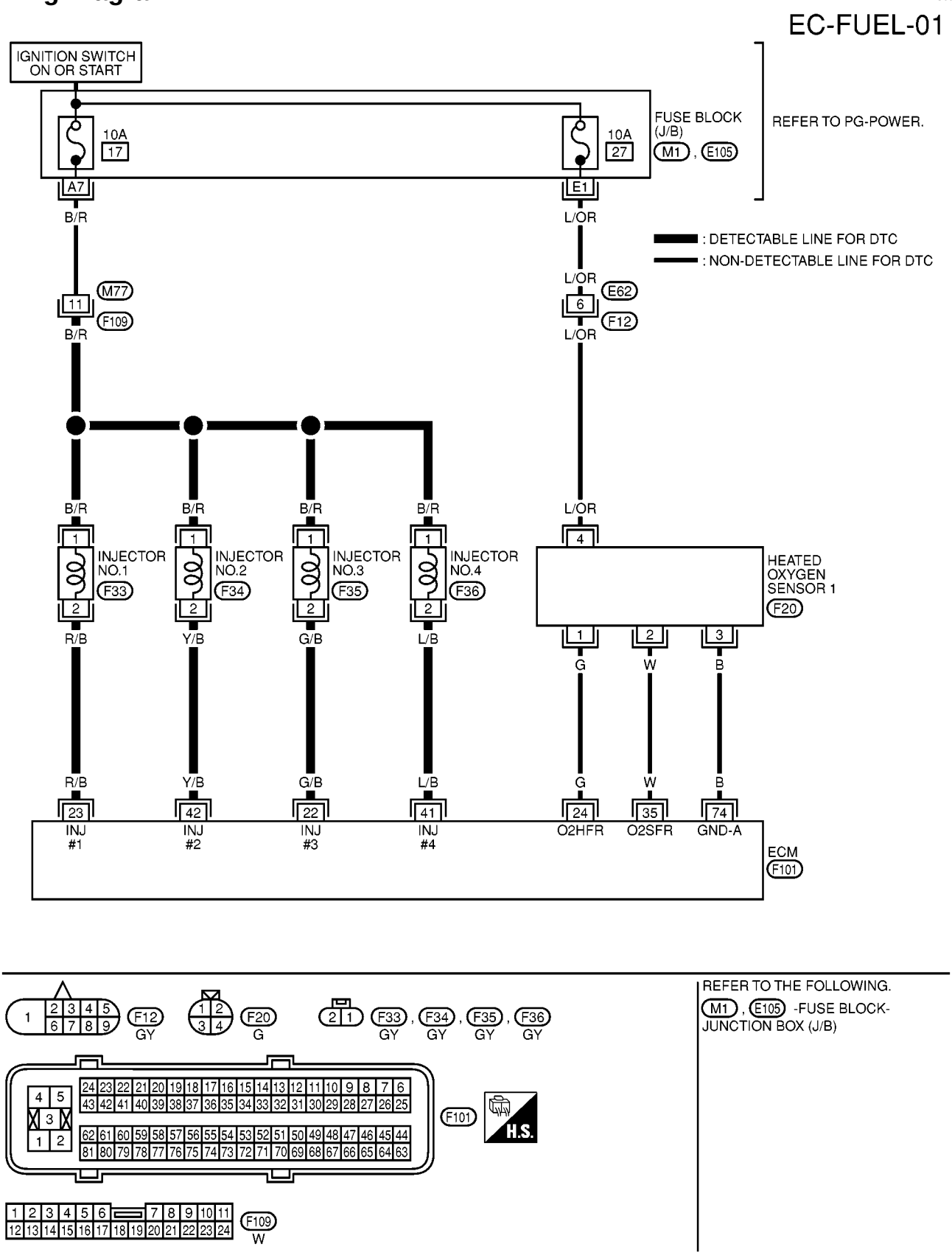
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.

3. Disconnect mass air flow sensor harness connector. Then restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Select “MODE 3” with GST. Make sure DTC P0102 is detected.
6. Select “MODE 4” with GST and erase the DTC P0102.
7. Start engine again and let it idle for at least 10 minutes.
8. Select “MODE 7” with GST. The 1st trip DTC P0171 should be detected at this stage, if a malfunction exists. If so, go to EC-288, "Diagnostic Procedure" .
9. If it is difficult to start engine at step 7, the fuel injection system has a malfunction.
10. Crank engine while depressing accelerator pedal. If engine starts, go to EC-288, "Diagnostic Procedure" . If engine does not start, check exhaust and intake air leak visually.



Wiring Diagram

EBS00ENC



REFER TO THE FOLLOWING.
M1, E105 -FUSE BLOCK-JUNCTION BOX (J/B)

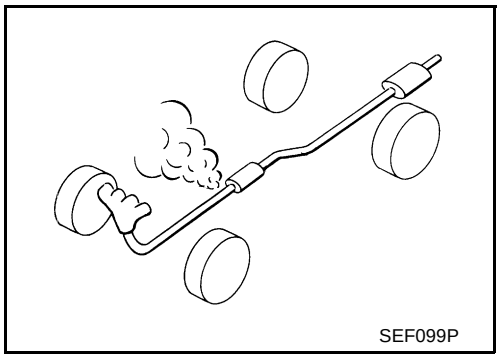
MBWA0060E

Diagnostic Procedure

EBS00END

1. CHECK EXHAUST AIR LEAK

1. Start engine and run it at idle.
2. Listen for an exhaust air leak before three way catalyst.



OK or NG

OK >> GO TO 2.
NG >> Repair or replace.

2. CHECK FOR INTAKE AIR LEAK AND PCV HOSE

1. Listen for an intake air leak after the mass air flow sensor.
2. Check PCV hose connection.

OK or NG

OK >> GO TO 3.
NG >> Repair or replace.

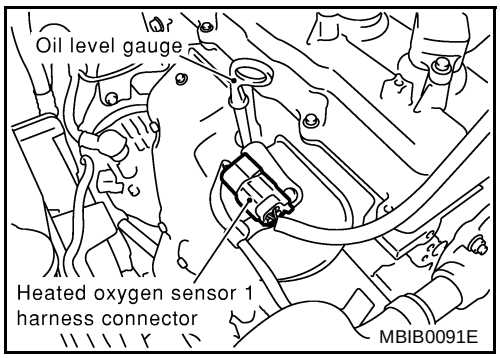
3. CHECK HEATED OXYGEN SENSOR 1 CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 1 (HO2S1) harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminal 35 and HO2S1 terminal 2, ECM terminal 74 and HO2S1 terminal 3.
   Refer to Wiring Diagram.

   Continuity should exist.

5. Check harness continuity between ECM terminals 35, 74 or HO2S1 terminals 2, 3 and ground.
   Refer to Wiring Diagram.

   Continuity should not exist.



6. Also check harness for short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK FUEL PRESSURE

1. Release fuel pressure to zero. Refer to EC-58, "FUEL PRESSURE RELEASE" .
2. Install fuel pressure gauge and check fuel pressure. Refer to EC-58, "FUEL PRESSURE CHECK" .

   At idling: Approximately 350 kPa (3.7 kg/cm^2 , 51 psi)

OK or NG

OK >> GO TO 5.
NG >> Follow the construction of “FUEL PRESSURE CHECK”.

5. CHECK MASS AIR FLOW SENSOR

With CONSULT-II

1. Install all removed parts.
2. Check “MASS AIR FLOW” in “DATA MONITOR” mode with CONSULT-II.

1.0 - 4.0 g·m/sec: at idling
5.0 - 10 g·m/sec: at 2,500 rpm

With GST

1. Install all removed parts.
2. Check mass air flow sensor signal in MODE 1 with GST.

1.0 - 4.0 g·m/sec: at idling
5.0 - 10 g·m/sec: at 2,500 rpm

OK or NG

OK >> GO TO 6.
NG >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds. Refer to EC-183, "DTC P0102, P0103 MAF SENSOR" .

6. CHECK FUNCTION OF INJECTORS

With CONSULT-II

1. Start engine.
2. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT-II.
3. Make sure that each circuit produces a momentary engine speed drop.

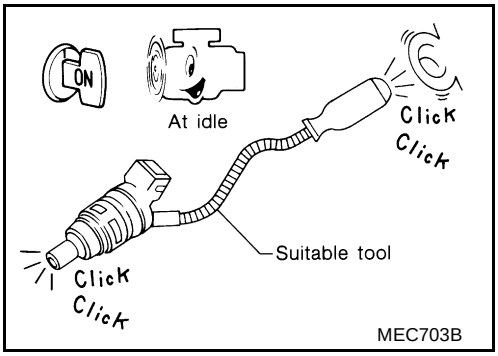
ACTIVE TEST	
POWER BALANCE	
MONITOR	
ENG SPEED	XXX rpm
MAS A/F SE-B1	XXX V

PBIB0133E

Without CONSULT-II

1. Start engine.
2. Listen to each injector operating sound.

Clicking noise should be heard.



MEC703B

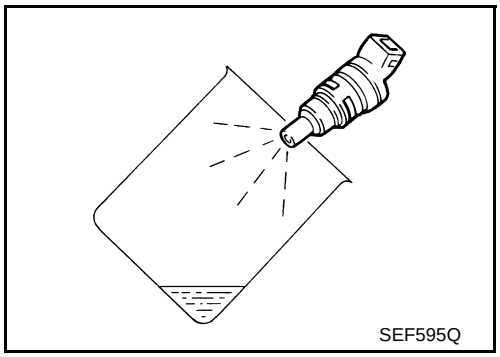
OK or NG

OK >> GO TO 7.
NG >> Perform trouble diagnosis for EC-530, "INJECTOR CIRCUIT" .

7. CHECK INJECTOR

1. Confirm that the engine is cooled down and there are no fire hazards near the vehicle.
2. Turn ignition switch “OFF”.
3. Disconnect injector harness connectors.
4. Remove injector gallery assembly. Refer to EM-31, "FUEL INJECTOR AND FUEL TUBE" .
   Keep fuel hose and all injectors connected to injector gallery.
   The injector harness connectors should remain connected.
5. Disconnect all ignition coil harness connectors.
6. Prepare pans or saucers under each injector.
7. Crank engine for about 3 seconds. Make sure that fuel sprays out from injectors.

Fuel should be sprayed evenly for each injector.



OK or NG

OK >> GO TO 8.
NG >> Replace injectors from which fuel does not spray out. Always replace O-ring with new ones.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

DTC P0171, P0174 FUEL INJECTION SYSTEM FUNCTION (QG18DE)

PFP:16600

On Board Diagnosis Logic

EBS00ENE

With the Air/Fuel Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought closely to the theoretical mixture ratio based on the mixture ratio feedback signal from the heated oxygen sensors 1. The ECM calculates the necessary compensation to correct the offset between the actual and the theoretical ratios.
In case the amount of the compensation value is extremely large (The actual mixture ratio is too lean.), the ECM judges the condition as the fuel injection system malfunction and light up the MI (2 trip detection logic).

Sensor	Input Signal to ECM	ECM function	Actuator
Heated oxygen sensors 1	Density of oxygen in exhaust gas (Mixture ratio feedback signal)	Fuel injection control	Fuel injectors

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0171 0171 (Bank 1) P0174 0174 (Bank 2)	Fuel injection system too lean	● Fuel injection system does not operate properly. ● The amount of mixture ratio compensation is too large. (The mixture ratio is too lean.)	● Intake air leaks ● Heated oxygen sensor 1 ● Injectors ● Exhaust gas leaks ● Incorrect fuel pressure ● Lack of fuel ● Mass air flow sensor ● Incorrect PCV hose connection

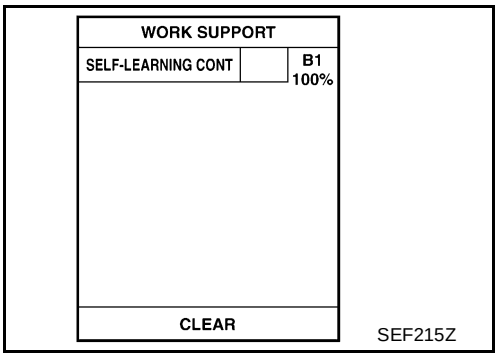
DTC Confirmation Procedure

EBS00ENF

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Turn ignition switch “ON” and select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
4. Clear the self-learning control coefficient by touching “CLEAR”.
5. Select “DATA MONITOR” mode with CONSULT-II.
6. Start engine again and let it idle for at least 10 minutes.
   The 1st trip DTC P0171 or P0174 should be detected at this stage, if a malfunction exists. If so, go to EC-295, "Diagnostic Procedure" .
7. If it is difficult to start engine at step 6, the fuel injection system has a malfunction, too.
8. Crank engine while depressing accelerator pedal. If engine starts, go to EC-295, "Diagnostic Procedure" . If engine does not start, check exhaust and intake air leak visually.

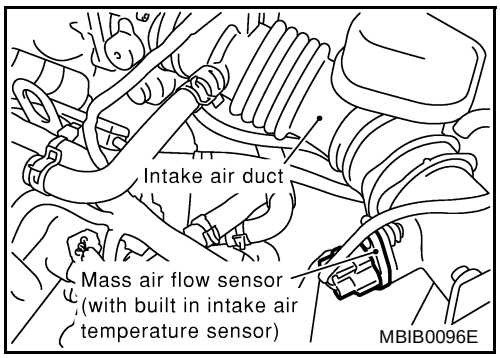


SEF215Z

WITH GST

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.

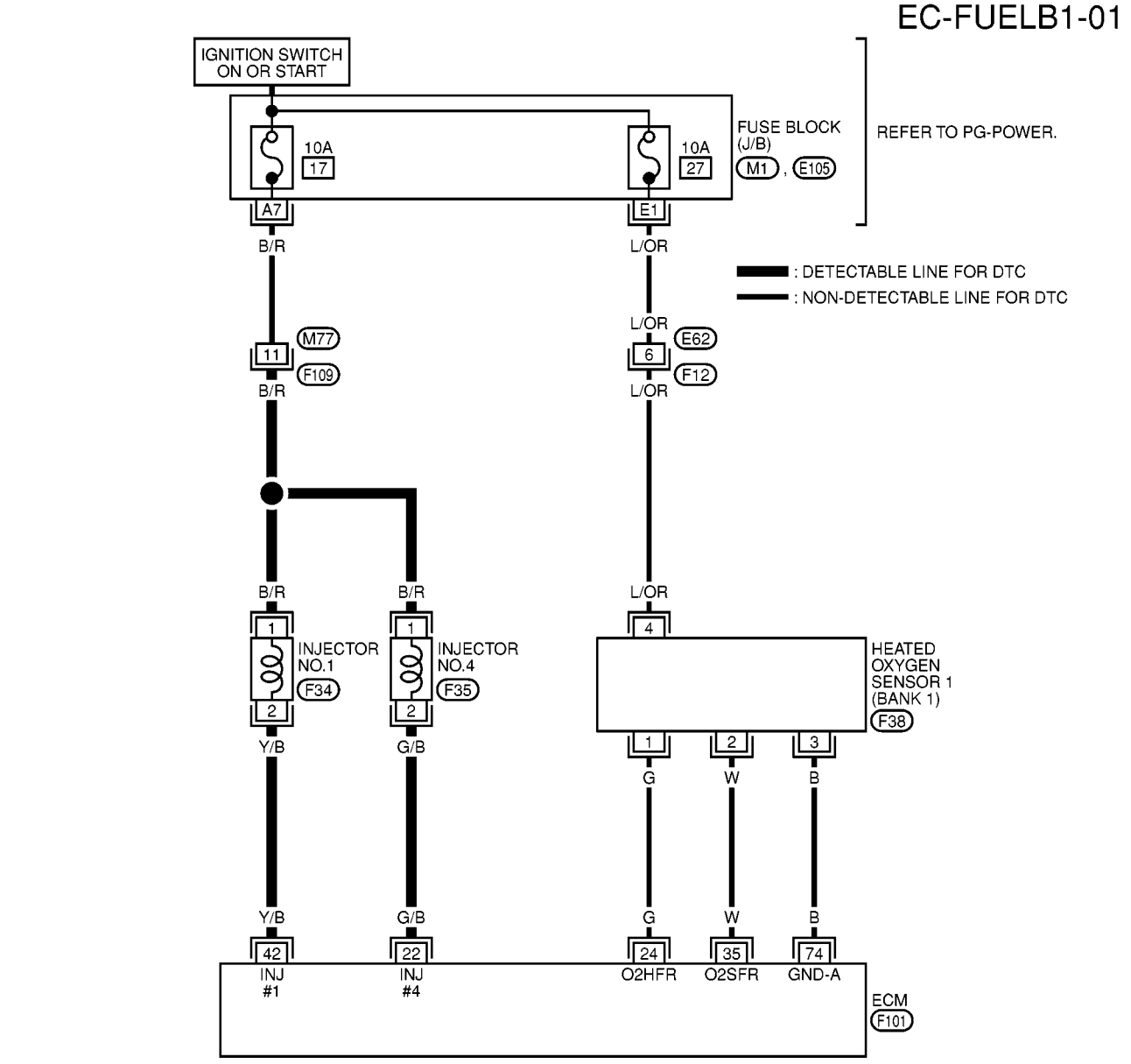
3. Disconnect mass air flow sensor harness connector. Then restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Select “MODE 3” with GST. Make sure DTC P0102 is detected.
6. Select “MODE 4” with GST and erase the DTC P0102.
7. Start engine again and let it idle for at least 10 minutes.
8. Select “MODE 7” with GST. The 1st trip DTC P0171 or P0174 should be detected at this stage, if a malfunction exists. If so, go to EC-295, "Diagnostic Procedure" .
9. If it is difficult to start engine at step 7, the fuel injection system has a malfunction.
10. Crank engine while depressing accelerator pedal. If engine starts, go to EC-295, "Diagnostic Procedure" . If engine does not start, check exhaust and intake air leak visually.

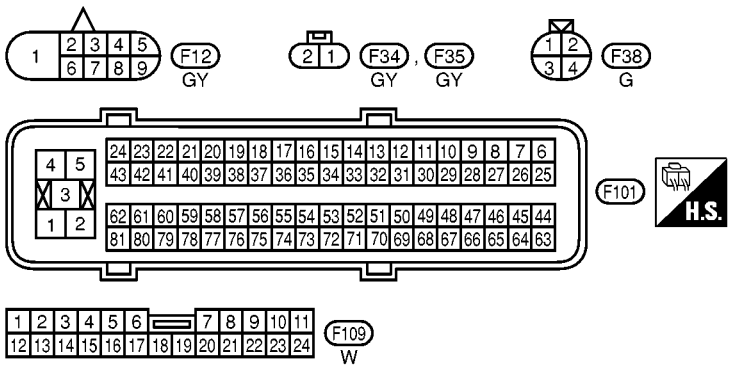


Wiring Diagram

EBS00ENG

BANK 1



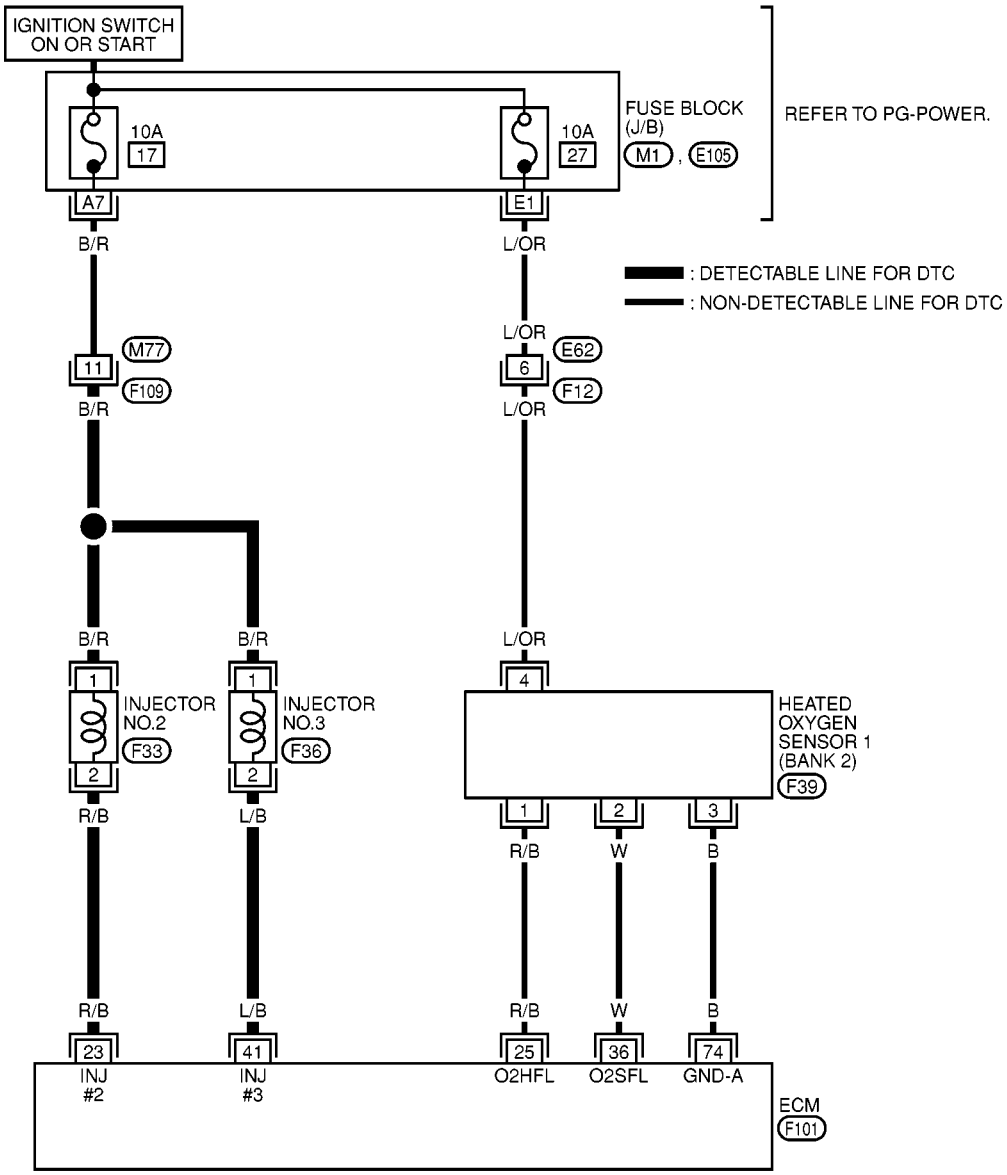


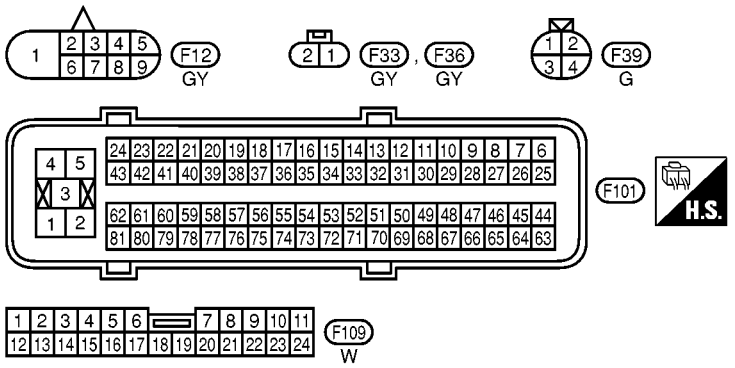
REFER TO THE FOLLOWING.
M1, E105 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0061E

BANK 2

EC-FUELB2-01





REFER TO THE FOLLOWING.
M1, E105 -FUSE BLOCK-JUNCTION BOX (J/B)

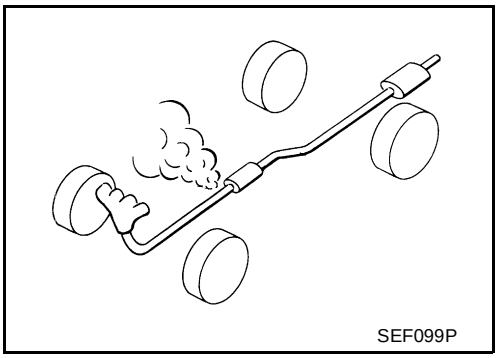
MBWA0062E

Diagnostic Procedure

EBS00ENH

1. CHECK EXHAUST AIR LEAK

1. Start engine and run it at idle.
2. Listen for an exhaust air leak before three way catalyst.


SEF099P

OK or NG

OK >> GO TO 2.
NG >> Repair or replace.

2. CHECK FOR INTAKE AIR LEAK

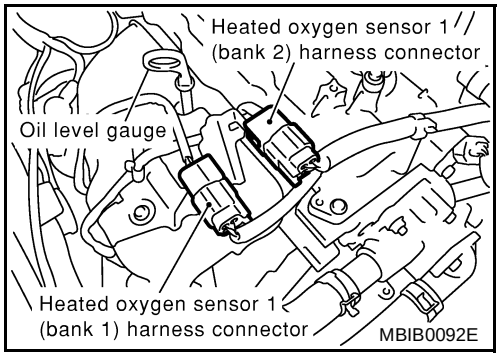
1. Listen for an intake air leak after the mass air flow sensor.
2. Check PCV hose connection.

OK or NG

OK >> GO TO 3.
NG >> Repair or replace.

3. CHECK HEATED OXYGEN SENSOR 1 CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect corresponding heated oxygen sensor 1 (HO2S1) harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminal and HO2S1 terminal as follows.
   Refer to Wiring Diagram.



DTC	Terminals		Bank
	ECM	Sensor	
P0171	35	2	1
	74	3	
P0174	36	2	2
	74	3	

Continuity should exist.

5. Check harness continuity between the following terminals and ground.
   Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM	Sensor	
P0171	35, 74	2, 3	1
P0174	36, 74	2, 3	2

Continuity should not exist.

6. Also check harness for short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK FUEL PRESSURE

1. Release fuel pressure to zero. Refer to EC-58, "FUEL PRESSURE RELEASE" .
2. Install fuel pressure gauge and check fuel pressure. Refer to EC-58, "FUEL PRESSURE CHECK" .

At idling: 350 kPa (3.7 kg/cm^2 , 51 psi)

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Fuel pump and circuit (Refer to EC-536, "FUEL PUMP CIRCUIT" .)
- Fuel pressure regulator (Refer to EC-58, "FUEL PRESSURE CHECK" .)
- Fuel lines (Refer to MA-23, "Checking Fuel Lines" .)
- Fuel filter for clogging

>> Repair or replace.

6. CHECK MASS AIR FLOW SENSOR

With CONSULT-II

1. Install all removed parts.
2. Check “MASS AIR FLOW” in “DATA MONITOR” mode with CONSULT-II.

1.0 - 4.0 g·m/sec: at idling
5.0 - 10.0 g·m/sec: at 2,500 rpm

With GST

1. Install all removed parts.
2. Check mass air flow sensor signal in MODE 1 with GST.

1.0 - 4.0 g·m/sec: at idling
5.0 - 10.0 g·m/sec: at 2,500 rpm

OK or NG

OK >> GO TO 7.
NG >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds. Refer to EC-183, "DTC P0102, P0103 MAF SENSOR" .

7. CHECK FUNCTION OF INJECTORS

With CONSULT-II

1. Start engine.
2. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT-II.
3. Make sure that each circuit produces a momentary engine speed drop.

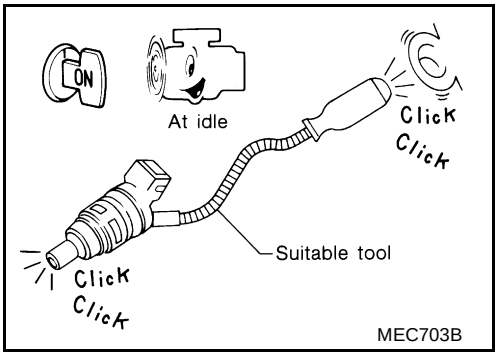
ACTIVE TEST	
POWER BALANCE	
MONITOR	
ENG SPEED	XXX rpm
MAS A/F SE-B1	XXX V

PBIB0133E

Without CONSULT-II

1. Start engine.
2. Listen to each injector operating sound.

Clicking noise should be heard.



MEC703B

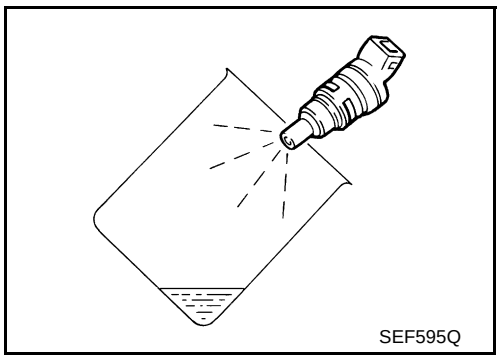
OK or NG

OK >> GO TO 8.
NG >> Perform trouble diagnosis for EC-530, "INJECTOR CIRCUIT" .

8. CHECK INJECTOR

1. Confirm that the engine is cooled down and there are no fire hazards near the vehicle.
2. Turn ignition switch “OFF”.
3. Disconnect injector harness connectors on bank 2 (for DTC P0171), bank 1 (for DTC P0174).
4. Remove injector gallery assembly. Refer to EM-31, "FUEL INJECTOR AND FUEL TUBE" .
   Keep fuel hose and all injectors connected to injector gallery.
   The injector harness connectors on bank 1 (for DTC P0171), bank 2 (for DTC P0174) should remain connected.
5. Disconnect all ignition coil harness connectors.
6. Prepare pans or saucers under each injector.
7. Crank engine for about 3 seconds. Make sure that fuel sprays out from injectors.

Fuel should be sprayed evenly for each injector.



OK or NG

OK >> GO TO 9.
NG >> Replace injectors from which fuel does not spray out. Always replace O-ring with new ones.

9. CHECK INTERMITTENT INCIDENT

Refer to EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

DTC P0172 FUEL INJECTION SYSTEM FUNCTION (QG16DE)

PFP:16600

On Board Diagnosis Logic

EBS00FRK

With the Air/Fuel Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought closely to the theoretical mixture ratio based on the mixture ratio feedback signal from the heated oxygen sensors 1. The ECM calculates the necessary compensation to correct the offset between the actual and the theoretical ratios.
In case the amount of the compensation value is extremely large (The actual mixture ratio is too rich.), the ECM judges the condition as the fuel injection system malfunction and light up the MI (2 trip detection logic).

Sensor	Input Signal to ECM	ECM function	Actuator
Heated oxygen sensors 1	Density of oxygen in exhaust gas (Mixture ratio feedback signal)	Fuel injection control	Fuel injectors

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0172 0172	Fuel injection system too rich	● Fuel injection system does not operate properly. ● The amount of mixture ratio compensation is too large. (The mixture ratio is too rich.)	● Heated oxygen sensor 1 ● Injectors ● Exhaust gas leaks ● Incorrect fuel pressure ● Mass air flow sensor

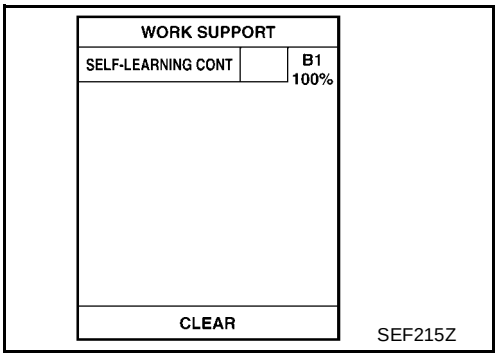
DTC Confirmation Procedure

EBS00FRL

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Turn ignition switch “ON” and select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
4. Clear the self-learning control coefficient by touching “CLEAR”.
5. Select “DATA MONITOR” mode with CONSULT-II.
6. Start engine again and let it idle for at least 10 minutes.
   The 1st trip DTC P0172 should be detected at this stage, if a malfunction exists. If so, go to EC-302, "Diagnostic Procedure" .
7. If it is difficult to start engine at step 6, the fuel injection system has a malfunction, too.
8. Crank engine while depressing accelerator pedal.
   If engine starts, go to EC-302, "Diagnostic Procedure" . If engine does not start, remove ignition plugs and check for fouling, etc.

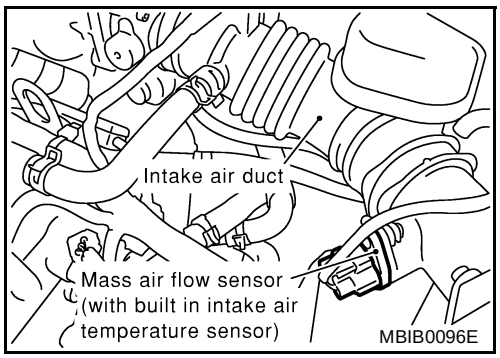


SEF215Z

WITH GST

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.

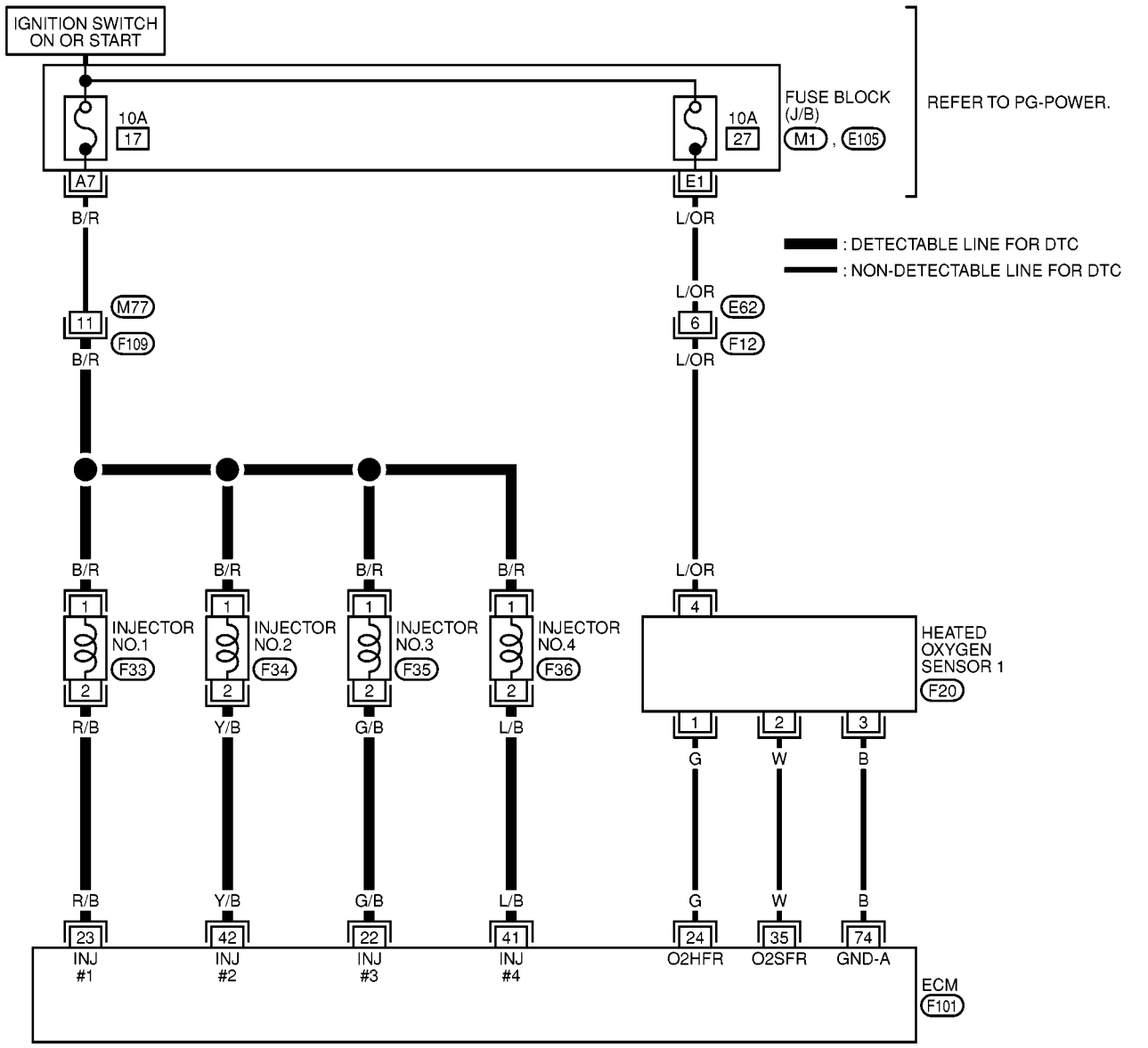
3. Disconnect mass air flow sensor harness connector. Then restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Select “MODE 3” with GST. Make sure DTC P0102 is detected.
6. Select “MODE 4” with GST and erase the DTC P0102.
7. Start engine again and let it idle for at least 10 minutes.
8. Select “MODE 7” with GST. The 1st trip DTC P0172 should be detected at this stage, if a malfunction exists. If so, go to EC-302, "Diagnostic Procedure" .
9. If it is difficult to start engine at step 7, the fuel injection system has a malfunction.
10. Crank engine while depressing accelerator pedal.
    If engine starts, go to EC-302, "Diagnostic Procedure" . If engine does not start, check exhaust and intake air leak visually.

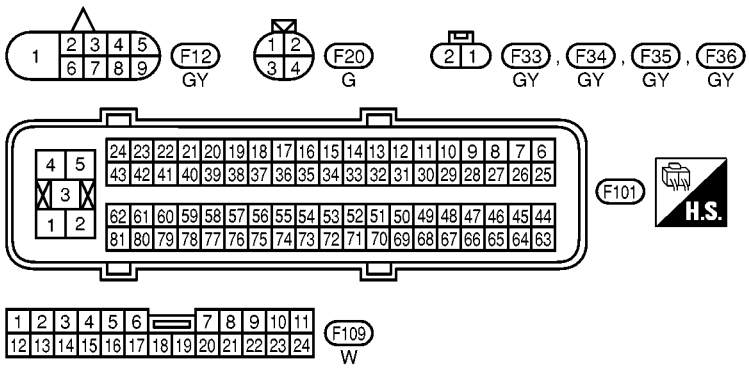


Wiring Diagram

EBS00FRM

EC-FUEL-01





REFER TO THE FOLLOWING.
M1, E105 -FUSE BLOCK-JUNCTION BOX (J/B)

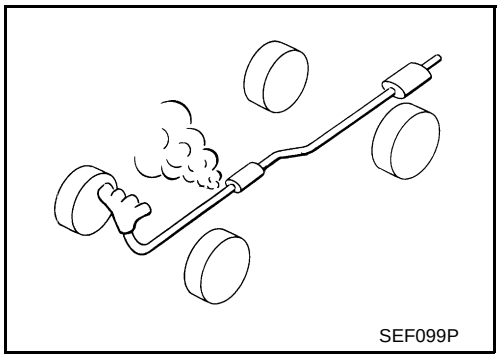
MBWA0060E

Diagnostic Procedure

EBS00FRN

1. CHECK EXHAUST AIR LEAK

1. Start engine and run it at idle.
2. Listen for an exhaust air leak before three way catalyst.


SEF099P

OK or NG

OK >> GO TO 2.
NG >> Repair or replace.

2. CHECK FOR INTAKE AIR LEAK

Listen for an intake air leak after the mass air flow sensor.

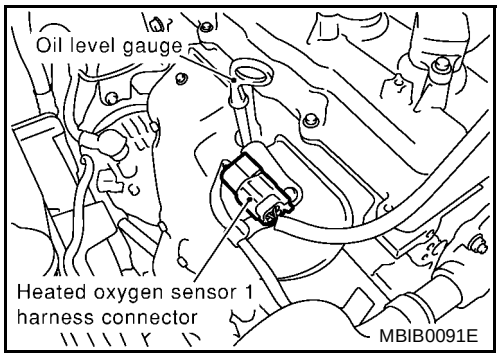
OK or NG

OK >> GO TO 3.
NG >> Repair or replace.

3. CHECK HEATED OXYGEN SENSOR 1 CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 1 (HO2S1) harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminal 35 and HO2S1 terminal 2, ECM terminal 74 and HO2S1 terminal 3.
   Refer to Wiring Diagram.

   Continuity should exist.



5. Check harness continuity between ECM terminals 35, 74 or HO2S1 terminals 2, 3 and ground.
   Refer to Wiring Diagram.

   Continuity should not exist.

6. Also check harness for short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK FUEL PRESSURE

1. Release fuel pressure to zero. Refer to EC-58, "FUEL PRESSURE RELEASE" .
2. Install fuel pressure gauge and check fuel pressure. Refer to EC-58, "FUEL PRESSURE CHECK" .

   At idling: 350 kPa (3.7 kg/cm2, 51 psi)

OK or NG

OK >> GO TO 5.
NG >> Follow the construction of “FUEL PRESSURE CHECK”.

5. CHECK MASS AIR FLOW SENSOR

With CONSULT-II

1. Install all removed parts.
2. Check “MASS AIR FLOW” in “DATA MONITOR” mode with CONSULT-II.

1.0 - 4.0 g·m/sec: at idling
5.0 - 10 g·m/sec: at 2,500 rpm

With GST

1. Install all removed parts.
2. Check mass air flow sensor signal in MODE 1 with GST.

1.0 - 4.0 g·m/sec: at idling
5.0 - 10 g·m/sec: at 2,500 rpm

OK or NG

OK >> GO TO 6.
NG >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds. Refer to EC-183, "DTC P0102, P0103 MAF SENSOR" .

6. CHECK FUNCTION OF INJECTORS

With CONSULT-II

1. Start engine.
2. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT-II.
3. Make sure that each circuit produces a momentary engine speed drop.

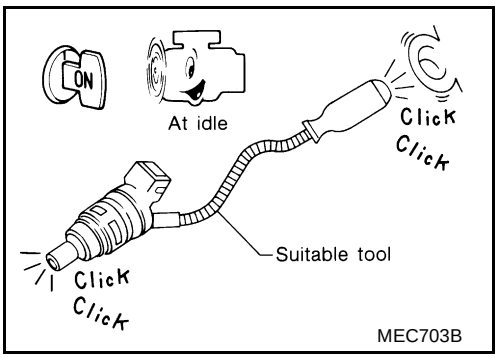
ACTIVE TEST	
POWER BALANCE	
MONITOR	
ENG SPEED	XXX rpm
MAS A/F SE-B1	XXX V

PBIB0133E

Without CONSULT-II

1. Start engine.
2. Listen to each injector operating sound.

Clicking noise should be heard.



MEC703B

OK or NG

OK >> GO TO 7.
NG >> Perform trouble diagnosis for EC-530, "INJECTOR CIRCUIT" .

7. CHECK INJECTOR

1. Remove injector assembly. Refer to EM-31, "FUEL INJECTOR AND FUEL TUBE" .
   Keep fuel hose and all injectors connected to injector gallery.
2. Confirm that the engine is cooled down and there are no fire hazards near the vehicle.
3. Disconnect injector harness connectors.
   The injector harness connectors should remain connected.
4. Disconnect all ignition coil harness connectors.
5. Prepare pans or saucers under each injectors.
6. Crank engine for about 3 seconds.
   Make sure fuel does not drip from injector.

OK or NG

OK (Does not drip.)>>GO TO 8.
NG (Drips.)>>Replace the injectors from which fuel is dripping. Always replace O-ring with new one.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

DTC P0172, P0175 FUEL INJECTION SYSTEM FUNCTION (QG18DE)

PFP:16600

On Board Diagnosis Logic

EBS00FRO

With the Air/Fuel Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought closely to the theoretical mixture ratio based on the mixture ratio feedback signal from the heated oxygen sensors 1. The ECM calculates the necessary compensation to correct the offset between the actual and the theoretical ratios.
In case the amount of the compensation value is extremely large (The actual mixture ratio is too rich.), the ECM judges the condition as the fuel injection system malfunction and light up the MI (2 trip detection logic).

Sensor	Input Signal to ECM	ECM function	Actuator
Heated oxygen sensors 1	Density of oxygen in exhaust gas (Mixture ratio feedback signal)	Fuel injection control	Fuel injectors

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0172 0172 (Bank 1) P0175 0175 (Bank 2)	Fuel injection system too rich	● Fuel injection system does not operate properly. ● The amount of mixture ratio compensation is too large. (The mixture ratio is too rich.)	● Heated oxygen sensor 1 ● Injectors ● Exhaust gas leaks ● Incorrect fuel pressure ● Mass air flow sensor

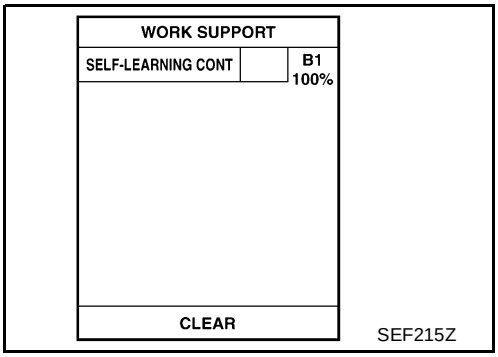
DTC Confirmation Procedure

EBS00FRP

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

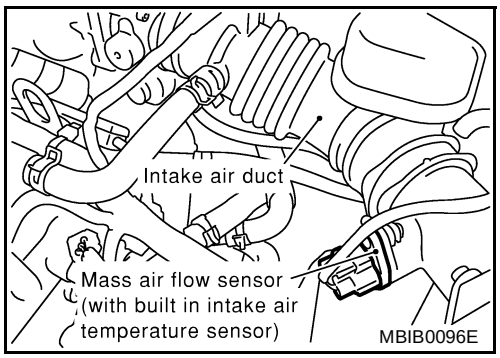
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Turn ignition switch “ON” and select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
4. Clear the self-learning control coefficient by touching “CLEAR”.
5. Select “DATA MONITOR” mode with CONSULT-II.
6. Start engine again and let it idle for at least 10 minutes.
   The 1st trip DTC P0172, P0175 should be detected at this stage, if a malfunction exists. If so, go to EC-309, "Diagnostic Procedure" .
7. If it is difficult to start engine at step 6, the fuel injection system has a malfunction, too.
8. Crank engine while depressing accelerator pedal.
   If engine starts, go to EC-309, "Diagnostic Procedure" . If engine does not start, remove ignition plugs and check for fouling, etc.



WITH GST

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.

3. Disconnect mass air flow sensor harness connector. Then restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Select “MODE 3” with GST. Make sure DTC P0102 is detected.
6. Select “MODE 4” with GST and erase the DTC P0102.
7. Start engine again and let it idle for at least 10 minutes.
8. Select “MODE 7” with GST. The 1st trip DTC P0172 or P0175 should be detected at this stage, if a malfunction exists. If so, go to EC-309, "Diagnostic Procedure" .
9. If it is difficult to start engine at step 7, the fuel injection system has a malfunction.
10. Crank engine while depressing accelerator pedal.
    If engine starts, go to EC-309, "Diagnostic Procedure" . If engine does not start, check exhaust and intake air leak visually.

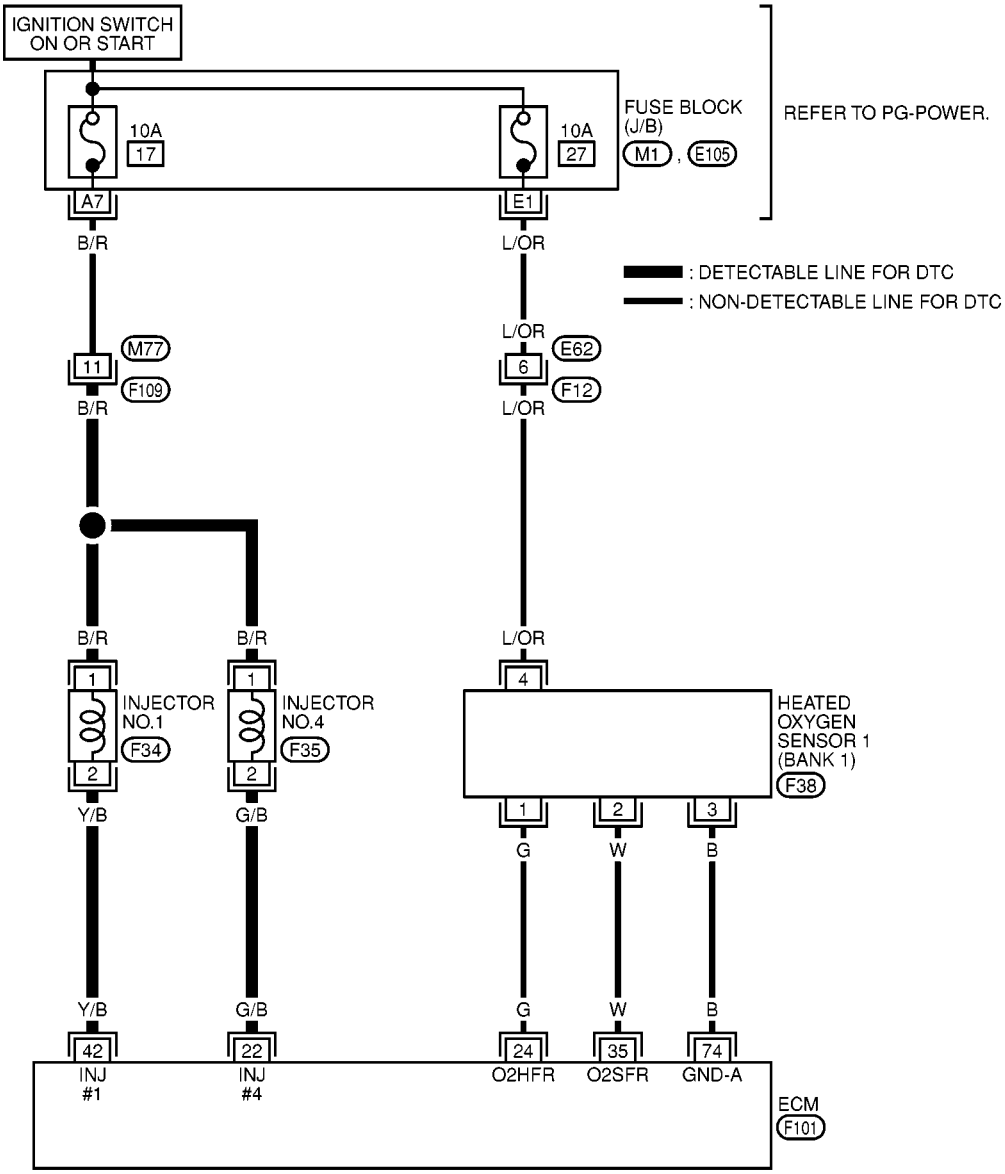


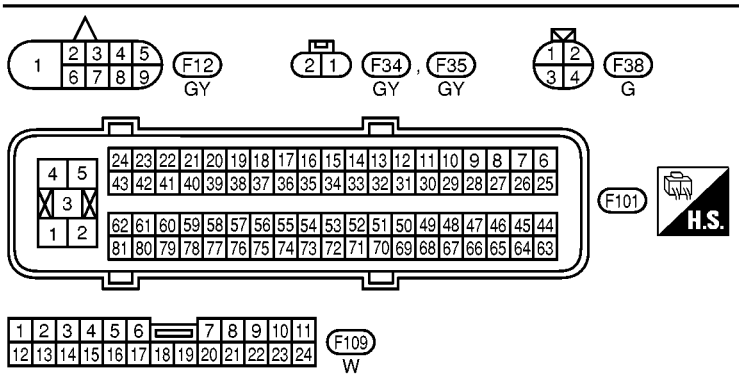
Wiring Diagram

EBS00FRQ

BANK 1

EC-FUELB1-01



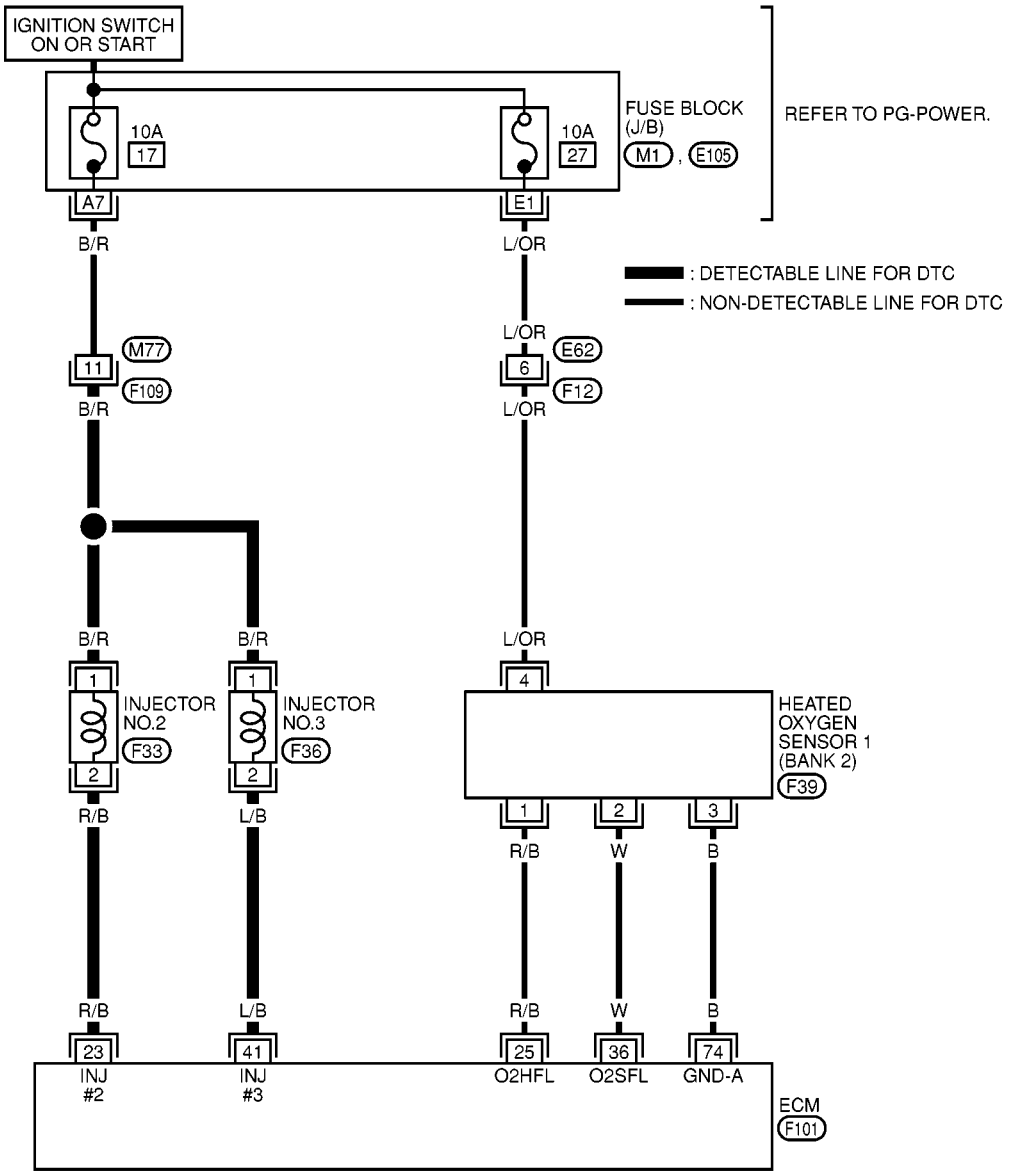


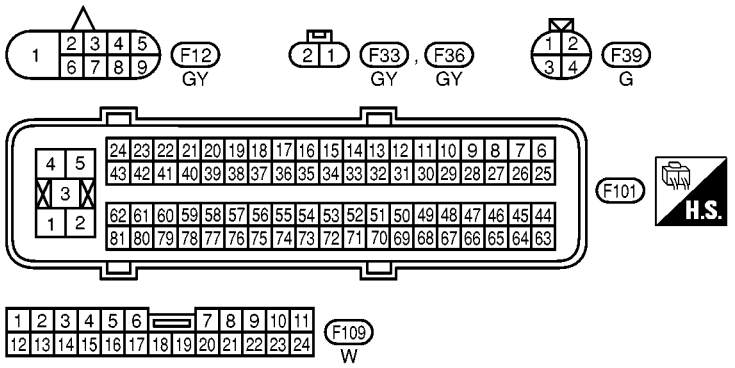
REFER TO THE FOLLOWING.
M1, E105 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0061E

BANK 2

EC-FUELB2-01





REFER TO THE FOLLOWING.
M1, E105 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0062E

Diagnostic Procedure

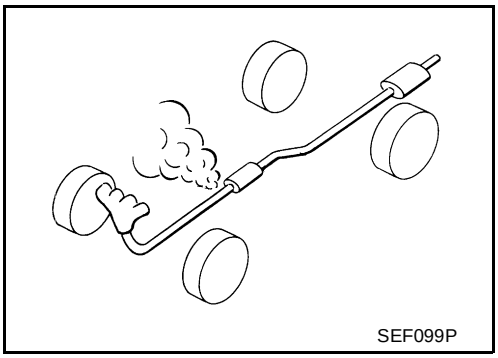
EBS00FRR

1. CHECK EXHAUST AIR LEAK

1. Start engine and run it at idle.
2. Listen for an exhaust air leak before three way catalyst.

OK or NG

OK >> GO TO 2.
NG >> Repair or replace.



2. CHECK FOR INTAKE AIR LEAK

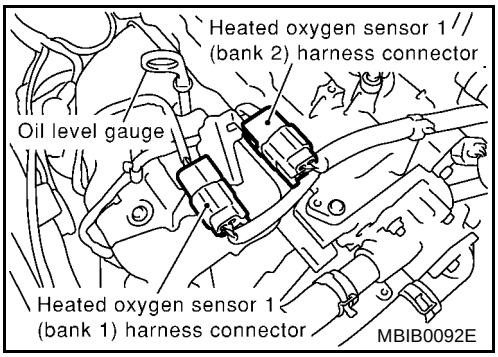
Listen for an intake air leak after the mass air flow sensor.

OK or NG

OK >> GO TO 3.
NG >> Repair or replace.

3. CHECK HEATED OXYGEN SENSOR 1 CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect corresponding heated oxygen sensor 1 (HO2S1) harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminal and HO2S1 terminal as follows.
   Refer to Wiring Diagram.



DTC	Terminals		Bank
	ECM	Sensor	
P0172	35	2	1
	74	3	
P0175	36	2	2
	74	3	

Continuity should exist.

5. Check harness continuity between the following terminals and ground.
   Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM	Sensor	
P0172	35, 74	2, 3	1
P0175	36, 74	2, 3	2

Continuity should not exist.

6. Also check harness for short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK FUEL PRESSURE

1. Release fuel pressure to zero. Refer to EC-58, "FUEL PRESSURE RELEASE" .
2. Install fuel pressure gauge and check fuel pressure. Refer to EC-58, "FUEL PRESSURE CHECK" .

At idling: 350 kPa (3.7 kg/cm^2 , 51 psi)

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Fuel pump and circuit (Refer to EC-536, "FUEL PUMP CIRCUIT" .)
- Fuel pressure regulator (Refer to EC-58, "FUEL PRESSURE CHECK" .)

>> Repair or replace.

6. CHECK MASS AIR FLOW SENSOR

With CONSULT-II

1. Install all removed parts.
2. Check “MASS AIR FLOW” in “DATA MONITOR” mode with CONSULT-II.

2.0 - 6.0 g·m/sec: at idling
7.0 - 20.0 g·m/sec: at 2,500 rpm

With GST

1. Install all removed parts.
2. Check mass air flow sensor signal in MODE 1 with GST.

2.0 - 6.0 g·m/sec: at idling
7.0 - 20.0 g·m/sec: at 2,500 rpm

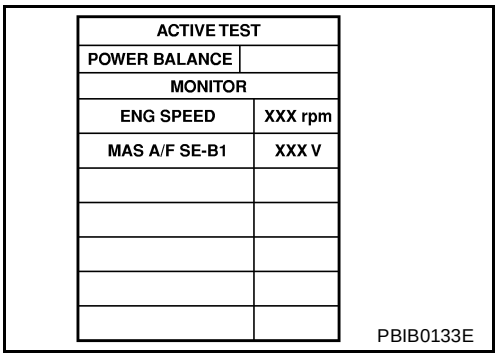
OK or NG

OK >> GO TO 7.
NG >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds. Refer to EC-183, "DTC P0102, P0103 MAF SENSOR" .

7. CHECK FUNCTION OF INJECTORS

With CONSULT-II

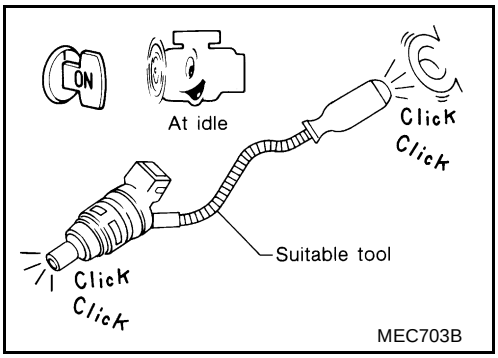
1. Start engine.
2. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT-II.
3. Make sure that each circuit produces a momentary engine speed drop.



Without CONSULT-II

1. Start engine.
2. Listen to each injector operating sound.

Clicking noise should be heard.



OK or NG

OK >> GO TO 8.
NG >> Perform trouble diagnosis for EC-530, "INJECTOR CIRCUIT" .

8. CHECK INJECTOR

1. Remove injector assembly. Refer to EM-31, "FUEL INJECTOR AND FUEL TUBE" .
   Keep fuel hose and all injectors connected to injector gallery.
2. Confirm that the engine is cooled down and there are no fire hazards near the vehicle.
3. Disconnect injector harness connectors bank 2 (for DTC P0172), bank 1 (for P0175).
   The injector harness connectors on bank 1 (for P0172), bank 2 (for P0175) should remain connected.
4. Disconnect all ignition coil harness connectors.
5. Prepare pans or saucers under each injectors.
6. Crank engine for about 3 seconds.
   Make sure fuel does not drip from injector.

OK or NG

OK (Does not drip.)>>GO TO 9.
NG (Drips.)>>Replace the injectors from which fuel is dripping. Always replace O-ring with new one.

9. CHECK INTERMITTENT INCIDENT

Refer to EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

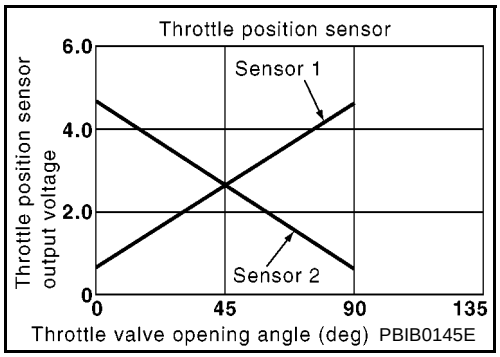
DTC P0221 TP SENSOR

PFP:16119

Component Description

EBS00ENI

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.
The throttle position sensor has the two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.



CONSULT-II Reference Value in Data Monitor Mode

EBS00ENJ

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
THRTL SEN1 THRTL SEN2	● Ignition switch: ON (Engine stopped) ● Shift lever: D (A/T model) 1st (M/T model)	Accelerator pedal: Fully released	More than 0.36V
		Accelerator pedal: Fully depressed	Less than 4.75V

On Board Diagnosis Logic

EBS00ENK

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0221 0221	Throttle position sensor circuit range/performance problem	Rationally incorrect voltage is sent to ECM compared with the signals from TP sensor 1 and TP sensor 2.	● Harness or connector (The TP sensor 1 and 2 circuit is open or shorted.) ● Electric throttle control actuator (TP sensor 1 and 2)

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MI lights up.

Engine operation condition in fail-safe mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.

DTC Confirmation Procedure

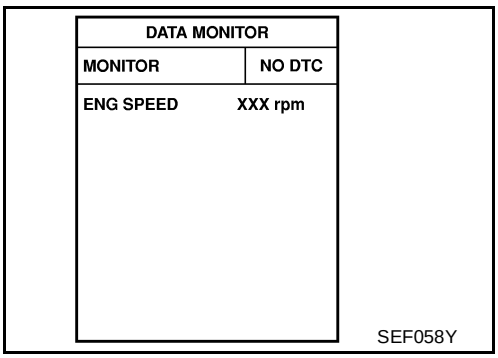
EBS00ENL

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 8V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.

2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-315, "Diagnostic Procedure" .



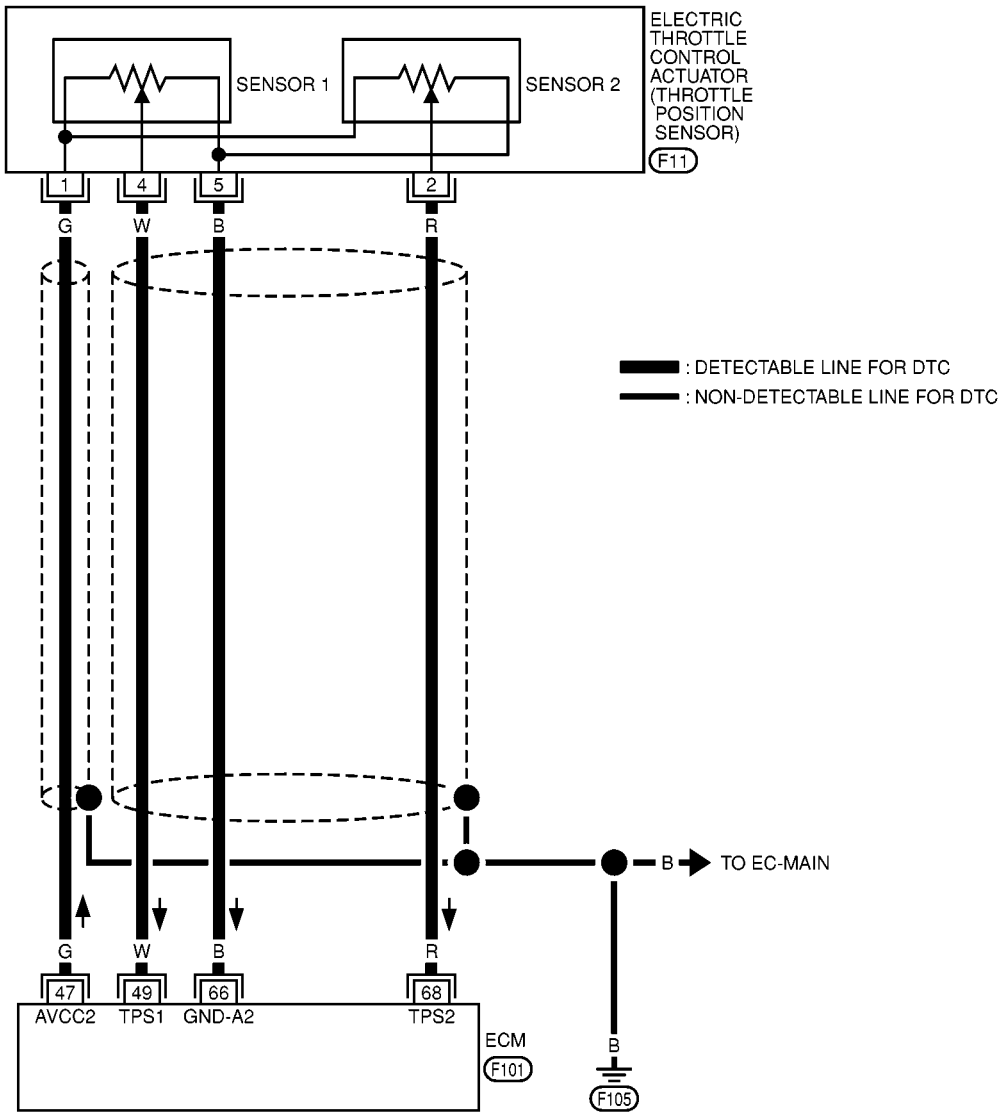
WITH GST

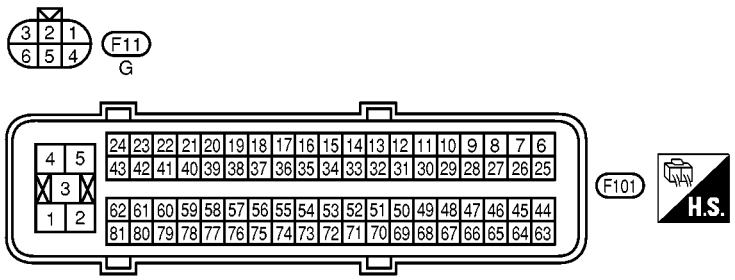
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

EBS00ENM

EC-TPS3-01





MBWA0138E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
47	G	Sensor power supply (Throttle position sensor)	**[Ignition switch "ON"]**	Approximately 5V
49	W	Throttle position sensor 1	**[Ignition switch "ON"]** ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully released	More than 0.36V
			[Ignition switch "ON"] ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully depressed	Less than 4.75V
66	B	Sensor ground (Throttle position sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
68	R	Throttle position sensor 2	**[Ignition switch "ON"]** ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully released	Less than 4.75V
			[Ignition switch "ON"] ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully depressed	More than 0.36V

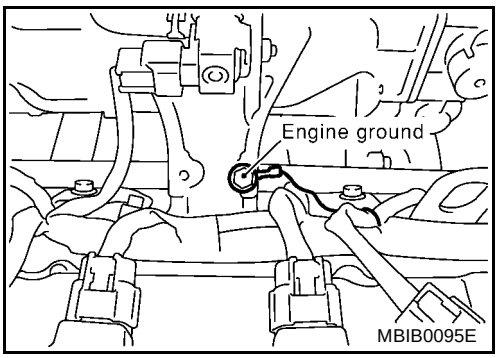
Diagnostic Procedure

EBS00ENN

1. RETIGHTEN GROUND SCREWS

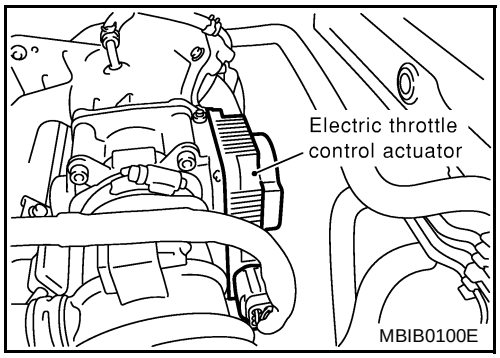
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



2. CHECK THROTTLE POSITION SENSOR POWER SUPPLY CIRCUIT

1. Disconnect electric throttle control actuator harness connector.
2. Turn ignition switch “ON”.

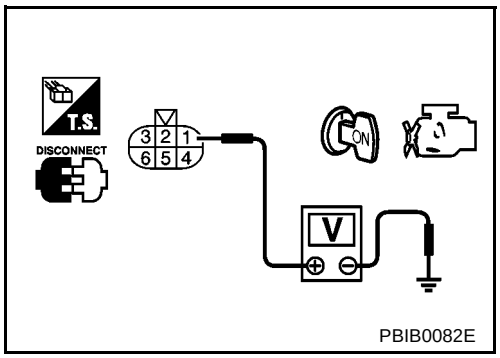


3. Check voltage between electric throttle control actuator terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 5V

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.



3. CHECK THROTTLE POSITION SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 66 and electric throttle control actuator terminal 5. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK THROTTLE POSITION SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 49 and electric throttle control actuator terminal 4, ECM terminal 68 and electric throttle control actuator terminal 2. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK THROTTLE POSITION SENSOR

Refer to EC-317, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-55, "Throttle Valve Closed Position Learning" .
3. Perform EC-55, "Idle Air Volume Learning" .

>> **INSPECTION END**

7. CHECK INTERMITTENT INCIDENT

Refer to EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

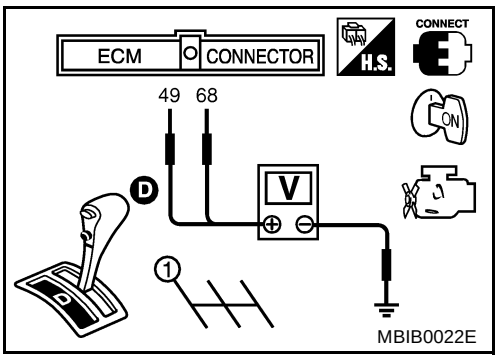
Component Inspection

EBS00ENO

THROTTLE POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Perform EC-55, "Throttle Valve Closed Position Learning" .
3. Turn ignition switch “ON”.
4. Set selector lever to “D” position (A/T models) or “1st” position (M/T models).
5. Check voltage between ECM terminals 49 (TP sensor 1 signal), 68 (TP sensor 2 signal) and engine ground under the following conditions.

Terminal	Accelerator pedal	Voltage
49 (Throttle position sensor 1)	Fully released	More than 0.36V
	Fully depressed	Less than 4.75V
68 (Throttle position sensor 2)	Fully released	Less than 4.75V
	Fully depressed	More than 0.36V



6. If NG, replace electric throttle control actuator and go to the next step.
7. Perform EC-55, "Throttle Valve Closed Position Learning" .
8. Perform EC-55, "Idle Air Volume Learning" .

Remove and Installation

EBS00ENP

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-19, "INTAKE MANIFOLD" .

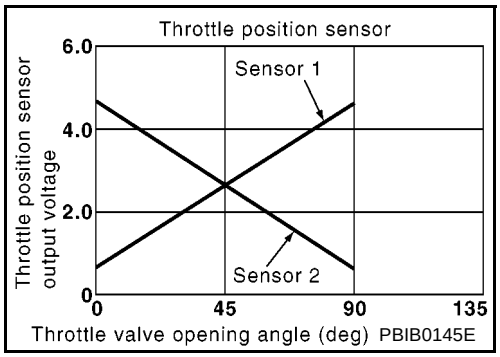
DTC P0222, P0223 TP SENSOR

PFP:16119

Component Description

EBS00ENQ

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.
The throttle position sensor has the two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.



CONSULT-II Reference Value in Data Monitor Mode

EBS00ENR

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
THRTL SEN1	● Ignition switch: ON (Engine stopped) ● Shift lever: D (A/T model) 1st (M/T model)	Accelerator pedal: Fully released	More than 0.36V
		Accelerator pedal: Fully depressed	Less than 4.75V

On Board Diagnosis Logic

EBS00ENS

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0222 0222	Throttle position sensor 1 circuit low input	An excessively low voltage from the TP sensor 1 is sent to ECM.	● Harness or connectors (The TP sensor 1 circuit is open or shorted.) ● Electric throttle control actuator (TP sensor 1)
P0223 0223	Throttle position sensor 1 circuit high input	An excessively high voltage from the TP sensor 1 is sent to ECM.	

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters in fail-safe mode and the MI lights up.

Engine operation condition in fail-safe mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.

DTC Confirmation Procedure

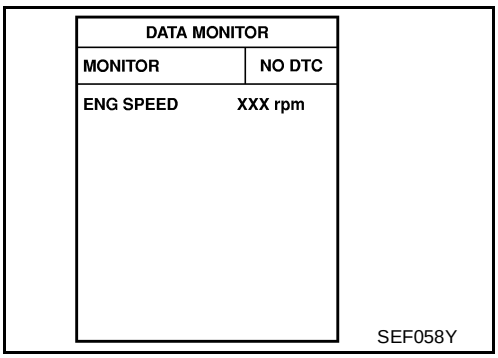
EBS00ENT

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 8V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.

2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-321, "Diagnostic Procedure" .



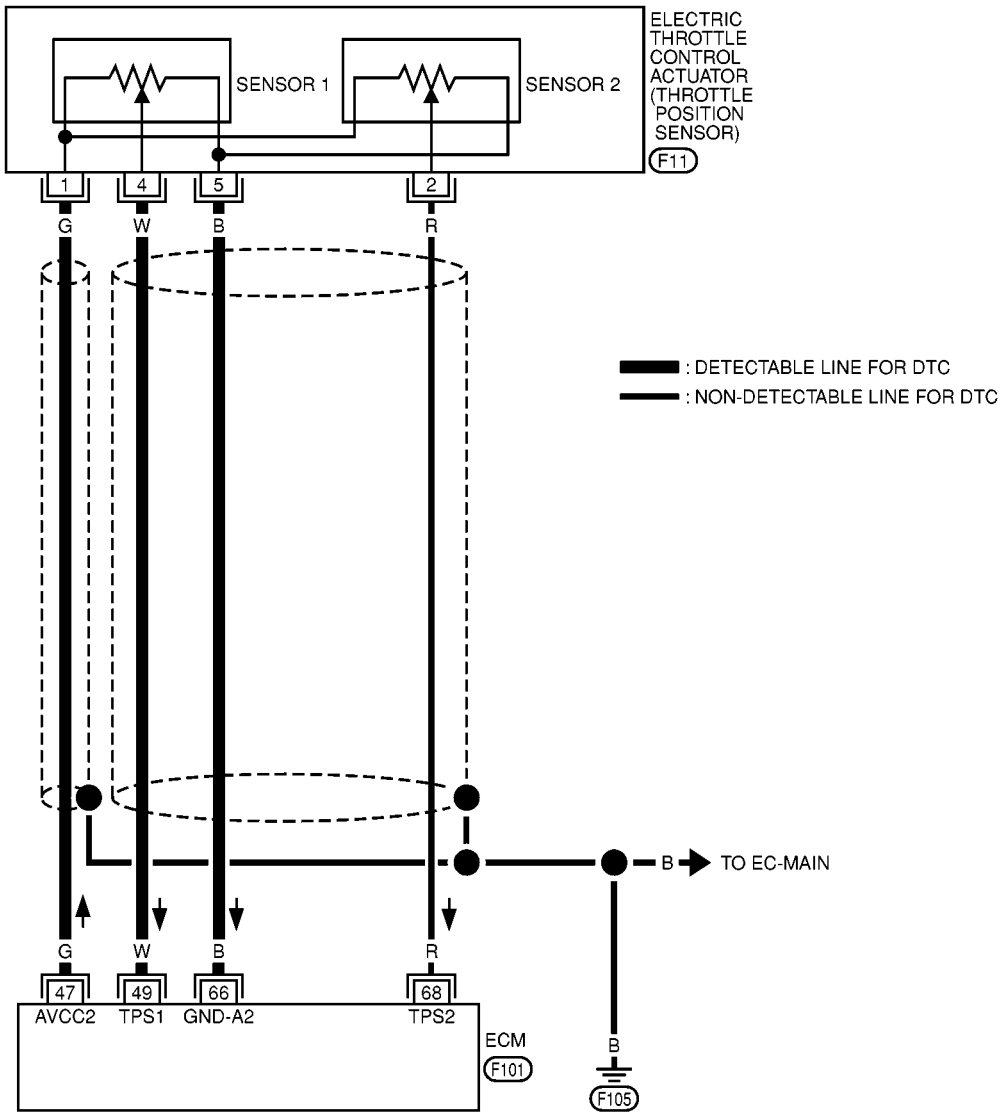
WITH GST

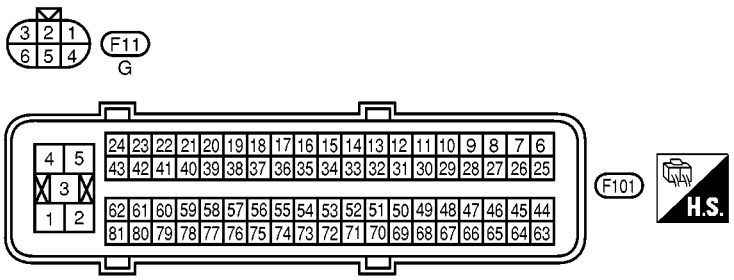
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

EBS00ENU

EC-TPS1-01





MBWA0136E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
47	G	Sensor power supply (Throttle position sensor)	**[Ignition switch "ON"]**	Approximately 5V
49	W	Throttle position sensor 1	**[Ignition switch "ON"]** ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully released	More than 0.36V
			[Ignition switch "ON"] ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully depressed	Less than 4.75V
66	B	Sensor ground (Throttle position sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
68	R	Throttle position sensor 2	**[Ignition switch "ON"]** ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully released	Less than 4.75V
			[Ignition switch "ON"] ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully depressed	More than 0.36V

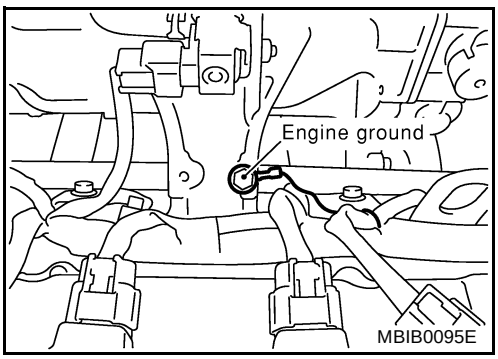
Diagnostic Procedure

EBS00ENV

1. RETIGHTEN GROUND SCREWS

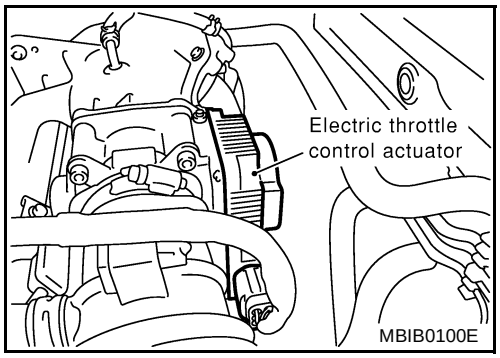
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



2. CHECK THROTTLE POSITION SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect electric throttle control actuator harness connector.
2. Turn ignition switch “ON”.

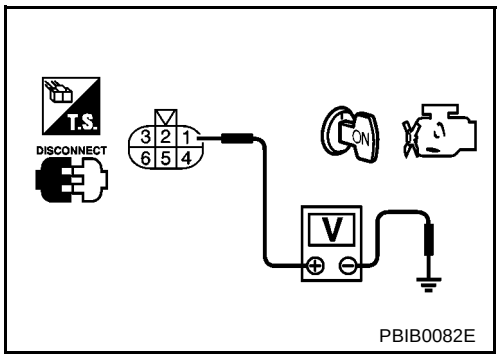


3. Check voltage between electric throttle control actuator terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 5V

OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.



3. CHECK THROTTLE POSITION SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 66 and electric throttle control actuator terminal 5. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK THROTTLE POSITION SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 49 and electric throttle control actuator terminal 4. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK THROTTLE POSITION SENSOR

Refer to EC-323, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-55, "Throttle Valve Closed Position Learning" .
3. Perform EC-55, "Idle Air Volume Learning" .

>> **INSPECTION END**

7. CHECK INTERMITTENT INCIDENT

Refer to EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

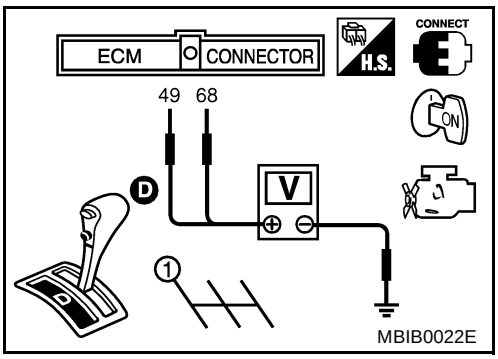
Component Inspection

EBS00ENW

THROTTLE POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Perform EC-55, "Throttle Valve Closed Position Learning" .
3. Turn ignition switch “ON”.
4. Set selector lever to “D” position (A/T models) or “1st” position (M/T models).
5. Check voltage between ECM terminals 49 (TP sensor 1 signal), 68 (TP sensor 2 signal) and engine ground under the following conditions.

Terminal	Accelerator pedal	Voltage
49 (Throttle position sensor 1)	Fully released	More than 0.36V
	Fully depressed	Less than 4.75V
68 (Throttle position sensor 2)	Fully released	Less than 4.75V
	Fully depressed	More than 0.36V



6. If NG, replace electric throttle control actuator and go to the next step.
7. Perform EC-55, "Throttle Valve Closed Position Learning" .
8. Perform EC-55, "Idle Air Volume Learning" .

Remove and Installation

EBS00ENX

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-19, "INTAKE MANIFOLD" .

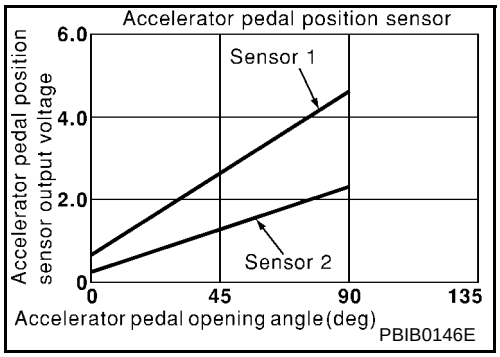
DTC P0226 APP SENSOR

PFP:18002

Component Description

EBS00ENY

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.
Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometers which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the accelerator pedal and feed the voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.



Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for the engine operation such as fuel cut.

CONSULT-II Reference Value in Data Monitor Mode

EBS00ENZ

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
ACCEL SEN1 ACCEL SEN2	● Ignition switch: ON (engine stopped)	Accelerator pedal: Fully released	0.35 - 0.67V
		Accelerator pedal: Fully depressed	More than 3.9V
CLSD THL POS	● Ignition switch: ON	Accelerator pedal: Fully released	ON
		Accelerator pedal: Slightly depressed	OFF

On Board Diagnosis Logic

EBS00EO0

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0226 0226	Accelerator pedal position sensor circuit range/performance problem	Rationally incorrect voltage is sent to ECM compared with the signals from APP sensor 1 and APP sensor 2.	● Harness or connector (The APP sensor 1 and 2 circuit is open or shorted.) ● Accelerator pedal position sensor 1 and 2

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters in fail-safe mode and the MI lights up.

Engine operating condition in fail-safe mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of throttle valve to be slower than the normal condition. So, the acceleration will be poor.

DTC Confirmation Procedure

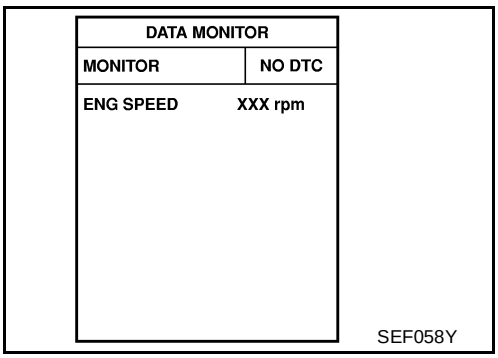
EBS00EO1

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 8V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.

2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-327, "Diagnostic Procedure" .

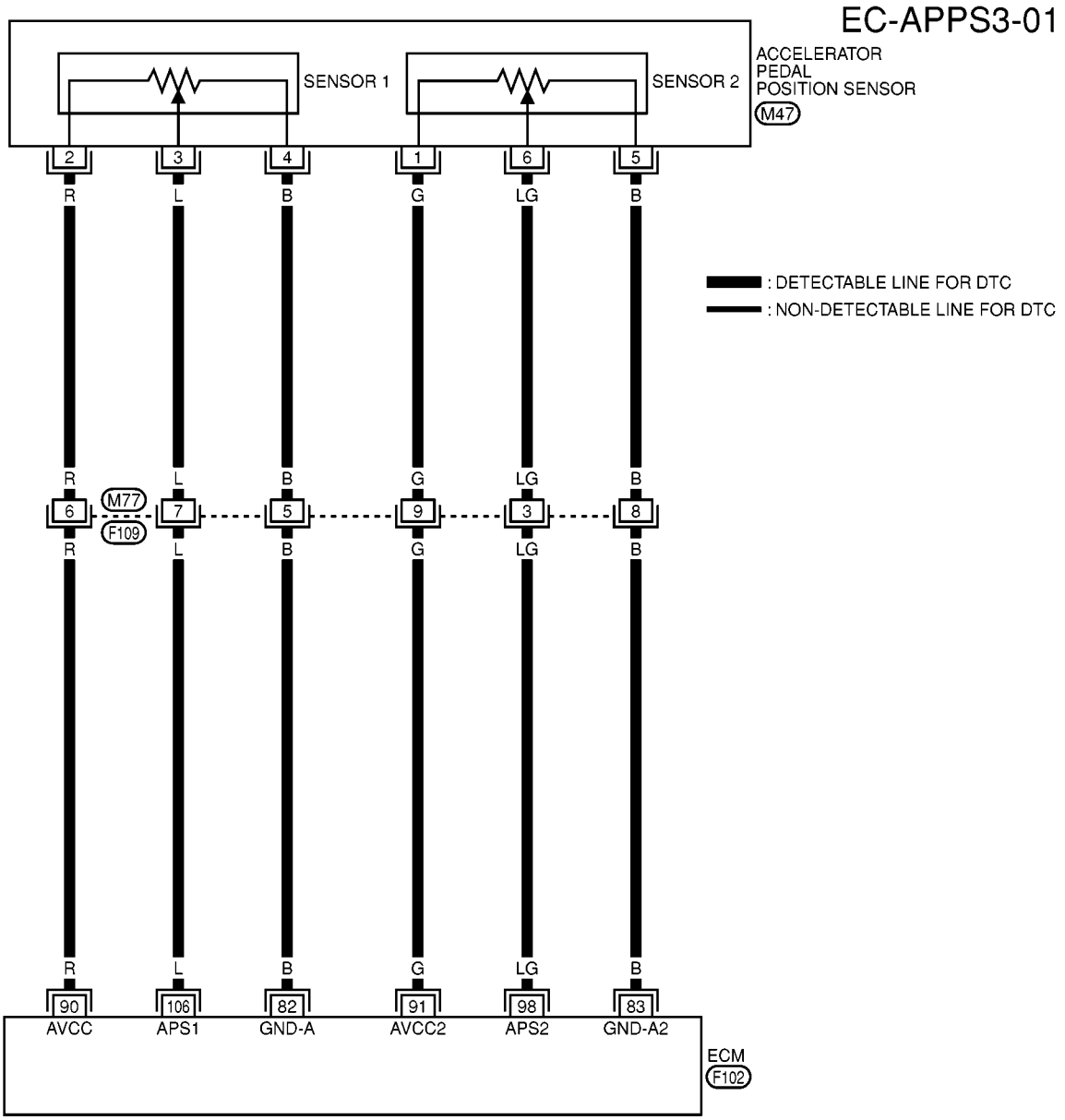


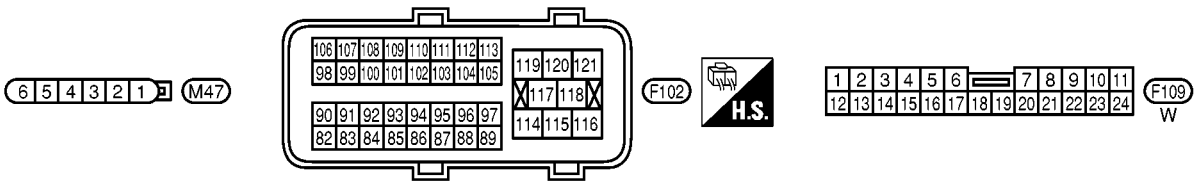
WITH GST

Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

EBS00EO2





MBWA0142E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
82	B	Sensor ground (Accelerator pedal position sensor 1)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
83	B	Sensor ground (Accelerator pedal position sensor 2)	**[Ignition switch "ON"]**	Approximately 0V
90	R	Sensor power supply (Accelerator pedal position sensor 1)	**[Ignition switch "ON"]**	Approximately 5V
91	G	Sensor power supply (Accelerator pedal position sensor 2)	**[Ignition switch "ON"]**	Approximately 5V
98	LG	Accelerator pedal position sensor 2	**[Ignition switch "ON"]** ● Accelerator pedal fully released	0.175 - 0.335V
			[Ignition switch "ON"] ● Accelerator pedal fully depressed	More than 1.95V
106	L	Accelerator pedal position sensor 1	**[Ignition switch "ON"]** ● Accelerator pedal fully released	0.35 - 0.67V
			[Ignition switch "ON"] ● Accelerator pedal fully depressed	More than 3.9V

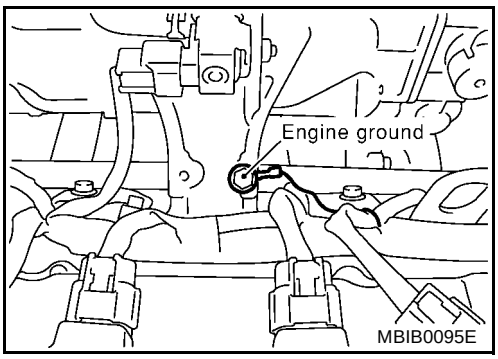
Diagnostic Procedure

EBS00EO3

1. RETIGHTEN GROUND SCREWS

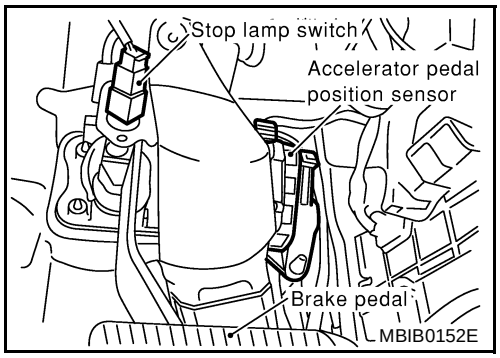
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



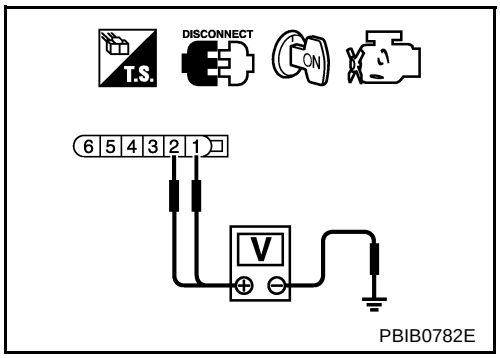
2. CHECK APP SENSOR POWER SUPPLY CIRCUIT

1. Disconnect accelerator pedal position (APP) sensor harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between APP sensor terminals 1, 2 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M77, F109
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK APP SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 82 and APP sensor terminal 4, ECM terminal 83 and APP sensor terminal 5.
   Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M77, F109
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK APP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 106 and APP sensor terminal 3, ECM terminal 98 and APP sensor terminal 6.
   Refer to Wiring Diagram.

   Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M77, F109
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK APP SENSOR

Refer to EC-329, "Component Inspection" .

OK or NG

OK >> GO TO 10.
NG >> GO TO 9.

9. REPLACE APP SENSOR

1. Replace the accelerator pedal position sensor.
2. Perform EC-55, "Accelerator Pedal Released Position Learning" .
3. Perform EC-55, "Throttle Valve Closed Position Learning" .
4. Perform EC-55, "Idle Air Volume Learning" .

>> **INSPECTION END**

10. CHECK INTERMITTENT INCIDENT

Refer to EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

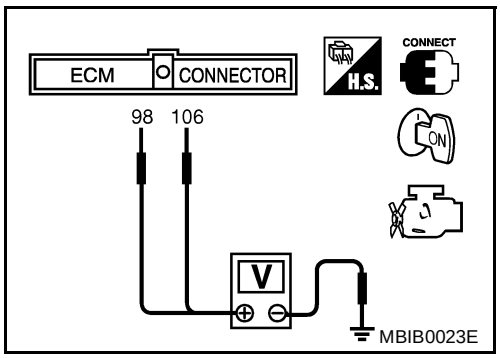
EBS00EO4

ACCELERATOR PEDAL POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Turn ignition switch “ON”.

3. Check voltage between ECM terminals 106 (APP sensor 1 signal), 98 (APP sensor 2 signal) and engine ground under the following conditions.

Terminal	Accelerator pedal	Voltage
106 (Accelerator pedal position sensor 1)	Fully released	0.35 - 0.67V
	Fully depressed	More than 3.9V
98 (Accelerator pedal position sensor 2)	Fully released	0.175 - 0.335V
	Fully depressed	More than 1.95V



4. If NG, replace accelerator pedal assembly and go to the next step.
5. Perform EC-55, "Accelerator Pedal Released Position Learning" .
6. Perform EC-55, "Throttle Valve Closed Position Learning" .
7. Perform EC-55, "Idle Air Volume Learning" .

Remove and Installation

EBS00EO5

ACCELERATOR PEDAL

Refer to ACC-2, "ACCELERATOR CONTROL SYSTEM" .

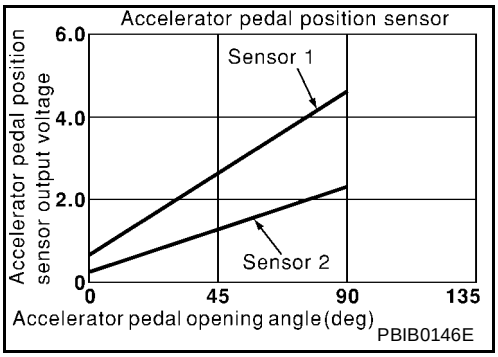
DTC P0227, P0228 APP SENSOR

PFP:18002

Component Description

EBS00EO6

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.
Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometers which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the accelerator pedal and feed the voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.
Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for the engine operation such as fuel cut.



CONSULT-II Reference Value in Data Monitor Mode

EBS00EO7

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
ACCEL SEN1	● Ignition switch: ON (engine stopped)	Accelerator pedal: Fully released	0.35 - 0.67V
		Accelerator pedal: Fully depressed	More than 3.9V
CLSD THL POS	● Ignition switch: ON	Accelerator pedal: Fully released	ON
		Accelerator pedal: Slightly depressed	OFF

On Board Diagnosis Logic

EBS00EO8

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0227 0227	Accelerator pedal position sensor 1 circuit low input	An excessively low voltage from the APP sensor 1 is sent to ECM.	● Harness or connectors (The APP sensor 1 circuit is open or shorted.) ● Accelerator pedal position sensor (Accelerator pedal position sensor 1)
P0228 0228	Accelerator pedal position sensor 1 circuit high input	An excessively high voltage from the APP sensor 1 is sent to ECM.	

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters in fail-safe mode and the MI lights up.

Engine operating condition in fail-safe mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of throttle valve to be slower than the normal condition. So, the acceleration will be poor.

DTC Confirmation Procedure

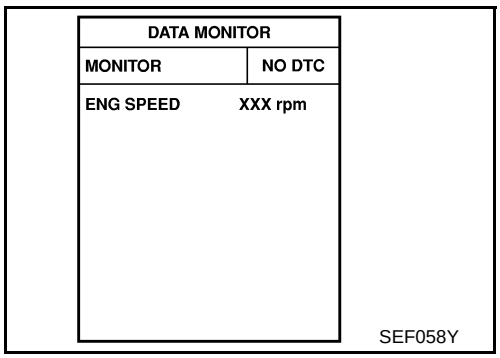
EBS00EO9

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.

2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-334, "Diagnostic Procedure" .

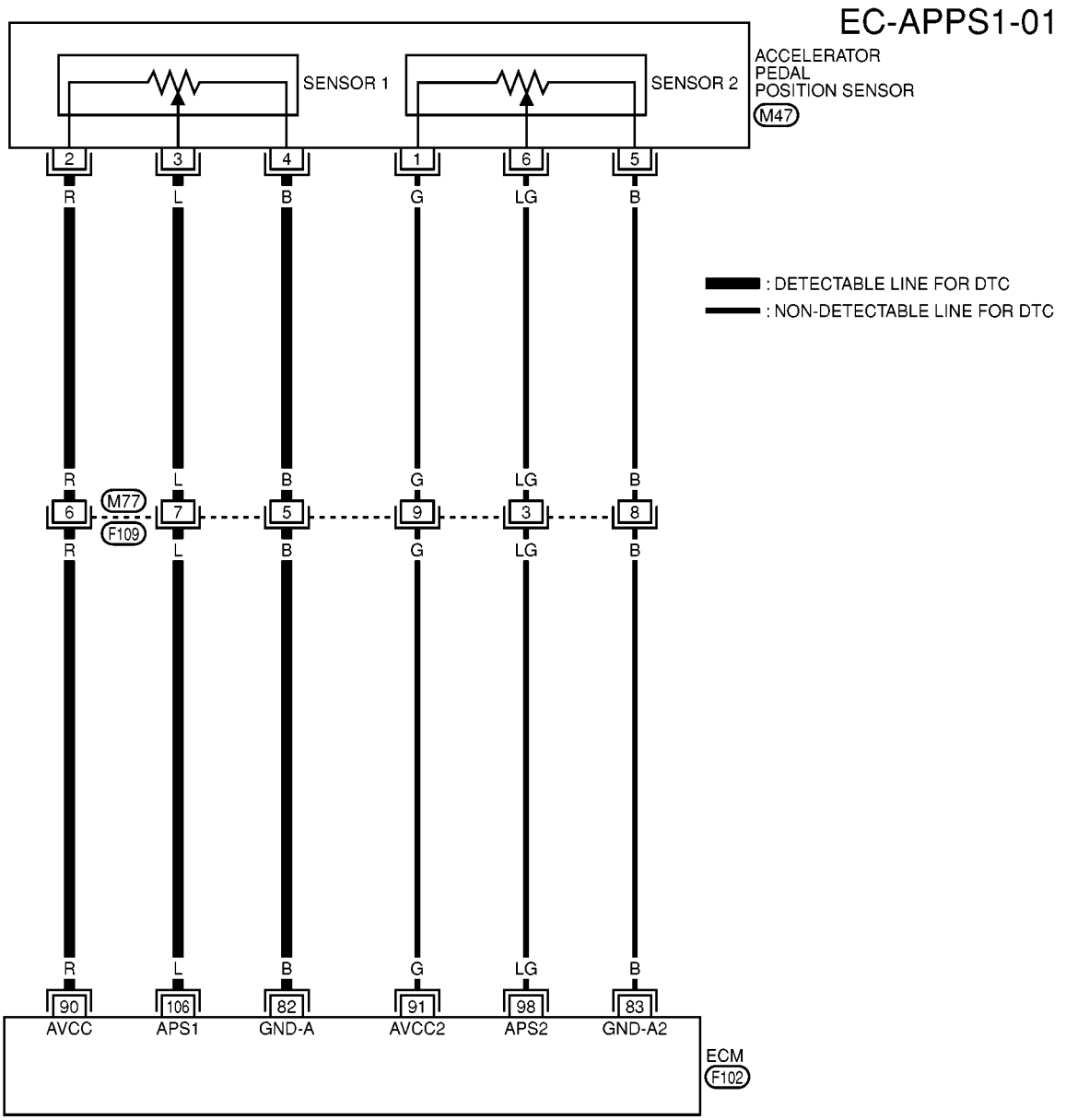


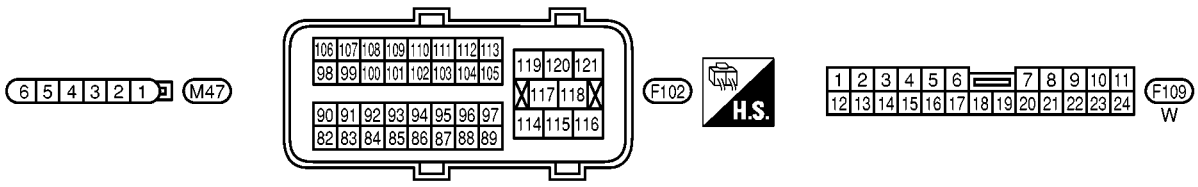
WITH GST

Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

EBS00EOA





MBWA0140E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
82	B	Sensor ground (Accelerator pedal position sensor 1)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
83	B	Sensor ground (Accelerator pedal position sensor 2)	**[Ignition switch "ON"]**	Approximately 0V
90	R	Sensor power supply (Accelerator pedal position sensor 1)	**[Ignition switch "ON"]**	Approximately 5V
91	G	Sensor power supply (Accelerator pedal position sensor 2)	**[Ignition switch "ON"]**	Approximately 5V
98	LG	Accelerator pedal position sensor 2	**[Ignition switch "ON"]** ● Accelerator pedal fully released	0.175 - 0.335V
			[Ignition switch "ON"] ● Accelerator pedal fully depressed	More than 1.95V
106	L	Accelerator pedal position sensor 1	**[Ignition switch "ON"]** ● Accelerator pedal fully released	0.35 - 0.67V
			[Ignition switch "ON"] ● Accelerator pedal fully depressed	More than 3.9V

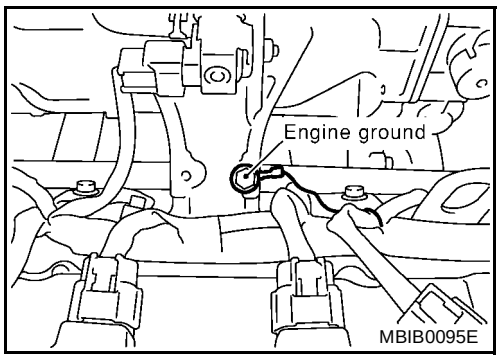
Diagnostic Procedure

EBS00EOB

1. RETIGHTEN GROUND SCREWS

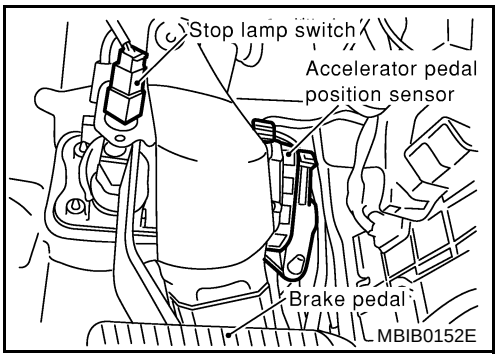
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



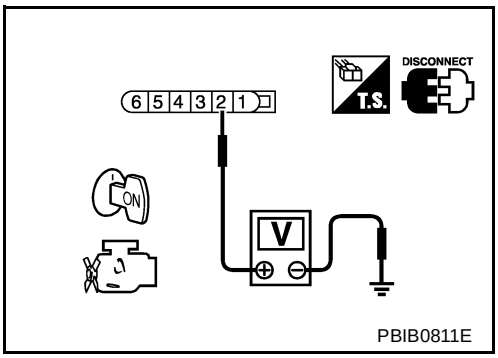
2. CHECK APP SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect accelerator pedal position (APP) sensor harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between APP sensor terminal 2 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M77, F109
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK APP SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 82 and APP sensor terminal 4. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M77, F109
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK APP SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 106 and APP sensor terminal 3. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M77, F109
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK APP SENSOR

Refer to EC-336, "Component Inspection" .

OK or NG

OK >> GO TO 10.
NG >> GO TO 9.

9. REPLACE APP SENSOR

1. Replace the accelerator pedal position sensor.
2. Perform EC-55, "Accelerator Pedal Released Position Learning" .
3. Perform EC-55, "Throttle Valve Closed Position Learning" .
4. Perform EC-55, "Idle Air Volume Learning" .

>> **INSPECTION END**

10. CHECK INTERMITTENT INCIDENT

Refer to EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

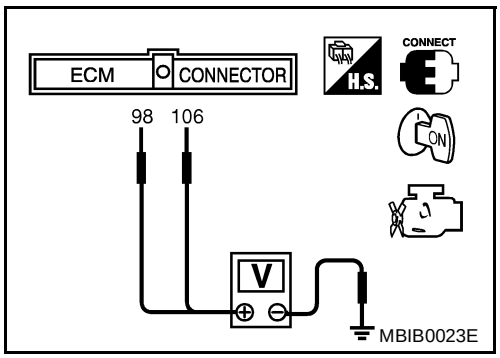
Component Inspection

EBS00EOC

ACCELERATOR PEDAL POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Turn ignition switch “ON”.
3. Check voltage between ECM terminals 106 (APP sensor 1 signal), 98 (APP sensor 2 signal) and engine ground under the following conditions.

Terminal	Accelerator pedal	Voltage
106 (Accelerator pedal position sensor 1)	Fully released	0.35 - 0.67V
	Fully depressed	More than 3.9V
98 (Accelerator pedal position sensor 2)	Fully released	0.175 - 0.335V
	Fully depressed	More than 1.95V



4. If NG, replace accelerator pedal assembly and go to the next step.
5. Perform EC-55, "Accelerator Pedal Released Position Learning" .
6. Perform EC-55, "Throttle Valve Closed Position Learning" .
7. Perform EC-55, "Idle Air Volume Learning" .

Remove and Installation

EBS00EOD

ACCELERATOR PEDAL

Refer to ACC-2, "ACCELERATOR CONTROL SYSTEM" .

DTC P0300 - P0304 MULTIPLE CYLINDER MISFIRE, NO. 1 - 4 CYLINDER MISFIRE

PFP:00000

On Board Diagnosis Logic

EBS00EOE

When a misfire occurs, engine speed will fluctuate. If the engine speed fluctuates enough to cause the crankshaft position (CKP) sensor (POS) signal to vary, ECM can determine that a misfire is occurring.

Sensor	Input Signal to ECM	ECM function
Crankshaft position sensor (POS)	Engine speed	On board diagnosis of misfire

The misfire detection logic consists of the following two conditions.

1. One Trip Detection Logic (Three Way Catalyst Damage)
   On the first trip that a misfire condition occurs that can damage the three way catalyst (TWC) due to overheating, the MI will blink.
   When a misfire condition occurs, the ECM monitors the CKP sensor (POS) signal every 200 engine revolutions for a change.
   When the misfire condition decreases to a level that will not damage the TWC, the MI will turn off.
   If another misfire condition occurs that can damage the TWC on a second trip, the MI will blink.
   When the misfire condition decreases to a level that will not damage the TWC, the MI will remain on.
   If another misfire condition occurs that can damage the TWC, the MI will begin to blink again.
2. Two Trip Detection Logic (Exhaust quality deterioration)
   For misfire conditions that will not damage the TWC (but will affect vehicle emissions), the MI will only light when the misfire is detected on a second trip. During this condition, the ECM monitors the CKP sensor signal every 1,000 engine revolutions.
   A misfire malfunction can be detected on any one cylinder or on multiple cylinders.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0300 0300	Multiple cylinder misfire detected	Multiple cylinder misfire.	● Improper spark plug ● Insufficient compression ● Incorrect fuel pressure ● The injector circuit is open or shorted ● Fuel injectors ● Intake air leak ● The ignition signal circuit is open or shorted ● Lack of fuel ● Drive plate or flywheel ● Heated oxygen sensor 1 ● Incorrect PCV hose connection
P0301 0301	No.1 cylinder misfire detected	No. 1 cylinder misfires.	
P0302 0302	No. 2 cylinder misfire detected	No. 2 cylinder misfires.	
P0303 0303	No. 3 cylinder misfire detected	No. 3 cylinder misfires.	
P0304 0304	No. 4 cylinder misfire detected	No. 4 cylinder misfires.	

DTC Confirmation Procedure

EBS00EOF

CAUTION:
Always drive vehicle at a safe speed.

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON”, and select “DATA MONITOR” mode with CONSULT-II.
2. Start engine and warm it up to normal operating temperature.
3. Turn ignition switch “OFF” and wait at least 10 seconds.

4. Start engine again and drive at 1,500 to 3,000 rpm for at least 3 minutes.
   Hold the accelerator pedal as steady as possible.
   NOTE:
   Refer to the freeze frame data for the test driving conditions.
5. If 1st trip DTC is detected, go to EC-339, "Diagnostic Procedure"
   .

DATA MONITOR	
MONITOR	NO DTC
ENG SPEED	XXX rpm
COOLAN TEMP/S	XXX °C
VHCL SPEED SE	XXX km/h
B/FUEL SCHDL	XXX msec

PBIB0164E

WITH GST

Follow the procedure “WITH CONSULT-II” above.

Diagnostic Procedure

EBS00EOG

1. CHECK FOR INTAKE AIR LEAK AND PCV HOSE

1. Start engine and run it at idle speed.
2. Listen for the sound of the intake air leak.
3. Check PCV hose connection.

OK or NG

OK >> GO TO 2.
NG >> Repair or replace.

2. CHECK FOR EXHAUST SYSTEM CLOGGING

Stop engine and visually check exhaust tube, three way catalyst and muffler for dents.

OK or NG

OK >> GO TO 3.
NG >> Repair or replace.

3. PERFORM POWER BALANCE TEST

With CONSULT-II

1. Perform “POWER BALANCE” in “ACTIVE TEST” mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

ACTIVE TEST	
POWER BALANCE	
MONITOR	
ENG SPEED	XXX rpm
MAS A/F SE-B1	XXX V

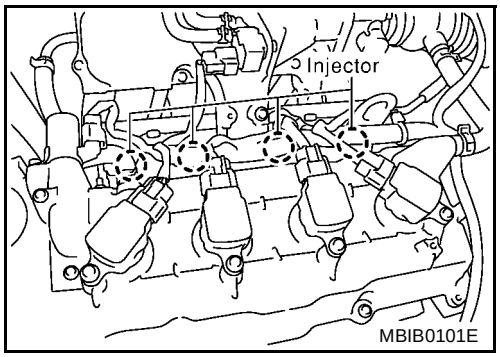
PBIB0133E

Without CONSULT-II

When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

Yes or No

Yes >> GO TO 4.
No >> GO TO 7.



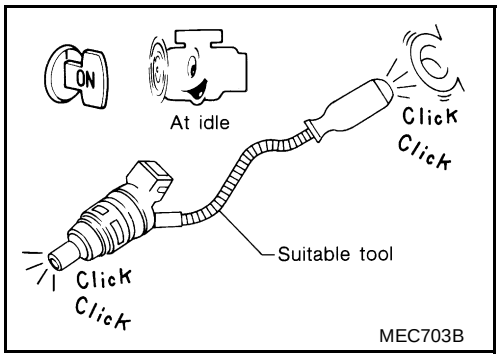
MBIB0101E

4. CHECK INJECTOR

Does each injector make an operating sound at idle?

Yes or No

Yes >> GO TO 5.
No >> Check injector(s) and circuit(s). Refer to EC-530, "INJECTOR CIRCUIT" .



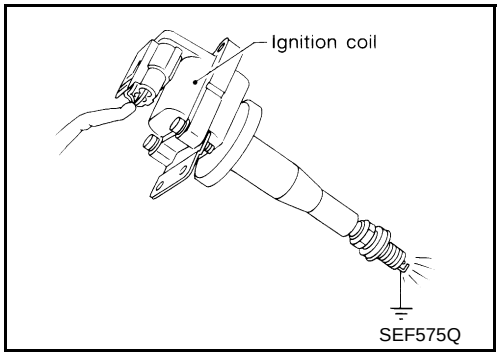
MEC703B

5. CHECK IGNITION SPARK

1. Disconnect ignition coil assembly from rocker cover.
2. Connect a known good spark plug to the ignition coil assembly.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

OK or NG

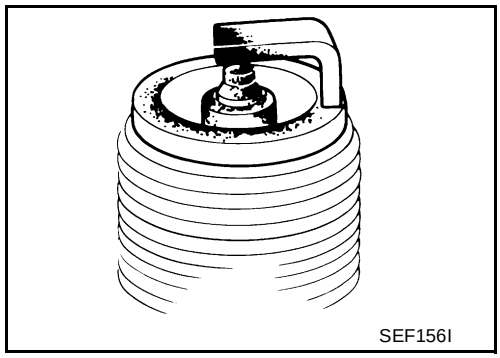
OK >> GO TO 6.
NG >> Check ignition coil, power transistor and their circuits. Refer to EC-520, "IGNITION SIGNAL" .



SEF575Q

6. CHECK SPARK PLUGS

Remove the spark plugs and check for fouling, etc.



OK or NG

OK >> GO TO 7.

NG >> Repair or replace spark plug(s) with standard type one(s). For spark plug type, refer to MA-26, "Checking and Changing Spark Plugs" .

7. CHECK COMPRESSION PRESSURE

Check compression pressure. Refer to EM-57, "CHECKING COMPRESSION PRESSURE" .

QG16DE engine

Standard:	**1,353 kPa (13.53 bar, 13.8 kg/cm^2 , 196 psi)/350 rpm**
Minimum:	**1,157 kPa (11.57 bar, 11.8 kg/cm^2 , 168 psi)/350 rpm**
Difference between each cylinder:	**98 kPa (0.98 bar, 1.0 kg/cm^2 , 14 psi)/350 rpm**

QG18DE engine

Standard:	**1,324 kPa (13.24 bar, 13.5 kg/cm^2 , 192 psi)/350 rpm**
Minimum:	**1,128 kPa (11.28 bar, 11.5 kg/cm^2 , 164 psi)/350 rpm**
Difference between each cylinder:	**98 kPa (0.98 bar, 1.0 kg/cm^2 , 14 psi)/350 rpm**

OK or NG

OK >> GO TO 8.

NG >> Check pistons, piston rings, valves, valve seats and cylinder head gaskets.

8. CHECK FUEL PRESSURE

1. Install all removed parts.
2. Release fuel pressure to zero. Refer to EC-58, "FUEL PRESSURE RELEASE" .
3. Install fuel pressure gauge and check fuel pressure. Refer to EC-58, "FUEL PRESSURE CHECK" .

At idle: Approx. 350 kPa (3.7 kg/cm^2 , 51 psi)

OK or NG

OK >> GO TO 9.

NG >> Follow the construction of “FUEL PRESSURE CHECK”.

9. CHECK IGNITION TIMING

Check the following items. Refer to EC-92, "Basic Inspection" .

Items	Specifications	
Target idle speed	A/T	800 ± 50 rpm (in “P” or “N” position)
	M/T	700 ± 50 rpm
Ignition timing	A/T	10 ± 5° BTDC (in “P” or “N” position)
	M/T	8 ± 5° BTDC

OK or NG

OK >> GO TO 10.
NG >> Follow the “Basic Inspection”.

10. CHECK HEATED OXYGEN SENSOR 1

Refer to EC-203, "Component Inspection" (QG16DE engine models), EC-211, "Component Inspection" (QG18DE engine models).

OK or NG

OK >> GO TO 12.
NG >> GO TO 11.

11. CHECK MASS AIR FLOW SENSOR

With CONSULT-II

Check mass air flow sensor signal in “DATA MONITOR” mode with CONSULT-II.

1.0 - 4.0 g·m/sec: at idling
5.0 - 10.0 g·m/sec: at 2,500 rpm

With GST

Check mass air flow sensor signal in MODE 1 with GST.

1.0 - 4.0 g·m/sec: at idling
5.0 - 10.0 g·m/sec: at 2,500 rpm

OK or NG

OK >> GO TO 12.
NG >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds. Refer to EC-183, "DTC P0102, P0103 MAF SENSOR" .

12. CHECK SYMPTOM MATRIX CHART

Check items on the rough idle symptom in EC-97, "Symptom Matrix Chart" .

OK or NG

OK >> GO TO 13.
NG >> Repair or replace.

13. ERASE THE 1ST TRIP DTC

Some tests may cause a 1st trip DTC to be set.
Erase the 1st trip DTC from the ECM memory after performing the tests. Refer to EC-73, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .

>> GO TO 14.

14. CHECK INTERMITTENT INCIDENT

Refer to EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

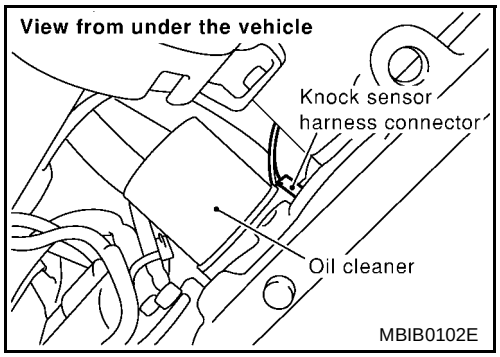
DTC P0327, P0328 KS

PFP:22060

Component Description

EBS00EOH

The knock sensor is attached to the cylinder block. It senses engine knocking using a piezoelectric element. A knocking vibration from the cylinder block is sensed as vibrational pressure. This pressure is converted into a voltage signal and sent to the ECM.



On Board Diagnosis Logic

EBS00EOI

The MI will not light for knock sensor malfunction.

DTC No.	Trouble Diagnosis Name	DTC Detected Condition	Possible Cause
P0327 0327	Knock sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Knock sensor
P0328 0328	Knock sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	

DTC Confirmation Procedure

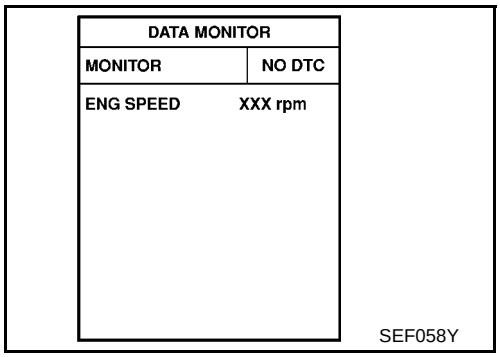
EBS00EOJ

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2. Start engine and run it for at least 5 seconds at idle speed.
3. If 1st trip DTC is detected, go to EC-346, "Diagnostic Procedure" .



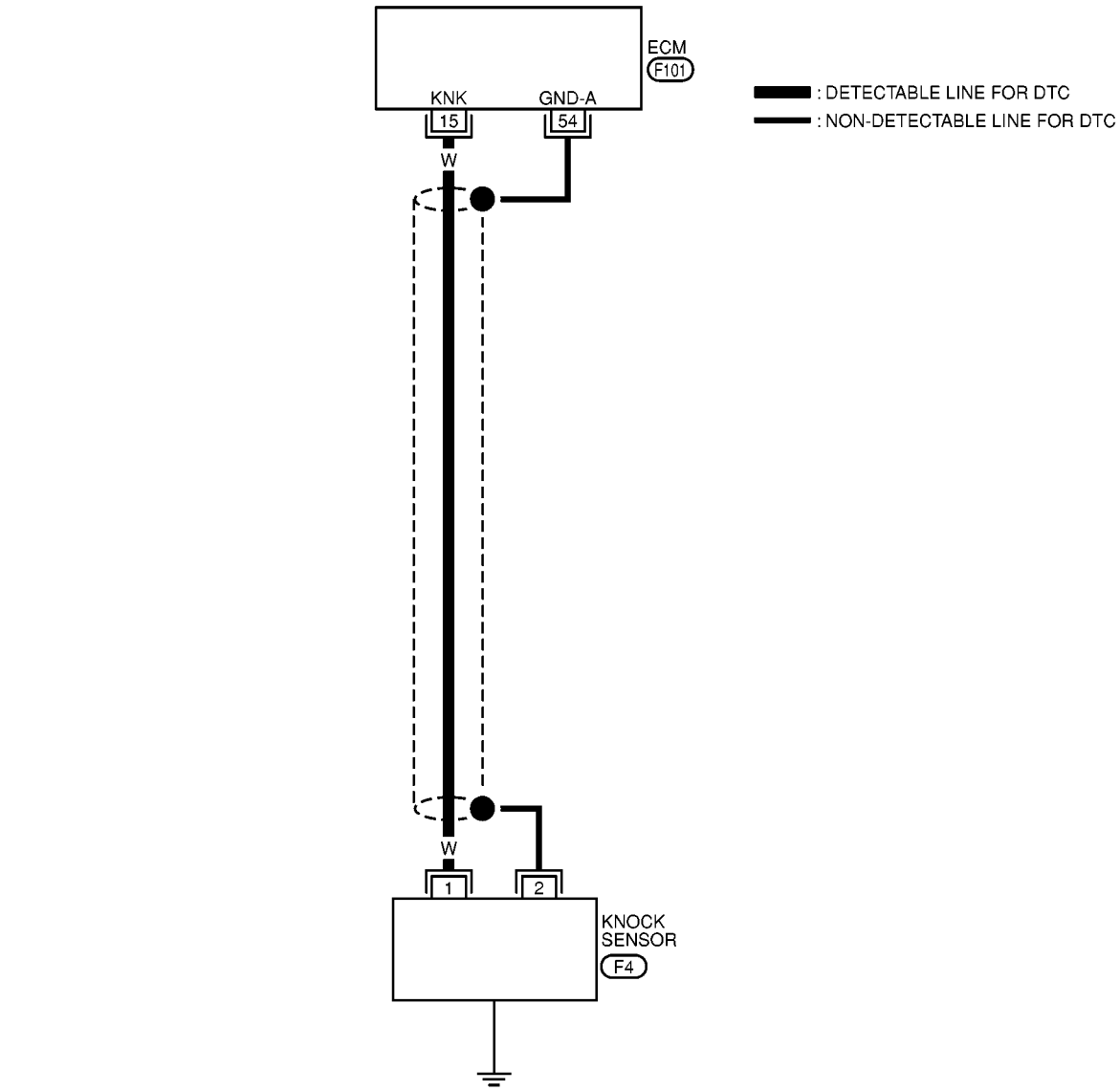
WITH GST

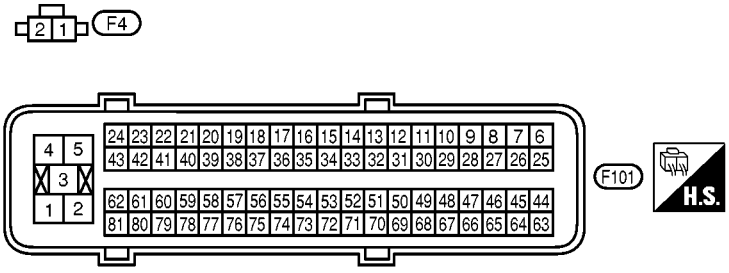
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

EBS00EOK

EC-KS-01





MBWA0063E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
15	W	Knock sensor	**[Engine is running]** ● Idle speed	Approximately 2.5V
54	—	Sensor ground (Knock sensor shield circuit)	**[Engine is running]** ● Idle speed	Approximately 0V

Diagnostic Procedure

EBS00EOL

1. CHECK KNOCK SENSOR INPUT SIGNAL CIRCUIT-I

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check resistance between ECM terminal 15 and engine ground. Refer to Wiring Diagram.
   NOTE:
   It is necessary to use an ohmmeter which can measure more than 10 MΩ.

   Resistance: Approximately 530 - 590kΩ [at 20°C (68°F)]
4. Also check harness for short to ground and short to power.

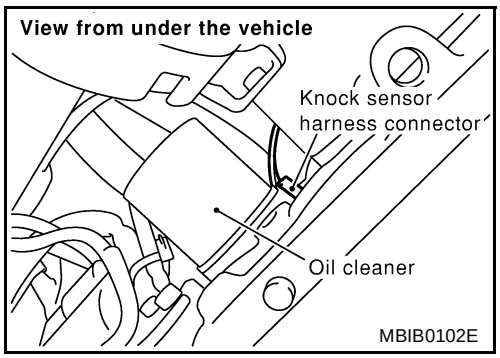
OK or NG

OK >> GO TO 4.
NG >> GO TO 2.

2. CHECK KNOCK SENSOR INPUT SIGNAL CIRCUIT-II

1. Disconnect knock sensor harness connector.
2. Check harness continuity between ECM terminal 15 and knock sensor terminal 1.
   Refer to Wiring Diagram.

   Continuity should exist.
3. Also check harness for short to ground and short to power.



OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK KNOCK SENSOR

Refer to EC-347, "Component Inspection" .

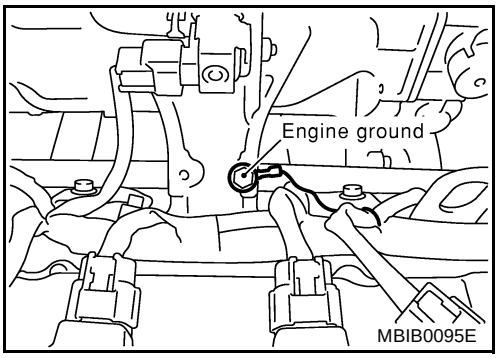
OK or NG

OK >> GO TO 5.
NG >> Replace knock sensor.

4. RETIGHTEN GROUND SCREWS

Loosen and retighten engine ground screws.

>> GO TO 5.



5. CHECK INTERMITTENT INCIDENT

Refer to EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

EBS00EOM

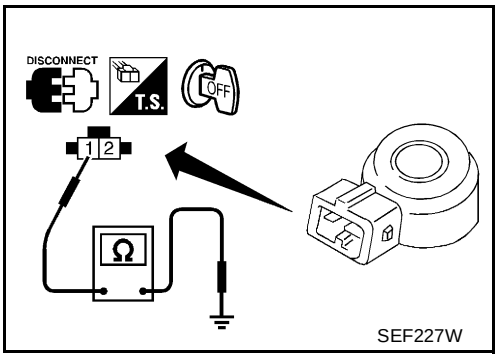
KNOCK SENSOR

Check resistance between knock sensor terminal 1 and ground.

NOTE:
It is necessary to use an ohmmeter which can measure more than 10 MΩ.

Resistance: Approximately 530 - 590kΩ [at 20°C (68°F)]

CAUTION:
Do not use any knock sensors that have been dropped or physically damaged. Use only new ones.



Removal and Installation

EBS00EON

KNOCK SENSOR

Refer to EM-70, "CYLINDER BLOCK" .

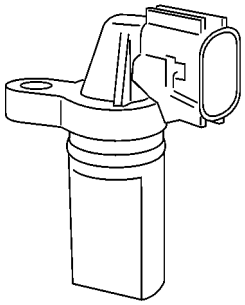
DTC P0335 CKP SENSOR (POS)

PFP:23731

Component Description

EBS00EOO

The crankshaft position sensor (POS) is located on the cylinder block rear housing facing the gear teeth (cogs) of the signal plate at the end of the crankshaft. It detects the fluctuation of the engine revolution.
The sensor consists of a permanent magnet and Hall IC.
When the engine is running, the high and low parts of the teeth cause the gap with the sensor change.
The changing gap causes the magnetic field near the sensor to change.
Due to the changing magnetic field, the voltage from the sensor changes.
The ECM receives the voltage signal and detects the fluctuation of the engine revolution.


PBIB0562E

CONSULT-II Reference Value in Data Monitor Mode

EBS00EOP

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
ENG SPEED	● Tachometer: Connect ● Run engine and compare tachometer indication with the CONSULT-II value.	Almost the same speed as the CONSULT-II value.

On Board Diagnosis Logic

EBS00EOQ

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0335 0335	Crankshaft position sensor (POS) circuit	● The crankshaft position sensor (POS) signal is not detected by the ECM during the first few seconds of engine cranking. ● The proper pulse signal from the crankshaft position sensor (POS) is not sent to ECM while the engine is running. ● The crankshaft position sensor (POS) signal is not in the normal pattern during engine running.	● Harness or connectors (The sensor circuit is open or shorted.) ● Crankshaft position sensor (POS) ● Signal plate

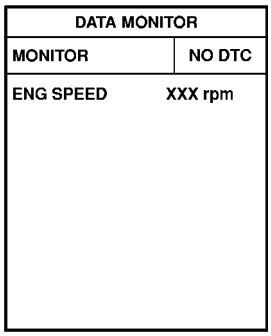
DTC Confirmation Procedure

EBS00EOR

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10.5V with ignition switch ON”.

WITH CONSULT-II

1. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2. Crank engine for at least 2 seconds and run it for at least 5 seconds at idle speed.
3. If 1st trip DTC is detected, go to EC-351, "Diagnostic Procedure" .



SEF058Y

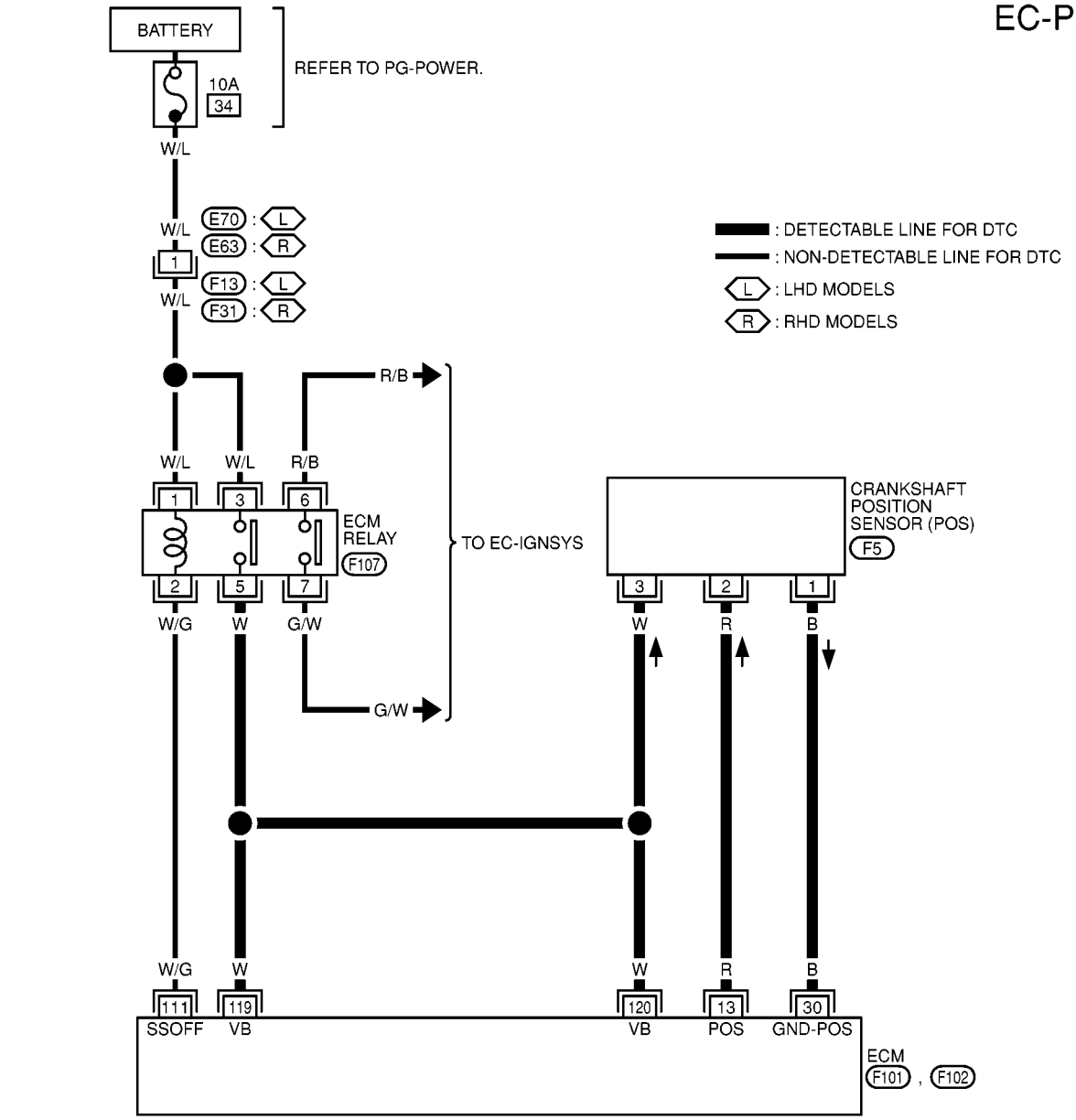
WITH GST

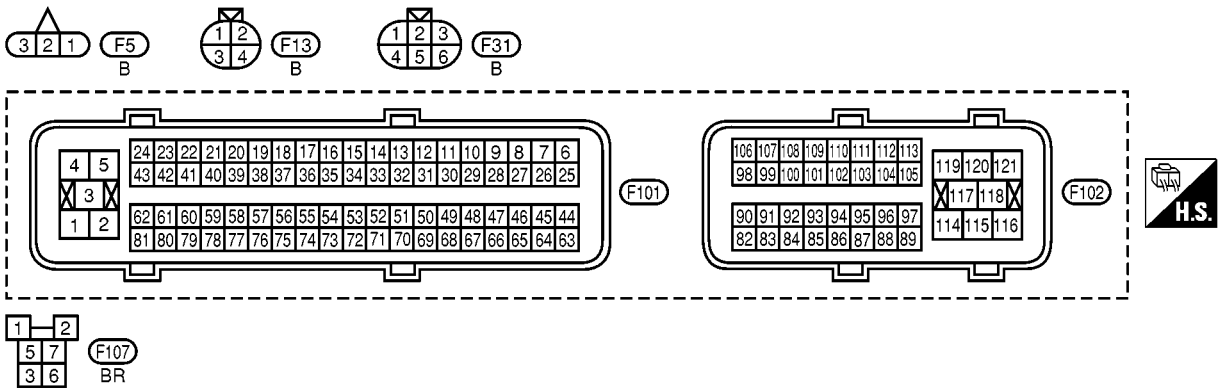
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

EBS00EOS

EC-POS-01



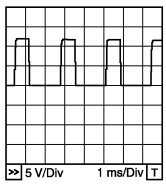
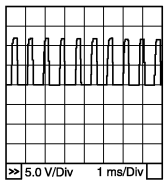


MBWA0064E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
13	W	Crankshaft position sensor (POS)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 3V★  PBIB0527E
			[Engine is running] ● Engine speed is 2,000 rpm	Approximately 3V★  PBIB0528E
30	B	Crankshaft position sensor (POS) ground	**[Engine is running]** ● Idle speed	Approximately 0V

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

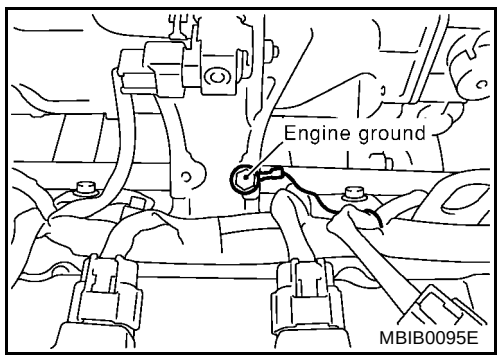
Diagnostic Procedure

EBS00EOT

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

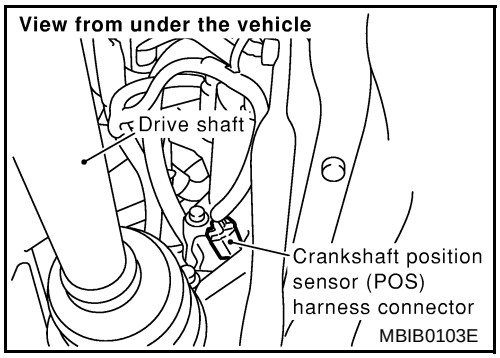
>> GO TO 2.



MBIB0095E

2. CHECK CKP SENSOR (POS) POWER SUPPLY CIRCUIT

1. Disconnect crankshaft position (CKP) sensor (POS) harness connector.
2. Turn ignition switch “ON”.



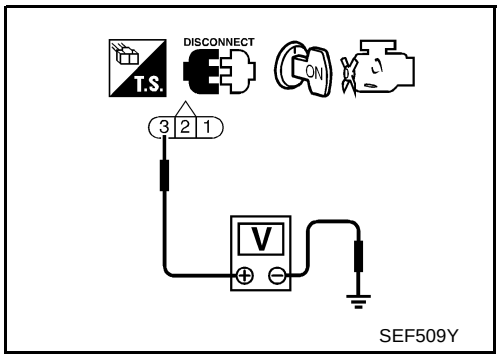
3. Check voltage between CKP sensor (POS) terminal 3 and ground with CONSULT-II or tester.

Voltage: Battery voltage

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> GO TO 3.



3. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between crankshaft position sensor (POS) and ECM
- Harness for open or short between crankshaft position sensor (POS) and ECM relay

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK CKP SENSOR (POS) GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 30 and CKP sensor (POS) terminal 1 Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for and short to ground and short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK CKP SENSOR (POS) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 13 and CKP sensor (POS) terminal 2. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK CRANKSHAFT POSITION SENSOR (POS)

Refer to EC-353, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace crankshaft position sensor (POS).

7. CHECK GEAR TOOTH

Visually check for chipping signal plate gear tooth.

OK or NG

OK >> GO TO 8.
NG >> Replace the signal plate.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

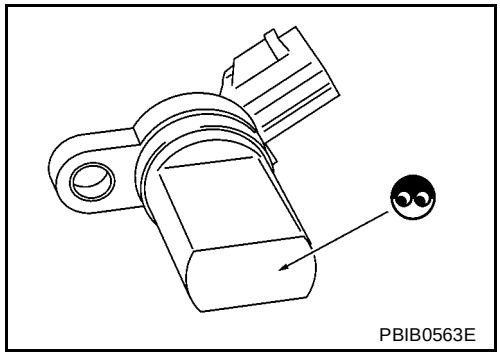
>> **INSPECTION END**

Component Inspection

EBS00EOU

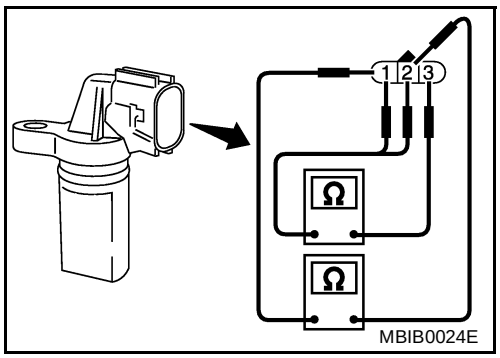
CRANKSHAFT POSITION SENSOR (POS)

1. Loosen the fixing bolt of the sensor.
2. Disconnect crankshaft position sensor (POS) harness connector.
3. Remove the sensor.
4. Visually check the sensor for chipping.


PBIB0563E

5. Check resistance as shown in the figure.

Terminal No. (Polarity)	Resistance Ω [at 25°C (77°F)]
3 (+) - 1 (-)	Except 0 or ∞
3 (+) - 2 (-)	
2 (+) - 1 (-)	



6. If NG, replace crankshaft position sensor (POS).

Removal and Installation

EBS00EOV

CRANKSHAFT POSITION SENSOR (POS)

Refer to EM-70, "CYLINDER BLOCK" .

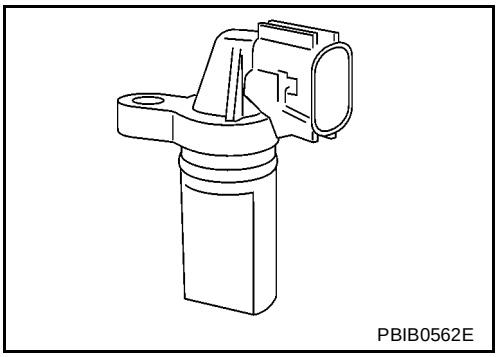
DTC P0340 CMP SENSOR (PHASE)

PFP:23731

Component Description

EBS00EOW

The camshaft position sensor (PHASE) senses the retraction with intake valve camshaft to identify a particular cylinder. The camshaft position sensor (PHASE) senses the piston position.
When the crankshaft position sensor (POS) system becomes inoperative, the camshaft position sensor (PHASE) provides various controls of engine parts instead, utilizing timing of cylinder identification signals.
The sensor consists of a permanent magnet and Hall IC.
When engine is running, the high and low parts of the teeth cause the gap with the sensor to change.
The changing gap causes the magnetic field near the sensor to change.
Due to the changing magnetic field, the voltage from the sensor changes.


PBIB0562E

On Board Diagnosis Logic

EBS00EOX

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0340 0340	Camshaft position sensor (PHASE) circuit	● The cylinder No. signal is not sent to ECM for the first few seconds during engine cranking. ● The cylinder No. signal is not set to ECM during engine running. ● The cylinder No. signal is not in the normal pattern during engine running.	● Harness or connectors (The sensor circuit is open or shorted.) ● Camshaft position sensor (PHASE) ● Camshaft (Intake) ● Starter motor (Refer to SC-22 .) ● Starting system circuit (Refer to SC-22 .) ● Dead (Weak) battery

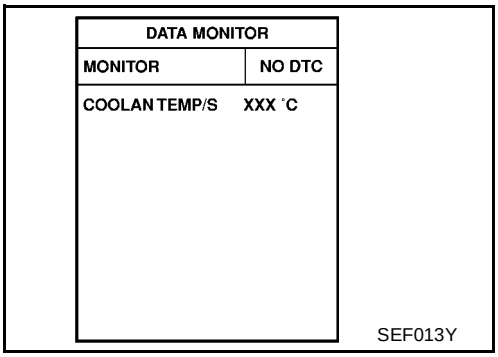
DTC Confirmation Procedure

EBS00EOY

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10.5V with ignition switch “ON”.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Crank engine for at least 2 seconds and run it for at least 5 seconds at idle speed.
4. If 1st trip DTC is detected, go to EC-357, "Diagnostic Procedure" .
   If 1st trip DTC is not detected, go to next step.
5. Maintain engine speed at more than 800 rpm for at least 5 seconds.
6. If 1st trip DTC is detected, go to EC-357, "Diagnostic Procedure" .



SEF013Y

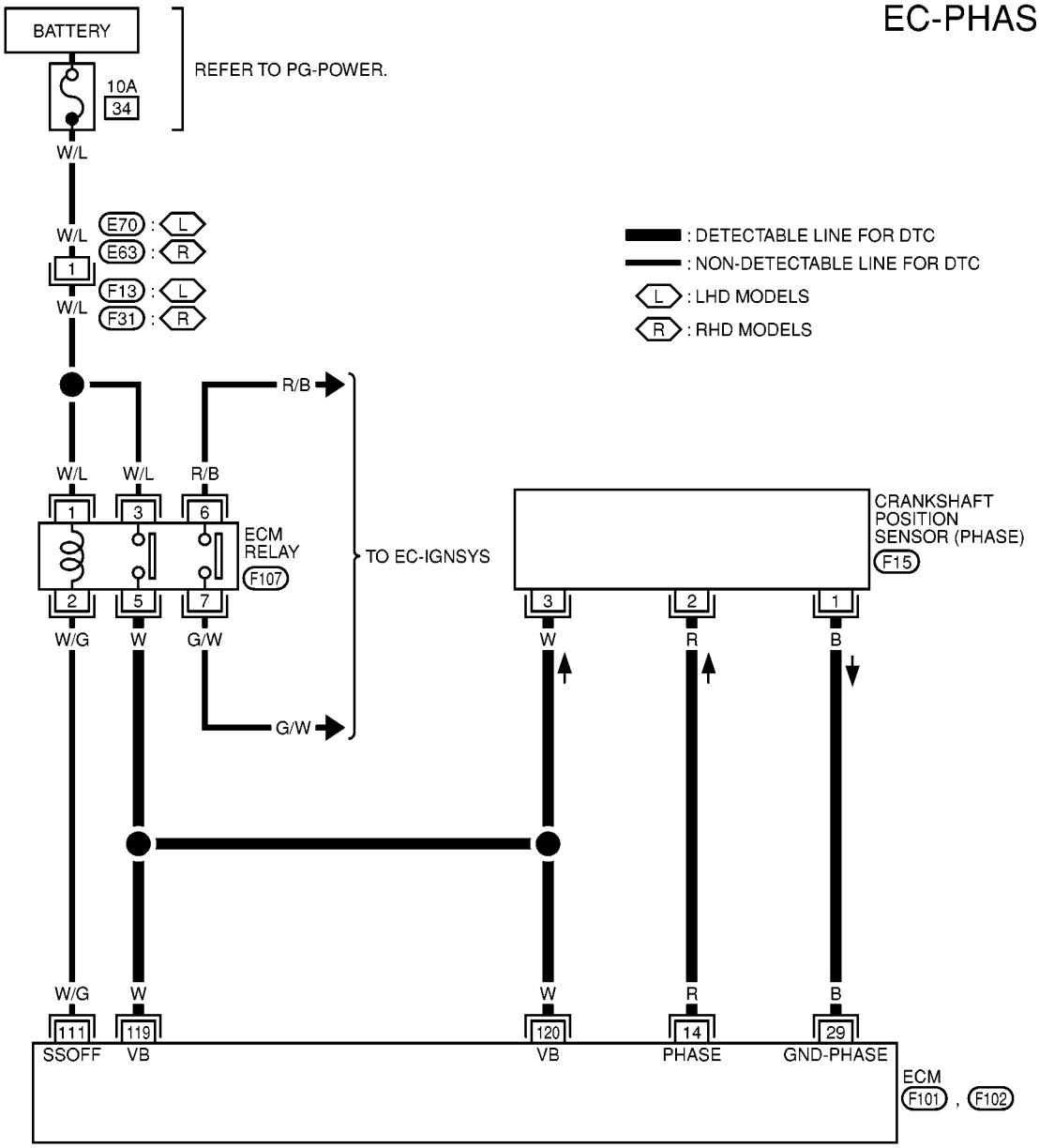
WITH GST

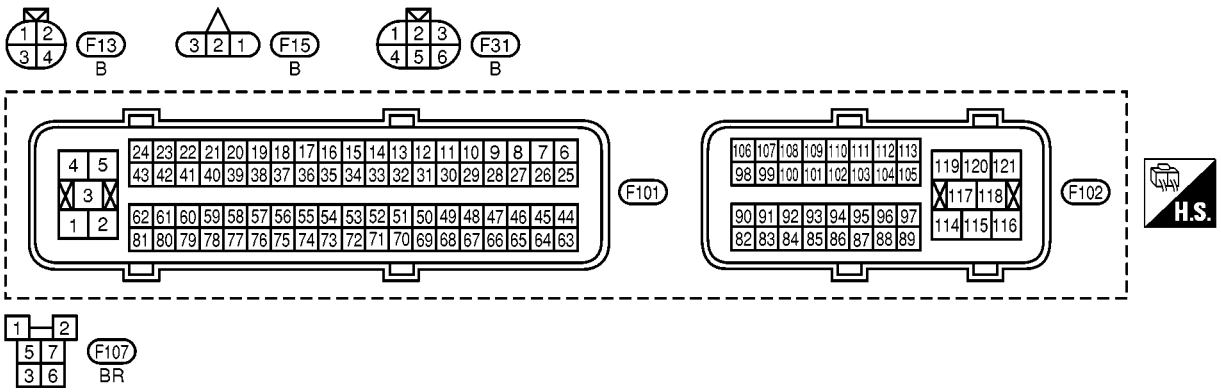
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

EBS00EOZ

EC-PHASE-01

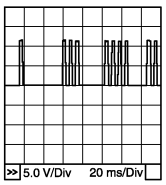
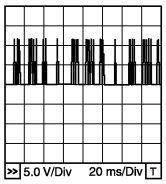




MBWA0065E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
14	R	Camshaft position sensor (PHASE)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.0 - 4.0V★  PBIB0525E
			[Engine is running] ● Engine speed is 2,000 rpm.	1.0 - 4.0V★  PBIB0526E
29	B	Camshaft position sensor (PHASE) ground	**[Engine is running]** ● Idle speed	Approximately 0V

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnostic Procedure

EBS00EP0

1. CHECK STARTING SYSTEM

Turn ignition switch to “START” position.

Does the engine turn over?

Does the starter motor operate?

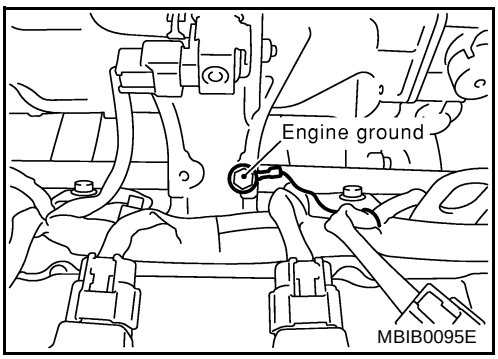
Yes or No

Yes >> GO TO 2.
No >> Check starting system. (Refer to SC-22, "STARTING SYSTEM" .)

2. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

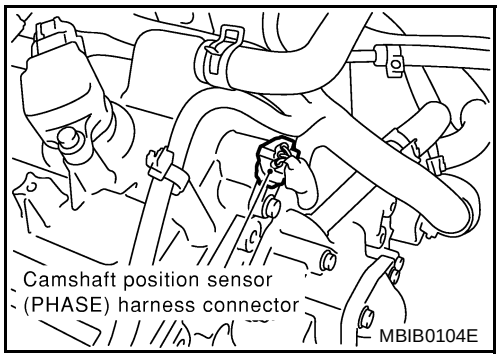
>> GO TO 3.



MBIB0095E

3. CHECK CMP SENSOR (PHASE) POWER SUPPLY CIRCUIT

1. Disconnect camshaft position (CMP) sensor (PHASE) harness connector.
2. Turn ignition switch “ON”.



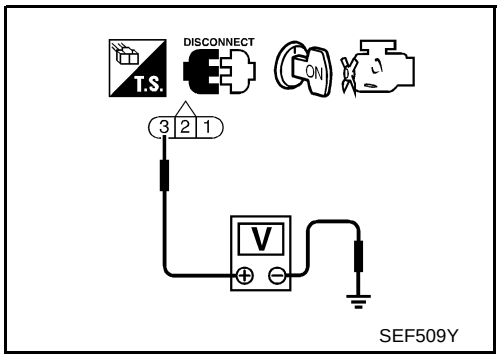
3. Check voltage between CMP sensor (PHASE) terminal 3 and ground with CONSULT-II or tester.

Voltage: Battery voltage

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.



4. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between camshaft position sensor (PHASE) and ECM
- Harness for open or short between camshaft position sensor (PHASE) and ECM relay

>> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK CMP SENSOR (PHASE) GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 29 and CMP sensor (PHASE) terminal 1.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK CMP SENSOR (PHASE) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 14 and CMP sensor (PHASE) terminal 2. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground or short to power.

OK or NG

OK >> GO TO 7.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK CAMSHAFT POSITION SENSOR (PHASE)

Refer to EC-359, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> Replace camshaft position sensor (PHASE).

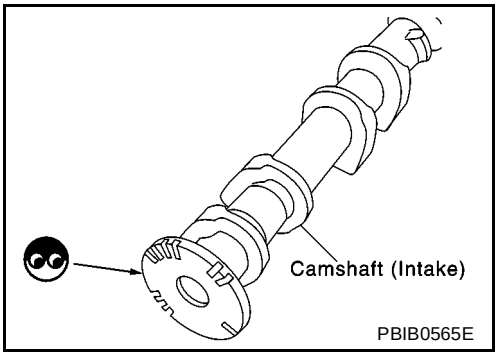
8. CHECK CAMSHAFT (INTAKE)

Check the following.

- Accumulation of debris to the signal plate of camshaft rear end
- Chipping signal plate of camshaft rear end

OK or NG

OK >> GO TO 9.
NG >> Remove debris and clean the signal plate of camshaft rear end or replace camshaft.



9. CHECK INTERMITTENT INCIDENT

Refer to EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

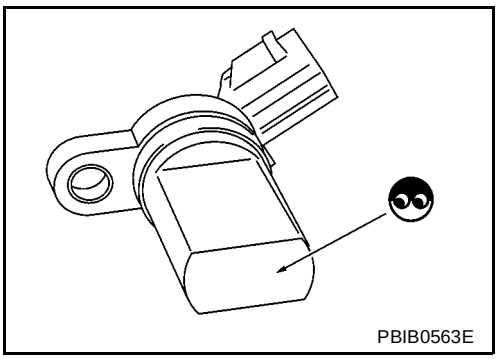
>> **INSPECTION END**

Component Inspection

EBS00EP1

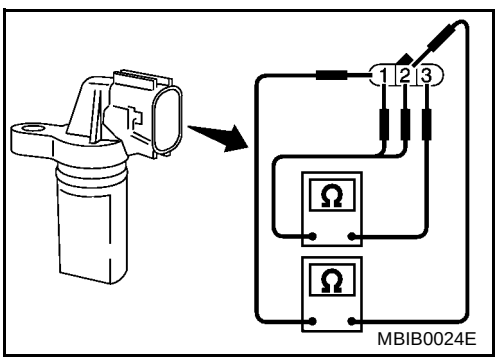
CAMSHAFT POSITION SENSOR (PHASE)

1. Loosen the fixing bolt of the sensor.
2. Disconnect camshaft position sensor (PHASE) harness connector.
3. Remove the sensor.
4. Visually check the sensor for chipping.



5. Check resistance as shown in the figure.

Terminal No. (Polarity)	Resistance Ω [at 25°C (77°F)]
3 (+) - 1 (-)	Except 0 or ∞
3 (+) - 2 (-)	
2 (+) - 1 (-)	



Removal and Installation

EBS00EP2

CAMSHAFT POSITION SENSOR (PHASE)

Refer to EM-36, "CAMSHAFT" .

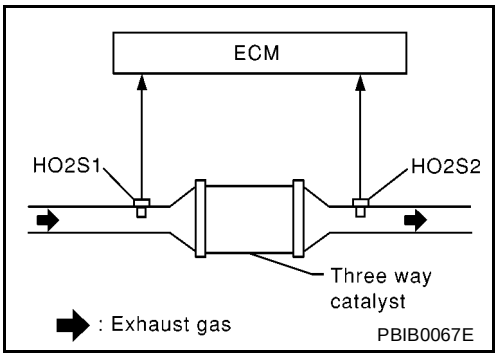
DTC P0420 THREE WAY CATALYST FUNCTION (QG16DE)

PFP:20905

On Board Diagnosis Logic

EBS00FRS

The ECM monitors the switching frequency ratio of heated oxygen sensors 1 and 2.
A three way catalyst (Manifold) with high oxygen storage capacity will indicate a low switching frequency of heated oxygen sensor 2. As oxygen storage capacity decreases, the heated oxygen sensor 2 switching frequency will increase.
When the frequency ratio of heated oxygen sensors 1 and 2 approaches a specified limit value, the three way catalyst (Manifold) malfunction is diagnosed.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0420 0420	Catalyst system efficiency below threshold	● Three way catalyst (Manifold) does not operate properly. ● Three way catalyst (Manifold) does not have enough oxygen storage capacity.	● Three way catalyst (Manifold) ● Exhaust tube ● Intake air leaks ● Fuel injectors ● Fuel injector leaks ● Spark plug ● Improper ignition timing

DTC Confirmation Procedure

EBS00FRT

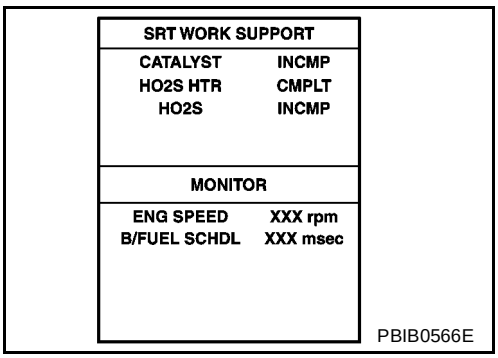
NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

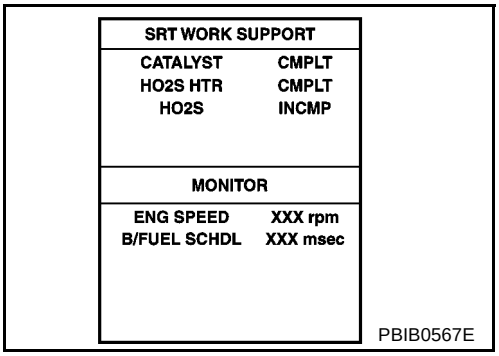
TESTING CONDITION:

- **Open engine hood before conducting the following procedure.**
- **Do not hold engine speed for more than the specified minutes below.**

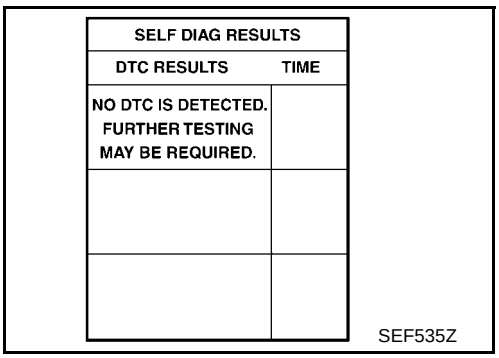
1. Turn ignition switch “ON”.
2. Select “DTC & SRT CONFIRMATION” then “SRT WORK SUPPORT” mode with CONSULT-II.
3. Start engine.
4. Rev engine up to 2,500 to 3,500 rpm and hold it for 3 consecutive minutes then release the accelerator pedal completely.
   If “INCMP” of “CATALYST” changed to “COMPLT”, go to step 7
5. Wait 5 seconds at idle.



6. Rev engine up to 2,000 to 3,000 rpm and maintain it until “INCMP” of “CATALYST” changes to “CMPLT” (It will take approximately 5 minutes).
If not “CMPLT”, stop engine and cool it down to less than 70°C (158°F) and then retest from step 1.



7. Select “SELF-DIAG RESULTS” mode with CONSULT-II.
8. Confirm that the 1st trip DTC is not detected.
If the 1st trip DTC is detected, go to EC-363, "Diagnostic Procedure" .



Overall Function Check

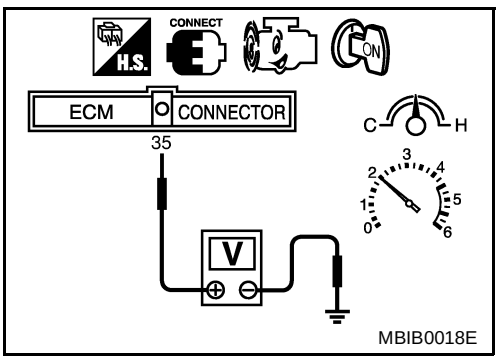
EBS00FRU

Use this procedure to check the overall function of the three way catalyst (Manifold). During this check, a 1st trip DTC might not be confirmed.

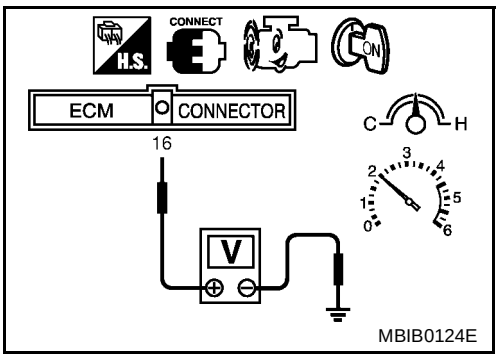
CAUTION:
Always drive vehicle at a safe speed.

WITH GST

1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Set voltmeters probes between ECM terminal 35 (HO2S1 signal) and engine ground, and ECM terminal 16 (HO2S2 signal) and engine ground.
4. Keep engine speed at 2,000 rpm constant under no load.



5. Make sure that the voltage switching frequency (high & low) between ECM terminal 16 and engine ground is very less than that of ECM terminal 35 and engine ground.
Switching frequency ratio = A/B
A: Heated oxygen sensor 2 voltage switching frequency
B: Heated oxygen sensor 1 voltage switching frequency
This ratio should be less than 0.75.
If the ratio is greater than above, it means three way catalyst does not operate properly. Go to EC-363, "Diagnostic Procedure" .



NOTE:
If the voltage at terminal 35 does not switch periodically more than 5 times within 10 seconds at step 5, perform trouble diagnosis for “DTC P0133” first. (See EC-214 .)

Diagnostic Procedure

EBS00FRV

1. CHECK EXHAUST SYSTEM

Visually check exhaust tubes and muffler for dent.

OK or NG

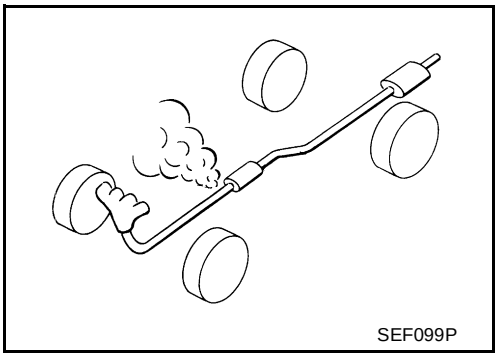
OK >> GO TO 2.
NG >> Repair or replace.

2. CHECK EXHAUST AIR LEAK

1. Start engine and run it at idle.
2. Listen for an exhaust air leak before the three way catalyst (Manifold).

OK or NG

OK >> GO TO 3.
NG >> Repair or replace.


SEF099P

3. CHECK INTAKE AIR LEAK

Listen for an intake air leak after the mass air flow sensor.

OK or NG

OK >> GO TO 4.
NG >> Repair or replace.

4. CHECK IGNITION TIMING

Check the following items. Refer to EC-92, "Basic Inspection" .

Items	Specifications
Ignition timing	8° ± 5° BTDC
Target idle speed	700 ± 50 rpm

OK or NG

OK >> GO TO 5.
NG >> Follow the “Basic Inspection”.

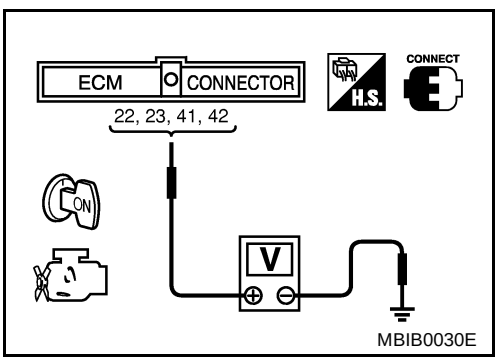
5. CHECK INJECTORS

1. Refer to Wiring Diagram for Injectors, EC-531 .
2. Stop engine and then turn ignition switch “ON”.
3. Check voltage between ECM terminals 22, 23, 41, 42 and ground with CONSULT-II or tester.

Battery voltage should exist.

OK or NG

OK >> GO TO 6.
NG >> Perform EC-532, "Diagnostic Procedure" .



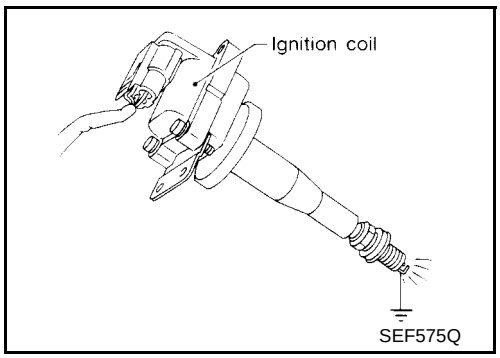
MBIB0030E

6. CHECK IGNITION SPARK

1. Turn ignition switch “OFF”.
2. Disconnect ignition coil assembly from rocker cover.
3. Connect a known good spark plug to the ignition coil assembly.
4. Place end of spark plug against a suitable ground and crank engine.
5. Check for spark.

OK or NG

OK >> GO TO 7.
NG >> Check ignition coil with power transistor and their circuit. Refer to EC-520, "IGNITION SIGNAL" .



7. CHECK INJECTOR

1. Turn ignition switch “OFF”.
2. Remove injector assembly.
   Refer to EM-31, "FUEL INJECTOR AND FUEL TUBE" .
   Keep fuel hose and all injectors connected to injector gallery.
3. Disconnect all ignition coil harness connectors.
4. Turn ignition switch “ON”.
   Make sure fuel does not drip from injector.

OK or NG

OK (Does not drip.)>>GO TO 8.
NG (Drips.)>>Replace the injector(s) from which fuel is dripping.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

Trouble is fixed.>>**INSPECTION END**
Trouble is not fixed.>>Replace three way catalyst (Manifold).

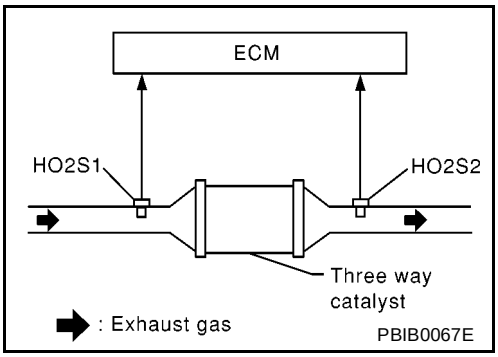
DTC P0420, P0430 THREE WAY CATALYST FUNCTION (QG18DE)

PFP:20905

On Board Diagnosis Logic

EBS00FRW

The ECM monitors the switching frequency ratio of heated oxygen sensors 1 and 2.
A three way catalyst (Manifold) with high oxygen storage capacity will indicate a low switching frequency of heated oxygen sensor 2. As oxygen storage capacity decreases, the heated oxygen sensor 2 switching frequency will increase.
When the frequency ratio of heated oxygen sensors 1 and 2 approaches a specified limit value, the three way catalyst (Manifold) malfunction is diagnosed.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0420 0420 (Bank 1) P0430 0430 (Bank 2)	Catalyst system efficiency below threshold	● Three way catalyst (Manifold) does not operate properly. ● Three way catalyst (Manifold) does not have enough oxygen storage capacity.	● Three way catalyst (Manifold) ● Exhaust tube ● Intake air leaks ● Fuel injectors ● Fuel injector leaks ● Spark plug ● Improper ignition timing

DTC Confirmation Procedure

EBS00FRX

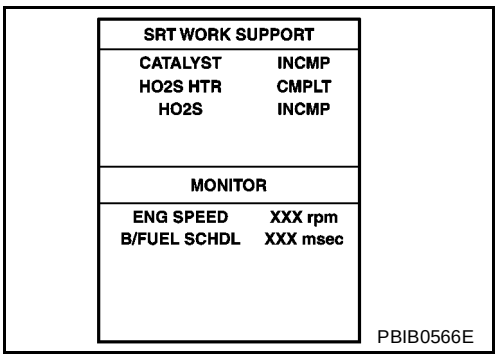
NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

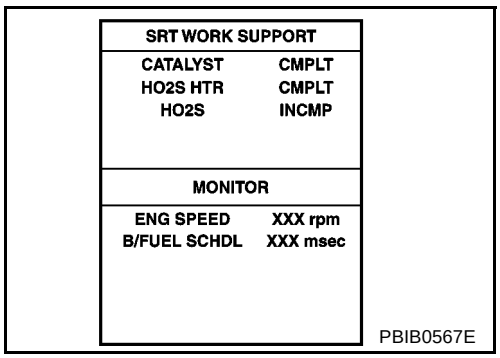
TESTING CONDITION:

- **Open engine hood before conducting the following procedure.**
- **Do not hold engine speed for more than the specified minutes below.**

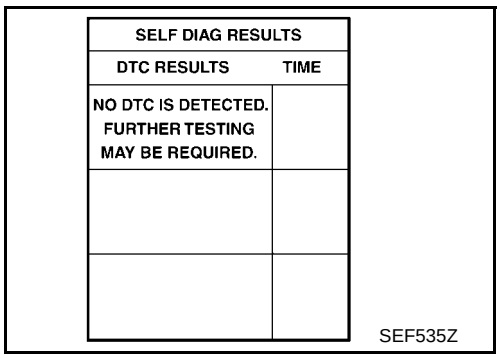
1. Turn ignition switch “ON”.
2. Select “DTC & SRT CONFIRMATION” then “SRT WORK SUPPORT” mode with CONSULT-II.
3. Start engine.
4. Rev engine up to 2,500 to 3,500 rpm and hold it for 3 consecutive minutes then release the accelerator pedal completely.
   If “INCMP” of “CATALYST” changed to “COMPLT”, go to step 7
5. Wait 5 seconds at idle.



6. Rev engine up to 2,000 to 3,000 rpm and maintain it until “INCMP” of “CATALYST” changes to “CMPLT” (It will take approximately 5 minutes).
If not “CMPLT”, stop engine and cool it down to less than 70°C (158°F) and then retest from step 1.



7. Select “SELF-DIAG RESULTS” mode with CONSULT-II.
8. Confirm that the 1st trip DTC is not detected.
If the 1st trip DTC is detected, go to EC-367, "Diagnostic Procedure" .



Overall Function Check

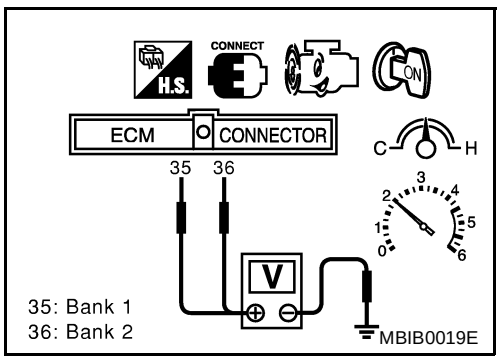
EBS00FRY

Use this procedure to check the overall function of the three way catalyst (Manifold). During this check, a 1st trip DTC might not be confirmed.

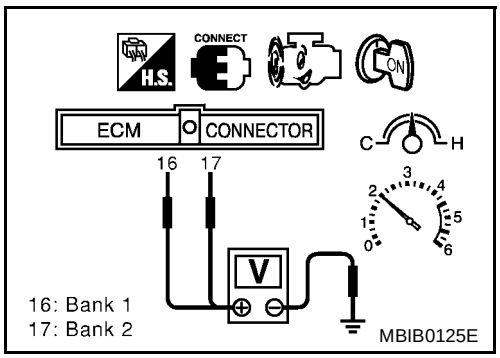
CAUTION:
Always drive vehicle at a safe speed.

WITH GST

1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Set voltmeters probes between ECM terminals 35 [HO2S1 (B 1) signal], 36 [HO2S1 (B 2) signal] and engine ground, and ECM terminals 16 [HO2S2 (B 1) signal], 17 [HO2S2 (B 2) signal] and engine ground.
4. Keep engine speed at 2,000 rpm constant under no load.



5. Make sure that the voltage switching frequency (high & low) between ECM terminals 16 and engine ground, or 17 and engine ground is very less than that of ECM terminals 35 and engine ground, or 36 and engine ground.
Switching frequency ratio = A/B
A: Heated oxygen sensor 2 voltage switching frequency
B: Heated oxygen sensor 1 voltage switching frequency
This ratio should be less than 0.75.
If the ratio is greater than above, it means three way catalyst does not operate properly. Go to EC-367, "Diagnostic Procedure" .



NOTE:
If the voltage at terminal 35 or 36 does not switch periodically more than 5 times within 10 seconds at step 5, perform trouble diagnosis for “DTC P0133, P0153” first. (See EC-223 .)

Diagnostic Procedure

EBS00FRZ

1. CHECK EXHAUST SYSTEM

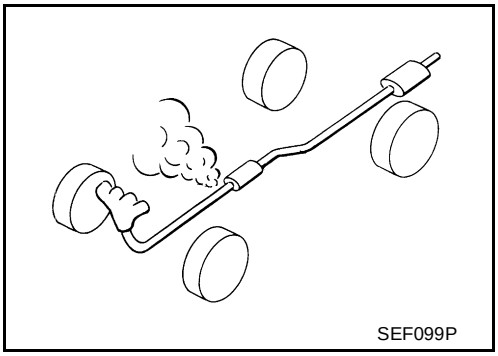
Visually check exhaust tubes and muffler for dent.

OK or NG

OK >> GO TO 2.
NG >> Repair or replace.

2. CHECK EXHAUST AIR LEAK

1. Start engine and run it at idle.
2. Listen for an exhaust air leak before the three way catalyst (Manifold).


SEF099P

OK or NG

OK >> GO TO 3.
NG >> Repair or replace.

3. CHECK INTAKE AIR LEAK

Listen for an intake air leak after the mass air flow sensor.

OK or NG

OK >> GO TO 4.
NG >> Repair or replace.

4. CHECK IGNITION TIMING

Check the following items. Refer to EC-92, "Basic Inspection" .

Items	Specifications
Ignition timing	M/T: 8° ± 5° BTDC
	A/T: 10° ± 5° BTDC (in “P” or “N” position)
Target idle speed	M/T: 700 ± 50 rpm
	A/T: 800 ± 50 rpm (in “P” or “N” position)

OK or NG

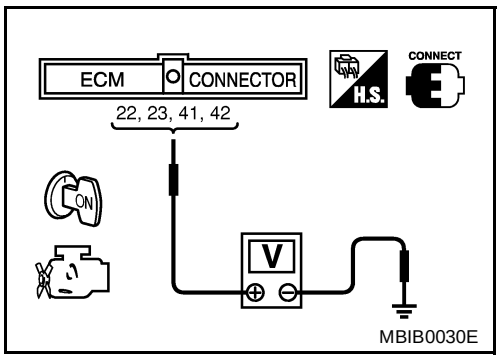
OK >> GO TO 5.
NG >> Follow the EC-92, "Basic Inspection" .

5. CHECK INJECTORS

1. Stop engine and then turn ignition switch “ON”.
2. Check voltage between ECM terminals 22, 23, 41, 42 and ground with CONSULT-II or tester.

   Battery voltage should exist.

3. Refer to Wiring Diagram for Injectors, EC-531 .

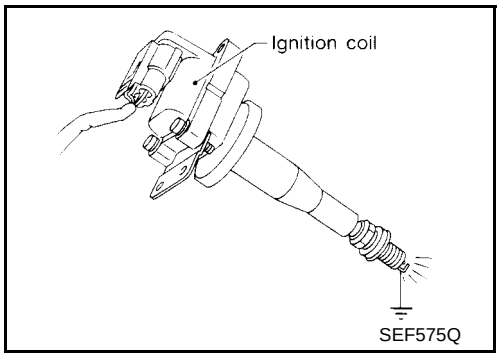


OK or NG

OK >> GO TO 6.
NG >> Perform EC-532, "Diagnostic Procedure" .

6. CHECK IGNITION SPARK

1. Turn ignition switch “OFF”.
2. Disconnect ignition coil assembly from rocker cover.
3. Connect a known good spark plug to the ignition coil assembly.
4. Place end of spark plug against a suitable ground and crank engine.
5. Check for spark.



OK or NG

OK >> GO TO 7.
NG >> Check ignition coil with power transistor and their circuit. Refer to EC-520, "IGNITION SIGNAL" .

7. CHECK INJECTOR

1. Turn ignition switch “OFF”.
2. Remove injector assembly.
   Refer to EM-31, "FUEL INJECTOR AND FUEL TUBE" .
   Keep fuel hose and all injectors connected to injector gallery.
3. Disconnect all ignition coil harness connectors.
4. Turn ignition switch “ON”.
   Make sure fuel does not drip from injector.

OK or NG

OK (Does not drip.)>>GO TO 8.
NG (Drips.)>>Replace the injector(s) from which fuel is dripping.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

Trouble is fixed.>>**INSPECTION END**
Trouble is not fixed.>>Replace three way catalyst (Manifold).

DTC P0444, P0445 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

PFP:14920

Description

EBS00GW7

SYSTEM DESCRIPTION

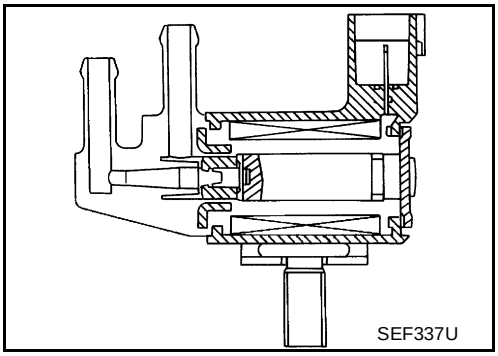
Sensor	Input Signal to ECM	ECM Function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*2	EVAP canister purge flow control	EVAP canister purge volume control solenoid valve
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Battery	Battery voltage*2		
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Closed throttle position		
Heated oxygen sensors 1	Density of oxygen in exhaust gas (Mixture ratio feedback signal)		
Vehicle speed signal*1	Vehicle speed		

*: This signal is sent to the ECM through CAN communication line.
*2: The ECM determines the start signal status by the signals of engine speed and battery voltage.

This system controls flow rate of fuel vapor from the EVAP canister. The opening of the vapor by-pass passage in the EVAP canister purge volume control solenoid valve changes to control the flow rate. The EVAP canister purge volume control solenoid valve repeats ON/OFF operation according to the signal sent from the ECM. The opening of the valve varies for optimum engine control. The optimum value stored in the ECM is determined by considering various engine conditions. When the engine is operating, the flow rate of fuel vapor from the EVAP canister is regulated as the air flow changes.

COMPONENT DESCRIPTION

The EVAP canister purge volume control solenoid valve uses a ON/OFF duty to control the flow rate of fuel vapor from the EVAP canister. The EVAP canister purge volume control solenoid valve is moved by ON/OFF pulses from the ECM. The longer the ON pulse, the greater the amount of fuel vapor that will flow through the valve.



CONSULT-II Reference Value in Data Monitor Mode

EBS00GW8

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
PURG VOL C/V	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	0%
		2,000 rpm	15 - 30%

On Board Diagnosis Logic

EBS00GWA

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0444 0444	EVAP canister purge volume control solenoid valve circuit open	An excessively low voltage signal is sent to ECM through the valve	● Harness or connectors (The solenoid valve circuit is open or shorted.) ● EVAP canister purge volume control solenoid valve
P0445 0445	EVAP canister purge volume control solenoid valve circuit shorted	An excessively high voltage signal is sent to ECM through the valve	● Harness or connectors (The solenoid valve circuit is shorted.) ● EVAP canister purge volume control solenoid valve

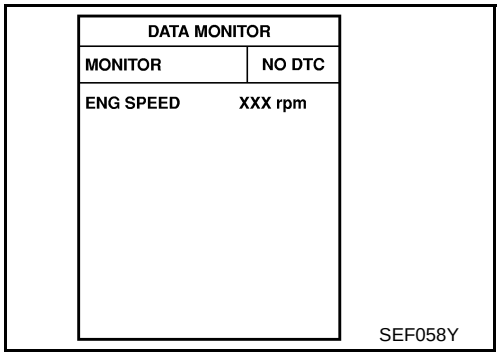
DTC Confirmation Procedure

EBS00GWB

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm battery voltage is more than 11V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for at least 13 seconds.
4. If 1st trip DTC is detected, go to EC-372, "Diagnostic Procedure"
.



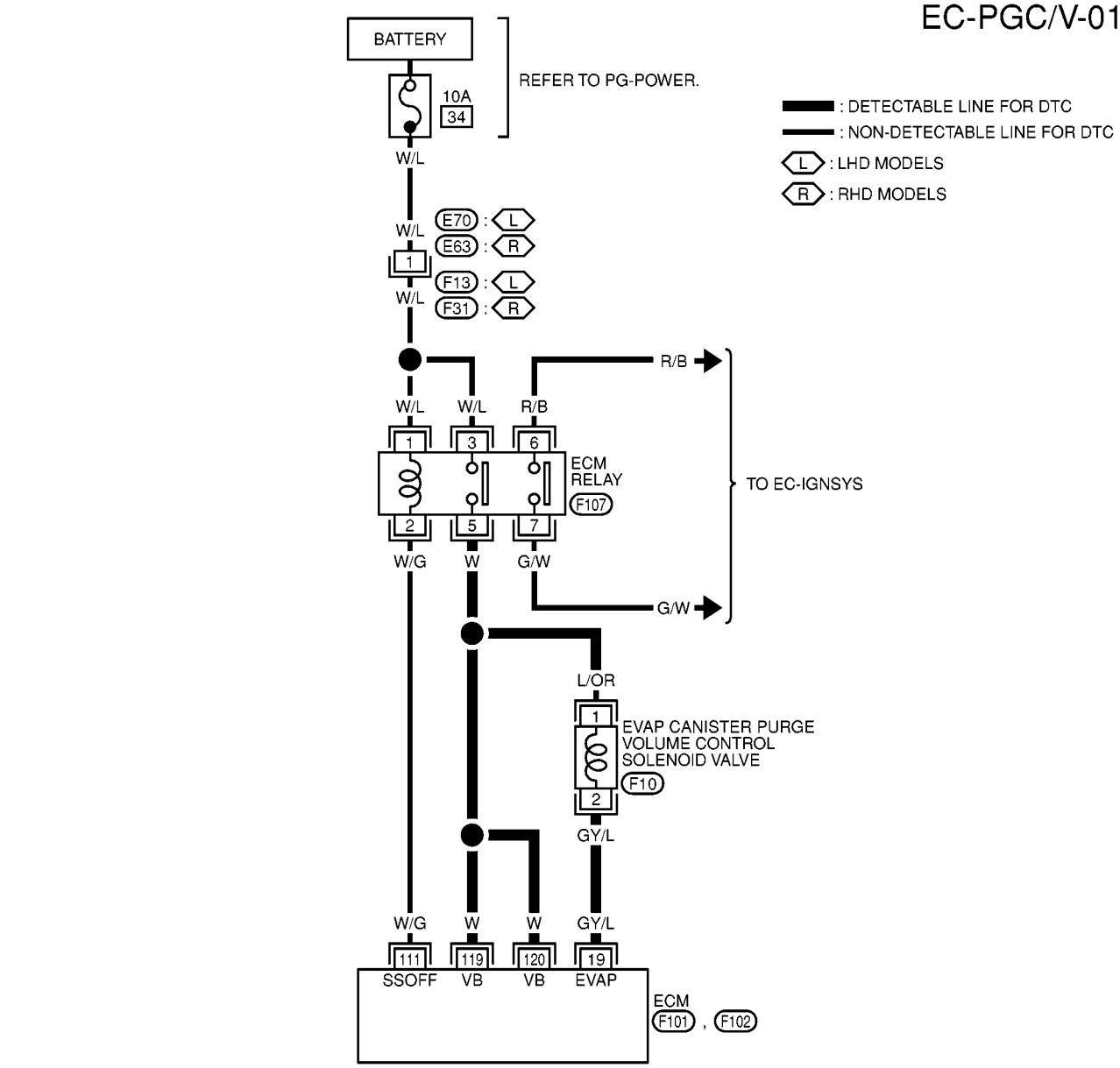
WITH GST

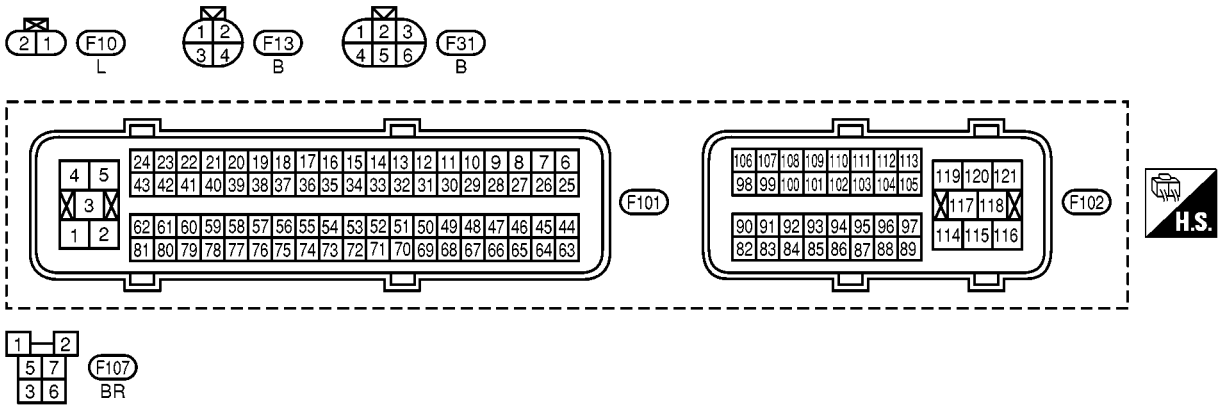
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

EBS00GWC

EC-PGC/V-01



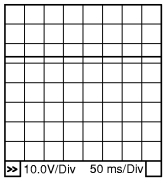
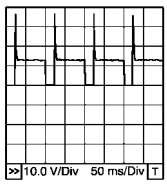


MBWA0066E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
19	GY/L	EVAP canister purge volume control solenoid valve	**[Engine is running]** ● Idle speed	BATTERY VOLTAGE (11 - 14V)★  PBIB0050E
			[Engine is running] ● Engine speed is about 2,000 rpm (More than 100 seconds after starting engine)	Approximately 10V★  PBIB0520E

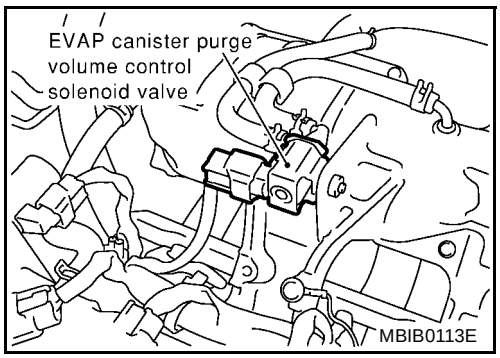
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnostic Procedure

EBS00GWD

1. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

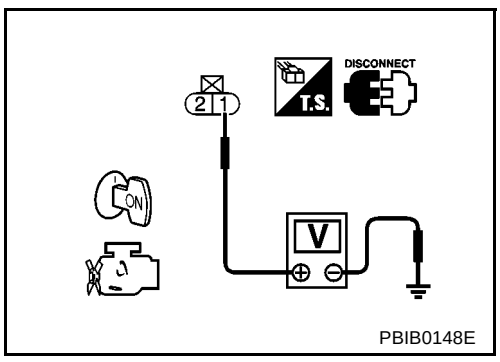
1. Turn ignition switch “OFF”.
2. Disconnect EVAP canister purge volume control solenoid valve harness connector.
3. Turn ignition switch “ON”.



MBIB0113E

4. Check voltage between EVAP canister purge volume control solenoid valve terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage



PBIB0148E

OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between EVAP canister purge volume control solenoid valve and ECM
- Harness for open or short between EVAP canister purge volume control solenoid valve and ECM relay

>> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 19 and EVAP canister purge volume control solenoid valve terminal 2.
   Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK (With CONSULT-II)>>GO TO 4.
OK (Without CONSULT-II)>>GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

With CONSULT-II

1. Reconnect all harness connectors disconnected.
2. Start engine.
3. Perform “PURG VOL CONT/V” in “ACTIVE TEST” mode with CONSULT-II. Check that engine speed varies according to the valve opening.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

ACTIVE TEST	
PURG VOL CONT/V	XXX %
MONITOR	
ENG SPEED	XXX rpm
A/F ALPHA-B1	XXX %
HO2S1 MNTR (B1)	LEAN

PBIB0569E

5. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-374, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace EVAP canister purge volume control solenoid valve.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

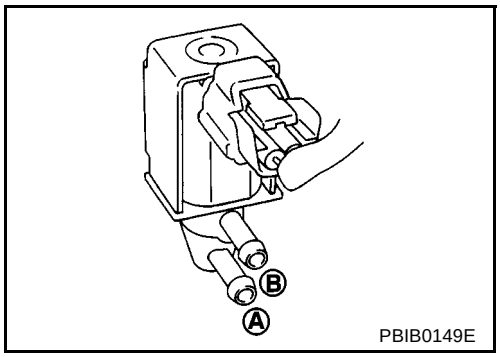
EBS00GWE

EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT-II

Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

Condition (PURG VOL CONT/V value)	Air passage continuity between A and B
100.0%	Yes
0.0%	No

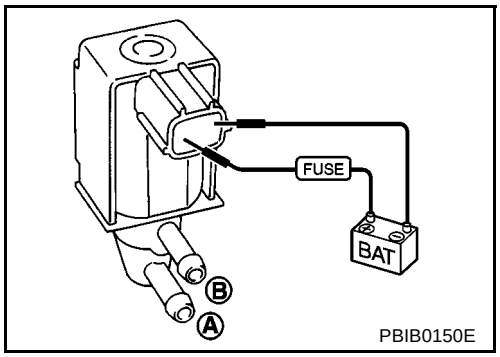


PBIB0149E

Without CONSULT-II

Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

Condition	Air passage continuity between A and B
12V direct current supply between terminals 1 and 2	Yes
No supply	No



PBIB0150E

Removal and Installation

EBS00GWF

EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EM-19, "INTAKE MANIFOLD" .

DTC P0500 VSS

PFP:32702

Description

EBS00EP3

NOTE:
If DTC P0500 is displayed with DTC U1000 or U1001, first perform the trouble diagnosis for DTC U1000, U1001. Refer to EC-150, "DTC U1000, U1001 CAN COMMUNICATION LINE" .
The vehicle speed signal is sent to the combination meter from ABS actuator and electric unit (control unit) through CAN communication line. The combination meter then sends a signal to the ECM through CAN communication line.

On Board Diagnosis Logic

EBS00EP4

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0500 0500	Vehicle speed sensor	The almost 0 km/h (0 MPH) signal from vehicle speed sensor is sent to ECM even when vehicle is being driven.	● Harness or connectors (The CAN communication line is open or shorted.) ● ABS actuator and electric unit (control unit) ● Combination meter ● Vehicle speed signal

DTC Confirmation Procedure

EBS00EP5

CAUTION:
Always drive vehicle at a safe speed.

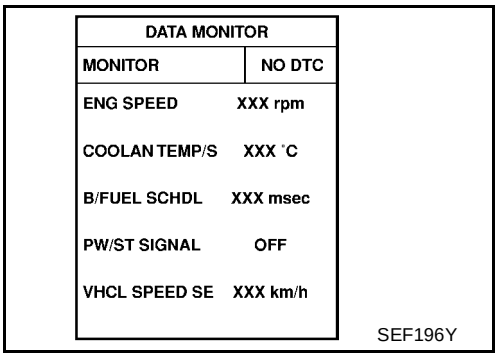
NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:
Steps 1 and 2 may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

WITH CONSULT-II

1. Start engine.
2. Read “VHCL SPEED SE” in “DATA MONITOR” mode with CONSULT-II. The vehicle speed on CONSULT-II should exceed 10 km/h (6 MPH) when rotating wheels with suitable gear position.
   If NG, go to EC-376, "Diagnostic Procedure" .
   If OK, go to following step.
3. Select “DATA MONITOR” mode with CONSULT-II.
4. Warm engine up to normal operating temperature.
5. Maintain the following conditions for at least 60 consecutive seconds.

ENG SPEED	2,000 - 6,000 rpm (A/T models) 2,300 - 6,000 rpm (M/T models)
COOLAN TEMP/S	More than 70°C (158°F)
B/FUEL SCHDL	More than 5.0 msec (A/T models) More than 4.3 msec (M/T models)
Selector lever	Suitable position
PW/ST SIGNAL	OFF



6. If 1st trip DTC is detected, go to EC-376, "Diagnostic Procedure" .

Overall Function Check

EBS00EP6

Use this procedure to check the overall function of the vehicle speed signal circuit. During this check, a 1st trip DTC might not be confirmed.

WITH GST

1. Lift up drive wheels.

2. Start engine.
3. Read vehicle speed signal in “MODE 1” with GST.
   The vehicle speed signal on GST should be able to exceed 10 km/h (6 MPH) when rotating wheels with suitable gear position.
4. If NG, go to EC-376, "Diagnostic Procedure" .

Diagnostic Procedure

EBS00EP7

1. CHECK DTC

Check DTC with ABS actuator and electric unit (control unit), Refer to BRC-17, "TROUBLE DIAGNOSIS" .

OK or NG

OK >> GO TO 2.
NG >> Repair or replace.

2. CHECK COMBINATION METER

Check combination meter function.
Refer to DI-5, "COMBINATION METERS (LHD MODELS)" or DI-34, "COMBINATION METERS (RHD MODELS)" .

>> **INSPECTION END**

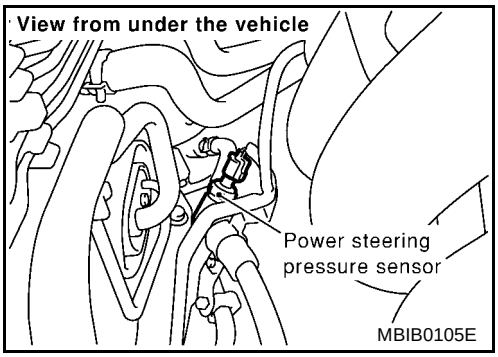
DTC P0550 PSP SENSOR

PFP:49763

Component Description

EBS00FS0

Power steering pressure (PSP) sensor is installed to the power steering high-pressure tube and detects a power steering load. This sensor is a potentiometer which transforms the power steering load into output voltage, and emits the voltage signal to the ECM. The ECM controls the electric throttle control actuator and adjusts the throttle valve opening angle to increase the engine speed and adjusts the idle speed for the increased load.



CONSULT-II Reference Value in Data Monitor Mode

EBS00FS1

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
PW/ST SIGNAL	● Engine: After warming up, idle the engine	Steering wheel is in neutral position. (Forward direction)	OFF
		Steering wheel is turned.	ON

On Board Diagnosis Logic

EBS00FS2

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0550 0550	Power steering pressure sensor circuit	An excessively low or high voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Power steering pressure sensor

DTC Confirmation Procedure

EBS00FS3

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for at least 5 seconds.
4. If 1st trip DTC is detected, go to EC-379, "Diagnostic Procedure" .

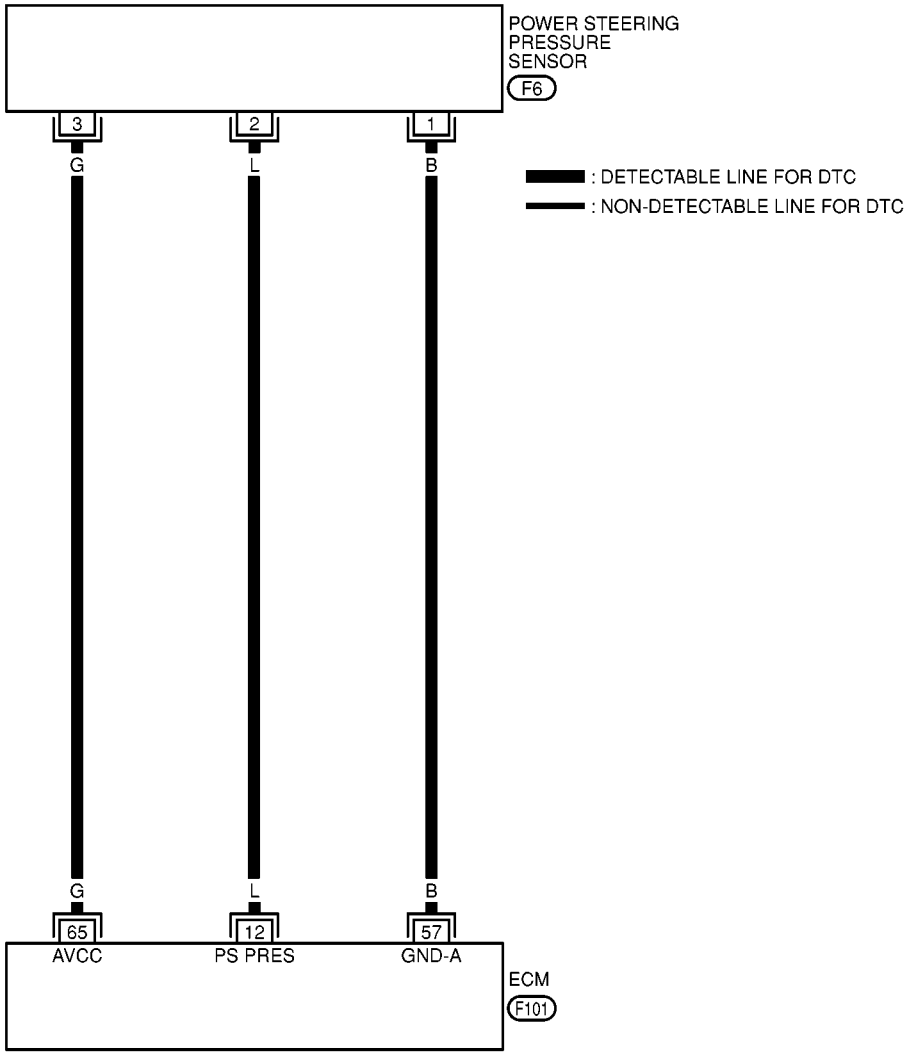
WITH GST

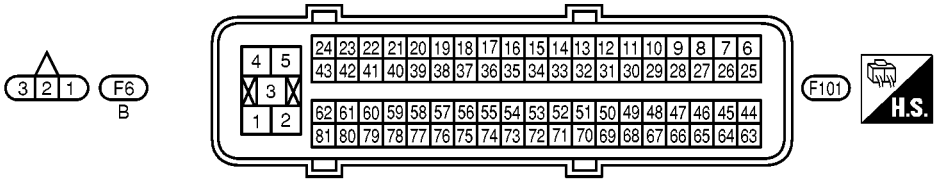
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

EBS00FS4

EC-PS/SEN-01





MBWA0089E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
12	L	Power steering pressure sensor	**[Engine is running]** ● Steering wheel is being turned.	0.5 - 4.0V
			[Engine is running] ● Steering wheel is not being turned.	0.4 - 0.8V
57	B	Sensor ground (Power steering pressure sensor)	**[Engine is running]** ● Idle speed	Approximately 0V
65	G	Sensor power supply (Power steering pressure sensor)	**[Ignition switch "ON"]**	Approximately 5V

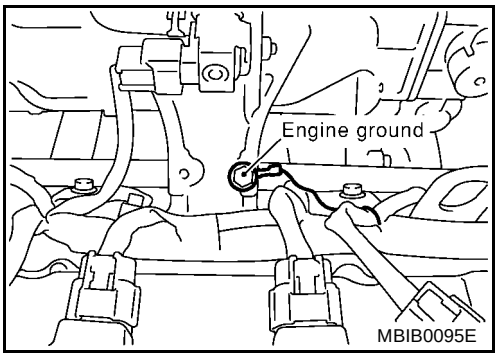
Diagnostic Procedure

EBS00FS5

1. RETIGHTEN GROUND SCREWS

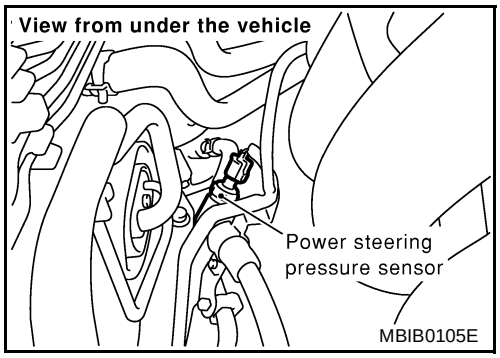
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



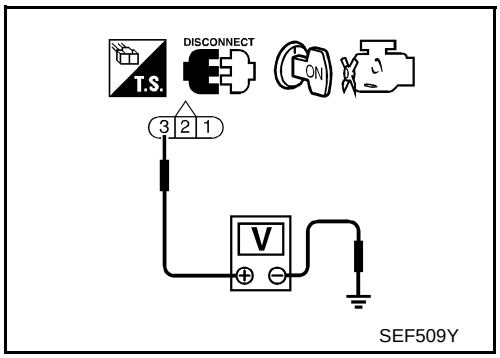
2. CHECK PSP SENSOR POWER SUPPLY CIRCUIT

1. Disconnect PSP sensor harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between PSP sensor terminal 3 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK PSP SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 57 and PSP sensor terminal 1. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK PSP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 12 and PSP sensor terminal 2.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK PSP SENSOR

Refer to EC-381, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace PSP sensor.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

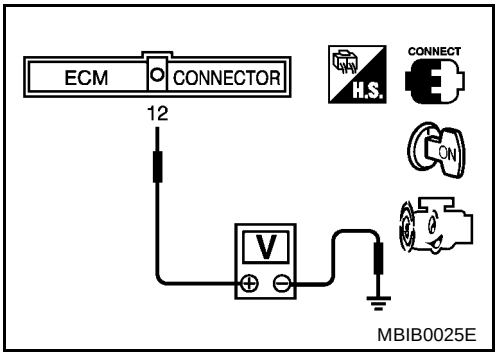
Component Inspection

EBS00FS6

POWER STEERING PRESSURE SENSOR

1. Reconnect all harness connectors disconnected.
2. Start engine and let it idle.
3. Check voltage between ECM terminal 12 and ground under the following conditions.

Condition	Voltage
Steering wheel is being turned fully.	Approximately 3.6V
Steering wheel is not being turned.	Approximately 0.6V



MBIB0025E

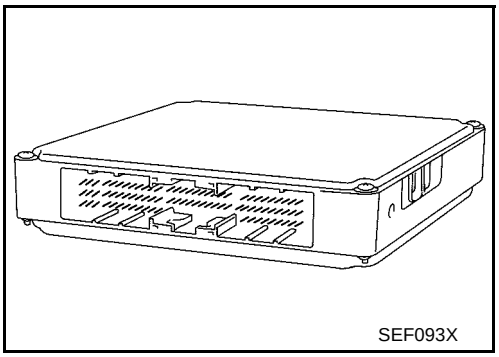
DTC P0605 ECM

PFP:23710

Component Description

EBS00EP8

The ECM consists of a microcomputer and connectors for signal input and output and for power supply. The ECM controls the engine.


SEF093X

On Board Diagnosis Logic

EBS00EP9

DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause
P0605 0605	Engine control module	A)	ECM calculation function is malfunctioning.	● ECM
		B)	ECM EEP-ROM system is malfunctioning.	
		C)	ECM self shut-off function is malfunctioning.	

FAIL-SAFE MODE

ECM enters fail-safe mode when malfunction A is detected.

Detected items	Engine operation condition in fail-safe mode
Malfunction A	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

DTC Confirmation Procedure

EBS00EPA

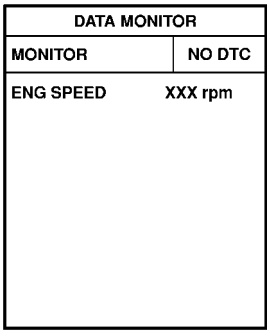
Perform “PROCEDURE FOR MALFUNCTION A” first. If the DTC cannot be confirmed, perform “PROCEDURE FOR MALFUNCTION B”. If there is no problem on “PROCEDURE FOR MALFUNCTION B”, perform “PROCEDURE FOR MALFUNCTION C”.

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

PROCEDURE FOR MALFUNCTION A

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. If DTC is detected, go to EC-384, "Diagnostic Procedure" .



SEF058Y

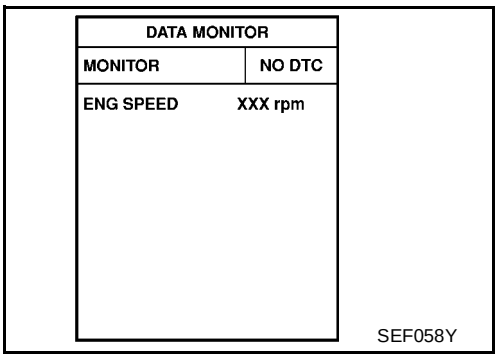
With GST

Follow the procedure “With CONSULT-II” above.

PROCEDURE FOR MALFUNCTION B

With CONSULT-II

1. Turn ignition switch “ON” and wait at least 1 second.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Turn ignition switch “OFF”, wait at least 10 seconds, and then turn “ON”.
4. If 1st trip DTC is detected, go to EC-384, "Diagnostic Procedure" .



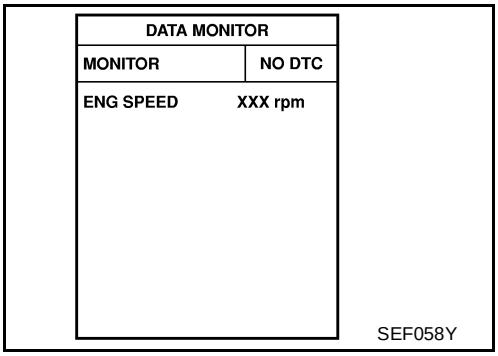
With GST

Follow the procedure “With CONSULT-II” above.

PROCEDURE FOR MALFUNCTION C

With CONSULT-II

1. Turn ignition switch “ON” and wait at least 1 second.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Turn ignition switch “OFF”, wait at least 10 seconds, and then turn “ON”.
4. Repeat step 3 procedure, 32 times.
5. If 1st trip DTC is detected, go to EC-384, "Diagnostic Procedure" .



With GST

Follow the procedure “With CONSULT-II” above.

Diagnostic Procedure

EBS00EPB

1. INSPECTION START

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “SELF DIAG RESULTS” mode with CONSULT-II.
3. Touch “ERASE”.
4. **Perform “DTC Confirmation Procedure”.**
   See EC-382 .
5. Is the 1st trip DTC P0605 displayed again?

With GST

1. Turn ignition switch “ON”.
2. Select MODE 4 with GST.
3. Touch “ERASE”.
4. **Perform “DTC Confirmation Procedure”.**
   See EC-382 .
5. Is the 1st trip DTC P0605 displayed again?

Yes or No

Yes >> GO TO 2.
No >> **INSPECTION END**

2. REPLACE ECM

1. Replace ECM.
2. Perform initialization of NATS system and registration of all NATS ignition key IDs. Refer to EC-75, "NATS (Nissan Anti-theft System)" .
3. Perform EC-55, "Accelerator Pedal Released Position Learning" .
4. Perform EC-55, "Throttle Valve Closed Position Learning" .
5. Perform EC-55, "Idle Air Volume Learning" .

>> **INSPECTION END**

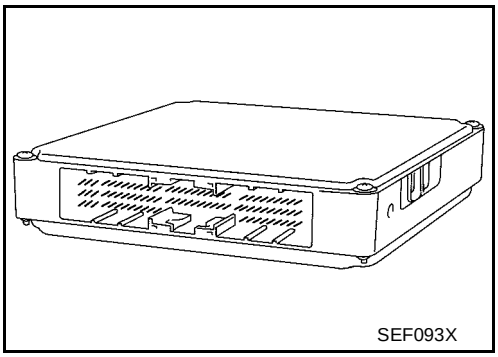
DTC P1065 ECM POWER SUPPLY

PFP:23710

Component Description

EBS00EPC

Battery voltage is supplied to the ECM even when the ignition switch is turned OFF for the ECM memory function of the DTC memory, the air fuel ratio feedback compensation value memory, the idle air volume learning value memory, etc.


SEF093X

On Board Diagnosis Logic

EBS00EPD

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1065 1065	ECM power supply circuit	ECM back up RAM system does not function properly.	● Harness or connectors [ECM power supply (back-up) circuit is open or shorted.] ● ECM

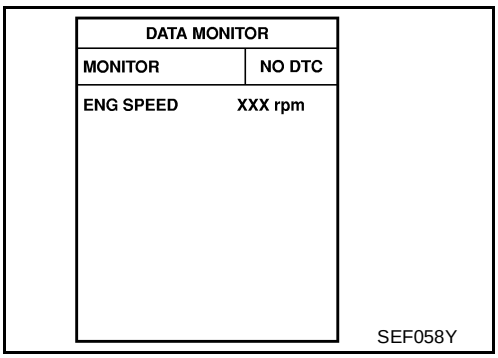
DTC Confirmation Procedure

EBS00EPE

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON” and wait at least 1 second.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. Turn ignition switch “OFF”, wait at least 10 seconds, and then turn “ON”.
5. Repeat steps 3 and 4 four times.
6. If 1st trip DTC is detected, go to EC-387, "Diagnostic Procedure"
.



SEF058Y

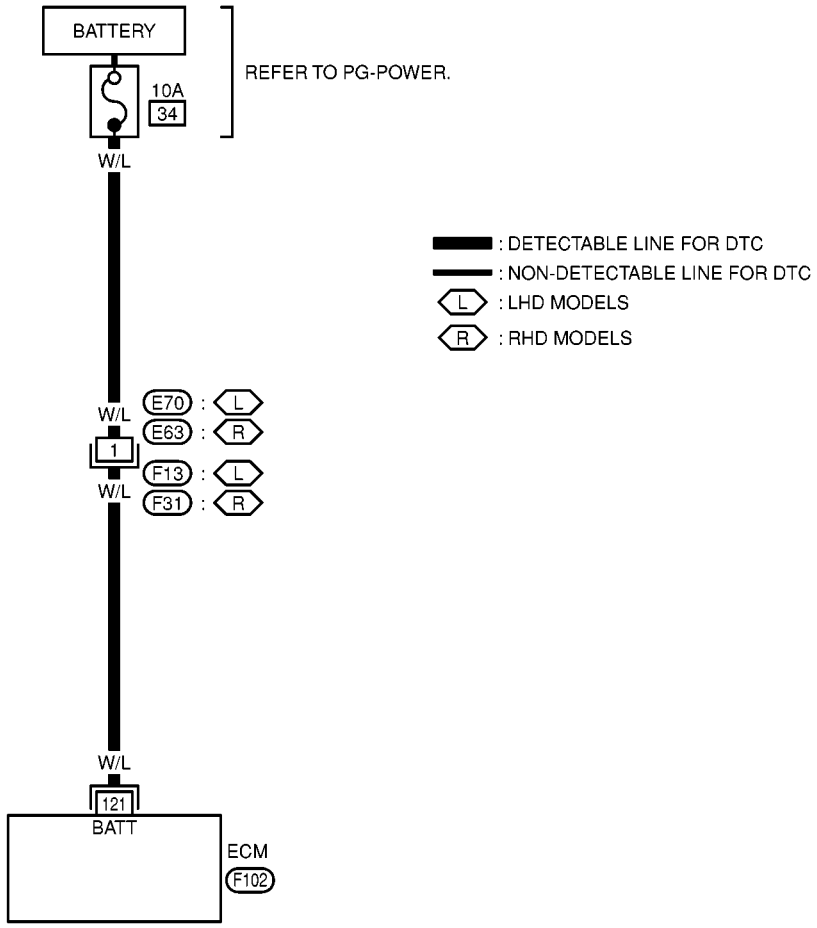
WITH GST

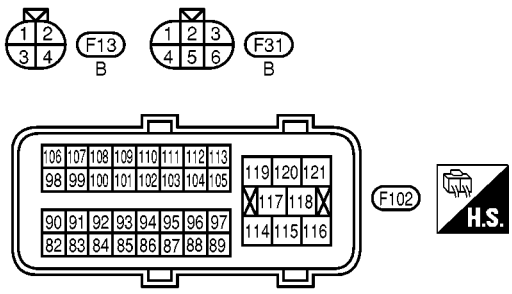
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

EBS00EPF

EC-ECM/PW-01





MBWA0094E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
121	W/L	Power supply for ECM (Buck-up)	**[Ignition switch "OFF"]**	BATTERY VOLTAGE (11 - 14V)

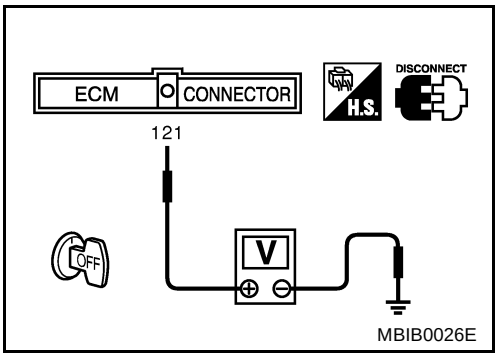
Diagnostic Procedure

EBS00EPG

1. CHECK ECM POWER SUPPLY

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check voltage between ECM terminal 121 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E70, F13 (LHD models)
- Harness connectors E63, F31 (RHD models)
- 10A fuse
- Harness for open or short between ECM and battery

>> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK INTERMITTENT INCIDENT

Refer to EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. PERFORM DTC CONFIRMATION PROCEDURE

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “SELF DIAG RESULTS” mode with CONSULT-II.
3. Touch “ERASE”.
4. **Perform “DTC Confirmation Procedure”.**
   See EC-385 .
5. Is the 1st trip DTC P1065 displayed again?

With GST

1. Turn ignition switch “ON”.
2. Select MODE 4 with GST.
3. Touch “ERASE”.
4. **Perform “DTC Confirmation Procedure”.**
   See EC-385 .
5. Is the 1st trip DTC P1065 displayed again?

Yes or No

Yes >> GO TO 5.
No >> **INSPECTION END**

5. REPLACE ECM

1. Replace ECM.
2. Perform initialization of NATS system and registration of all NATS ignition key IDs. Refer to EC-75, "NATS (Nissan Anti-theft System)" .
3. Perform EC-55, "Accelerator Pedal Released Position Learning" .
4. Perform EC-55, "Throttle Valve Closed Position Learning" .
5. Perform EC-55, "Idle Air Volume Learning" .

>> **INSPECTION END**

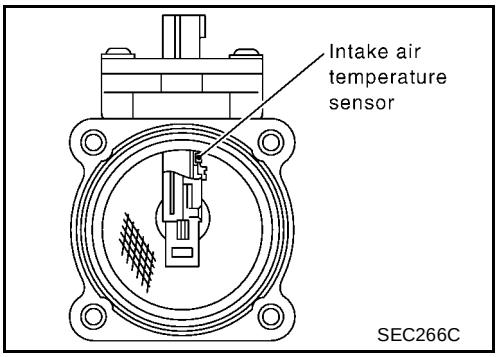
DTC P1102 MAF SENSOR

PFP:22680

Component Description

EBS00FS7

The mass air flow sensor is placed in the stream of intake air. It measures the intake flow rate by measuring a part of the entire intake flow. It consists of a hot film that is supplied with electric current from the ECM. The temperature of the hot film is controlled by the ECM a certain amount. The heat generated by the hot film is reduced as the intake air flows around it. The more air, the greater the heat loss.
Therefore, the ECM must supply more electric current to maintain the temperature of the hot film as air flow increases. The ECM detects the air flow by means of this current change.



CONSULT-II Reference Value in Data Monitor Mode

EBS00FS8

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
MAS A/F SE-B1	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: N ● No-load	Idle	Approx. 1.0 - 1.7V
		2,500 rpm	Approx. 1.5 - 2.1V
CAL/LD VALUE	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	10% - 35%
		2,500 rpm	10% - 35%
MASS AIRFLOW	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	1.0 - 4.0 g·m/s
		2,500 rpm	5.0 - 10.0 g·m/s

On Board Diagnosis Logic

EBS00FS9

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1102 1102	Mass air flow sensor circuit range/performance problem	A voltage from the sensor is constantly approx.1.0V when engine is running.	● Harness or connectors (The sensor circuit is open or shorted.) ● Mass air flow sensor

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MI lights up.

Detected items	Engine operating condition in fail-safe mode
Mass air flow sensor circuit	Engine speed will not rise more than 2,400 rpm due to the fuel cut.

DTC Confirmation Procedure

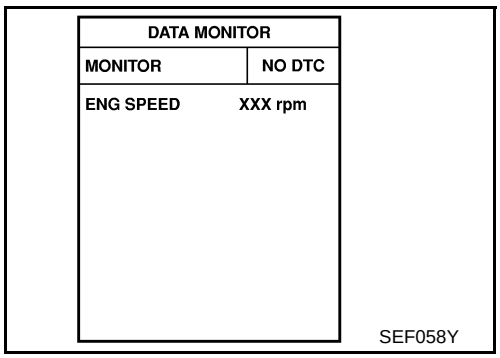
EBS00FSA

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON”.

2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and wait 5 seconds at most.
4. If DTC is detected, go to EC-392, "Diagnostic Procedure" .



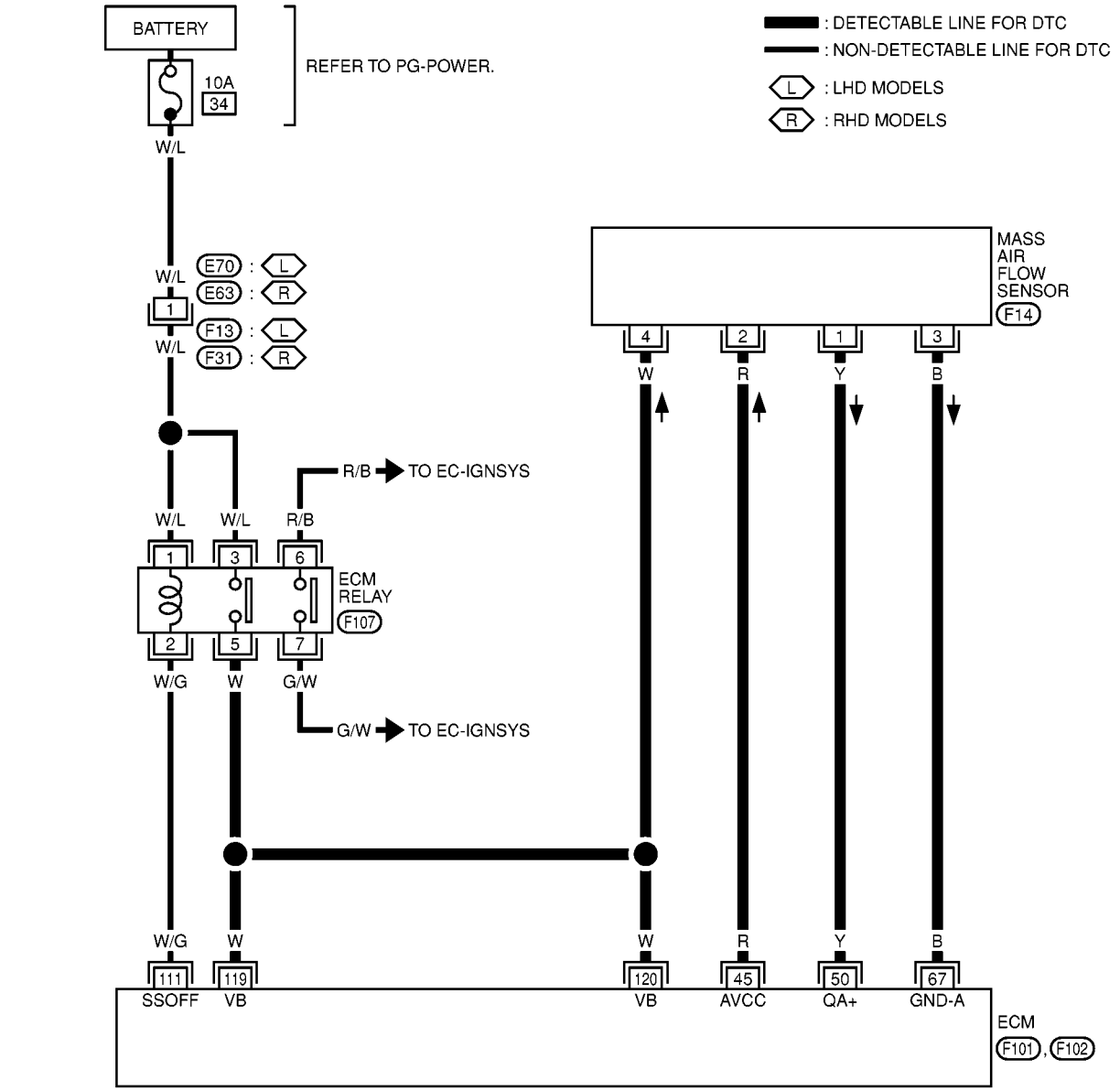
WITH GST

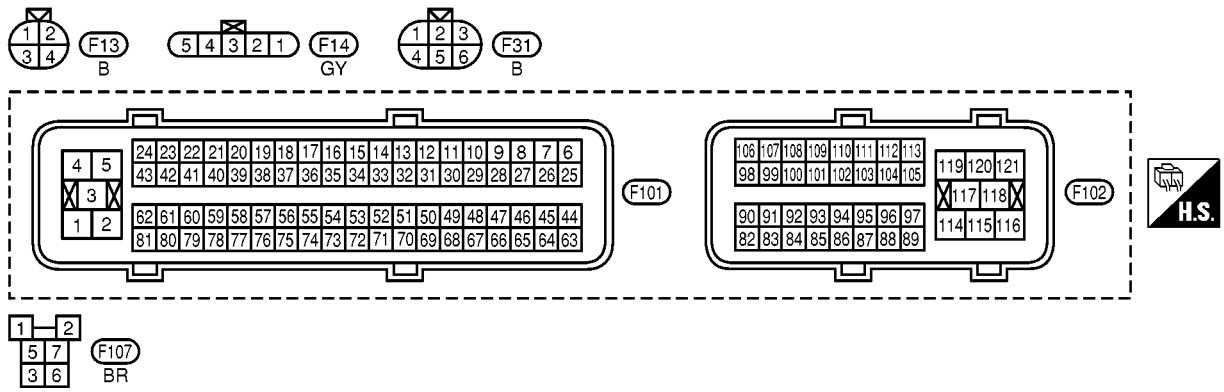
Follow the procedure “With CONSULT-II” above.

Wiring Diagram

EBS00FSB

EC-MAFS-01





MBWA0045E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
45	R	Sensor power supply (Mass air flow sensor sensor)	**[Ignition switch "ON"]**	Approximately 5V
50	Y	Mass air flow sensor	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.0 - 1.7V
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,500 rpm.	1.5 - 2.1V
67	B	Sensor ground (Mass air flow sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V

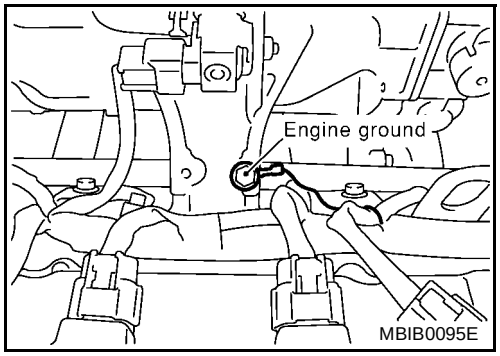
Diagnostic Procedure

EBS00FSC

1. RETIGHTEN GROUND SCREWS

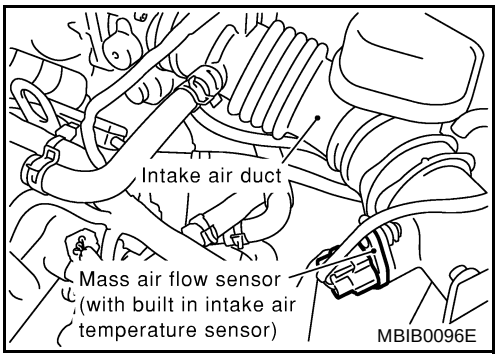
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



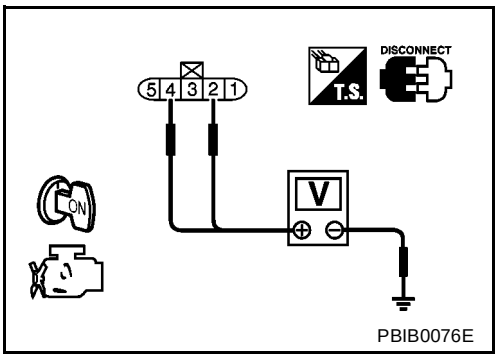
2. CHECK MAF SENSOR POWER SUPPLY CIRCUIT

1. Disconnect MAF sensor harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between MAF sensor terminals 2, 4 and ground with CONSULT-II or tester.

Terminal	Voltage
2	Approximately 5V
4	Battery voltage



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between mass air flow sensor and ECM
- Harness for open or short between mass air flow sensor and ECM relay

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK MAF SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 67 and MAF sensor terminal 3. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK MAF SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 50 and MAF sensor terminal 1. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK MASS AIR FLOW SENSOR

Refer to EC-394, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace mass air flow sensor.

7. CHECK INTERMITTENT INCIDENT

Refer to EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

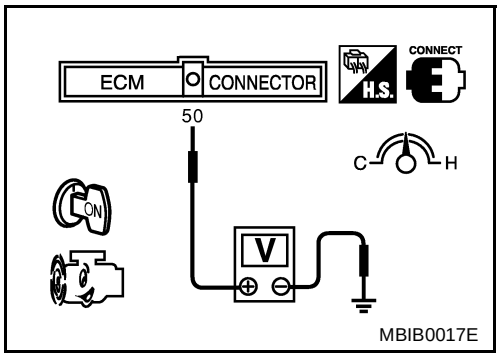
EBS00FSD

MASS AIR FLOW SENSOR

1. Reconnect harness connectors disconnected.
2. Start engine and warm it up to normal operating temperature.
3. Check voltage between ECM terminal 50 (Mass air flow sensor signal) and ground.

Condition	Voltage V
Ignition switch “ON” (Engine stopped.)	Approx. 1.0
Idle (Engine is warmed-up to normal operating temperature.)	1.0 - 1.7
2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.5 - 2.1
Idle to about 4,000 rpm*	1.0 - 1.7 to Approx. 4.0

*: Check for liner voltage rise in response to engine being increased to about 4,000 rpm.



4. If the voltage is out of specification, proceed the following.

a. Turn ignition switch “OFF”.
b. Disconnect mass air flow sensor harness connector and reconnect it again.
c. Perform steps 2 and 3 again.

5. If NG, remove mass air flow sensor from air duct. Check hot film for damage or dust.
6. If NG, clean or replace mass air flow sensor.

Removal and Installation

EBS00FSE

MASS AIR FLOW SENSOR

Refer to EM-17, "AIR CLEANER AND AIR DUCT" .

DTC P1111 IVT CONTROL SOLENOID VALVE

PFP:23796

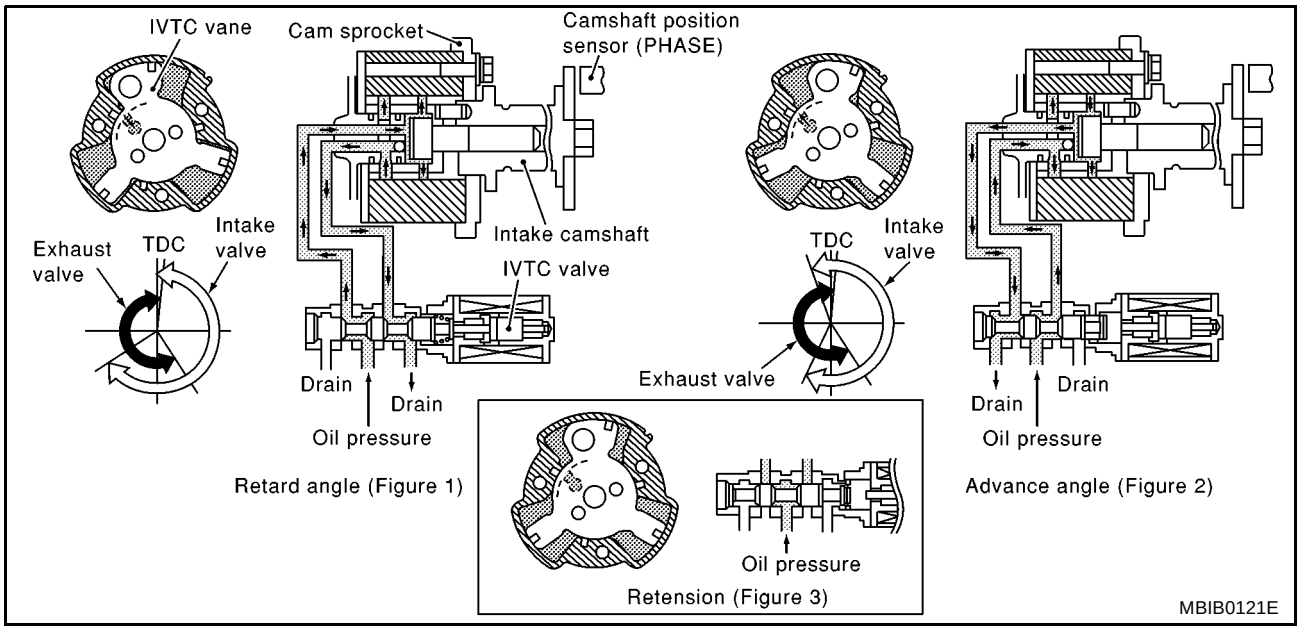
Description

EBS00GNV

SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM Function	Actuator
Crankshaft position sensor (POS)	Engine speed	Intake valve timing control	Intake valve timing control solenoid valve
Camshaft position sensor (PHASE)			
Engine coolant temperature sensor	Engine coolant temperature		
Vehicle speed signal*	Vehicle speed		

*: This signal is sent to the ECM through CAN communication line.



This mechanism hydraulically controls cam phases continuously with the fixed operating angle of the intake valve.

The ECM receives signals such as crankshaft position, camshaft position, engine speed, and engine coolant temperature. Then, the ECM sends ON/OFF pulse duty signals to the intake valve timing control solenoid valve depending on driving status. This makes it possible to control the shut/open timing of the intake valve to increase engine torque in low/mid speed range and output in high-speed range.

COMPONENT DESCRIPTION

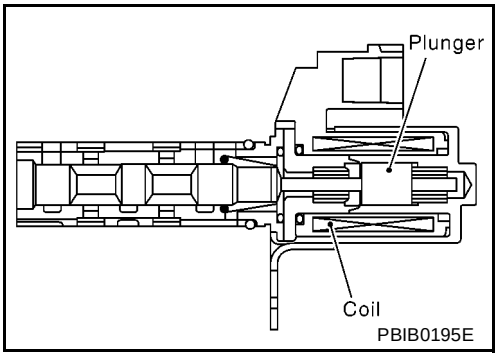
Intake valve timing control solenoid valve is activated by ON/OFF pulse duty (ratio) signals from the ECM.

The intake valve timing control solenoid valve changes the oil amount and direction of flow through intake valve timing control unit or stops oil flow.

The longer pulse width advances valve angle.

The shorter pulse width retards valve angle.

When ON and OFF pulse widths become equal, the solenoid valve stops oil pressure flow to fix the intake valve angle at the control position.



CONSULT-II Reference Value in Data Monitor Mode

EBS00EPI

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
INT/V SOL (B1)	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	0% - 2%
		2,000 rpm	Approx. 0% - 60%

On Board Diagnosis Logic

EBS00EPJ

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1111 1111	Intake valve timing control solenoid valve circuit	An improper voltage is sent to the ECM through intake valve timing control solenoid valve.	● Harness or connectors (Solenoid valve circuit is open or shorted.) ● Intake valve timing control solenoid valve

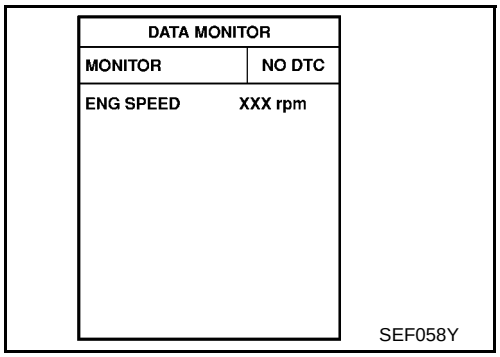
DTC Confirmation Procedure

EBS00EPK

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 5 seconds.
4. If 1st trip DTC is detected, go to EC-398, "Diagnostic Procedure"
.



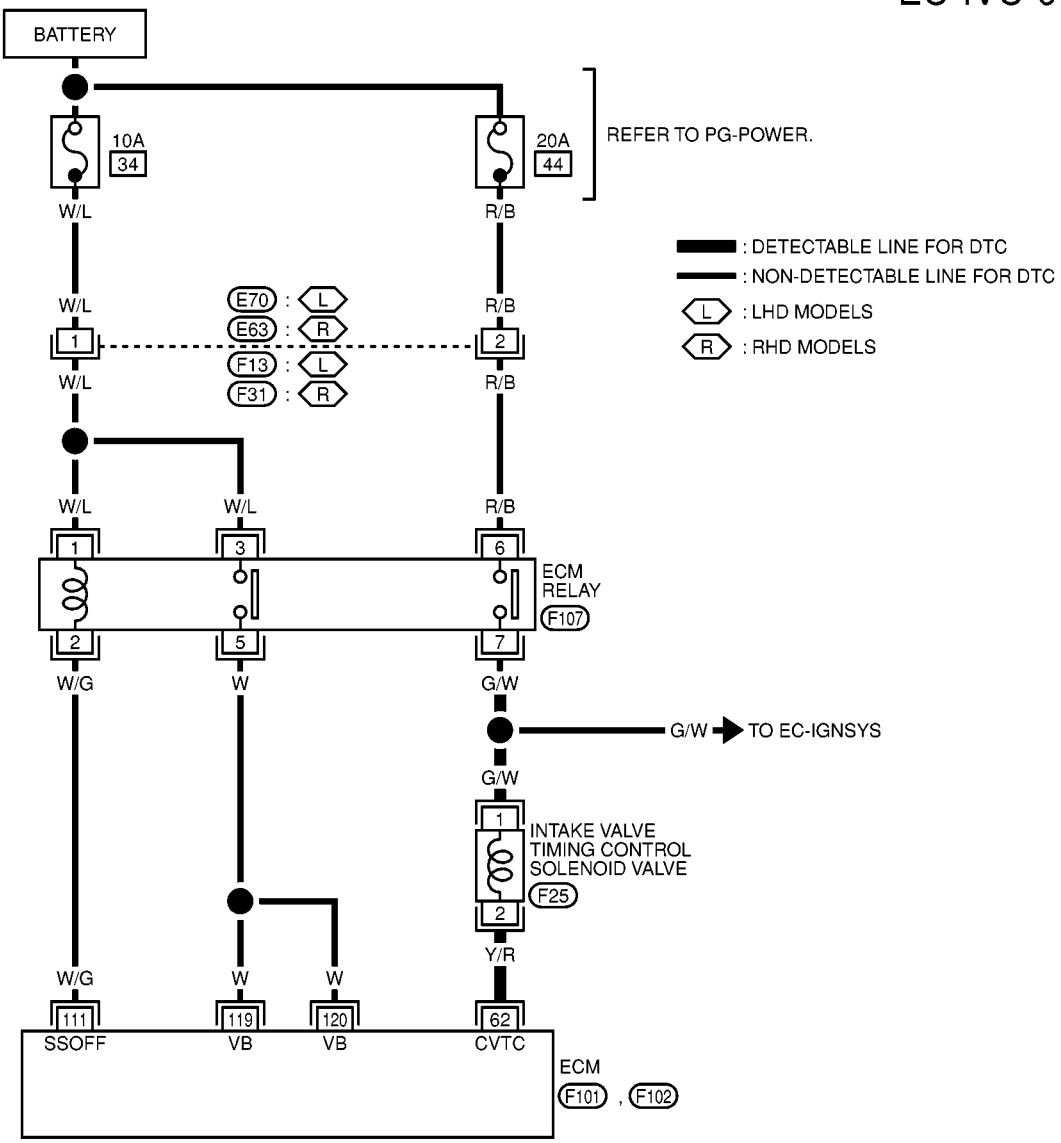
WITH GST

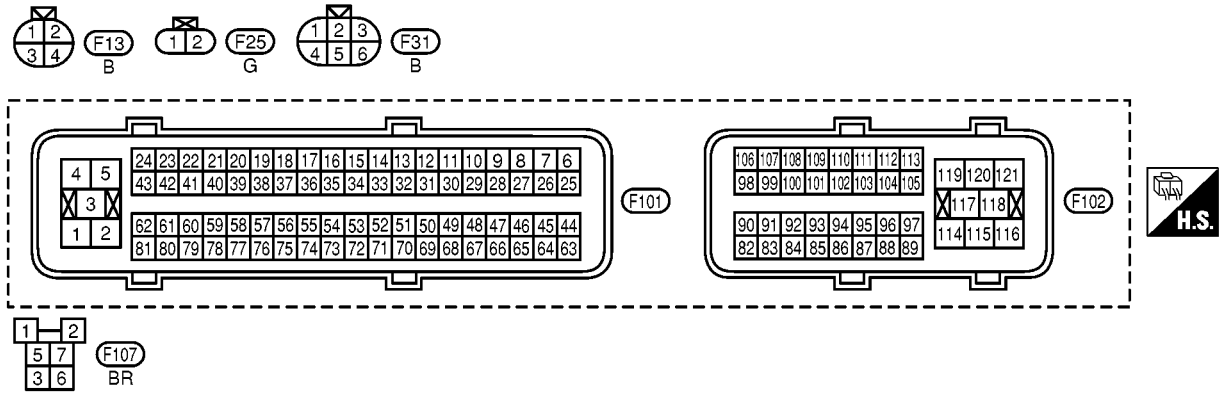
Following the procedure “WITH CONSULT-II” above.

Wiring Diagram

EBS00EPL

EC-IVC-01



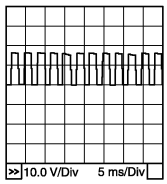


MBWA0067E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
62	Y/R	Intake valve timing control solenoid valve	**[Engine is running]** ● **Warm-up condition** ● Idle speed	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	Approximately 9V★  PBIB0532E

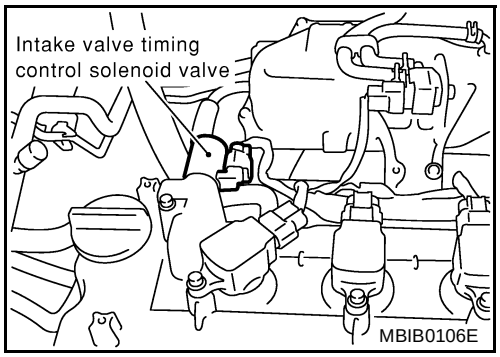
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnostic Procedure

EBS00EPM

1. CHECK IVT CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

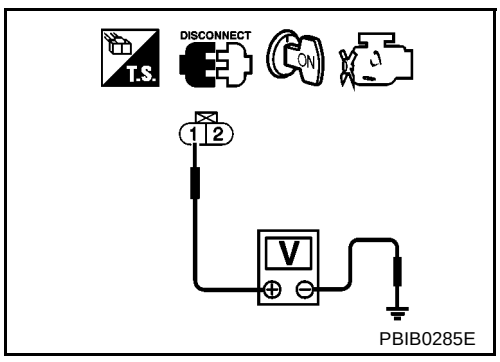
1. Turn ignition switch “OFF”.
2. Disconnect intake valve timing control solenoid valve harness connector.
3. Turn ignition switch “ON”.



MBIB0106E

4. Check voltage between intake valve timing control solenoid valve terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage



PBIB0285E

OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTION PART

Check the following.

- Harness for open or short between intake valve timing control solenoid valve and ECM relay

>> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK IVT CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 62 and intake valve timing control solenoid valve terminal 2. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE

Refer to EC-399, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace intake valve timing control solenoid valve.

5. CHECK INTERMITTENT INCIDENT

Refer to EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

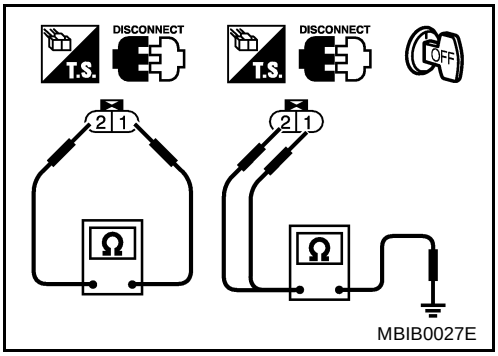
Component Inspection

EBS00EPN

INTAKE VALVE TIMING CONTROL SOLENOID VALVE

1. Disconnect intake valve timing control solenoid valve harness connector.
2. Check resistance between intake valve timing control solenoid valve terminals 1 and 2 under the following conditions.

Terminals	Resistance
1 and 2	Approximately 8Ω at 20°C (68°F)
1 or 2 and ground	∞Ω (Continuity should not exist)



Removal and Installation

EBS00EPO

INTAKE VALVE TIMING CONTROL SOLENOID VALVE

Refer to EM-49, "TIMING CHAIN" .

DTC P1121 ELECTRIC THROTTLE CONTROL ACTUATOR

PFP:16119

Component Description

EBS00EPP

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc.
The throttle control motor is operated by the ECM and it opens and closes the throttle valve.
The throttle position sensor detects the throttle valve position, and the opening and closing speed of the throttle valve and feeds the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

On Board Diagnosis Logic

EBS00EPQ

DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause
P1121 1121	Electric throttle control actuator	A)	Electric throttle control actuator does not function properly due to the return spring malfunction.	● Electric throttle control actuator
		B)	Throttle valve opening angle in fail-safe mode is not in specified range.	
		C)	ECM detect the throttle valve is stuck open. **This self-diagnosis has the one trip detection logic.**	

FAIL-SAFE MODE

When the malfunction A or B is detected in the two consecutive trips, the ECM enters in fail-safe mode and MI lights up.
When the malfunction C is detected even in the 1st trip, the ECM enters in fail-safe mode and the MI lights up.

Detected items	Engine operating condition in fail-safe mode
Malfunction A	The ECM controls the electric throttle actuator by regulating the throttle opening around the idle position. The engine speed will not rise more than 2,000 rpm.
Malfunction B	ECM controls the electric throttle control actuator by regulating the throttle opening to 20 degrees or less.
Malfunction C	While the vehicle is driving, it slows down gradually by fuel cut. After the vehicle stops, the engine stalls. The engine can restart in “N” or “P” position, and engine speed will not exceed 1,000 rpm or more.

DTC Confirmation Procedure

EBS00EPR

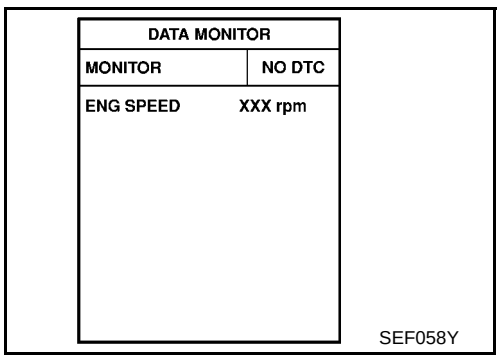
NOTE:

- **Perform “PROCEDURE FOR MALFUNCTION A AND B” first. If the 1st trip DTC cannot be confirmed, perform “PROCEDURE FOR MALFUNCTION C”.**
- If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

PROCEDURE FOR MALFUNCTION A AND B

With CONSULT-II

1. Turn ignition witch “ON” and wait at least 1 second.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Shift selector lever to “D” position (A/T), “1st” position (M/T) and wait at least 2 seconds.
4. Turn ignition switch “OFF”, wait at least 10 seconds, and then turn “ON”.
5. If 1st trip DTC is detected, go to EC-401, "Diagnostic Procedure" .



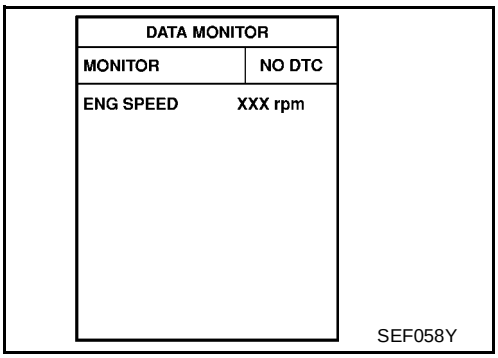
With GST

Follow the procedure “With CONSULT-II” above.

PROCEDURE FOR MALFUNCTION C

With CONSULT-II

1. Turn ignition switch “ON” and wait at least 1 second.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Shift selector lever to “D” position (A/T), “1st” position (M/T) and wait at least 2 seconds.
4. Shift selector lever to “N” or “P” position.
5. Start engine and let it idle for 3 seconds.
6. If DTC is detected, go to EC-401, "Diagnostic Procedure" .



With GST

Follow the procedure “With CONSULT-II” above.

Diagnostic Procedure

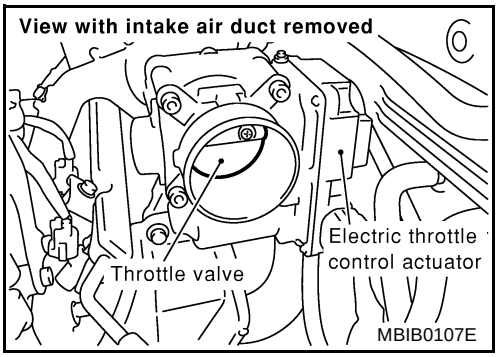
EBS00EPS

1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Remove the intake air duct.
2. Check if a foreign matter is caught between the throttle valve and the housing.

OK or NG

OK >> GO TO 2.
NG >> Remove the foreign matter and clean the electric throttle control actuator inside.



2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-55, "Throttle Valve Closed Position Learning" .
3. Perform EC-55, "Idle Air Volume Learning" .

>> **INSPECTION END**

Remove and Installation

EBS00HBX

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-19, "INTAKE MANIFOLD" .

DTC P1122 ELECTRIC THROTTLE CONTROL FUNCTION

PFP:16119

Description

EBS00EPT

NOTE:
If DTC P1122 is displayed with DTC P1121 or 1126, first perform the trouble diagnosis for DTC P1121 or P1126. Refer to EC-400 or EC-409 .

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc.
The throttle control motor is operated by the ECM and it opens and closes the throttle valve.
The current opening angle of the throttle valve is detected by the throttle position sensor and it provides feedback to the ECM to control the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

On Board Diagnosis Logic

EBS00GB5

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1122 1122	Electric throttle control performance problem	Electric throttle control function does not operate properly.	● Harness or connectors (Throttle control motor circuit is open or shorted.) ● Harness or connectors (Throttle control motor relay circuit is open or shorted.) ● Electric throttle control actuator ● Throttle control motor relay

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MI lights up.

Engine operating condition in fail-safe mode
ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

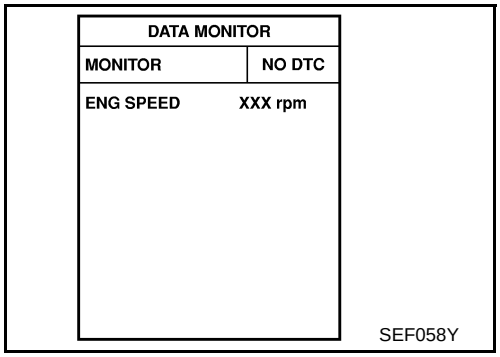
DTC Confirmation Procedure

EBS00GB6

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON” and wait at least 2 seconds.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 5 seconds.
4. If DTC is detected, go to EC-404, "Diagnostic Procedure" .



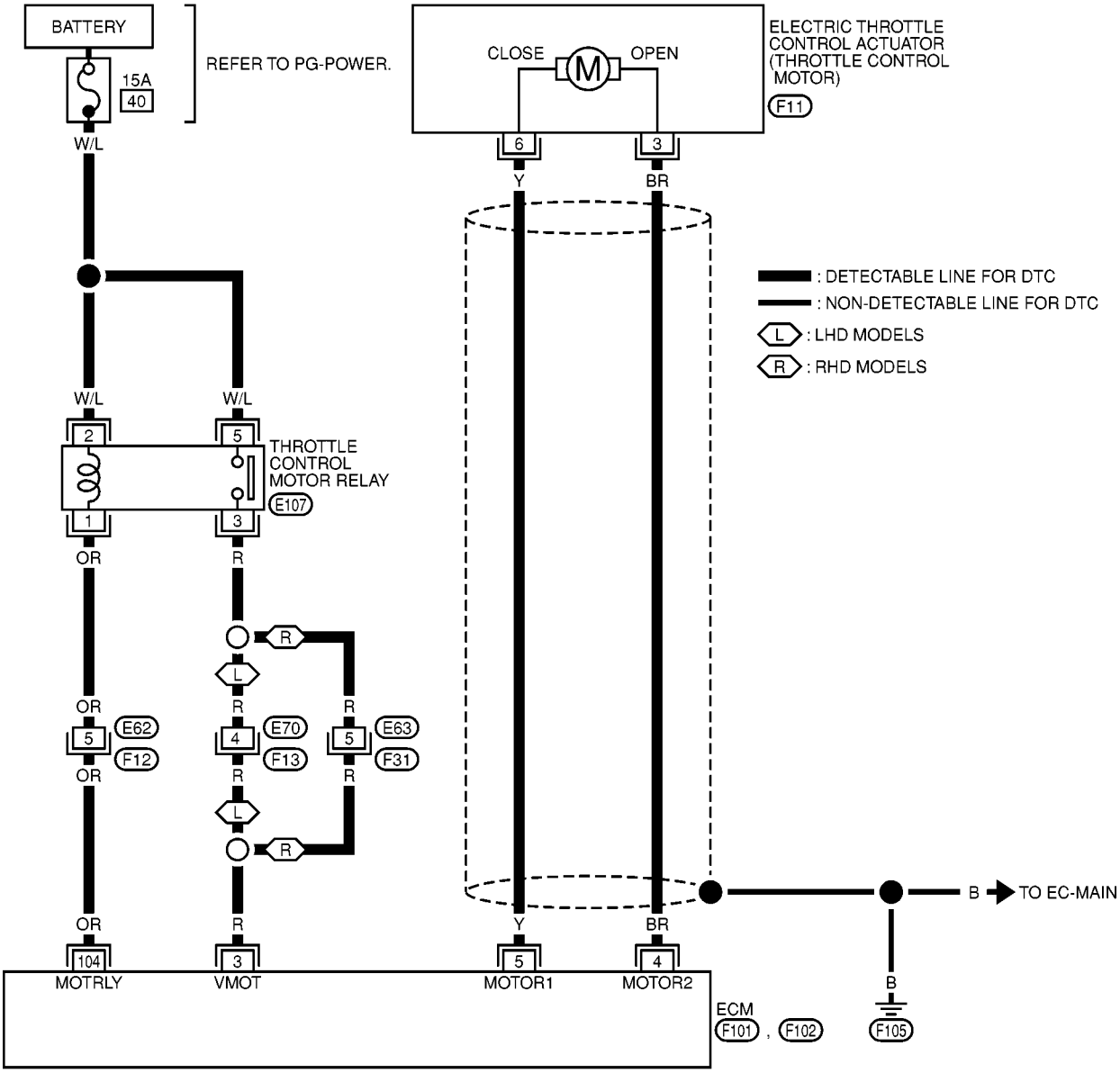
WITH GST

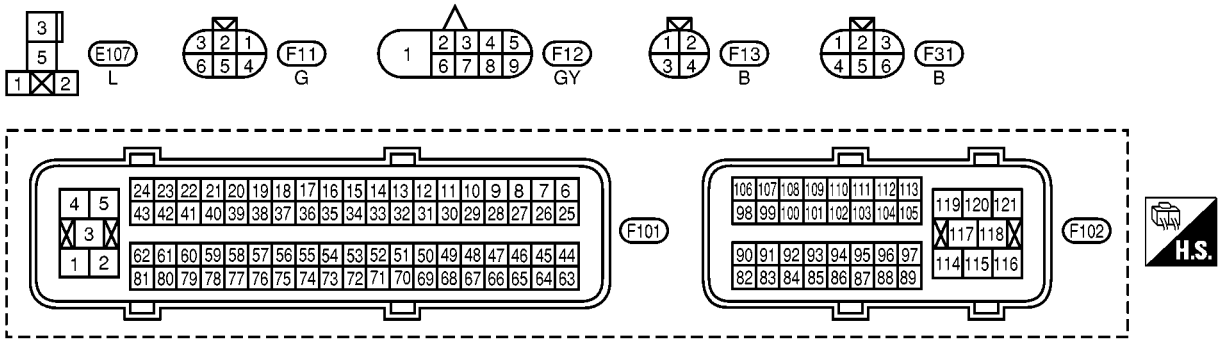
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

EBS00GB7

EC-ETC1-01



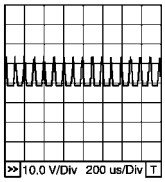
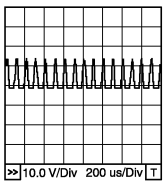


MBWA0143E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
3	R	Throttle control motor power supply	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)
4	BR	Throttle control motor (Close)	**[Ignition switch "ON"]** ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal is releasing	0 - 14V★  PBIB0534E
5	Y	Throttle control motor (Open)	**[Ignition switch "ON"]** ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal is depressing	0 - 14V★  PBIB0533E
104	OR	Throttle control motor relay	**[Ignition switch "OFF"]**	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"]	0 - 1.0V

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

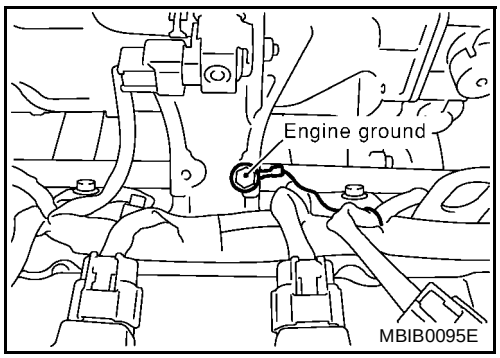
Diagnostic Procedure

EBS00GB8

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.

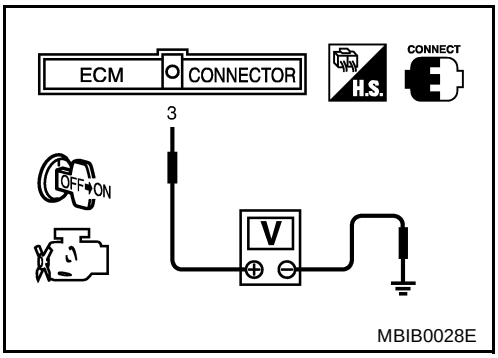


MBIB0095E

2. CHECK THROTTLE CONTROL MOTOR RELAY SIGNAL CIRCUIT

Check voltage between ECM terminal 3 and ground under the following conditions with CONSULT-II or tester.

Ignition switch	Voltage
OFF	Approximately 0V
ON	Battery voltage (11 - 14V)

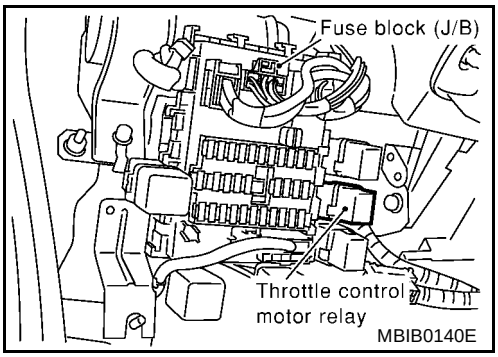


OK or NG

OK >> GO TO 10.
NG >> GO TO 3.

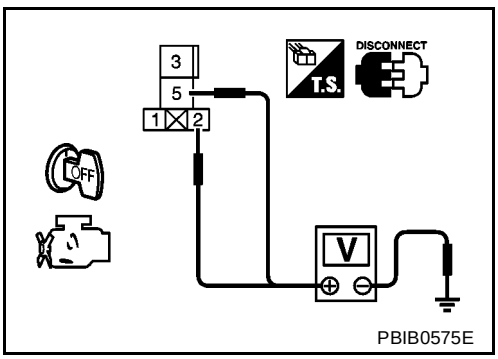
3. CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect throttle control motor relay.



3. Check voltage between throttle control motor relay terminals 2, 5 and ground.

Voltage: Battery voltage



OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

- 15A fuse
- Harness for open or short between throttle control motor relay and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 3 and throttle control motor relay terminal 3. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E70, F13 (LHD models)
- Harness connectors E63, F31 (RHD models)
- Harness for open or short between ECM and throttle control motor relay

>> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK THROTTLE CONTROL MOTOR RELAY OUTPUT SIGNAL CIRCUIT

1. Check continuity between ECM terminal 104 and throttle control motor relay terminal 1. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 9.
NG >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E62, F12
- Harness for open or short between ECM and throttle control motor relay

>> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK THROTTLE CONTROL MOTOR RELAY

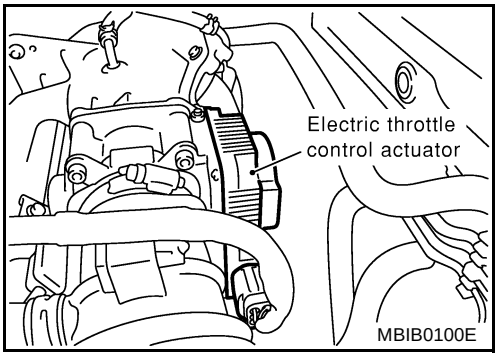
Refer to EC-408, "Component Inspection" .

OK or NG

OK >> GO TO 13.
NG >> Replace throttle control motor relay.

10. CHECK THROTTLE CONTROL MOTOR OUTPUT SIGNAL CIRCUIT FOR OPEN OR SHORT

1. Turn ignition switch “OFF”.
2. Disconnect electric throttle control actuator harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between the following terminals. Refer to Wiring Diagram.



Electric throttle control actuator terminal	ECM terminal	Continuity
3	4	Should exist
	5	Should not exist
6	4	Should not exist
	5	Should exist

5. Also check harness for short to ground and short to power.

OK or NG

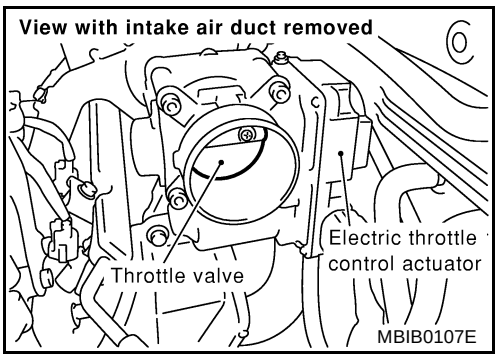
OK >> GO TO 11.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

11. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Remove the intake air duct.
2. Check if foreign matter is caught between the throttle valve and the housing.

OK or NG

OK >> GO TO 12.
NG >> Remove the foreign matter and clean the electric throttle control actuator inside.



12. CHECK THROTTLE CONTROL MOTOR

Refer to EC-408, "Component Inspection" .

OK or NG

OK >> GO TO 13.
NG >> GO TO 14.

13. CHECK INTERMITTENT INCIDENT

Refer to EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

OK or NG

OK >> GO TO 14.
NG >> Repair or replace harness or connectors.

14. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-55, "Throttle Valve Closed Position Learning" .
3. Perform EC-55, "Idle Air Volume Learning" .

>> **INSPECTION END**

Component Inspection

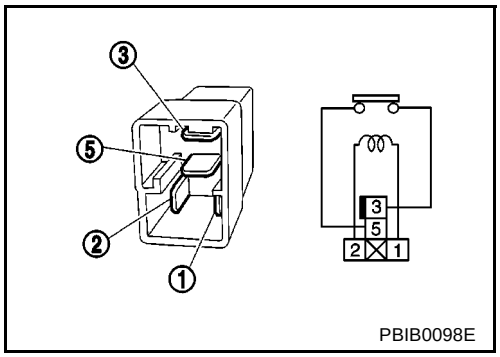
EBS00EPY

THROTTLE CONTROL MOTOR RELAY

1. Apply 12V direct current between relay terminals 1 and 2.
2. Check continuity between relay terminals 3 and 5.

Conditions	Continuity
12V direct current supply between terminals 1 and 2	Yes
No current supply	No

3. If NG, replace throttle control motor relay.



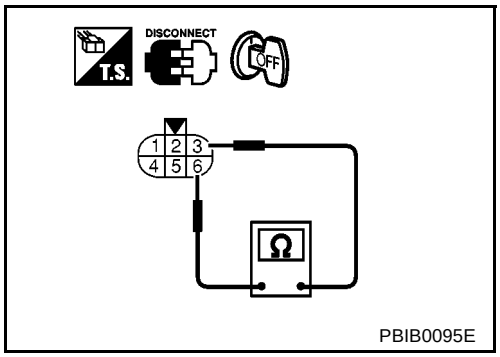
PBIB0098E

THROTTLE CONTROL MOTOR

1. Disconnect electric throttle control actuator harness connector.
2. Check resistance between terminals 3 and 6.

Resistance: Approximately 1 - 15 Ω [at 25 °C (77°F)]

3. If NG, replace electric throttle control actuator and go to next step.
4. Perform EC-55, "Throttle Valve Closed Position Learning" .
5. Perform EC-55, "Idle Air Volume Learning" .



PBIB0095E

Remove and Installation

EBS00EPZ

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-19, "INTAKE MANIFOLD" .

DTC P1124, P1126 THROTTLE CONTROL MOTOR RELAY

PFP:16119

Component Description

EBS00EQ0

Power supply for the Throttle Control motor is provided to the ECM via throttle control motor relay. The throttle control motor relay is ON/OFF controlled by the ECM. When the ignition switch is turned ON, the ECM sends an ON signal to throttle control motor relay and battery voltage is provided to the ECM. When the ignition switch is turned OFF, the ECM sends an OFF signal to throttle control motor relay and battery voltage is not provided to the ECM.

CONSULT-II Reference Value in Data Monitor Mode

EBS00EQ1

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
THRTL RELAY	● Ignition switch: ON	ON

On Board Diagnosis Logic

EBS00EQ2

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1124 1124	Throttle control motor relay circuit short	ECM detect the throttle control motor relay is stuck ON.	● Harness or connectors (Throttle control motor relay circuit is shorted.) ● Throttle control motor relay
P1126 1126	Throttle control motor relay circuit open	ECM detects a voltage of power source for throttle control motor is excessively low. **This self-diagnosis has the one trip detection logic.**	● Harness or connectors (Throttle control motor relay circuit is open.) ● Throttle control motor relay

FAIL-SAFE MODE

When the DTC P1124 is detected in the two consecutive trips, the ECM enters fail-safe mode and the MI lights up.
When the DTC P1126 is detected even in the 1st trip, the ECM enters fail-safe mode and the MI lights up.

Engine operating condition in fail-safe mode
ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

DTC Confirmation Procedure

EBS00EQ3

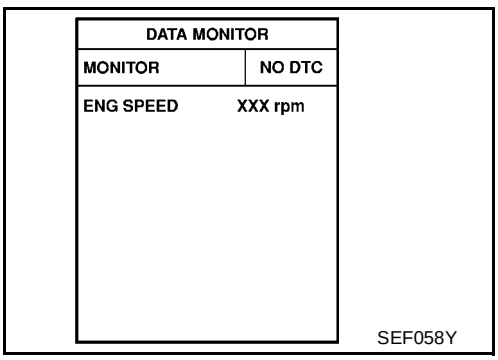
NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

PROCEDURE FOR DTC P1124

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

With CONSULT-II

1. Turn ignition switch “ON” and wait at least 1 second.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. If 1st trip DTC is detected, go to EC-412, "Diagnostic Procedure"
.



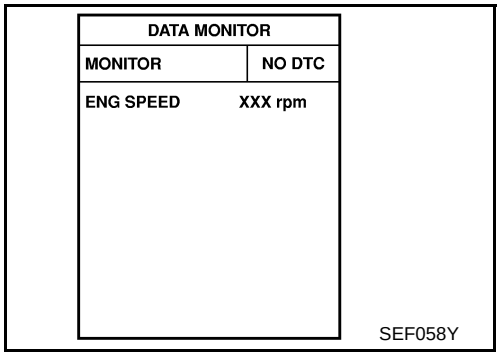
With GST

Follow the procedure “With CONSULT-II” above.

PROCEDURE FOR DTC P1126

With CONSULT-II

1. Turn ignition switch “ON” and wait at least 2 seconds.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 5 seconds.
4. If DTC is detected, go to EC-412, "Diagnostic Procedure" .



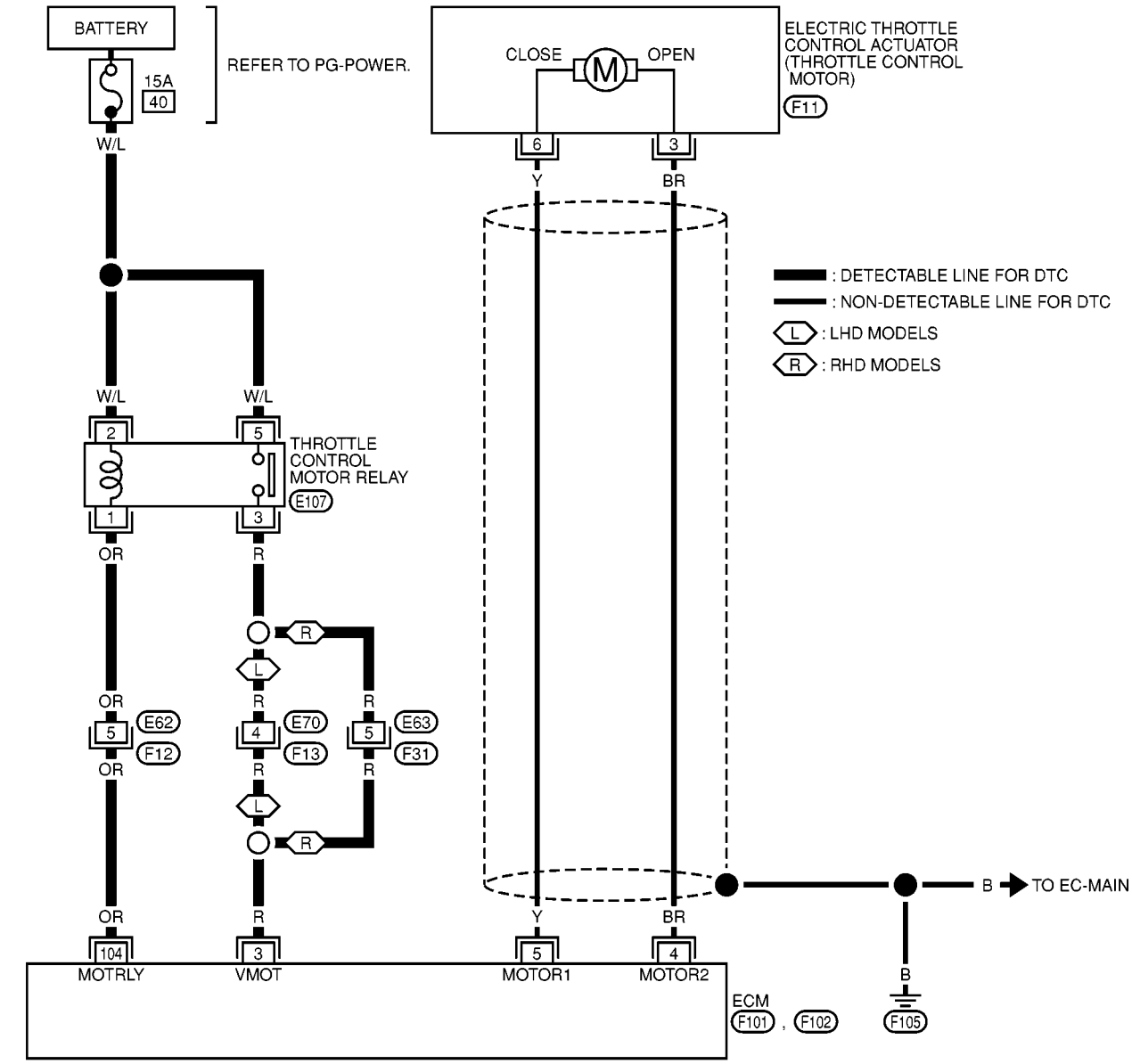
With GST

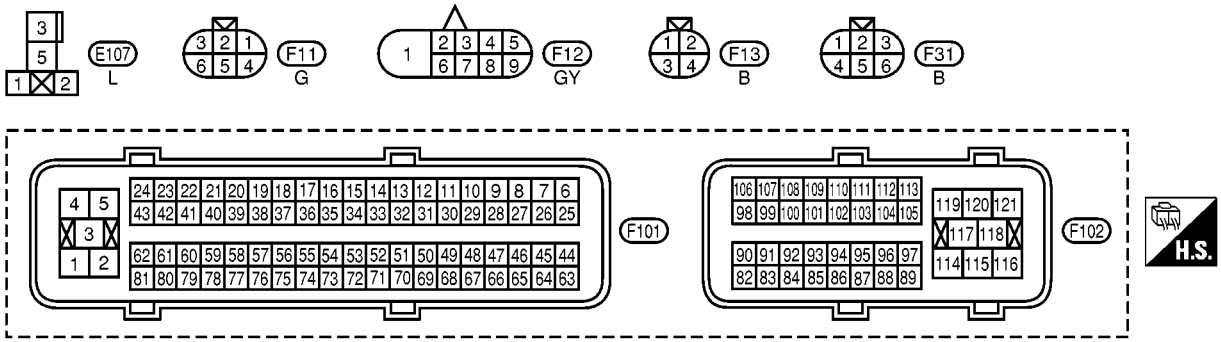
Follow the procedure “With CONSULT-II” above.

Wiring Diagram

EBS00EQ4

EC-ETC2-01





MBWA0144E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

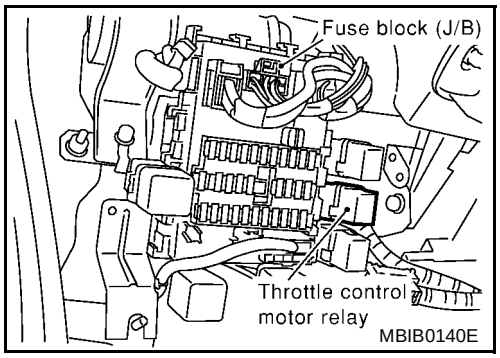
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
3	R	Throttle control motor power supply	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)
104	OR	Throttle control motor relay	**[Ignition switch "OFF"]**	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"]	0 - 1.0V

Diagnostic Procedure

EBS00EQ5

1. CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect throttle control motor relay.

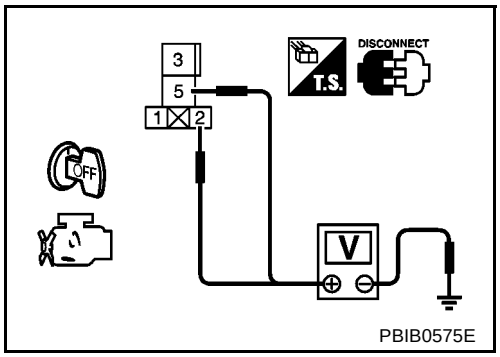


3. Check voltage between throttle control motor relay terminals 2, 5 and ground.

Voltage: Battery voltage

OK or NG

OK >> GO TO 3.
NG >> GO TO 2.



2. DETECT MALFUNCTIONING PART

Check the following.

- 15A fuse
- Harness for open or short between throttle control motor relay and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 3 and throttle control motor relay terminal 3. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E70, F13 (LHD models)
- Harness connectors E63, F31 (RHD models)
- Harness for open or short between ECM and throttle control motor relay

>> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK THROTTLE CONTROL MOTOR RELAY OUTPUT SIGNAL CIRCUIT

1. Check continuity between ECM terminal 104 and throttle control motor relay terminal 1. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E62, F12
- Harness for open or short between ECM and throttle control motor relay

>> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK THROTTLE CONTROL MOTOR RELAY

Refer to EC-413, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> Replace throttle control motor relay.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

EBS00GBA

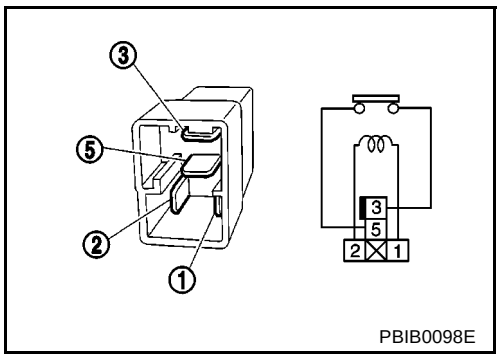
THROTTLE CONTROL MOTOR RELAY

1. Apply 12V direct current between relay terminals 1 and 2.

2. Check continuity between relay terminals 3 and 5.

Conditions	Continuity
12V direct current supply between terminals 1 and 2	Yes
No current supply	No

3. If NG, replace throttle control motor relay.



PBIB0098E

DTC P1128 THROTTLE CONTROL MOTOR

PFP:16119

Component Description

EBS00EQ6

The throttle control motor is operated by the ECM and it opens and closes the throttle valve.
The current opening angle of the throttle valve is detected by the throttle position sensor and it provides feedback to the ECM to control the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

On Board Diagnosis Logic

EBS00EQ7

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1128 1128	Throttle control motor circuit short	ECM detects short both circuits between ECM and throttle control motor.	● Harness or connectors (Throttle control motor circuit is shorted.) ● Electric throttle control actuator (Throttle control motor)

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MI lights up.

Engine operating condition in fail-safe mode
ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

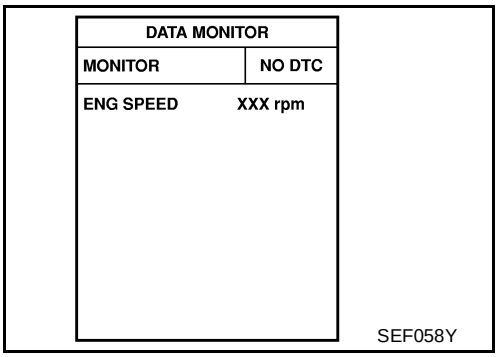
DTC Confirmation Procedure

EBS00EQ8

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON” and wait at least 2 seconds.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 5 seconds.
4. If DTC is detected, go to EC-417, "Diagnostic Procedure" .



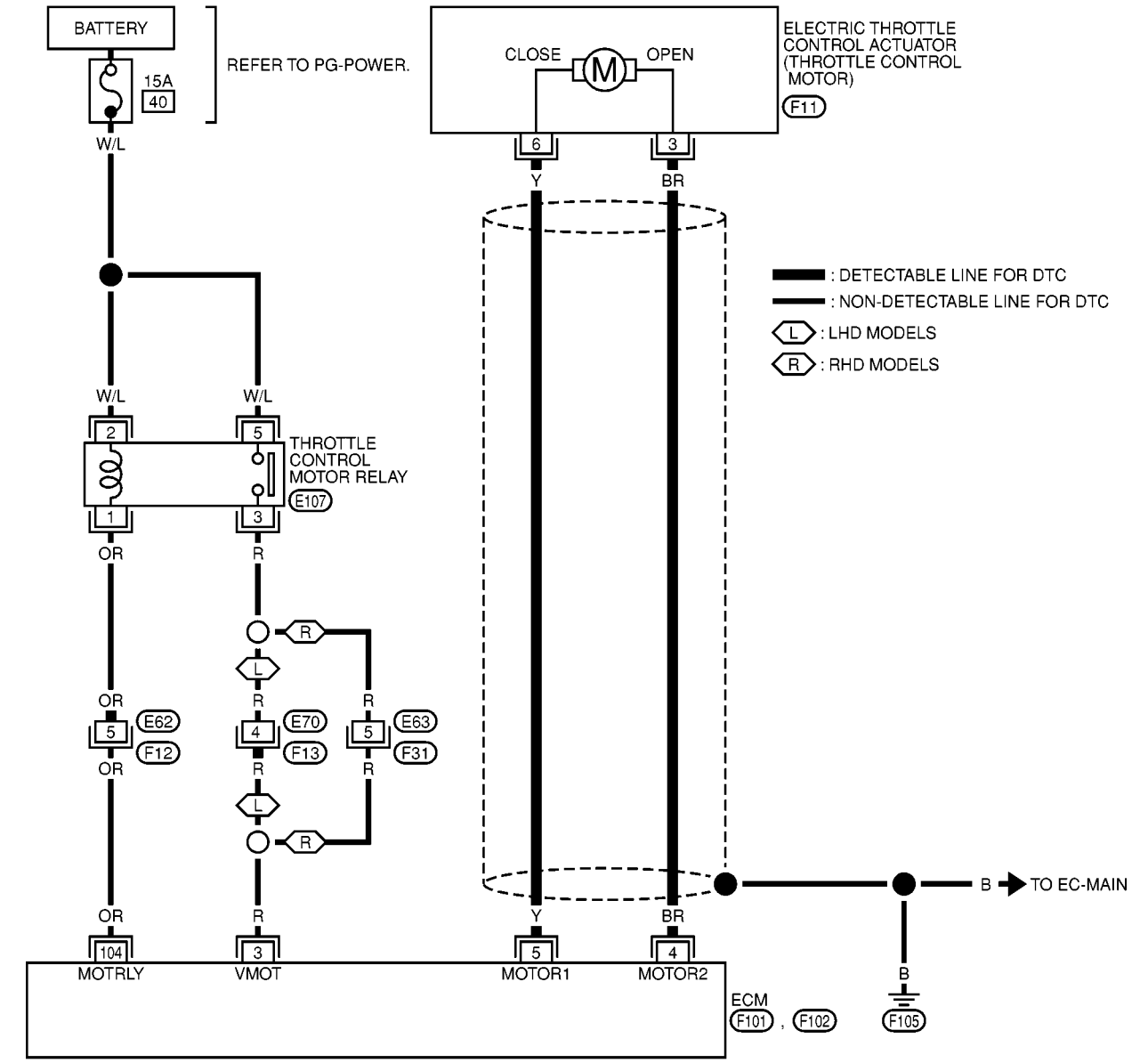
WITH GST

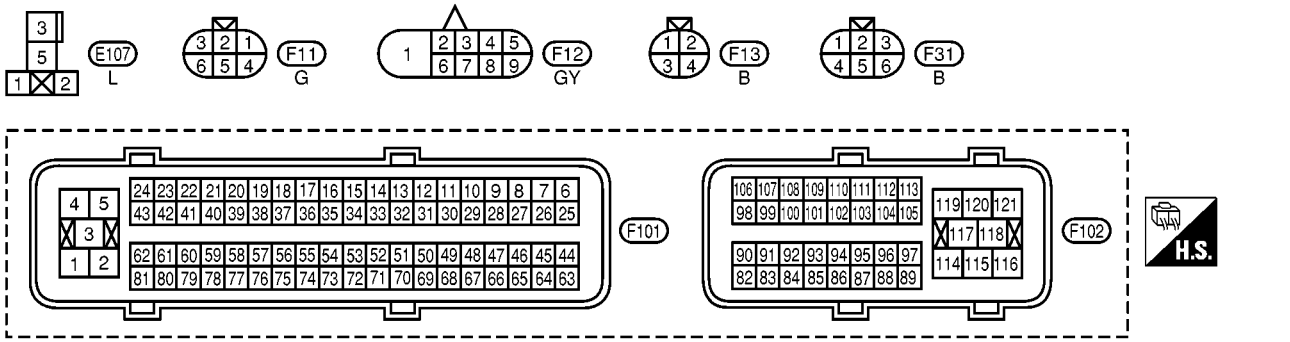
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

EBS00EQ9

EC-ETC3-01



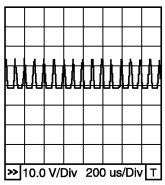
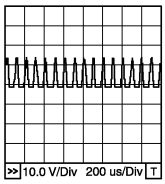


MBWA0145E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
4	BR	Throttle control motor (Close)	**[Ignition switch "ON"]** ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal is releasing	0 - 14V★  PBIB0534E
5	Y	Throttle control motor (Open)	**[Ignition switch "ON"]** ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal is depressing	0 - 14V★  PBIB0533E

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

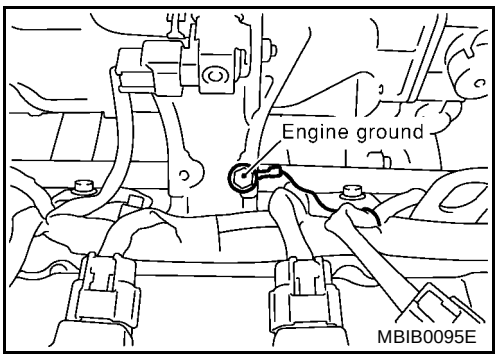
Diagnostic Procedure

EBS00EQA

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

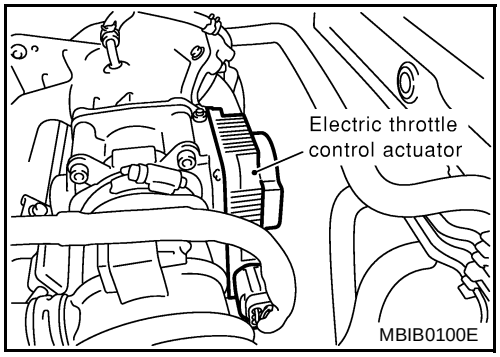
>> GO TO 2.



MBIB0095E

2. CHECK THROTTLE CONTROL MOTOR OUTPUT SIGNAL CIRCUIT FOR OPEN OR SHORT

1. Turn ignition switch “OFF”.
2. Disconnect electric throttle control actuator harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between the following terminals. Refer to Wiring Diagram.



Electric throttle control actuator terminal	ECM terminal	Continuity
3	4	Should exist
	5	Should not exist
6	4	Should not exist
	5	Should exist

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK THROTTLE CONTROL MOTOR

Refer to EC-418, "Component Inspection" .

OK or NG

OK >> GO TO 4.
NG >> GO TO 5.

4. CHECK INTERMITTENT INCIDENT

Refer to EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

OK or NG

OK >> GO TO 5.
NG >> Repair or replace harness or connectors.

5. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-55, "Throttle Valve Closed Position Learning" .
3. Perform EC-55, "Idle Air Volume Learning" .

>> **INSPECTION END**

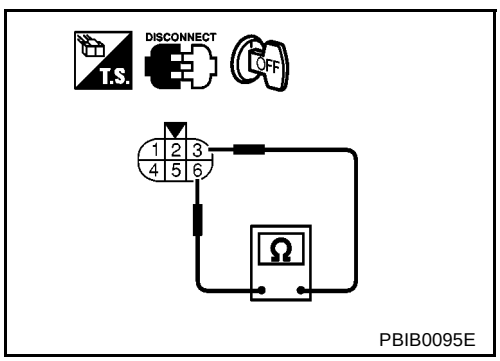
Component Inspection

EBS00EQB

THROTTLE CONTROL MOTOR

1. Disconnect electric throttle control actuator harness connector.
2. Check resistance between terminals 3 and 6.

Resistance: Approximately 1 - 15 Ω [at 25 °C (77°F)]



3. If NG, replace electric throttle control actuator and go to next step.
4. Perform EC-55, "Throttle Valve Closed Position Learning" .
5. Perform EC-55, "Idle Air Volume Learning" .

Remove and Installation

EBS00EQC

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-19, "INTAKE MANIFOLD" .

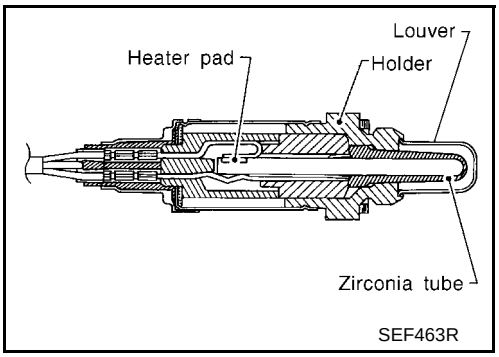
DTC P1143 HO2S1 (QG16DE)

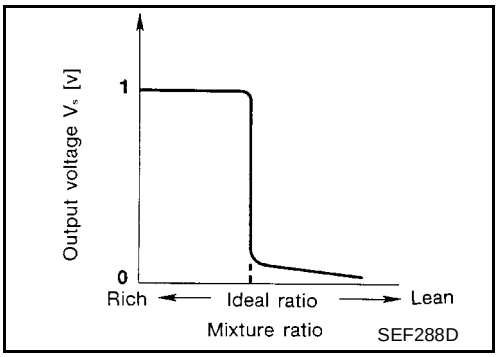
PFP:22690

Component Description

EBS00FSF

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.





CONSULT-II Reference Value in Data Monitor Mode

EBS00FSG

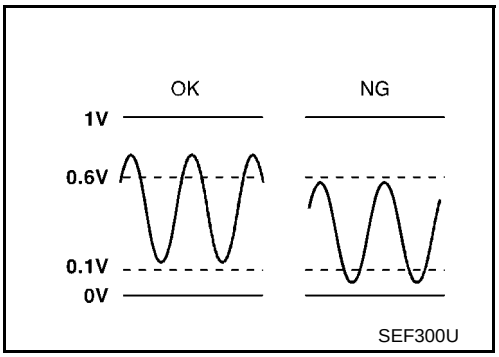
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S1 (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S1 MNTR (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	LEAN ←→ RICH Changes more than 5 times during 10 seconds.

On Board Diagnosis Logic

EBS00FSH

To judge the malfunction, the output from the heated oxygen sensor 1 is monitored to determine whether the “rich” output is sufficiently high and whether the “lean” output is sufficiently low. When both the outputs are shifting to the lean side, the malfunction will be detected.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1143 1143	Heated oxygen sensor 1 lean shift monitoring	The maximum and minimum voltage from the sensor are not reached to the specified voltages.	● Heated oxygen sensor 1 ● Heated oxygen sensor 1 heater ● Fuel pressure ● Injectors ● Intake air leaks

DTC Confirmation Procedure

EBS00FSI

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

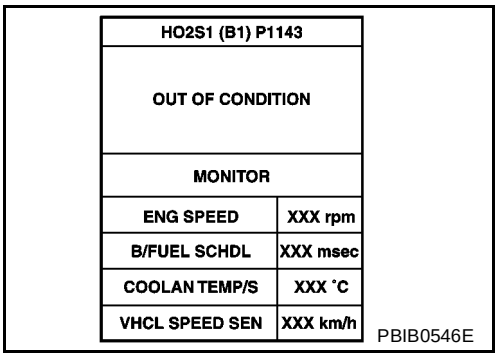
- **Always perform at a temperature above −10°C (14°F).**
- **Before performing following procedure, confirm that battery voltage is more than 11V at idle.**

WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Stop engine and wait at least 10 seconds.
3. Turn ignition switch “ON” and select “HO2S1 (B1) P1143” of “HO2S1” in “DTC WORK SUPPORT” mode with CONSULT-II.
4. Touch “START”.
5. Start engine and let it idle for at least 3 minutes.

   NOTE:

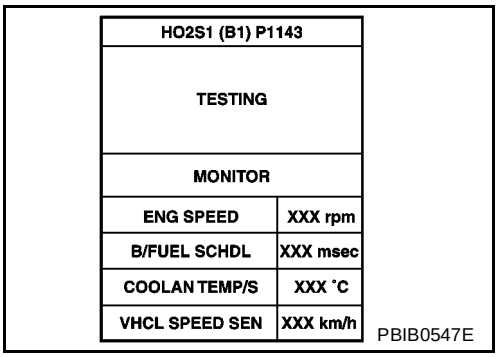
   Never raise engine speed above 3,600 rpm after this step. If the engine speed limit is exceeded, return to step 5.



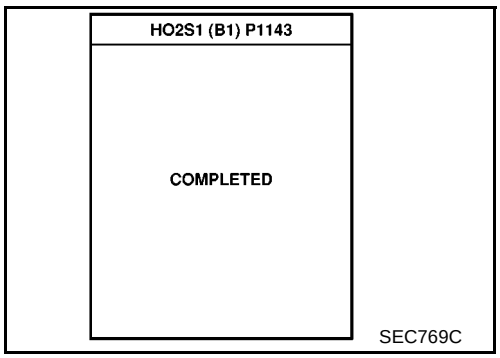
6. When the following conditions are met, “TESTING” will be displayed on the CONSULT-II screen. Maintain the conditions continuously until “TESTING” changes to “COMPLETED”. (It will take approximately 50 seconds or more.)

ENG SPEED	1,300 - 3,000 rpm
Vehicle speed	50 - 100 km/h (30 - 62 MPH)
B/FUEL SCHDL	2.4 - 5.5 msec
Selector lever	Suitable position

If “TESTING” is not displayed after 5 minutes, retry from step 2.



7. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”. If “NG” is displayed, refer to EC-422, "Diagnostic Procedure" .



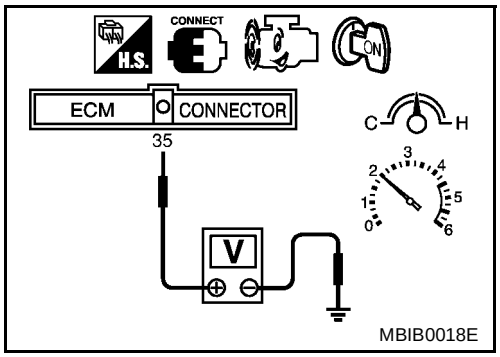
Overall Function Check

EBS00FSJ

Use this procedure to check the overall function of the heated oxygen sensor 1 circuit. During this check, a 1st trip DTC might not be confirmed.

WITH GST

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 (HO2S1 signal) and engine ground.
3. Check one of the following with engine speed held at 2,000 rpm constant under no load.
   - The maximum voltage is over 0.6V at least one time.
   - The minimum voltage is over 0.1V at least one time.
4. If NG, go to EC-422, "Diagnostic Procedure" .



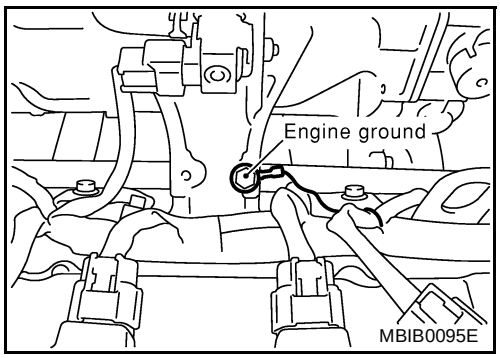
Diagnostic Procedure

EBS00FSK

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

>> GO TO 2.

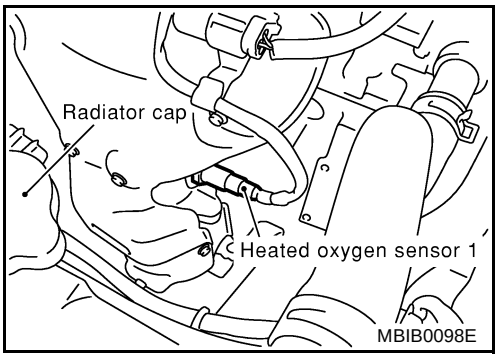


2. RETIGHTEN HEATED OXYGEN SENSOR 1

Loosen and retighten heated oxygen sensor 1.

Tightening torque: 40 - 60 N·m (4.1 - 6.2 kg-m, 30 - 44 ft-lb)

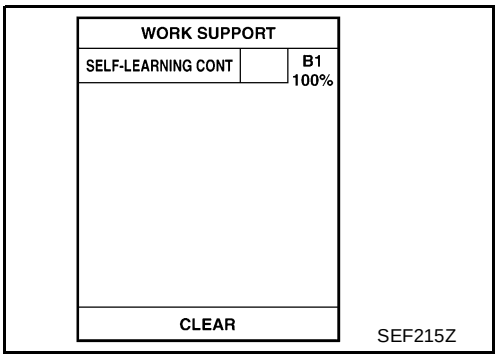
>> GO TO 3.



3. CLEAR THE SELF-LEARNING DATA

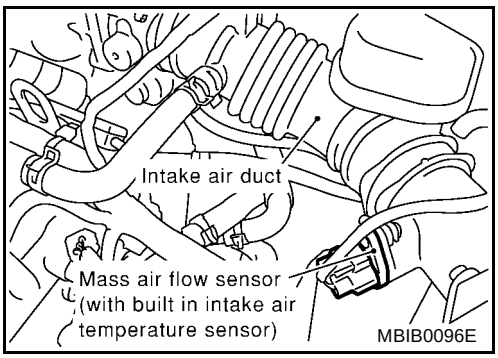
With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching “CLEAR”.
4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 detected?
   Is it difficult to start engine?



Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF”.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure that DTC P0102 is displayed.
6. Erase the DTC memory. Refer to EC-73, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
7. Make sure that DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 detected?
   Is it difficult to start engine?



Yes or No

Yes >> Perform trouble diagnosis for DTC P0171. Refer to EC-285 .
No >> GO TO 4.

4. CHECK HEATED OXYGEN SENSOR 1 HEATER

Refer to EC-161, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace heated oxygen sensor 1.

5. CHECK HEATED OXYGEN SENSOR 1

Refer to EC-424, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace heated oxygen sensor 1.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .
For circuit, refer to EC-201, "Wiring Diagram" .

>> **INSPECTION END**

Component Inspection

EBS00FSL

HEATED OXYGEN SENSOR 1

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “MANU TRIG” and adjust “TRIGGER POINT” to 100% in “DATA MONITOR” mode with CONSULT-II.
3. Select “HO2S1 (B1)” and “HO2S1 MNTR (B1)”.
4. Hold engine speed at 2,000 rpm under no load during the following steps.
5. Touch “RECORD” on CONSULT-II screen.

DATA MONITOR	
MONITOR	NO DTC
ENG SPEED	XXX rpm
MAS A/F SE-B1	XXX V
COOLAN TEMP/S	XXX °C
HO2S1 (B1)	XXX V
HO2S1 MNTR (B1)	LEAN

SEF646Y

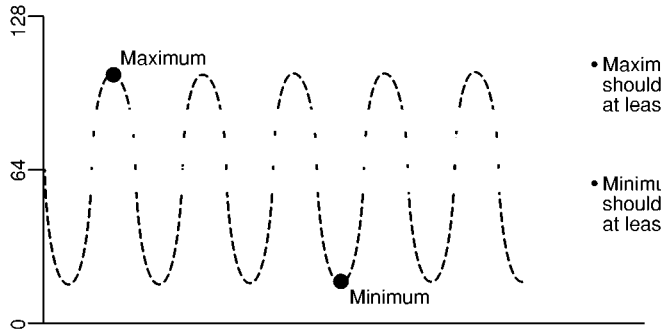
6. Check the following.
   - “HO2S1 MNTR (B1)” in “DATA MONITOR” mode changes from “RICH” to “LEAN” to “RICH” 5 times in 10 seconds.
     5 times (cycles) are counted as shown at right.
   - “HO2S1 (B1)” voltage goes above 0.6V at least once.
   - “HO2S1 (B1)” voltage goes below 0.3V at least once.
   - “HO2S1 (B1)” voltage never exceeds 1.0V.

cycle	1	2	3	4	5
HO2S1 MNTR (B1)	R-L	R-L	R-L	R-L	R-L

R means HO2S1 MNTR (B1) indicates RICH
L means HO2S1 MNTR (B1) indicates LEAN

SEF217YA

Trigger	ENG SPEED	HO2S1 (B1)
	rpm	V
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX



SEF648Y

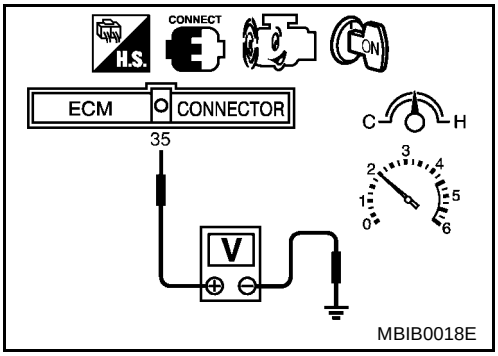
CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 (HO2S1 signal) and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no load.
   - The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds.
   - The maximum voltage is over 0.6V at least one time.
   - The minimum voltage is below 0.3V at at least one time.
   - The voltage never exceeds 1.0V.

   1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V
   2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V



CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

EBS00FSM

HEATED OXYGEN SENSOR 1

Refer to EM-23, "EXHAUST MANIFOLD AND CATALYTIC CONVERTER" .

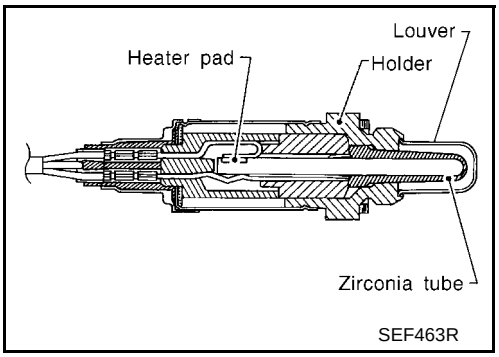
DTC P1143, P1163 HO2S1 (QG18DE)

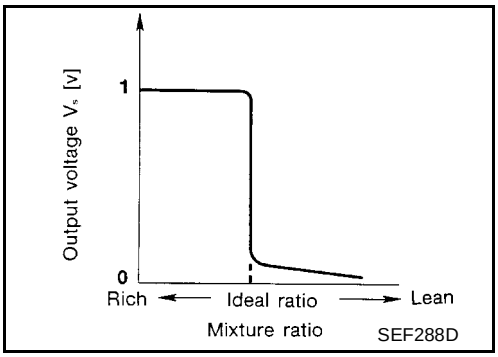
PFP:22690

Component Description

EBS00FSN

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.





CONSULT-II Reference Value in Data Monitor Mode

EBS00FSO

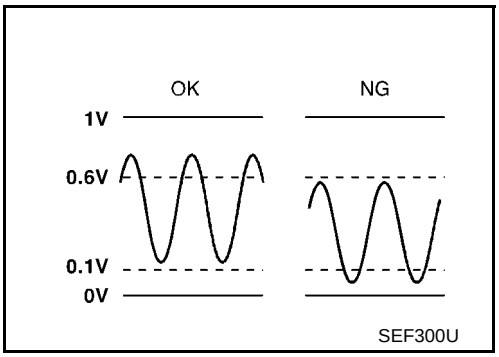
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S1 (B1) HO2S1 (B2)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ⟷ Approx. 0.6 - 1.0V
HO2S1 MNTR (B1) HO2S1 MNTR (B2)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	LEAN ⟷ RICH Changes more than 5 times during 10 seconds.

On Board Diagnosis Logic

EBS00FSP

To judge the malfunction, the output from the heated oxygen sensor 1 is monitored to determine whether the “rich” output is sufficiently high and whether the “lean” output is sufficiently low. When both the outputs are shifting to the lean side, the malfunction will be detected.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1143 1143 (Bank 1) P1163 1163 (Bank 2)	Heated oxygen sensor 1 lean shift monitoring	The maximum and minimum voltage from the sensor are not reached to the specified voltages.	● Heated oxygen sensor 1 ● Heated oxygen sensor 1 heater ● Fuel pressure ● Injectors ● Intake air leaks

DTC Confirmation Procedure

EBS00FSQ

CAUTION:
Always drive vehicle at a safe speed.

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

- **Always perform at a temperature above −10°C (14°F).**
- **Before performing following procedure, confirm that battery voltage is more than 11V at idle.**

WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Stop engine and wait at least 10 seconds.
3. Turn ignition switch “ON” and select “HO2S1 (B1) P1143” of “HO2S1” or “HO2S1 (B2) P1163” of “HO2S1” in “DTC WORK SUPPORT” mode with CONSULT-II.
4. Touch “START”.
5. Start engine and let it idle for at least 3 minutes.

   NOTE:
   Never raise engine speed above 3,600 rpm (M/T models) or 3,200 rpm (A/T models) after this step. If the engine speed limit is exceeded, return to step 5.

HO2S1 (B1) P1143	
OUT OF CONDITION	
MONITOR	
ENG SPEED	XXX rpm
B/FUEL SCHDL	XXX msec
COOLAN TEMP/S	XXX °C
VHCL SPEED SEN	XXX km/h

PBIB0546E

6. When the following conditions are met, “TESTING” will be displayed on the CONSULT-II screen. Maintain the conditions continuously until “TESTING” changes to “COMPLETED”. (It will take approximately 50 seconds or more.)

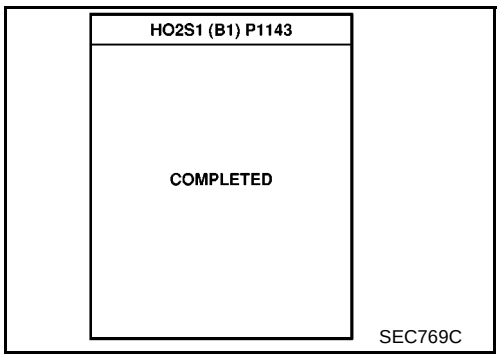
ENG SPEED	1,200 - 2,600 rpm (A/T models) 1,300 - 3,000 rpm (M/T models)
Vehicle speed	50 - 100 km/h (30 - 62 MPH)
B/FUEL SCHDL	3.0 - 6.5 msec (A/T models) 2.4 - 5.5 msec (M/T models)
Selector lever	Suitable position

HO2S1 (B1) P1143	
TESTING	
MONITOR	
ENG SPEED	XXX rpm
B/FUEL SCHDL	XXX msec
COOLAN TEMP/S	XXX °C
VHCL SPEED SEN	XXX km/h

PBIB0547E

If “TESTING” is not displayed after 5 minutes, retry from step 2.

7. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”. If “NG” is displayed, refer to EC-428, "Diagnostic Procedure" .



Overall Function Check

EBS00FSR

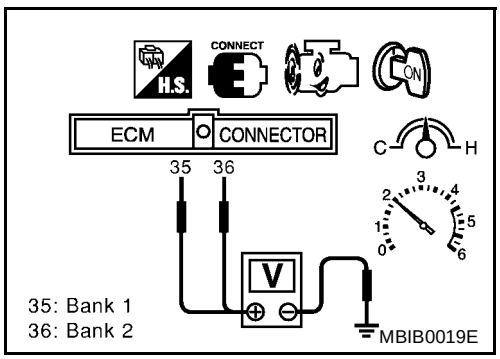
Use this procedure to check the overall function of the heated oxygen sensor 1 circuit. During this check, a 1st trip DTC might not be confirmed.

WITH GST

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 [HO2S1 (B1) signal] or 36 [HO2S1 (B2) signal] and engine ground.
3. Check one of the following with engine speed held at 2,000 rpm constant under no load.

- The maximum voltage is over 0.6V at least one time.
- The minimum voltage is over 0.1V at least one time.

4. If NG, go to EC-428, "Diagnostic Procedure" .



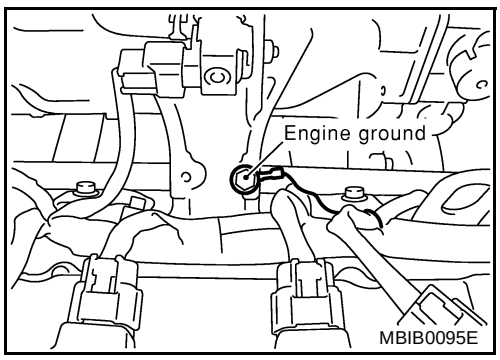
Diagnostic Procedure

EBS00FSS

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

>> GO TO 2.

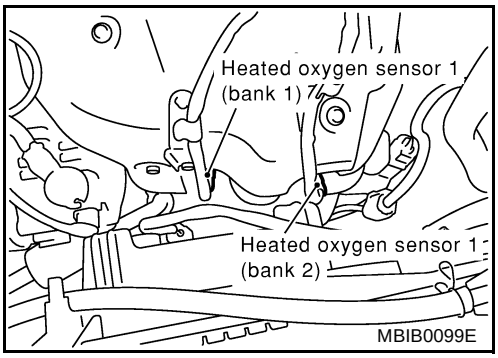


2. RETIGHTEN HEATED OXYGEN SENSOR 1

Loosen and retighten corresponding heated oxygen sensor 1.

Tightening torque: 40 - 60 N·m (4.1 - 6.2 kg-m, 30 - 44 ft-lb)

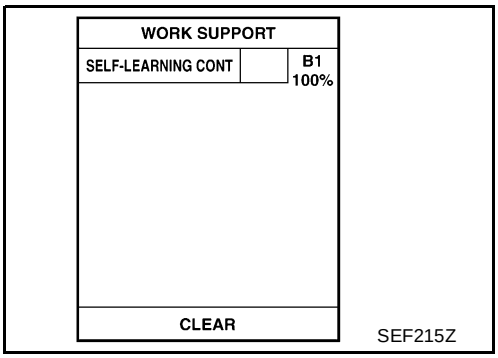
>> GO TO 3.



3. CLEAR THE SELF-LEARNING DATA

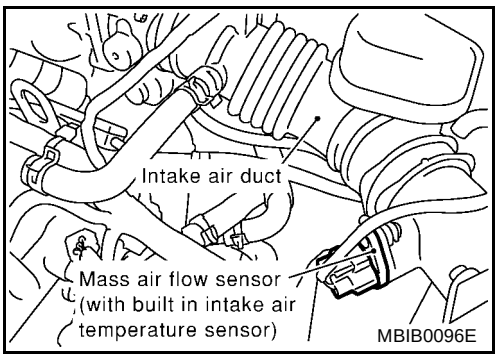
With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching “CLEAR”.
4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 or P0174 detected?
   Is it difficult to start engine?



Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF”.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure that DTC P0102 is displayed.
6. Erase the DTC memory. Refer to EC-73, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
7. Make sure that DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 or P0174 detected?
   Is it difficult to start engine?



Yes or No

Yes >> Perform trouble diagnosis for DTC P0171, P0174. Refer to EC-291 .
No >> GO TO 4.

4. CHECK HEATED OXYGEN SENSOR 1 HEATER

Refer to EC-169, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace malfunctioning heated oxygen sensor 1.

5. CHECK HEATED OXYGEN SENSOR 1

Refer to EC-430, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace malfunctioning heated oxygen sensor 1.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .
For circuit, refer to EC-207, "Wiring Diagram" .

>> **INSPECTION END**

Component Inspection

EBS00FST

HEATED OXYGEN SENSOR 1

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “MANU TRIG” and adjust “TRIGGER POINT” to 100% in “DATA MONITOR” mode with CONSULT-II.
3. Select “HO2S1 (B1)/(B2)” and “HO2S1 MNTR (B1)/(B2)”.
4. Hold engine speed at 2,000 rpm under no load during the following steps.
5. Touch “RECORD” on CONSULT-II screen.

DATA MONITOR	
MONITOR	NO DTC
ENG SPEED	XXX rpm
MAS A/F SE-B1	XXX V
COOLAN TEMP/S	XXX °C
HO2S1 (B1)	XXX V
HO2S1 MNTR (B1)	LEAN

SEF646Y

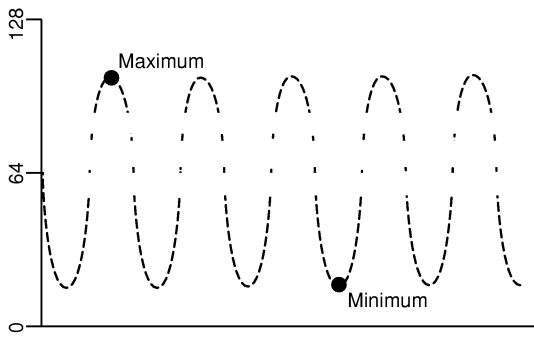
6. Check the following.
   - “HO2S1 MNTR (B1)/(B2)” in “DATA MONITOR” mode changes from “RICH” to “LEAN” to “RICH” 5 times in 10 seconds.
     5 times (cycles) are counted as shown at right.
   - “HO2S1 (B1)/(B2)” voltage goes above 0.6V at least once.
   - “HO2S1 (B1)/(B2)” voltage goes below 0.3V at least once.
   - “HO2S1 (B1)/(B2)” voltage never exceeds 1.0V.

Bank 1						
	cycle	1	2	3	4	5
HO2S1 MNTR (B1)	R-L-R-L-R-L-R-L-R-L-R					
Bank 2						
	cycle	1	2	3	4	5
HO2S1 MNTR (B2)	R-L-R-L-R-L-R-L-R-L-R					

R means HO2S1 MNTR (B1)/(B2) indicates RICH
L means HO2S1 MNTR (B1)/(B2) indicates LEAN

SEF647Y

Trigger	ENG SPEED	HO2S1 (B1)
	rpm	V
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX



SEF648Y

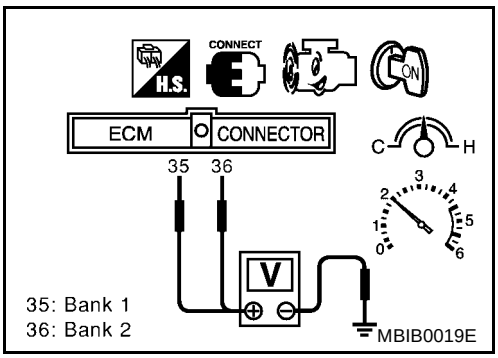
CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 [HO2S1 (B1) signal] or 36 [HO2S1 (B2) signal] and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no load.
   - The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds.
   - The maximum voltage is over 0.6V at least one time.
   - The minimum voltage is below 0.3V at least one time.
   - The voltage never exceeds 1.0V.

   1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V
   2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V



CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

EBS00FSU

HEATED OXYGEN SENSOR 1

Refer to EM-23, "EXHAUST MANIFOLD AND CATALYTIC CONVERTER" .

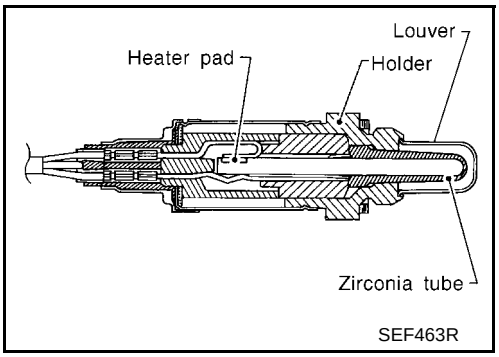
DTC P1144 HO2S1 (QG16DE)

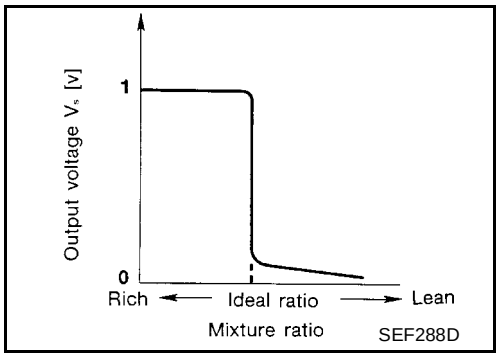
PFP:22690

Component Description

EBS00FSV

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.





CONSULT-II Reference Value in Data Monitor Mode

EBS00FSW

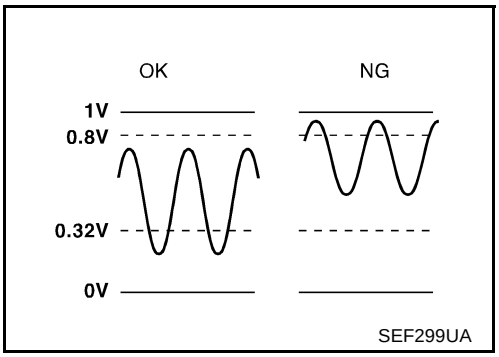
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S1 (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S1 MNTR (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	LEAN ←→ RICH Changes more than 5 times during 10 seconds.

On Board Diagnosis Logic

EBS00FSX

To judge the malfunction, the output from the heated oxygen sensor 1 is monitored to determine whether the “rich” output is sufficiently high. The “lean” output is sufficiently low. When both the outputs are shifting to the rich side, the malfunction will be detected.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1144 1144	Heated oxygen sensor 1 rich shift monitoring	The maximum and minimum voltages from the sensor are beyond the specified voltages.	● Heated oxygen sensor 1 ● Heated oxygen sensor 1 heater ● Fuel pressure ● Injectors

DTC Confirmation Procedure

EBS00FSY

CAUTION:
Always drive vehicle at a safe speed.

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

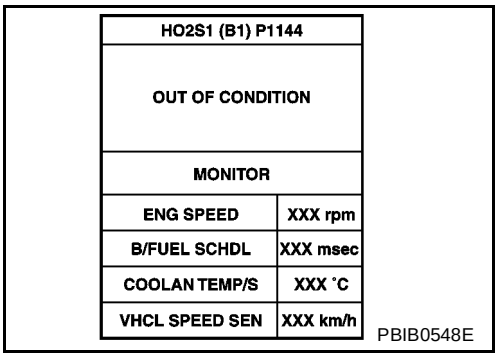
TESTING CONDITION:

- **Always perform at a temperature above −10°C (14°F).**
- **Before performing the following procedure, confirm that battery voltage is more than 11V at idle.**

WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Stop engine and wait at least 5 seconds.
3. Turn ignition switch “ON” and select “HO2S1 (B1) P1144” of “HO2S1” in “DTC WORK SUPPORT” mode with CONSULT-II.
4. Touch “START”.
5. Start engine and let it idle for at least 3 minutes.

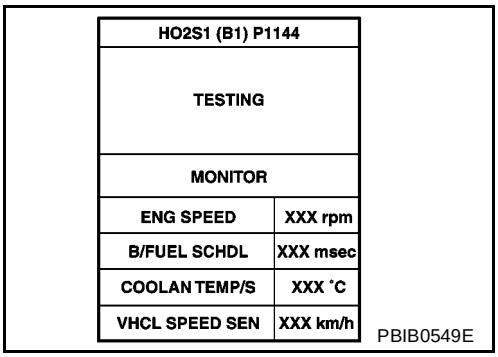
   NOTE:
   Never raise engine speed above 3,600 rpm after this step. If the engine speed limit is exceeded, return to step 5.



PBIB0548E

6. When the following conditions are met, “TESTING” will be displayed on the CONSULT-II screen. Maintain the conditions continuously until “TESTING” changes to “COMPLETED”. (It will take approximately 50 seconds or more.)

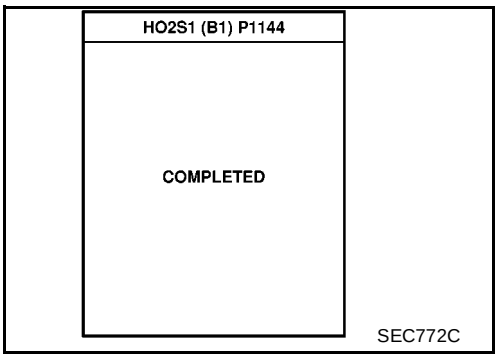
ENG SPEED	1,300 - 3,000 rpm
Vehicle speed	50 - 100 km/h (30 - 62 MPH)
B/FUEL SCHDL	2.4 - 5.5 msec
Selector lever	Suitable position



PBIB0549E

   If “TESTING” is not displayed after 5 minutes, retry from step 2.

7. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”. If “NG” is displayed, refer to EC-434, "Diagnostic Procedure" .



SEC772C

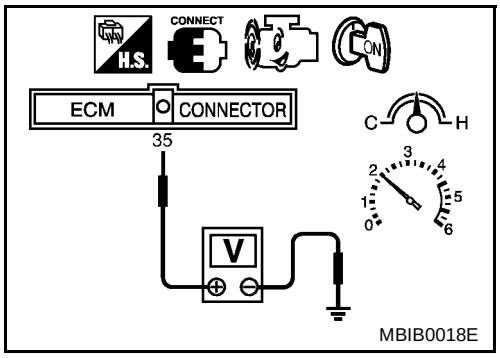
Overall Function Check

EBS00FSZ

Use this procedure to check the overall function of the heated oxygen sensor 1 circuit. During this check, a 1st trip DTC might not be confirmed.

WITH GST

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 (HO2S1 signal) and engine ground.
3. Check one of the following with engine speed held at 2,000 rpm constant under no load.
   - The maximum voltage is below 0.8V at at least one time.
   - The minimum voltage is below 0.32V at least one time.
4. If NG, go to EC-434, "Diagnostic Procedure" .



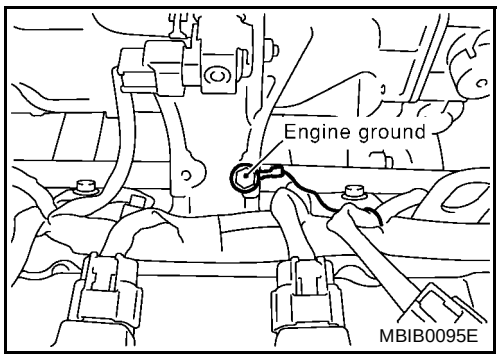
Diagnostic Procedure

EBS00FT0

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

>> GO TO 2.

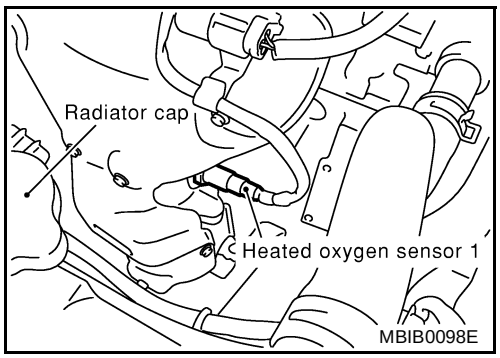


2. RETIGHTEN HEATED OXYGEN SENSOR 1

Loosen and retighten heated oxygen sensor 1.

Tightening torque: 40 - 60 N·m (4.1 - 6.2 kg-m, 30 - 44 ft-lb)

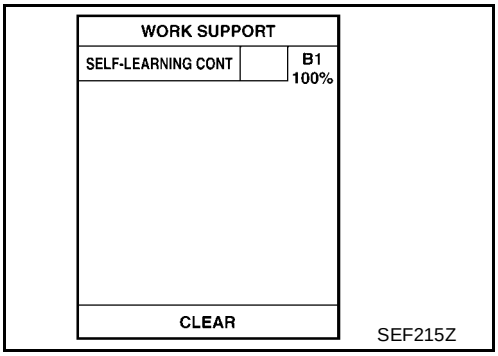
>> GO TO 3.



3. CLEAR THE SELF-LEARNING DATA

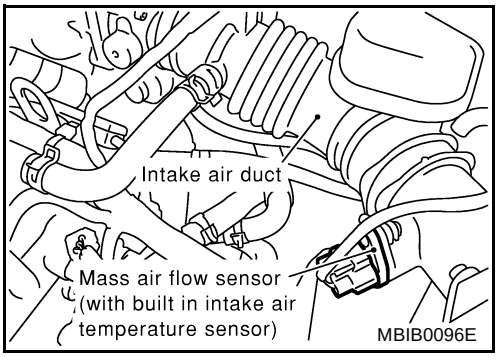
With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching “CLEAR”.
4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0172 detected?
   Is it difficult to start engine?



Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF”.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure that DTC P0102 is displayed.
6. Erase the DTC memory. Refer to EC-73, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
7. Make sure that DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0172 detected?
   Is it difficult to start engine?



Yes or No

Yes >> Perform trouble diagnosis for DTC P0172. Refer to EC-299 .
No >> GO TO 4.

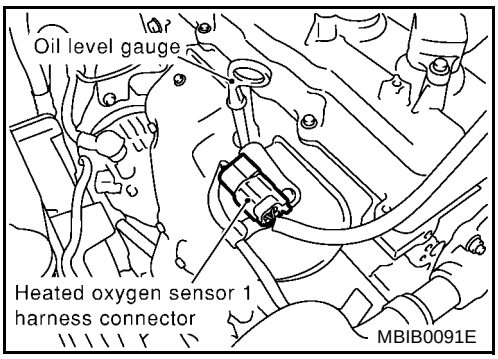
4. CHECK HO2S1 CONNECTOR FOR WATER

1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 1 harness connector.
3. Check connectors for water.

Water should not exist.

OK or NG

OK >> GO TO 5.
NG >> Repair or replace harness or connectors.



5. CHECK HEATED OXYGEN SENSOR 1 HEATER

Refer to EC-161, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace heated oxygen sensor 1.

6. CHECK HEATED OXYGEN SENSOR 1

Refer to EC-436, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace heated oxygen sensor 1.

7. CHECK INTERMITTENT INCIDENT

Refer to EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .
For circuit, refer to EC-201, "Wiring Diagram" .

>> **INSPECTION END**

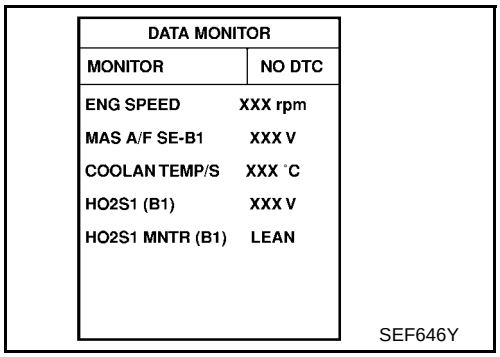
Component Inspection

EBS00FT1

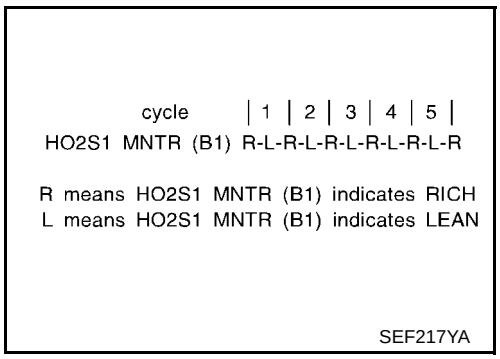
HEATED OXYGEN SENSOR 1

With CONSULT-II

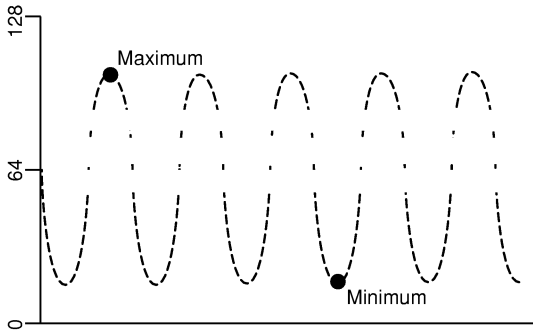
1. Start engine and warm it up to normal operating temperature.
2. Select “MANU TRIG” and adjust “TRIGGER POINT” to 100% in “DATA MONITOR” mode with CONSULT-II.
3. Select “HO2S1 (B1)” and “HO2S1 MNTR (B1)”.
4. Hold engine speed at 2,000 rpm under no load during the following steps.
5. Touch “RECORD” on CONSULT-II screen.



6. Check the following.
   - “HO2S1 MNTR (B1)” in “DATA MONITOR” mode changes from “RICH” to “LEAN” to “RICH” 5 times in 10 seconds.
     5 times (cycles) are counted as shown at right.
   - “HO2S1 (B1)” voltage goes above 0.6V at least once.
   - “HO2S1 (B1)” voltage goes below 0.3V at least once.
   - “HO2S1 (B1)” voltage never exceeds 1.0V.



Trigger	ENG SPEED	HO2S1 (B1)
	rpm	V
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX



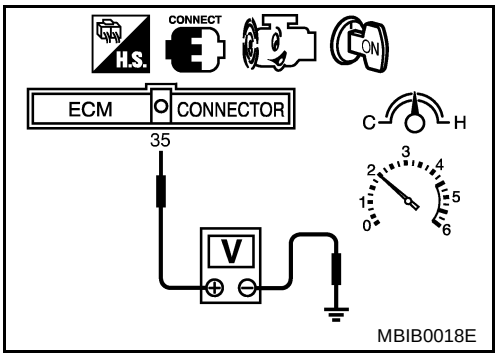
CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

⊗ Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 (HO2S1 signal) and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no load.
   - The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds.
   - The maximum voltage is over 0.6V at least one time.
   - The minimum voltage is below 0.3V at least one time.
   - The voltage never exceeds 1.0V.

   1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V
   2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V



CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

EBS00FT2

HEATED OXYGEN SENSOR 1

Refer to EM-23, "EXHAUST MANIFOLD AND CATALYTIC CONVERTER" .

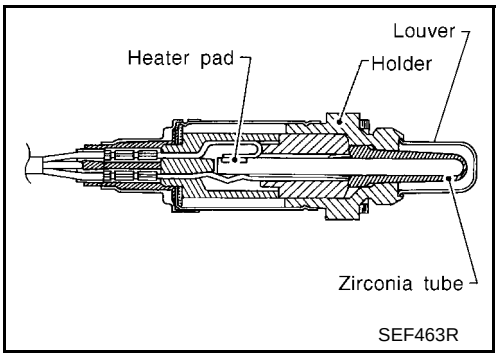
DTC P1144, P1164 HO2S1 (QG18DE)

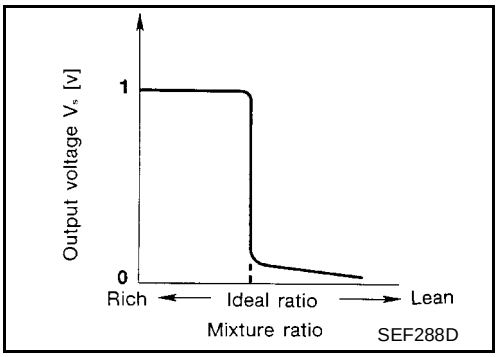
PFP:22690

Component Description

EBS00FT3

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.





CONSULT-II Reference Value in Data Monitor Mode

EBS00FT4

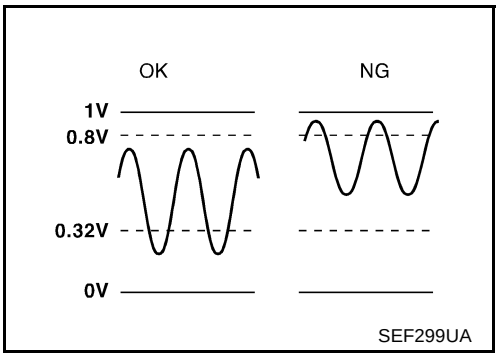
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S1 (B1) HO2S1 (B2)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S1 MNTR (B1) HO2S1 MNTR (B2)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	LEAN ←→ RICH Changes more than 5 times during 10 seconds.

On Board Diagnosis Logic

EBS00FT5

To judge the malfunction, the output from the heated oxygen sensor 1 is monitored to determine whether the “rich” output is sufficiently high. The “lean” output is sufficiently low. When both the outputs are shifting to the rich side, the malfunction will be detected.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1144 1144 (Bank 1)	Heated oxygen sensor 1 rich shift monitoring	The maximum and minimum voltages from the sensor are beyond the specified voltages.	● Heated oxygen sensor 1 ● Heated oxygen sensor 1 heater ● Fuel pressure ● Injectors
P1164 1164 (Bank 2)			

DTC Confirmation Procedure

EBS00FT6

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

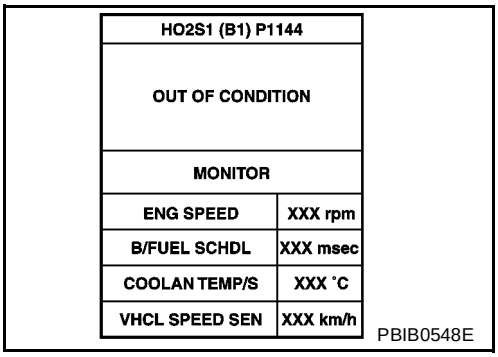
TESTING CONDITION:

- **Always perform at a temperature above −10°C (14°F).**
- **Before performing the following procedure, confirm that battery voltage is more than 11V at idle.**

WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Stop engine and wait at least 5 seconds.
3. Turn ignition switch “ON” and select “HO2S1 (B1) P1144” or “HO2S1 (B2) P1164” of “HO2S1” in “DTC WORK SUPPORT” mode with CONSULT-II.
4. Touch “START”.
5. Start engine and let it idle for at least 3 minutes.

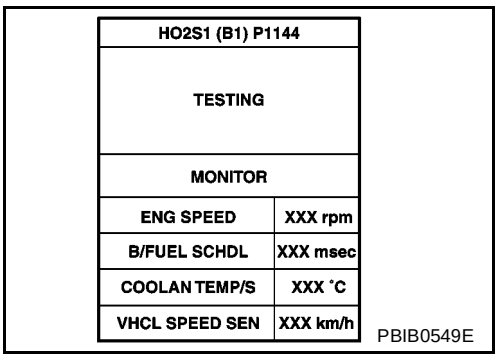
   NOTE:
   Never raise engine speed above 3,600 rpm (M/T models) or 3,200 rpm (A/T models) after this step. If the engine speed limit is exceeded, return to step 5.



PBIB0548E

6. When the following conditions are met, “TESTING” will be displayed on the CONSULT-II screen. Maintain the conditions continuously until “TESTING” changes to “COMPLETED”. (It will take approximately 50 seconds or more.)

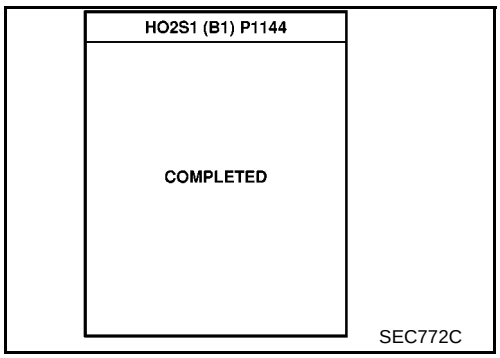
ENG SPEED	1,200 - 2,600 rpm (A/T models) 1,300 - 3,000 rpm (M/T models)
Vehicle speed	50 - 100 km/h (30 - 62 MPH)
B/FUEL SCHDL	3.0 - 6.5 msec (A/T models) 2.4 - 5.5 msec (M/T models)
Selector lever	Suitable position



PBIB0549E

If “TESTING” is not displayed after 5 minutes, retry from step 2.

7. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”. If “NG” is displayed, refer to EC-440, "Diagnostic Procedure" .



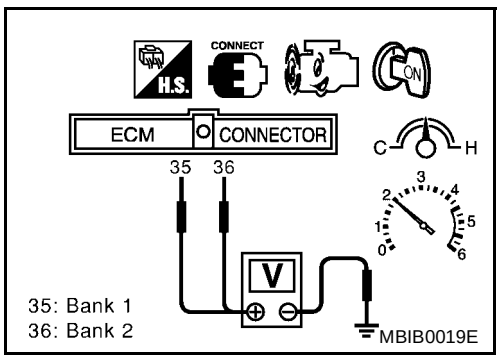
Overall Function Check

EBS00FT7

Use this procedure to check the overall function of the heated oxygen sensor 1 circuit. During this check, a 1st trip DTC might not be confirmed.

WITH GST

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 [HO2S1 (B1) signal] or 36 [HO2S1 (B2) signal] and engine ground.
3. Check one of the following with engine speed held at 2,000 rpm constant under no load.
   - The maximum voltage is below 0.8V at least one time.
   - The minimum voltage is below 0.32V at least one time.
4. If NG, go to EC-440, "Diagnostic Procedure" .



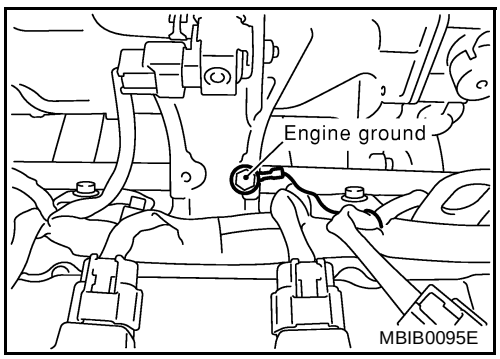
Diagnostic Procedure

EBS00FT8

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

>> GO TO 2.

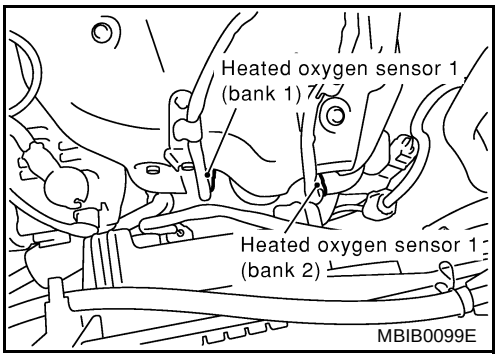


2. RETIGHTEN HEATED OXYGEN SENSOR 1

Loosen and retighten heated oxygen sensor 1.

Tightening torque: 40 - 60 N·m (4.1 - 6.2 kg-m, 30 - 44 ft-lb)

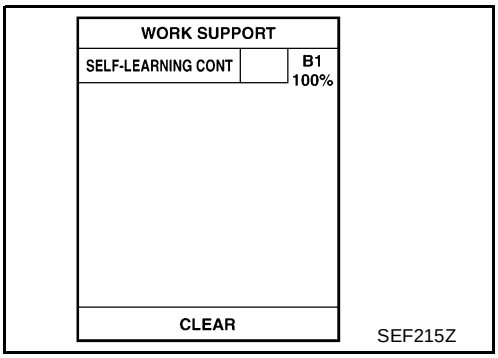
>> GO TO 3.



3. CLEAR THE SELF-LEARNING DATA

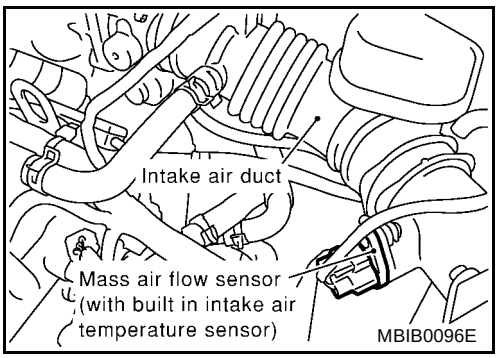
With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching “CLEAR”.
4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0172 or P0175 detected?
   Is it difficult to start engine?



Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF”.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure that DTC P0102 is displayed.
6. Erase the DTC memory. Refer to EC-73, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
7. Make sure that DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0172 or P0175 detected?
   Is it difficult to start engine?



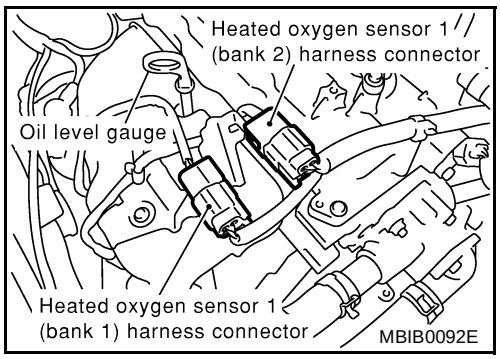
Yes or No

Yes >> Perform trouble diagnosis for DTC P0172, P0175. Refer to EC-305 .
No >> GO TO 4.

4. CHECK HO2S1 CONNECTOR FOR WATER

1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 1 harness connector.
3. Check connectors for water.

Water should not exist.



OK or NG

OK >> GO TO 5.
NG >> Repair or replace harness or connectors.

5. CHECK HEATED OXYGEN SENSOR 1 HEATER

Refer to EC-169, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace malfunctioning heated oxygen sensor 1.

6. CHECK HEATED OXYGEN SENSOR 1

Refer to EC-442, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace malfunctioning heated oxygen sensor 1.

7. CHECK INTERMITTENT INCIDENT

Refer to EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .
For circuit, refer to EC-207, "Wiring Diagram" .

>> **INSPECTION END**

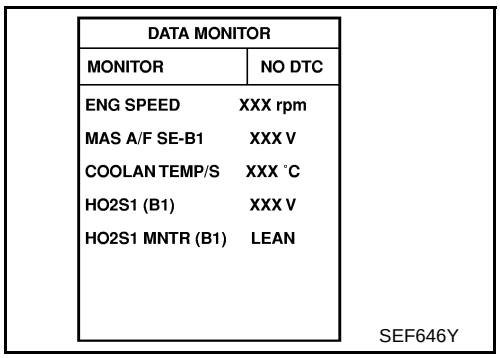
Component Inspection

EBS00FT9

HEATED OXYGEN SENSOR 1

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “MANU TRIG” and adjust “TRIGGER POINT” to 100% in “DATA MONITOR” mode with CONSULT-II.
3. Select “HO2S1 (B1)” and “HO2S1 MNTR (B1)”.
4. Hold engine speed at 2,000 rpm under no load during the following steps.
5. Touch “RECORD” on CONSULT-II screen.



6. Check the following.
   - "HO2S1 MNTR (B1)/(B2)" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" 5 times in 10 seconds.
     5 times (cycles) are counted as shown at right.
   - "HO2S1 (B1)/(B2)" voltage goes above 0.6V at least once.
   - "HO2S1 (B1)/(B2)" voltage goes below 0.3V at least once.
   - "HO2S1 (B1)/(B2)" voltage never exceeds 1.0V.

Bank 1						
cycle	1	2	3	4	5	
HO2S1 MNTR (B1)	R-L-R-L-R-L-R-L-R-L-R					

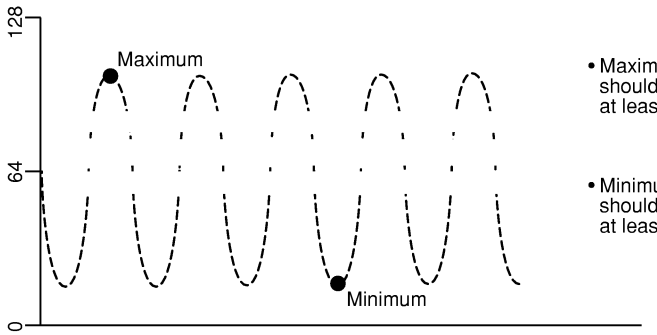
Bank 2						
cycle	1	2	3	4	5	
HO2S1 MNTR (B2)	R-L-R-L-R-L-R-L-R-L-R					

R means HO2S1 MNTR (B1)/(B2) indicates RICH

L means HO2S1 MNTR (B1)/(B2) indicates LEAN

SEF647Y

Trigger	ENG SPEED	HO2S1 (B1)
	rpm	V
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX



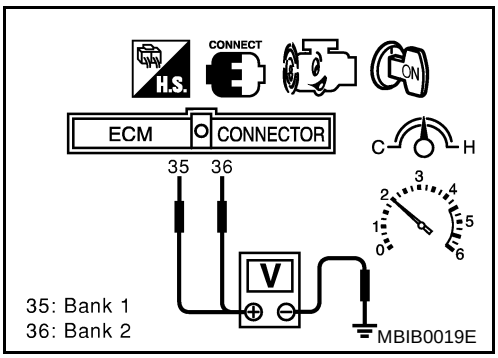
CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

⊗ Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 [HO2S1 (B1) signal] or 36 [HO2S1 (B2) signal] and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no load.
   - The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds.
   - The maximum voltage is over 0.6V at least one time.
   - The minimum voltage is below 0.3V at least one time.
   - The voltage never exceeds 1.0V.

   1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V
   2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V



CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

EBS00FTA

HEATED OXYGEN SENSOR 1

Refer to EM-23, "EXHAUST MANIFOLD AND CATALYTIC CONVERTER" .

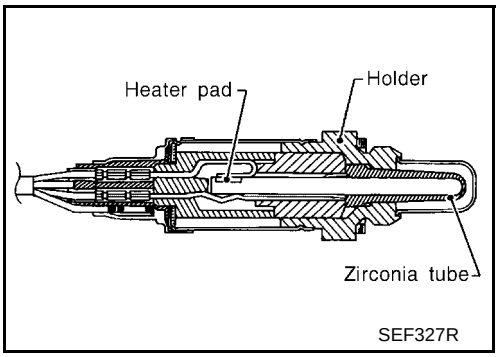
DTC P1146 HO2S2 (QG16DE)

PFP:226A0

Component Description

EBS00FTB

The heated oxygen sensor 2, after three way catalyst, monitors the oxygen level in the exhaust gas.
Even if switching characteristics of the heated oxygen sensor 1 are shifted, the air fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.
This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.
Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.



CONSULT-II Reference Value in Data Monitor Mode

EBS00FTC

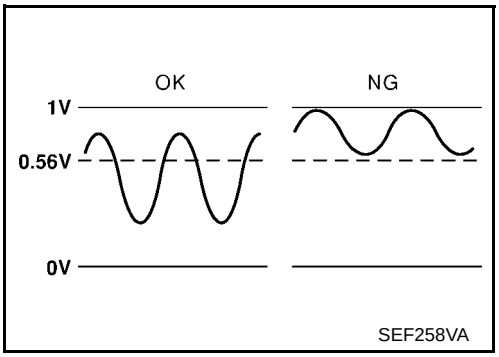
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S2 (B1)	● Engine: After warming up	Revving engine from idle to 3,000 rpm quickly.	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S2 MNTR (B1)	● Engine: After warming up	Revving engine from idle to 3,000 rpm quickly.	LEAN ←→ RICH

On Board Diagnosis Logic

EBS00FTE

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the heated oxygen sensor 1. The oxygen storage capacity before the three way catalyst causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the minimum voltage of sensor is sufficiently low during the various driving condition such as fuel-cut.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1146 1146	Heated oxygen sensor 2 minimum voltage monitoring	The minimum voltage from the sensor is not reached to the specified voltage.	● Harness or connectors (The sensor circuit is open or shorted.) ● Heated oxygen sensor 2 ● Fuel pressure ● Injectors

DTC Confirmation Procedure

EBS00FTF

CAUTION:
Always drive vehicle at a safe speed.

NOTE:

- **"COMPLETED" will appear on CONSULT-II screen when all tests "COND1", "COND2" and "COND3" are completed.**
- If "DTC confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.

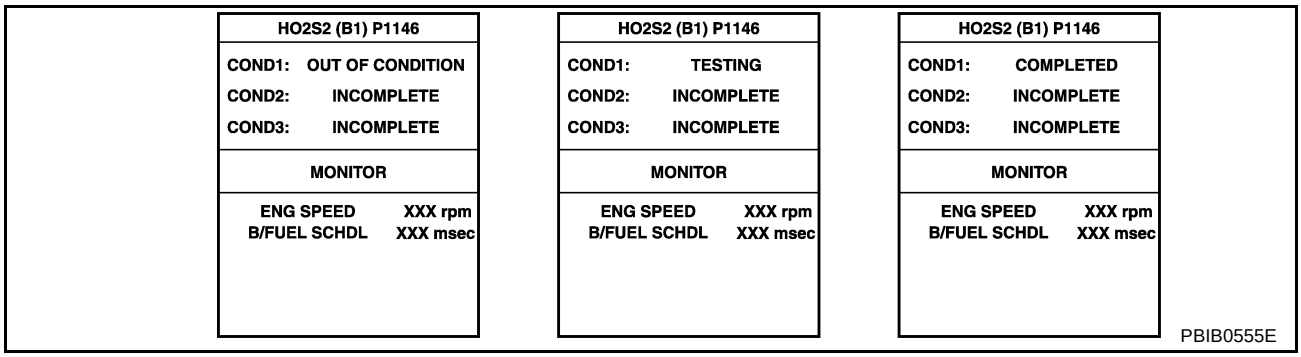
TESTING CONDITION:
Never stop engine during this procedure. If the engine is stopped, retry procedure from step 2 in "Procedure for COND1"

WITH CONSULT-II

Procedure for COND1

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Turn ignition switch “ON” and select “HO2S2 (B1) P1146” of “HO2S2” in “DTC WORK SUPPORT” mode with CONSULT-II.
4. Touch START”.
5. Start engine and let it idle for at least 30 seconds.
6. Rev engine up to 2,000 rpm 2 or 3 times quickly under no load.
   If “COMPLETED” appears on CONSULT-II screen, go to step 2 in Procedure for COND3”.
   If “COMPLETED” does not appear on CONSULT-II screen, go to the following step.
7. Drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
8. When the following conditions are met, “TESTING” will be displayed at “COND1” on the CONSULT-II screen. Maintain the conditions continuously until “TESTING” changes to “COMPLETED”. (It will take approximately 60 seconds.)

ENG SPEED	More than 1,000 rpm
B/FUEL SCHDL	More than 1.0 msec
COOLANT TEMP/S	70 - 105°C
Selector lever	Suitable position



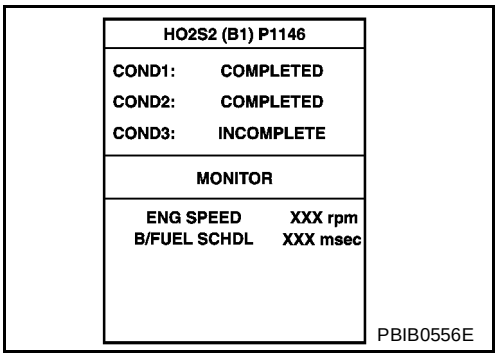
NOTE:

- **If “TESTING” is not displayed after 5 minutes, retry from step 2 in “Procedure for COND1”.**
- **If “COMPLETED” already appears at “COND2” on CONSULT-II screen before “Procedure for COND2” is conducted, it is unnecessary to conduct step 1 in “Procedure for COND2”.**

Procedure for COND2

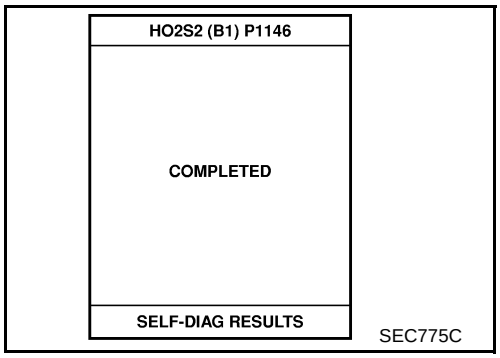
1. While driving, release accelerator pedal completed from the above condition [step 8] until “INCOMPLETE” at “COND2” on CONSULT-II screen has turned to “COMPLETED” (It will take approximately 4 seconds.)

   NOTE:
   If “COMPLETE” already appears at “COND3” on CONSULT-II screen before “Procedure for COND3” is conducted, it is unnecessary to conduct step 1 in “Procedure for COND3”.



Procedure for COND3

1. Stop vehicle and let it idle until “INCOMPLETE” of “COND3” on CONSULT-II screen has turned to “COMPLETED”. (It will take a maximum of approximately 6 minutes.)
2. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”.
   If “NG” is displayed, refer to EC-448, "Diagnostic Procedure" .



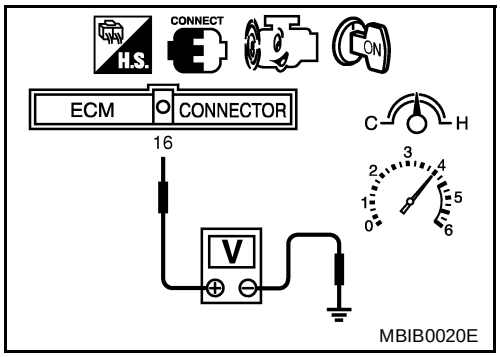
Overall Function Check

EBS00FTG

Use this procedure to check the overall function of the heated oxygen sensor 2 circuit. During this check, a 1st trip DTC might not be confirmed.

WITH GST

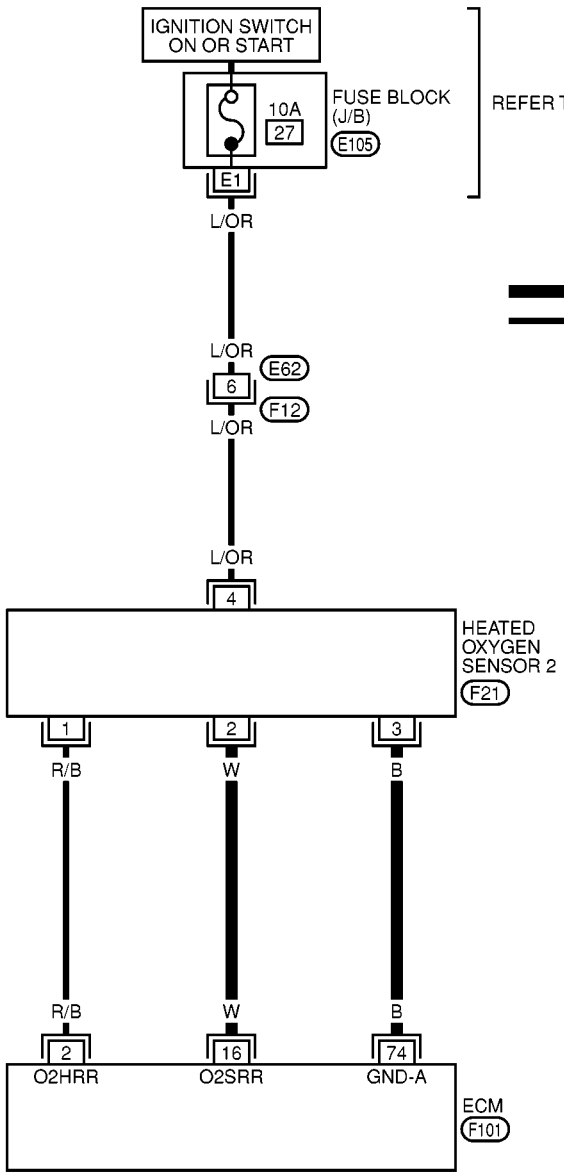
1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Set voltmeter probes between ECM terminal 16 (HO2S2 signal) and engine ground.
4. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be below 0.56V at least once during this procedure.
   If the voltage can be confirmed in step 4, step 5 is not necessary.
5. Keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in 3rd gear position.
   The voltage should be below 0.56V at least once during this procedure.
6. If NG, go to EC-448, "Diagnostic Procedure" .

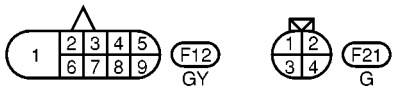


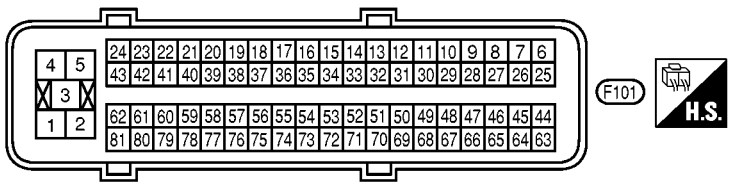
Wiring Diagram

EBS00FTH

EC-HO2S2-01







REFER TO THE FOLLOWING.
E105 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0050E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
16	W	Heated oxygen sensor 2	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V
74	B	Heated oxygen sensor ground	**[Engine is running]** ● Idle speed	Approximately 0V

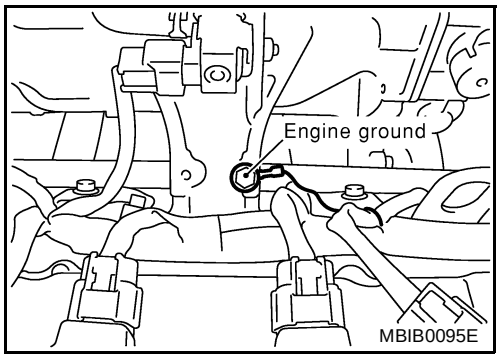
Diagnostic Procedure

EBS00FTI

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

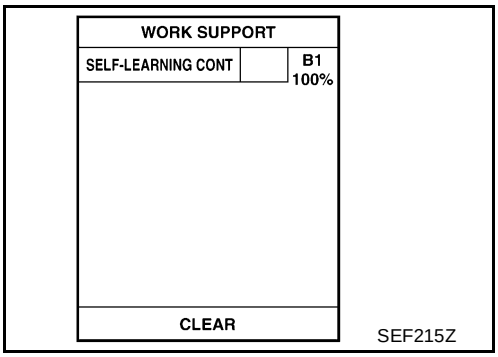
>> GO TO 2.



2. CLEAR THE SELF-LEARNING DATA

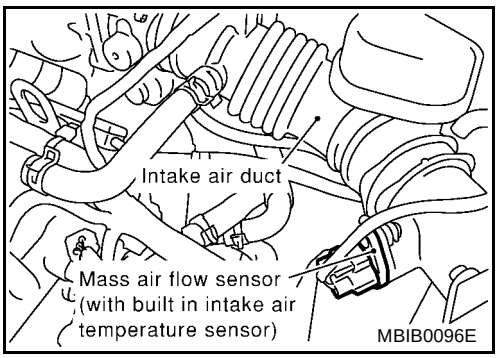
With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching “CLEAR”.
4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0172 detected?
   Is it difficult to start engine?



Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF”.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure that DTC P0102 is displayed.
6. Erase the DTC memory. Refer to EC-73, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
7. Make sure that DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0172 detected?
   Is it difficult to start engine?



Yes or No

Yes >> Perform trouble diagnosis for DTC P0172. Refer to EC-299 .
No >> GO TO 3.

3. CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

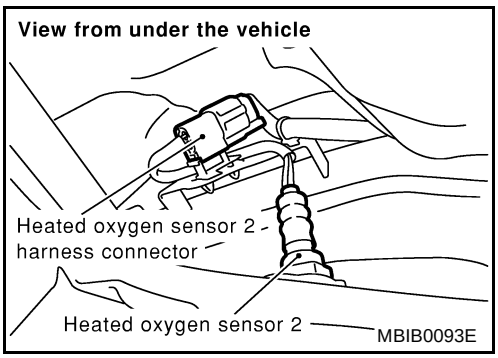
1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 2 harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminal 74 and HO2S2 terminal 3.
   Refer to Wiring Diagram.

   Continuity should exist.

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.



4. CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 16 and HO2S2 terminal 2.
   Refer to Wiring Diagram.

   Continuity should exist.

2. Check harness continuity between ECM terminal 16 or HO2S2 terminal 2 and ground.
   Refer to Wiring Diagram.

   Continuity should not exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK HEATED OXYGEN SENSOR 2

Refer to EC-450, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace heated oxygen sensor 2.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

EBS00FTJ

HEATED OXYGEN SENSOR 2

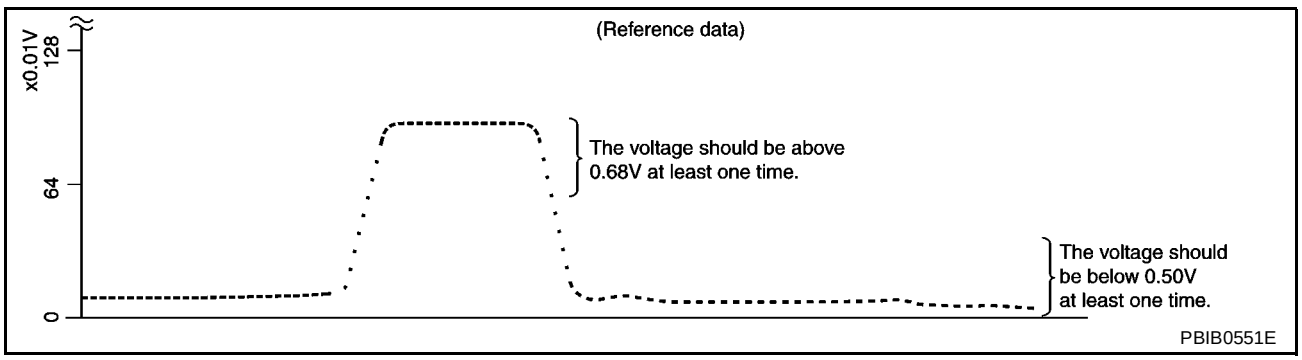
With CONSULT-II

1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)” as the monitor item with CONSULT-II.

ACTIVE TEST	
FUEL INJECTION	25 %
MONITOR	
ENG SPEED	XXX rpm
HO2S1 (B1)	XXX V
HO2S2 (B1)	XXX V
HO2S1 MNTR (B1)	RICH
HO2S2 MNTR (B1)	RICH

SEF662Y

4. Check “HO2S2 (B1)” at idle speed when adjusting “FUEL INJECTION” to ±25%.



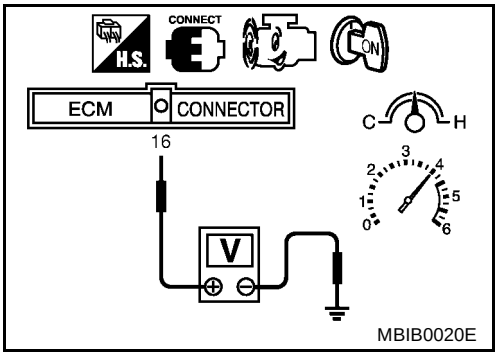
"HO2S2 (B1)" should be above 0.68V at least once when the "FUEL INJECTION" is +25%.
"HO2S2 (B1)" should be below 0.56V at least once when the "FUEL INJECTION" is −25%.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Set voltmeter probes between ECM terminal 16 (HO2S2 signal) and engine ground.
4. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be above 0.68V at least once during this procedure.
   If the voltage is above 0.68V at step 4, step 5 is not necessary.
5. Keep vehicle at idling for 10 minutes, then check voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in 3rd gear position.
   The voltage should be below 0.56V at least once during this procedure.
6. If NG, replace heated oxygen sensor 2.



CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

EBS00FTK

HEATED OXYGEN SENSOR 2

Refer to EX-3, "EXHAUST SYSTEM" .

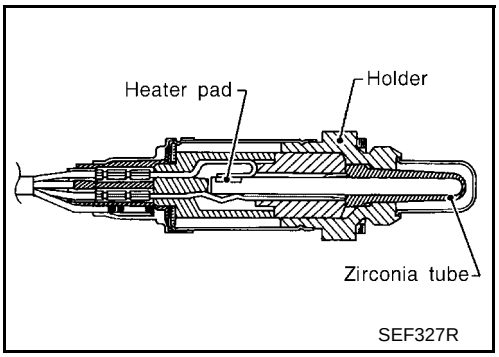
DTC P1146, P1166 HO2S2 (QG18DE)

PFP:226A0

Component Description

EBS00FTL

The heated oxygen sensor 2, after three way catalyst, monitors the oxygen level in the exhaust gas on each bank.
Even if switching characteristics of the heated oxygen sensor 1 are shifted, the air fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.
This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.
Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.



CONSULT-II Reference Value in Data Monitor Mode

EBS00FTM

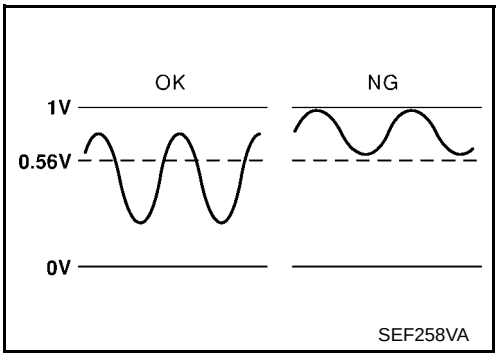
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S2 (B1) HO2S2 (B2)	● Engine: After warming up	Revving engine from idle to 3,000 rpm quickly.	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S2 MNTR (B1) HO2S2 MNTR (B2)	● Engine: After warming up	Revving engine from idle to 3,000 rpm quickly.	LEAN ←→ RICH

On Board Diagnosis Logic

EBS00FTO

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the heated oxygen sensor 1. The oxygen storage capacity before the three way catalyst causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the minimum voltage of sensor is sufficiently low during the various driving condition such as fuel-cut.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1146 1146 (Bank 1) P1166 1166 (Bank 2)	Heated oxygen sensor 2 minimum voltage monitoring	The minimum voltage from the sensor is not reached to the specified voltage.	● Harness or connectors (The sensor circuit is open or shorted.) ● Heated oxygen sensor 2 ● Fuel pressure ● Injectors

DTC Confirmation Procedure

EBS00FTP

CAUTION:
Always drive vehicle at a safe speed.

NOTE:

- **“COMPLETED” will appear on CONSULT-II screen when all tests “COND1”, “COND2” and “COND3” are completed.**
- If “DTC confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

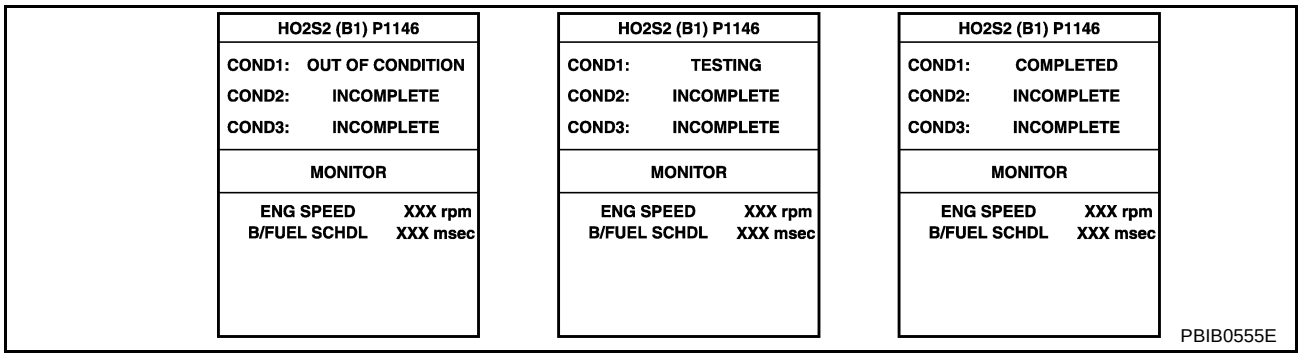
TESTING CONDITION:
Never stop engine during this procedure. If the engine is stopped, retry procedure from step 2 in “Procedure for COND1”

WITH CONSULT-II

Procedure for COND1

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Turn ignition switch “ON” and select “HO2S2 (B1) P1146” or “HO2S2 (B2) P1166” of “HO2S2” in “DTC WORK SUPPORT” mode with CONSULT-II.
4. Touch “START”.
5. Start engine and let it idle for at least 30 seconds.
6. Rev engine up to 2,000 rpm 2 or 3 times quickly under no load.
   If “COMPLETED” appears on CONSULT-II screen, go to step 2 in “Procedure for COND3”.
   If “COMPLETED” does not appear on CONSULT-II screen, go to the following step.
7. Drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
8. When the following conditions are met, “TESTING” will be displayed at “COND1” on the CONSULT-II screen. Maintain the conditions continuously until “TESTING” changes to “COMPLETED”. (It will take approximately 60 seconds.)

ENG SPEED	More than 1,000 rpm
B/FUEL SCHDL	More than 1.0 msec
COOLANT TEMP/S	70 - 105°C
Selector lever	Suitable position



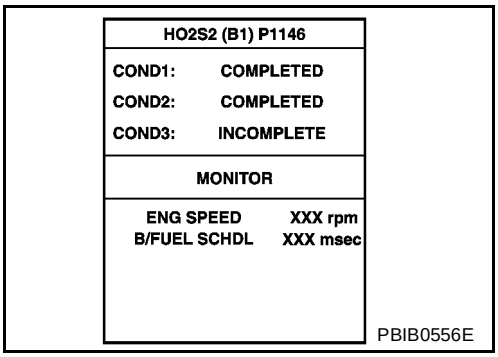
NOTE:

- **If “TESTING” is not displayed after 5 minutes, retry from step 2 in “Procedure for COND1”.**
- **If “COMPLETED” already appears at “COND2” on CONSULT-II screen before “Procedure for COND2” is conducted, it is unnecessary to conduct step 1 in “Procedure for COND2”.**

Procedure for COND2

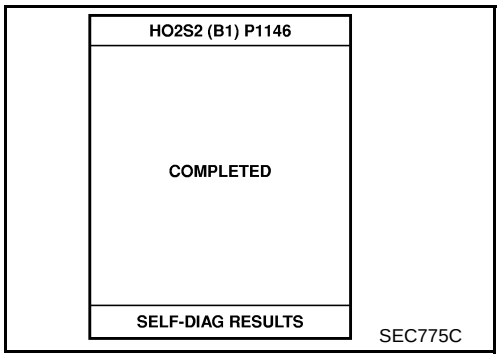
1. While driving, release accelerator pedal completed with “OD” OFF (A/T models only) from the above condition [step 8] until “INCOMPLETE” at “COND2” on CONSULT-II screen has turned to “COMPLETED” (It will take approximately 4 seconds.)

   NOTE:
   If “COMPLETE” already appears at “COND3” on CONSULT-II screen before “Procedure for COND3” is conducted, it is unnecessary to conduct step 1 in “Procedure for COND3”.



Procedure for COND3

1. Stop vehicle and let it idle until “INCOMPLETE” of “COND3” on CONSULT-II screen has turned to COMPLETED”. (It will take a maximum of approximately 6 minutes.)
2. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”.
   If “NG” is displayed, refer to EC-458, "Diagnostic Procedure" .



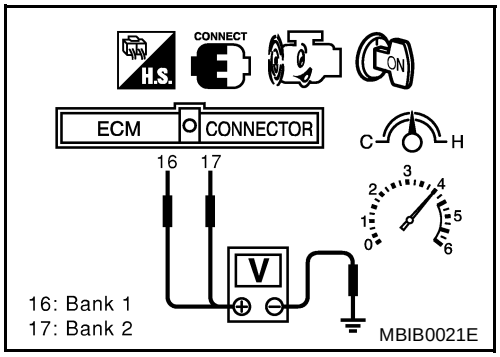
Overall Function Check

EBS00FTQ

Use this procedure to check the overall function of the heated oxygen sensor 2 circuit. During this check, a 1st trip DTC might not be confirmed.

WITH GST

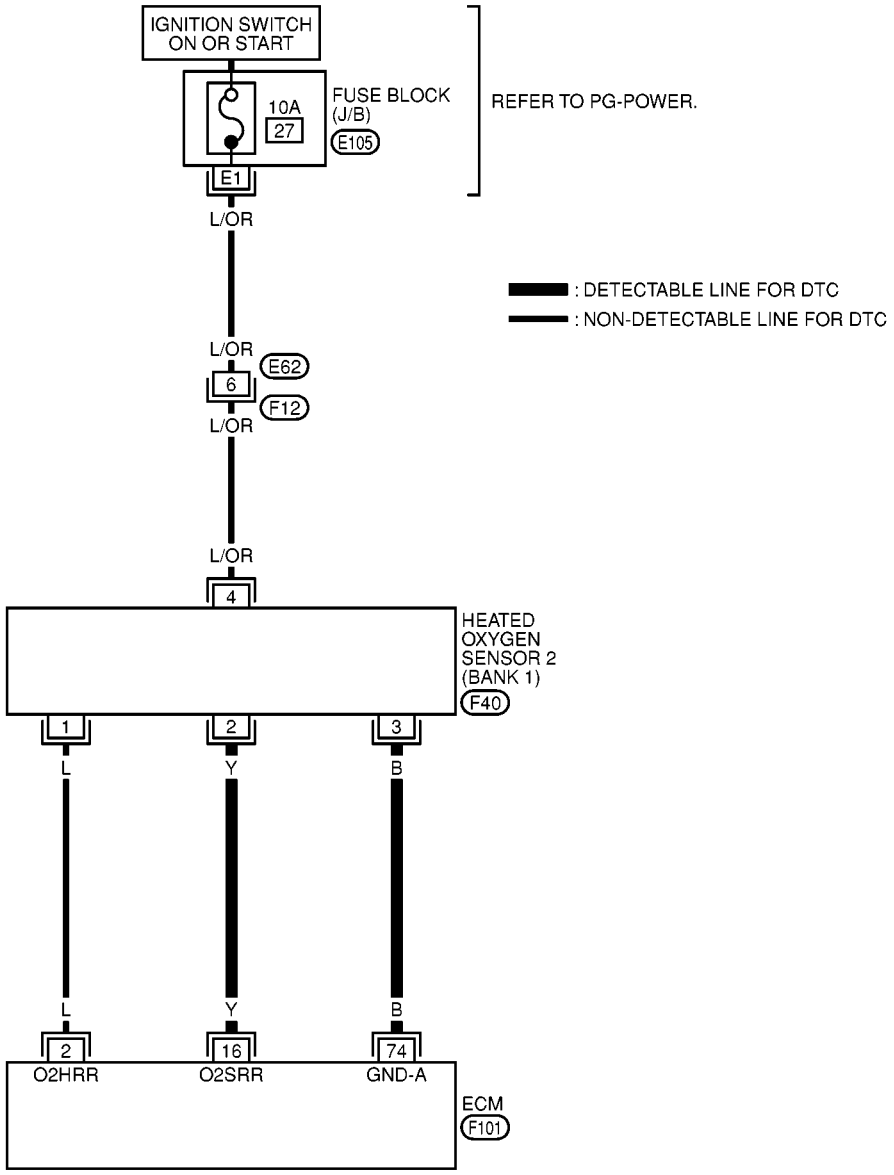
1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Set voltmeter probes between ECM terminal 16 [HO2S2 (B1) signal] or 17 [HO2S2 (B2) signal] and engine ground.
4. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be below 0.56V at least once during this procedure.
   If the voltage can be confirmed in step 4, step 5 is not necessary.
5. Keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in “D” position with “OD” OFF (A/T), 3rd gear position (M/T).
   The voltage should be below 0.56V at least once during this procedure.
6. If NG, go to EC-458, "Diagnostic Procedure" .

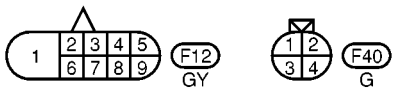


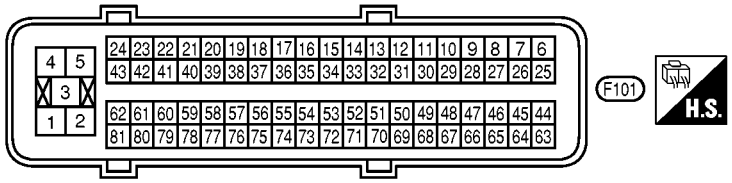
Wiring Diagram
BANK 1

EBS00FTR

EC-O2S2B1-01







REFER TO THE FOLLOWING.
E105 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0056E

Specification data are reference values and are measured between each terminal and ground.

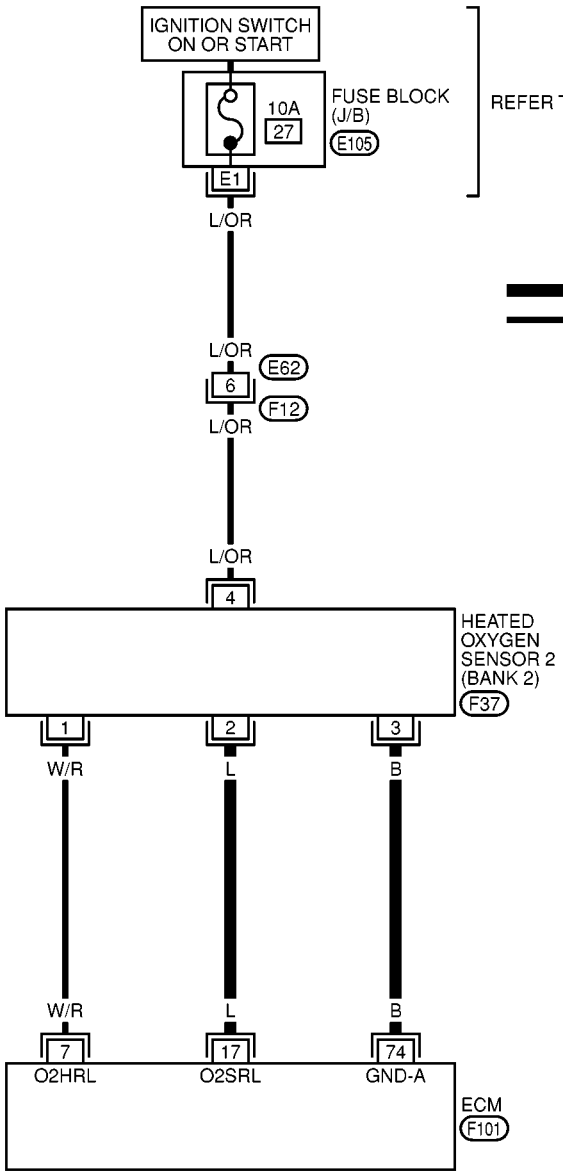
CAUTION:

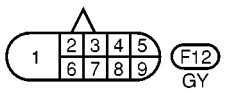
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

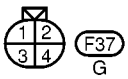
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
16	Y	Heated oxygen sensor 2 (bank 1)	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V
74	B	Heated oxygen sensor ground	**[Engine is running]** ● Idle speed	Approximately 0V

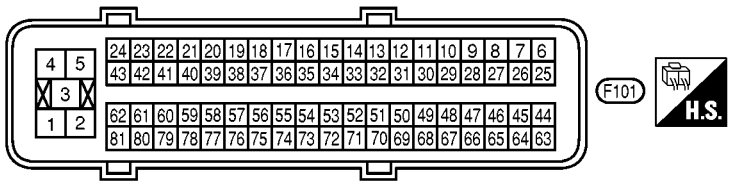
BANK 2

EC-O2S2B2-01









REFER TO THE FOLLOWING.
E105 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0058E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
17	L	Heated oxygen sensor 2 (bank 2)	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V
74	B	Heated oxygen sensor ground	**[Engine is running]** ● Idle speed	Approximately 0V

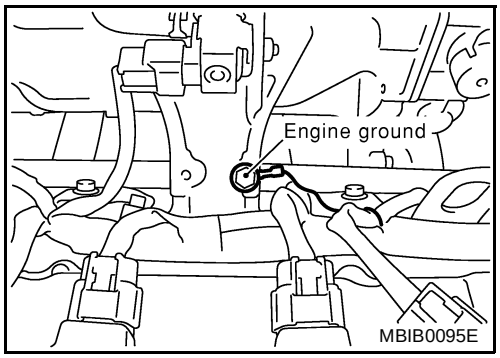
Diagnostic Procedure

EBS00FTS

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

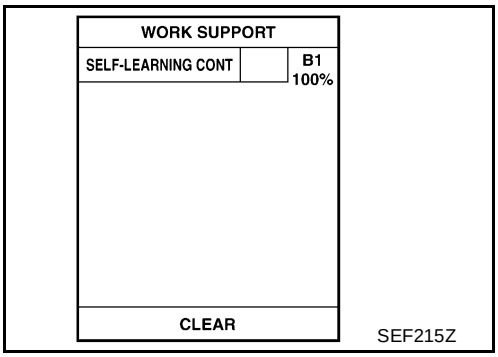
>> GO TO 2.



2. CLEAR THE SELF-LEARNING DATA

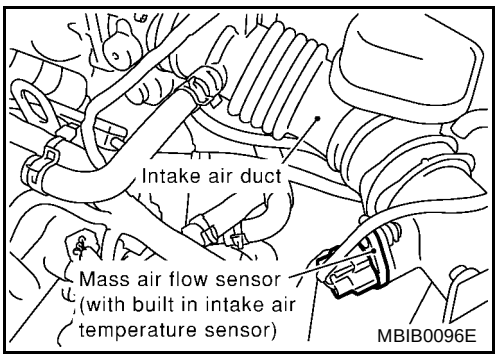
With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching “CLEAR”.
4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0172 or P0175 detected?
   Is it difficult to start engine?



Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF”.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure that DTC P0102 is displayed.
6. Erase the DTC memory. Refer to EC-73, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
7. Make sure that DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0172 or P0175 detected?
   Is it difficult to start engine?



Yes or No

Yes >> Perform trouble diagnosis for DTC P0172, P0175. Refer to EC-305 .
No >> GO TO 3.

3. CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

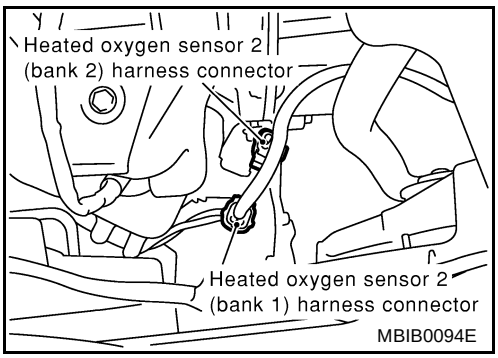
1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 2 harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminal 74 and HO2S2 terminal 3.
   Refer to Wiring Diagram.

   Continuity should exist.

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.



4. CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal and HO2S2 terminal as follows. Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM	Sensor	
P1146	16	2	1
P1166	17	2	2

Continuity should exist.

2. Check harness continuity between the following terminals and ground. Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM	Sensor	
P1146	16	2	1
P1166	17	2	2

Continuity should not exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK HEATED OXYGEN SENSOR 2

Refer to EC-460, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace heated oxygen sensor 2.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

EBS00FTT

HEATED OXYGEN SENSOR 2

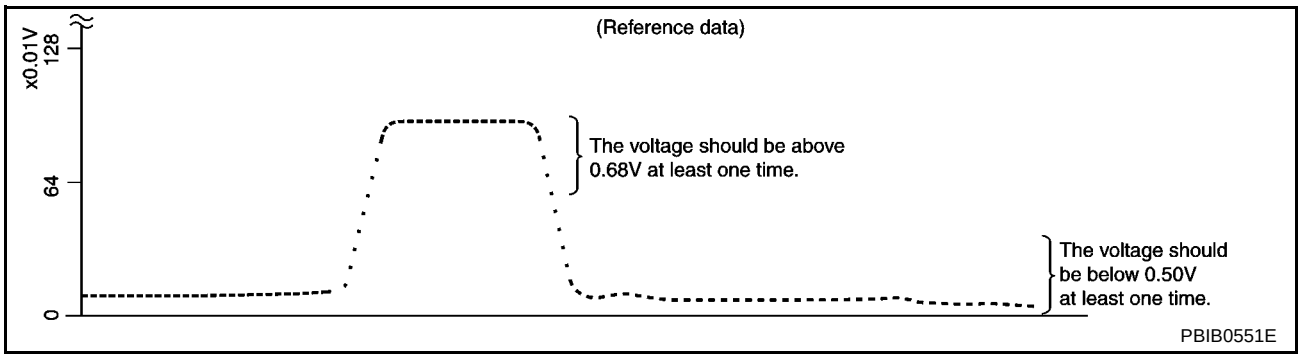
With CONSULT-II

1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)/(B2)” as the monitor item with CONSULT-II.

ACTIVE TEST	
FUEL INJECTION	25 %
MONITOR	
ENG SPEED	XXX rpm
HO2S1 (B1)	XXX V
HO2S2 (B1)	XXX V
HO2S1 MNTR (B1)	RICH
HO2S2 MNTR (B1)	RICH

SEF662Y

4. Check “HO2S2 (B1)/(B2)” at idle speed when adjusting “FUEL INJECTION” to ±25%.



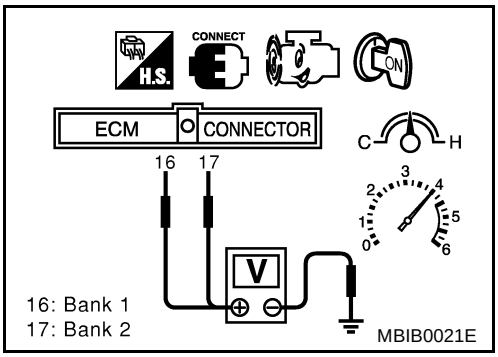
“HO2S2 (B1)/(B2)” should be above 0.68V at least once when the “FUEL INJECTION” is +25%.
“HO2S2 (B1)/(B2)” should be below 0.56V at least once when the “FUEL INJECTION” is −25%.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Set voltmeter probes between ECM terminal 16 [HO2S2 (B1) signal] or 17 [HO2S2 (B2) signal] and engine ground.
4. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be above 0.68V at least once during this procedure.
   If the voltage is above 0.68V at step 4, step 5 is not necessary.
5. Keep vehicle at idling for 10 minutes, then check voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in “D” position with “OD” OFF (A/T), 3rd gear position (M/T).
   The voltage should be below 0.56V at least once during this procedure.
6. If NG, replace heated oxygen sensor 2.



CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

EBS00FTU

HEATED OXYGEN SENSOR 2

Refer to EX-3, "EXHAUST SYSTEM" .

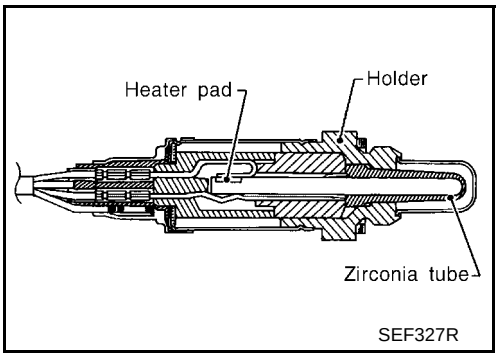
DTC P1147 HO2S2 (QG16DE)

PFP:226A0

Component Description

EBS00FTV

The heated oxygen sensor 2, after three way catalyst, monitors the oxygen level in the exhaust gas.
Even if switching characteristics of the heated oxygen sensor 1 are shifted, the air fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.
This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.
Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.



CONSULT-II Reference Value in Data Monitor Mode

EBS00FTW

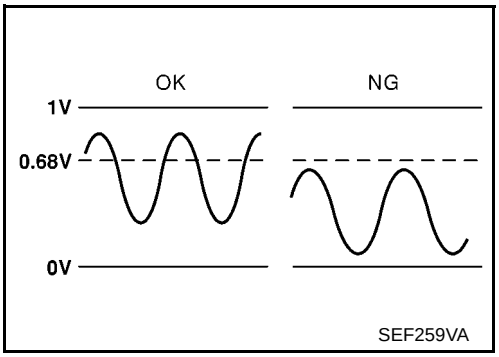
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S2 (B1)	● Engine: After warming up	Revving engine from idle to 3,000 rpm quickly.	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S2 MNTR (B1)	● Engine: After warming up	Revving engine from idle to 3,000 rpm quickly.	LEAN ←→ RICH

On Board Diagnosis Logic

EBS00FTY

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the heated oxygen sensor 1. The oxygen storage capacity before the three way catalyst causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the maximum voltage of the sensor is sufficiently high during the various driving condition such as fuel-cut.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1147 1147	Heated oxygen sensor 2 maximum voltage monitoring	The maximum voltage from the sensor is not reached to the specified voltage.	● Harness or connectors (The sensor circuit open or shorted.) ● Heated oxygen sensor 2 ● Fuel pressure ● Injectors ● Intake air leaks

DTC Confirmation Procedure

EBS00FTZ

CAUTION:
Always drive vehicle at a safe speed.

NOTE:

- **“COMPLETED” will appear on CONSULT-II screen when all tests “COND1”, “COND2” and “COND3” are completed.**
- If “DTC confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

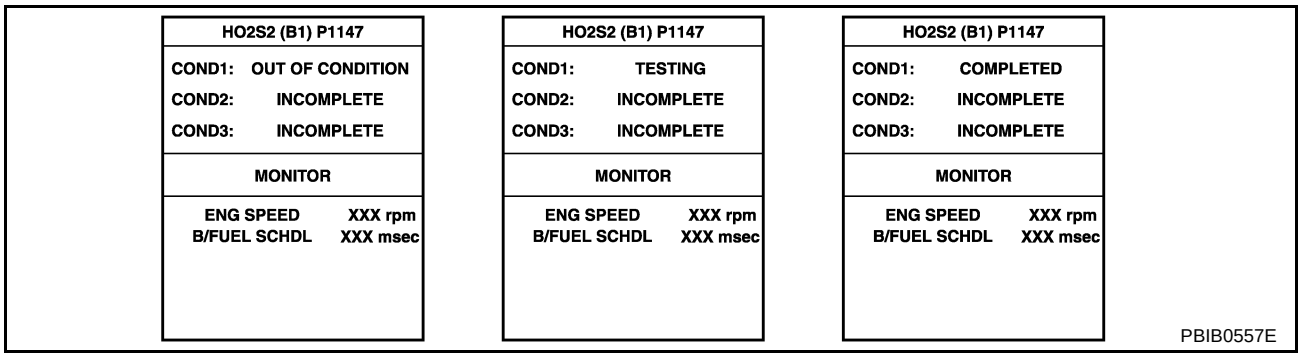
TESTING CONDITION:
Never stop engine during this procedure. If the engine is stopped, retry procedure from step 2 in “Procedure for COND1”

WITH CONSULT-II

Procedure for COND1

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Turn ignition switch “ON” and select “HO2S2 (B1) P1147” of “HO2S2” in “DTC WORK SUPPORT” mode with CONSULT-II.
4. Touch “START”.
5. Start engine and let it idle for at least 30 seconds.
6. Rev engine up to 2,000 rpm 2 or 3 times quickly under no load.
   If “COMPLETED” appears on CONSULT-II screen, go to step 2 in “Procedure for COND3”.
   If “COMPLETED” does not appear on CONSULT-II screen, go to the following step.
7. Drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
8. When the following conditions are met, “TESTING” will be displayed at COND1” on the CONSULT-II screen. Maintain the conditions continuously until “TESTING” changes to “COMPLETED”. (It will take approximately 60 seconds.)

ENG SPEED	More than 1,000 rpm
B/FUEL SCHDL	More than 1.0 msec
COOLANT TEMP/S	70 - 105°C
Selector lever	Suitable position



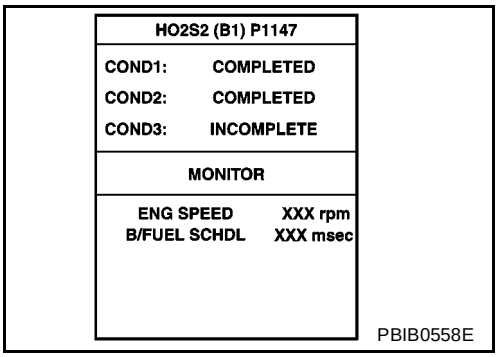
NOTE:

- **If “TESTING” is not displayed after 5 minutes, retry from step 2 in “Procedure for COND1”.**
- **If “COMPLETED” already appears at “COND2” on CONSULT-II screen before “Procedure for COND2” is conducted, it is unnecessary to conduct step 1 in “Procedure for COND2”.**

Procedure for COND2

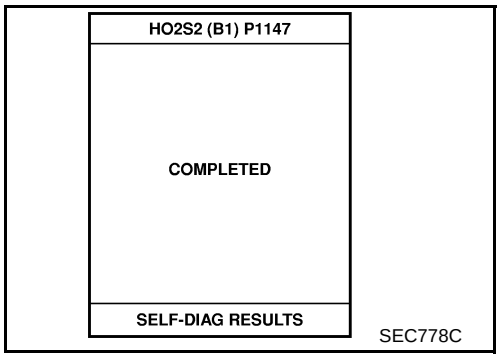
1. While driving, release accelerator pedal completed from the above condition [step 8] until “INCOMPLETE” at “COND2” on CONSULT-II screen has turned to “COMPLETED” (It will take approximately 4 seconds.)

   NOTE:
   If “COMPLETE” already appears at “COND3” on CONSULT-II screen before “Procedure for COND3” is conducted, it is unnecessary to conduct step 1 in “Procedure for COND3”.



Procedure for COND3

1. Stop vehicle and let it idle until “INCOMPLETE” of “COND3” on CONSULT-II screen has turned to “COMPLETED”. (It will take a maximum of approximately 6 minutes.)
2. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”.
   If “NG” is displayed, refer to EC-466, "Diagnostic Procedure" .



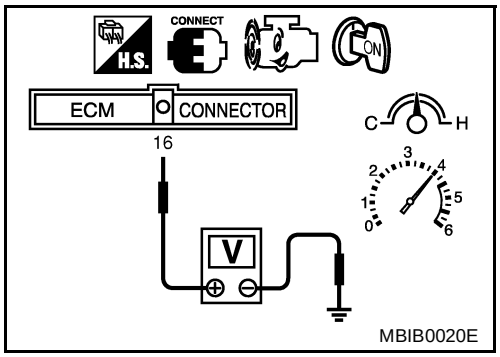
Overall Function Check

EBS00FU0

Use this procedure to check the overall function of the heated oxygen sensor 2 circuit. During this check, a 1st trip DTC might not be confirmed.

WITH GST

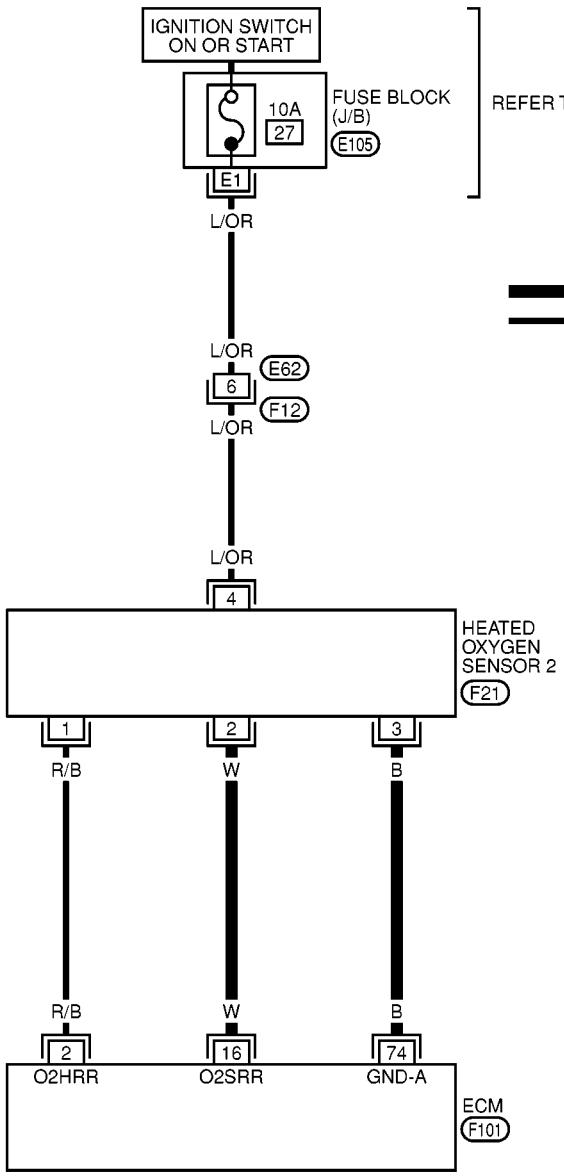
1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Set voltmeter probes between ECM terminal 16 (HO2S2 signal) and engine ground.
4. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be above 0.68V at least once during this procedure.
   If the voltage can be confirmed in step 4, step 5 is not necessary.
5. Keep vehicle idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in 3rd gear position.
   The voltage should be above 0.68V at least once during this procedure.
6. If NG, go to EC-466, "Diagnostic Procedure" .

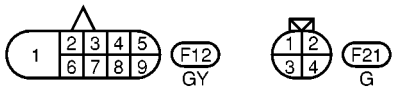


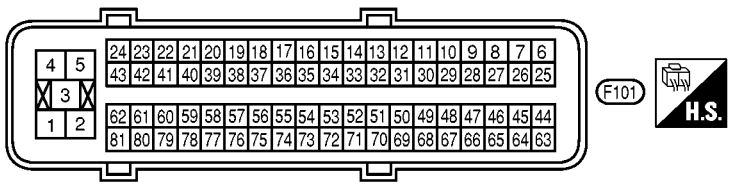
Wiring Diagram

EBS00FU1

EC-HO2S2-01







REFER TO THE FOLLOWING.
E105 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0050E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
16	W	Heated oxygen sensor 2	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V
74	B	Heated oxygen sensor ground	**[Engine is running]** ● Idle speed	Approximately 0V

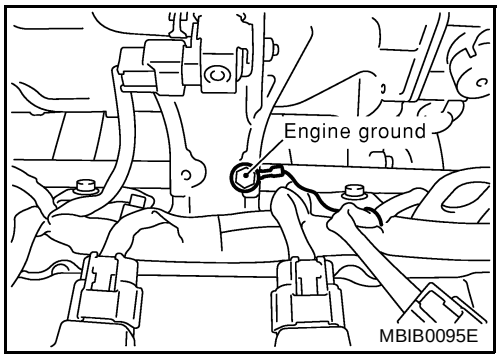
Diagnostic Procedure

EBS00FU2

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

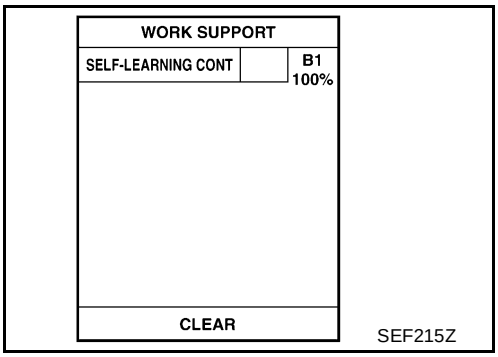
>> GO TO 2.



2. CLEAR THE SELF-LEARNING DATA

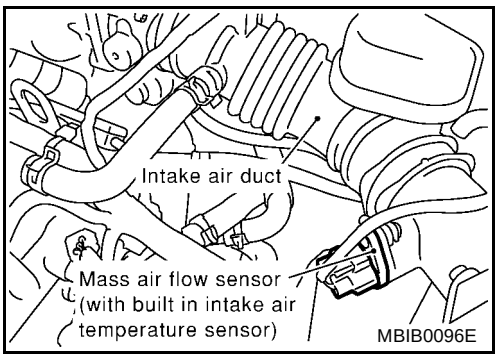
With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching “CLEAR”.
4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 detected?
   Is it difficult to start engine?



Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF”.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure that DTC P0102 is displayed.
6. Erase the DTC memory. Refer to EC-73, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
7. Make sure that DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 detected?
   Is it difficult to start engine?



Yes or No

Yes >> Perform trouble diagnosis for DTC P0171. Refer to EC-285 .
No >> GO TO 3.

3. CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

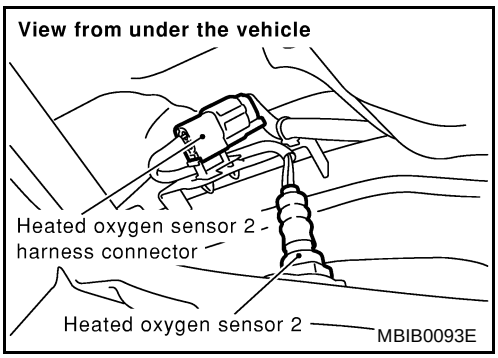
1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 2 harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminal 74 and HO2S2 terminal 3.
   Refer to Wiring Diagram.

   Continuity should exist.

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.



4. CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 16 and HO2S2 terminal 2.
   Refer to Wiring Diagram.

   Continuity should exist.

2. Check harness continuity between ECM terminal 16 or HO2S2 terminal 2 and ground.
   Refer to Wiring Diagram.

   Continuity should not exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK HEATED OXYGEN SENSOR 2

Refer to EC-468, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace heated oxygen sensor 2.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

EBS00FU3

HEATED OXYGEN SENSOR 2

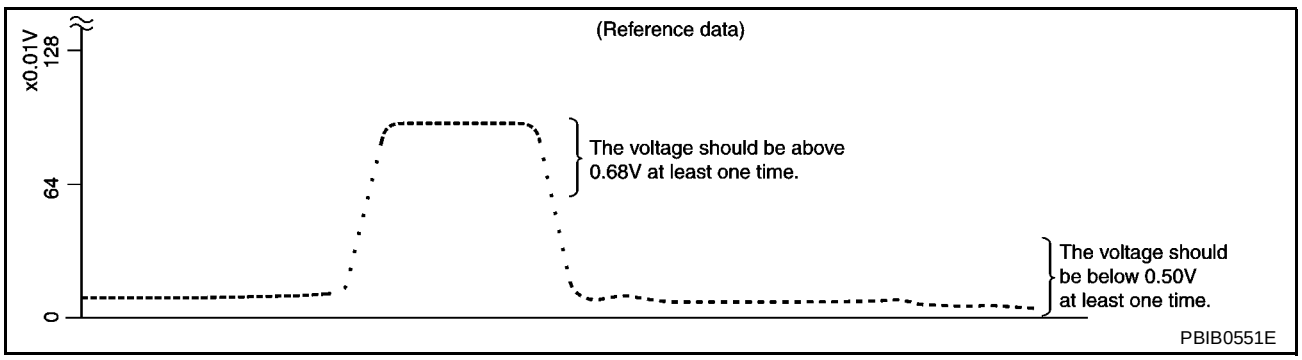
With CONSULT-II

1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)” as the monitor item with CONSULT-II.

ACTIVE TEST	
FUEL INJECTION	25 %
MONITOR	
ENG SPEED	XXX rpm
HO2S1 (B1)	XXX V
HO2S2 (B1)	XXX V
HO2S1 MNTR (B1)	RICH
HO2S2 MNTR (B1)	RICH

SEF662Y

4. Check “HO2S2 (B1)” at idle speed when adjusting “FUEL INJECTION” to ±25%.



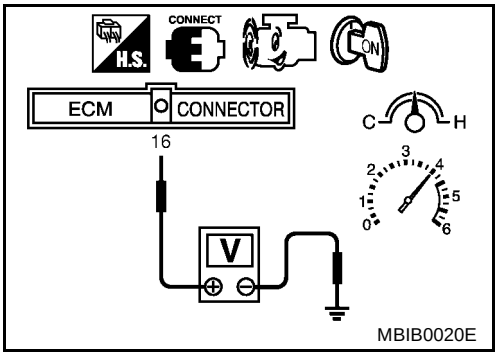
"HO2S2 (B1)" should be above 0.68V at least once when the "FUEL INJECTION" is +25%.
"HO2S2 (B1)" should be below 0.56V at least once when the "FUEL INJECTION" is −25%.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Set voltmeter probes between ECM terminal 16 (HO2S2 signal) and engine ground.
4. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be above 0.68V at least once during this procedure.
   If the voltage is above 0.68V at step 4, step 5 is not necessary.
5. Keep vehicle idling for 10 minutes, then check voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in 3rd gear position.
   The voltage should be below 0.56V at least once during this procedure.
6. If NG, replace heated oxygen sensor 2.



CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

EBS00FU4

HEATED OXYGEN SENSOR 2

Refer to EX-3, "EXHAUST SYSTEM" .

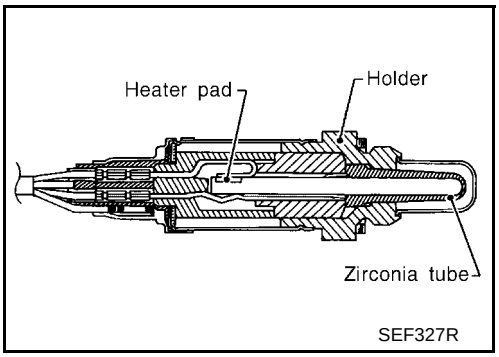
DTC P1147, P1167 HO2S2 (QG18DE)

PFP:226A0

Component Description

EBS00FU5

The heated oxygen sensor 2, after three way catalyst, monitors the oxygen level in the exhaust gas on each bank.
Even if switching characteristics of the heated oxygen sensor 1 are shifted, the air fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.
This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.
Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.



CONSULT-II Reference Value in Data Monitor Mode

EBS00FU6

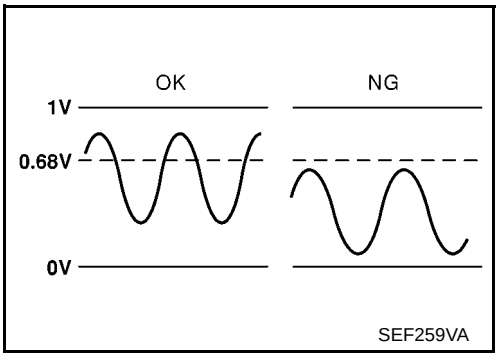
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S2 (B1) HO2S2 (B2)	● Engine: After warming up	Revving engine from idle to 3,000 rpm quickly.	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S2 MNTR (B1) HO2S2 MNTR (B2)	● Engine: After warming up	Revving engine from idle to 3,000 rpm quickly.	LEAN ←→ RICH

On Board Diagnosis Logic

EBS00FU8

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the heated oxygen sensor 1. The oxygen storage capacity before the three way catalyst causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the maximum voltage of the sensor is sufficiently high during the various driving condition such as fuel-cut.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1147 1147 (Bank 1) P1167 1167 (Bank 2)	Heated oxygen sensor 2 maximum voltage monitoring	The maximum voltage from the sensor is not reached to the specified voltage.	● Harness or connectors (The sensor circuit is open or shorted.) ● Heated oxygen sensor 2 ● Fuel pressure ● Injectors ● Intake air leaks

DTC Confirmation Procedure

EBS00FU9

CAUTION:
Always drive vehicle at a safe speed.

NOTE:

- **“COMPLETED” will appear on CONSULT-II screen when all tests “COND1”, “COND2” and “COND3” are completed.**
- If “DTC confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

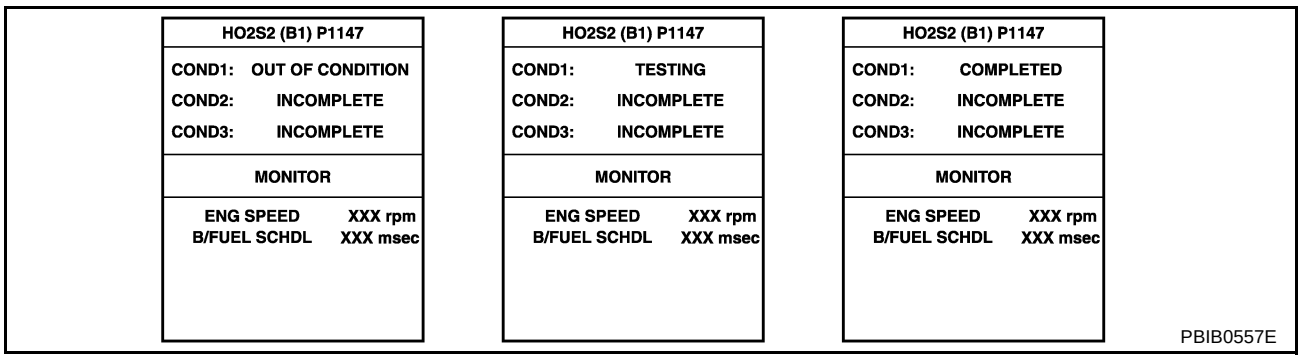
Never stop engine during this procedure. If the engine is stopped, retry procedure from step 2 in "Procedure for COND1"

WITH CONSULT-II

Procedure for COND1

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch "OFF" and wait at least 10 seconds.
3. Turn ignition switch "ON" and select "HO2S2 (B1) P1147" or "HO2S2 (B2) P1167" of "HO2S2" in "DTC WORK SUPPORT" mode with CONSULT-II.
4. Touch "START".
5. Start engine and let it idle for at least 30 seconds.
6. Rev engine up to 2,000 rpm 2 or 3 times quickly under no load.
   If "COMPLETED" appears on CONSULT-II screen, go to step 2 in "Procedure for COND3".
   If "COMPLETED" does not appear on CONSULT-II screen, go to the following step.
7. Drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
8. When the following conditions are met, "TESTING" will be displayed at "COND1" on the CONSULT-II screen. Maintain the conditions continuously until "TESTING" changes to "COMPLETED". (It will take approximately 60 seconds.)

ENG SPEED	More than 1,000 rpm
B/FUEL SCHDL	More than 1.0 msec
COOLANT TEMP/S	70 - 105°C
Selector lever	Suitable position



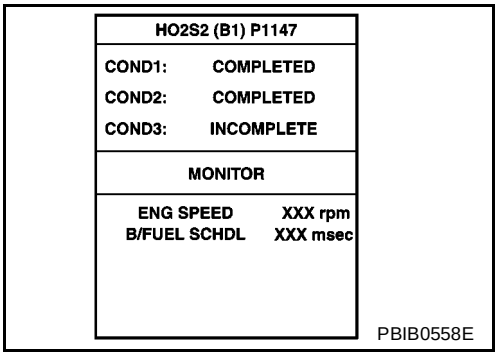
NOTE:

- **If "TESTING" is not displayed after 5 minutes, retry from step 2 in Procedure for COND1".**
- **If "COMPLETED" already appears at "COND2" on CONSULT-II screen before "Procedure for COND2" is conducted, it is unnecessary to conduct step 1 in "Procedure for COND2".**

Procedure for COND2

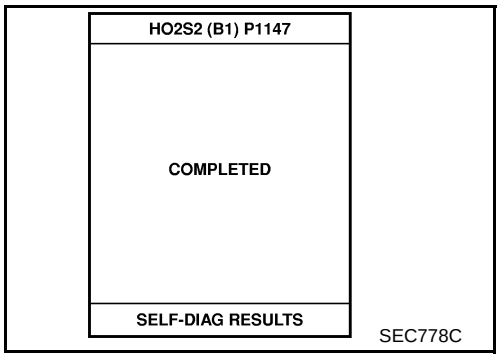
1. While driving, release accelerator pedal completed with "OD" OFF (A/T models only) from the above condition [step 8] until "INCOMPLETE" at "COND2" on CONSULT-II screen has turned to "COMPLETED" (It will take approximately 4 seconds.)

   NOTE:
   If "COMPLETE" already appears at "COND3" on CONSULT-II screen before "Procedure for COND3" is conducted, it is unnecessary to conduct step 1 in "Procedure for COND3".



Procedure for COND3

1. Stop vehicle and let it idle until “INCOMPLETE” of “COND3” on CONSULT-II screen has turned to “COMPLETED”. (It will take a maximum of approximately 6 minutes.)
2. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”.
   If “NG” is displayed, refer to EC-476, "Diagnostic Procedure" .



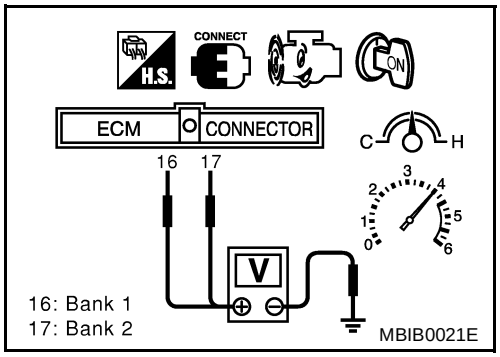
Overall Function Check

EBS00FUA

Use this procedure to check the overall function of the heated oxygen sensor 2 circuit. During this check, a 1st trip DTC might not be confirmed.

WITH GST

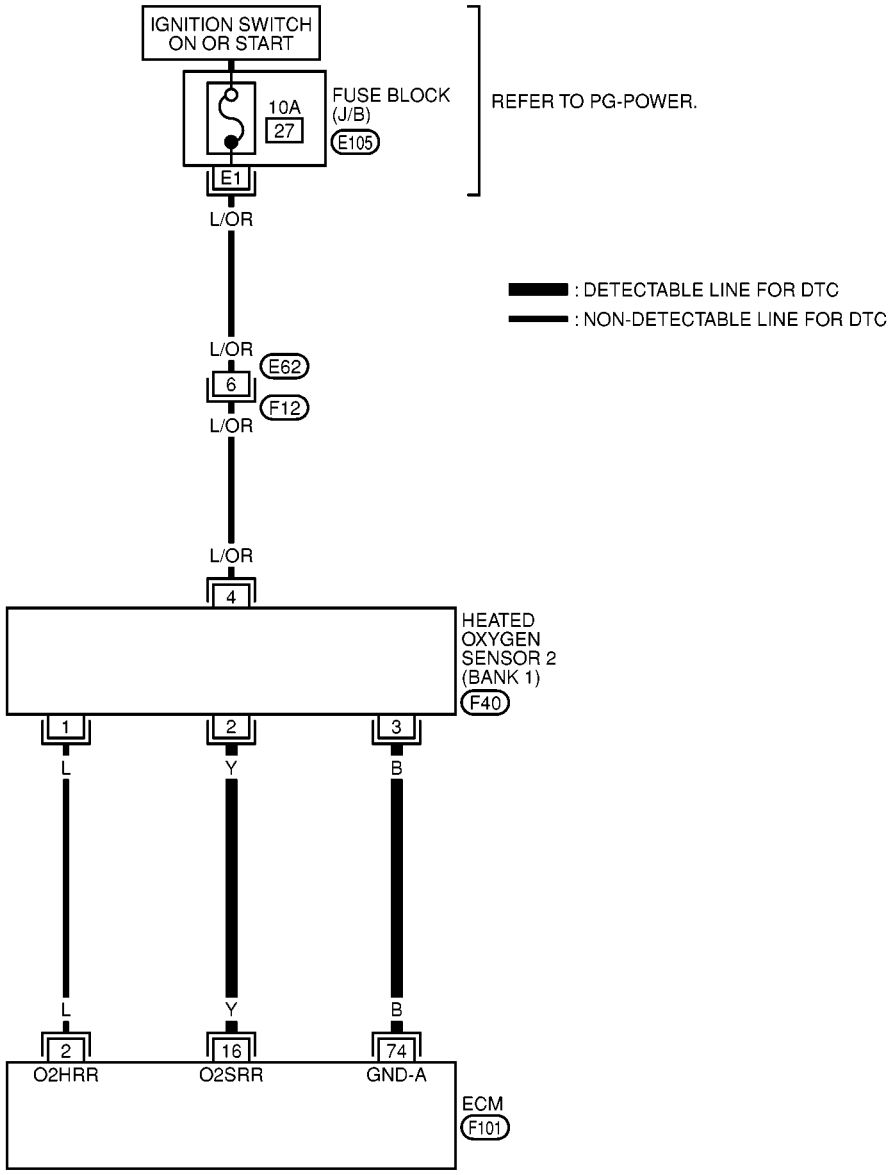
1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Set voltmeter probes between ECM terminal 16 [HO2S2 (B1) signal] or 17 [HO2S2 (B2) signal] and engine ground.
4. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be above 0.68V at least once during this procedure.
   If the voltage can be confirmed in step 4, step 5 is not necessary.
5. Keep vehicle idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in “D” position with “OD” OFF (A/T), 3rd gear position (M/T).
   The voltage should be above 0.68V at least once during this procedure.
6. If NG, go to EC-476, "Diagnostic Procedure" .

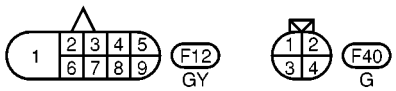


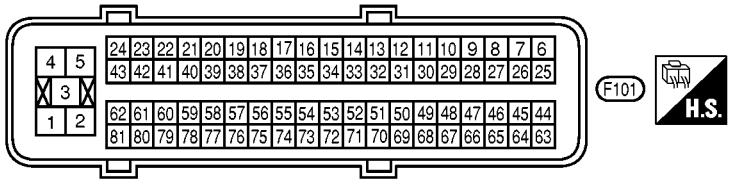
Wiring Diagram
BANK 1

EBS00FUB

EC-O2S2B1-01







REFER TO THE FOLLOWING.
E105 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0056E

Specification data are reference values and are measured between each terminal and ground.

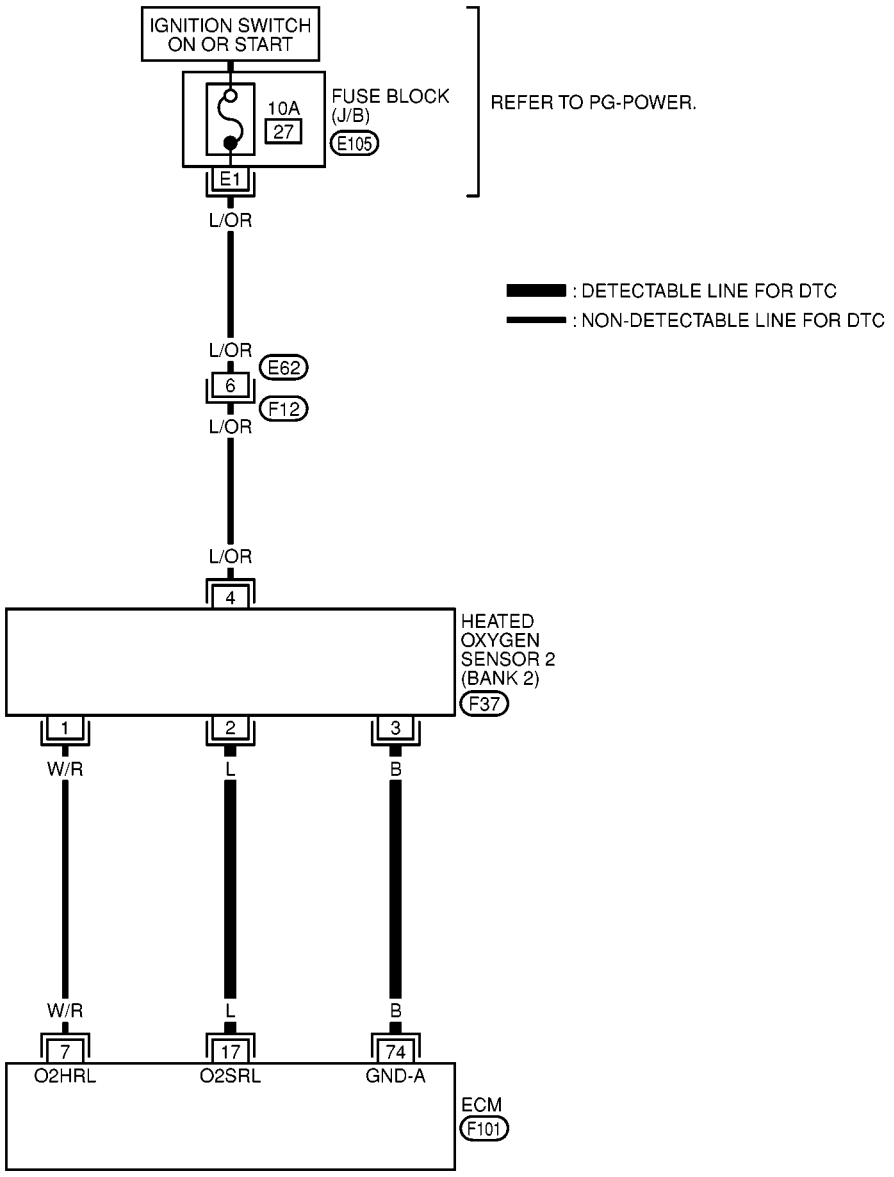
CAUTION:

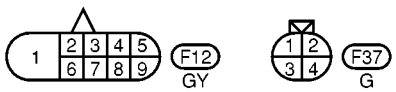
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

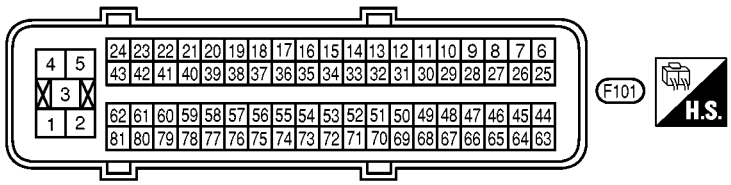
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
16	Y	Heated oxygen sensor 2 (bank 1)	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V
74	B	Heated oxygen sensor ground	**[Engine is running]** ● Idle speed	Approximately 0V

BANK 2

EC-O2S2B2-01







REFER TO THE FOLLOWING.
E105 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0058E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
17	L	Heated oxygen sensor 2 (bank 2)	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V
74	B	Heated oxygen sensor ground	**[Engine is running]** ● Idle speed	Approximately 0V

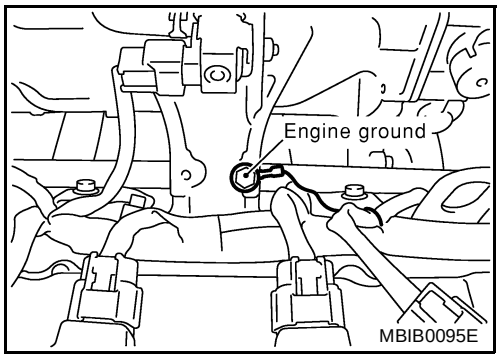
Diagnostic Procedure

EBS00FUC

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

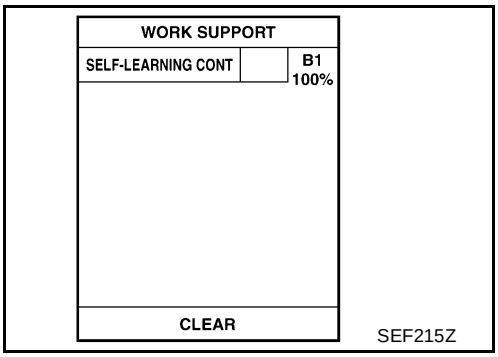
>> GO TO 2.



2. CLEAR THE SELF-LEARNING DATA

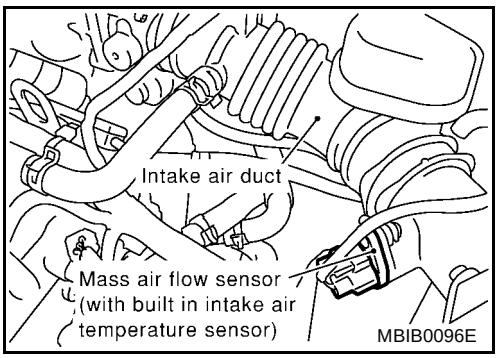
With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching “CLEAR”.
4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 or P0174 detected?
   Is it difficult to start engine?



Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF”.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure that DTC P0102 is displayed.
6. Erase the DTC memory. Refer to EC-73, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
7. Make sure that DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 or P0174 detected?
   Is it difficult to start engine?



Yes or No

Yes >> Perform trouble diagnosis for DTC P0171, P0174. Refer to EC-291 .
No >> GO TO 3.

3. CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

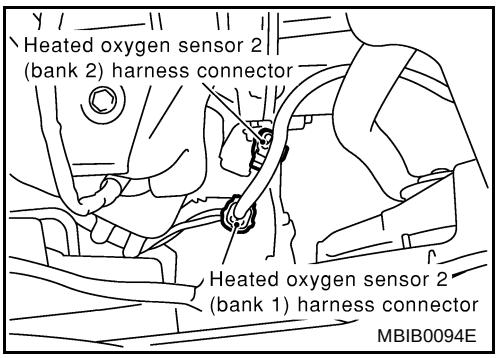
1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 2 harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminal 74 and HO2S2 terminal 3.
   Refer to Wiring Diagram.

   Continuity should exist.

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.



4. CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal and HO2S2 terminal as follows. Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM	Sensor	
P1147	16	2	1
P1167	17	2	2

Continuity should exist.

2. Check harness continuity between the following terminals and ground. Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM	Sensor	
P1147	16	2	1
P1167	17	2	2

Continuity should not exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK HEATED OXYGEN SENSOR 2

Refer to EC-478, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace heated oxygen sensor 2.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

EBS00FUD

HEATED OXYGEN SENSOR 2

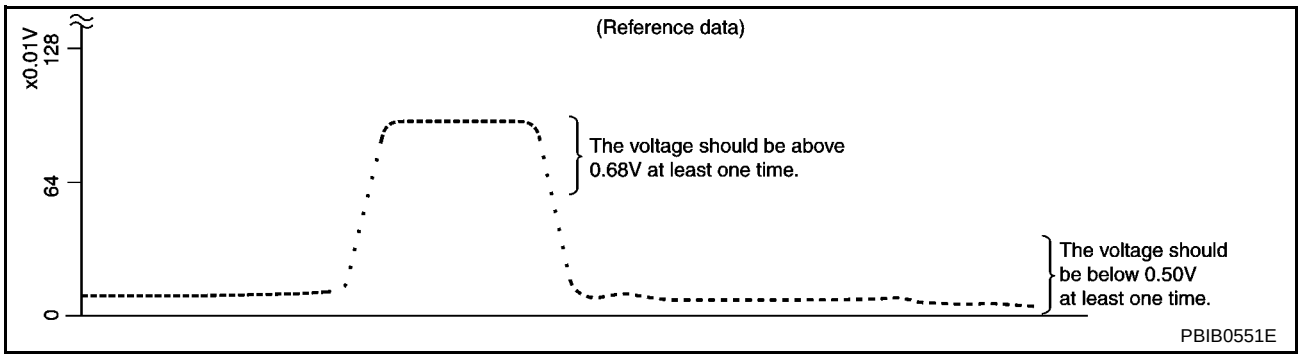
With CONSULT-II

1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)/(B2)” as the monitor item with CONSULT-II.

ACTIVE TEST	
FUEL INJECTION	25 %
MONITOR	
ENG SPEED	XXX rpm
HO2S1 (B1)	XXX V
HO2S2 (B1)	XXX V
HO2S1 MNTR (B1)	RICH
HO2S2 MNTR (B1)	RICH

SEF662Y

4. Check “HO2S2 (B1)/(B2)” at idle speed when adjusting “FUEL INJECTION” to ±25%.



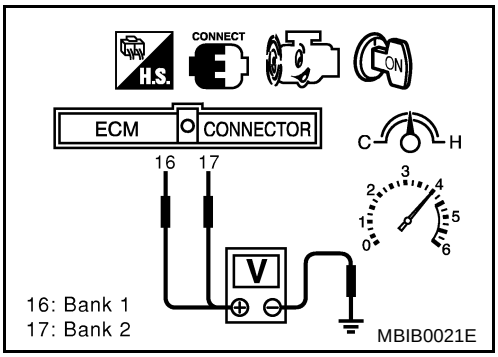
“HO2S2 (B1)/(B2)” should be above 0.68V at least once when the “FUEL INJECTION” is +25%.
“HO2S2 (B1)/(B2)” should be below 0.56V at least once when the “FUEL INJECTION” is −25%.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Set voltmeter probes between ECM terminal 16 [HO2S2 (B1) signal] or 17 [HO2S2 (B2) signal] and engine ground.
4. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be above 0.68V at least once during this procedure.
   If the voltage is above 0.68V at step 4, step 5 is not necessary.
5. Keep vehicle idling for 10 minutes, then check voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in “D” position with “OD” OFF (A/T), 3rd gear position (M/T).
   The voltage should be below 0.56V at least once during this procedure.
6. If NG, replace heated oxygen sensor 2.



CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

EBS00FUE

HEATED OXYGEN SENSOR 2

Refer to EX-3, "EXHAUST SYSTEM" .

DTC P1217 ENGINE OVER TEMPERATURE

PFP:00000

System Description

EBS00EQD

NOTE:
If DTC P1217 is displayed with DTC U1000, U1001, first perform the trouble diagnosis for DTC U1000, U1001. Refer to EC-150, "DTC U1000, U1001 CAN COMMUNICATION LINE" .

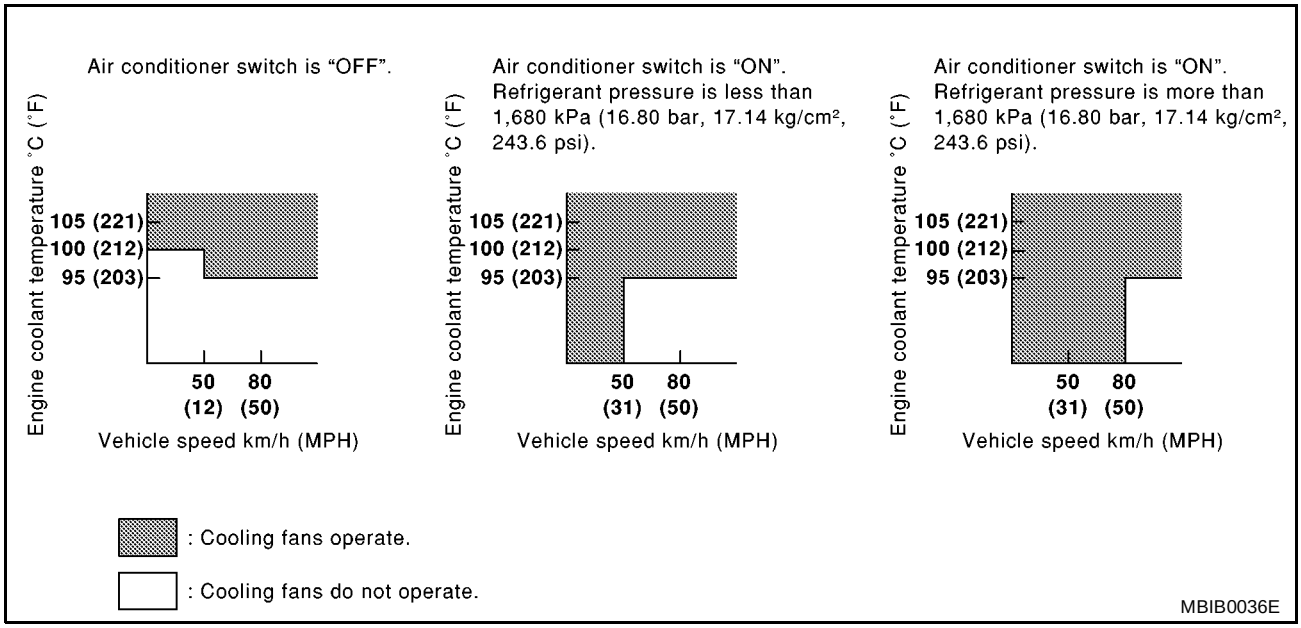
COOLING FAN CONTROL

Sensor	Input Signal to ECM	ECM Function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*1	Cooling fan control	Cooling fan relay(s)
Battery	Battery voltage*1		
Vehicle speed signal	Vehicle speed*2		
Engine coolant temperature sensor	Engine coolant temperature		
Air conditioner switch	Air conditioner “ON” signal*2		
Refrigerant pressure sensor	Refrigerant pressure		

*1: The ECM determines the start signal status by the signals of engine speed and battery voltage.
*2: These signals are sent to the ECM through CAN communication line.

The ECM controls the cooling fan corresponding to the vehicle speed, engine coolant temperature, refrigerant pressure, and air conditioner ON signal. The control system has 2-step control [ON/OFF].
The ECM sends a cooling fan control signal to the smart entrance control unit through CAN communication line, and the smart entrance control unit controls cooling fan relays.

OPERATION



CONSULT-II Reference Value in Data Monitor Mode

EBS00EQE

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
AIR COND SIG	● Engine: After warming up, idle the engine	Air conditioner switch: OFF	OFF
		Air conditioner switch: ON (Compressor operates.)	ON
COOLING FAN	● Engine: After warming up, idle the engine ● Air conditioner switch: OFF	Engine coolant temperature is 99°C (210°F) or less	OFF
		Engine coolant temperature is 100°C (212°F) or more	ON

On Board Diagnosis Logic

EBS00EQF

If the cooling fan or another component in the cooling system malfunctions, engine coolant temperature will rise. When the engine coolant temperature reaches an abnormally high temperature condition, a malfunction is indicated.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1217 1217	Engine over temperature (Overheat)	● Cooling fan does not operate properly (Overheat). ● Cooling fan system does not operate properly (Overheat). ● Engine coolant was not added to the system using the proper filling method.	● Harness or connectors (The cooling fan circuit is open or shorted.) ● Harness or connectors (The CAN communication line is open or shorted.) ● Cooling fan ● Radiator hose ● Radiator ● Radiator cap ● Water pump ● Thermostat For more information, refer to EC-488, "Main 12 Causes of Overheating" .

CAUTION:

When a malfunction is indicated, be sure to replace the coolant. Refer to CO-8, "Changing Engine Coolant" . Also, replace the engine oil. Refer to LU-7, "Changing Engine Oil" .

1. **Fill radiator with coolant up to specified level with a filling speed of 2 liters per minute. Be sure to use coolant with the proper mixture ratio. Refer to MA-18, "Engine Coolant Mixture Ratio" .**
2. **After refilling coolant, run engine to ensure that no water-flow noise is emitted.**

Overall Function Check

EBS00EQG

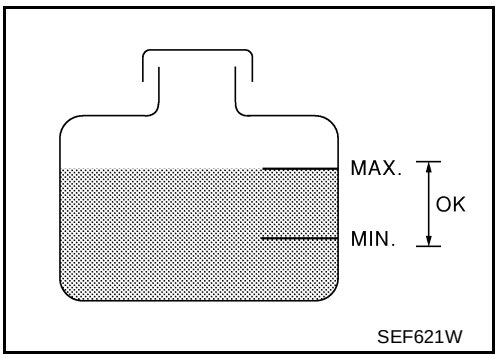
Use this procedure to check the overall function of the cooling fan. During this check, a DTC might not be confirmed.

WARNING:

Never remove the radiator cap when the engine is hot. Serious burns could be caused by high pressure fluid escaping from the radiator.
Wrap a thick cloth around cap. Carefully remove the cap by turning it a quarter turn to allow built-up pressure to escape. Then turn the cap all the way off.

WITH CONSULT-II

1. Check the coolant level in the reservoir tank and radiator.
   Allow engine to cool before checking coolant level.
   If the coolant level in the reservoir tank and/or radiator is below the proper range, skip the following steps and go to EC-484, "Diagnostic Procedure" .
2. Confirm whether customer filled the coolant or not. If customer filled the coolant, skip the following steps and go to EC-484, "Diagnostic Procedure" .
3. Turn ignition switch “ON”.



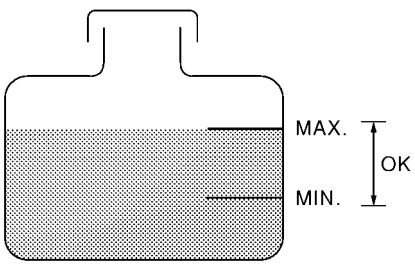
4. Perform “COOLING FAN” in “ACTIVE TEST” mode with CONSULT-II.
5. If the results are NG, go to EC-484, "Diagnostic Procedure" .

ACTIVE TEST	
COOLING FAN	ON
MONITOR	
COOLAN TEMP/S	XXX °C

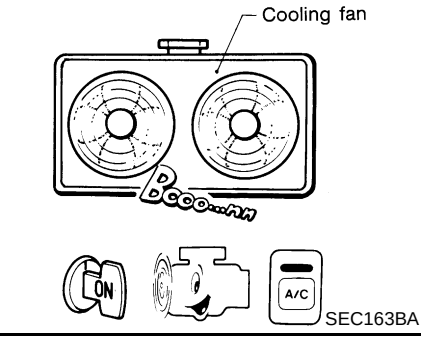
MBIB0037E

WITH GST

1. Check the coolant level in the reservoir tank and radiator.
   Allow engine to cool before checking coolant level.
   If the coolant level in the reservoir tank and/or radiator is below the proper range, skip the following steps and go to EC-484, "Diagnostic Procedure" .
2. Confirm whether customer filled the coolant or not. If customer filled the coolant, skip the following steps and go to EC-484, "Diagnostic Procedure" .
3. Start engine.
   Be careful not to overheat engine.
4. Turn air conditioner switch “ON”.
5. Turn blower fan switch “ON”.
6. Make sure that cooling fans operate.
   If NG, go to EC-484, "Diagnostic Procedure" .



SEF621W

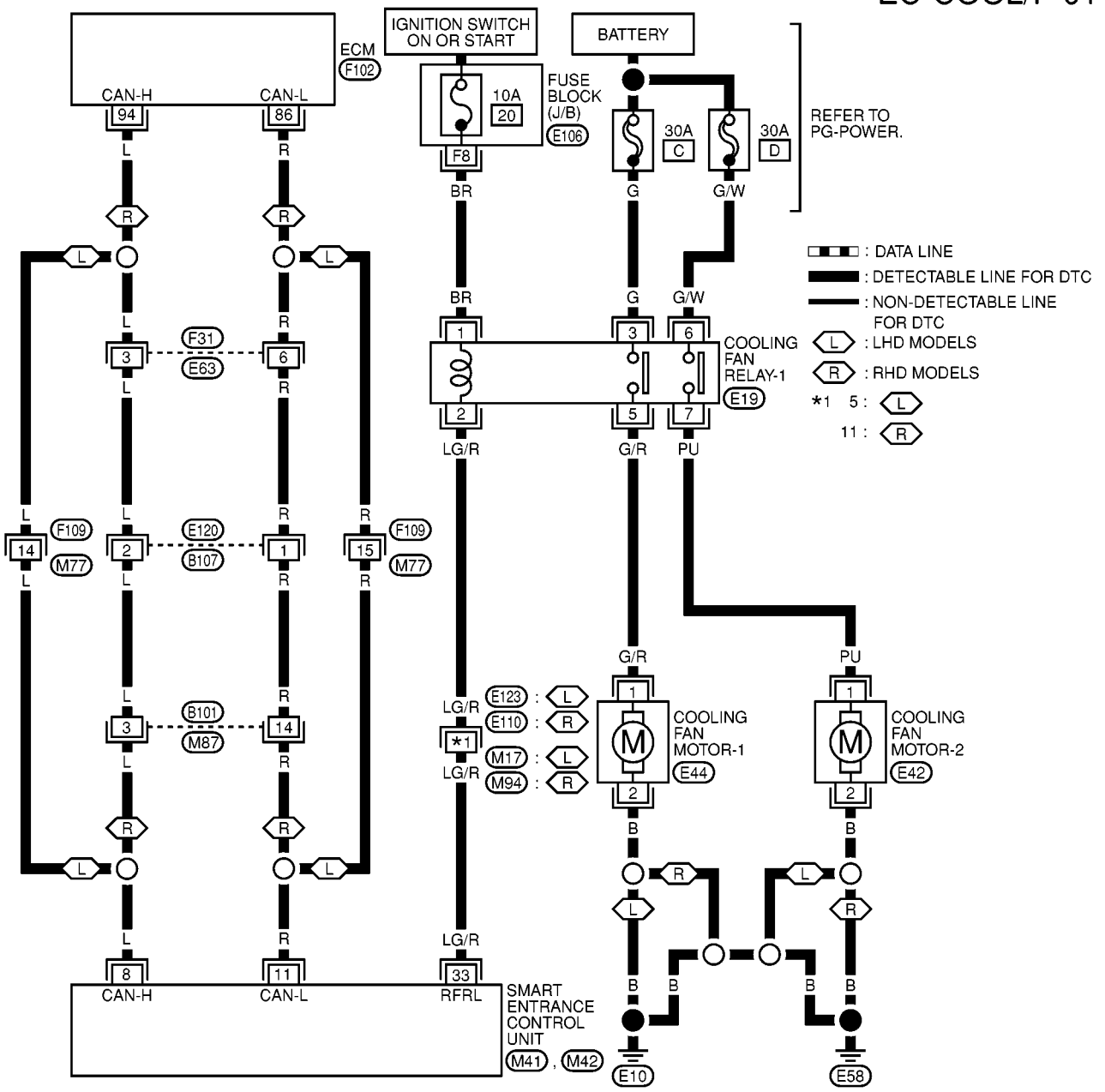


SEC163BA

Wiring Diagram

EBS00EQH

EC-COOL/F-01



MBWA0068E

Diagnostic Procedure

EBS00EQI

1. INSPECTION START

Do you have CONSULT-II?

Yes or No

Yes >> GO TO 2.
No >> GO TO 3.

2. CHECK COOLING FAN OPERATION

With CONSULT-II

1. Start engine and let it idle.
2. Select “COOLING FAN” in “ACTIVE TEST” mode with CONSULT-II and touch “ON” on the CONSULT-II screen.
3. Make sure that cooling fans-1 and -2 operate.

OK or NG

OK >> GO TO 4.
NG >> Check cooling fan control circuit. (Go to EC-486, "PROCEDURE A" .)

ACTIVE TEST	
COOLING FAN	ON
MONITOR	
COOLAN TEMP/S	XXX °C

MBIB0037E

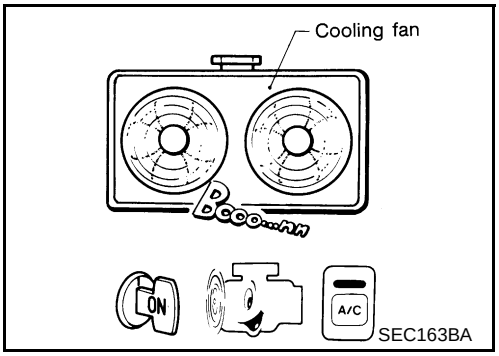
3. CHECK COOLING FAN OPERATION

Without CONSULT-II

1. Start engine and let it idle.
2. Turn air conditioner switch “ON”.
3. Turn blower fan switch “ON”.
4. Make sure that cooling fans-1 and -2 operate.

OK or NG

OK >> GO TO 4.
NG >> Check cooling fan control circuit. (Go to EC-486, "PROCEDURE A" .)



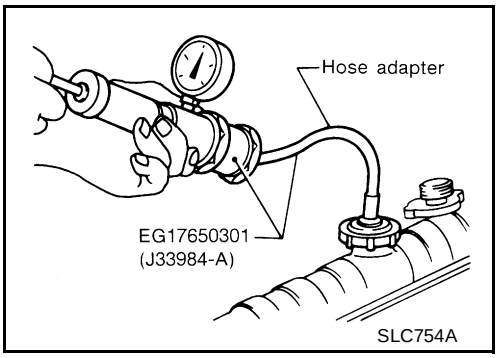
SEC163BA

4. CHECK COOLING SYSTEM FOR LEAK

Apply pressure to the cooling system with a tester, and check if the pressure drops.

Testing pressure: 157 kPa (1.6 kg/cm^2 , 23 psi)

CAUTION:
Higher than the specified pressure may cause radiator damage.
Pressure should not drop.



OK or NG

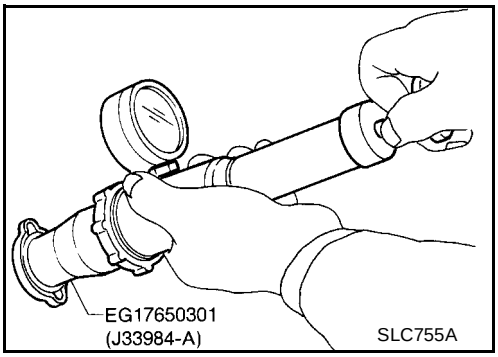
OK >> GO TO 5.
NG >> Check the following for leak

- Hose
- Radiator
- Water pump
  Refer to CO-18, "WATER PUMP" .

5. CHECK RADIATOR CAP

Apply pressure to cap with a tester.

Radiator cap relief pressure: 59 - 98 kPa (0.6 - 1.0 kg/cm^2 , 9 - 14 psi)



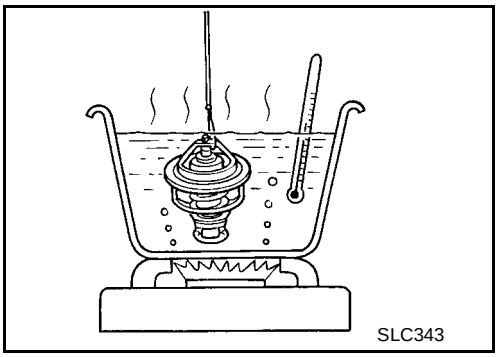
OK or NG

OK >> GO TO 6.
NG >> Replace radiator cap.

6. CHECK THERMOSTAT

1. Check valve seating condition at normal room temperatures.
   It should seat tightly.
2. Check valve opening temperature and valve lift.

Valve opening temperature: 82°C (180°F) [standard]
Valve lift: More than 8 mm/95°C (0.31 in/203°F)



3. Check if valve is closed at 5°C (9°F) below valve opening temperature.

For details, refer to CO-20, "THERMOSTAT AND THERMOSTAT HOUSING" .

OK or NG

OK >> GO TO 7.
NG >> Replace thermostat

7. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-198, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> Replace engine coolant temperature sensor.

8. CHECK MAIN 12 CAUSES

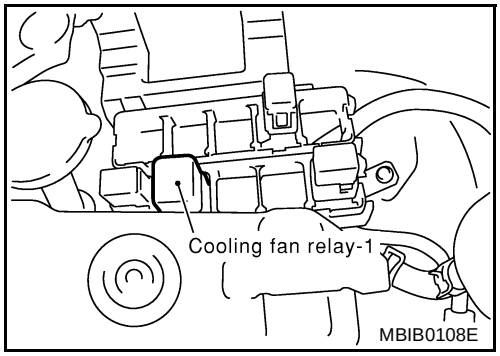
If the cause cannot be isolated, go to EC-488, "Main 12 Causes of Overheating" .

>> **INSPECTION END**

PROCEDURE A

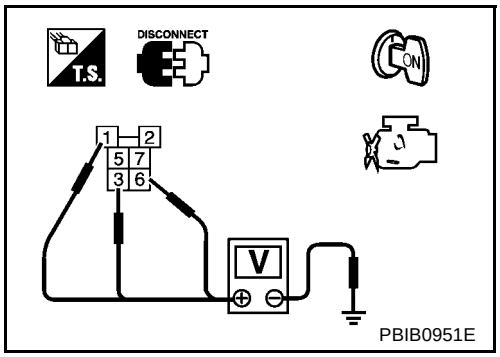
1. CHECK COOLING FAN POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect cooling fan relay-1.
3. Turn ignition switch “ON”.



4. Check voltage between cooling fan relay-1 terminals 1, 3, 6 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector E106
- 10A fuse
- 30A fusible links
- Harness for open or short between cooling fan relay-1 and fuse
- Harness for open or short between cooling fan relay-1 and battery

>> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK COOLING FAN MOTORS CIRCUIT

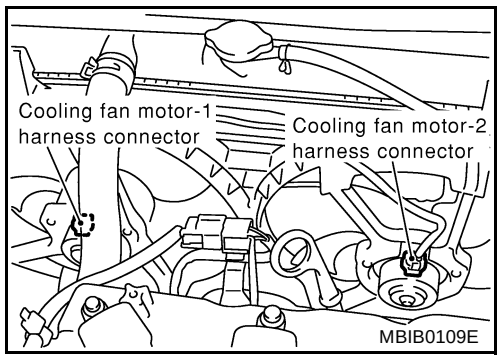
1. Turn ignition switch “OFF”.
2. Disconnect cooling fan motor-1 harness connector and cooling fan motor-2 harness connector.
3. Check harness continuity between cooling fan relay-1 terminal 5 and cooling fan motor-1 terminal 1, cooling fan motor-1 terminal 2 and body ground.
   Refer to Wiring Diagram.

   Continuity should exist.

4. Also check harness for short to ground and short to power.
5. Check harness continuity between cooling fan relay-1 terminal 7 and cooling fan motor-2 terminal 1, cooling fan motor-2 terminal 2 and body ground.
   Refer to Wiring Diagram.

   Continuity should exist.

6. Also check harness for short to ground and short to power.



OK or NG

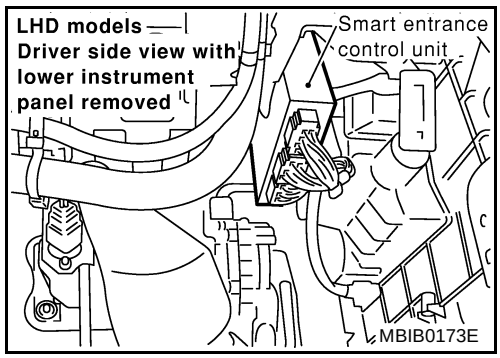
OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK COOLING FAN OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect smart entrance control unit.
2. Check harness continuity between smart entrance control unit terminal 33 and cooling fan relay-1 terminal 2.
   Refer to Wiring Diagram.

   Continuity should exist.

3. Also check harness for short to ground and short to power.



OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E123, M17 (LHD models)
- Harness connectors E110, M94 (RHD models)
- Harness for open or short between smart entrance control unit and cooling fan relay-1

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK COOLING FAN RELAY-1

Refer to EC-489, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace cooling fan relay.

7. CHECK COOLING FAN MOTORS

Refer to EC-489, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> Replace cooling fan motors.

8. CHECK SMART ENTRANCE CONTROL UNIT

Refer to EC-489, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> Replace smart entrance control unit.

9. CHECK INTERMITTENT INCIDENT

Perform EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Main 12 Causes of Overheating

EBS00EQJ

Engine	Step	Inspection item	Equipment	Standard	Reference page
OFF	1	● Blocked radiator ● Blocked condenser ● Blocked radiator grille ● Blocked bumper	● Visual	No blocking	—
	2	● Coolant mixture	● Coolant tester	50 - 50% coolant mixture	See MA-18, "Engine Coolant Mixture Ratio" .
	3	● Coolant level	● Visual	Coolant up to MAX level in reservoir tank and radiator filler neck	See MA-20, "Changing Engine Coolant" .
	4	● Radiator cap	● Pressure tester	59 - 98 kPa (0.6 - 1.0 kg/cm^2 , 9 - 14 psi) (Limit)	See MA-22, "CHECKING RADIATOR CAP" .
ON*2	5	● Coolant leaks	● Visual	No leaks	See MA-23, "CHECKING COOLING SYSTEM FOR LEAKS" .
ON*2	6	● Thermostat	● Touch the upper and lower radiator hoses	Both hoses should be hot	See CO-20, "THERMOSTAT AND THERMOSTAT HOUSING" , and CO-11, "RADIATOR" .
ON*1	7	● Cooling fan	● CONSULT-II	Operating	See trouble diagnosis for DTC P1217 (EC-480).
OFF	8	● Combustion gas leak	● Color checker chemical tester 4 Gas analyzer	Negative	—
ON*3	9	● Coolant temperature gauge	● Visual	Gauge less than 3/4 when driving	—
		● Coolant overflow to reservoir tank	● Visual	No overflow during driving and idling	See MA-20, "Changing Engine Coolant" .
OFF*4	10	● Coolant return from reservoir tank to radiator	● Visual	Should be initial level in reservoir tank	See CO-8, "LEVEL CHECK" .

Engine	Step	Inspection item	Equipment	Standard	Reference page
OFF	11	● Cylinder head	● Straight gauge feeler gauge	0.1 mm (0.004 in) Maximum distortion (warping)	See EM-57, "CYLINDER HEAD" .
	12	● Cylinder block and pistons	● Visual	No scuffing on cylinder walls or piston	See EM-57, "CYLINDER HEAD" .

*1: Turn the ignition switch ON.
*2: Engine running at 3,000 rpm for 10 minutes.
*3: Drive at 90 km/h (55 MPH) for 30 minutes and then let idle for 10 minutes.
*4: After 60 minutes of cool down time.
For more information, refer to CO-5, "OVERHEATING CAUSE ANALYSIS" .

Component Inspection

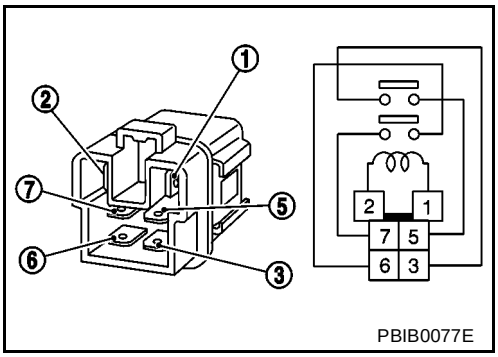
EBS00EQK

COOLING FAN RELAY-1

1. Apply 12V direct current between relay terminals 1 and 2.
2. Check continuity between relay terminals 3 and 5, 6 and 7.

Condition	Continuity
12V direct current supply between terminals 1 and 2	Yes
OFF	No

3. If NG, replace cooling fan relay.



PBIB0077E

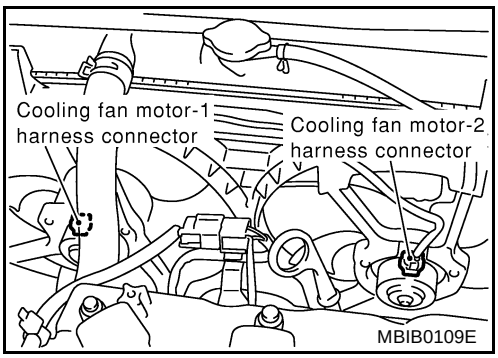
COOLING FAN MOTORS-1 AND -2

1. Disconnect cooling fan motor harness connectors.
2. Supply cooling fan motor terminals with battery voltage and check operation.

	Terminals	
	(+)	(–)
Cooling fan motor	1	2

Cooling fan motor should operate.

3. If NG, replace cooling fan motor.



MBIB0109E

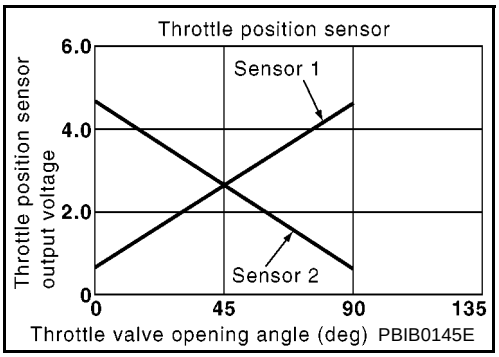
DTC P1223, P1224 TP SENSOR

PFP:16119

Component Description

EBS00EQL

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.
The throttle position sensor has the two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.



CONSULT-II Reference Value in Data Monitor Mode

EBS00EQM

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
THRTL SEN2	● Ignition switch: ON (Engine stopped) ● Shift lever: D (A/T model) 1st (M/T model)	Accelerator pedal: Fully released	More than 0.36V
		Accelerator pedal: Fully depressed	Less than 4.75V

On Board Diagnosis Logic

EBS00EQN

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1223 1223	Throttle position sensor 2 circuit low input	An excessively low voltage from the TP sensor 2 is sent to ECM.	● Harness or connectors (The TP sensor 2 circuit is open or shorted.) ● Electric throttle control actuator (TP sensor 2)
P1224 1224	Throttle position sensor 2 circuit high input	An excessively high voltage from the TP sensor 2 is sent to ECM.	

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters in fail-safe mode and the MI lights up.

Engine operation condition in fail-safe mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.

DTC Confirmation Procedure

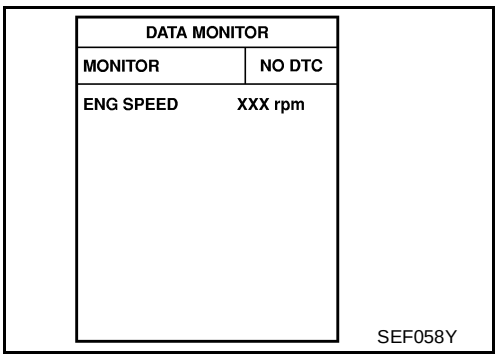
EBS00EQO

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 8V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.

2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-493, "Diagnostic Procedure" .



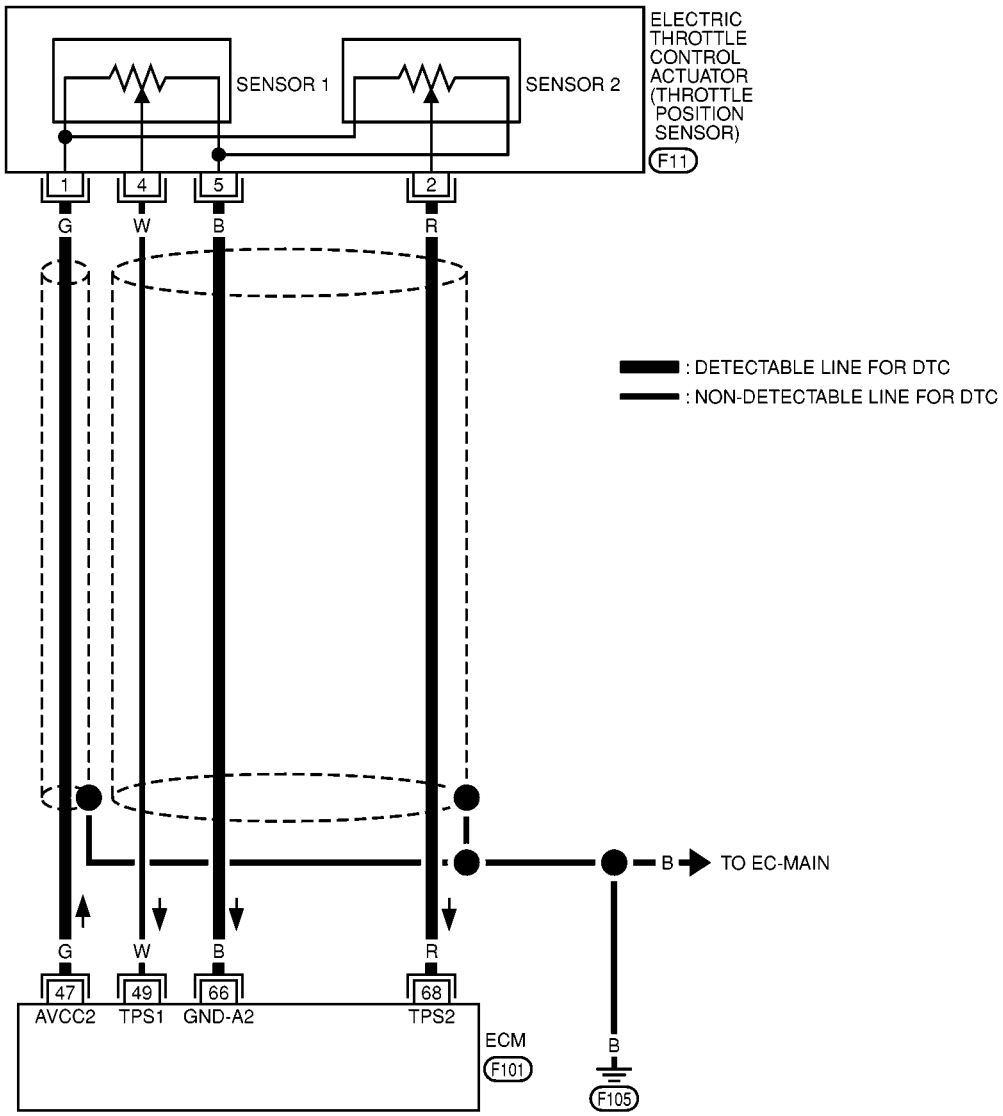
WITH GST

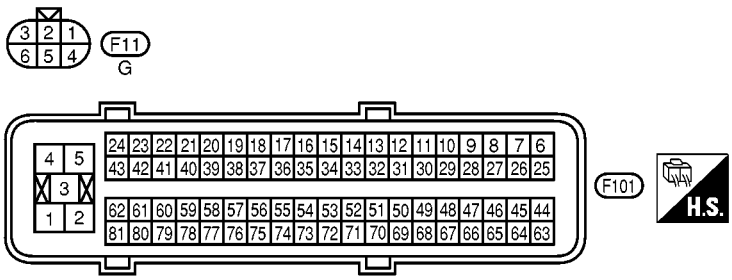
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

EBS00EQP

EC-TPS2-01





MBWA0137E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
47	G	Sensor power supply (Throttle position sensor)	**[Ignition switch "ON"]**	Approximately 5V
49	W	Throttle position sensor 1	**[Ignition switch "ON"]** ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully released	More than 0.36V
			[Ignition switch "ON"] ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully depressed	Less than 4.75V
66	B	Sensor ground (Throttle position sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
68	R	Throttle position sensor 2	**[Ignition switch "ON"]** ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully released	Less than 4.75V
			[Ignition switch "ON"] ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully depressed	More than 0.36V

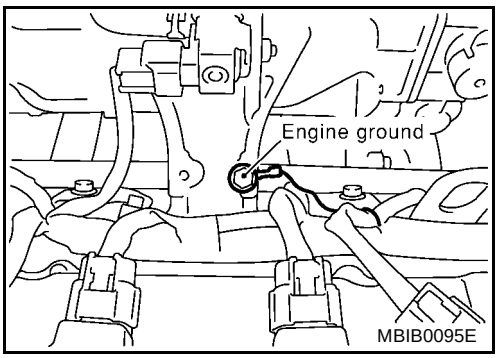
Diagnostic Procedure

EBS00EQQ

1. RETIGHTEN GROUND SCREWS

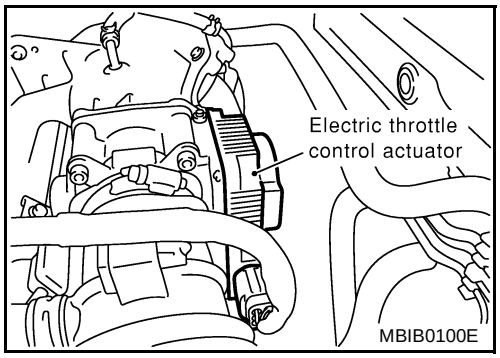
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



2. CHECK THROTTLE POSITION SENSOR 2 POWER SUPPLY CIRCUIT

1. Disconnect electric throttle control actuator harness connector.
2. Turn ignition switch “ON”.

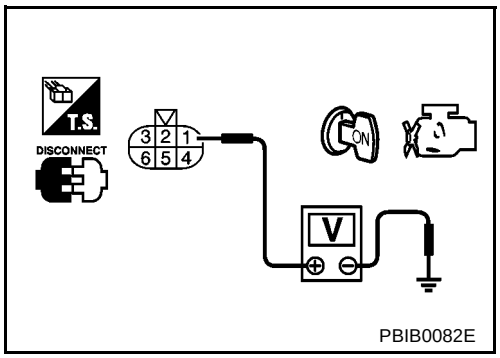


3. Check voltage between electric throttle control actuator terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 5V

OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.



3. CHECK THROTTLE POSITION SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 66 and electric throttle control actuator terminal 5. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK THROTTLE POSITION SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 68 and electric throttle control actuator terminal 2. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK THROTTLE POSITION SENSOR

Refer to EC-495, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-55, "Throttle Valve Closed Position Learning" .
3. Perform EC-55, "Idle Air Volume Learning" .

>> **INSPECTION END**

7. CHECK INTERMITTENT INCIDENT

Refer to EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

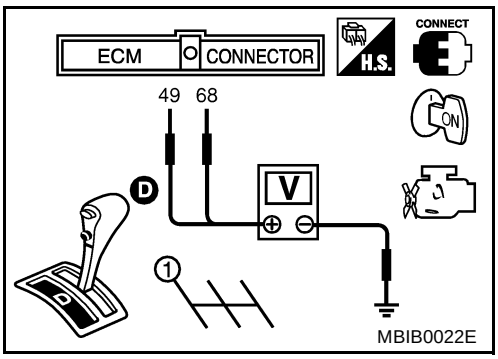
Component Inspection

EBS00EQR

THROTTLE POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Perform EC-55, "Throttle Valve Closed Position Learning" .
3. Turn ignition switch “ON”.
4. Set selector lever to “D” position (A/T models) or “1st” position (M/T models).
5. Check voltage between ECM terminals 49 (TP sensor 1 signal), 68 (TP sensor 2 signal) and engine ground under the following conditions.

Terminal	Accelerator pedal	Voltage
49 (Throttle position sensor 1)	Fully released	More than 0.36V
	Fully depressed	Less than 4.75V
68 (Throttle position sensor 2)	Fully released	Less than 4.75V
	Fully depressed	More than 0.36V



6. If NG, replace electric throttle control actuator and go to the next step.
7. Perform EC-55, "Throttle Valve Closed Position Learning" .
8. Perform EC-55, "Idle Air Volume Learning" .

Remove and Installation

EBS00EQS

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-19, "INTAKE MANIFOLD" .

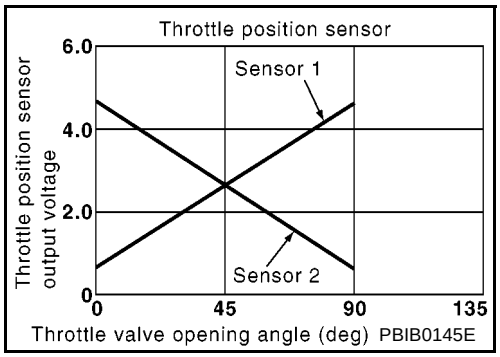
DTC P1225 TP SENSOR

PFP:16119

Component Description

EBS00EQT

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.
The throttle position sensor has the two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.



On Board Diagnosis Logic

EBS00EQU

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1225 1225	Closed throttle position learning performance problem	Closed throttle position learning value is excessively low.	● Electric throttle control actuator (TP sensor 1 and 2)

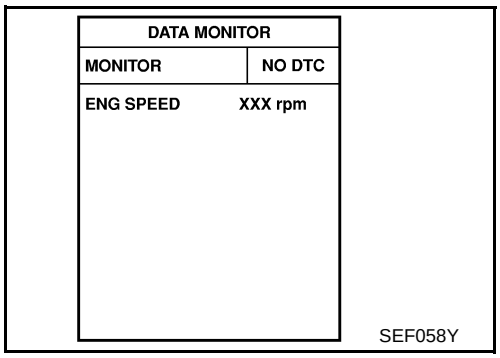
DTC Confirmation Procedure

EBS00EQV

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Turn ignition switch “OFF”, wait at least 10 seconds.
4. Turn ignition switch “ON”.
5. If 1st trip DTC is detected, go to EC-497, "Diagnostic Procedure" .



WITH GST

Follow the procedure “With CONSULT-II” above.

Diagnostic Procedure

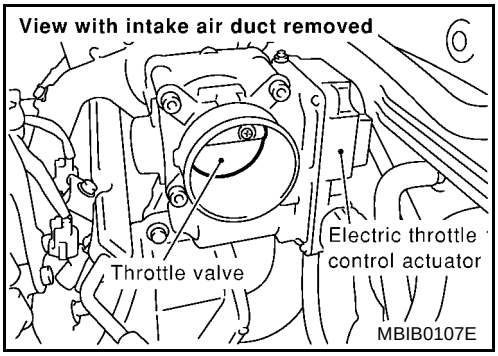
EBS00EQW

1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Turn ignition switch “OFF”.
2. Remove the intake air duct.
3. Check if foreign matter is caught between the throttle valve and the housing.

OK or NG

OK >> GO TO 2.
NG >> Remove the foreign matter and clean the electric throttle control actuator inside.



2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-55, "Throttle Valve Closed Position Learning" .
3. Perform EC-55, "Idle Air Volume Learning" .

>> **INSPECTION END**

Remove and Installation

EBS00EQX

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-19, "INTAKE MANIFOLD" .

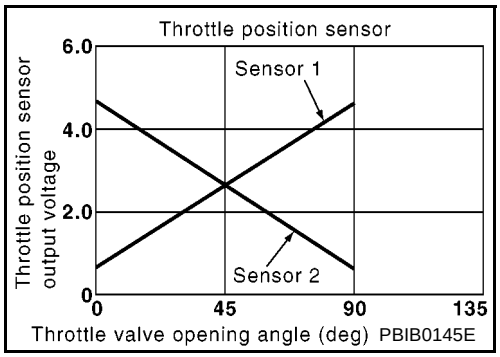
DTC P1226 TP SENSOR

PFP:16119

Component Description

EBS00EQY

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.
The throttle position sensor has the two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.



On Board Diagnosis Logic

EBS00EQZ

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1226 1226	Closed throttle position learning performance problem	Closed throttle position learning is not performed successfully, repeatedly.	● Electric throttle control actuator (TP sensor 1 and 2)

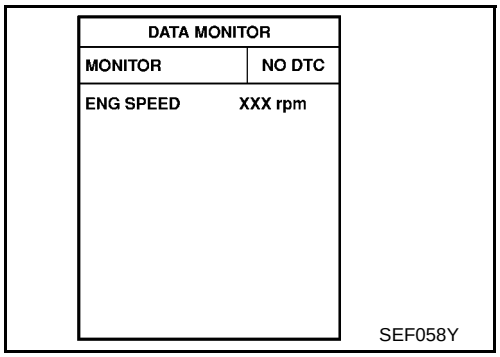
DTC Confirmation Procedure

EBS00ER0

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Turn ignition switch “OFF”, wait at least 10 seconds.
4. Turn ignition switch “ON”.
5. Repeat steps 3 and 4, 32 times.
6. If 1st trip DTC is detected, go to EC-499, "Diagnostic Procedure"
.



WITH GST

Follow the procedure “With CONSULT-II” above.

Diagnostic Procedure

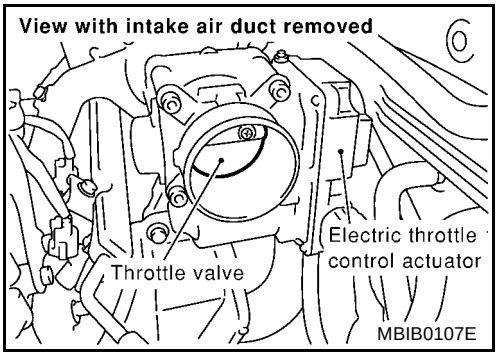
EBS00ER1

1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Turn ignition switch “OFF”.
2. Remove the intake air duct.
3. Check if foreign matter is caught between the throttle valve and the housing.

OK or NG

OK >> GO TO 2.
NG >> Remove the foreign matter and clean the electric throttle control actuator inside.



2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-55, "Throttle Valve Closed Position Learning" .
3. Perform EC-55, "Idle Air Volume Learning" .

>> **INSPECTION END**

Remove and Installation

EBS00ER2

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-19, "INTAKE MANIFOLD" .

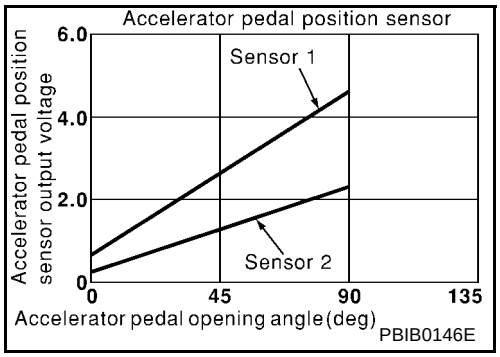
DTC P1227, P1228 APP SENSOR

PFP:18002

Component Description

EBS00ER3

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.
Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometers which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the accelerator pedal and feed the voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.



Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for the engine operation such as fuel cut.

CONSULT-II Reference Value in Data Monitor Mode

EBS00ER4

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
ACCEL SEN2	● Ignition switch: ON (engine stopped)	Accelerator pedal: Fully released	0.41 - 0.71V
		Accelerator pedal: Fully depressed	More than 4.2V
CLSD THL POS	● Ignition switch: ON	Accelerator pedal: Fully released	ON
		Accelerator pedal: Slightly depressed	OFF

On Board Diagnosis Logic

EBS00ER5

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1227 1227	Accelerator pedal position sensor 2 circuit low input	An excessively low voltage from the APP sensor 2 is sent to ECM.	● Harness or connectors (The APP sensor 2 circuit is open or shorted.) ● Accelerator pedal position sensor (Accelerator pedal position sensor 2)
P1228 1228	Accelerator pedal position sensor 2 circuit high input	An excessively high voltage from the APP sensor 2 is sent to ECM.	

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters in fail-safe mode and the MI lights up.

Engine operating condition in fail-safe mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.

DTC Confirmation Procedure

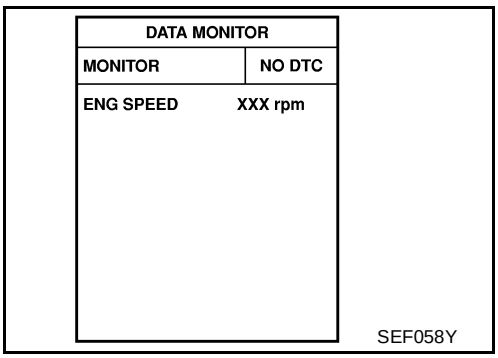
EBS00ER6

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 8V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.

2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-503, "Diagnostic Procedure" .

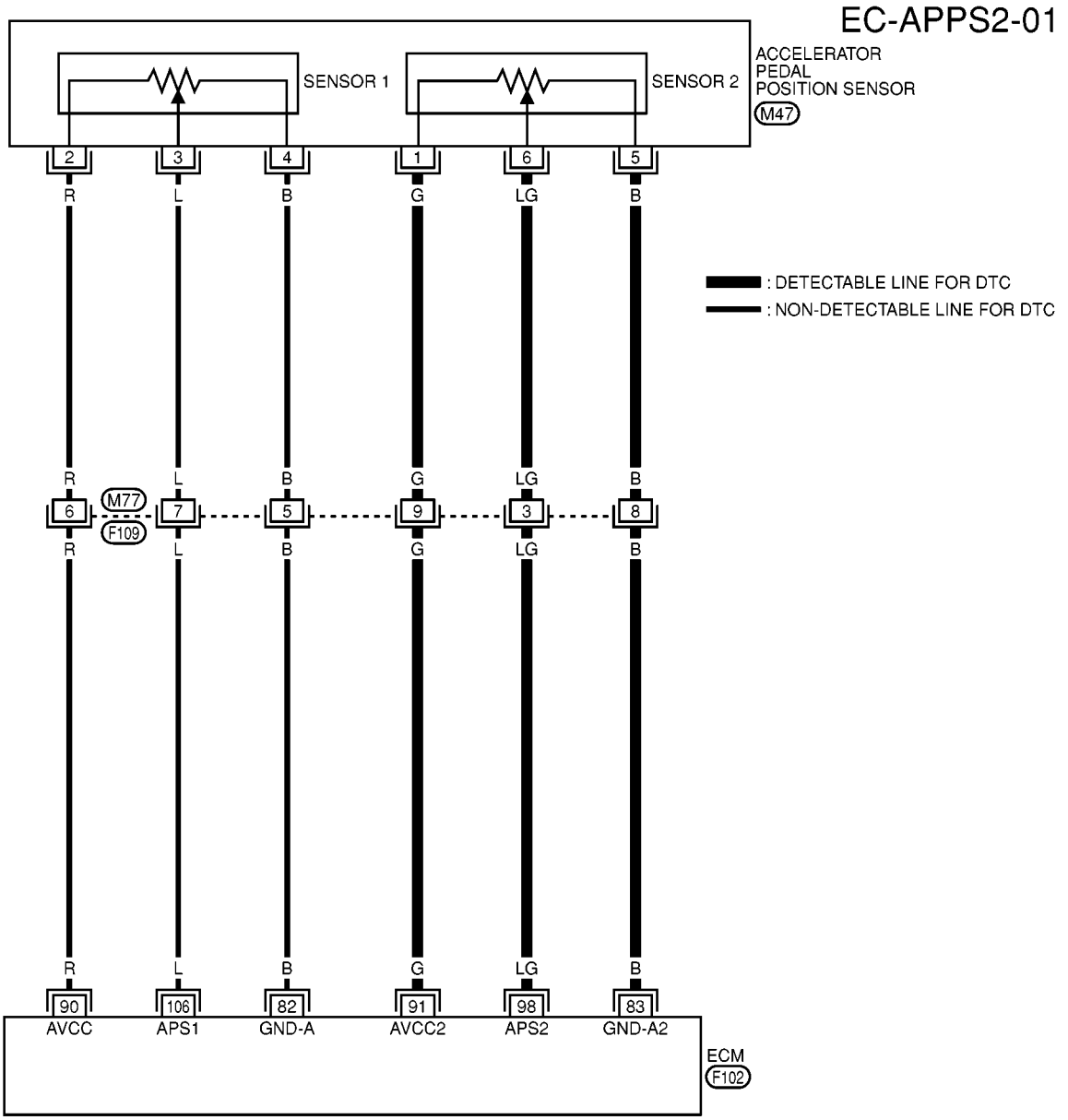


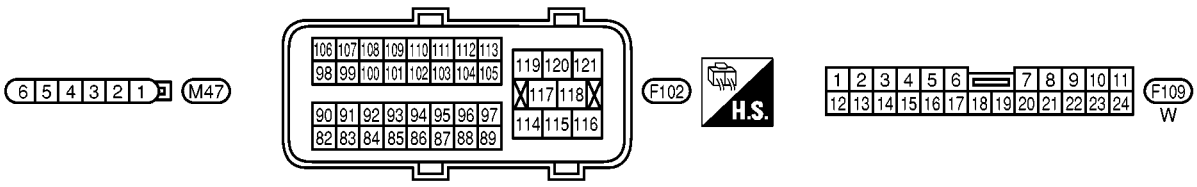
WITH GST

Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

EBS00ER7





MBWA0141E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
82	B	Sensor ground (Accelerator pedal position sensor 1)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
83	B	Sensor ground (Accelerator pedal position sensor 2)	**[Ignition switch "ON"]**	Approximately 0V
90	R	Sensor power supply (Accelerator pedal position sensor 1)	**[Ignition switch "ON"]**	Approximately 5V
91	G	Sensor power supply (Accelerator pedal position sensor 2)	**[Ignition switch "ON"]**	Approximately 5V
98	LG	Accelerator pedal position sensor 2	**[Ignition switch "ON"]** ● Accelerator pedal fully released	0.175 - 0.335V
			[Ignition switch "ON"] ● Accelerator pedal fully depressed	More than 1.95V
106	L	Accelerator pedal position sensor 1	**[Ignition switch "ON"]** ● Accelerator pedal fully released	0.35 - 0.67V
			[Ignition switch "ON"] ● Accelerator pedal fully depressed	More than 3.9V

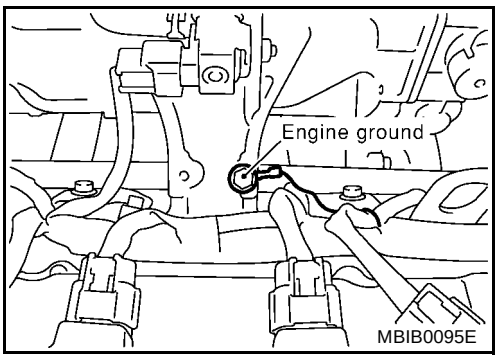
Diagnostic Procedure

EBS00ER8

1. RETIGHTEN GROUND SCREWS

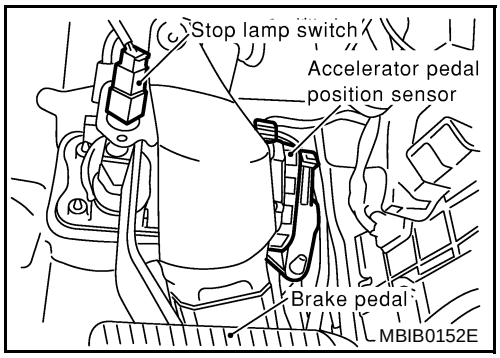
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



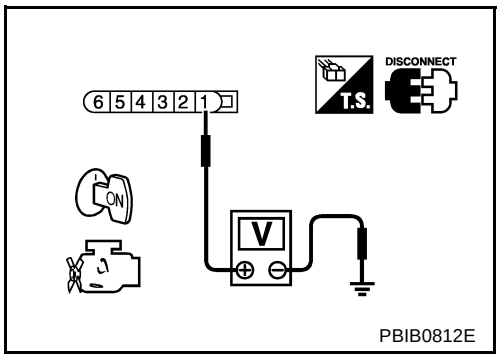
2. CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT

1. Disconnect accelerator pedal position (APP) sensor harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between APP sensor terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M77, F109
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK APP SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 83 and APP sensor terminal 5. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M77, F109
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK APP SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 98 and APP sensor terminal 6. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M77, F109
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK APP SENSOR

Refer to EC-505, "Component Inspection" .

OK or NG

OK >> GO TO 10.
NG >> GO TO 9.

9. REPLACE APP SENSOR

1. Replace the accelerator pedal position sensor.
2. Perform EC-55, "Accelerator Pedal Released Position Learning" .
3. Perform EC-55, "Throttle Valve Closed Position Learning" .
4. Perform EC-55, "Idle Air Volume Learning" .

>> **INSPECTION END**

10. CHECK INTERMITTENT INCIDENT

Refer to EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

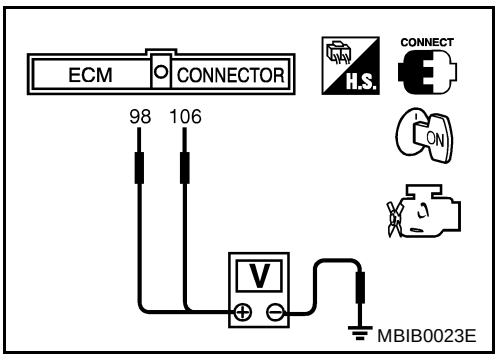
Component Inspection

EBS00ER9

ACCELERATOR PEDAL POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Turn ignition switch “ON”.
3. Check voltage between ECM terminals 106 (APP sensor 1 signal), 98 (APP sensor 2 signal) and engine ground under the following conditions.

Terminal	Accelerator pedal	Voltage
106 (Accelerator pedal position sensor 1)	Fully released	0.35 - 0.67V
	Fully depressed	More than 3.9V
98 (Accelerator pedal position sensor 2)	Fully released	0.175 - 0.335V
	Fully depressed	More than 1.95V



4. If NG, replace accelerator pedal assembly and go to the next step.
5. Perform EC-55, "Accelerator Pedal Released Position Learning" .
6. Perform EC-55, "Throttle Valve Closed Position Learning" .
7. Perform EC-55, "Idle Air Volume Learning" .

Remove and Installation

EBS00ERA

ACCELERATOR PEDAL

Refer to ACC-2, "ACCELERATOR CONTROL SYSTEM" .

DTC P1229 SENSOR POWER SUPPLY

PFP:16119

On Board Diagnosis Logic

EBS00ERB

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1229 1229	Sensor power supply circuit short	ECM detects a voltage of power source for sensor is excessively low or high.	● Harness or connectors (The TP sensor 1 and 2 circuit is shorted.) ● Electric throttle control actuator (TP sensor 1 and 2)

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters in fail-safe mode and the MI lights up.

Engine operation condition in fail-safe mode
ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

DTC Confirmation Procedure

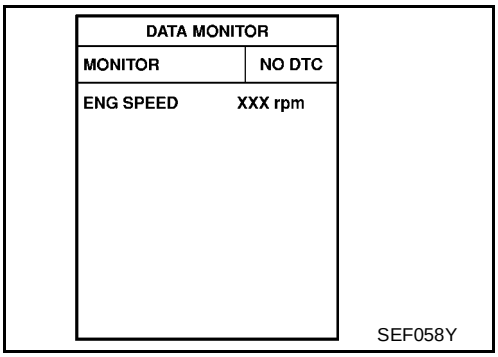
EBS00ERC

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 8V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-509, "Diagnostic Procedure" .



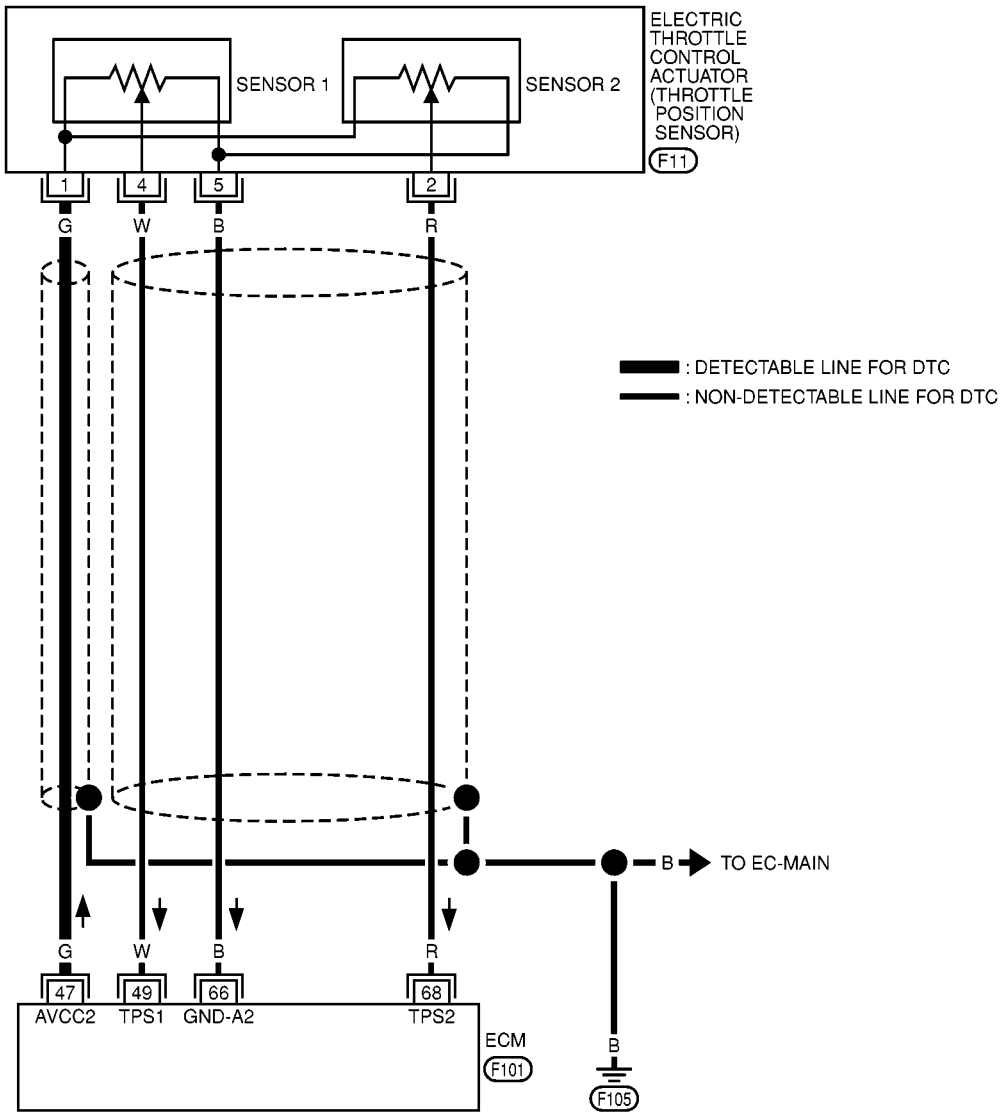
WITH GST

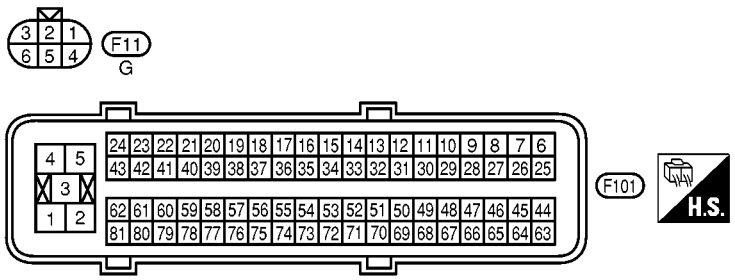
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

EBS00ERD

EC-SEN/PW-01





MBWA0139E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
47	G	Sensor power supply (Throttle position sensor)	**[Ignition switch "ON"]**	Approximately 5V

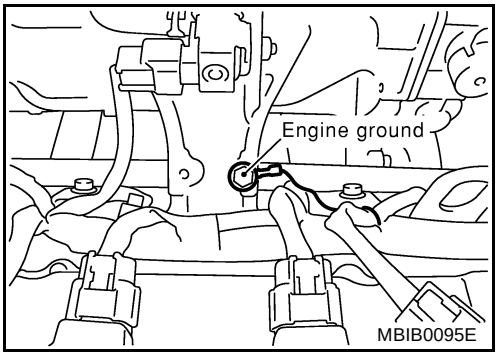
Diagnostic Procedure

EBS00ERE

1. RETIGHTEN GROUND SCREWS

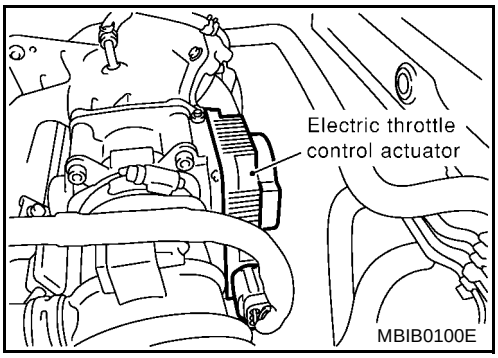
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



2. CHECK THROTTLE POSITION SENSOR POWER SUPPLY CIRCUIT

1. Disconnect electric throttle control actuator harness connector.
2. Turn ignition switch "ON".

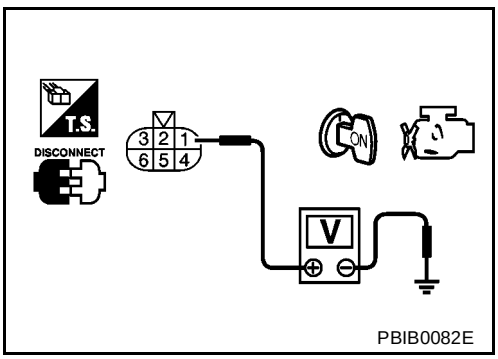


3. Check voltage between electric throttle control actuator terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 5V

OK or NG

OK >> GO TO 4.
NG >> GO TO 3.



3. CHECK SENSOR POWER SUPPLY CIRCUITS FOR SHORT

Check the following.

- Harness for short to power and short to ground between ECM terminal 47 and electric throttle control actuator terminal 1.
- ECM pin terminal.

OK or NG

OK >> GO TO 4.
NG >> Repair short to ground or short to power in harness or connectors.

4. CHECK THROTTLE POSITION SENSOR

Refer to EC-317, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace electric throttle control actuator.
2. Perform EC-55, "Throttle Valve Closed Position Learning" .
3. Perform EC-55, "Idle Air Volume Learning" .

>> **INSPECTION END**

6. CHECK INTERMITTENT INCIDENT

Refer to EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

DTC P1706 PNP SWITCH

PFP:32006

Component Description

EBS00ERF

When the shift lever position is “P” (A/T models only) or “N”, park/neutral position (PNP) switch is “ON”.
ECM detects the position because the continuity of the line (the “ON” signal) exists.

CONSULT-II Reference Value in Data Monitor Mode

EBS00ERG

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
P/N POSI SW	● Ignition switch: ON	Shift lever: P or N (A/T model) Neutral (M/T model)	ON
		Shift lever: Except above	OFF

On Board Diagnosis Logic

EBS00ERH

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1706 1706	Park/neutral position switch	The signal of the park/neutral position (PNP) switch is not changed in the process of engine starting and driving.	● Harness or connectors (PNP switch circuit is open or shorted.) ● Park/neutral position (PNP) switch

DTC Confirmation Procedure

EBS00ERI

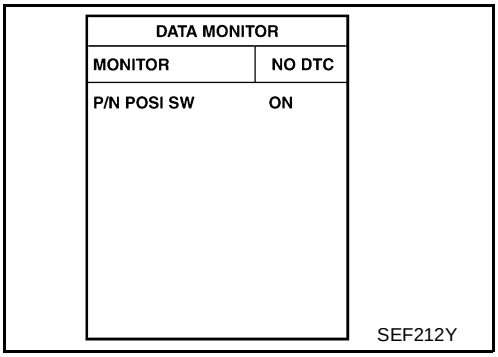
CAUTION:
Always drive vehicle at a safe speed.

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “P/N POSI SW” in “DATA MONITOR” mode with CONSULT-II. Then check the “P/N POSI SW” signal under the following conditions.

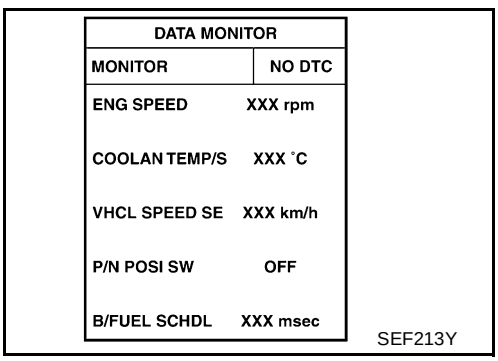
Position (Selector lever)	Known-good signal
“N” and “P” position	ON
Except the above position	OFF



If NG, go to EC-514, "Diagnostic Procedure" .
If OK, go to following step.

3. Select “DATA MONITOR” mode with CONSULT-II.
4. Start engine and warm it up to normal operating temperature.
5. Maintain the following conditions for at least 60 consecutive seconds.

ENG SPEED	1,200 - 6,000 rpm (A/T models) 1,300 - 6,000 rpm (M/T models)
COOLAN TEMP/S	More than 70°C (158°F)
B/FUEL SCHDL	More than 3.0 msec (A/T models) More than 2.7 msec (M/T models)
VHCL SPEED SE	More than 46 km/h (30 MPH)
Selector lever	Suitable position



6. If 1st trip DTC is detected, go to EC-514, "Diagnostic Procedure" .

Overall Function Check

EBS00ERJ

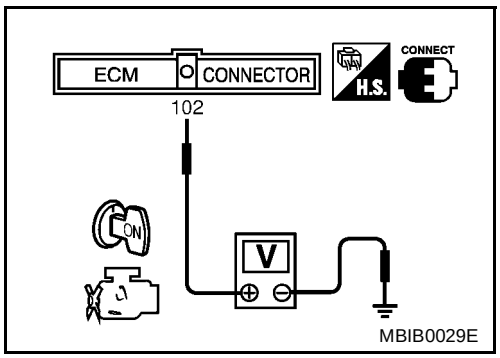
Use this procedure to check the overall function of the park/neutral position (PNP) switch circuit. During this check, a 1st trip DTC might not be confirmed.

WITH GST

1. Turn ignition switch “ON”.
2. Check voltage between ECM terminal 102 (PNP switch signal) and body ground under the following conditions.

Condition (Gear position)	Voltage V (Known-good data)
“P” (A/T models only) and “N” position	Approximately 0
Except the above position	A/T models: Battery voltage M/T models: Approximately 5

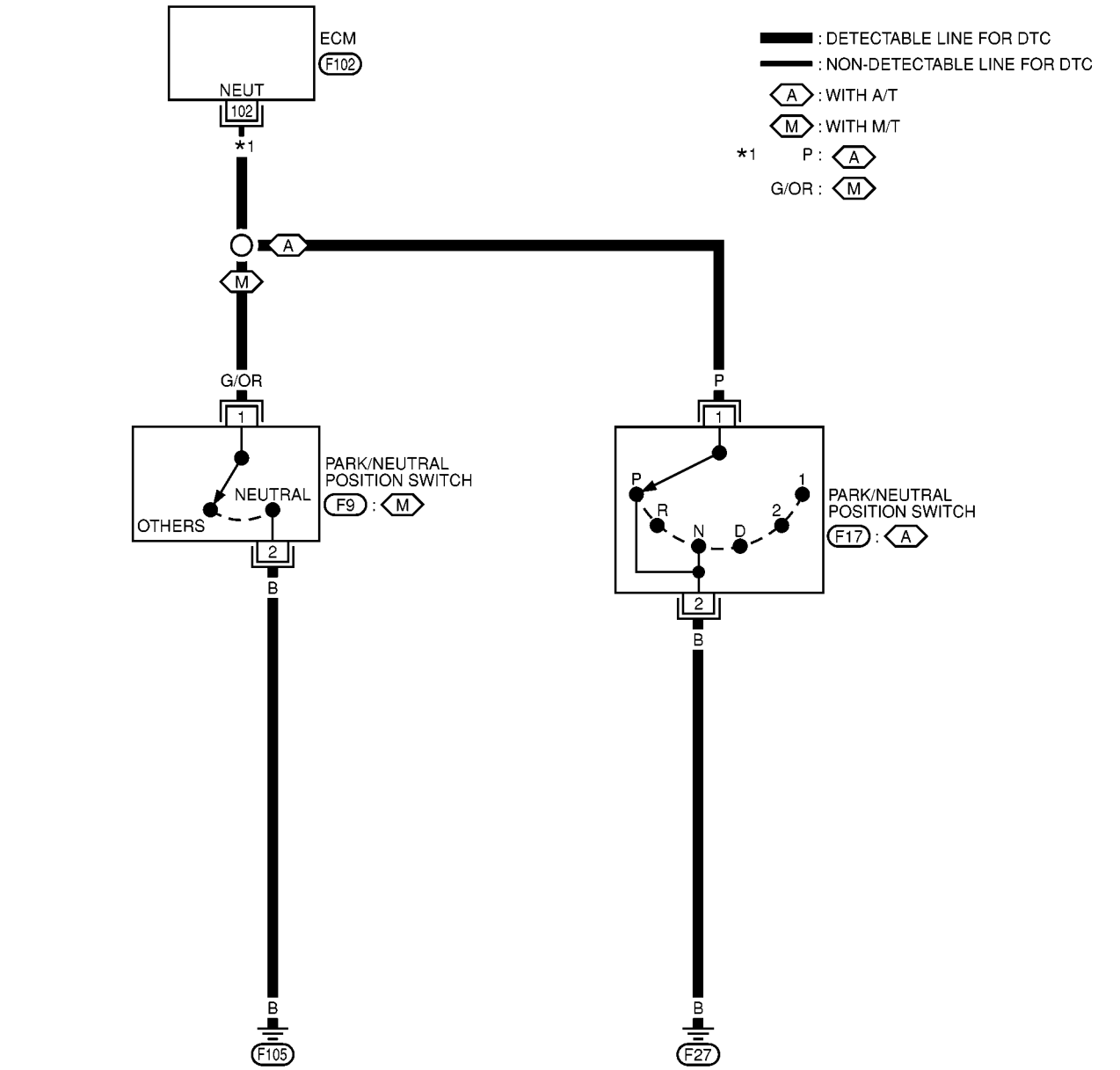
3. If NG, go to EC-514, "Diagnostic Procedure" .

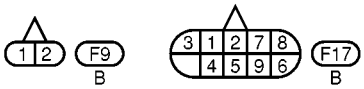


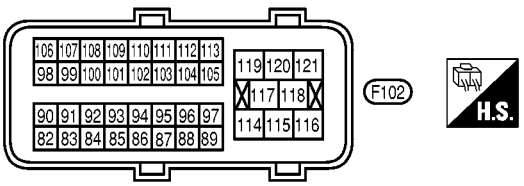
Wiring Diagram

EBS00ERK

EC-PNP/SW-01







MBWA0069E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
102	P (A/T) G/OR (M/T)	PNP switch	**[Ignition switch "ON"]** ● Shift lever position is "P" or "N" (A/T models), "Neutral" (M/T models).	Approximately 0V
			[Ignition switch "ON"] ● Except the above gear position	**A/T models** BATTERY VOLTAGE (11 - 14V) **M/T models** Approximately 5V

Diagnostic Procedure

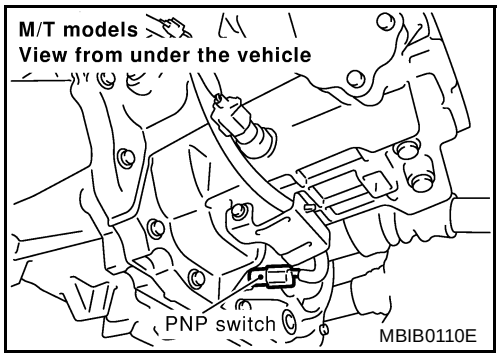
EBS00ERL

1. CHECK PNP SWITCH GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Disconnect PNP switch harness connector.
3. Check harness continuity between PNP switch terminal 2 and body ground.
   Refer to Wiring Diagram.

   Continuity should exist.

4. Also check harness for short to power.



OK or NG

OK >> GO TO 2.
NG >> Repair open circuit or short to power in harness or connectors.

2. CHECK PNP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 102 and PNP switch terminal 1.
   Refer to Wiring Diagram.

   Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK PNP SWITCH

Refer to AT-110, "DTC P0705 PARK/NEUTRAL POSITION (PNP) SWITCH" (A/T models) or MT-14, "POSITION SWITCH" , MT-62, "POSITION SWITCH" (M/T models).

OK or NG

OK >> GO TO 4.
NG >> Replace PNP switch.

4. CHECK INTERMITTENT INCIDENT

Refer to EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

DTC P1805 BRAKE SWITCH

PFP:25320

Description

EBS00ERM

Brake switch signal is applied to the ECM through the stop lamp switch when the brake pedal is depressed. This signal is used mainly to decrease the engine speed when the vehicle is driving.

CONSULT-II Reference Value in Data Monitor Mode

EBS00ERN

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
BRAKE SW	● Ignition switch: ON	Brake pedal: Fully released	OFF
		Brake pedal: Slightly depressed	ON

On Board Diagnosis Logic

EBS00ERO

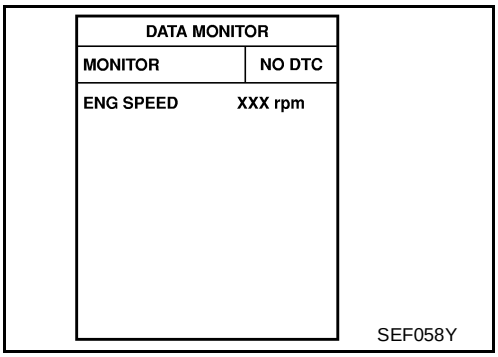
DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1805 1805	Brake switch	A brake switch signal is not sent to ECM for an extremely long time while the vehicle is driving.	● Harness or connectors (Stop lamp switch circuit is open or shorted.) ● Stop lamp switch

DTC Confirmation Procedure

EBS00ERP

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Fully depress the brake pedal for at least 5 seconds.
3. Erase the DTC with CONSULT-II.
4. Select “DATA MONITOR” mode with CONSULT-II.
5. If 1st trip DTC is detected, go to EC-517, "Diagnostic Procedure" .



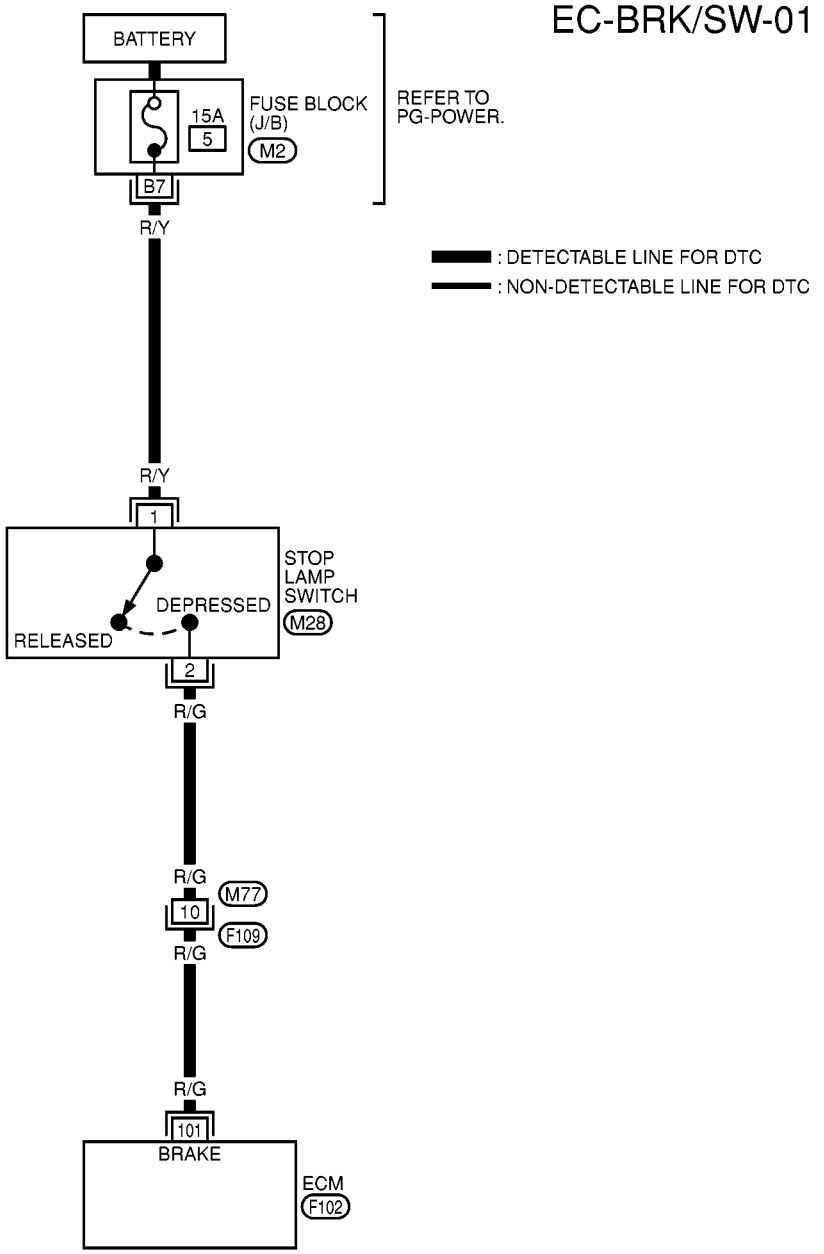
WITH GST

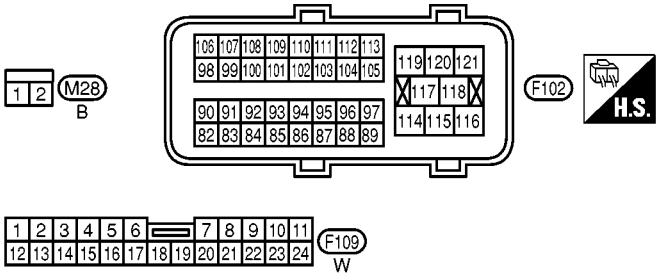
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

EBS00ERQ

EC-BRK/SW-01





REFER TO THE FOLLOWING.
M2 -FUSE BLOCK-
JUNCTION BOX (J/B)

MBWA0091E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
101	R/G	Stop lamp switch	**[Engine is running]** ● Brake pedal fully released	Approximately 0V
			[Engine is running] ● Brake pedal depressed	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

EBS00ERR

1. CHECK STOP LAMP SWITCH CIRCUIT

1. Turn ignition switch “OFF”.
2. Check the stop lamp when depressing and releasing the brake pedal.

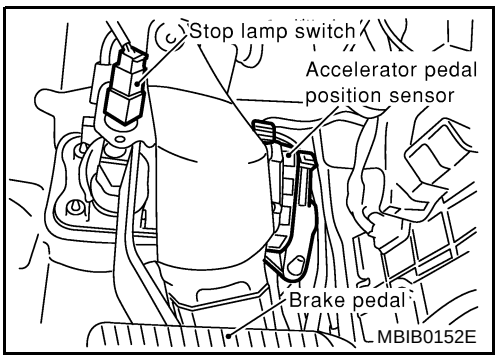
Brake pedal	Stop lamp
Fully released	Not illuminated
Depressed	Illuminated

OK or NG

OK >> GO TO 4.
NG >> GO TO 2.

2. CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT

1. Disconnect stop lamp switch harness connector.

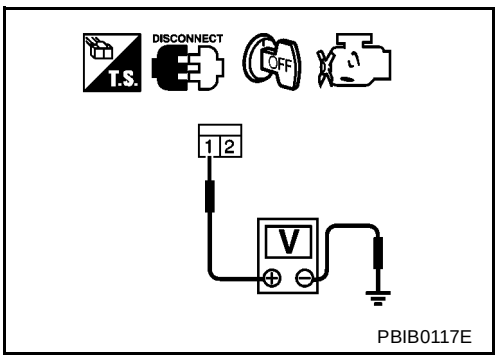


2. Check voltage between stop lamp switch terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 4.
NG >> GO TO 3.



3. DETECT MALFUNCTIONING PART

Check the following.

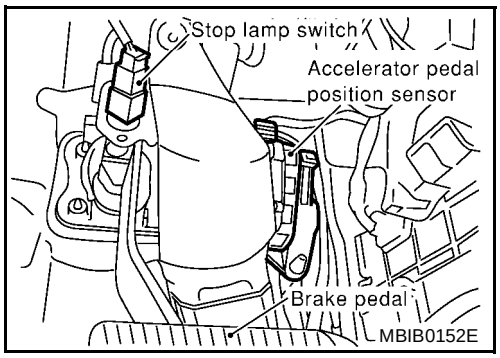
- 15A fuse
- Fuse block (J/B) connector M2
- Harness for open and short between stop lamp switch and battery

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK STOP LAMP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Disconnect stop lamp switch harness connector.
4. Check harness continuity between ECM terminal 101 and stop lamp switch terminal 2.
   Refer to Wiring Diagram.

   Continuity should exist.
5. Also check harness for short to ground and short to power.



OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M77, F109
- Harness for open or short between ECM and stop lamp switch

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK STOP LAMP SWITCH

Refer to EC-519, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace stop lamp switch.

7. CHECK INTERMITTENT INCIDENT

Refer to EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

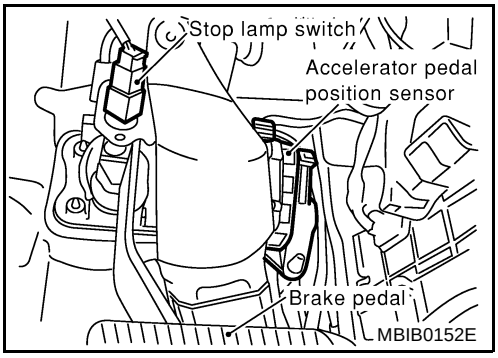
>> **INSPECTION END**

Component Inspection

EBS00ERS

STOP LAMP SWITCH

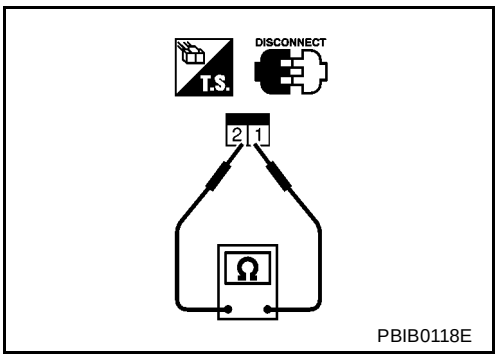
1. Disconnect stop lamp switch harness connector.



2. Check continuity between stop lamp switch terminals 1 and 2 under the following conditions.

Conditions	Continuity
Brake pedal fully released	Should not exist.
Brake pedal depressed	Should exist.

If NG, adjust brake pedal installation, refer to BR-6, "BRAKE PEDAL" , and perform step 2 again.



IGNITION SIGNAL

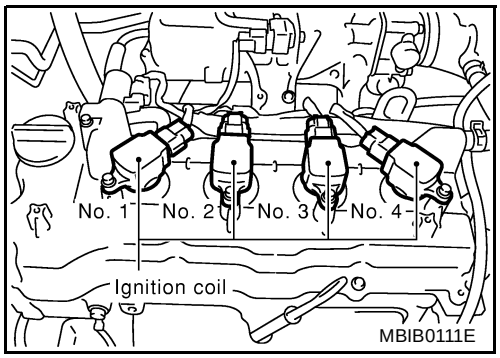
PFP:22448

Component Description

EBS00ERT

IGNITION COIL & POWER TRANSISTOR

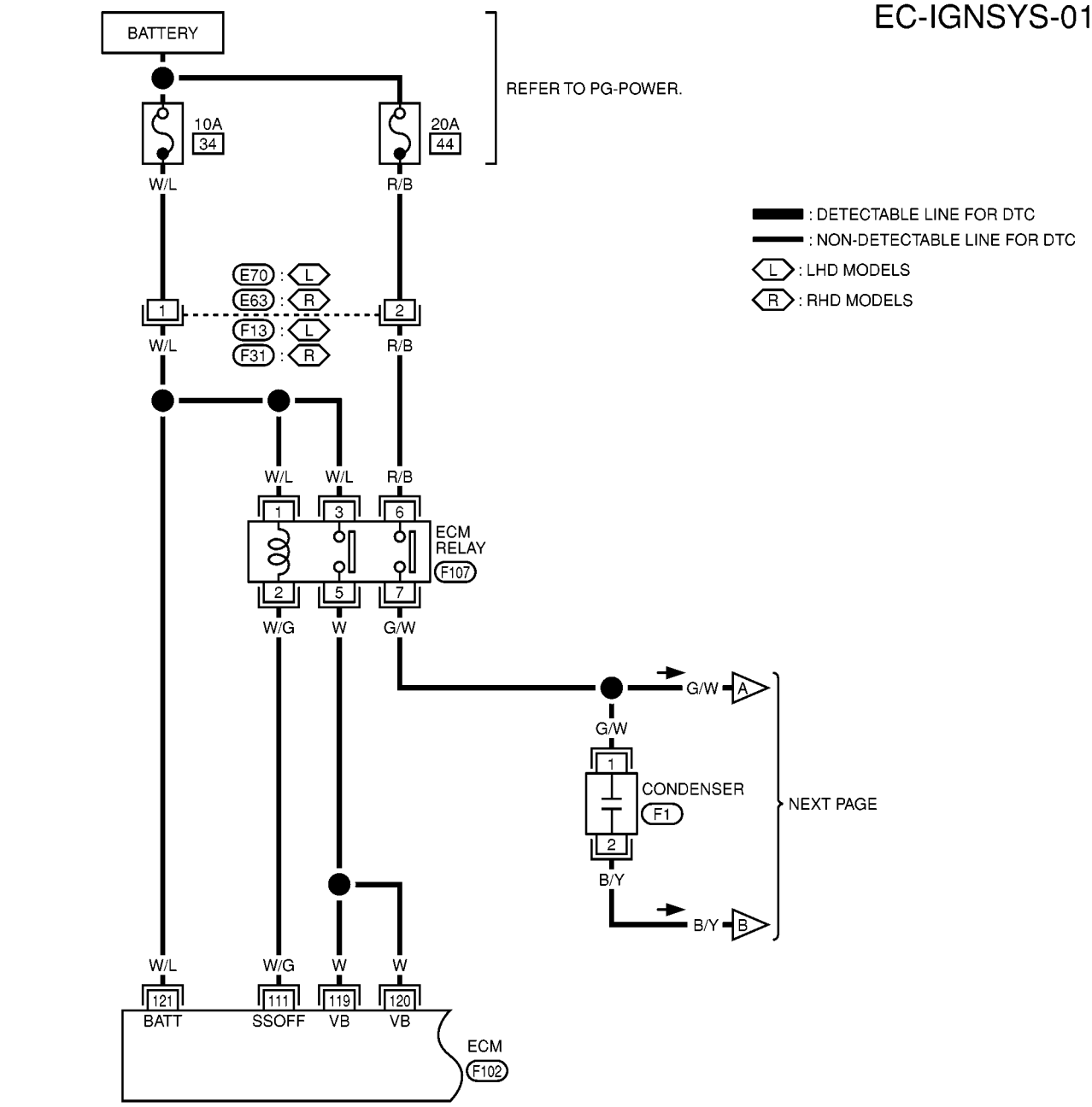
The ignition signal from the ECM is sent to and amplified by the power transistor. The power transistor turns on and off the ignition coil primary circuit. This on-off operation induces the proper high voltage in the coil secondary circuit.

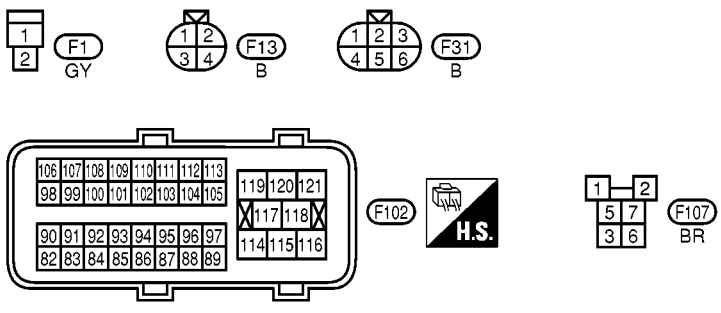


Wiring Diagram

EBS00ERU

EC-IGNSYS-01





MBWA0087E

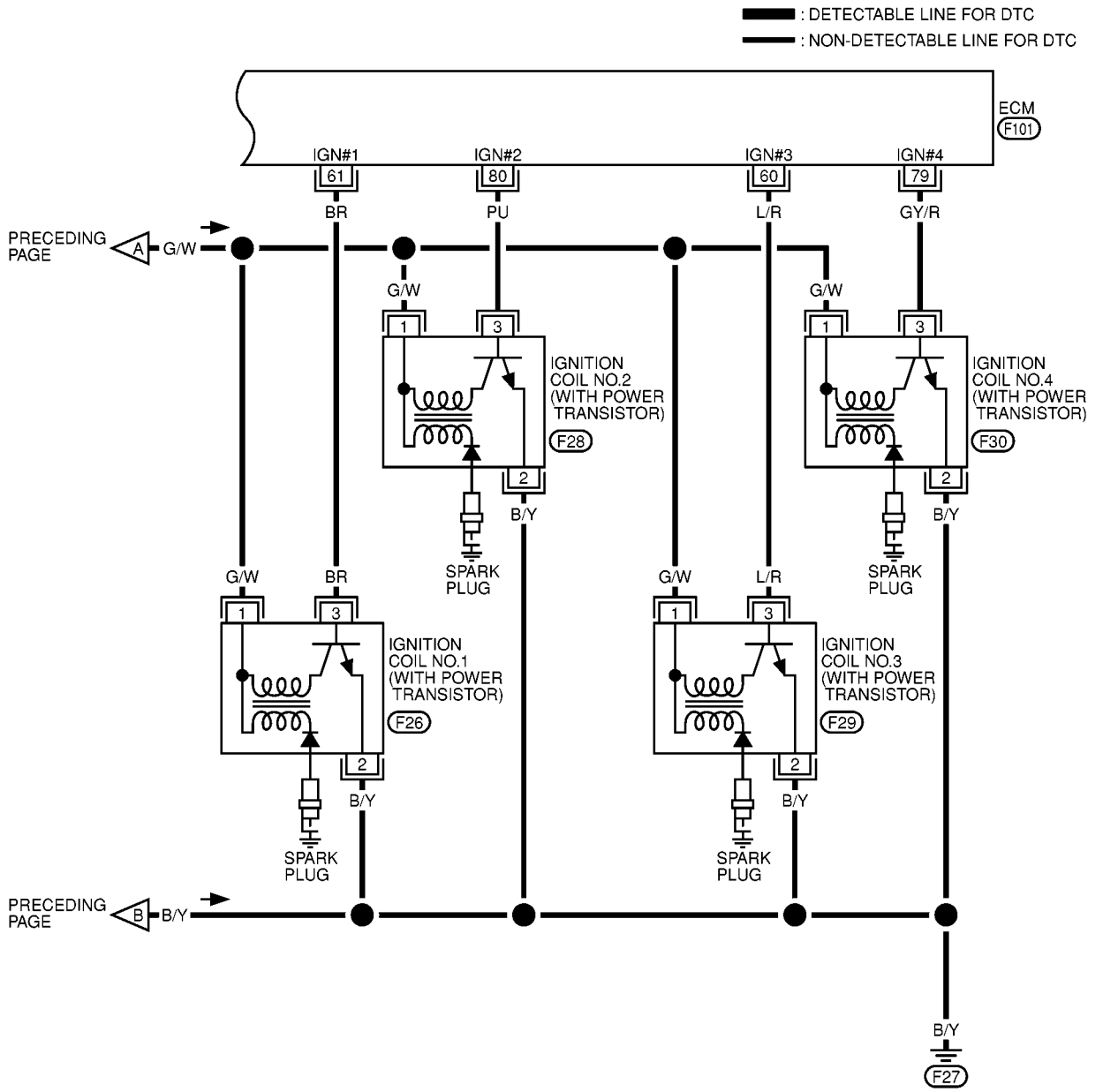
Specification data are reference values and are measured between each terminal and ground.

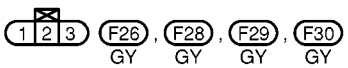
CAUTION:

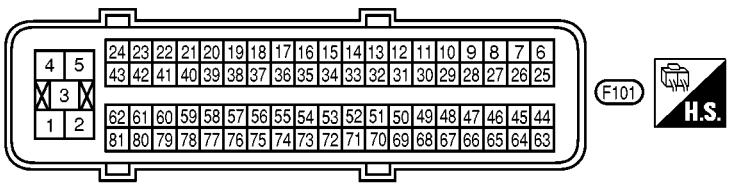
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
111	W/G	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch "OFF"]** ● For a few seconds after turning ignition switch "OFF"	0 - 1.0V
			[Ignition switch "OFF"] ● More than a few seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
119 120	W W	Power supply for ECM	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)

EC-IGNSYS-02





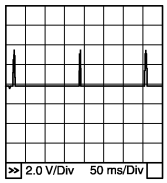
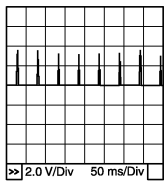


MBWA0088E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
60 61 79 80	L/R BR GY/R PU	Ignition signal No. 3 Ignition signal No. 1 Ignition signal No. 4 Ignition signal No. 2	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0 - 0.1V★  PBIB0521E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - 0.2V★  PBIB0522E

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnostic Procedure

EBS00ERV

1. CHECK ENGINE START

Turn ignition switch “OFF”, and restart engine.

Is engine running?

Yes or No

Yes (With CONSULT-II)>>GO TO 2.
Yes (Without CONSULT-II)>>GO TO 3.
No >> GO TO 4.

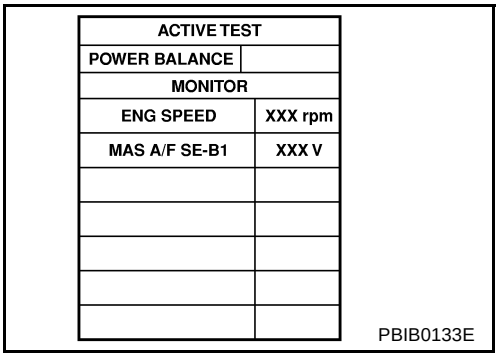
2. CHECK OVERALL FUNCTION

With CONSULT-II

1. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT-II.
2. Make sure that each circuit produces a momentary engine speed drop.

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 10.

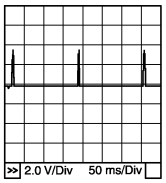


PBIB0133E

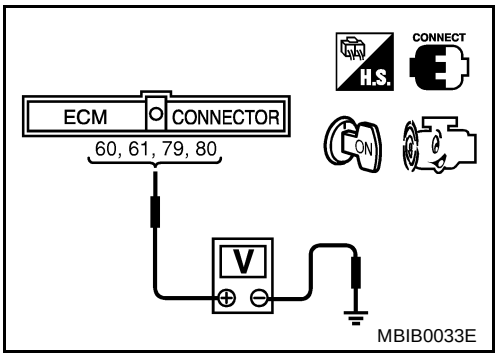
3. CHECK OVERALL FUNCTION

Without CONSULT-II

1. Let engine idle.
2. Read the voltage signal between ECM terminals 60, 61, 79, 80 and ground with an oscilloscope.
3. Verify that the oscilloscope screen shows the signal wave as shown below.



PBIB0521E



MBIB0033E

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 10.

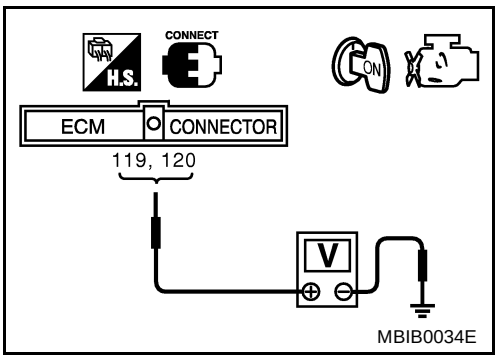
4. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-I

1. Turn ignition switch “ON”.
2. Check voltage between ECM terminals 119, 120 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 5.
NG >> Go to EC-144, "POWER SUPPLY CIRCUIT FOR ECM"
.



MBIB0034E

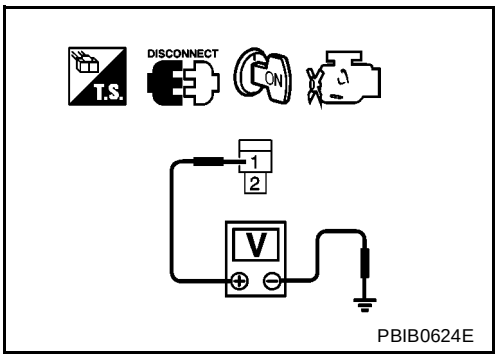
5. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-II

1. Turn ignition switch “OFF”.
2. Disconnect condenser harness connector.
3. Turn ignition switch “ON”.
4. Check voltage between condenser terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 10.
NG >> GO TO 6.



PBIB0624E

6. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-III

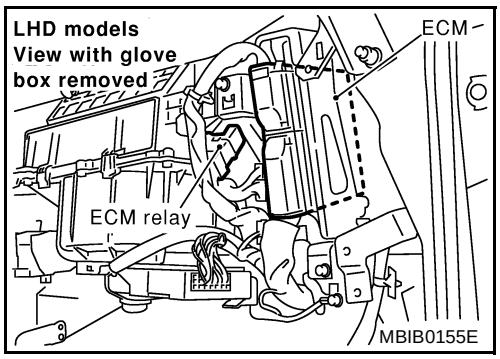
1. Turn ignition switch “OFF”.
2. Disconnect ECM relay.
3. Check harness continuity between ECM relay terminal 7 and condenser terminal 1.
   Refer to Wiring Diagram.

   Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.



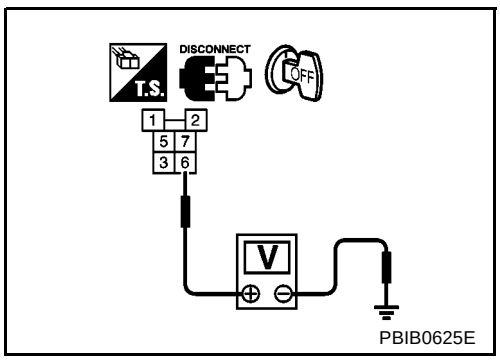
7. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-IV

Check voltage between ECM relay terminal 6 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 9.
NG >> GO TO 8.



8. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E70, F13 (LHD models)
- Harness connectors E63, F31 (RHD models)
- 20A fuse
- Harness for open or short between ECM relay and battery

>> Repair or replace harness or connectors.

9. CHECK ECM RELAY

Refer to EC-528, "Component Inspection" .

OK or NG

OK >> GO TO 17.
NG >> Replace ECM relay.

10. CHECK CONDENSER GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect condenser harness connector.
3. Check harness continuity between condenser terminal 2 and ground. Refer to Wiring diagram.

Continuity should exist.

4. Also check harness for short to power.

OK or NG

OK >> GO TO 11.
NG >> Repair open circuit or short to power in harness or connector.

11. CHECK CONDENSER

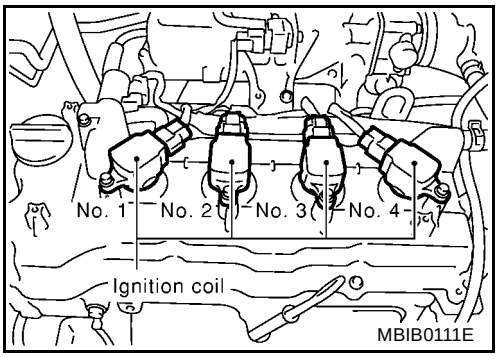
Refer to EC-528, "Component Inspection" .

OK or NG

OK >> GO TO 12.
NG >> Replace condenser.

12. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-V

1. Turn ignition switch “OFF”.
2. Reconnect all harness connectors disconnected.
3. Disconnect ignition coil harness connector.
4. Turn ignition switch “ON”.

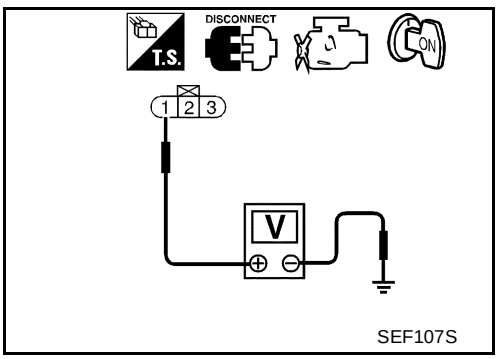


5. Check voltage between ignition coil terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 14.
NG >> GO TO 13.



13. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between ignition coil and ECM relay

>> Repair open circuit or short to ground or short to power in harness or connectors.

14. CHECK IGNITION COIL GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between ignition coil terminal 2 and engine ground.
   Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 15.
NG >> Repair open circuit or short to power in harness or connectors.

15. CHECK IGNITION COIL OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminals 60, 61, 79, 80 and ignition coil terminal 1.
   Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 16.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

16. CHECK IGNITION COIL WITH POWER TRANSISTOR

Refer to EC-528, "Component Inspection" .

OK or NG

OK >> GO TO 17.
NG >> Replace ignition coil with power transistor.

17. CHECK INTERMITTENT INCIDENT

Refer to EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

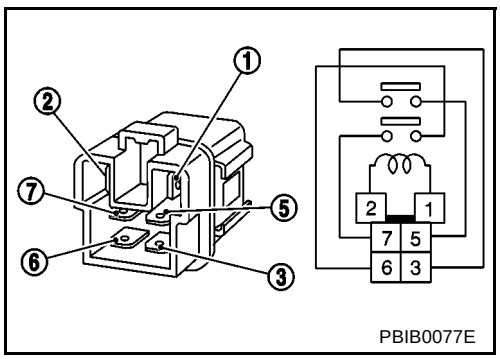
EBS00ERW

ECM RELAY

1. Apply 12V direct current between ECM relay terminals 1 and 2.
2. Check continuity between relay terminals 3 and 5, 6 and 7.

Condition	Continuity
12V direct current supply between terminals 1 and 2	Yes
OFF	No

3. If NG, replace ECM relay.



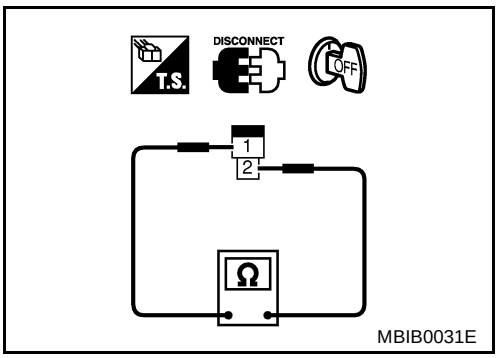
PBIB0077E

CONDENSER

1. Turn ignition switch “OFF”.
2. Disconnect condenser harness connector.

3. Check resistance between condenser terminals 1 and 2.

Resistance: Above 1 MΩ at 25°C (77°F)

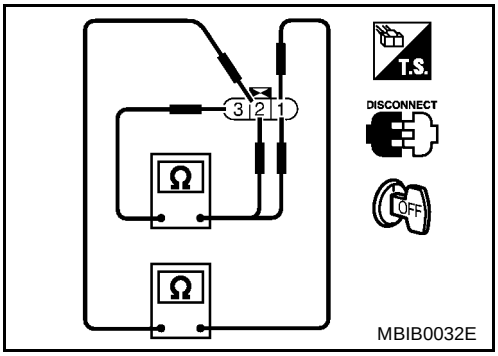


MBIB0031E

IGNITION COIL WITH POWER TRANSISTOR

1. Turn ignition switch “OFF”.
2. Disconnect ignition coil harness connector.
3. Check resistance between ignition coil terminals as follows.

Terminal No.	Resistance Ω [at 25°C (77°F)]
3 and 1	Except 0 or ∞
3 and 2	Except 0
1 and 2	



MBIB0032E

EBS00ERX

Removal and Installation

IGNITION COIL WITH POWER TRANSISTOR

Refer to EM-29, "IGNITION COIL" .

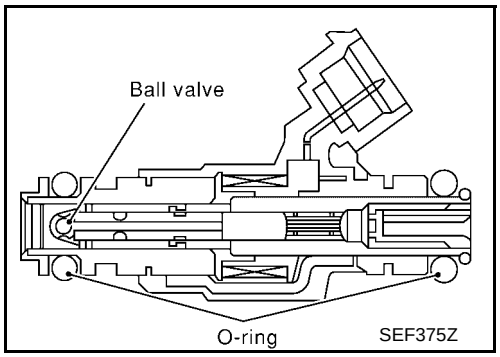
INJECTOR CIRCUIT

PFP:16600

Component Description

EBS00ES5

The fuel injector is a small, precise solenoid valve. When the ECM supplies a ground to the injector circuit, the coil in the injector is energized. The energized coil pulls the needle valve back and allows fuel to flow through the injector into the intake manifold. The amount of fuel injected depends upon the injection pulse duration. Pulse duration is the length of time the injector remains open. The ECM controls the injection pulse duration based on engine fuel needs.



CONSULT-II Reference Value in Data Monitor Mode

EBS00ES6

Specification data are reference values.

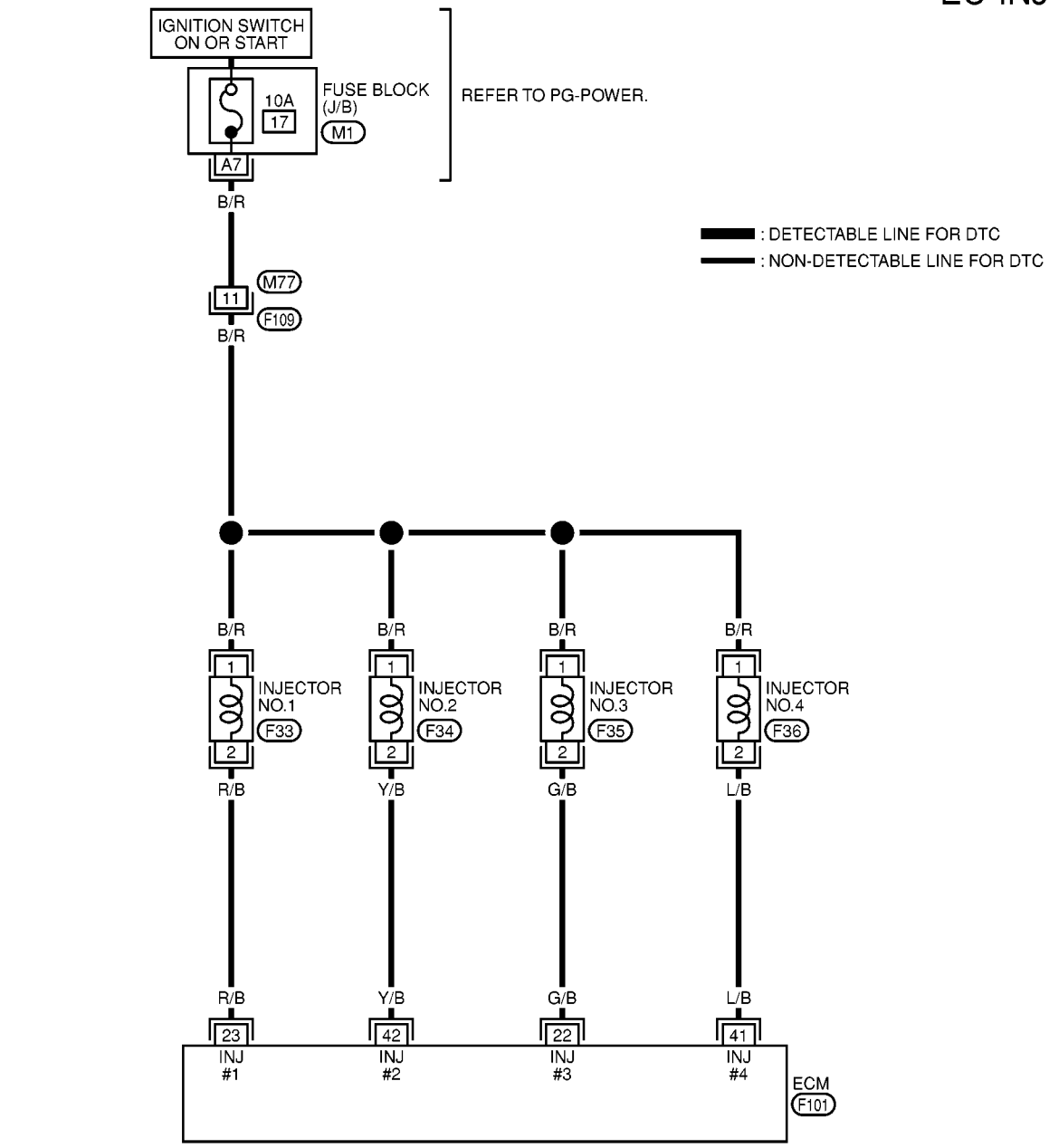
MONITOR ITEM	CONDITION		SPECIFICATION
B/FUEL SCHDL	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	1.5 - 3.0 msec
		2,000 rpm	1.2 - 3.0 msec
INJ PULSE-B1 INJ PULSE-B2*	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	2.0 - 3.5 msec
		2,000 rpm	1.5 - 3.5 msec

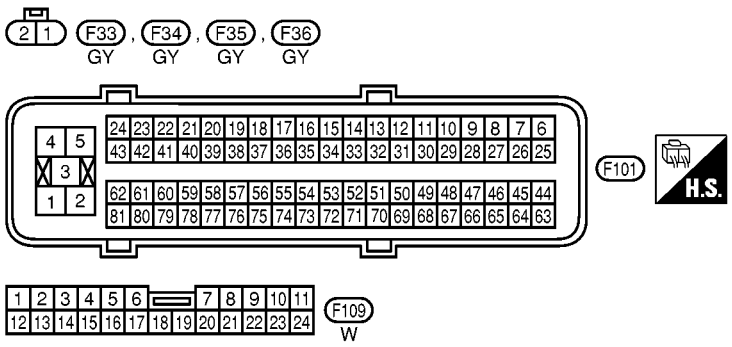
*: This item is displayed with QG18DE engine models.

Wiring Diagram

EBS00ES7

EC-INJECT-01





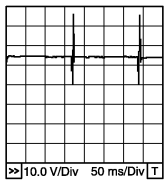
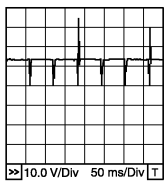
REFER TO THE FOLLOWING.
M1 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0086E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
22 23 41 42	G/B R/B L/B Y/B	Injector No. 3 Injector No. 1 Injector No. 4 Injector No. 2	**[Engine is running]** ● **Warm-up condition** ● Idle speed	BATTERY VOLTAGE (11 - 14V)★  PBIB0529E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	BATTERY VOLTAGE (11 - 14V)★  PBIB0530E

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnostic Procedure

EBS00ES8

1. INSPECTION START

Turn ignition switch to “START”.

Is any cylinder ignited?

Yes or No

Yes >> GO TO 2.

No >> GO TO 3.

2. CHECK OVERALL FUNCTION

With CONSULT-II

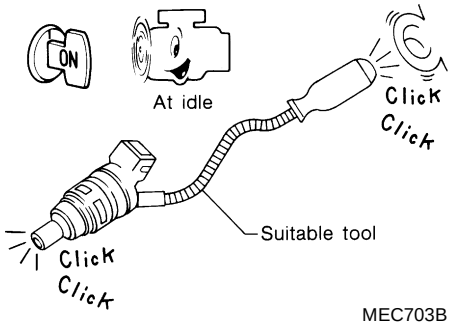
1. Start engine.
2. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT-II.
3. Make sure that each circuit produces a momentary engine speed drop.

ACTIVE TEST	
POWER BALANCE	
MONITOR	
ENG SPEED	XXX rpm
MAS A/F SE-B1	XXX V

PBIB0133E

Without CONSULT-II

1. Start engine.
2. Listen to each injector operating sound.
   Clicking noise should be heard.



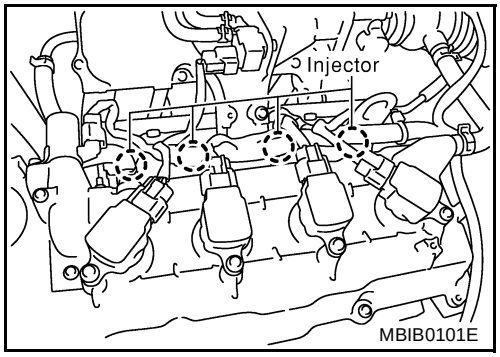
MEC703B

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 3.

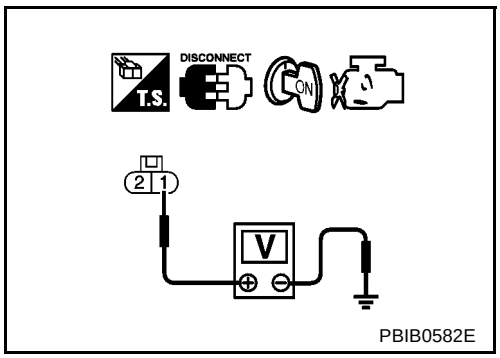
3. CHECK INJECTOR POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect injector harness connector.
3. Turn ignition switch “ON”.



4. Check voltage between injector terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M77, F109
- Fuse block (J/B) connector M1
- 10A fuse
- Harness for open or short between injector and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK INJECTOR OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between injector terminal 2 and ECM terminals 22, 23, 41, 42. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK INJECTOR

Refer to EC-535, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace injector.

7. CHECK INTERMITTENT INCIDENT

Refer to EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

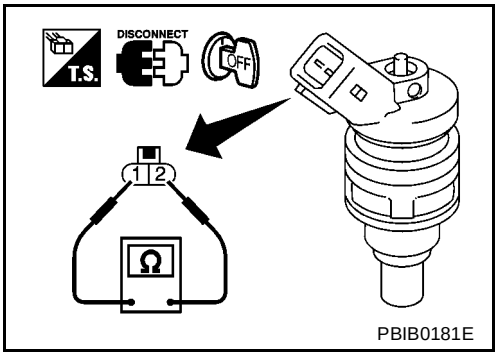
Component Inspection

EBS00ES9

INJECTOR

1. Disconnect injector harness connector.
2. Check resistance between terminals as shown in the figure.

Resistance: 13.5 - 17.5Ω [at 20°C (68°F)]



Removal and Installation

EBS00ESA

INJECTOR

Refer to EM-31, "FUEL INJECTOR AND FUEL TUBE" .

FUEL PUMP CIRCUIT

PFP:17042

Description

EBS00ESE

SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM Function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*	Fuel pump control	Fuel pump relay
Battery	Battery voltage*		

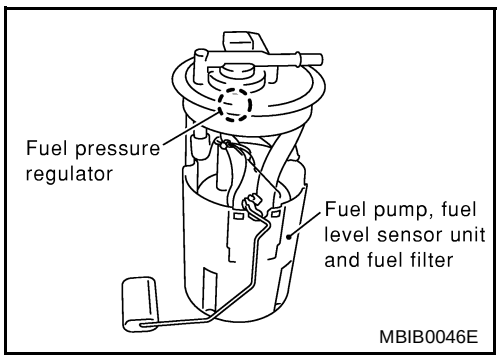
*: The ECM determines the start signal status by the signals of engine speed and battery voltage.

The ECM activates the fuel pump for several seconds after the ignition switch is turned on to improve engine startability. If the ECM receives a engine speed signal from the crankshaft position sensor (POS) and camshaft position sensor (PHASE), it knows that the engine is rotating, and causes the pump to operate. If the engine speed signal is not received when the ignition switch is ON, the engine stalls. The ECM stops pump operation and prevents battery discharging, thereby improving safety. The ECM does not directly drive the fuel pump. It controls the ON/OFF fuel pump relay, which in turn controls the fuel pump.

Condition	Fuel pump operation
Ignition switch is turned to ON.	Operates for 1 second.
Engine running and cranking	Operates.
When engine is stopped	Stops in 1.5 seconds.
Except as shown above	Stops.

COMPONENT DESCRIPTION

A turbine type design fuel pump is used in the fuel tank.



CONSULT-II Reference Value in Data Monitor Mode

EBS00ESF

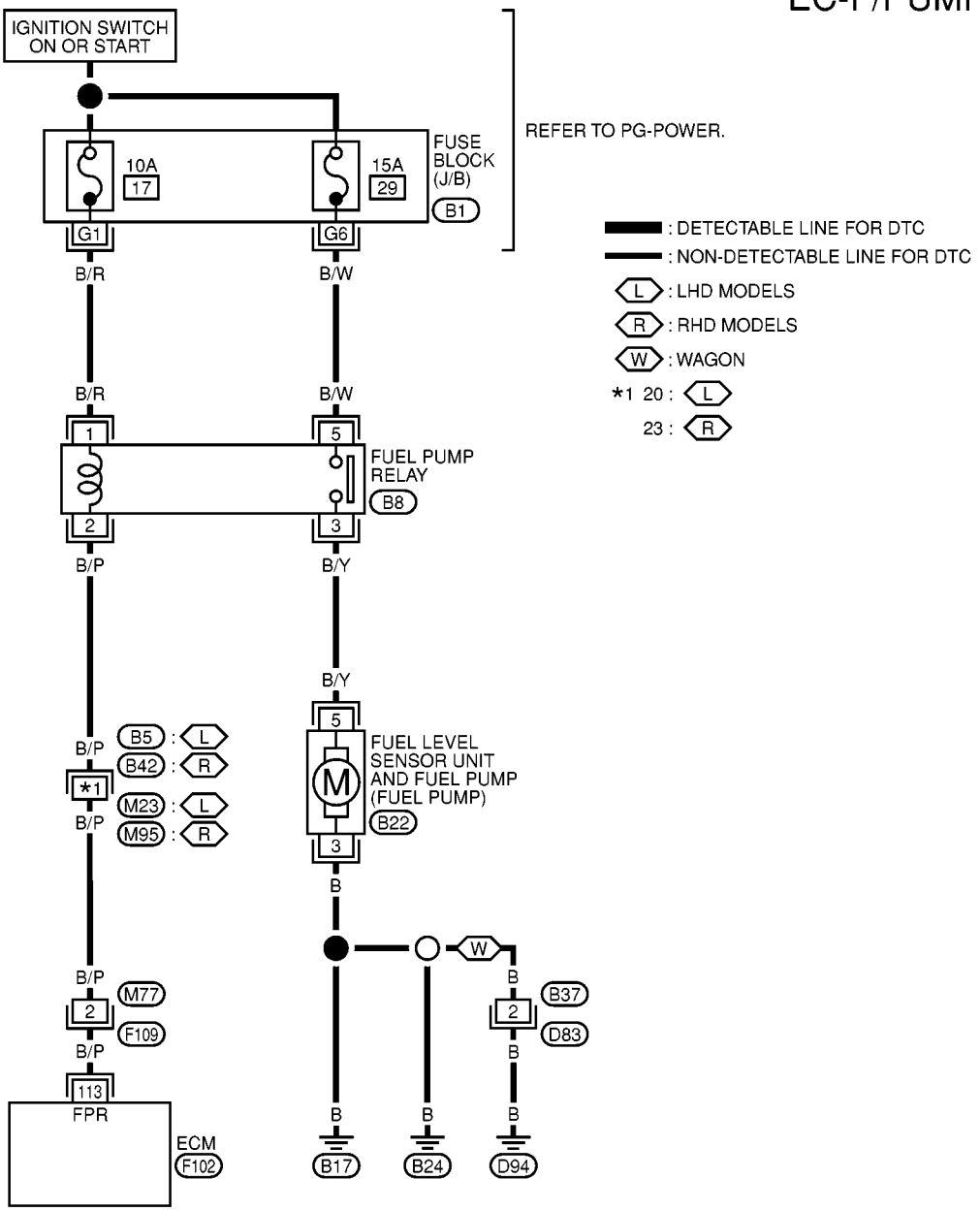
Specification data are reference values.

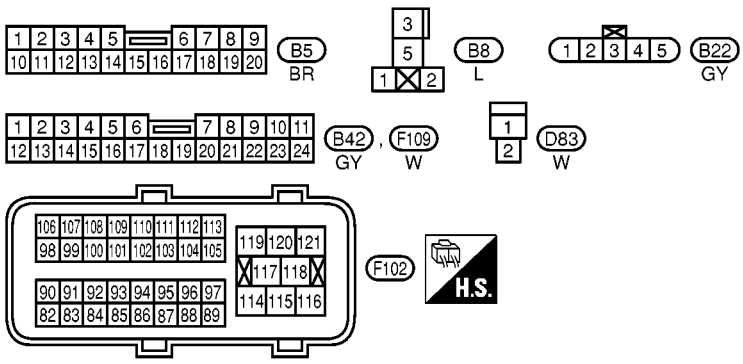
MONITOR ITEM	CONDITION	SPECIFICATION
FUEL PUMP RLY	● For 1 seconds after turning ignition switch ON ● Engine running or cranking	ON
	● Except above conditions	OFF

Wiring Diagram

EBS00ESG

EC-F/PUMP-01





REFER TO THE FOLLOWING.
B1 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0031E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

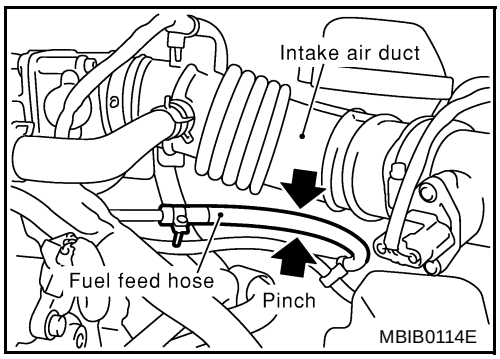
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
113	B/P	Fuel pump relay	**[Ignition switch "ON"]** ● For 1 seconds after turning ignition switch "ON" **[Engine is running]**	0 - 1.0V
			[Ignition switch "ON"] ● More than 1 seconds after turning ignition switch "ON".	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

EBS00ESH

1. CHECK OVERALL FUNCTION

1. Turn ignition switch "ON".
2. Pinch fuel feed hose with two fingers.
   Fuel pressure pulsation should be felt on the fuel hose for 1 second after ignition switch is turned "ON".

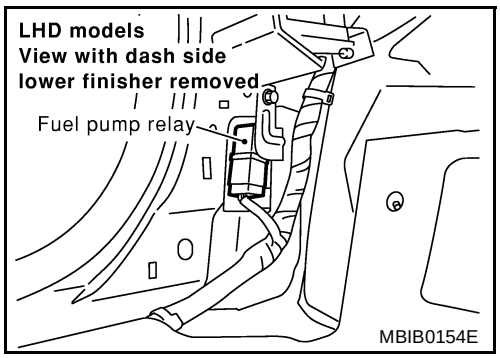


OK or NG

OK >> **INSPECTION END**
NG >> GO TO 2.

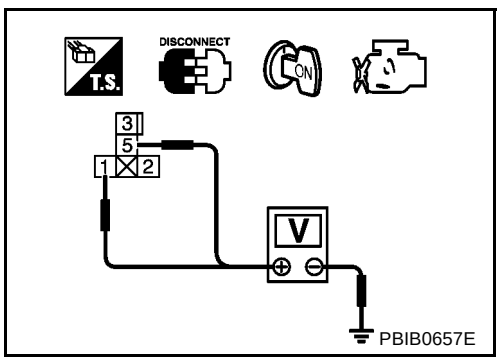
2. CHECK FUEL PUMP RELAY POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect fuel pump relay.
3. Turn ignition switch "ON".



4. Check voltage between fuel pump relay terminals 1, 5 and ground with CONSULT-II or tester.

   Voltage: Battery voltage



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector B1
- 10A fuse
- 15A fuse
- Harness for open or short between fuel pump relay and fuse

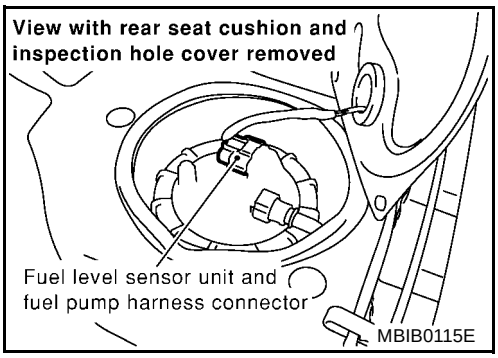
>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK FUEL PUMP POWER SUPPLY AND GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect fuel level sensor unit and fuel pump harness connector.
3. Check harness continuity between fuel pump relay terminal 3 and fuel level sensor unit and fuel pump terminal 5, fuel level sensor unit and fuel pump terminal 3 and body ground.
   Refer to Wiring Diagram.

   Continuity should exist.

4. Also check harness for short to ground and short to power.



OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors B37, D83
- Harness for open or short between fuel level sensor unit and fuel pump and fuel pump relay
- Harness for open or short between fuel level sensor unit and fuel pump and body ground

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK FUEL PUMP RELAY OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 113 and fuel pump relay terminal 2.
   Refer to Wiring Diagram.

   Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M77, F109
- Harness connectors B5, M23 (LHD models)
- Harness connectors B42, M95 (RHD models)
- Harness for open or short between ECM and fuel pump relay

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK FUEL PUMP RELAY

Refer to EC-540, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> Replace fuel pump relay.

9. CHECK FUEL PUMP

Refer to EC-540, "Component Inspection" .

OK or NG

OK >> GO TO 10.
NG >> Replace fuel pump.

10. CHECK INTERMITTENT INCIDENT

Refer to EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

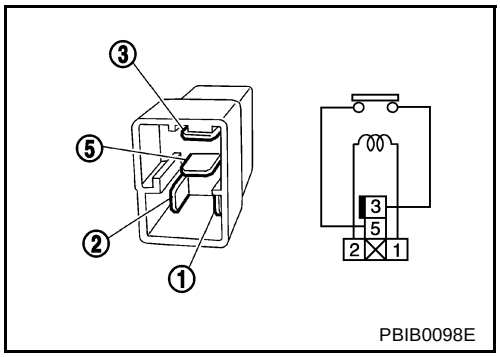
Component Inspection

EBS00ESI

FUEL PUMP RELAY

Check continuity between terminals 3 and 5 under the following conditions.

Conditions	Continuity
12V direct current supply between terminals 1 and 2	Yes
No current supply	No

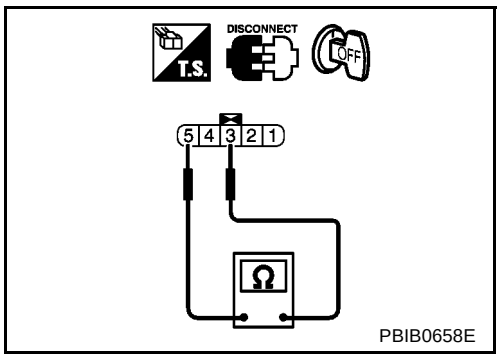


PBIB0098E

FUEL PUMP

1. Disconnect fuel level sensor unit and fuel pump harness connector.
2. Check resistance between fuel level sensor unit and fuel pump terminals 3 and 5.

Resistance: Approximately 1.0Ω [at 25°C (77°F)]



PBIB0658E

Removal and Installation

EBS00ESJ

FUEL PUMP

Refer to DI-32, "FUEL LEVEL SENSOR UNIT CHECK" .

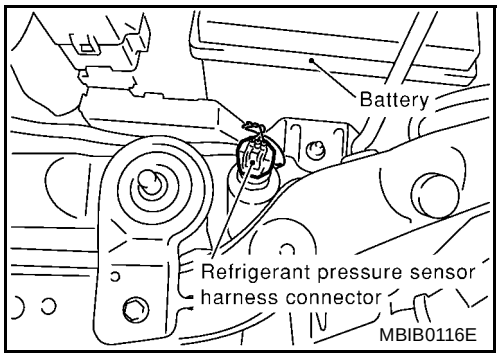
REFRIGERANT PRESSURE SENSOR

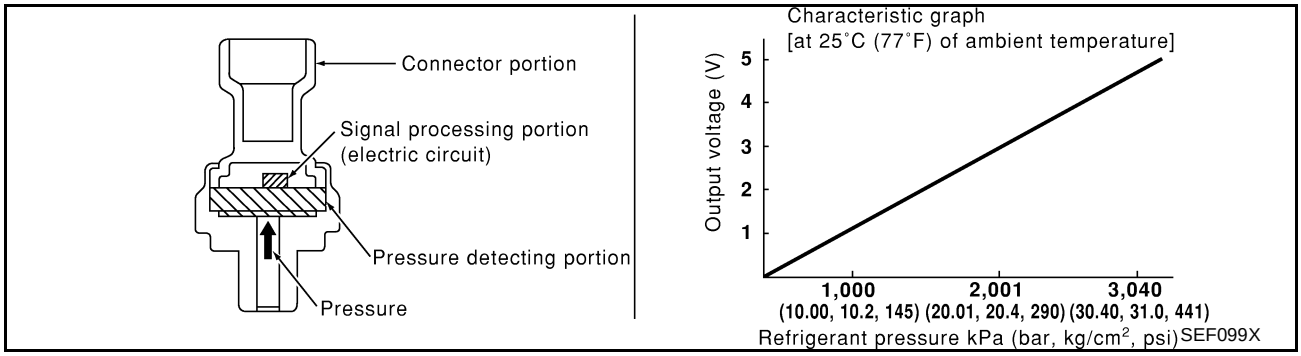
PFP:92136

Component Description

EBS00ESQ

The refrigerant pressure sensor is installed at the liquid tank of the air conditioner system. The sensor uses an electrostatic volume pressure transducer to convert refrigerant pressure to voltage. The voltage signal is sent to ECM, and ECM controls cooling fan system.

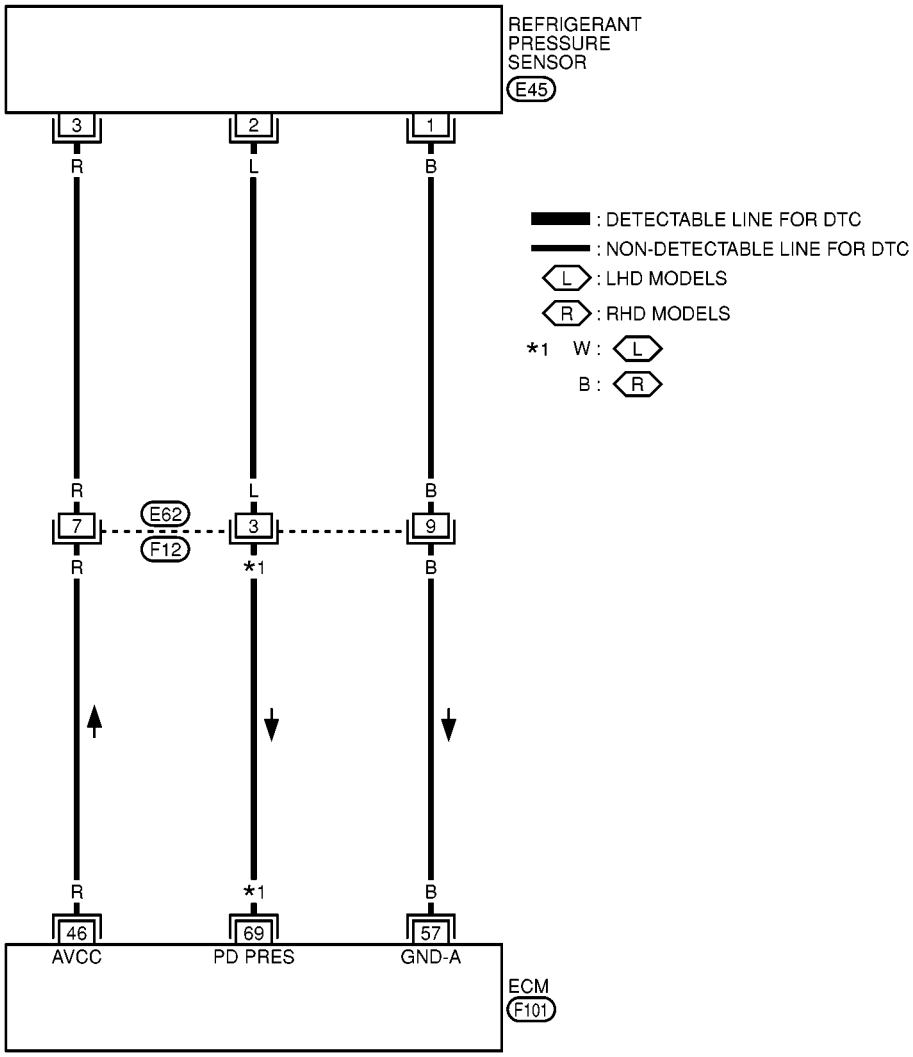


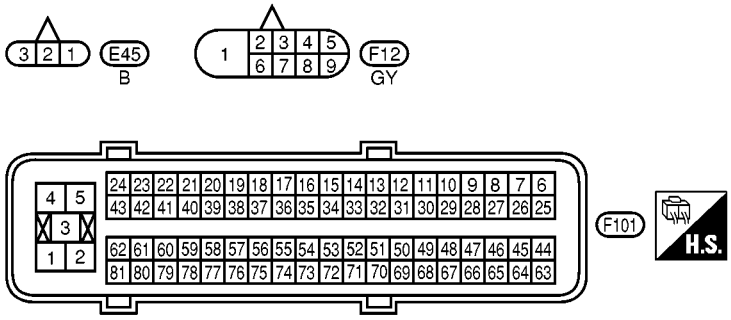


Wiring Diagram

EBS00ESR

EC-RP/SEN-01





MBWA0090E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
46	R	Sensor power supply (Refrigerant pressure sensor)	**[Ignition switch "ON"]**	Approximately 5V
57	B	Sensor ground (Refrigerant pressure sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
69	W (LHD) B (RHD)	Refrigerant pressure sensor	**[Engine is running]** ● **Warm-up condition** ● Both A/C switch and blower switch are "ON". (Compressor operates.)	1.0 - 4.0V

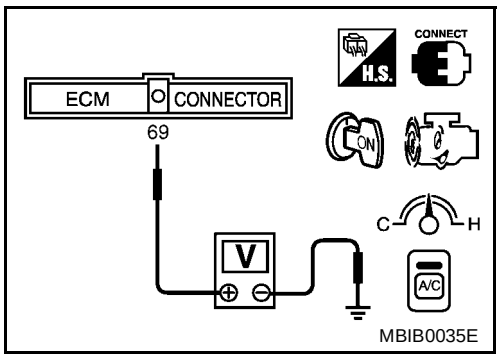
Diagnostic Procedure

EBS00ESS

1. CHECK REFRIGERANT PRESSURE SENSOR OVERALL FUNCTION

1. Start engine and warm it up to normal operating temperature.
2. Turn A/C switch and blower switch "ON".
3. Check voltage between ECM terminal 69 and ground with CONSULT-II or tester.

Voltage: 1.0 - 4.0V

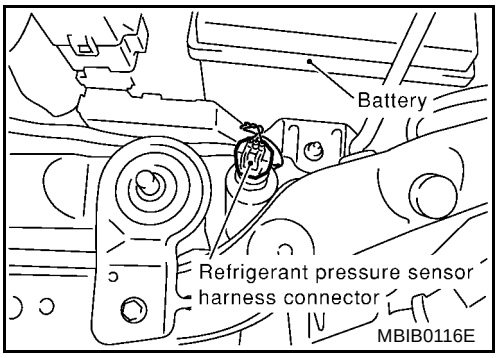


OK or NG

OK >> **INSPECTION END**
NG >> GO TO 2.

2. CHECK REFRIGERANT PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Turn A/C switch and blower switch “OFF”.
2. Stop engine.
3. Disconnect refrigerant pressure sensor harness connector.
4. Turn ignition switch “ON”.

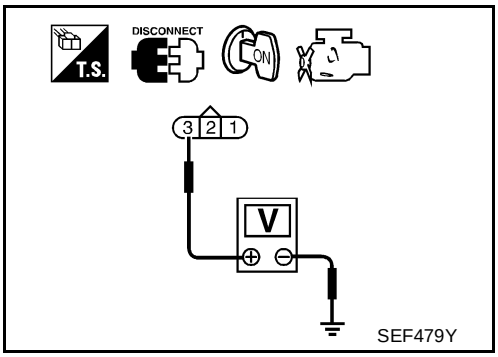


5. Check voltage between refrigerant pressure sensor terminal 3 and ground with CONSULT-II or tester.

Voltage: Approximately 5V

OK or NG

OK >> GO TO 4.
NG >> GO TO 3.



3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E62, F12
- Harness for open or short between ECM and refrigerant pressure sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK REFRIGERANT PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 57 and refrigerant pressure sensor terminal 1. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E62, F12
- Harness for open or short between ECM and refrigerant pressure sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK REFRIGERANT PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 69 and refrigerant pressure sensor terminal 2. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E62, F12
- Harness for open or short between ECM and refrigerant pressure sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

OK or NG

OK >> Replace refrigerant pressure sensor.
NG >> Repair or replace.

Removal and Installation

EBS00EST

REFRIGERANT PRESSURE SENSOR

Refer to ATC-127, "REFRIGERANT LINES" .

ELECTRICAL LOAD SIGNAL

PFP:25350

Description

EBS00ESU

The electrical load signals except headlamp switch signal are transferred through the CAN communication line.

CONSULT-II Reference Value in Data Monitor Mode

EBS00H63

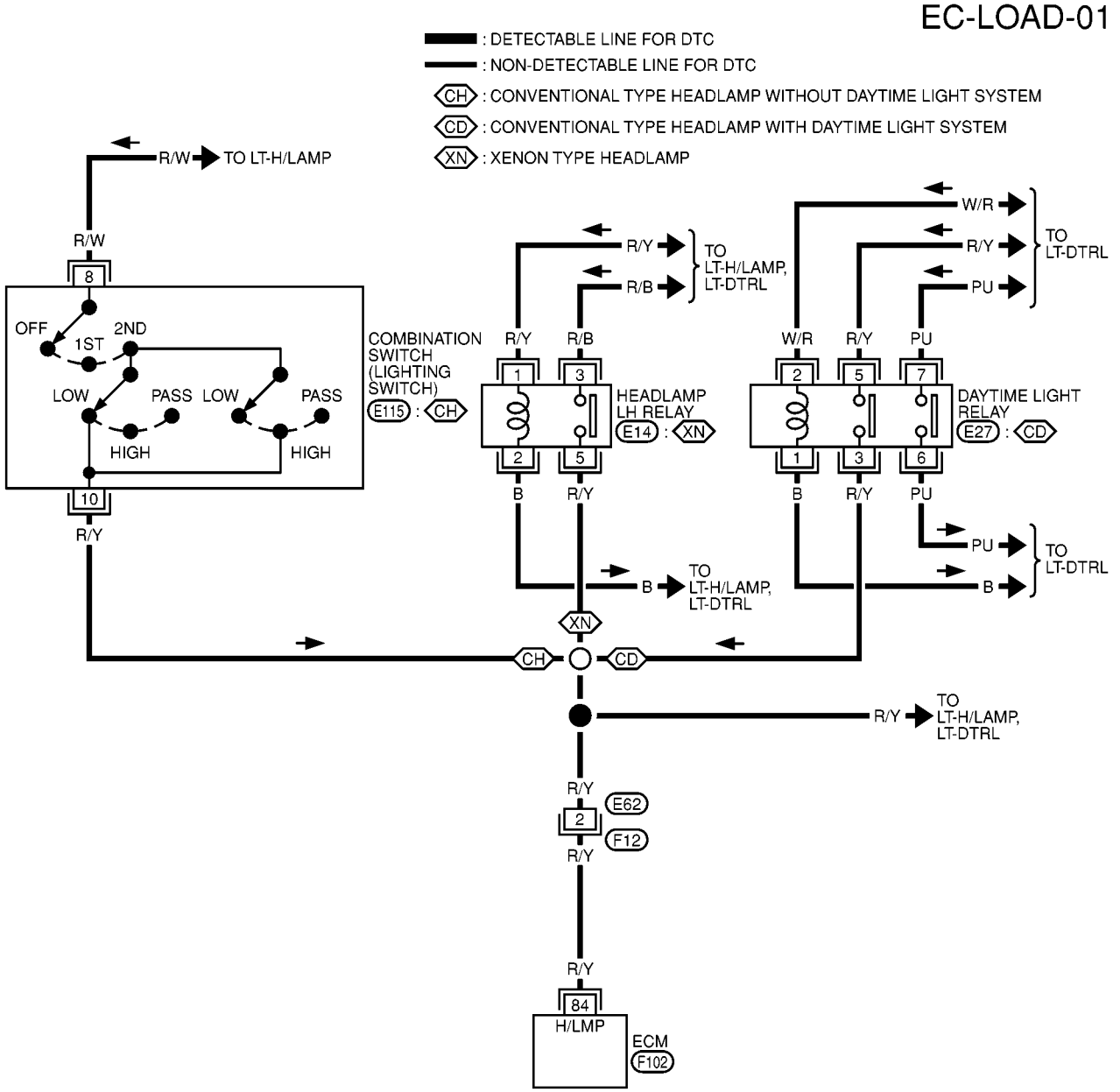
Specification data are reference values.

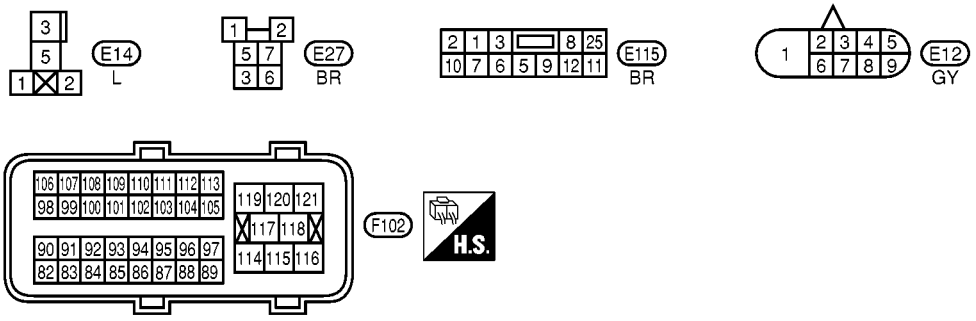
MONITOR ITEM	CONDITION		SPECIFICATION
LOAD SIGNAL	● Ignition switch: ON	Rear window defogger switch is ON and/or lighting switch is 2nd.	ON
		Rear window defogger switch is OFF and lighting switch is OFF.	OFF

Wiring Diagram

EBS00H64

EC-LOAD-01





MBWA0147E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
84	R/Y	Electrical load signal (Headlamp signal)	**[Ignition switch "ON"]** ● Lighting switch is "2ND" position	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"] ● Lighting switch is "OFF"	Approximately 0V

Diagnostic Procedure

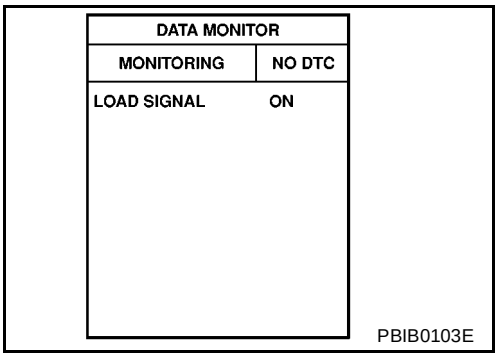
EBS00H65

1. CHECK LOAD SIGNAL CIRCUIT OVERALL FUNCTION-I

With CONSULT-II
With GST

1. Turn ignition switch "ON".
2. Connect CONSULT-II or GST and select "DATA MONITOR" mode.
3. Select "LOAD SIGNAL" and check indication under the following conditions.

Condition	Indication
Rear window defogger switch "ON"	ON
Rear window defogger switch "OFF"	OFF



OK or NG

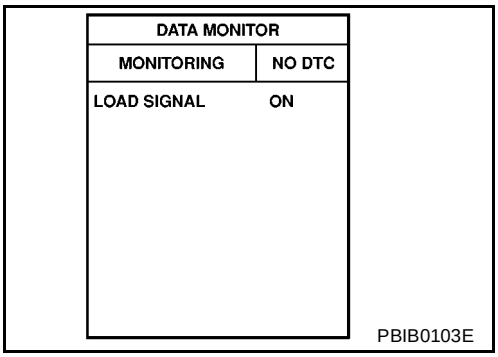
OK (With CONSULT-II)>>GO TO 2.
OK (Without CONSULT-II)>>GO TO 3.
NG >> GO TO 4.

2. CHECK LOAD SIGNAL CIRCUIT OVERALL FUNCTION-II

With CONSULT-II

Check "LOAD SIGNAL" indication under the following conditions.

Condition	Indication
Lighting switch "ON" at 2nd position	ON
Lighting switch "OFF"	OFF



OK or NG

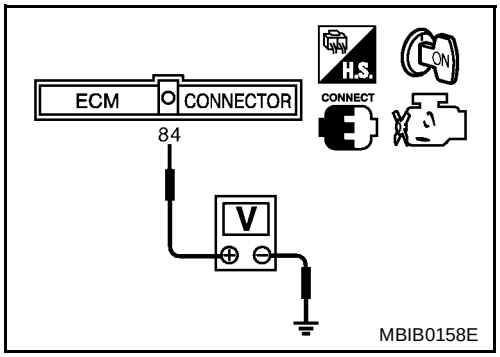
OK >> **INSPECTION END**
NG >> GO TO 5.

3. CHECK LOAD SIGNAL CIRCUIT OVERALL FUNCTION-II

Without CONSULT-II

Check voltage between ECM terminal 84 and ground under the following conditions.

Condition	Voltage
Lighting switch “ON” at 2nd position	Battery voltage
Lighting switch “OFF”	Approximately 0V



OK or NG

OK >> **INSPECTION END**
NG >> GO TO 5.

4. CHECK REAR WINDOW DEFOGGER SYSTEM

Refer to GW-40, "REAR WINDOW DEFOGGER" .

>> **INSPECTION END**

5. CHECK HEADLAMP FUNCTION

1. Turn lighting switch “ON” at 2nd position.
2. Check that headlamps are illuminated.

OK or NG

OK >> GO TO 6.
NG >> Refer to LT-5, "HEADLAMP -CONVENTIONAL TYPE-" , LT-10, "HEADLAMP - XENON TYPE -" , LT-18, "HEADLAMP (WITH DAYTIME) - CONVENTIONAL TYPE -" or LT-25, "HEADLAMP (WITH DAYTIME) - XENON TYPE -" .

6. CHECK HEADLAMP INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

CONVENTIONAL TYPE HEADLAMP WITHOUT DAYTIME LIGHT SYSTEM

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Disconnect lighting switch harness connector.
4. Check harness continuity between ECM terminal 84 and lighting switch terminal 10. Refer to Wiring Diagram.

Continuity should exist.

5. Also check harness for short to ground and short to power.

CONVENTIONAL TYPE HEADLAMP WITH DAYTIME LIGHT SYSTEM

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Disconnect daytime light relay.
4. Check harness continuity between ECM terminal 84 and daytime light relay terminal 3. Refer to Wiring Diagram.

Continuity should exist.

5. Also check harness for short to ground and short to power.

XENON TYPE HEADLAMP

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Disconnect headlamp LH relay.
4. Check harness continuity between ECM terminal 84 and headlamp LH relay terminal 5. Refer to Wiring Diagram.

Continuity should exist.

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E62, F12
- harness for open and short between ECM and lighting switch
- harness for open and short between ECM and daytime light relay
- harness for open and short between ECM and headlamp LH relay

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-143, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

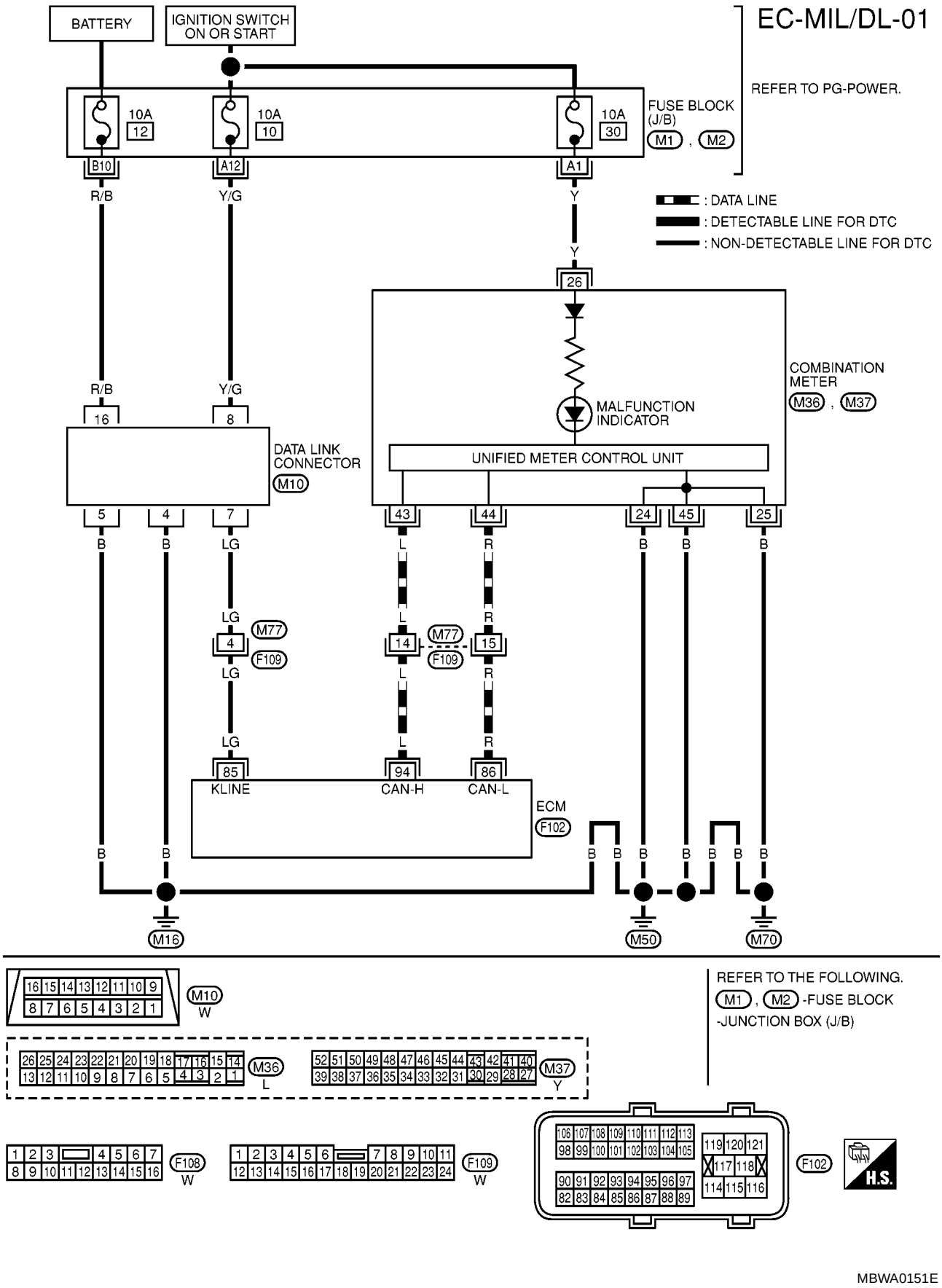
>> **INSPECTION END**

MI & DATA LINK CONNECTORS

PFP:24814

Wiring Diagram—LHD Models

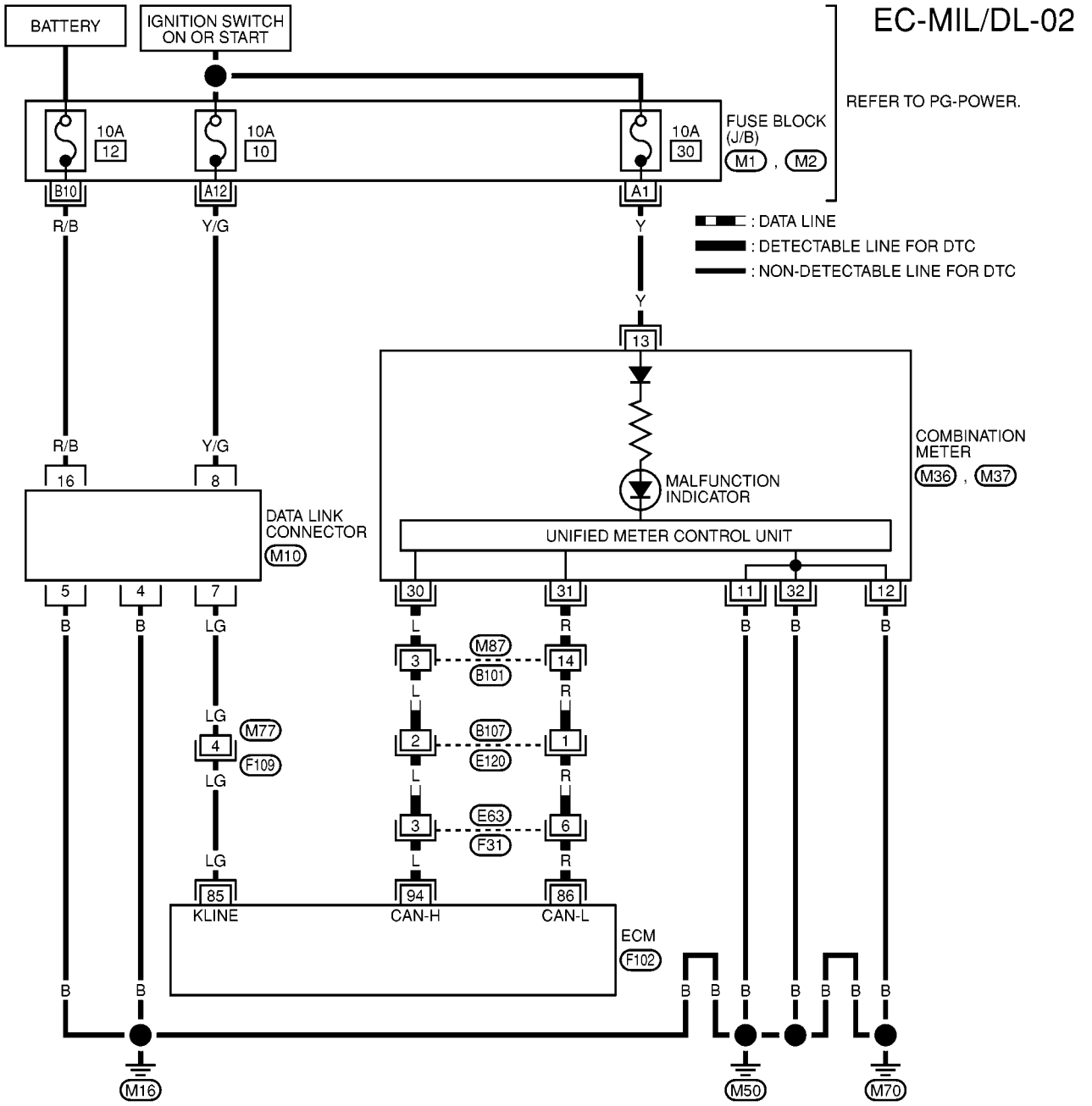
EBS00ESW

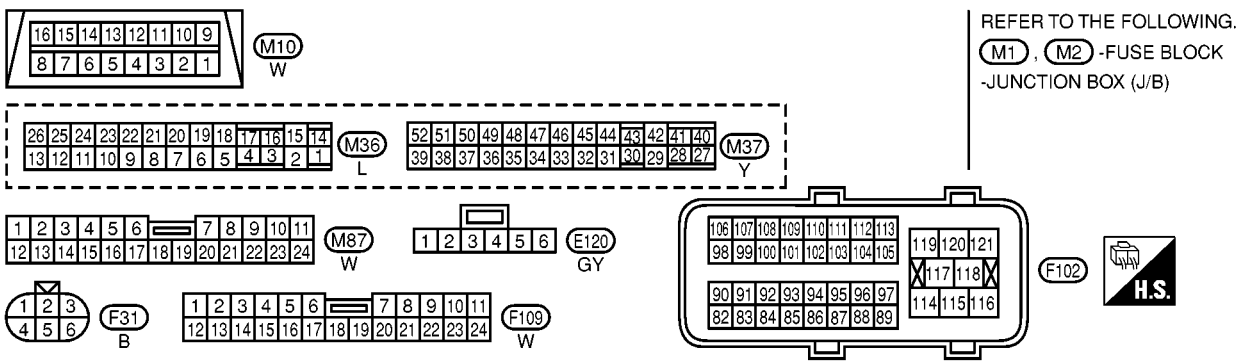


MBWA0151E

Wiring Diagram—RHD Models

EBS00H9S





MBWA0152E

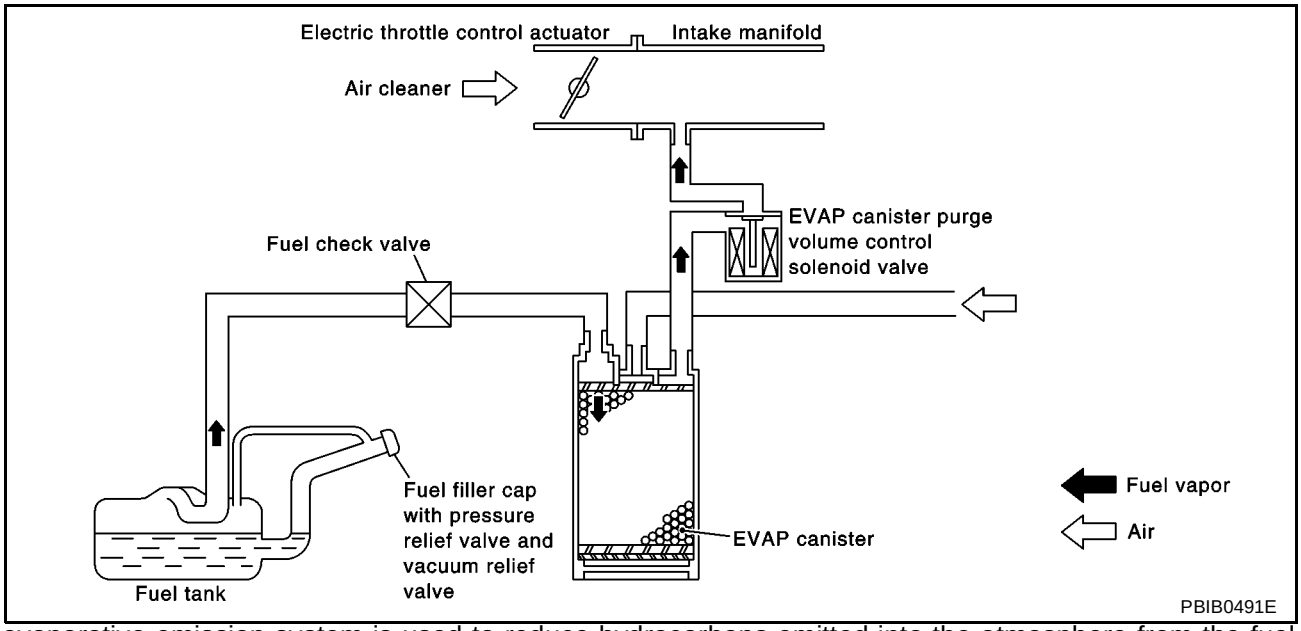
EVAPORATIVE EMISSION SYSTEM

PFP:14950

Description

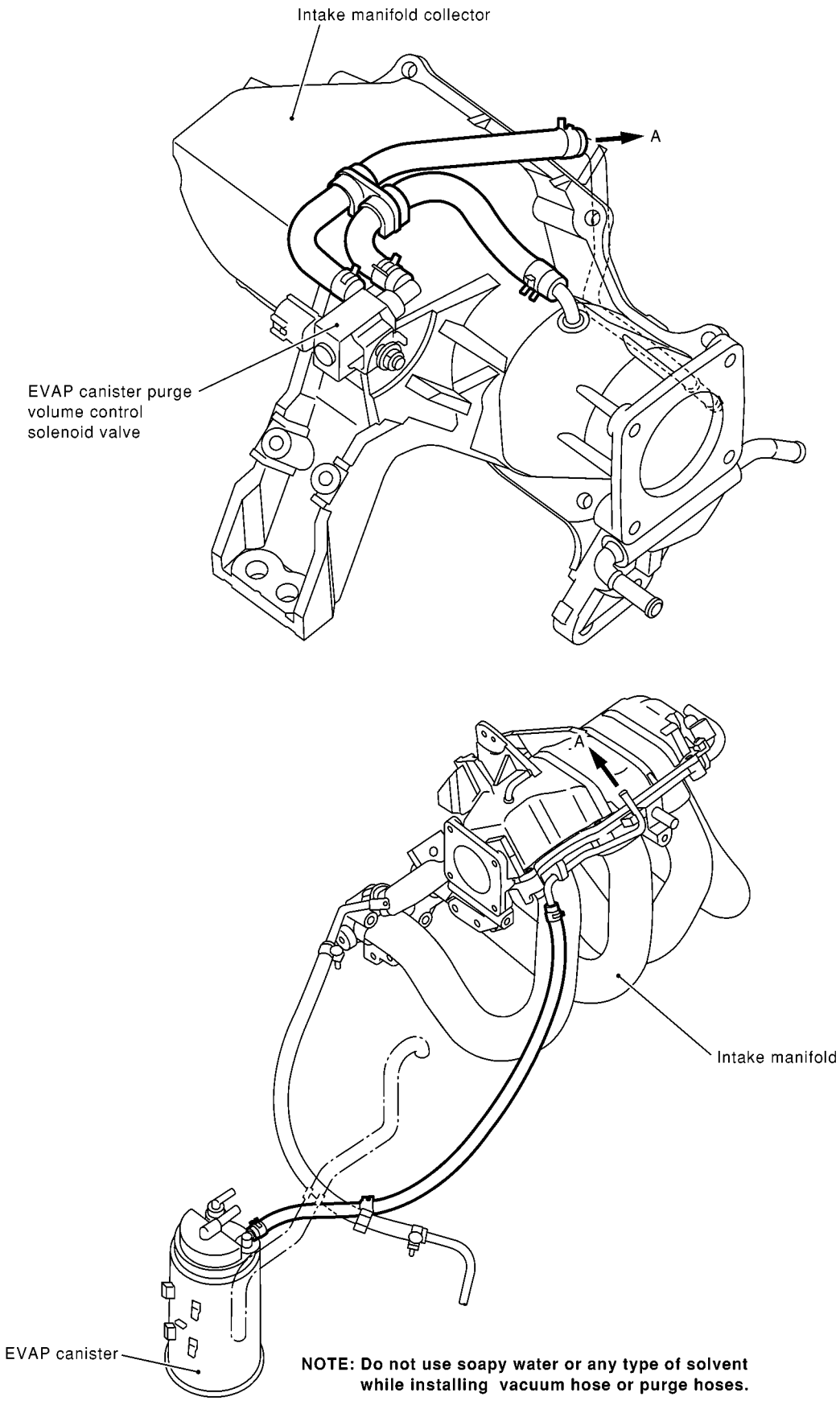
EBS00ESX

SYSTEM DESCRIPTION



The evaporative emission system is used to reduce hydrocarbons emitted into the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the EVAP canister.
The fuel vapor in the sealed fuel tank is led into the EVAP canister which contains activated carbon and the vapor is stored there when the engine is not operating or when refueling to the fuel tank.
The vapor in the EVAP canister is purged by the air through the purge line to the intake manifold when the engine is operating. EVAP canister purge volume control solenoid valve is controlled by ECM. When the engine operates, the flow rate of vapor controlled by EVAP canister purge volume control solenoid valve is proportionally regulated as the air flow increases.
EVAP canister purge volume control solenoid valve also shuts off the vapor purge line during decelerating and idling.

EVAPORATIVE EMISSION LINE DRAWING



NOTE: Do not use soapy water or any type of solvent while installing vacuum hose or purge hoses.

MBIB0014E

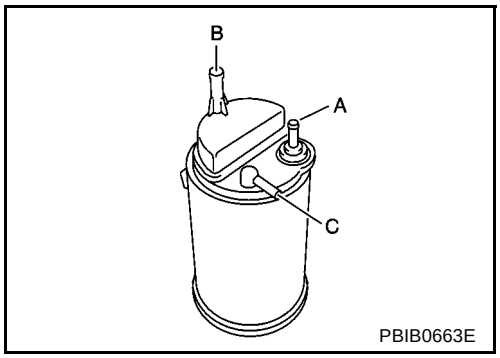
Component Inspection

EBS00ESY

EVAP CANISTER

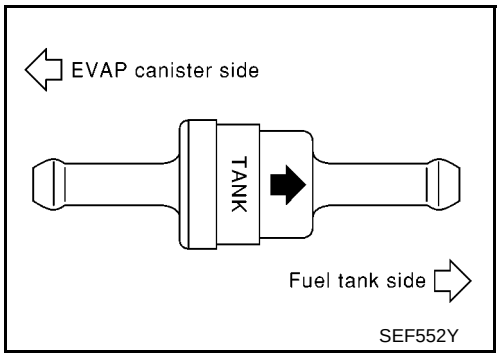
Check EVAP canister as follows:

1. Block port **B** . Orally blow air through port **A** . Check that air flows freely through port **C** .
2. Block port **A** . Orally blow air through port **B** . Check that air flows freely through port **C** .



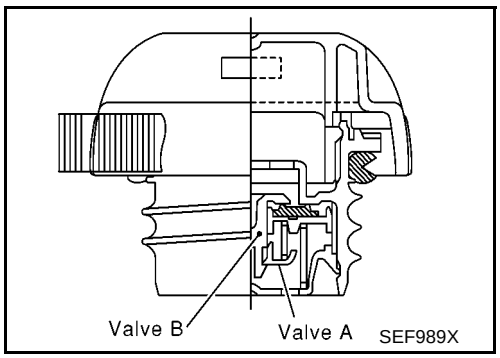
FUEL CHECK VALVE

1. Blow air through connector on fuel tank side. A considerable resistance should be felt and a portion of air flow should be directed toward the EVAP canister side.
2. Blow air through connector on EVAP canister side. Air flow should be smoothly directed toward fuel tank side.
3. If fuel check valve is suspected of not properly functioning in steps 1 and 2 above, replace it.



FUEL TANK VACUUM RELIEF VALVE (BUILT INTO FUEL FILLER CAP)

1. Wipe clean valve housing.

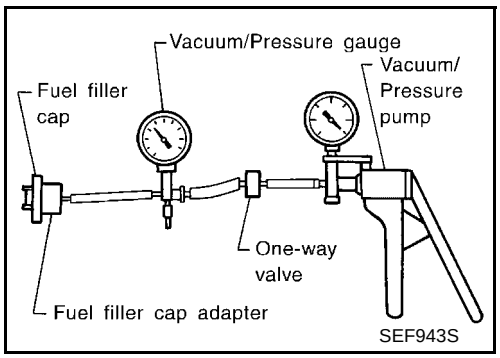


2. Check valve opening pressure and vacuum.

Pressure: 15.3 - 20.0 kPa (0.153 - 0.200 bar, 0.156 - 0.204 kg/cm^2 , 2.22 - 2.90 psi)

Vacuum: –6.0 to –3.3 kPa (–0.060 to –0.033 bar, –0.061 to –0.034 kg/cm^2 , –0.87 to –0.48 psi)

3. If out of specification, replace fuel filler cap as an assembly.



EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-374, "Component Inspection" .

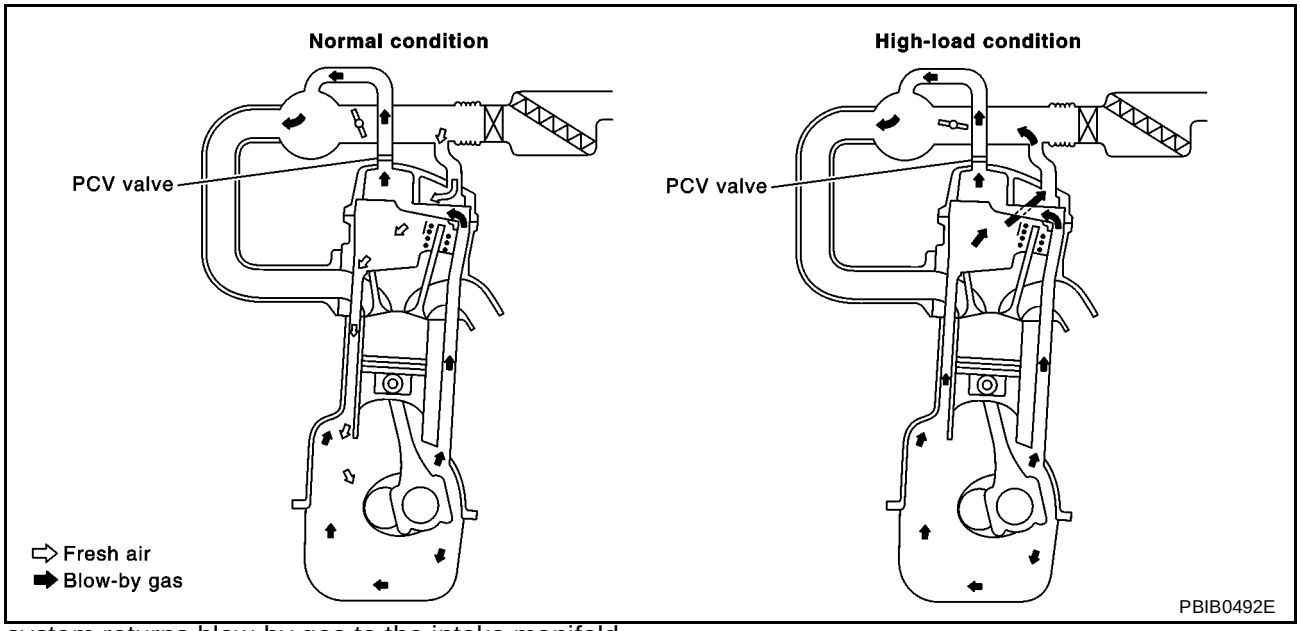
POSITIVE CRANKCASE VENTILATION

PFP:11810

Description

EBS00ESZ

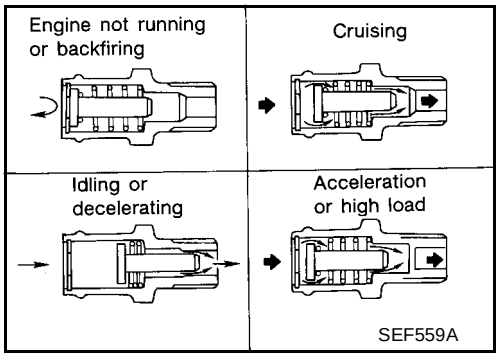
SYSTEM DESCRIPTION



This system returns blow-by gas to the intake manifold.

The positive crankcase ventilation (PCV) valve is provided to conduct crankcase blow-by gas to the intake manifold. During partial throttle operation of the engine, the intake manifold sucks the blow-by gas through the PCV valve. Normally, the capacity of the valve is sufficient to handle any blow-by and a small amount of ventilating air. The ventilating air is then drawn from the air inlet tubes into the crankcase. In this process the air passes through the hose connecting air inlet tubes to rocker cover. Under full-throttle condition, the manifold vacuum is insufficient to draw the blow-by flow through the valve. The flow goes through the hose connection in the reverse direction.

On vehicles with an excessively high blow-by, the valve does not meet the requirement. This is because some of the flow will go through the hose connection to the air inlet tubes under all conditions.

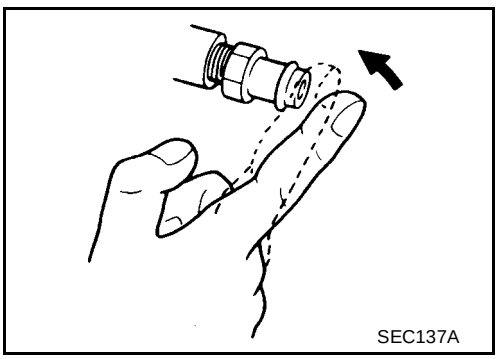


Component Inspection

EBS00ET0

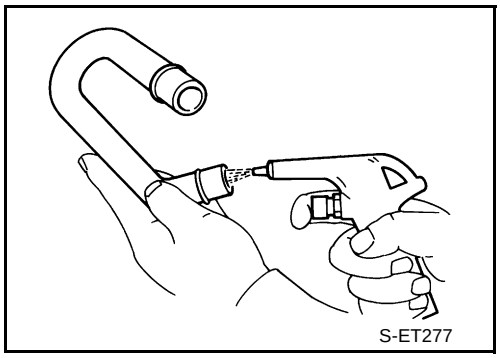
PCV (POSITIVE CRANKCASE VENTILATION) VALVE

With engine running at idle, remove PCV valve from rocker cover. A properly working valve makes a hissing noise as air passes through it. A strong vacuum should be felt immediately when a finger is placed over valve inlet.



PCV VALVE VENTILATION HOSE

1. Check hoses and hose connections for leaks.
2. Disconnect all hoses and clean with compressed air. If any hose cannot be freed of obstructions, replace.


S-ET277

SERVICE DATA AND SPECIFICATIONS (SDS)

PFP:00030

Fuel Pressure

EBS00ET1

Fuel pressure at idle	Approximately 350 kPa (3.7kg/cm^2 , 51psi)

Idle Speed and Ignition Timing

EBS00ET2

Target idle speed	No-load*1 (in “P” or N” position)	A/T: 800±50 rpm M/T: 700±50 rpm
Air conditioner: ON	In “P” or N” position	825 rpm or more
Ignition timing	In “P” or N” position	A/T: 10°±5° BTDC M/T: 8°±5° BTDC

*1: Under the following conditions:

- Air conditioner switch: OFF
- Electric load: OFF (Lights, heater fan & rear window defogger)
- Steering wheel: Kept in straight-ahead position

Calculated Load Value

EBS00ET3

	Calculated load value % (Using CONSULT-II or GST)
At idle	10 - 35
At 2,500 rpm	10 - 35

Mass Air Flow Sensor

EBS00ET4

Supply voltage	Battery voltage (11 - 14V)
Output voltage at idle	1.0 - 1.7*V
Mass air flow (Using CONSULT-II or GST)	1.0 - 4.0 g·m/sec at idle* 5.0 - 10.0 g·m/sec at 2,500 rpm*

*: Engine is warmed up to normal operating temperature and running under no-load.

Intake Air Temperature Sensor

EBS00ET5

Temperature °C (°F)	Resistance kΩ
25 (77)	1.9 - 2.1
80 (176)	0.31 - 0.37

Engine Coolant Temperature Sensor

EBS00ET6

Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.00
90 (194)	0.236 - 0.260

Heated Oxygen Sensor 1 Heater

EBS00ET7

Resistance [at 20°C (68°F)]	8 - 10Ω

Heated Oxygen sensor 2 Heater

EBS00ET8

Resistance [at 25°C (77°F)]	2.3 - 4.3Ω

Crankshaft Position Sensor (POS)

EBS00ET9

Refer to EC-353, "Component Inspection" .

Camshaft Position Sensor (PHASE)

EBS00ETA

Refer to EC-359, "Component Inspection" .

Throttle Control Motor

EBS00ETB

Resistance [at 25°C (77°F)]	Approximately 1 - 15Ω

Injector

EBS00ETC

Resistance [at 20°C (68°F)]	13.5 - 17.5Ω

Fuel Pump

EBS00ETD

Resistance [at 25°C (77°F)]	Approximately 1.0Ω

INDEX FOR DTC

PFP:00024

Alphabetical Index

EBS00ETE

Check if the vehicle is a model with Euro-OBD (E-OBD) system or not by the “Type approval number” on the identification plate. Refer to GI-46, "IDENTIFICATION PLATE" .

NOTE:
If DTC U1000 or U1001 is displayed with other DTC, first perform the trouble diagnosis for DTC U1000, U1001. Refer to EC-663, "DTC U1000, U1001 CAN COMMUNICATION LINE" .

QG16DE ENGINE MODELS

Items (CONSULT-II screen terms)	DTC*1		Reference page
	CONSULT-II*2	ECM*3	
APP SEN 1/CIRC*5	P0227	0227	EC-742
APP SEN 1/CIRC*5	P0228	0228	EC-742
APP SEN 2/CIRC*5	P1227	1227	EC-821
APP SEN 2/CIRC*5	P1228	1228	EC-821
APP SENSOR*5	P0226	0226	EC-735
BRAKE SW/CIRCUIT	P1805	1805	EC-832
CAN COMM CIRCUIT*6	U1001	1001	EC-663
CKP SEN/CIRCUIT	P0335	0335	EC-753
CMP SEN/CIRC-B1	P0340	0340	EC-760
CTP LEARNING	P1225	1225	EC-817
CTP LEARNING	P1226	1226	EC-819
ECM	P0605	0605	EC-767
ECM BACK UP/CIRC	P1065	1065	EC-770
ECT SEN/CIRCUIT*5	P0117	0117	EC-672
ECT SEN/CIRCUIT*5	P0118	0118	EC-672
ENG OVER TEMP	P1217	1217	EC-801
ETC ACTR*5	P1121	1121	EC-780
ETC FUNCTION/CIRC*5	P1122	1122	EC-783
ETC MOT*5	P1128	1128	EC-796
ETC MOT PWR*5	P1124	1124	EC-790
ETC MOT PWR*5	P1126	1126	EC-790
HO2S1 (B1)	P0132	0132	EC-677
HO2S1 (B1)	P0134	0134	EC-692
HO2S2 (B1)	P0138	0138	EC-707
KNOCK SEN/CIRC-B1	P0327	0327	EC-749
KNOCK SEN/CIRC-B1	P0328	0328	EC-749
MAF SEN/CIRCUIT*5	P0102	0102	EC-666
MAF SEN/CIRCUIT*5	P0103	0103	EC-666
MAF SENSOR*5	P1102	1102	EC-774
NATS MALFUNCTION	P1610 - P1615	1610 - 1615	EC-595
NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	No DTC	Flashing*4	EC-596

Items (CONSULT-II screen terms)	DTC*1		Reference page
	CONSULT-II*2	ECM*3	
NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	**P0000**	**0000**	**—**
SENSOR POWER/CIRC*5	P1229	1229	EC-828
TP SEN 1/CIRC*5	P0222	0222	EC-729
TP SEN 1/CIRC*5	P0223	0223	EC-729
TP SEN 2/CIRC*5	P1223	1223	EC-811
TP SEN 2/CIRC*5	P1224	1224	EC-811
TP SENSOR*5	P0221	0221	EC-723

*1: 1st trip DTC No. is the same as DTC No.
*2: These numbers are prescribed by ISO 15031-5.
*3: In Diagnostic Test Mode II (Self-diagnostic results), these numbers are controlled by NISSAN.
*4: When engine is running.
*5: When the fail-safe operation occurs, the MI illuminates.
*6: The trouble shooting for this DTC needs CONSULT-II.

QG18DE ENGINE MODELS

Items (CONSULT-II screen terms)	DTC*1		Reference page
	CONSULT-II*2	ECM*3	
APP SEN 1/CIRC*5	P0227	0227	EC-742
APP SEN 1/CIRC*5	P0228	0228	EC-742
APP SEN 2/CIRC*5	P1227	1227	EC-821
APP SEN 2/CIRC*5	P1228	1228	EC-821
APP SENSOR*5	P0226	0226	EC-735
BRAKE SW/CIRCUIT	P1805	1805	EC-832
CAN COMM CIRCUIT*5	U1000	1000	EC-663
CAN COMM CIRCUIT*6	U1001	1001	EC-663
CKP SEN/CIRCUIT	P0335	0335	EC-753
CMP SEN/CIRC-B1	P0340	0340	EC-760
CTP LEARNING	P1225	1225	EC-817
CTP LEARNING	P1226	1226	EC-819
ECM	P0605	0605	EC-767
ECM BACK UP/CIRC	P1065	1065	EC-770
ECT SEN/CIRCUIT*5	P0117	0117	EC-672
ECT SEN/CIRCUIT*5	P0118	0118	EC-672
ENG OVER TEMP	P1217	1217	EC-801
ETC ACTR*5	P1121	1121	EC-780
ETC FUNCTION/CIRC*5	P1122	1122	EC-783
ETC MOT*5	P1128	1128	EC-796
ETC MOT PWR*5	P1124	1124	EC-790
ETC MOT PWR*5	P1126	1126	EC-790
HO2S1 (B1)	P0132	0132	EC-683

Items (CONSULT-II screen terms)	DTC*1		Reference page
	CONSULT-II*2	ECM*3	
HO2S1 (B1)	P0134	0134	EC-698
HO2S1 (B2)	P0152	0152	EC-683
HO2S1 (B2)	P0154	0154	EC-698
HO2S2 (B1)	P0138	0138	EC-714
HO2S2 (B2)	P0158	0158	EC-714
KNOCK SEN/CIRC-B1	P0327	0327	EC-749
KNOCK SEN/CIRC-B1	P0328	0328	EC-749
MAF SEN/CIRCUIT*5	P0102	0102	EC-666
MAF SEN/CIRCUIT*5	P0103	0103	EC-666
MAF SENSOR*5	P1102	1102	EC-774
NATS MALFUNCTION	P1610 - P1615	1610 - 1615	EC-595
NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	No DTC	Flashing*4	EC-596
NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	**P0000**	**0000**	**—**
SENSOR POWER/CIRC*5	P1229	1229	EC-828
TP SEN 1/CIRC*5	P0222	0222	EC-729
TP SEN 1/CIRC*5	P0223	0223	EC-729
TP SEN 2/CIRC*5	P1223	1223	EC-811
TP SEN 2/CIRC*5	P1224	1224	EC-811
TP SENSOR*5	P0221	0221	EC-723

*1: 1st trip DTC No. is the same as DTC No.
*2: These numbers are prescribed by ISO 15031-5.
*3: In Diagnostic Test Mode II (Self-diagnostic results), these numbers are controlled by NISSAN.
*4: When engine is running.
*5: When the fail-safe operation occurs, the MI illuminates.
*6: The trouble shooting for this DTC needs CONSULT-II.

NOTE:
Regarding P12 models with QG18DE engine, “B1” indicates bank 1, “B2” indicates bank 2.

DTC No. Index

EBS00ETF

Check if the vehicle is a model with Euro-OBD (E-OBD) system or not by the “Type approval number” on the identification plate. Refer to GI-46, "IDENTIFICATION PLATE" .

NOTE:
If DTC U1000 or U1001 is displayed with other DTC, first perform the trouble diagnosis for DTC U1000, U1001. Refer to EC-663, "DTC U1000, U1001 CAN COMMUNICATION LINE" .

QG16DE ENGINE MODELS

DTC*1		Items (CONSULT-II screen terms)	Reference page
CONSULT-II*2	ECM*3		
No DTC	Flashing*4	NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	**EC-596**
U1001	1001*6	CAN COMM CIRCUIT	EC-663

DTC[*1]		Items (CONSULT-II screen terms)	Reference page
CONSULT-II[*2]	ECM[*3]		
P0000	**0000**	**NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.**	—
P0102	0102	MAF SEN/CIRCUIT[*5]	EC-666
P0103	0103	MAF SEN/CIRCUIT[*5]	EC-666
P0117	0117	ECT SEN/CIRCUIT[*5]	EC-672
P0118	0118	ECT SEN/CIRCUIT[*5]	EC-672
P0132	0132	HO2S1 (B1)	EC-677
P0134	0134	HO2S1 (B1)	EC-692
P0138	0138	HO2S2 (B1)	EC-707
P0221	0221	TP SENSOR[*5]	EC-723
P0222	0222	TP SEN 1/CIRC[*5]	EC-729
P0223	0223	TP SEN 1/CIRC[*5]	EC-729
P0226	0226	APP SENSOR[*5]	EC-735
P0227	0227	APP SEN 1/CIRC[*5]	EC-742
P0228	0228	APP SEN 1/CIRC[*5]	EC-742
P0327	0327	KNOCK SEN/CIRC-B1	EC-749
P0328	0328	KNOCK SEN/CIRC-B1	EC-749
P0335	0335	CKP SEN/CIRCUIT	EC-753
P0340	0340	CMP SEN/CIRC-B1	EC-760
P0605	0605	ECM	EC-767
P1065	1065	ECM BACK UP/CIRC	EC-770
P1102	1102	MAF SENSOR[*5]	EC-774
P1121	1121	ETC ACTR[*5]	EC-780
P1122	1122	ETC FUNCTION/CIRC[*5]	EC-783
P1124	1124	ETC MOT PWR[*5]	EC-790
P1126	1126	ETC MOT PWR[*5]	EC-790
P1128	1128	ETC MOT[*5]	EC-796
P1217	1217	ENG OVER TEMP	EC-801
P1223	1223	TP SEN 2/CIRC[*5]	EC-811
P1224	1224	TP SEN 2/CIRC[*5]	EC-790
P1225	1225	CTP LEARNING	EC-817
P1226	1226	CTP LEARNING	EC-819
P1227	1227	APP SEN 2/CIRC[*5]	EC-821
P1228	1228	APP SEN 2/CIRC[*5]	EC-821
P1229	1229	SENSOR POWER/CIRC[*5]	EC-828
P1610 - P1615	1610 - 1615	NATS MALFUNCTION	EC-595
P1805	1805	BRAKE SW/CIRCUIT	EC-832

*1: 1st trip DTC No. is the same as DTC No.
*2: These numbers are prescribed by ISO 15031-5.
*3: In Diagnostic Test Mode II (Self-diagnostic results), these numbers are controlled by NISSAN.

*4: When engine is running.
*5: When the fail-safe operation occurs, the MI illuminates.
*6: The troubleshooting for this DTC needs CONSULT-II.

QG18DE ENGINE MODELS

DTC[*1]		Items (CONSULT-II screen terms)	Reference page
CONSULT-II[*2]	ECM[*3]		
No DTC	Flashing[*4]	NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	EC-596
U1000	1000[*6]	CAN COMM CIRCUIT	EC-663
U1001	1001[*6]	CAN COMM CIRCUIT	EC-663
P0000	**0000**	**NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.**	—
P0102	0102	MAF SEN/CIRCUIT[*5]	EC-666
P0103	0103	MAF SEN/CIRCUIT[*5]	EC-666
P0117	0117	ECT SEN/CIRCUIT[*5]	EC-672
P0118	0118	ECT SEN/CIRCUIT[*5]	EC-672
P0132	0132	HO2S1 (B1)	EC-683
P0134	0134	HO2S1 (B1)	EC-698
P0138	0138	HO2S2 (B1)	EC-714
P0152	0152	HO2S1 (B2)	EC-683
P0154	0154	HO2S1 (B2)	EC-698
P0158	0158	HO2S2 (B2)	EC-714
P0221	0221	TP SENSOR*	EC-723
P0222	0222	TP SEN 1/CIRC[*5]	EC-729
P0223	0223	TP SEN 1/CIRC[*5]	EC-729
P0226	0226	APP SENSOR[*5]	EC-735
P0227	0227	APP SEN 1/CIRC[*5]	EC-742
P0228	0228	APP SEN 1/CIRC[*5]	EC-742
P0327	0327	KNOCK SEN/CIRC-B1	EC-749
P0328	0328	KNOCK SEN/CIRC-B1	EC-749
P0335	0335	CKP SEN/CIRCUIT	EC-753
P0340	0340	CMP SEN/CIRC-B1	EC-760
P0605	0605	ECM	EC-767
P1065	1065	ECM BACK UP/CIRC	EC-770
P1102	1102	MAF SENSOR[*5]	EC-774
P1121	1121	ETC ACTR[*5]	EC-780
P1122	1122	ETC FUNCTION/CIRC[*5]	EC-783
P1124	1124	ETC MOT PWR	EC-811
P1126	1126	ETC MOT PWR[*5]	EC-790
P1128	1128	ETC MOT[*5]	EC-796
P1217	1217	ENG OVER TEMP	EC-801
P1223	1223	TP SEN 2/CIRC[*5]	EC-811

DTC*1		Items (CONSULT-II screen terms)	Reference page
CONSULT-II*2	ECM*3		
P1224	1224	TP SEN 2/CIRC*5	EC-811
P1225	1225	CTP LEARNING	EC-817
P1226	1226	CTP LEARNING	EC-819
P1227	1227	APP SEN 2/CIRC*5	EC-821
P1228	1228	APP SEN 2/CIRC*5	EC-821
P1229	1229	SENSOR POWER/CIRC*5	EC-828
P1610 - P1615	1610 - 1615	NATS MALFUNCTION	EC-595
P1805	1805	BRAKE SW/CIRCUIT	EC-832

*1: 1st trip DTC No. is the same as DTC No.
*2: These numbers are prescribed by ISO 15031-5.
*3: In Diagnostic Test Mode II (Self-diagnostic results), these numbers are controlled by NISSAN.
*4: When engine is running.
*5: When the fail-safe operation occurs, the MI illuminates.
*6: The troubleshooting for this DTC needs CONSULT-II.

NOTE:
Regarding P12 models with QG18DE engine, “B1” indicates bank 1, “B2” indicates bank 2.

PRECAUTIONS

PFP:00001

Precautions for Supplemental Restraint System (SRS) “AIR BAG” and “SEAT BELT PRE-TENSIONER”

EBS00ETG

The Supplemental Restraint System such as "AIR BAG" and "SEAT BELT PRE-TENSIONER", used along with a front seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. Information necessary to service the system safely is included in the SRS and SB section of this Service Manual.

WARNING:

- **To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance must be performed by an authorized NISSAN/INFINITI dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system. For removal of Spiral Cable and Air Bag Module, see the SRS section.**
- **Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses can be identified by yellow and/or orange harness connectors.**

On Board Diagnostic (OBD) System of Engine

EBS00ETH

The ECM has an on board diagnostic system. It will light up the malfunction indicator (MI) to warn the driver of a malfunction causing emission deterioration.

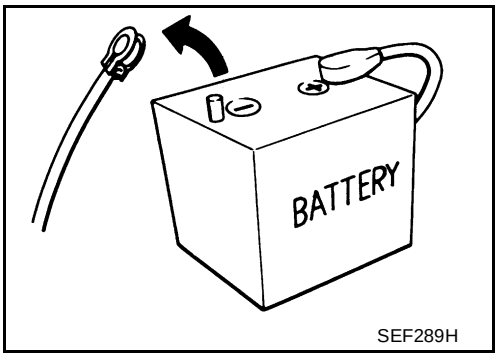
CAUTION:

- **Be sure to turn the ignition switch OFF and disconnect the battery ground cable before any repair or inspection work. The open/short circuit of related switches, sensors, solenoid valves, etc. will cause the MI to light up.**
- **Be sure to connect and lock the connectors securely after work. A loose (unlocked) connector will cause the MI to light up due to the open circuit. (Be sure the connector is free from water, grease, dirt, bent terminals, etc.)**
- **Certain systems and components, especially those related to OBD, may use a new style slide-locking type harness connector. For description and how to disconnect, refer to PG-86, "HARNESS CONNECTOR" .**
- **Be sure to route and secure the harnesses properly after work. The interference of the harness with a bracket, etc. may cause the MI to light up due to the short circuit.**
- **Be sure to connect rubber tubes properly after work. A misconnected or disconnected rubber tube may cause the MI to light up due to the malfunction of the fuel injection system, etc.**
- **Be sure to erase the unnecessary malfunction information (repairs completed) from the ECM before returning the vehicle to the customer.**

Precaution

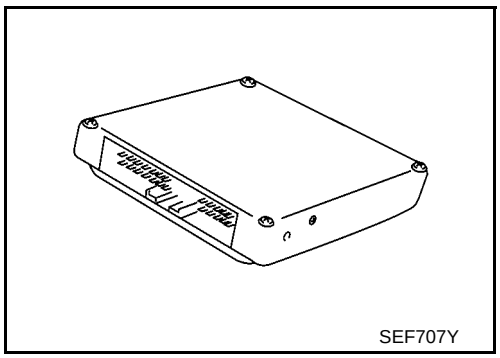
EBS00ETI

- **Always use a 12 volt battery as power source.**
- **Do not attempt to disconnect battery cables while engine is running.**
- **Before connecting or disconnecting the ECM harness connector, turn ignition switch OFF and disconnect battery ground cable. Failure to do so may damage the ECM because battery voltage is applied to ECM even if ignition switch is turned off.**
- **Before removing parts, turn ignition switch OFF and then disconnect battery ground cable.**

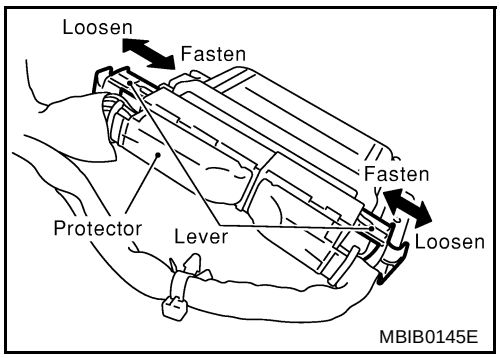


SEF289H

- **Do not disassemble ECM.**
- **If battery cable is disconnected, the memory will return to the initial ECM values.**
  The ECM will now start to self-control at its initial values. Engine operation can vary slightly when the cable is disconnected. However, this is not an indication of a problem. Do not replace parts because of a slight variation.

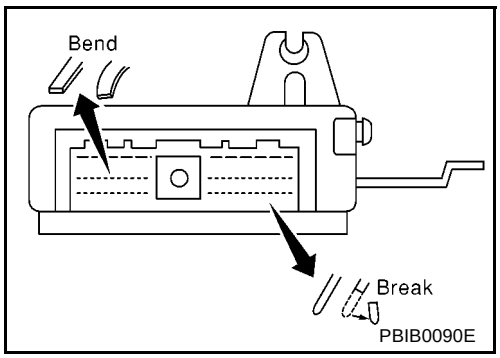

SEF707Y

- **When connecting ECM harness connector, fasten it securely with a lever as far as it will go as shown at right.**



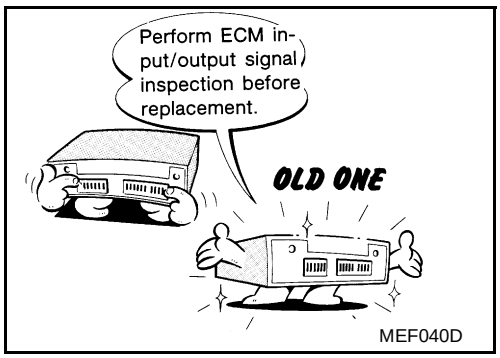
MBIB0145E

- **When connecting or disconnecting pin connectors into or from ECM, take care not to damage pin terminals (bend or break).**
  Make sure that there are not any bends or breaks on ECM pin terminal, when connecting pin connectors.
- **Securely connect ECM harness connectors.**
  A poor connection can cause an extremely high (surge) voltage to develop in coil and condenser, thus resulting in damage to ICs.
- **Keep engine control system harness at least 10 cm (4 in) away from adjacent harness, to prevent engine control system malfunctions due to receiving external noise, degraded operation of ICs, etc.**
- **Keep engine control system parts and harness dry.**



PBIB0090E

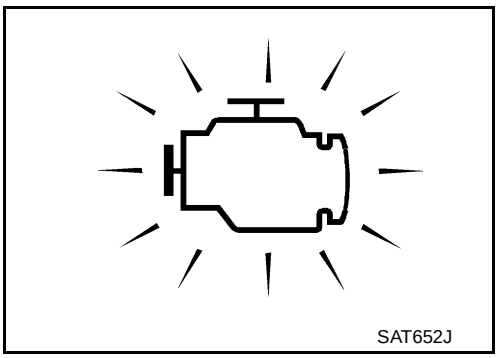
- **Before replacing ECM, perform “ECM Terminals and Reference Value” inspection and make sure ECM functions properly. Refer to EC-622, "ECM Terminals and Reference Value".**
- **Handle mass air flow sensor carefully to avoid damage.**
- **Do not disassemble mass air flow sensor.**
- **Do not clean mass air flow sensor with any type of detergent.**
- **Do not disassemble electric throttle control actuator.**
- **Even a slight leak in the air intake system can cause serious problems.**



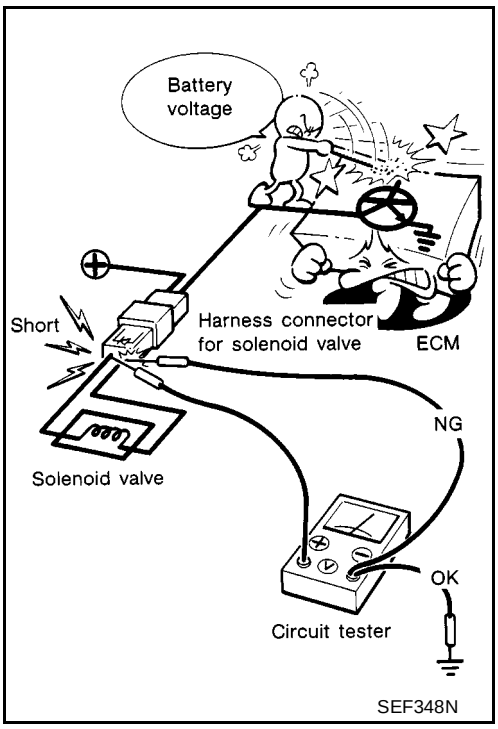
MEF040D

- **Do not shock or jar the camshaft position sensor (PHASE), crankshaft position sensor (POS).**

- **After performing each TROUBLE DIAGNOSIS, perform "DTC Confirmation Procedure" or "Overall Function Check".**
  The DTC should not be displayed in the "DTC Confirmation Procedure" if the repair is completed. The "Overall Function Check" should be a good result if the repair is completed.

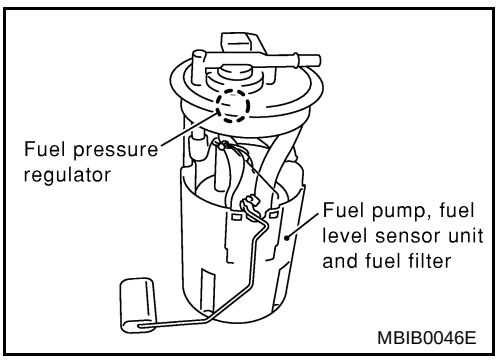

SAT652J

- **When measuring ECM signals with a circuit tester, connect a break-out box (SST) and Y-cable adapter (SST) between the ECM and ECM harness connector.**
- **When measuring ECM signals with a circuit tester, never allow the two tester probes to contact.**
  Accidental contact of probes will cause a short circuit and damage the ECM power transistor.
- **Do not use ECM ground terminals when measuring input/ output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**



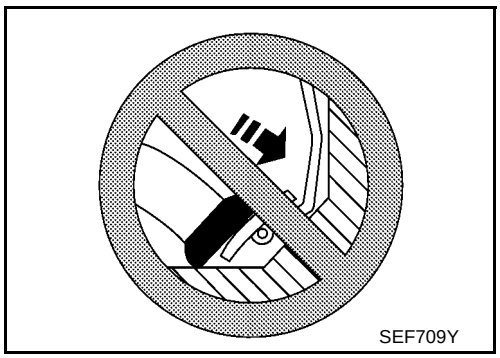
SEF348N

- **Do not operate fuel pump when there is no fuel in lines.**
- **Tighten fuel hose clamps to the specified torque.**

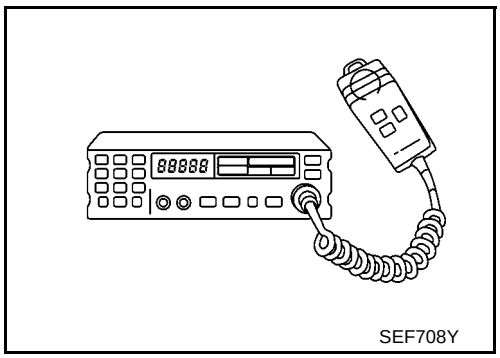


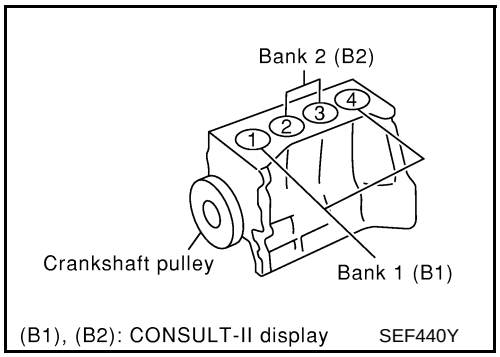
MBIB0046E

- **Do not depress accelerator pedal when starting.**
- **Immediately after starting, do not rev up engine unnecessarily.**
- **Do not rev up engine just prior to shutdown.**


SEF709Y

- **When installing C.B. ham radio or a mobile phone, be sure to observe the following as it may adversely affect electronic control systems depending on installation location.**
  - **Keep the antenna as far as possible from the electronic control units.**
  - **Keep the antenna feeder line more than 20 cm (8 in) away from the harness of electronic controls.**
    Do not let them run parallel for a long distance.
  - **Adjust the antenna and feeder line so that the standing-wave radio can be kept smaller.**
  - **Be sure to ground the radio to vehicle body.**
- **Regarding P12 models with QG18DE engine, “B1” indicates bank 1 (cylinders number 1 and 4), “B2” indicates bank 2 (cylinders number 2 and 3).**


SEF708Y



(B1), (B2): CONSULT-II display SEF440Y

Wiring Diagrams and Trouble Diagnosis

EBS00ETJ

When you read wiring diagrams, refer to the following:

- GI-14, "How to Read Wiring Diagrams"
- PG-3, "POWER SUPPLY ROUTING" for power distribution circuit

When you perform trouble diagnosis, refer to the following:

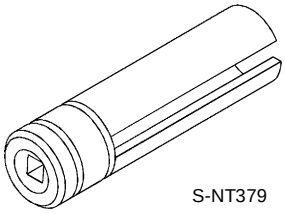
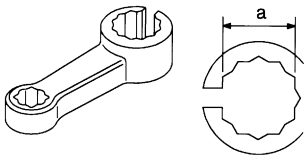
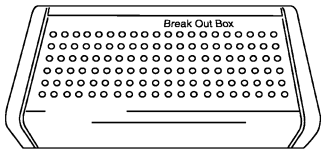
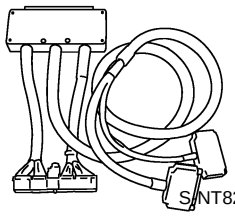
- GI-11, "HOW TO FOLLOW TEST GROUPS IN TROUBLE DIAGNOSES"
- GI-24, "How to Perform Efficient Diagnosis for an Electrical Incident"

PREPARATION

PFP:00002

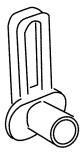
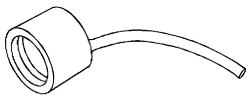
Special Service Tools

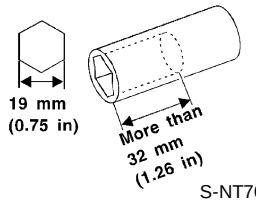
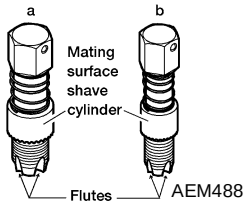
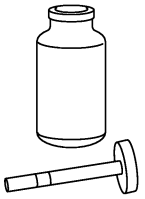
EBS00ETK

Tool number Tool name	Description	
KV10117100 Heated oxygen sensor wrench	 S-NT379	Loosening or tightening heated oxygen sensors with 22 mm (0.87 in) hexagon nut
KV10114400 Heated oxygen sensor wrench	 S-NT636	Loosening or tightening heated oxygen sensors **a: 22 mm (0.87 in)**
KV109E0010 Break-out box	 S-NT825	Measuring ECM signals with a circuit tester
KV109E0080 Y-cable adapter	 S-NT826	Measuring ECM signals with a circuit tester

Commercial Service Tools

EBS00ETL

Tool name	Description	
Quick connector release	 PBIC0198E	Removing fuel tube quick connectors in engine room (Available in SEC. 164 of PARTS CATALOG: Part No. 16441 6N210)
Fuel filler cap adapter	 S-NT653	Checking fuel tank vacuum relief valve opening pressure

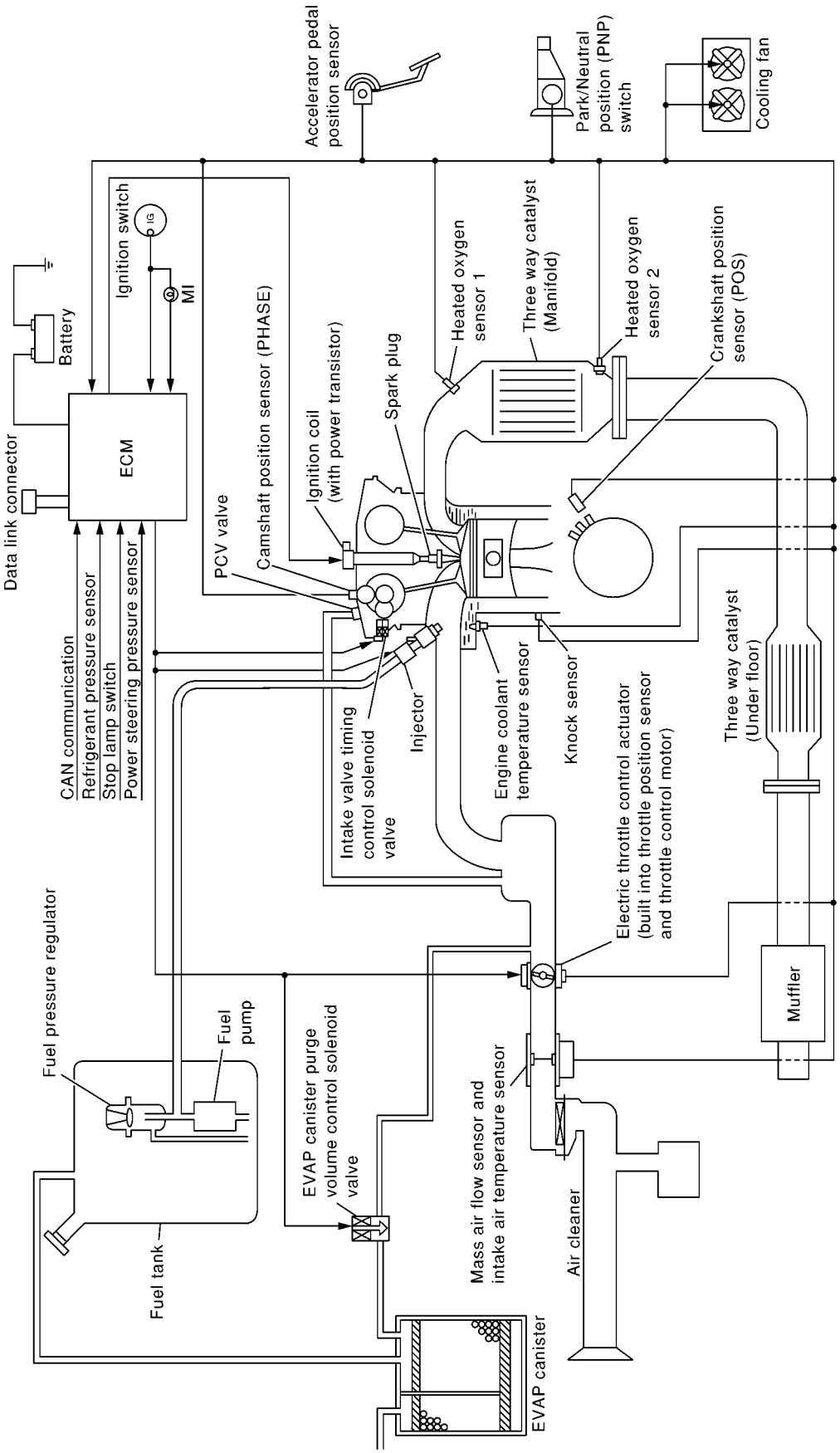
Tool name	Description	
Socket wrench	 S-NT705	Removing and installing engine coolant temperature sensor
Oxygen sensor thread cleaner ie: (J-43897-18) (J-43897-12)	 AEM488	Reconditioning the exhaust system threads before installing a new oxygen sensor. Use with anti-seize lubricant shown below. **a: 18 mm diameter with pitch 1.5 mm for Zirconia Oxygen Sensor** **b: 12 mm diameter with pitch 1.25 mm for Titania Oxygen Sensor**
Anti-seize lubricant ie: (Permatex™ 133AR or equivalent meeting MIL specification MIL-A-907)	 S-NT779	Lubricating oxygen sensor thread cleaning tool when reconditioning exhaust system threads.

ENGINE CONTROL SYSTEM

PFP:23710

System Diagram - QG16DE Engine Models

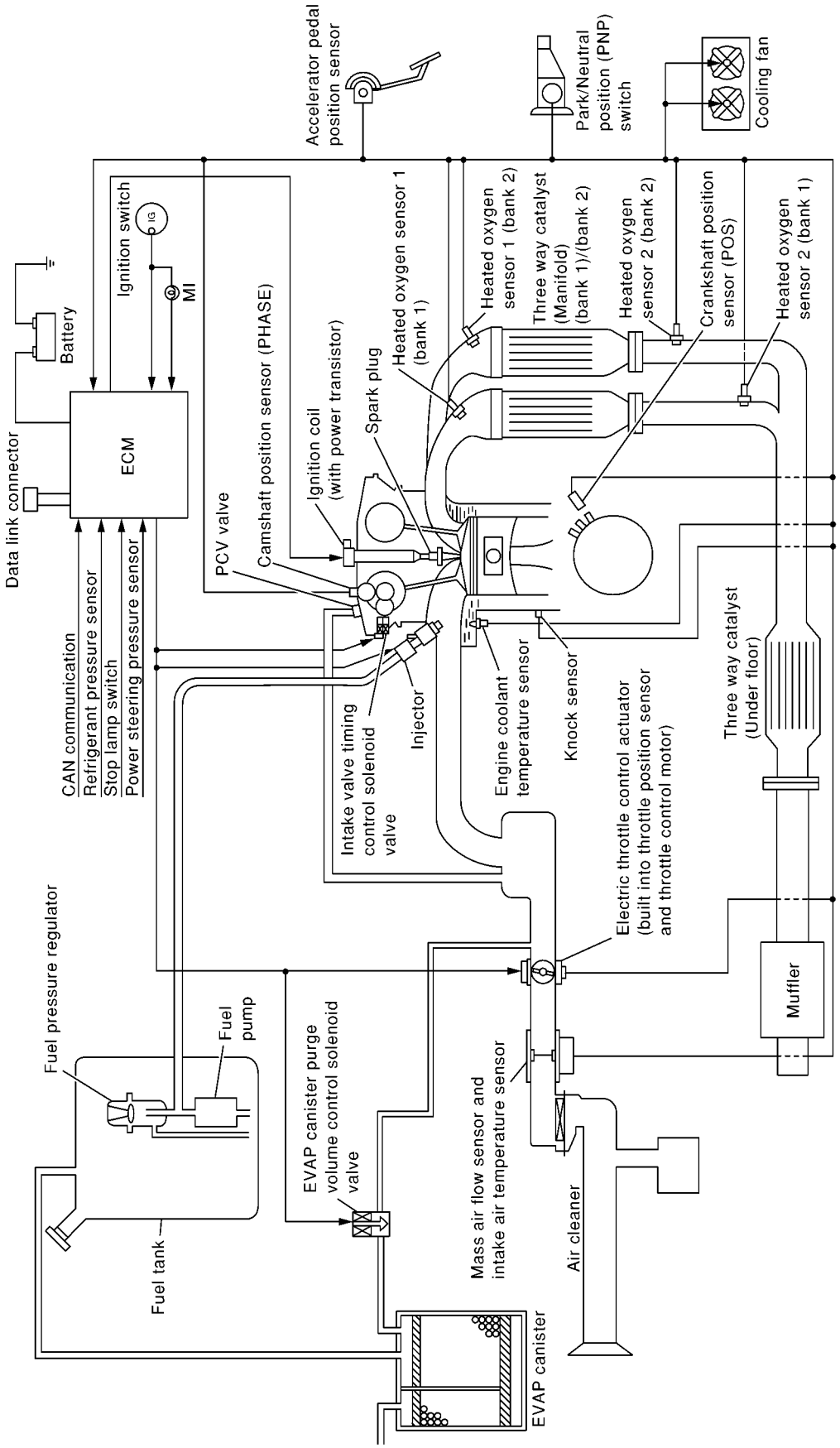
EBS00ETM



MBIB0011E

System Diagram - QG18DE Engine Models

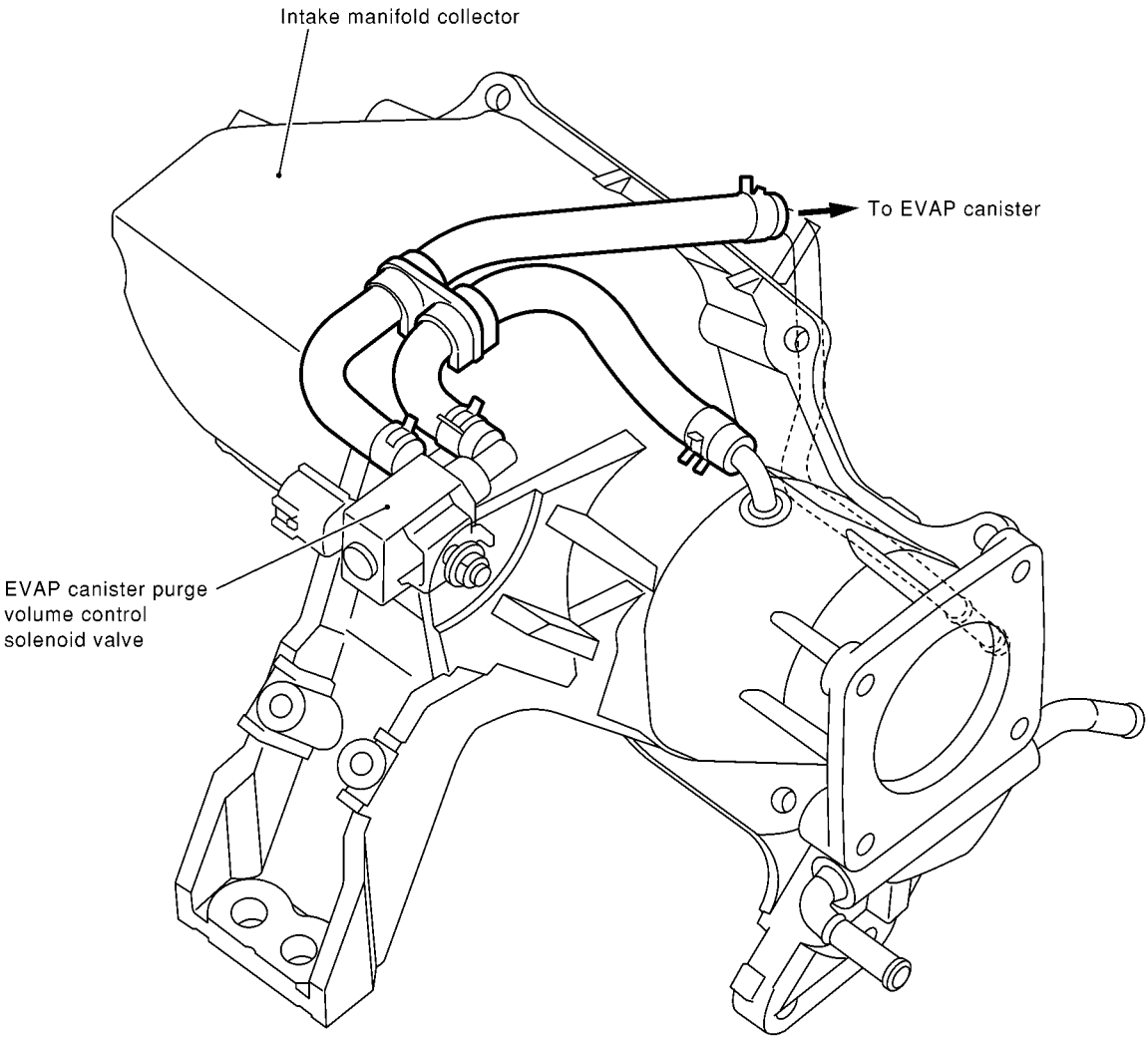
EBS00GBB



MBIB0012E

Vacuum Hose Drawing

EBS00ETN



NOTE: Do not use soapy water or any type of solvent while installing vacuum hose or purge hoses.

MBIB0013E

Refer to EC-573, "System Diagram - QG16DE Engine Models" or EC-574, "System Diagram - QG18DE Engine Models" for Vacuum Control System.

System Chart

EBS00ETO

Input (Sensor)	ECM Function	Output (Actuator)
● Camshaft position sensor (PHASE) ● Crankshaft position sensor (POS) ● Mass air flow sensor ● Engine coolant temperature sensor ● Heated oxygen sensor 1 ● Throttle position sensor ● Accelerator pedal position sensor ● Park/neutral position (PNP) switch ● Intake air temperature sensor ● Power steering pressure sensor ● Ignition switch ● Stop lamp switch ● Battery voltage ● Knock sensor ● Refrigerant pressure sensor ● Heated oxygen sensor 2*1 ● TCM (Transmission control module)*2 ● Air conditioner switch*2 ● Vehicle speed signal*2 ● Electrical load signal*2	Fuel injection & mixture ratio control	Fuel injectors
	Electronic ignition system	Power transistor
	Fuel pump control	Fuel pump relay
	On board diagnostic system	MI (On the instrument panel)*3
	Intake valve timing control	Intake valve timing control solenoid valve
	Heated oxygen sensor 1 heater control	Heated oxygen sensor 1 heater
	Heated oxygen sensor 2 heater control	Heated oxygen sensor 2 heater
	EVAP canister purge flow control	EVAP canister purge volume control solenoid valve
	Air conditioning cut control	Air conditioner relay*3
	Cooling fan control	Cooling fan relays*3

*1: This sensor is not used to control the engine system under normal conditions.
*2: The signals are sent to the ECM through CAN communication line.
*3: The output signals are sent from the ECM through CAN communication line.

Multiport Fuel Injection (MFI) System

EBS00ETP

INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*3 and piston position	Fuel injection & mixture ratio control	Fuel injectors
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Heated oxygen sensor 1	Density of oxygen in exhaust gas		
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Accelerator pedal position		
Park/neutral position (PNP) switch	Gear position		
Knock sensor	Engine knocking condition		
Battery	Battery voltage*3		
Power steering pressure sensor	Power steering operation		
Heated oxygen sensor 2*1	Density of oxygen in exhaust gas		
Vehicle speed signal*2	Vehicle speed		
Air conditioner switch*2	Air conditioner operation		

*1: Under normal conditions, this sensor is not for engine control operation.
*2: This signal is sent to the ECM through CAN communication line.
*3: The ECM determines the start signal status by the signals of engine speed and battery voltage.

SYSTEM DESCRIPTION

The amount of fuel injected from the fuel injector is determined by the ECM. The ECM controls the length of time the valve remains open (injection pulse duration). The amount of fuel injected is a program value in the ECM memory. The program value is preset by engine operating conditions. These conditions are determined by input signals (for engine speed and intake air) from the crankshaft position sensor (POS), camshaft position sensor (PHASE) and the mass air flow sensor.

VARIOUS FUEL INJECTION INCREASE/DECREASE COMPENSATION

In addition, the amount of fuel injected is compensated to improve engine performance under various operating conditions as listed below.

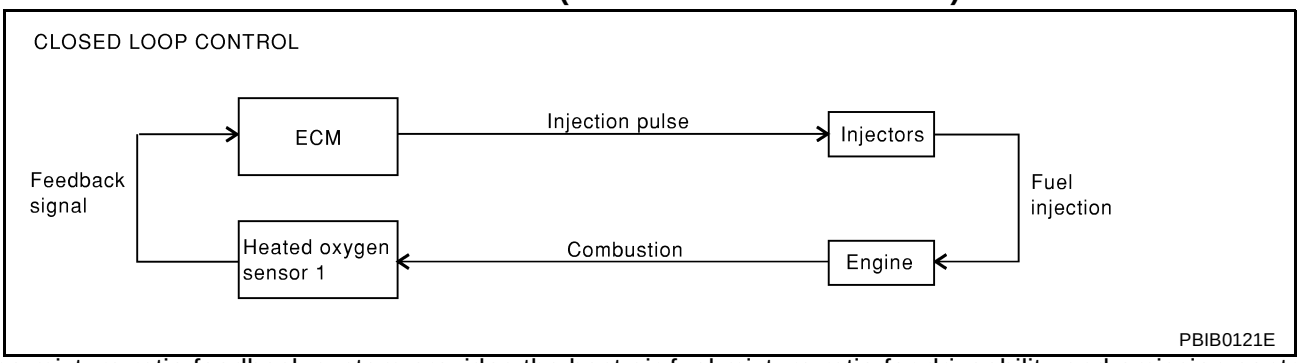
<Fuel increase>

- During warm-up
- When starting the engine
- During acceleration
- Hot-engine operation
- When selector lever is changed from “N” to “D” (A/T models)
- High-load, high-speed operation

<Fuel decrease>

- During deceleration
- During high engine speed operation

MIXTURE RATIO FEEDBACK CONTROL (CLOSED LOOP CONTROL)



The mixture ratio feedback system provides the best air-fuel mixture ratio for driveability and emission control. The three way catalyst (manifold) can then better reduce CO, HC and NOx emissions. This system uses heated oxygen sensor 1 in the exhaust manifold to monitor if the engine operation is rich or lean. The ECM adjusts the injection pulse width according to the sensor voltage signal. For more information about heated oxygen sensor 1, refer to EC-692, "DTC P0134 HO2S1 (QG16DE)" or EC-698, "DTC P0134, P0154 HO2S1 (QG18DE)" . This maintains the mixture ratio within the range of stoichiometric (ideal air-fuel mixture).
This stage is referred to as the closed loop control condition.
Heated oxygen sensor 2 is located downstream of the three way catalyst (manifold). Even if the switching characteristics of heated oxygen sensor 1 shift, the air-fuel ratio is controlled to stoichiometric by the signal from heated oxygen sensor 2.

Open Loop Control

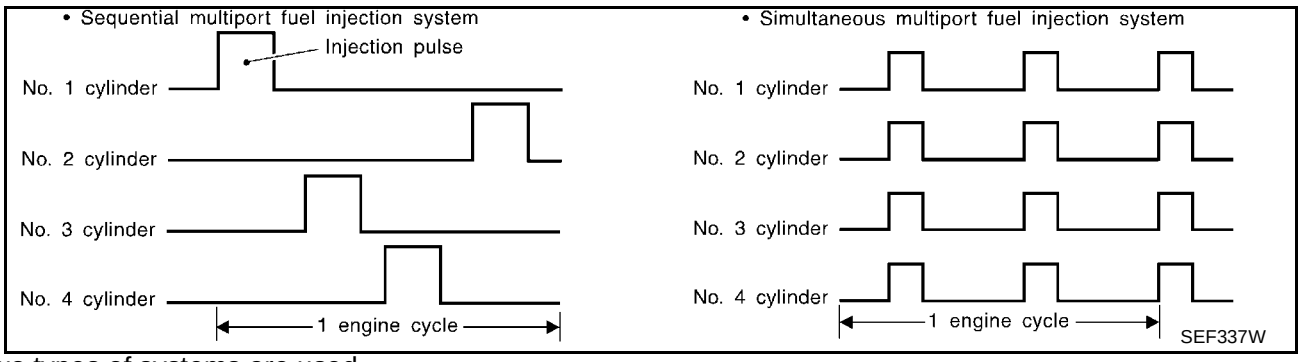
The open loop system condition refers to when the ECM detects any of the following conditions. Feedback control stops in order to maintain stabilized fuel combustion.

- Deceleration and acceleration
- High-load, high-speed operation
- Malfunction of heated oxygen sensor 1 or its circuit
- Insufficient activation of heated oxygen sensor 1 at low engine coolant temperature
- High engine coolant temperature
- During warm-up
- After shifting from “N” to “D” (A/T models)
- When starting the engine

MIXTURE RATIO SELF-LEARNING CONTROL

The mixture ratio feedback control system monitors the mixture ratio signal transmitted from heated oxygen sensor 1. This feedback signal is then sent to the ECM. The ECM controls the basic mixture ratio as close to the theoretical mixture ratio as possible. However, the basic mixture ratio is not necessarily controlled as originally designed. Both manufacturing differences (i.e., mass air flow sensor hot film) and characteristic changes during operation (i.e., injector clogging) directly affect mixture ratio.
Accordingly, the difference between the basic and theoretical mixture ratios is monitored in this system. This is then computed in terms of “injection pulse duration” to automatically compensate for the difference between the two ratios.
“Fuel trim” refers to the feedback compensation value compared against the basic injection duration. Fuel trim includes short term fuel trim and long term fuel trim.
“Short term fuel trim” is the short-term fuel compensation used to maintain the mixture ratio at its theoretical value. The signal from heated oxygen sensor 1 indicates whether the mixture ratio is RICH or LEAN compared to the theoretical value. The signal then triggers a reduction in fuel volume if the mixture ratio is rich, and an increase in fuel volume if it is lean.
“Long term fuel trim” is overall fuel compensation carried out long-term to compensate for continual deviation of the short term fuel trim from the central value. Such deviation will occur due to individual engine differences, wear over time and changes in the usage environment.

FUEL INJECTION TIMING



Two types of systems are used.

Sequential Multiport Fuel Injection System

Fuel is injected into each cylinder during each engine cycle according to the firing order. This system is used when the engine is running.

Simultaneous Multiport Fuel Injection System

Fuel is injected simultaneously into all four cylinders twice each engine cycle. In other words, pulse signals of the same width are simultaneously transmitted from the ECM.
The four injectors will then receive the signals two times for each engine cycle.
This system is used when the engine is being started and/or if the fail-safe system (CPU) is operating.

FUEL SHUT-OFF

Fuel to each cylinder is cut off during deceleration or operation of the engine at excessively high speeds.

Electronic Ignition (EI) System

EBS00ETQ

INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*2 and piston position	Ignition timing control	Power transistor
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Accelerator pedal position		
Knock sensor	Engine knocking		
Park/neutral position (PNP) switch	Gear position		
Battery	Battery voltage*2		
Vehicle speed signal*1	Vehicle speed		

*1: This signal is sent to the ECM through CAN communication line.

*2: The ECM determines the start signal status by the signals of engine speed and battery voltage.

SYSTEM DESCRIPTION

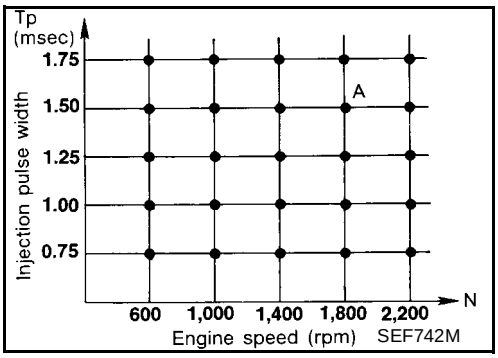
The ignition timing is controlled by the ECM to maintain the best air-fuel ratio for every running condition of the engine. The ignition timing data is stored in the ECM. This data forms the map shown.

The ECM receives information such as the injection pulse width and camshaft position sensor signal. Computing this information, ignition signals are transmitted to the power transistor.

e.g., N: 1,800 rpm, Tp: 1.50 msec

A °BTDC

During the following conditions, the ignition timing is revised by the ECM according to the other data stored in the ECM.



- At starting
- During warm-up
- At idle
- At low battery voltage
- During acceleration

The knock sensor retard system is designed only for emergencies. The basic ignition timing is programmed within the anti-knocking zone, if recommended fuel is used under dry conditions. The retard system does not operate under normal driving conditions. If engine knocking occurs, the knock sensor monitors the condition. The signal is transmitted to the ECM. The ECM retards the ignition timing to eliminate the knocking condition.

Air Conditioning Cut Control

EBS00ETR

INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM function	Actuator
Air conditioner switch*1	Air conditioner “ON” signal	Air conditioner cut control	Air conditioner relay
Throttle position sensor	Throttle valve opening angle		
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*2		
Engine coolant temperature sensor	Engine coolant temperature		
Battery	Battery voltage*2		
Refrigerant pressure sensor	Refrigerant pressure		
Power steering pressure sensor	Power steering operation		
Vehicle speed signal*1	Vehicle speed		

*1: These signals are sent to the ECM through CAN communication line.

*2: The ECM determines the start signal status by the signals of engine speed and battery voltage.

SYSTEM DESCRIPTION

This system improves engine operation when the air conditioner is used.
Under the following conditions, the air conditioner is turned off.

- When the accelerator pedal is fully depressed.
- When cranking the engine.
- At high engine speeds.
- When the engine coolant temperature becomes excessively high.
- When operating power steering during low engine speed or low vehicle speed.
- When engine speed is excessively low.
- When refrigerant pressure is excessively low or high.

Fuel Cut Control (at No Load and High Engine Speed)

EBS00ETS

INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM function	Actuator
Park/neutral position (PNP) switch	Neutral position	Fuel cut control	Fuel injectors
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Accelerator pedal position		
Engine coolant temperature sensor	Engine coolant temperature		
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed		
Vehicle speed signal*1	Vehicle speed		

*1: This signal is sent to the ECM through CAN communication line.

SYSTEM DESCRIPTION

If the engine speed is above 3,950 rpm with no load (for example, in neutral and engine speed over 3,950 rpm) fuel will be cut off after some time. The exact time when the fuel is cut off varies based on engine speed. Fuel cut will operate until the engine speed reaches 1,500 rpm, then fuel cut is cancelled.

NOTE:
This function is different from deceleration control listed under “Multiport Fuel Injection (MFI) System”, EC-576
.

CAN communication

EBS00ETT

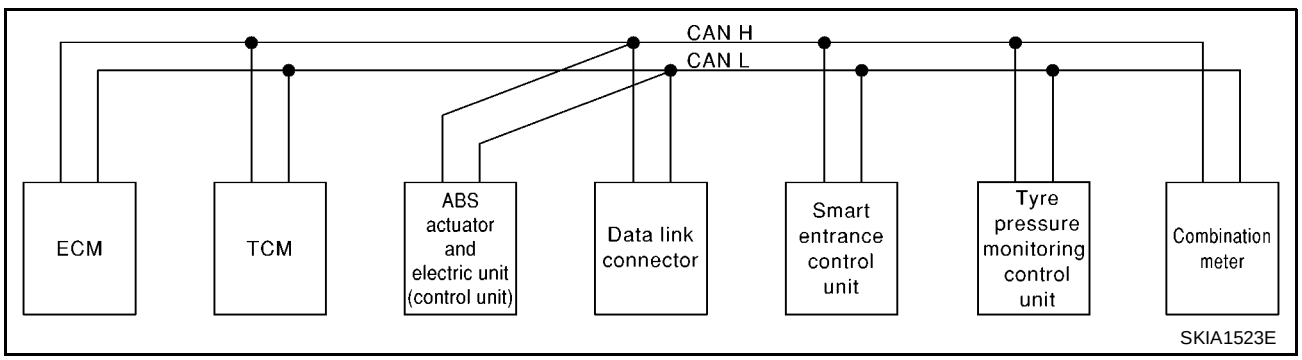
SYSTEM DESCRIPTION

CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent error detection ability. Many electronic control units are equipped onto a vehicle, and each control unit shares information and links with other control units during operation (not independent). In CAN communication, control units are connected with 2 communication lines (CAN H line, CAN L line) allowing a high rate of information transmission with less wiring. Each control unit transmits/receives data but selectively reads required data only.

LHD MODELS WITH TYRE PRESSURE MONITORING SYSTEM

A/T Models

System diagram



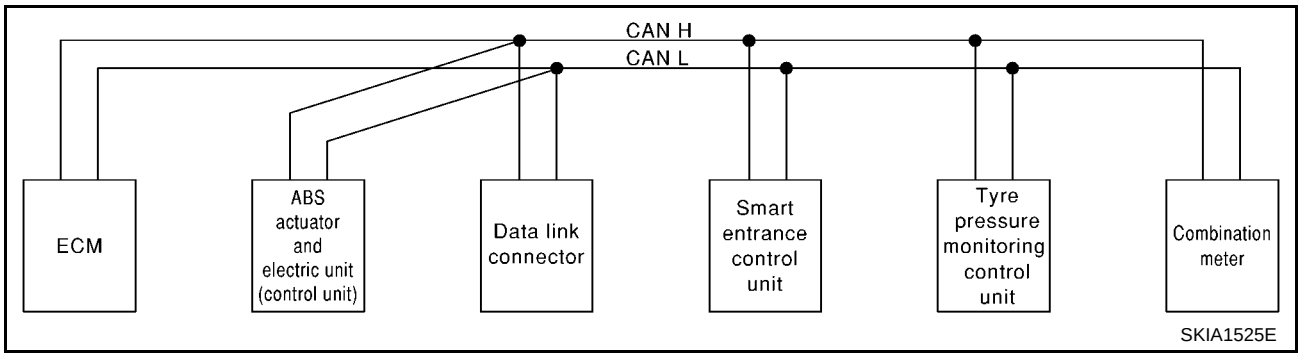
Input/output signal chart

T: Transmit R: Receive

Signals	ECM	TCM	ABS actuator and electric unit (control unit)	Smart entrance control unit	Tyre pressure monitoring control unit	Combination meter
Engine speed signal	T	R				R
Stop lamp switch signal		R	T			
Rear window defogger signal	R			T		
Heater fan switch signal	R					T
Air conditioner switch signal	R					T
MI signal	T					R
Current gear position signal		T				R
Engine coolant temperature signal	T					R
Fuel consumption signal	T					R
Vehicle speed signal			T			R
	R					T
Seat belt reminder signal				R		T
Headlamp switch signal				T		R
Flashing indicator signal				T		R
Engine cooling fan speed signal	T			R		
Child lock indicator signal				T		R
Door switches state signal				T		R
Key ID signal	R			T		
	T			R		
A/C compressor signal	T			R		
Tire pressure signal					T	R

M/T Models

System diagram



Input/output signal chart

T: Transmit R: Receive

Signals	ECM	ABS actuator and electric unit (control unit)	Smart entrance control unit	Tyre pressure monitoring control unit	Combination meter
Engine speed signal	T				R
Rear window defogger signal	R*1		T		
Heater fan switch signal	R*1				T
Air conditioner switch signal	R				T

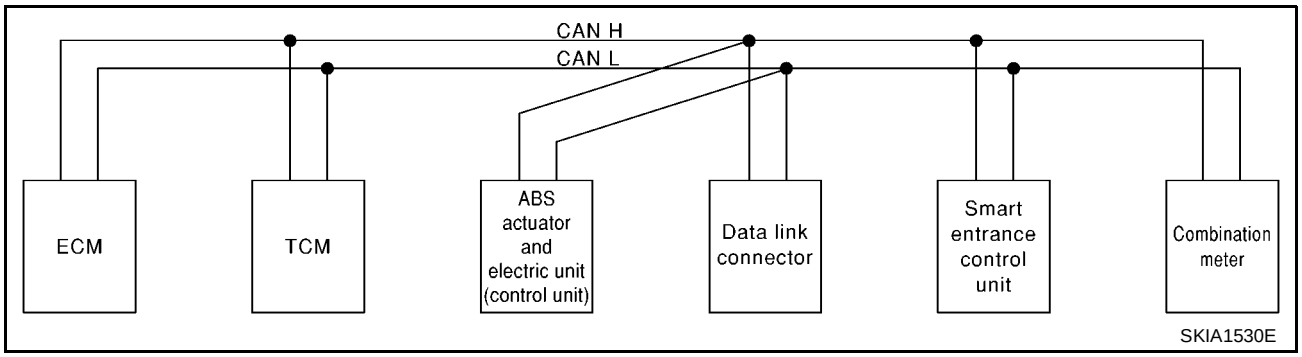
Signals	ECM	ABS actuator and electric unit (control unit)	Smart entrance control unit	Tyre pressure monitoring control unit	Combination meter
MI signal	T				R
Glow lamp signal*2	T				R
Engine coolant temperature signal	T				R
Fuel consumption signal	T				R
Vehicle speed signal		T			R
	R				T
Seat belt reminder signal			R		T
Headlamp switch signal			T		R
Flashing indicator signal			T		R
Engine cooling fan speed signal	T		R		
Child lock indicator signal			T		R
Door switches state signal			T		R
Key ID signal	R		T		
	T		R		
A/C compressor signal	T		R		
Tire pressure signal				T	R

*1: Except YD22DDTi engine model
*2: YD22DDTi engine model only

LHD MODELS WITHOUT TYRE PRESSURE MONITORING SYSTEM

A/T Models

System diagram



Input/output signal chart

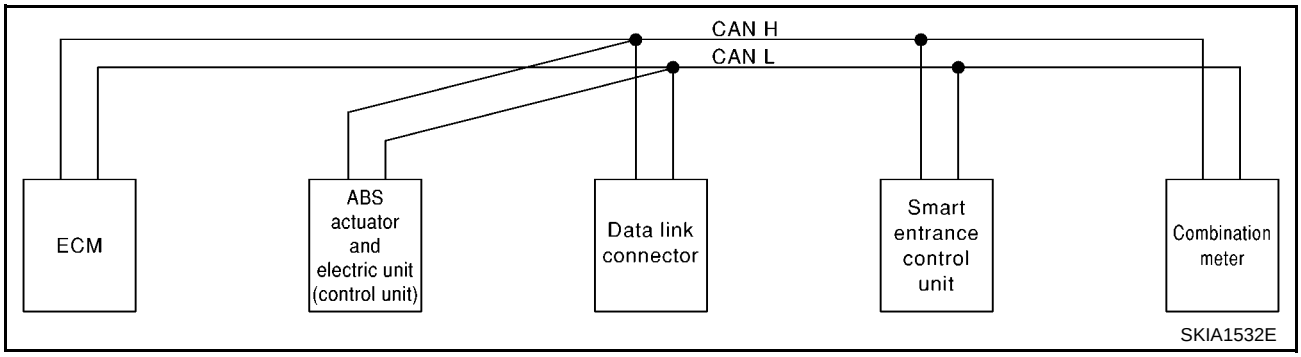
T: Transmit R: Receive

Signals	ECM	TCM	ABS actuator and electric unit (control unit)	Smart entrance control unit	Combination meter
Engine speed signal	T	R			R
Stop lamp switch signal		R	T		
Rear window defogger signal	R			T	
Heater fan switch signal	R				T
Air conditioner switch signal	R				T
MI signal	T				R
Current gear position signal		T			R
Engine coolant temperature signal	T				R

Signals	ECM	TCM	ABS actuator and electric unit (control unit)	Smart entrance control unit	Combination meter
Fuel consumption signal	T				R
Vehicle speed signal			T		R
	R				T
Seat belt reminder signal				R	T
Headlamp switch signal				T	R
Flashing indicator signal				T	R
Engine cooling fan speed signal	T			R	
Child lock indicator signal				T	R
Door switches state signal				T	R
Key ID signal	R			T	
	T			R	
A/C compressor signal	T			R	

M/T Models

System diagram



Input/output signal chart

T: Transmit R: Receive

Signals	ECM	ABS actuator and electric unit (control unit)	Smart entrance control unit	Combination meter
Engine speed signal	T			R
Rear window defogger signal	R*1		T	
Heater fan switch signal	R*1			T
Air conditioner switch signal	R			T
MI signal	T			R
Glow lamp signal*2	T			R
Engine coolant temperature signal	T			R
Fuel consumption signal	T			R
Vehicle speed signal		T		R
	R			T
Seat belt reminder signal			R	T
Headlamp switch signal			T	R
Flashing indicator signal			T	R
Engine cooling fan speed signal	T		R	
Child lock indicator signal			T	R

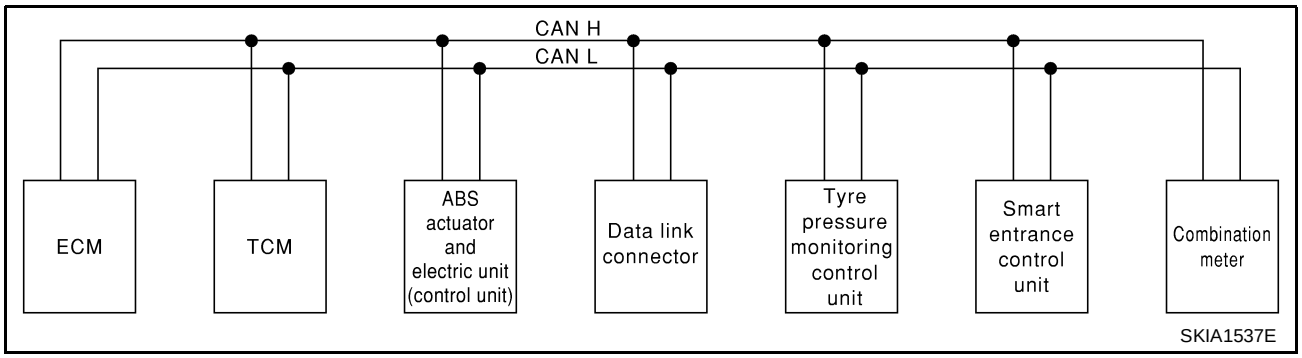
Signals	ECM	ABS actuator and electric unit (control unit)	Smart entrance control unit	Combination meter
Door switches state signal			T	R
Key ID signal	R		T	
	T		R	
A/C compressor signal	T		R	

*1: Except YD22DDTi engine model
*2:YD22DDTi engine model only

RHD MODELS WITH TYRE PRESSURE MONITORING SYSTEM

A/T Models

System diagram



Input/output signal chart

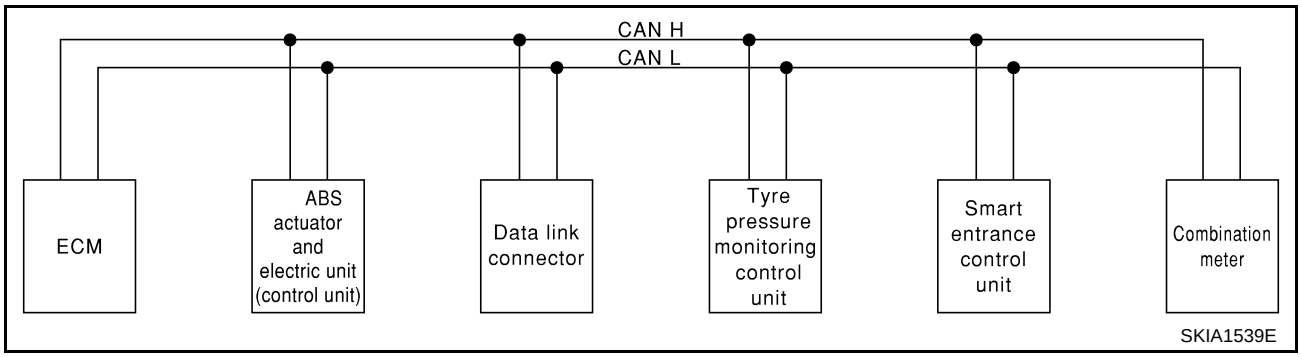
T: Transmit R: Receive

Signals	ECM	TCM	ABS actuator and electric unit (control unit)	Tyre pressure monitoring control unit	Smart entrance control unit	Combination meter
Engine speed signal	T	R				R
Stop lamp switch signal		R	T			
Rear window defogger signal	R				T	
Heater fan switch signal	R					T
Air conditioner switch signal	R					T
MI signal	T					R
Current gear position signal		T				R
Engine coolant temperature signal	T					R
Fuel consumption signal	T					R
Vehicle speed signal			T			R
	R					T
Seat belt reminder signal					R	T
Headlamp switch signal					T	R
Flashing indicator signal					T	R
Engine cooling fan speed signal	T				R	
Child lock indicator signal					T	R
Door switches state signal					T	R
Key ID signal	R				T	
	T				R	

Signals	ECM	TCM	ABS actuator and electric unit (control unit)	Tyre pressure monitoring control unit	Smart entrance control unit	Combination meter
A/C compressor signal	T				R	
Tire pressure signal				T		R

M/T Models

System diagram



Input/output signal chart

T: Transmit R: Receive

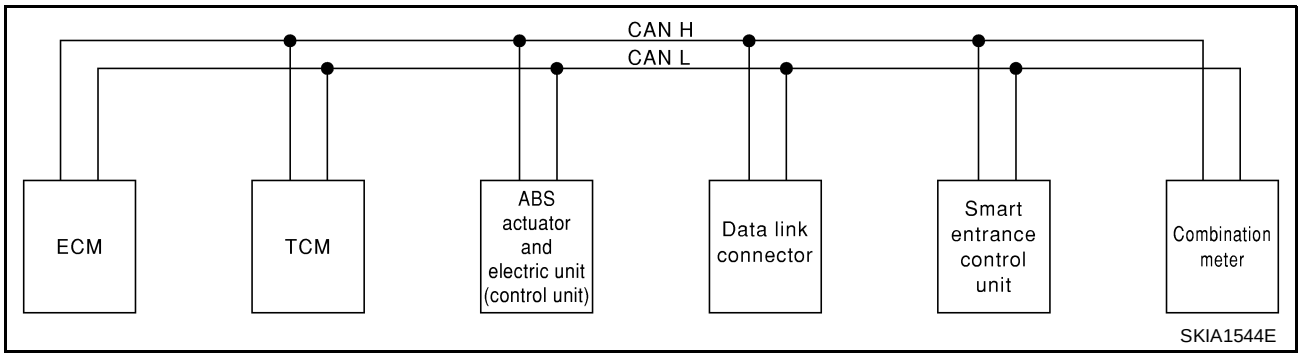
Signals	ECM	ABS actuator and electric unit (control unit)	Tyre pressure monitoring control unit	Smart entrance control unit	Combination meter
Engine speed signal	T				R
Rear window defogger signal	R*1			T	
Heater fan switch signal	R*1				T
Air conditioner switch signal	R				T
MI signal	T				R
Glow lamp signal*2	T				R
Engine coolant temperature signal	T				R
Fuel consumption signal	T				R
Vehicle speed signal		T			R
	R				T
Seat belt reminder signal				R	T
Headlamp switch signal				T	R
Flashing indicator signal				T	R
Engine cooling fan speed signal	T			R	
Child lock indicator signal				T	R
Door switches state signal				T	R
Key ID signal	R			T	
	T			R	
A/C compressor signal	T			R	
Tire pressure signal			T		R

*1: Except YD22DDTi engine model
*2: YD22DDTi engine model only

RHD MODELS WITHOUT TYRE PRESSURE MONITORING SYSTEM

A/T Models

System diagram



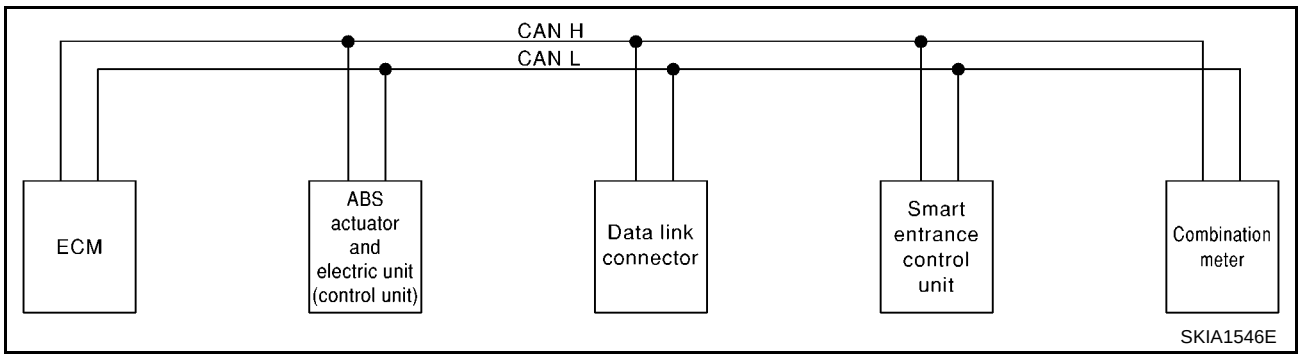
Input/output signal chart

T: Transmit R: Receive

Signals	ECM	TCM	ABS actuator and electric unit (control unit)	Smart entrance control unit	Combination meter
Engine speed signal	T	R			R
Stop lamp switch signal		R	T		
Rear window defogger signal	R			T	
Heater fan switch signal	R				T
Air conditioner switch signal	R				T
MI signal	T				R
Current gear position signal		T			R
Engine coolant temperature signal	T				R
Fuel consumption signal	T				R
Vehicle speed signal			T		R
	R				T
Seat belt reminder signal				R	T
Headlamp switch signal				T	R
Flashing indicator signal				T	R
Engine cooling fan speed signal	T			R	
Child lock indicator signal				T	R
Door switches state signal				T	R
Key ID signal	R			T	
	T			R	
A/C compressor signal	T			R	

M/T Models

System diagram



Input/output signal chart

T: Transmit R: Receive

Signals	ECM	ABS actuator and electric unit (control unit)	Smart entrance control unit	Combination meter
Engine speed signal	T			R
Rear window defogger signal	R*1		T	
Heater fan switch signal	R*1			T
Air conditioner switch signal	R			T
MI signal	T			R
Glow lamp signal*2	T			R
Engine coolant temperature signal	T			R
Fuel consumption signal	T			R
Vehicle speed signal		T		R
	R			T
Seat belt reminder signal			R	T
Headlamp switch signal			T	R
Flashing indicator signal			T	R
Engine cooling fan speed signal	T		R	
Child lock indicator signal			T	R
Door switches state signal			T	R
Key ID signal	R		T	
	T		R	
A/C compressor signal	T		R	

*1: Except YD22DDTi engine model
*2: YD22DDTi engine model only

BASIC SERVICE PROCEDURE

PFP:00018

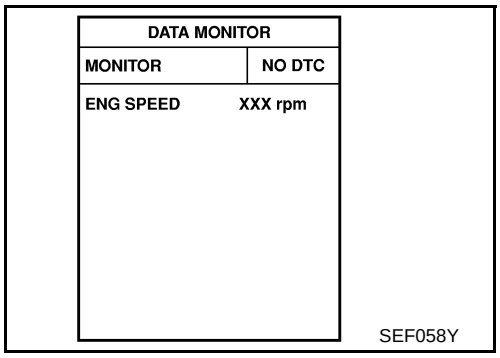
Idle Speed and Ignition Timing Check

EBS00ETU

IDLE SPEED

With CONSULT-II

Check idle speed in “DATA MONITOR” mode with CONSULT-II.

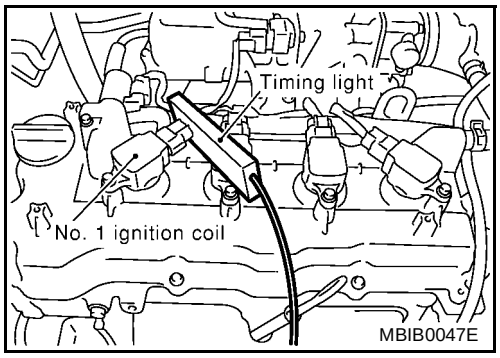


IGNITION TIMING

Any of following two methods may be used.

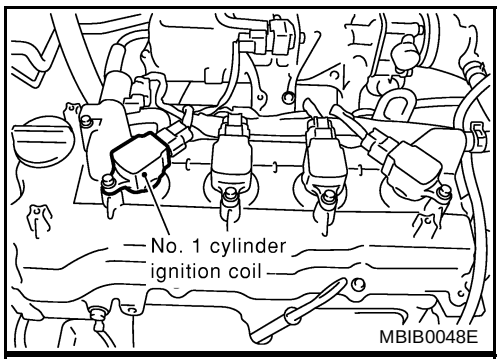
Method A

1. Slide the harness protector of ignition coil No. to clear the wires.
2. Attach timing light to the wires as shown.
3. Check ignition timing.

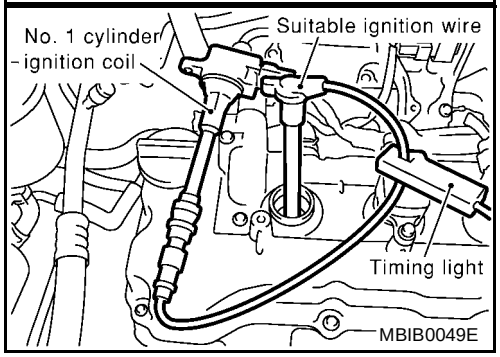


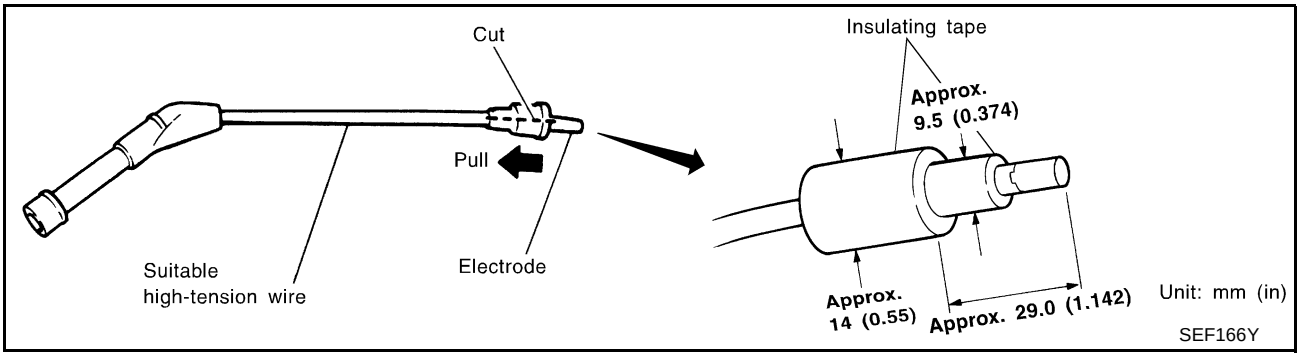
Method B

1. Remove No. 1 ignition coil.



2. Connect No. 1 ignition coil and No. 1 spark plug with suitable high-tension wire as shown, and attach timing light clamp to this wire.





3. Check ignition timing.

Accelerator Pedal Released Position Learning

EBS00ETW

DESCRIPTION

"Accelerator Pedal Released Position Learning" is an operation to learn the fully released position of the accelerator pedal by monitoring the accelerator pedal position sensor output signal. It must be performed each time harness connector of accelerator pedal position sensor or ECM is disconnected.

OPERATION PROCEDURE

1. Make sure that accelerator pedal is fully released.
2. Turn ignition switch "ON" and wait at least 2 seconds.
3. Turn ignition switch "OFF" wait at least 10 seconds.
4. Turn ignition switch "ON" and wait at least 2 seconds.
5. Turn ignition switch "OFF" wait at least 10 seconds.

Throttle Valve Closed Position Learning

EBS00ETX

DESCRIPTION

"Throttle Valve Closed Position Learning" is an operation to learn the fully closed position of the throttle valve by monitoring the throttle position sensor output signal. It must be performed each time harness connector of electric throttle control actuator or ECM is disconnected.

OPERATION PROCEDURE

1. Make sure that accelerator pedal is fully released.
2. Turn ignition switch "ON".
3. Turn ignition switch "OFF" wait at least 10 seconds.
   Make sure that throttle valve moves during above 10 seconds by confirming the operating sound.

Idle Air Volume Learning

EBS00ETY

DESCRIPTION

"Idle Air Volume Learning" is an operation to learn the idle air volume that keeps each engine within the specific range. It must be performed under any of the following conditions:

- Each time electric throttle control actuator or ECM is replaced.
- Idle speed or ignition timing is out of specification.

PREPARATION

Before performing "Idle Air Volume Learning", make sure that all of the following conditions are satisfied.
Learning will be cancelled if any of the following conditions are missed for even a moment.

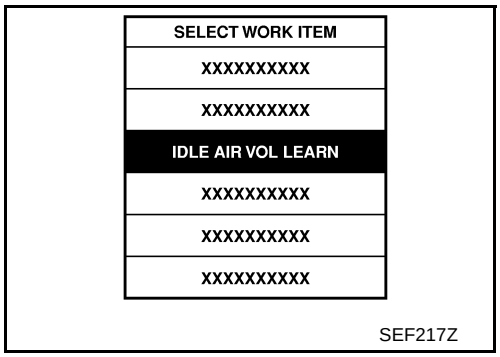
- Battery voltage: More than 12.9V (At idle)
- Engine coolant temperature: 70 - 95°C (158 - 203°F)
- PNP switch: ON
- Electric load switch: OFF
  (Air conditioner, headlamp, rear window defogger)
  On vehicles equipped with daytime light systems, set lighting switch to the 1st position to light only small lamps.
- Steering wheel: Neutral (Straight-ahead position)
- Vehicle speed: Stopped

- Transmission: Warmed-up
  For A/T models with CONSULT-II, drive vehicle until “FLUID TEMP SE” in “DATA MONITOR” mode of “A/T” system indicates less than 0.9V.
  For A/T models without CONSULT-II and M/T models, drive vehicle for 10 minutes.

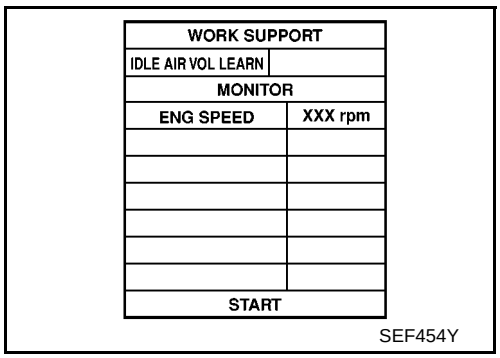
OPERATION PROCEDURE

With CONSULT-II

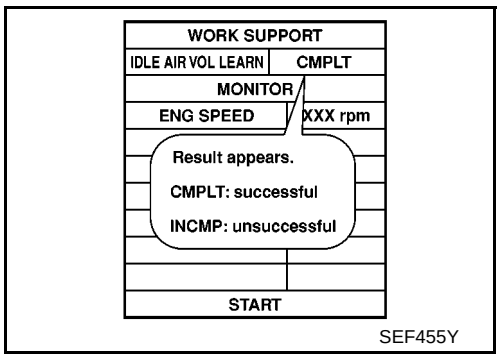
1. Perform EC-589, "Accelerator Pedal Released Position Learning" .
2. Perform EC-589, "Throttle Valve Closed Position Learning" .
3. Start engine and warm it up to normal operating temperature.
4. Check that all items listed under the topic “PRE-CONDITIONING” (previously mentioned) are in good order.
5. Select “IDLE AIR VOL LEARN” in “WORK SUPPORT” mode.



6. Touch “START” and wait 20 seconds.



7. Make sure that “CMPLT” is displayed on CONSULT-II screen. If “INCMP” is displayed, “Idle Air Volume Learning” will not be carried out successfully. In this case, find the cause of the problem by referring to the “Diagnostic Procedure” below.
8. Rev up the engine two or three times and make sure that idle speed and ignition timing are within the specifications.



ITEM	SPECIFICATION
Idle speed	M/T: 700±50 rpm A/T: 800±50 rpm (in “P” or “N” position)
Ignition timing	M/T: 8±5° BTDC A/T: 10° BTDC (in “P” or “N” position)

Without CONSULT-II

NOTE:

- **It is better to count the time accurately with a clock.**
- **It is impossible to switch the diagnostic mode when an accelerator pedal position sensor circuit has a malfunction.**

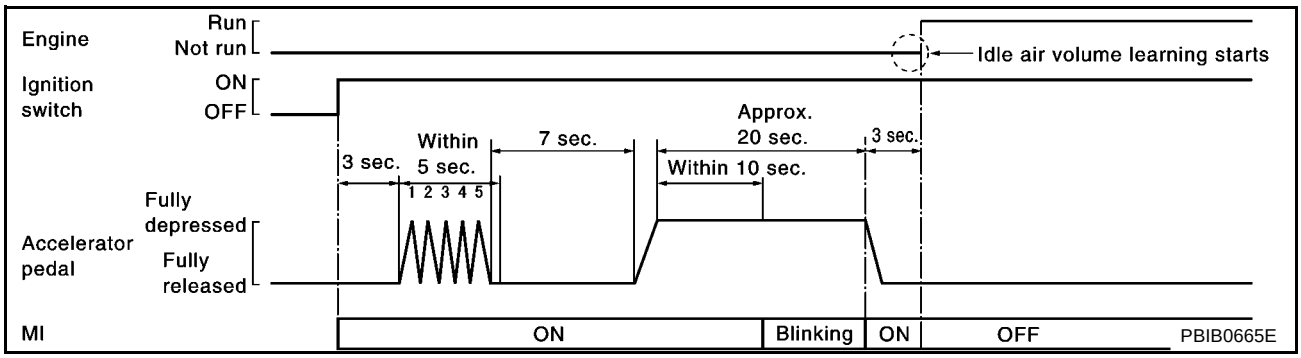
1. Perform EC-589, "Accelerator Pedal Released Position Learning" .
2. Perform EC-589, "Throttle Valve Closed Position Learning" .

3. Start engine and warm it up to normal operating temperature.
4. Check that all items listed under the topic “PRE-CONDITIONING” (previously mentioned) are in good order.
5. Turn ignition switch “OFF” and wait at least 10 seconds.
6. Confirm that accelerator pedal is fully released, turn ignition switch “ON” and wait 3 seconds.
7. Repeat the following procedure quickly five times within 5 seconds.

a. Fully depress the accelerator pedal.

b. Fully release the accelerator pedal.

8. Wait 7 seconds, fully depress the accelerator pedal and keep it for approx. 20 seconds until the MI stops blinking and turned ON.
9. Fully release the accelerator pedal within 3 seconds after the MI turned ON.
10. Start engine and let it idle.
11. Wait 20 seconds.



12. Rev up the engine two or three times and make sure that idle speed and ignition timing are within the specifications.

ITEM	SPECIFICATION
Idle speed	M/T: 700±50 rpm A/T: 800±50 rpm (in “P” or “N” position)
Ignition timing	M/T: 8±5° BTDC A/T: 10±5° BTDC (in “P” or “N” position)

13. If idle speed and ignition timing are not within the specification, the result will be incomplete. In this case, find the cause of the problem by referring to the “Diagnostic Procedure” below.

DIAGNOSTIC PROCEDURE

If idle air volume learning cannot be performed successfully, proceed as follows:

1. **Check that throttle valve is fully closed.**
2. **Check PCV valve operation.**
3. **Check that downstream of throttle valve is free from air leakage.**
4. **When the above three items check out OK, engine component parts and their installation condition are questionable. Check and eliminate the cause of the problem.**
   It is useful to perform EC-652, "TROUBLE DIAGNOSIS - SPECIFICATION VALUE" .
5. **If any of the following conditions occur after the engine has started, eliminate the cause of the problem and perform “Idle air volume learning” all over again:**

- **Engine stalls.**
- **Erroneous idle.**

Fuel Pressure Check

EBS00ETZ

FUEL PRESSURE RELEASE

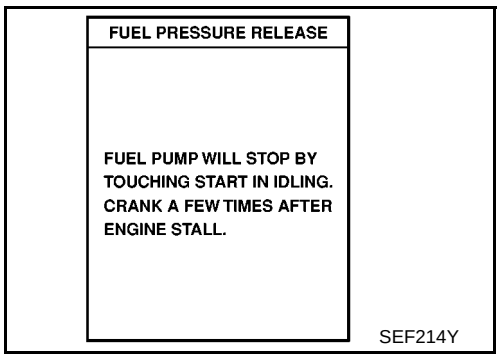
Before disconnecting fuel line, release fuel pressure from fuel line to eliminate danger.

NOTE:

Prepare pans or saucers under the disconnected fuel line because the fuel may spill out. The fuel pressure cannot be completely released because P12 models do not have fuel return system.

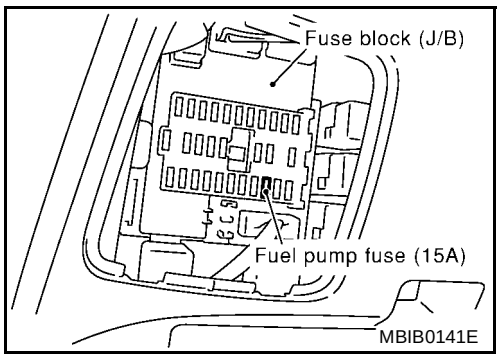
With CONSULT-II

1. Turn ignition switch “ON”.
2. Perform “FUEL PRESSURE RELEASE” in “WORK SUPPORT” mode with CONSULT-II.
3. Start engine.
4. After engine stalls, crank it two or three times to release all fuel pressure.
5. Turn ignition switch “OFF”.



Without CONSULT-II

1. Remove fuel pump fuse located in fuse box.
2. Start engine.
3. After engine stalls, crank it two or three times to release all fuel pressure.
4. Turn ignition switch “OFF”.
5. Reinstall fuel pump fuse after servicing fuel system.



FUEL PRESSURE CHECK

NOTE:

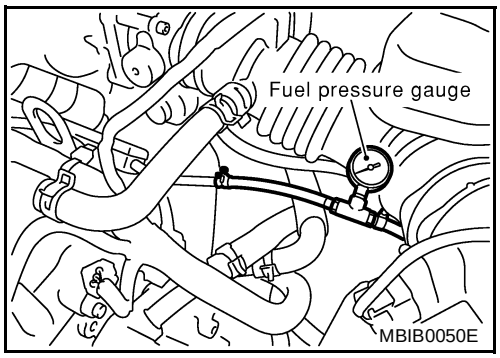
- **When reconnecting fuel line, always use new clamps.**
- **Make sure that clamp screw does not contact adjacent parts.**
- **Use a torque driver to tighten clamps.**
- **Use Pressure Gauge to check fuel pressure.**
- **Do not perform fuel pressure check with system operating. Fuel pressure gauge may indicate false readings.**

1. Release fuel pressure to zero. Refer to EC-591, "FUEL PRESSURE RELEASE" .
2. Install the fuel pressure gauge with the fuel pressure check adapter as shown in the figure.
3. Turn ignition switch “ON”, and check for fuel leakage.
4. Start engine and check for fuel leakage.
5. Read the indication of fuel pressure gauge.

   At idling: Approximately 350 kPa (3.7 kg/cm^2 , 51 psi)

6. If result is unsatisfactory, go to next step.
7. Check the following.
   - Fuel hoses and fuel tubes for clogging
   - Fuel filter for clogging
   - Fuel pump
   - Fuel pressure regulator for clogging

   If OK, replace fuel pressure regulator.
   If NG, repair or replace.



ON BOARD DIAGNOSTIC (OBD) SYSTEM

PFP:00028

Introduction

EBS00EU0

The ECM has an on board diagnostic system, which detects malfunctions related to engine sensors or actuators. The ECM also records various emission-related diagnostic information including:

Emission-related diagnostic information
Diagnostic Trouble Code (DTC)
Freeze Frame data
1st Trip Diagnostic Trouble Code (1st Trip DTC)
1st Trip Freeze Frame data

The above information can be checked using procedures listed in the table below.

×: Applicable —: Not applicable

	DTC	1st trip DTC	Freeze Frame data	1st trip Freeze Frame data
CONSULT-II	×	×	×	×
ECM	×	×*1	—	—

*1: When DTC and 1st trip DTC simultaneously appear on the display, they cannot be clearly distinguished from each other.

The malfunction indicator (MI) on the instrument panel lights up when the same malfunction is detected in two consecutive trips (Two trip detection logic), or when the ECM enters fail-safe mode. (Refer to EC-605 .)

Two Trip Detection Logic

EBS00EU1

When a malfunction is detected for the first time, 1st trip DTC and 1st trip Freeze Frame data are stored in the ECM memory. The MI will not light up at this stage. <1st trip>
If the same malfunction is detected again during the next drive, the DTC and Freeze Frame data are stored in the ECM memory, and the MI lights up. The MI lights up at the same time when the DTC is stored. <2nd trip>
The “trip” in the “Two Trip Detection Logic” means a driving mode in which self-diagnosis is performed during vehicle operation. When the ECM enters fail-safe mode (Refer to EC-605 .), the DTC is stored in the ECM memory even in the 1st trip.

Emission-related Diagnostic Information

EBS00EU2

DTC AND 1ST TRIP DTC

The 1st trip DTC (whose number is the same as the DTC number) is displayed for the latest self-diagnostic result obtained. If the ECM memory was cleared previously, and the 1st trip DTC did not reoccur, the 1st trip DTC will not be displayed.
If a malfunction is detected during the 1st trip, the 1st trip DTC is stored in the ECM memory. The MI will not light up (two trip detection logic). If the same malfunction is not detected in the 2nd trip (meeting the required driving pattern), the 1st trip DTC is cleared from the ECM memory. If the same malfunction is detected in the 2nd trip, both the 1st trip DTC and DTC are stored in the ECM memory and the MI lights up. In other words, the DTC is stored in the ECM memory and the MI lights up when the same malfunction occurs in two consecutive trips. If a 1st trip DTC is stored and a non-diagnostic operation is performed between the 1st and 2nd trips, only the 1st trip DTC will continue to be stored. For fail-safe items, the DTC is stored in the ECM memory even in the 1st trip.
Procedures for clearing the DTC and the 1st trip DTC from the ECM memory are described in EC-594, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
When a 1st trip DTC is detected, check, print out or write down and erase (1st trip) DTC and Freeze Frame data as specified in “Work Flow” procedure Step II, refer to EC-601 . Then perform “DTC Confirmation Procedure” or “Overall Function Check” to try to duplicate the problem. If the malfunction is duplicated, the item requires repair.

How to Read DTC and 1st Trip DTC

DTC and 1st trip DTC can be read by the following methods.

With CONSULT-II

CONSULT-II displays the DTC in “SELF-DIAG RESULTS” mode. Examples: P0117, P0340, P1065, etc.
(CONSULT-II also displays the malfunctioning component or system.)

Without CONSULT-II

The number of blinks of the MI in the Diagnostic Test Mode II (Self-Diagnostic Results) indicates the DTC. Example: 0117, 0340 1065 etc.

- **1st trip DTC No. is the same as DTC No.**
- **Output of a DTC indicates a malfunction. However, the Diagnostic Test Mode II does not indicate whether the malfunction is still occurring or has occurred in the past and has returned to normal. CONSULT-II can identify malfunction status as shown below. Therefore, using CONSULT-II (if available) is recommended.**

A sample of CONSULT-II display for DTC and 1st trip DTC is shown below. DTC or 1st trip DTC of a malfunction is displayed in SELF-DIAGNOSTIC RESULTS mode of CONSULT-II. Time data indicates how many times the vehicle was driven after the last detection of a DTC.
If the DTC is being detected currently, the time data will be “0”.
If a 1st trip DTC is stored in the ECM, the time data will be “[1t]”.

DTC display

SELF DIAG RESULTS	
DTC RESULTS	TIME
CKP SEN/CIRCUIT [P0335]	0

1st trip DTC display

SELF DIAG RESULTS	
DTC RESULTS	TIME
CKP SEN/CIRCUIT [P0335]	1t

PBIB0911E

FREEZE FRAME DATA AND 1ST TRIP FREEZE FRAME DATA

The ECM records the driving conditions such as fuel system status, calculated load value, engine coolant temperature, short term fuel trim, long term fuel trim, engine speed, vehicle speed, base fuel schedule and intake air temperature at the moment a malfunction is detected.
Data which are stored in the ECM memory, along with the 1st trip DTC, are called 1st trip freeze frame data. The data, stored together with the DTC data, are called freeze frame data and displayed on CONSULT-II. For details, see EC-639 .
Only one set of freeze frame data (either 1st trip freeze frame data or freeze frame data) can be stored in the ECM. 1st trip freeze frame data is stored in the ECM memory along with the 1st trip DTC. There is no priority for 1st trip freeze frame data and it is updated each time a different 1st trip DTC is detected. However, once freeze frame data (2nd trip detection/MI on) is stored in the ECM memory, 1st trip freeze frame data is no longer stored. Remember, only one set of freeze frame data can be stored in the ECM.
Both 1st trip freeze frame data and freeze frame data (along with the DTCs) are cleared when the ECM memory is erased. Procedures for clearing the ECM memory are described in EC-594, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .

HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION

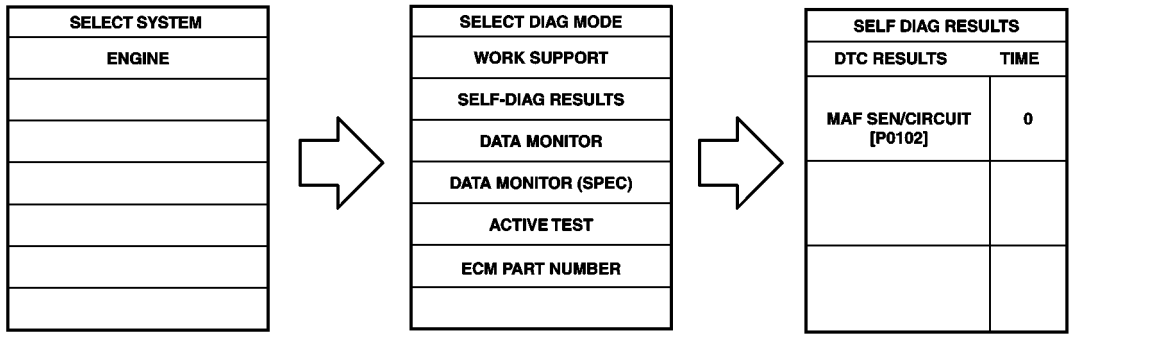
How to Erase DTC (With CONSULT-II)

The emission related diagnostic information in the ECM can be erased by selecting “ERASE” in the “SELF-DIAG RESULTS” mode with CONSULT-II.

1. If the ignition switch stays “ON” after repair work, be sure to turn ignition switch “OFF” once. Wait at least 10 seconds and then turn it “ON” (engine stopped) again.
2. Touch “ENGINE”.
3. Touch “SELF-DIAG RESULTS”.

4. Touch “ERASE”. (The DTC in the ECM will be erased.)

How to erase DTC (With CONSULT-II)
1. If the ignition switch stays “ON” after repair work, be sure to turn ignition switch “OFF” once.
   Wait at least 10 seconds and then turn it “ON” again.



2. Turn **CONSULT-II** “ON” and touch “ENGINE”.
3. Touch “SELF-DIAG RESULTS”.
4. Touch “ERASE”. (The DTC in the ECM will be erased.)

PBIB0671E

How to Erase DTC (Without CONSULT-II)

1. If the ignition switch stays “ON” after repair work, be sure to turn ignition switch “OFF” once.
2. Wait at least 10 seconds and then turn it “ON” (engine stopped) again.
3. Change the diagnostic test mode from Mode II to Mode I by depressing the accelerator pedal. Refer to EC-597, "HOW TO SWITCH DIAGNOSTIC TEST MODE" .

- **If the battery is disconnected, the emission-related diagnostic information will be lost after approx. 24 hours.**
- **The following data are cleared when the ECM memory is erased.**

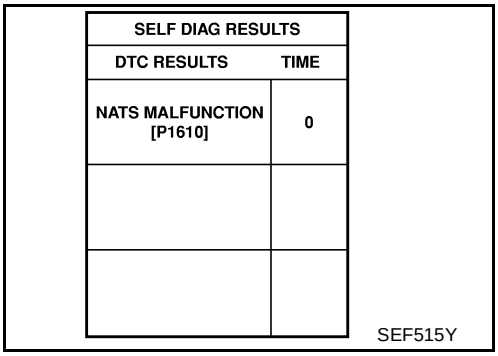
1. Diagnostic trouble codes
2. 1st trip diagnostic trouble codes
3. Freeze frame data
4. 1st trip freeze frame data
5. Others

Actual work procedures are explained using a DTC as an example. Be careful so that not only the DTC, but all of the data listed above, are cleared from the ECM memory during work procedures.

NATS (Nissan Anti-theft System)

EBS00EU3

- **If the security indicator lights up with the ignition switch in the “ON” position or “NATS MALFUNCTION” is displayed on “SELF-DIAG RESULTS” screen, perform self-diagnostic results mode with CONSULT-II using NATS program card. Refer to BL-156, "NATS (NISSAN ANTI-THEFT SYSTEM)" .**
- **Confirm no self-diagnostic results of NATS is displayed before touching “ERASE” in “SELF-DIAG RESULTS” mode with CONSULT-II.**
- **When replacing ECM, initialization of NATS system and registration of all NATS ignition key IDs must be carried out with CONSULT-II using NATS program card.**
  Therefore, be sure to receive all keys from vehicle owner.
  Regarding the procedures of NATS initialization and NATS ignition key ID registration, refer to CONSULT-II operation manual, NATS.



SEF515Y

Malfunction Indicator (MI)

EBS00EU4

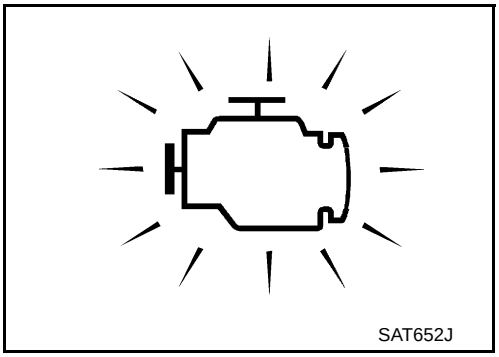
DESCRIPTION

The MI is located on the instrument panel.

1. The MI will light up when the ignition switch is turned ON without the engine running. This is a bulb check.

- If the MI does not light up, refer to DI-95, "WARNING LAMPS" , or see EC-950, "MI & DATA LINK CONNECTORS" .

2. When the engine is started, the MI should go off.
   If the MI remains on, the on board diagnostic system has detected an engine system malfunction.


SAT652J

ON BOARD DIAGNOSTIC SYSTEM FUNCTION

The on board diagnostic system has the following four functions.

Diagnostic Test Mode	KEY and ENG. Status	Function	Explanation of Function
Mode I	Ignition switch in “ON” position  Engine stopped 	BULB CHECK	This function checks the MI bulb for damage (blown, open circuit, etc.). If the MI does not come on, check MI circuit.
	Engine running 	MALFUNCTION WARNING	This is a usual driving condition. When a malfunction is detected twice in two consecutive driving cycles (two trip detection logic), the MI will light up to inform the driver that a malfunction has been detected. The following malfunctions will light up the MI in the 1st trip. ● Fail-safe mode
Mode II	Ignition switch in “ON” position  Engine stopped 	SELF-DIAGNOSTIC RESULTS	This function allows DTCs and 1st trip DTCs to be read.
	Engine running 	HEATED OXYGEN SENSOR 1 MONITOR	This function allows the fuel mixture condition (lean or rich), monitored by heated oxygen sensor 1, to be read.

MI Flashing without DTC

If the ECM is in Diagnostic Test Mode II, MI may flash when engine is running. In this case, check ECM diagnostic test mode. Refer to EC-597, "HOW TO SWITCH DIAGNOSTIC TEST MODE" .
How to switch the diagnostic test (function) modes, and details of the above functions are described later EC-597, "HOW TO SWITCH DIAGNOSTIC TEST MODE" .
The following emission-related diagnostic information is cleared when the ECM memory is erased.

1. Diagnostic trouble codes
2. 1st trip diagnostic trouble codes
3. Freeze frame data

4. 1st trip freeze frame data
5. Others

HOW TO SWITCH DIAGNOSTIC TEST MODE

NOTE:

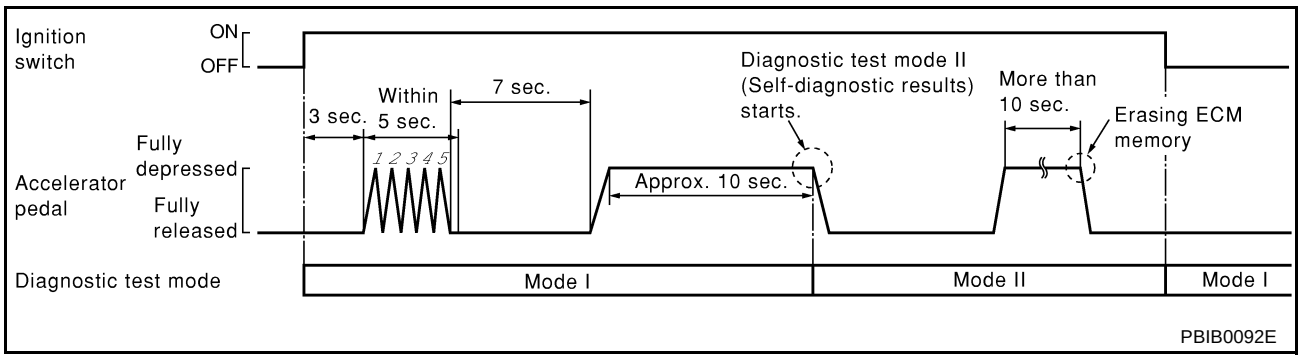
- **It is better to count the time accurately with a clock.**
- **It is impossible to switch the diagnostic mode when an accelerator pedal position sensor circuit has a malfunction.**
- **Always ECM returns to Diagnostic Test Mode I after ignition switch is turned "OFF".**

How to Set Diagnostic Test Mode II (Self-diagnostic Results)

1. Confirm that accelerator pedal is fully released, turn ignition switch "ON" and wait 3 seconds.
2. Repeat the following procedure quickly five times within 5 seconds.

a. Fully depress the accelerator pedal.
b. Fully release the accelerator pedal.

3. Wait 7 seconds, fully depress the accelerator pedal and keep it for approx. 10 seconds until the MI starts blinking.
4. Fully release the accelerator pedal.
   ECM has entered to Diagnostic Test Mode II (Self-diagnostic results).

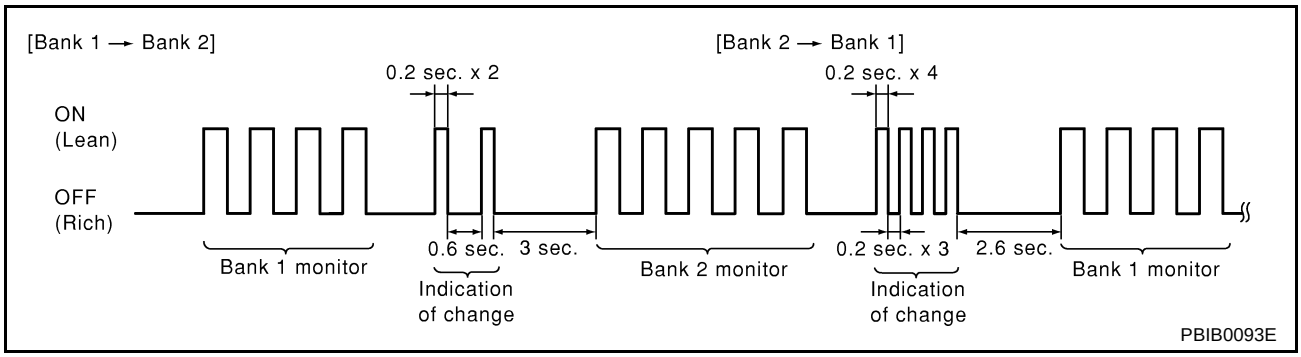


How to Set Diagnostic Test Mode II (Heated Oxygen Sensor 1 Monitor)

1. Set the ECM in Diagnostic Test Mode II (Self-diagnostic results). Refer to EC-597, "How to Set Diagnostic Test Mode II (Self-diagnostic Results)" .
2. Start Engine.
   ECM has entered to Diagnostic Test Mode II (Heated oxygen sensor 1 monitor).
   ECM will start heated oxygen sensor 1 monitoring from the bank 1 sensor for QG18DE engine models.

How to Switch Monitored Sensor From Bank 1 to Bank 2 or Vice Versa

1. Fully depress the accelerator pedal quickly and then release it immediately.
2. Make sure that monitoring sensor has changed by MI blinking as follows.



How to Erase Diagnostic Test Mode II (Self-diagnostic Results)

1. Set ECM in Diagnostic Test Mode II (Self-diagnostic results). Refer to EC-597, "How to Set Diagnostic Test Mode II (Self-diagnostic Results)" .
2. Fully depress the accelerator pedal and keep it for more than 10 seconds.
   The emission-related diagnostic information has been erased from the backup memory in the ECM.

3. Fully release the accelerator pedal, and confirm the DTC 0000 is displayed.

DIAGNOSTIC TEST MODE I — BULB CHECK

In this mode, the MI on the instrument panel should stay ON. If it remains OFF, check the bulb. Refer to DI-95, "WARNING LAMPS" or see EC-950, "MI & DATA LINK CONNECTORS" .

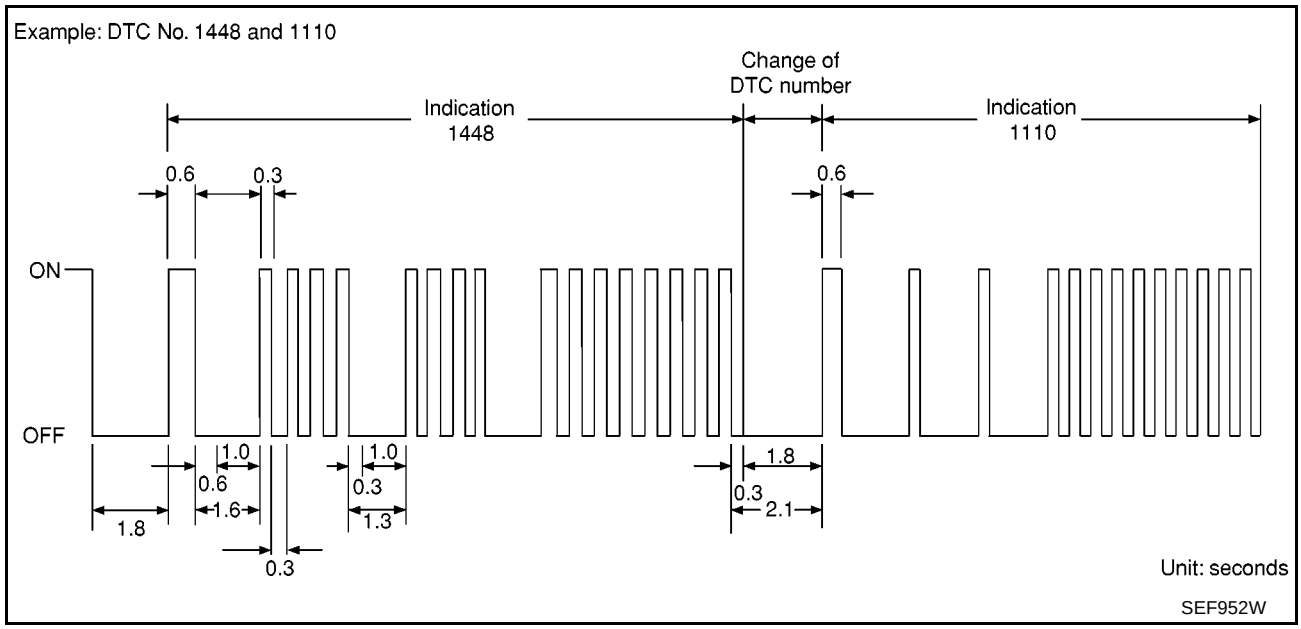
DIAGNOSTIC TEST MODE I — MALFUNCTION WARNING

MI	Condition
ON	When the malfunction is detected.
OFF	No malfunction.

- These DTC numbers are clarified in Diagnostic Test Mode II (SELF-DIAGNOSTIC RESULTS)

DIAGNOSTIC TEST MODE II — SELF-DIAGNOSTIC RESULTS

In this mode, the DTC and 1st trip DTC are indicated by the number of blinks of the MI as shown below.
The DTC and 1st trip DTC are displayed at the same time. If the MI does not illuminate in diagnostic test mode I (Malfunction warning), all displayed items are 1st trip DTCs. If only one code is displayed when the MI illuminates in diagnostic test mode II (SELF-DIAGNOSTIC RESULTS), it is a DTC; if two or more codes are displayed, they may be either DTCs or 1st trip DTCs. DTC No. is same as that of 1st trip DTC. These unidentified codes can be identified by using the CONSULT-II. A DTC will be used as an example for how to read a code.



A particular trouble code can be identified by the number of four-digit numeral flashes. The “zero” is indicated by the number of ten flashes. The length of time the 1,000th-digit numeral flashes on and off is 1.2 seconds consisting of an ON (0.6-second) - OFF (0.6-second) cycle.
The 100th-digit numeral and lower digit numerals consist of a 0.3-second ON and 0.3-second OFF cycle.
A change from one digit numeral to another occurs at an interval of 1.0-second OFF. In other words, the later numeral appears on the display 1.3 seconds after the former numeral has disappeared.
A change from one trouble code to another occurs at an interval of 1.8-second OFF.
In this way, all the detected malfunctions are classified by their DTC numbers. The DTC “0000” refers to no malfunction. (See EC-561, "INDEX FOR DTC")

How to Erase Diagnostic Test Mode II (Self-diagnostic Results)

The DTC can be erased from the back up memory in the ECM by depressing accelerator pedal. Refer to EC-597, "HOW TO SWITCH DIAGNOSTIC TEST MODE" .

- **If the battery is disconnected, the DTC will be lost from the backup memory after approx 24 hours.**
- **Be careful not to erase the stored memory before starting trouble diagnoses.**

DIAGNOSTIC TEST MODE II — HEATED OXYGEN SENSOR 1 MONITOR

In this mode, the MI displays the condition of the fuel mixture (lean or rich) which is monitored by the heated oxygen sensor 1.

MI	Fuel mixture condition in the exhaust gas	Air fuel ratio feedback control condition
ON	Lean	Closed loop system
OFF	Rich	
*Remains ON or OFF	Any condition	Open loop system

*: Maintains conditions just before switching to open loop.

To check the heated oxygen sensor 1 function, start engine in the Diagnostic Test Mode II and warm it up until engine coolant temperature indicator points to the middle of the gauge.
Next run engine at about 2,000 rpm for about 2 minutes under no-load conditions. Then make sure that the MI comes ON more than 5 times within 10 seconds with engine running at 2,000 rpm under no-load.

TROUBLE DIAGNOSIS

PFP:00004

Trouble Diagnosis Introduction

EBS00EU5

INTRODUCTION

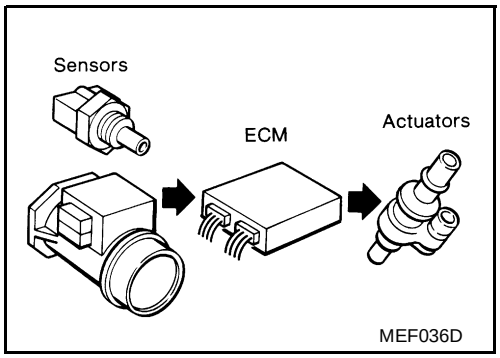
The engine has an ECM to control major systems such as fuel control, ignition control, idle air control system, etc. The ECM accepts input signals from sensors and instantly drives actuators. It is essential that both input and output signals are proper and stable. At the same time, it is important that there are no problems such as vacuum leaks, fouled spark plugs, or other problems with the engine.

It is much more difficult to diagnose a problem that occurs intermittently rather than continuously. Most intermittent problems are caused by poor electric connections or improper wiring. In this case, careful checking of suspected circuits may help prevent the replacement of good parts.

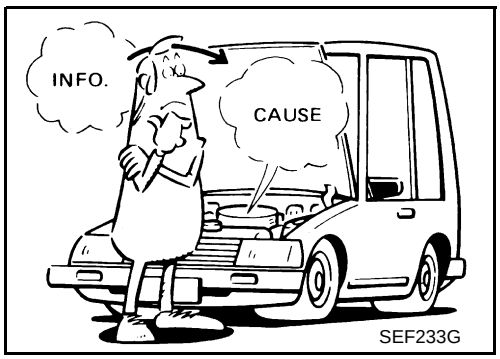
A visual check only may not find the cause of the problems. A road test with CONSULT-II or a circuit tester connected should be performed. Follow the “Work Flow” on EC-601 .

Before undertaking actual checks, take a few minutes to talk with a customer who approaches with a driveability complaint. The customer can supply good information about such problems, especially intermittent ones. Find out what symptoms are present and under what conditions they occur. A “Diagnostic Worksheet” like the example on EC-604 should be used.

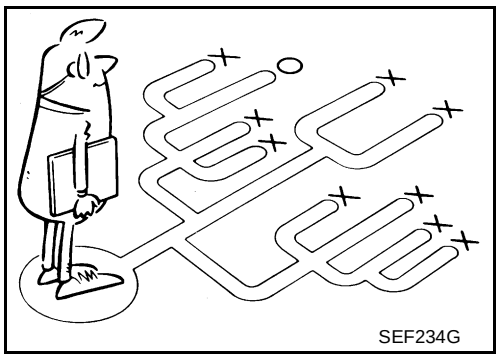
Start your diagnosis by looking for “conventional” problems first. This will help troubleshoot driveability problems on an electronically controlled engine vehicle.



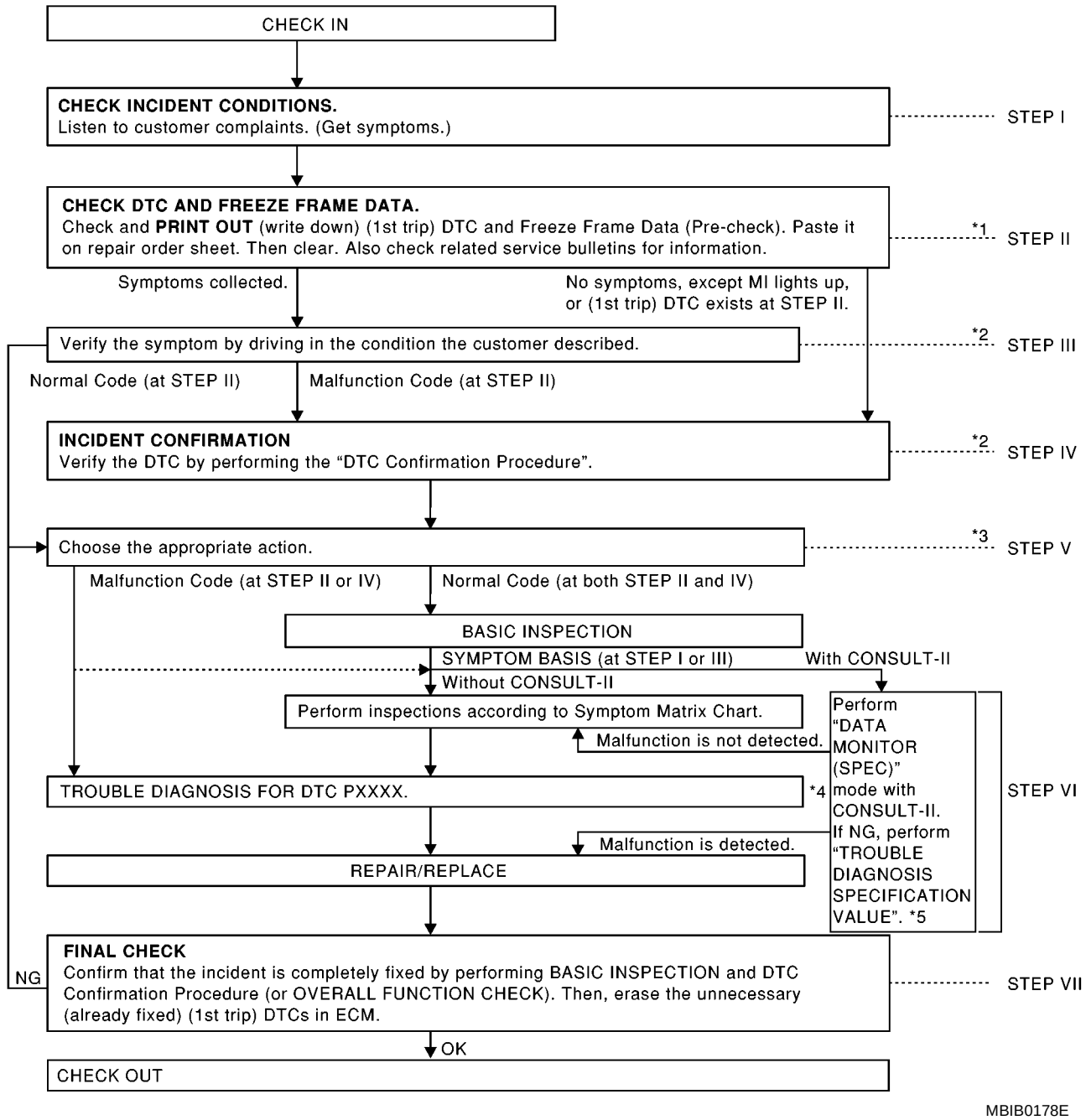
MEF036D



SEF233G


SEF234G

WORK FLOW
Flow Chart



MBIB0178E

*1 If time data of "SELF-DIAG RESULTS" is other than "0" or "[1t]", perform EC-656, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

*2 If time data of "SELF-DIAG RESULTS" is other than "0" or "[1t]", perform EC-656, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

*3 If the on board diagnostic system cannot be performed, check main power supply and ground circuit. Refer to EC-657, "POWER SUPPLY CIRCUIT FOR ECM" .

*4 If the incident cannot be verified, perform EC-656, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

*5 EC-652, "TROUBLE DIAGNOSIS - SPECIFICATION VALUE"

Description for Work Flow

STEP	DESCRIPTION
STEP I	Get detailed information about the conditions and the environment when the incident/symptom occurred using the “DIAGNOSTIC WORK SHEET”, EC-604 .
STEP II	Before confirming the concern, check and write down (print out using CONSULT-II) the (1st trip) DTC and the (1st trip) freeze frame data, then erase the DTC and the data. (Refer to EC-594, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .) The (1st trip) DTC and the (1st trip) freeze frame data can be used when duplicating the incident at STEP III & IV. If the incident cannot be verified, perform EC-656, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" . Study the relationship between the cause, specified by (1st trip) DTC, and the symptom described by the customer. (The “Symptom Matrix Chart” will be useful. See EC-612 .) Also check related service bulletins for information.
STEP III	Try to confirm the symptom and under what conditions the incident occurs. The “DIAGNOSTIC WORK SHEET” and the freeze frame data are useful to verify the incident. Connect CONSULT-II to the vehicle in DATA MONITOR (AUTO TRIG) mode and check real time diagnosis results. If the incident cannot be verified, perform EC-656, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" . If the malfunction code is detected, skip STEP IV and perform STEP V.
STEP IV	Try to detect the (1st trip) DTC by driving in (or performing) the “DTC Confirmation Procedure”. Check and read the (1st trip) DTC and (1st trip) freeze frame data by using CONSULT-II or GST. During the (1st trip) DTC verification, be sure to connect CONSULT-II to the vehicle in DATA MONITOR (AUTO TRIG) mode and check real time diagnosis results. If the incident cannot be verified, perform EC-656, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" . In case the “DTC Confirmation Procedure” is not available, perform the “Overall Function Check” instead. The (1st trip) DTC cannot be displayed by this check, however, this simplified “check” is an effective alternative. The “NG” result of the “Overall Function Check” is the same as the (1st trip) DTC detection.
STEP V	Take the appropriate action based on the results of STEP I through IV. If the malfunction code is indicated, proceed to TROUBLE DIAGNOSIS FOR DTC PXXXX. If the normal code is indicated, proceed to the BASIC INSPECTION. (Refer to EC-607 .) If COSULT-II is available, perform “DATA MONITOR (SPEC)” mode with CONSULT-II and proceed to the “TOROUBLE DIAGNOSIS – SPECIFICATION VALUE”. (Refer to EC-652 .) (If malfunction is detected, proceed to “PERAIR/REPLACE”.) Then perform inspections according to the Symptom Matrix Chart. (Refer to EC-612 .)
STEP VI	Identify where to begin diagnosis based on the relationship study between symptom and possible causes. Inspect the system for mechanical binding, loose connectors or wiring damage using (tracing) “Harness Layouts”. Gently shake the related connectors, components or wiring harness with CONSULT-II set in “DATA MONITOR (AUTO TRIG)” mode. Check the voltage of the related ECM terminals or monitor the output data from the related sensors with CONSULT-II. Refer to EC-622 , EC-646 . The “Diagnostic Procedure” in EC section contains a description based on open circuit inspection. A short circuit inspection is also required for the circuit check in the Diagnostic Procedure. For details, refer to “Circuit Inspection” in GI-24, "How to Perform Efficient Diagnosis for an Electrical Incident" . Repair or replace the malfunction parts. If malfunctioning part cannot be detected, perform EC-656, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .
STEP VII	Once you have repaired the circuit or replaced a component, you need to run the engine in the same conditions and circumstances which resulted in the customer's initial complaint. Perform the “DTC Confirmation Procedure” and confirm the normal code [DTC No. P0000] is detected. If the incident is still detected in the final check, perform STEP VI by using a method different from the previous one. Before returning the vehicle to the customer, be sure to erase the unnecessary (already fixed) (1st trip) DTC in ECM and TCM (Transmission control module). (Refer to EC-594, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .)

DIAGNOSTIC WORKSHEET

Description

There are many operating conditions that lead to the malfunction of engine components. A good grasp of such conditions can make troubleshooting faster and more accurate.

In general, each customer feels differently about a problem. It is important to fully understand the symptoms or conditions for a customer complaint.

Utilize a diagnostic worksheet like the one on the next page in order to organize all the information for troubleshooting.

Some conditions may cause the MI to come on steady or blink and DTC to be detected. Examples:

- Vehicle ran out of fuel, which caused the engine to misfire.
- Fuel filler cap was left off or incorrectly screwed on, allowing fuel to evaporate into the atmosphere.

KEY POINTS

WHAT ..... Vehicle & engine model
WHEN ..... Date, Frequencies
WHERE..... Road conditions
HOW ..... Operating conditions, Weather conditions, Symptoms

SEF907L

Worksheet Sample

Customer name MR/MS		Model & Year	VIN
Engine #		Trans.	Mileage
Incident Date		Manuf. Date	In Service Date
Fuel and fuel filler cap		☐ Vehicle ran out of fuel causing misfire ☐ Fuel filler cap was left off or incorrectly screwed on.	
Symptoms	☐ Startability	☐ Impossible to start ☐ No combustion ☐ Partial combustion ☐ Partial combustion affected by throttle position ☐ Partial combustion NOT affected by throttle position ☐ Possible but hard to start ☐ Others [ ]	
	☐ Idling	☐ No fast idle ☐ Unstable ☐ High idle ☐ Low idle ☐ Others [ ]	
	☐ Driveability	☐ Stumble ☐ Surge ☐ Knock ☐ Lack of power ☐ Intake backfire ☐ Exhaust backfire ☐ Others [ ]	
	☐ Engine stall	☐ At the time of start ☐ While idling ☐ While accelerating ☐ While decelerating ☐ Just after stopping ☐ While loading	
Incident occurrence		☐ Just after delivery ☐ Recently ☐ In the morning ☐ At night ☐ In the daytime	
Frequency		☐ All the time ☐ Under certain conditions ☐ Sometimes	
Weather conditions		☐ Not affected	
	Weather	☐ Fine ☐ Raining ☐ Snowing ☐ Others [ ]	
	Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold ☐ Humid ˚F	
Engine conditions		☐ Cold ☐ During warm-up ☐ After warm-up Engine speed 0 2,000 4,000 6,000 8,000 rpm	
Road conditions		☐ In town ☐ In suburbs ☐ Highway ☐ Off road (up/down)	
Driving conditions		☐ Not affected ☐ At starting ☐ While idling ☐ At racing ☐ While accelerating ☐ While cruising ☐ While decelerating ☐ While turning (RH/LH) Vehicle speed 0 10 20 30 40 50 60 MPH	
Malfunction indicator lamp		☐ Turned on ☐ Not turned on	

MTBL0017

DTC Inspection Priority Chart

EBS00EU6

If some DTCs are displayed at the same time, perform inspections one by one based on the following priority chart.

NOTE:
If DTC U1000 and/or U1001 is displayed with other DTC, first perform the trouble diagnosis for DTC U1000 and U1001. Refer to EC-663, "DTC U1000, U1001 CAN COMMUNICATION LINE" .

QG16DE ENGINE

Priority	Detected items (DTC)
1	● U1001 CAN communication line ● P0102 P0103 P1102 Mass air flow sensor ● P0117 P0118 Engine coolant temperature sensor ● P0221 P0222 P0223 P1223 P1224 P1225 P1226 P1229 Throttle position sensor ● P0226 P0227 P0228 P1227 P1228 Accelerator pedal position sensor ● P0327 P0328 Knock sensor ● P0335 Crankshaft position sensor (POS) ● P0340 Camshaft position sensor (PHASE) ● P0605 ECM ● P1610-P1615 NATS
2	● P0132 P0134 Heated oxygen sensor 1 ● P0138 Heated oxygen sensor 2 ● P1065 ECM power supply ● P1122 Electric throttle control function ● P1124 P1126 P1128 Electric throttle control actuator ● P1805 Brake switch
3	● P1121 Electric throttle control actuator ● P1217 Engine over temperature (OVERHEAT)

QG18DE ENGINE

Priority	Detected items (DTC)
1	● U1000 U1001 CAN communication line ● P0102 P0103 P1102 Mass air flow sensor ● P0117 P0118 Engine coolant temperature sensor ● P0221 P0222 P0223 P1223 P1224 P1225 P1226 P1229 Throttle position sensor ● P0226 P0227 P0228 P1227 P1228 Accelerator pedal position sensor ● P0327 P0328 Knock sensor ● P0335 Crankshaft position sensor (POS) ● P0340 Camshaft position sensor (PHASE) ● P0605 ECM ● P1610-P1615 NATS
2	● P0132 P0134 P0152 P0154 Heated oxygen sensor 1 ● P0138 P0158 Heated oxygen sensor 2 ● P1065 ECM power supply ● P1122 Electric throttle control function ● P1124 P1126 P1128 Electric throttle control actuator ● P1805 Brake switch
3	● P1121 Electric throttle control actuator ● P1217 Engine over temperature (OVERHEAT)

Fail-safe Chart

EBS00EU7

When the DTC listed below is detected, the ECM enters the fail-safe mode and the MI lights up.

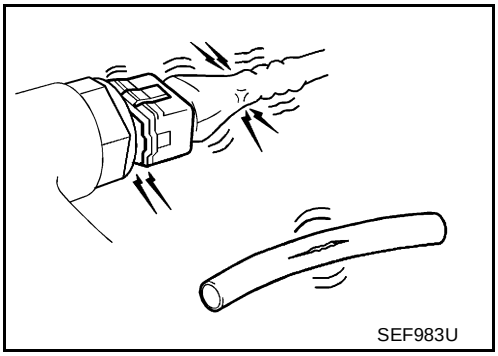
<table>
<tr><th>DTC No.</th><th>Detected items</th><th>Engine operating condition in fail-safe mode</th></tr>
<tr><td>P0102
P0103
P1102</td><td>Mass air flow sensor circuit</td><td colspan="2">Engine speed will not rise more than 2,400 rpm due to the fuel cut.</td></tr>
<tr><td rowspan="6">P0117
P0118</td><td rowspan="6">Engine coolant temperature sensor circuit</td><td colspan="2">Engine coolant temperature will be determined by ECM based on the time after turning ignition switch “ON” or “START”.
CONSULT-II displays the engine coolant temperature decided by ECM.</td></tr>
<tr><td>Condition</td><td>Engine coolant temperature decided (CONSULT-II display)</td></tr>
<tr><td>Just as ignition switch is turned ON or Start</td><td>40°C (104°F)</td></tr>
<tr><td>More than approx. 4 minutes after ignition ON or Start</td><td>80°C (176°F)</td></tr>
<tr><td>Except as shown above</td><td>40 - 80°C (104 - 176°F)
(Depends on the time)</td></tr>
<tr><td colspan="2">When the fail-safe system for engine coolant temperature sensor is activated, the cooling fan operates while engine is running.</td></tr>
<tr><td>P0221
P0222
P0223
P1223
P1224</td><td>Throttle position sensor</td><td colspan="2">The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees.
The ECM regulates the opening speed of the throttle valve to be slower than the normal condition.
So, the acceleration will be poor.</td></tr>
<tr><td>P0226
P0227
P0228
P1227
P1228</td><td>Accelerator pedal position sensor</td><td colspan="2">The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees.
The ECM regulates the opening speed of the throttle valve to be slower than the normal condition.
So, the acceleration will be poor.</td></tr>
<tr><td>P1121</td><td>Electric throttle control actuator
(ECM detect the throttle valve is stuck open.)</td><td colspan="2">While the vehicle is driving, it slows down gradually by fuel cut. After the vehicle stops, the engine stalls.
The engine can restart in “N” or “P” position, and engine speed will not exceed 1,000 rpm or more.</td></tr>
<tr><td>P1122</td><td>Electric throttle control function</td><td colspan="2">ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.</td></tr>
<tr><td>P1124
P1126</td><td>Throttle control motor relay</td><td colspan="2">ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.</td></tr>
<tr><td>P1128</td><td>Throttle control motor</td><td colspan="2">ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.</td></tr>
<tr><td>P1229</td><td>Sensor power supply</td><td colspan="2">ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.</td></tr>
</table>

Basic Inspection

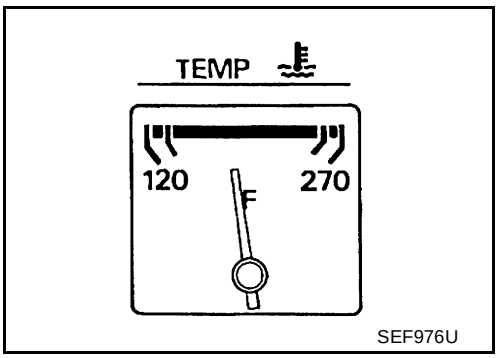
EBS00EU8

1. INSPECTION START

1. Check service records for any recent repairs that may indicate a related problem, or a current need for scheduled maintenance.
2. Open engine hood and check the following:
   - Harness connectors for improper connections
   - Wiring harness for improper connections, pinches and cut
   - Vacuum hoses for splits, kinks and improper connections
   - Hoses and ducts for leaks
   - Air cleaner clogging
   - Gasket


SEF983U

3. Confirm that electrical or mechanical loads are not applied.
   - Headlamp switch is OFF.
   - Air conditioner switch is OFF.
   - Rear window defogger switch is OFF.
   - Steering wheel is in the straight-ahead position, etc.
4. Start engine and warm it up until engine coolant temperature indicator points the middle of gauge.
   Ensure engine stays below 1,000 rpm.

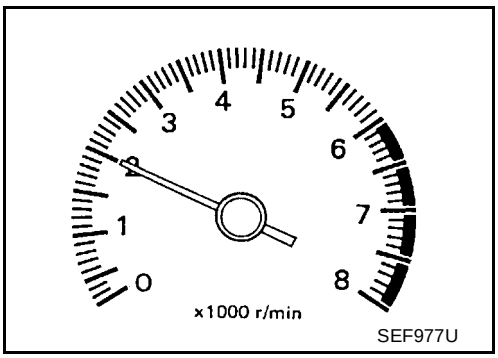


SEF976U

5. Run engine at about 2,000 rpm for about 2 minutes under no-load.
6. Make sure that no DTC is displayed with CONSULT-II or ECM.

OK or NG

OK >> GO TO 3.
NG >> GO TO 2.



SEF977U

2. REPAIR OR REPLACE

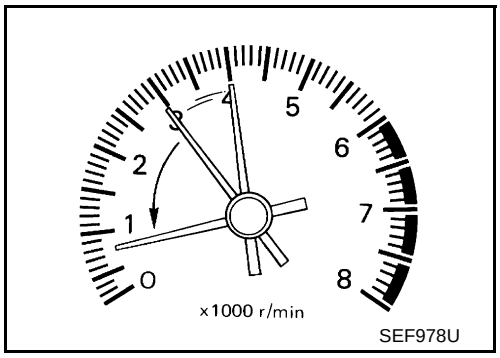
Repair or replace components as necessary according to corresponding “Diagnostic Procedure”.

>> GO TO 3.

3. CHECK TARGET IDLE SPEED

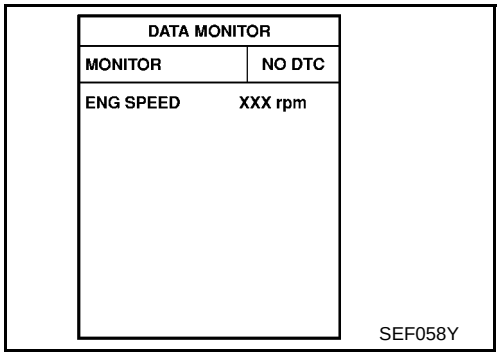
With CONSULT-II

1. Run engine at about 2,000 rpm for about 2 minutes under no-load.
2. Rev engine (2,000 to 3,000 rpm) two or three times under no-load, then run engine at idle speed for about 1 minute.



3. Read idle speed in “DATA MONITOR” mode with CONSULT-II.

M/T: 700 ± 50 rpm
A/T: 800 ± 50 rpm (in “P” or “N” position)



Without CONSULT-II

1. Run engine at about 2,000 rpm for about 2 minutes under no-load.
2. Rev engine (2,000 to 3,000 rpm) two or three times under no-load, then run engine at idle speed for about 1 minute.
3. Check idle speed.

M/T: 700 ± 50 rpm
A/T: 800 ± 50 rpm (in “P” or “N” position)

OK or NG

OK >> GO TO 10.
NG >> GO TO 4.

4. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

1. Stop engine.
2. Perform EC-589, "Accelerator Pedal Released Position Learning" .

>> GO TO 5.

5. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform EC-589, "Throttle Valve Closed Position Learning" .

>> GO TO 6.

6. PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-589, "Idle Air Volume Learning" .

Which is the result CMPLT or INCMP?

CMPLT or INCMP

CMPLT >> GO TO 7.
INCMP >> 1. Follow the construction of “Idle Air Volume Learning”.
2. GO TO 4.

7. CHECK TARGET IDLE SPEED AGAIN

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Read idle speed in “DATA MONITOR” mode with CONSULT-II.

M/T: 700 ± 50 rpm
A/T: 800 ± 50 rpm (in “P” or “N” position)

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Check idle speed.

M/T: 700 ± 50 rpm
A/T: 800 ± 50 rpm (in “P” or “N” position)

OK or NG

OK >> GO TO 10.
NG >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the following.

- Check camshaft position sensor (PHASE) and circuit. Refer to EC-760 .
- Check crankshaft position sensor (POS) and circuit. Refer to EC-753 .

OK or NG

OK >> GO TO 9.
NG >> 1. Repair or replace.
2. GO TO 4.

9. CHECK ECM FUNCTION

1. Substitute another known-good ECM to check ECM function. (ECM may be the cause of a problem, but this is the rarely the case.)
2. Perform initialization of NATS system and registration of NATS ignition key IDs. Refer to EC-595, "NATS (Nissan Anti-theft System)" .

>> GO TO 4.

10. CHECK IGNITION TIMING

1. Run engine at idle.
2. Check ignition timing with a timing light.

M/T: 8 ± 5° BTDC
A/T: 10 ± 5° BTDC (in “P” or “N” position)

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 11.

11. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

1. Stop engine.
2. Perform EC-589, "Accelerator Pedal Released Position Learning" .

>> GO TO 12.

12. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform EC-589, "Throttle Valve Closed Position Learning" .

>> GO TO 13.

13. PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-589, "Idle Air Volume Learning" .

Which is the result CMPLT or INCMP?

CMPLT or INCMP

CMPLT >> GO TO 14.
INCMP >> 1. Follow the construction of “Idle Air Volume Learning”.
2. GO TO 4.

14. CHECK TARGET IDLE SPEED AGAIN

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Read idle speed in “DATA MONITOR” mode with CONSULT-II.

M/T: 700 ± 50 rpm
A/T: 800 ± 50 rpm (in “P” or “N” position)

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Check idle speed.

M/T: 700 ± 50 rpm
A/T: 800 ± 50 rpm (in “P” or “N” position)

OK or NG

OK >> GO TO 15.
NG >> GO TO 17.

15. CHECK IGNITION TIMING AGAIN

1. Run engine at idle.
2. Check ignition timing with a timing light.

M/T: 8 ± 5° BTDC
A/T: 10 ± 5° BTDC (in "P" or "N" position)

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 16.

16. CHECK TIMING CHAIN INSTALLATION

Check timing chain installation. Refer to EM-49, "TIMING CHAIN" .

OK or NG

OK >> GO TO 17.
NG >> 1. Repair the timing chain installation.
2. GO TO 4.

17. DETECT MALFUNCTIONING PART

Check the following.

- Check camshaft position sensor (PHASE) and circuit. Refer to EC-760 .
- Check crankshaft position sensor (POS) and circuit. Refer to EC-753 .

OK or NG

OK >> GO TO 18.
NG >> 1. Repair or replace.
2. GO TO 4.

18. CHECK ECM FUNCTION

1. Substitute another known-good ECM to check ECM function. (ECM may be the cause of a problem, but this is the rarely the case.)
2. Perform initialization of NATS system and registration of NATS ignition key IDs. Refer to EC-595, "NATS (Nissan Anti-theft System)" .

>> GO TO 4.

Symptom Matrix Chart

EBS00EU9

SYSTEM — BASIC ENGINE CONTROL SYSTEM

		SYMPTOM													Reference page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Fuel	Fuel pump circuit	1	1	2	3	2		2	2			3		2	EC-934
	Fuel pressure regulator system	3	3	4	4	4	4	4	4	4		4			EC-591
	Injector circuit	1	1	2	3	2		2	2			2			EC-928
	Evaporative emission system	3	3	4	4	4	4	4	4	4		4			EC-952
Air	Positive crankcase ventilation system	3	3	4	4	4	4	4	4	4		4	1		EC-955
	Incorrect idle speed adjustment	3	3				1	1	1	1		1			EC-607
	Electric throttle control actuator	1	1	2	3	3	2	2	2	2		2		2	EC-780, EC-783, EC-790, EC-796
Ignition	Incorrect ignition timing adjustment	3	3	1	1	1		1	1			1			EC-607
	Ignition circuit	1	1	2	2	2		2	2			2			EC-895
Main power supply and ground circuit		2	2	3	3	3		3	3		2	3			EC-657
Mass air flow sensor circuit		1	1	2	2	2		2	2			2			EC-666, EC-774
Engine coolant temperature sensor circuit		1	1	2	2	2	3	2	2	3	1	2			EC-672
Throttle position sensor circuit			1	2		2	2	2	2	2		2			EC-723, EC-729, EC-811, EC-817, EC-819, EC-828
Accelerator pedal position sensor circuit				3	2	1	2			2					EC-735, EC-742, EC-821
Heated oxygen sensor 1 circuit			1	2	3	2		2	2			2			EC-677, EC-683, EC-692, EC-698, EC-865, EC-872
Knock sensor circuit				2	2							3			EC-749
Crankshaft position sensor (POS) circuit		2	2												EC-753
Camshaft position sensor (PHASE) circuit		2	2												EC-760

	SYMPTOM													Reference page
	HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code	AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Vehicle speed signal circuit		2	3		3						3			EC-912
Power steering pressure sensor circuit		2				3	3	3	3					EC-913
ECM	2	2	3	3	3	3	3	3	3	3	3			EC-767, EC-770
Intake valve timing control solenoid valve circuit	3	3	2		1	3	2	2	3		3			EC-918
PNP switch circuit			3		3	3	3	3	3		3			EC-924
Refrigerant pressure sensor circuit		2				3	3	3	3		4			EC-940
Electrical load signal circuit						3	3	3	3					EC-945
Air conditioner circuit	2	2	3	3	3	3	3	3	3		3		2	ATC-30

1 - 6: The numbers refer to the order of inspection.
(continued on next page)

SYSTEM — ENGINE MECHANICAL & OTHER

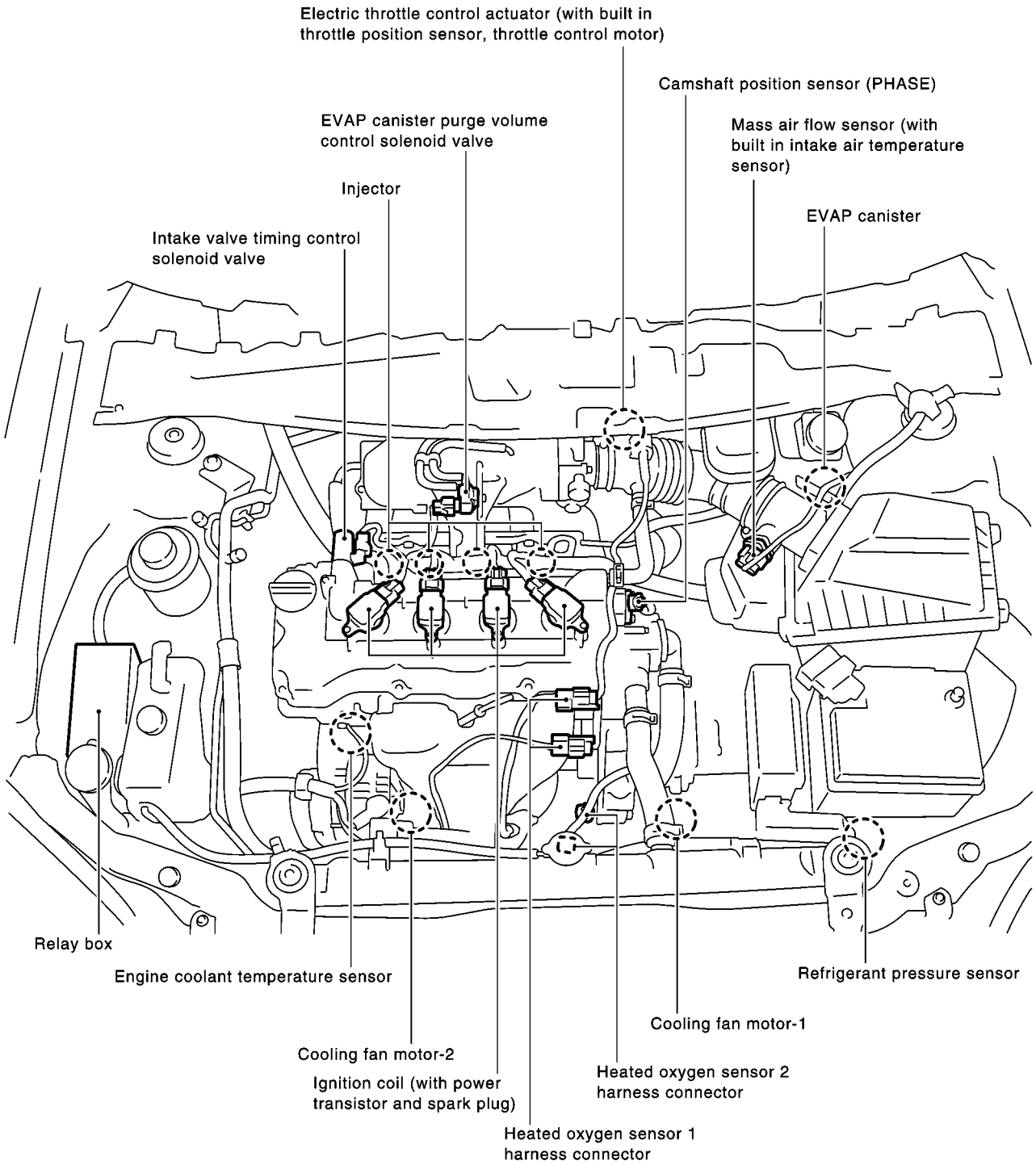
		SYMPTOM													Reference page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Fuel	Fuel tank	5	5												FL-13
	Fuel piping			5	5	5		5	5			5			FL-3, MA-23
	Vapor lock														—
	Valve deposit	5		5	5	5		5	5			5			—
	Poor fuel (Heavy weight gasoline, Low octane)														—
Air	Air duct	5	5	5	5	5	5	5	5	5		5			EM-17
	Air cleaner														EM-17
	Air leakage from air duct (Mass air flow sensor —electric throttle control actuator)														EM-17
	Electric throttle control actuator														EM-19
	Air leakage from intake manifold/ Collector/Gasket														EM-19
Cranking	Battery	1	1	1		1		1	1			1		1	SC-3
	Alternator circuit														SC-12
	Starter circuit	3													SC-22
	Signal plate/Flywheel/Drive plate	6													EM-70
	PNP switch	4													MT-14, MT-62 or AT-115
Engine	Cylinder head	5	5	5	5	5		5	5			5			EM-57
	Cylinder head gasket										4		3		
	Cylinder block	6	6	6	6	6		6	6			6	4		EM-70
	Piston														
	Piston ring														
	Connecting rod														
	Bearing														
	Crankshaft														

		SYMPTOM													Reference page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Valve mechanism	Timing chain	5	5	5	5	5		5	5			5			EM-49
	Camshaft														EM-36
	Intake valve timing control														EM-49
	Intake valve												3		EM-57
	Exhaust valve														
Exhaust	Exhaust manifold/Tube/Muffler/Gasket	5	5	5	5	5		5	5			5			EM-23, EX-3
	Three way catalyst														
Lubrication	Oil pan/Oil strainer/Oil pump/Oil filter/Oil gallery	5	5	5	5	5		5	5			5	2		EM-27, LU-8 , LU-9 , LU-5
	Oil level (Low)/Filthy oil														LU-6
Cooling	Radiator/Hose/Radiator filler cap	5	5	5	5	5		5	5		2	5			CO-11
	Thermostat									5					CO-20
	Water pump														CO-18
	Water gallery														CO-7
	Cooling fan									5					CO-11
	Coolant level (low)/Contaminated coolant														CO-8
NATS (Nissan Anti-Theft System)		1	1												EC-595 or BL-156

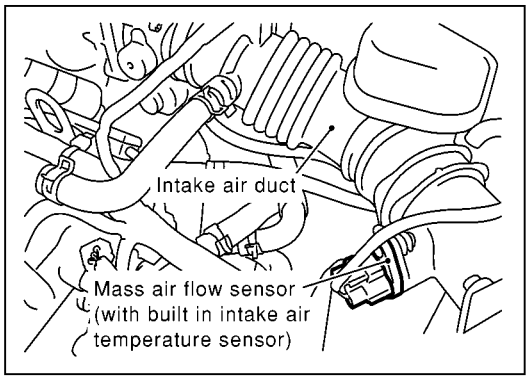
1 - 6: The numbers refer to the order of inspection.

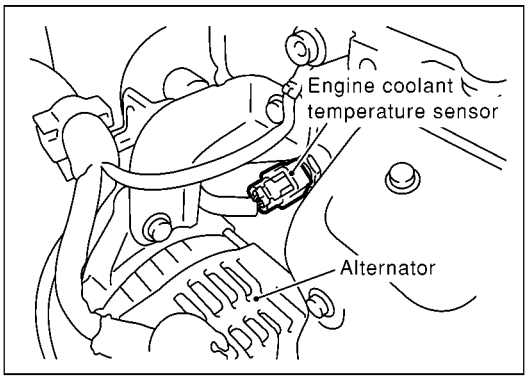
Engine Control Component Parts Location

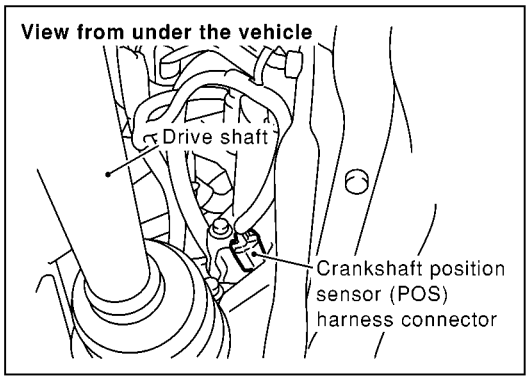
EBS00EUA

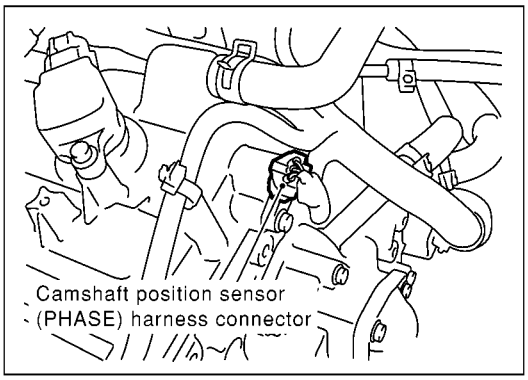


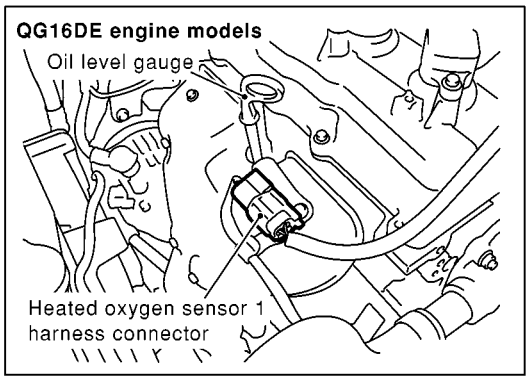
MBIB0117E

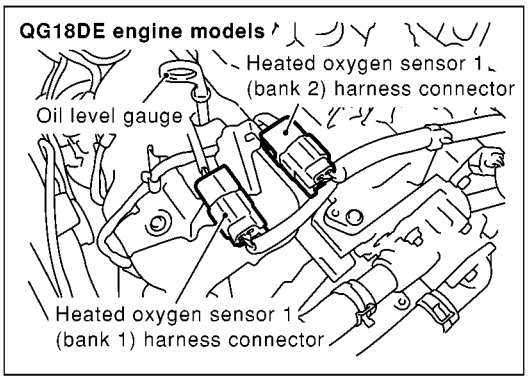

Intake air duct
Mass air flow sensor
(with built in intake air
temperature sensor)

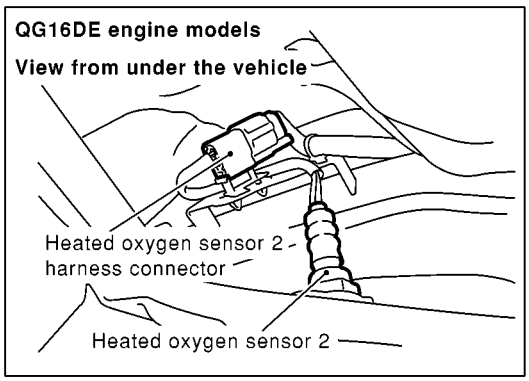

Engine coolant
temperature sensor
Alternator

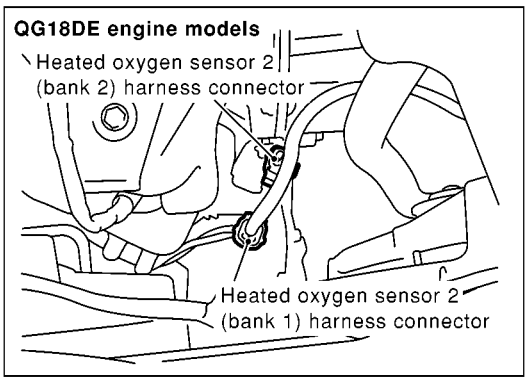

View from under the vehicle
Drive shaft
Crankshaft position
sensor (POS)
harness connector


Camshaft position sensor
(PHASE) harness connector

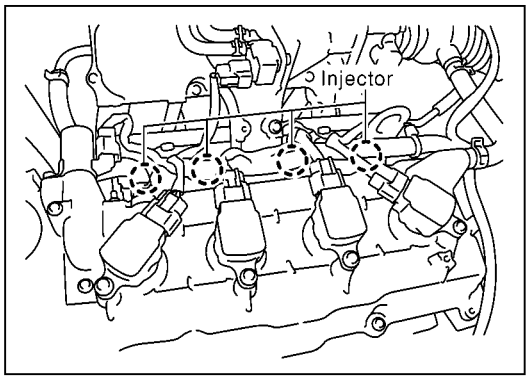

QG16DE engine models
Oil level gauge
Heated oxygen sensor 1
harness connector

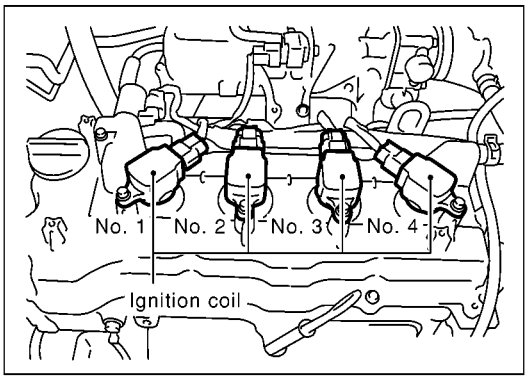

QG18DE engine models
Heated oxygen sensor 1
(bank 2) harness connector
Oil level gauge
Heated oxygen sensor 1
(bank 1) harness connector

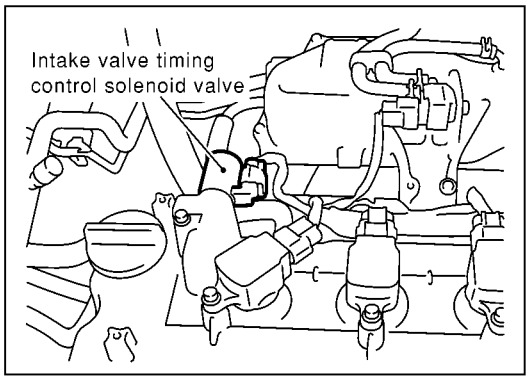

QG16DE engine models
View from under the vehicle
Heated oxygen sensor 2
harness connector
Heated oxygen sensor 2

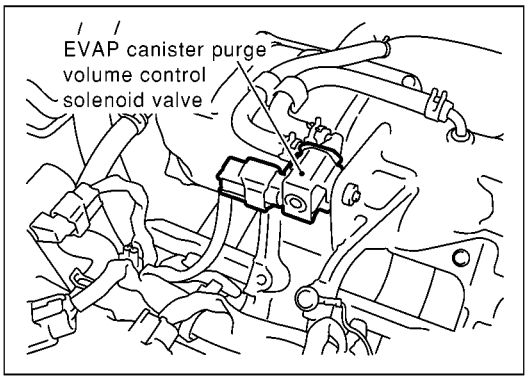

QG18DE engine models
Heated oxygen sensor 2
(bank 2) harness connector
Heated oxygen sensor 2
(bank 1) harness connector

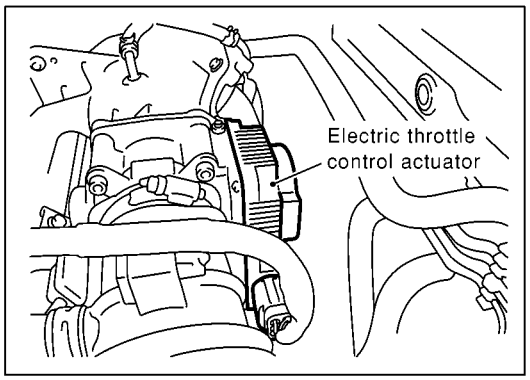
MBIB0118E

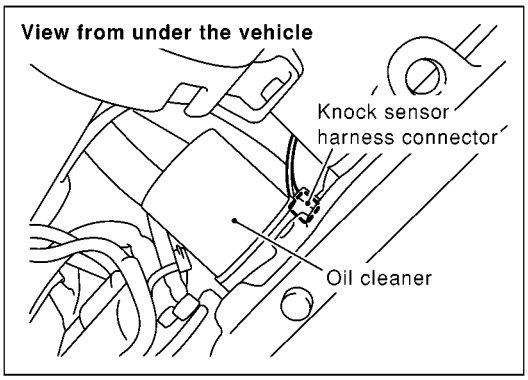

Injector

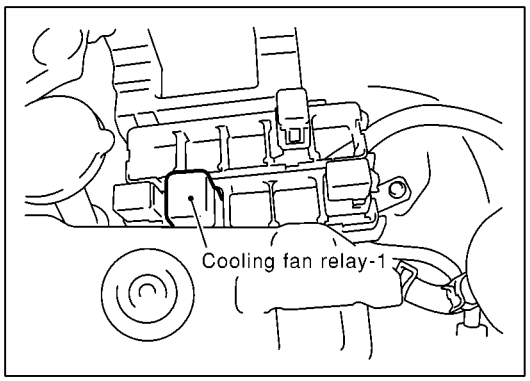

No. 1
No. 2
No. 3
No. 4
Ignition coil

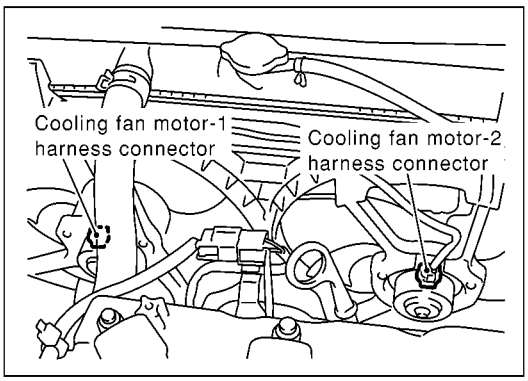

Intake valve timing
control solenoid valve


EVAP canister purge
volume control
solenoid valve

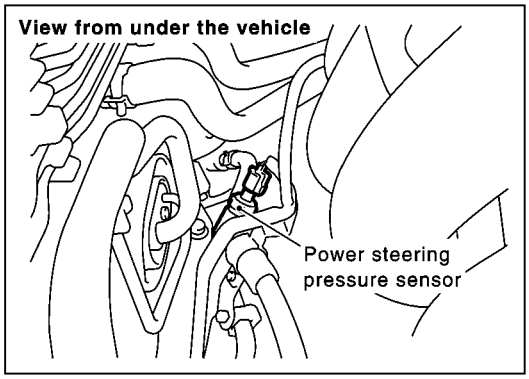

Electric throttle
control actuator

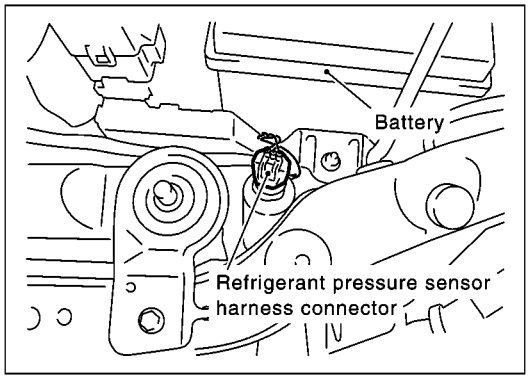

View from under the vehicle
Knock sensor
harness connector
Oil cleaner

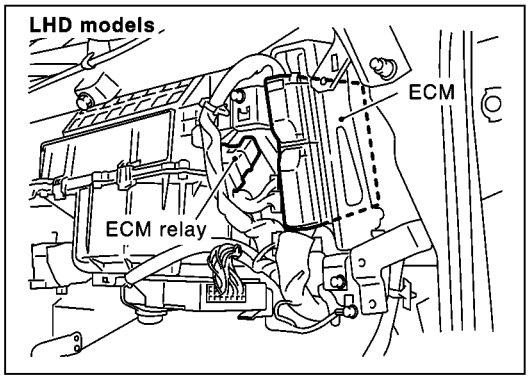

Cooling fan relay-1

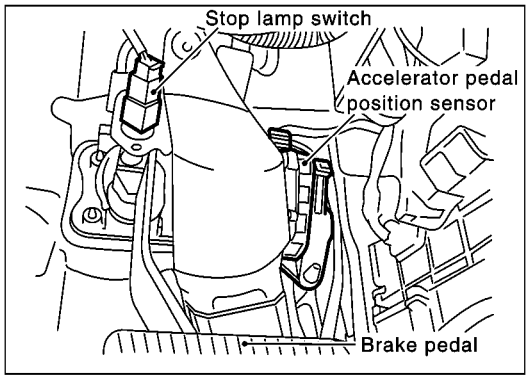

Cooling fan motor-1
harness connector
Cooling fan motor-2
harness connector

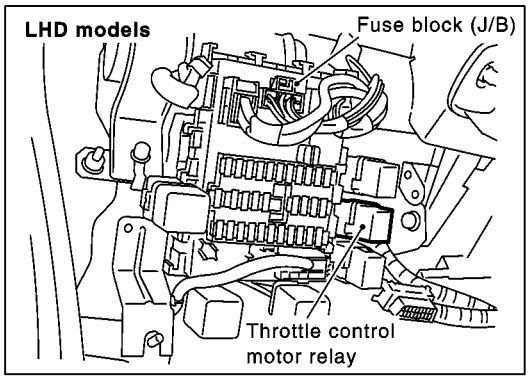
MBIB0119E

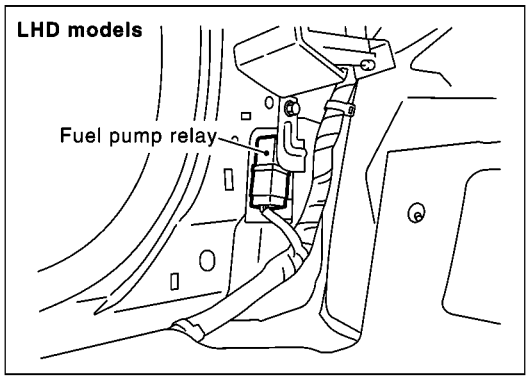

View from under the vehicle
Power steering
pressure sensor

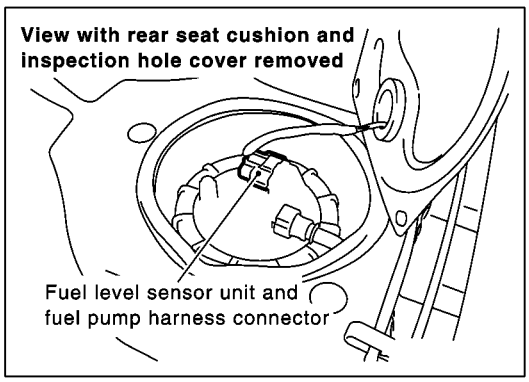

Battery
Refrigerant pressure sensor
harness connector

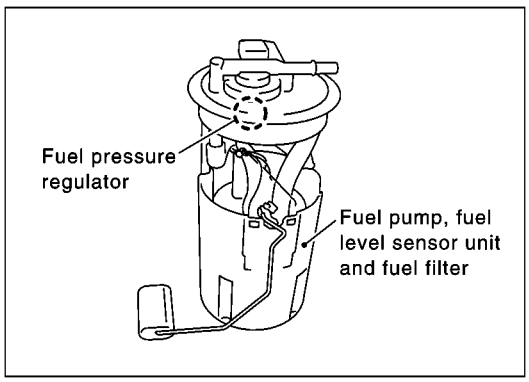

LHD models
ECM
ECM relay


Stop lamp switch
Accelerator pedal
position sensor
Brake pedal


LHD models
Fuse block (J/B)
Throttle control
motor relay


LHD models
Fuel pump relay

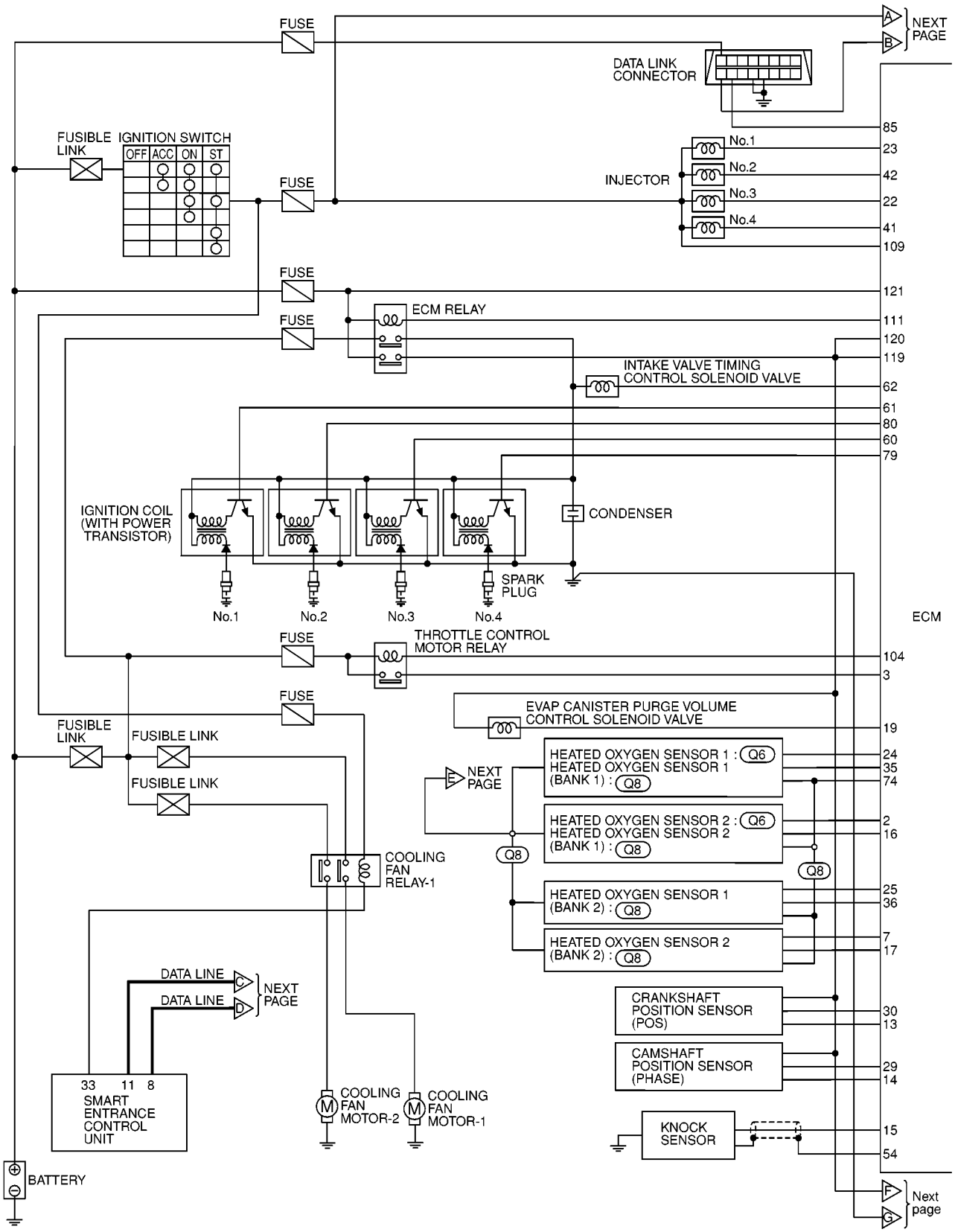

View with rear seat cushion and
inspection hole cover removed
Fuel level sensor unit and
fuel pump harness connector


Fuel pressure
regulator
Fuel pump, fuel
level sensor unit
and fuel filter

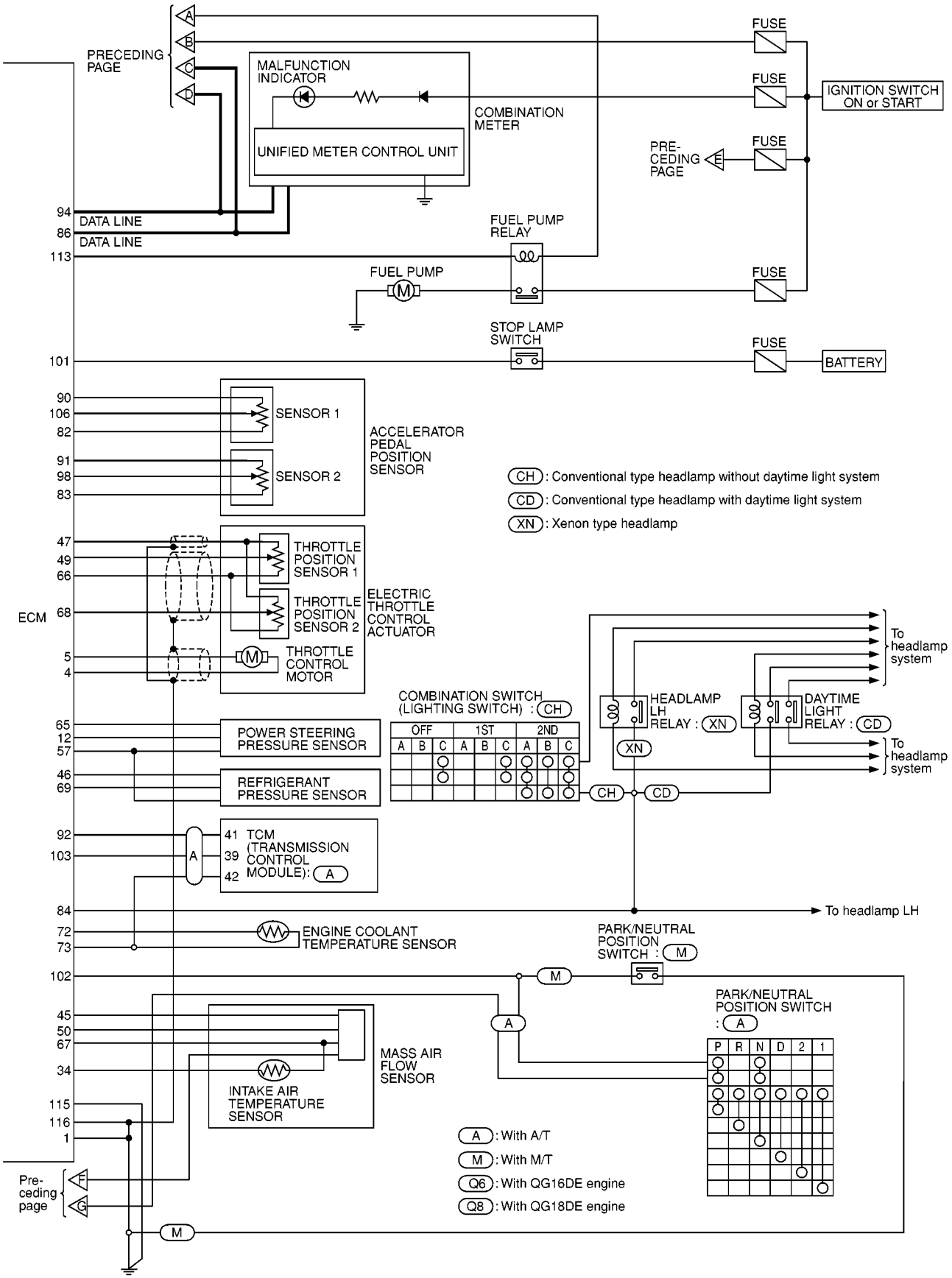
MBIB0120E

Circuit Diagram

EBS00EUB



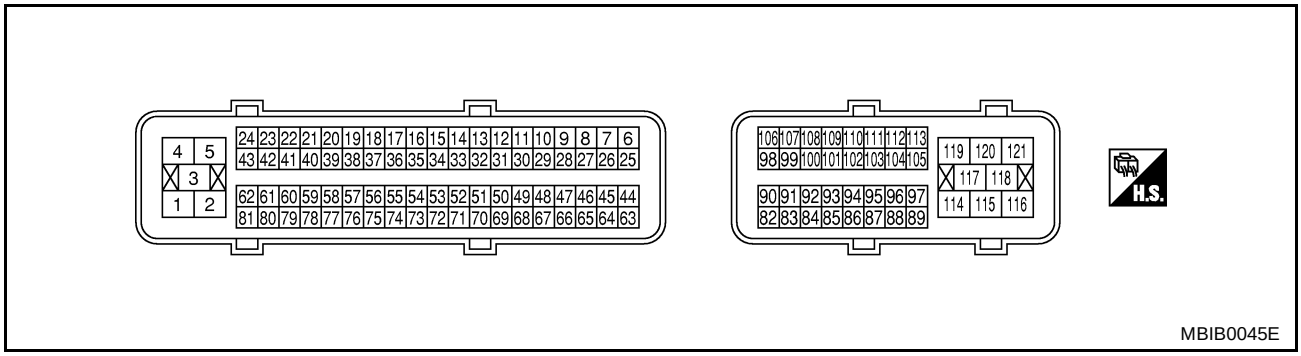
MBWA0042E


PRECEDING PAGE
A
B
C
D
MALFUNCTION INDICATOR
COMBINATION METER
UNIFIED METER CONTROL UNIT
FUSE
IGNITION SWITCH ON or START
PRE-CEDING PAGE
E
94 DATA LINE
86 DATA LINE
113
FUEL PUMP RELAY
FUEL PUMP
M
STOP LAMP SWITCH
101
BATTERY
90
106
82
SENSOR 1
91
98
83
SENSOR 2
ACCELERATOR PEDAL POSITION SENSOR
CH : Conventional type headlamp without daytime light system
CD : Conventional type headlamp with daytime light system
XN : Xenon type headlamp
47
49
66
THROTTLE POSITION SENSOR 1
68
THROTTLE POSITION SENSOR 2
ECM
ELECTRIC THROTTLE CONTROL ACTUATOR
5
4
THROTTLE CONTROL MOTOR
To headlamp system
COMBINATION SWITCH (LIGHTING SWITCH) : CH
OFF 1ST 2ND
A B C A B C A B C
HEADLAMP LH RELAY : XN
DAYTIME LIGHT RELAY : CD
XN
CH
CD
To headlamp system
65
12
57
POWER STEERING PRESSURE SENSOR
46
69
REFRIGERANT PRESSURE SENSOR
92
103
A
41 TCM (TRANSMISSION CONTROL MODULE): A
39
42
84
To headlamp LH
72
73
ENGINE COOLANT TEMPERATURE SENSOR
PARK/NEUTRAL POSITION SWITCH : M
102
M
PARK/NEUTRAL POSITION SWITCH : A
P R N D 2 1
45
50
67
34
MASS AIR FLOW SENSOR
INTAKE AIR TEMPERATURE SENSOR
115
116
1
A : With A/T
M : With M/T
Q6 : With QG16DE engine
Q8 : With QG18DE engine
Pre-ceding page
F
G
M

MBWA0043E

ECM Harness Connector Terminal Layout

EBS00EUC

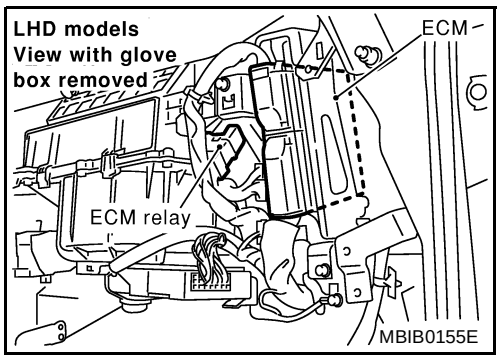


ECM Terminals and Reference Value

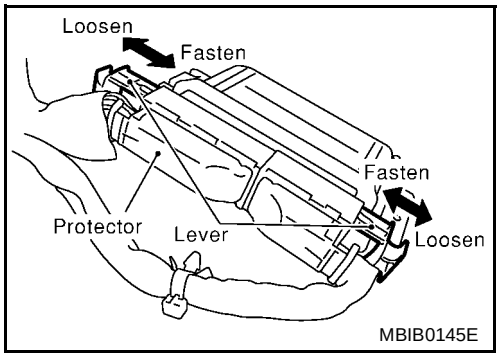
EBS00EUD

PREPARATION

1. ECM is located behind the glove box. For this inspection, remove glove box.
2. Remove ECM harness protector.



3. When disconnecting ECM harness connector, loosen it with levers as far as they will go as shown at right.
4. Connect a break-out box (SST) and Y-cable adapter (SST) between the ECM and ECM harness connector.
   - Use extreme care not to touch 2 pins at one time.
   - Data is for comparison and may not be exact.



ECM INSPECTION TABLE

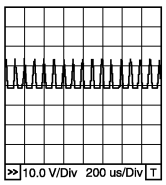
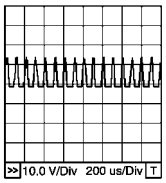
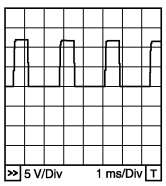
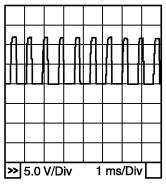
Specification data are reference values and are measured between each terminal and ground.

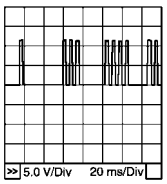
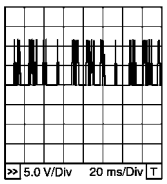
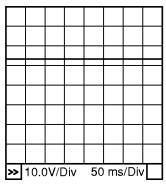
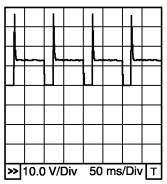
CAUTION:

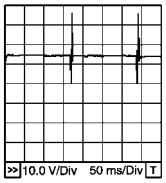
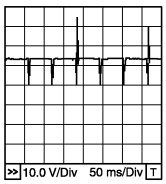
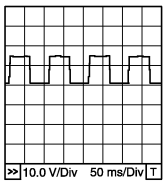
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

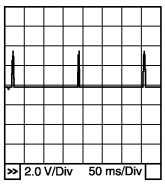
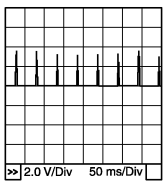
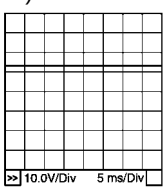
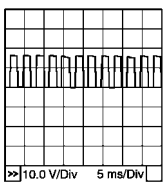
QG16DE Engine Models

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
1	B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
2	R/B	Heated oxygen sensor 2 heater	**[Engine is running]** ● Engine speed is below 3,600 rpm. ● After driving for 2 minutes at a speed of 70 km/h (43 MPH) or more	0 - 1.0V
			[Ignition switch "ON"] ● Engine stopped **[Engine is running]** ● Engine speed is above 3,600 rpm	BATTERY VOLTAGE (11 - 14V)
3	R	Throttle control motor power supply	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)
4	BR	Throttle control motor (Close)	**[Ignition switch "ON"]** ● Shift lever position is "1st" ● Accelerator pedal is releasing	0 - 14V★  PBIB0534E
5	Y	Throttle control motor (Open)	**[Ignition switch "ON"]** ● Shift lever position is "1st" ● Accelerator pedal is depressing	0 - 14V★  PBIB0533E
12	L	Power steering pressure sensor	**[Engine is running]** ● Steering wheel is being turned	0.5 - 4.0V
			[Engine is running] ● Steering wheel is not being turned	0.4 - 0.8V
13	R	Crankshaft position sensor (POS)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 3.0V★  PBIB0527E
			[Engine is running] ● Engine speed is 2,000 rpm	Approximately 3.0V★  PBIB0528E

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
14	R	Camshaft position sensor (PHASE)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.0 - 4.0V★  PBIB0525E
			[Engine is running] ● Engine speed is 2,000 rpm.	1.0 - 4.0V★  PBIB0526E
15	W	Knock sensor	**[Engine is running]** ● Idle speed	Approximately 2.5V
16	W	Heated oxygen sensor 2	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V
19	GY/L	EVAP canister purge volume control solenoid valve	**[Engine is running]** ● Idle speed	BATTERY VOLTAGE (11 - 14V)★  PBIB0050E
			[Engine is running] ● Engine speed is about 2,000 rpm (More than 100 seconds after starting engine)	Approximately 10V★  PBIB0520E

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
22 23 41 42	G/B R/B L/B Y/B	Injector No. 3 Injector No. 1 Injector No. 4 Injector No. 2	**[Engine is running]** ● **Warm-up condition** ● Idle speed	BATTERY VOLTAGE (11 - 14V)★  PBIB0529E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	BATTERY VOLTAGE (11 - 14V)★  PBIB0530E
24	G	Heated oxygen sensor 1 heater	**[Engine is running]** ● **Warm-up condition** ● Engine speed is below 3,600 rpm.	Approximately 7.0V★  PBIB0519E
			[Ignition switch “ON”] ● Engine stopped. **[Engine is running]** ● Engine speed is above 3,600 rpm.	BATTERY VOLTAGE (11 - 14V)
29	B	Camshaft position sensor (PHASE) ground	**[Engine is running]** ● Idle speed	Approximately 0V
30	B	Camshaft position sensor (POS) ground	**[Engine is running]** ● Idle speed	Approximately 0V
34	BR	Intake air temperature sensor	**[Engine is running]**	Approximately 0 - 4.8V Output voltage varies with intake air temperature.
35	W	Heated oxygen sensor 1	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm	0 - Approximately 1.0V (Periodically change)
45	R	Sensor power supply (Mass air flow sensor)	**[Ignition switch “ON”]**	Approximately 5V
46	R	Sensor power supply (Refrigerant pressure sensor)	**[Ignition switch “ON”]**	Approximately 5V
47	G	Sensor power supply (Throttle position sensor)	**[Ignition switch “ON”]**	Approximately 5V

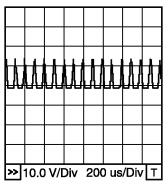
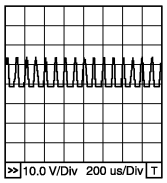
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
49	W	Throttle position sensor 1	**[Ignition switch "ON"]** ● Shift lever position is "1st" ● Accelerator pedal fully released	More than 0.36V
			[Ignition switch "ON"] ● Shift lever position is "1st" ● Accelerator pedal fully depressed	Less than 4.75V
50	Y	Mass air flow sensor	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.0 - 1.7V
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,500 rpm.	1.5 - 2.1V
54	-	Sensor ground (Knock sensor shield circuit)	**[Engine is running]** ● Idle speed	Approximately 0V
57	B	Sensor ground (Power steering pressure sensor/Refrigerant pressure sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
60 61 79 80	L/R BR GY/R PU	Ignition signal No. 3 Ignition signal No. 1 Ignition signal No. 4 Ignition signal No. 2	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0 - 0.1V★  PBIB0521E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - 0.2V★  PBIB0522E
62	Y/R	Intake valve timing control solenoid valve	**[Engine is running]** ● **Warm-up condition** ● Idle speed	BATTERY VOLTAGE (11 - 14V)★  MBIB0052E
			[Engine is running] ● **Warm-up condition** ● Engine speed 2,500 rpm	7 - 10V★  PBIB0532E

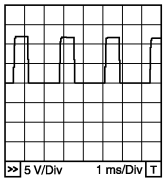
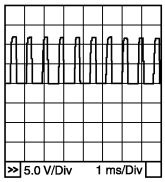
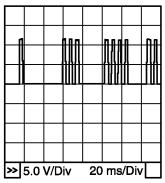
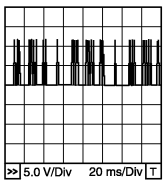
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
65	G	Sensor power supply (Power steering pressure sensor)	**[Ignition switch “ON”]**	Approximately 5V
66	B	Sensor ground (Throttle position sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
67	B	Sensor ground (Mass air flow sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
68	R	Throttle position sensor 2	**[Ignition switch “ON”]** ● Shift lever position is “1st” ● Accelerator pedal fully released	Less than 4.75V
			[Ignition switch “ON”] ● Shift lever position is “1st” ● Accelerator pedal fully depressed	More than 0.36V
69	R/L	Refrigerant pressure sensor	**[Engine is running]** ● **Warm-up condition** ● Both A/C switch and blower switch are “ON” (Compressor operates.)	1.0 - 4.0V
72	BR/W	Engine coolant temperature sensor	**[Engine is running]**	Approximately 0 - 4.8V Output voltage varies with engine coolant temperature.
73	B	Sensor ground (Engine coolant temperature sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
74	B	Sensor ground (Heated oxygen sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
82	B	Sensor ground (Accelerator pedal position sensor 1)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
83	B	Sensor ground (Accelerator pedal position sensor 2)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
85	LG	DATA link connector	**[Ignition switch “ON”]** ● CONSULT-II or GST is disconnected.	BATTERY VOLTAGE (11 - 14V)
86	R	CAN communication line	**[Ignition switch “ON”]**	Approximately 2.3V
90	R	Sensor power supply (Accelerator pedal position sensor 1)	**[Ignition switch “ON”]**	Approximately 5V
91	G	Sensor power supply (Accelerator pedal position sensor 2)	**[Ignition switch “ON”]**	Approximately 5V
94	L	CAN communication line	**[Ignition switch “ON”]**	Approximately 2.8V

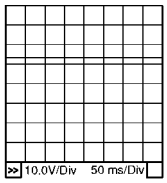
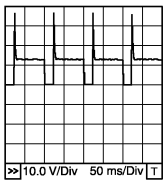
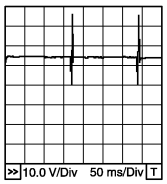
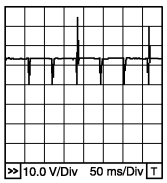
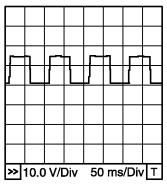
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
98	LG	Accelerator pedal position sensor 2	**[Ignition switch "ON"]** ● Shift lever position is "1st" ● Accelerator pedal fully released	0.175 - 0.335V
			[Ignition switch "ON"] ● Shift lever position is "1st" ● Accelerator pedal fully depressed	More than 1.95V
101	R/G	Stop lamp switch	**[Ignition switch "ON"]** ● Brake pedal fully released	Approximately 0V
			[Ignition switch "ON"] ● Brake pedal fully depressed	BATTERY VOLTAGE (11 - 14V)
102	G/OR	PNP switch	**[Ignition switch "ON"]** ● Gear position is neutral	Approximately 0V
			[Ignition switch "ON"] ● Except the above gear position	Approximately 5V
104	OR	Throttle control motor relay	**[Ignition switch "OFF"]**	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"]	0 - 1.0V
106	L	Accelerator pedal position sensor 1	**[Ignition switch "ON"]** ● Shift lever position is "1st" ● Accelerator pedal fully released	0.35 - 0.67V
			[Ignition switch "ON"] ● Shift lever position is "1st" ● Accelerator pedal fully depressed	More than 3.9V
109	B/R	Ignition switch	**[Ignition switch "OFF"]**	0V
			[Ignition switch "ON"]	BATTERY VOLTAGE (11 - 14V)
111	W/G	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch "OFF"]** ● For 5 seconds after turning ignition switch "OFF"	0 - 1.0V
			[Ignition switch "OFF"] ● 5 seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
113	B/P	Fuel pump relay	**[Ignition switch "ON"]** ● For 1 second after turning ignition switch "ON" **[Engine is running]**	0 - 1.0V
			[Ignition switch "ON"] ● More than 1 second after turning ignition switch "ON".	BATTERY VOLTAGE (11 - 14V)
115 116	B B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
119 120	W W	Power supply for ECM	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)
121	W/L	Power supply for ECM (Buck-up)	**[Ignition switch "OFF"]**	BATTERY VOLTAGE (11 - 14V)

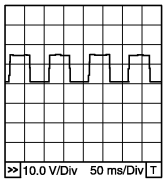
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

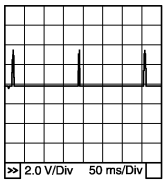
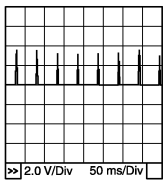
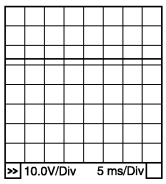
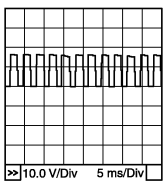
QG18DE Engine Models

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
1	B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
2	L	Heated oxygen sensor 2 heater (bank 1)	**[Engine is running]** ● Engine speed is below 3,600 rpm. ● After driving for 2 minutes at a speed of 70 km/h (43 MPH) or more	0 - 1.0V
			[Ignition switch "ON"] ● Engine stopped **[Engine is running]** ● Engine speed is above 3,600 rpm	BATTERY VOLTAGE (11 - 14V)
3	R	Throttle control motor power supply	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)
4	BR	Throttle control motor (Close)	**[Ignition switch "ON"]** ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal is releasing	0 - 14V★  PBIB0534E
5	Y	Throttle control motor (Open)	**[Ignition switch "ON"]** ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal is depressing	0 - 14V★  PBIB0533E
7	W/R	Heated oxygen sensor 2 heater (bank 2)	**[Engine is running]** ● Engine speed is below 3,600 rpm ● After driving for 2 minutes at a speed of 70 km/h (43 MPH) or more	0 - 1.0V
			[Ignition switch "ON"] ● Engine stopped **[Engine is running]** ● Engine speed is above 3,600 rpm	BATTERY VOLTAGE (11 - 14)
12	L	Power steering pressure sensor	**[Engine is running]** ● Steering wheel is being turned	Approximately 3.6V
			[Engine is running] ● Steering wheel is not being turned	Approximately 0.6V

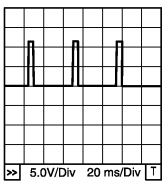
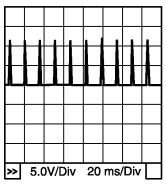
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
13	R	Crankshaft position sensor (POS)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 3.0V★  PBIB0527E
			[Engine is running] ● Engine speed is 2,000 rpm	Approximately 3.0V★  PBIB0528E
14	R	Camshaft position sensor (PHASE)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.0 - 4.0V★  PBIB0525E
			[Engine is running] ● Engine speed is 2,000 rpm.	1.0 - 4.0V★  PBIB0526E
15	W	Knock sensor	**[Engine is running]** ● Idle speed	Approximately 2.5V
16	Y	Heated oxygen sensor 2 (bank 1)	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V
17	L	Heated oxygen sensor 2 (bank 2)	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
19	GY/L	EVAP canister purge volume control solenoid valve	**[Engine is running]** ● Idle speed	BATTERY VOLTAGE (11 - 14V)★  PBIB0050E
			[Engine is running] ● Engine speed is about 2,000 rpm (More than 100 seconds after starting engine)	Approximately 10V★  PBIB0520E
22 23 41 42	G/B R/B L/B Y/B	Injector No. 3 Injector No. 1 Injector No. 4 Injector No. 2	**[Engine is running]** ● **Warm-up condition** ● Idle speed	BATTERY VOLTAGE (11 - 14V)★  PBIB0529E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	BATTERY VOLTAGE (11 - 14V)★  PBIB0530E
24	G	Heated oxygen sensor 1 heater (bank 1)	**[Engine is running]** ● **Warm-up condition** ● Engine speed is below 3,600 rpm (M/T model) ● Engine speed is below 3,200 rpm (A/T model)	Approximately 7.0V★  PBIB0519E
			[Ignition switch “ON”] ● Engine stopped **[Engine is running]** ● Engine speed is above 3,200 rpm (M/T model) ● Engine speed is above 3,200 rpm (A/T model)	BATTERY VOLTAGE (11 - 14V)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
25	R/B	Heated oxygen sensor 1 heater (bank 2)	**[Engine is running]** ● **Warm-up condition** ● Engine speed is below 3,600 rpm (M/T model) ● Engine speed is below 3,200 rpm (A/T model)	Approximately 7.0V★  PBIB0519E
			[Ignition switch "ON"] ● Engine stopped **[Engine is running]** ● Engine speed is above 3,600 rpm (M/T model) ● Engine speed is above 3,200 rpm (A/T model)	BATTERY VOLTAGE (11 - 14V)
29	B	Camshaft position sensor (PHASE) ground	**[Engine is running]** ● Idle speed	Approximately 0V
30	B	Camshaft position sensor (POS) ground	**[Engine is running]** ● Idle speed	Approximately 0V
34	BR	Intake air temperature sensor	**[Engine is running]**	Approximately 0 - 4.8V Output voltage varies with intake air temperature.
35	W	Heated oxygen sensor 1 (bank 1)	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V (Periodically change)
36	W	Heated oxygen sensor 1 (bank 2)	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V (Periodically change)
45	R	Sensor power supply (Mass air flow sensor)	**[Ignition switch "ON"]**	Approximately 5V
46	R	Sensor power supply (Refrigerant pressure sensor)	**[Ignition switch "ON"]**	Approximately 5V
47	G	Sensor power supply (Throttle position sensor)	**[Ignition switch "ON"]**	Approximately 5V
49	W	Throttle position sensor 1	**[Ignition switch "ON"]** ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully released	More than 0.36V
			[Ignition switch "ON"] ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully depressed	Less than 4.75V
50	Y	Mass air flow sensor	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.0 - 1.7V
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,500 rpm	1.5 - 2.1V

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
54	-	Sensor ground (Knock sensor shield circuit)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
57	B	Sensor ground (Power steering pressure sensor/Refrigerant pressure sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
60 61 79 80	L/R BR GY/R PU	Ignition signal No. 3 Ignition signal No. 1 Ignition signal No. 4 Ignition signal No. 2	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0 - 0.1V★  PBIB0521E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	0 - 0.2V★  PBIB0522E
62	Y/R	Intake valve timing control solenoid valve	**[Engine is running]** ● **Warm-up condition** ● Idle speed	BATTERY VOLTAGE (11 - 14V)★  MBIB0052E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,500 rpm	7 - 10V★  PBIB0532E
65	G	Sensor power supply (Power steering pressure sensor)	**[Ignition switch "ON"]**	Approximately 5V
66	B	Sensor ground (Throttle position sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
67	B	Sensor ground (Mass air flow sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
68	R	Throttle position sensor 2	**[Ignition switch "ON"]** ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully released	Less than 4.75V
			[Ignition switch "ON"] ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully depressed	More than 0.36V
69	R/L	Refrigerant pressure sensor	**[Engine is running]** ● **Warm-up condition** ● Both A/C switch and blower switch are "ON" (Compressor operates.)	1.0 - 4.0V
72	BR/W	Engine coolant temperature sensor	**[Engine is running]**	Approximately 0 - 4.8V Output voltage varies with engine coolant temperature.
73	B	Sensor ground (Engine coolant temperature sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
74	B	Sensor ground (Heated oxygen sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
82	B	Sensor ground (Accelerator pedal position sensor 1)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
83	B	Sensor ground (Accelerator pedal position sensor 2)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
85	LG	DATA link connector	**[Ignition switch "ON"]** ● CONSULT-II or GST is disconnected.	BATTERY VOLTAGE (11 - 14V)
86	R	CAN communication line	**[Ignition switch "ON"]**	Approximately 2.3V
90	R	Sensor power supply (Accelerator pedal position sensor 1)	**[Ignition switch "ON"]**	Approximately 5V
91	G	Sensor power supply (Accelerator pedal position sensor 2)	**[Ignition switch "ON"]**	Approximately 5V
92		Accelerator pedal position sensor signal output	**[Ignition switch "ON"]** ● Shift lever position is "D" (A/T models) ● Shift lever position is "1st" (M/T models) ● Accelerator pedal fully released	0.35 - 0.67V
			[Ignition switch "ON"] ● Shift lever position is "D" (A/T models) ● Shift lever position is "1st" (M/T models) ● Accelerator pedal fully depressed	More than 3.9V
94	L	CAN communication line	**[Ignition switch "ON"]**	Approximately 2.8V

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
98	LG	Accelerator pedal position sensor 2	**[Ignition switch "ON"]** ● Shift lever position is "D" (A/T models) ● Shift lever position is "1st" (M/T models) ● Accelerator pedal fully released	0.175 - 0.335V
			[Ignition switch "ON"] ● Shift lever position is "D" (A/T models) ● Shift lever position is "1st" (M/T models) ● Accelerator pedal fully depressed	More than 1.95V
101	R/G	Stop lamp switch	**[Ignition switch "ON"]** ● Brake pedal fully released	Approximately 0V
			[Ignition switch "ON"] ● Brake pedal fully depressed	BATTERY VOLTAGE (11 - 14V)
102	P (A/T) G/OR (M/T)	PNP switch	**[Ignition switch "ON"]** ● Gear position is "P" or "N"	Approximately 0V
			[Ignition switch "ON"] ● Except the above gear position	**A/T models** BATTERY VOLTAGE (11 - 14V) **M/T models** Approximately 5V
103		Tachometer signal output	**[Engine is running]** ● **Warm-up condition** ● Idle speed	10 - 11V★  MBIB0053E
			[Engine is running] ● Engine speed is 2,000 rpm	10 - 11V★  MBIB0054E
104	OR	Throttle control motor relay	**[Ignition switch "OFF"]**	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"]	0 - 1.0V
106	L	Accelerator pedal position sensor 1	**[Ignition switch "ON"]** ● Shift lever position is "D" (A/T models) ● Shift lever position is "1st" (M/T models) ● Accelerator pedal fully released	More than 0.36V
			[Ignition switch "ON"] ● Shift lever position is "D" (A/T models) ● Shift lever position is "1st" (M/T models) ● Accelerator pedal fully depressed	Less than 4.75V
109	B/R	Ignition switch	**[Ignition switch "OFF"]**	0V
			[Ignition switch "ON"]	BATTERY VOLTAGE (11 - 14V)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
111	W/G	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch "OFF"]** ● For 5 seconds after turning ignition switch "OFF"	0 - 1.0V
			[Ignition switch "OFF"] ● 5 seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
113	B/P	Fuel pump relay	**[Ignition switch "ON"]** ● For 1 second after turning ignition switch "ON" **[Engine is running]**	0 - 1.0V
			[Ignition switch "ON"] ● More than 1 second after turning ignition switch "ON".	BATTERY VOLTAGE (11 - 14V)
115 116	B B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
119 120	W W	Power supply for ECM	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)
121	W/L	Power supply for ECM (Buck-up)	**[Ignition switch "OFF"]**	BATTERY VOLTAGE (11 - 14V)

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

CONSULT-II Function

EBS00EUE

FUNCTION

Diagnostic test mode	Function
Work support	This mode enables a technician to adjust some devices faster and more accurately by following the indications on the CONSULT-II unit.
Self-diagnostic results	Self-diagnostic results such as 1st trip DTC, DTCs and 1st trip freeze frame data or freeze frame data can be read and erased quickly.*1
Data monitor	Input/Output data in the ECM can be read.
Data monitor (SPEC)	Input/Output of the specification for Basic fuel schedule, AFM, A/F feedback control value and the other data monitor items can be read.
Active test	Diagnostic Test Mode in which CONSULT-II drives some actuators apart from the ECMs and also shifts some parameters in a specified range.
Function test	This mode is used to inform customers when their vehicle condition requires periodic maintenance.
ECM part number	ECM part number can be read.

*1: The following emission-related diagnostic information is cleared when the ECM memory is erased.

1. Diagnostic trouble codes
2. 1st trip diagnostic trouble codes
3. Freeze frame data
4. 1st trip freeze frame data
5. Others

ENGINE CONTROL COMPONENT PARTS/CONTROL SYSTEMS APPLICATION

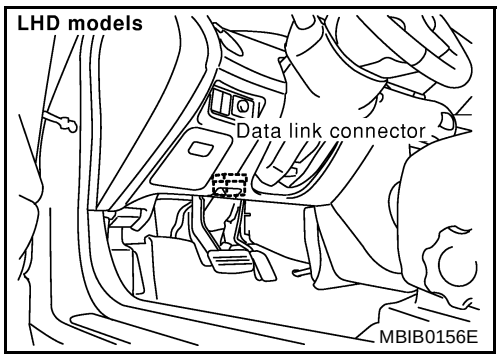
		Item	DIAGNOSTIC TEST MODE					
			WORK SUPPORT	SELF-DIAGNOSTIC RESULTS		DATA MONITOR	DATA MONITOR (SPEC)	ACTIVE TEST
				DTC*1	FREEZE FRAME DATA*2			
ENGINE CONTROL COMPONENT PARTS	INPUT	Crankshaft position sensor (POS)		×	×	×	×	
		Camshaft position sensor (PHASE)		×		×	×	
		Mass air flow sensor		×		×	×	
		Engine coolant temperature sensor		×	×	×	×	×
		Heated oxygen sensor 1		×		×	×	
		Heated oxygen sensor 2		×		×	×	
		Vehicle speed signal			×	×	×	
		Accelerator pedal position sensor		×		×	×	
		Throttle position sensor		×		×	×	
		Intake air temperature sensor				×	×	
		Knock sensor		×				
		Refrigerant pressure sensor				×	×	
		Closed throttle position switch (accelerator pedal position sensor signal)				×	×	
		Air conditioner switch				×	×	
		Park/neutral position (PNP) switch				×	×	
		Stop lamp switch		×		×	×	
		Power steering pressure sensor				×	×	
		Battery voltage				×	×	
		Electrical load signal				×	×	
ENGINE CONTROL COMPONENT PARTS	OUTPUT	Injectors				×	×	×
		Power transistor (Ignition timing)				×	×	×
		Throttle control motor relay		×		×	×	
		Throttle control motor		×				
		EVAP canister purge volume control solenoid valve				×	×	×
		Air conditioner relay				×	×	
		Fuel pump relay	×			×	×	×
		Cooling fan relay		×		×	×	×
		Heated oxygen sensor 1 heater				×	×	
		Heated oxygen sensor 2 heater				×	×	
		Intake valve timing control solenoid valve				×	×	×
		Calculated load value			×	×	×	

X: Applicable
*1: This item includes 1st trip DTCs.
*2: This mode includes 1st trip freeze frame data or freeze frame data. The items appear on CONSULT-II screen in freeze frame data mode only if a 1st trip DTC or DTC is detected. For details, refer to EC-639 .

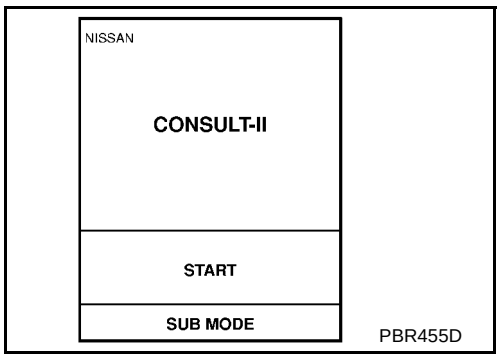
CONSULT-II INSPECTION PROCEDURE

1. Turn ignition switch OFF.

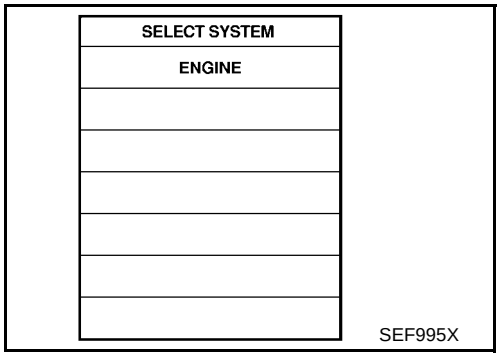
2. Connect “CONSULT-II” to data link connector, which is located under the driver’s side dash panel.
3. Turn ignition switch ON.



4. Touch “START”.

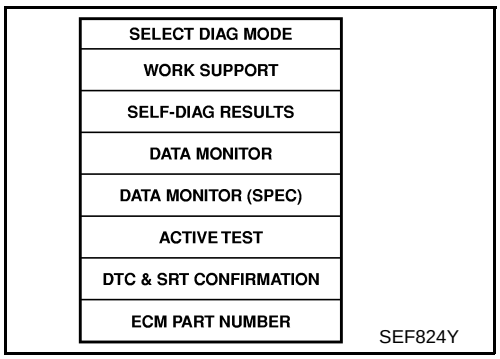


5. Touch “ENGINE”.



6. Perform each diagnostic test mode according to each service procedure.

For further information, see the CONSULT-II Operation Manual.



WORK SUPPORT MODE

Work Item

WORK ITEM	CONDITION	USAGE
FUEL PRESSURE RELEASE	● FUEL PUMP WILL STOP BY TOUCHING “START” DURING IDLING. CRANK A FEW TIMES AFTER ENGINE STALLS.	When releasing fuel pressure from fuel line
IDLE AIR VOL LEARN	● THE IDLE AIR VOLUME THAT KEEPS THE ENGINE WITHIN THE SPECIFIED RANGE IS MEMORIZED IN ECM.	When learning the idle air volume

WORK ITEM	CONDITION	USAGE
SELF-LEARNING CONT	● THE COEFFICIENT OF SELF-LEARNING CONTROL MIXTURE RATIO RETURNS TO THE ORIGINAL COEFFICIENT.	When clearing the coefficient of self-learning control value
TARGET IDLE RPM ADJ*	● IDLE CONDITION	When setting target idle speed
TARGET IGN TIM ADJ*	● IDLE CONDITION	When adjusting target ignition timing After adjustment, confirm target ignition timing with a timing light.

*: This function is not necessary in the usual service procedure.

SELF-DIAG RESULTS MODE

Self Diagnostic Item

Regarding items of “DTC and 1st trip DTC”, refer to EC-561, "INDEX FOR DTC" .)

Freeze Frame Data and 1st Trip Freeze Frame Data

Freeze frame data item*1	Description
DIAG TROUBLE CODE [PXXXX]	● The engine control component part/control system has a trouble code, it is displayed as “PXXXX”. (Refer to EC-561, "INDEX FOR DTC" .)
FUEL SYS-B1	● “Fuel injection system status” at the moment a malfunction is detected is displayed. ● One mode in the following is displayed. “MODE 2”: Open loop due to detected system malfunction “MODE 3”: Open loop due to driving conditions (power enrichment, deceleration enrichment) “MODE 4”: Closed loop - using oxygen sensor(s) as feedback for fuel control “MODE 5”: Open loop - has not yet satisfied condition to go to closed loop
CAL/LD VALUE [%]	● The calculated load value at the moment a malfunction is detected is displayed.
COOLANT TEMP [°C] or [°F]	● The engine coolant temperature at the moment a malfunction is detected is displayed.
L-FUEL TRIM-B1 [%]	● “Long-term fuel trim” at the moment a malfunction is detected is displayed. ● The long-term fuel trim indicates much more gradual feedback compensation to the base fuel schedule than short-term fuel trim.
S-FUEL TRIM-B1 [%]	● “Short-term fuel trim” at the moment a malfunction is detected is displayed. ● The short-term fuel trim indicates dynamic or instantaneous feedback compensation to the base fuel schedule.
ENGINE SPEED [rpm]	● The engine speed at the moment a malfunction is detected is displayed.
VHCL SPEED [km/h] or [mph]	● The vehicle speed at the moment a malfunction is detected is displayed.
B/FUEL SCHDL [msec]	● The base fuel schedule at the moment a malfunction is detected is displayed.
INT/A TEMP SE [°C] or [°F]	● The intake air temperature at the moment a malfunction is detected is displayed.

*1: The items are the same as those of 1st trip freeze frame data.

DATA MONITOR MODE
Monitored Item

×: Applicable

Monitored item [Unit]	ECM INPUT SIG-NALS	MAIN SIG-NALS	CAN DIAG SUP-PORT MNTR	Description	Remarks
ENG SPEED [rpm]	×	×		● Indicates the engine speed computed from the signals of the crankshaft position sensor (POS) and camshaft position sensor (PHASE).	● Accuracy becomes poor if engine speed drops below the idle rpm. ● If the signal is interrupted while the engine is running, an abnormal value may be indicated.
MAS A/F SE-B1 [V]	×	×		● The signal voltage of the mass air flow sensor is displayed.	● When the engine is stopped, a certain value is indicated.
B/FUEL SCHDL [msec]		×		● “Base fuel schedule” indicates the fuel injection pulse width programmed into ECM, prior to any learned on board correction.	
A/F ALPHA-B1 [%]		×		● The mean value of the air-fuel ratio feedback correction factor per cycle is indicated.	● When the engine is stopped, a certain value is indicated. ● This data also includes the data for the air-fuel ratio learning control.
A/F ALPHA-B2 [%]*1		×			
COOLAN TEMP/S [°C] or [°F]	×	×		● The engine coolant temperature (determined by the signal voltage of the engine coolant temperature sensor) is displayed.	● When the engine coolant temperature sensor is open or short-circuited, ECM enters fail-safe mode. The engine coolant temperature determined by the ECM is displayed.
HO2S1 (B1) [V]	×	×		● The signal voltage of the heated oxygen sensor 1 is displayed.	
HO2S1 (B2) [V]*1	×				
HO2S2 (B1) [V]	×	×		● The signal voltage of the heated oxygen sensor 2 is displayed.	
HO2S2 (B2) [V]*1	×				
HO2S1 MNTR (B1) [RICH/LEAN]	×	×		● Display of heated oxygen sensor 1 signal during air-fuel ratio feedback control: RICH ... means the mixture became “rich”, and control is being affected toward a leaner mixture. LEAN ... means the mixture became “lean”, and control is being affected toward a rich mixture.	● After turning ON the ignition switch, “RICH” is displayed until air-fuel mixture ratio feedback control begins. ● When the air-fuel ratio feedback is clamped, the value just before the clamping is displayed continuously.
HO2S1 MNTR (B2) [RICH/LEAN]*1	×				
HO2S2 MNTR (B1) [RICH/LEAN]	×			● Display of heated oxygen sensor 2 signal: RICH ... means the amount of oxygen after three way catalyst is relatively small. LEAN ... means the amount of oxygen after three way catalyst is relatively large.	● When the engine is stopped, a certain value is indicated.
HO2S2 MNTR (B2) [RICH/LEAN]*1	×				
VHCL SPEED SE [km/h] or [mph]	×	×		● The vehicle speed computed from the vehicle speed signal is displayed.	
BATTERY VOLT [V]	×	×		● The power supply voltage of ECM is displayed.	

Monitored item [Unit]	ECM INPUT SIG-NALS	MAIN SIG-NALS	CAN DIAG SUP-PORT MNTR	Description	Remarks
ACCEL SEN 1 [V]	×	×		● The accelerator pedal position sensor signal voltage is displayed.	
ACCEL SEN 2 [V]	×				
THRTL SEN 1 [V]	×	×		● The throttle position sensor signal voltage is displayed.	
THRTL SEN 2 [V]	×				
INT/A TEMP SE [°C] or [°F]	×	×		● The intake air temperature (determined by the signal voltage of the intake air temperature sensor) is indicated.	
START SIGNAL [ON/OFF]	×	×		● Indicates [ON/OFF] condition of the starter signal computed from the signals of the crankshaft position sensor (POS), camshaft position sensor (PHASE) and battery voltage.	● After starting the engine, [OFF] is displayed regardless of the starter signal.
CLSD THL POS [ON/OFF]	×	×		● Indicates idle position [ON/OFF] computed by ECM according to the accelerator pedal position sensor signal.	
AIR COND SIG [ON/OFF]	×	×		● Indicates [ON/OFF] condition of the air conditioner switch as determined by the air conditioner signal.	
P/N POSI SW [ON/OFF]	×	×		● Indicates [ON/OFF] condition from the park/neutral position (PNP) switch signal.	
PW/ST SIGNAL [ON/OFF]	×	×		● [ON/OFF] condition of the power steering oil pressure switch as determined by the power steering oil pressure signal is indicated.	
LOAD SIGNAL [ON/OFF]	×	×		● Indicates [ON/OFF] condition from the electrical load signal. ON ... Rear window defogger switch is ON and/or lighting switch is in 2nd position. OFF ... Both rear window defogger switch and lighting switch are OFF.	
IGNITION SW [ON/OFF]	×			● Indicates [ON/OFF] condition from ignition switch.	
HEATER FAN SW [ON/OFF]	×			● Indicates [ON/OFF] condition from the heater fan switch signal.	
BRAKE SW [ON/OFF]	×			● Indicates [ON/OFF] condition from the stop lamp switch signal.	
INJ PULSE-B1 [msec]		×		● Indicates the actual fuel injection pulse width compensated by ECM according to the input signals.	● When the engine is stopped, a certain computed value is indicated.
INJ PULSE-B2 [msec]*1					
IGN TIMING [BTDC]		×		● Indicates the ignition timing computed by ECM according to the input signals.	● When the engine is stopped, a certain value is indicated.
CAL/LD VALUE [%]				● "Calculated load value" indicates the value of the current airflow divided by peak airflow.	
MASS AIRFLOW [g·m/s]				● Indicates the mass airflow computed by ECM according to the signal voltage of the mass air flow sensor.	

Monitored item [Unit]	ECM INPUT SIG-NALS	MAIN SIG-NALS	CAN DIAG SUP-PORT MNTR	Description	Remarks
PURG VOL C/V [%]				● Indicates the EVAP canister purge volume control solenoid valve control value computed by the ECM according to the input signals. ● The opening becomes larger as the value increases.	
INT/V TIM (B1) [°CA]				● Indicates [°CA] of intake camshaft advanced angle.	
INT/V SOL (B1) [%]				● The control condition of the intake valve timing control solenoid valve (determined by ECM according to the input signals) is indicated. ON ... intake valve timing control is operating. OFF ... Intake valve timing control is not operating.	
AIR COND RLY [ON/OFF]		×		● The air conditioner relay control condition (determined by ECM according to the input signals) is indicated.	
FUEL PUMP RLY [ON/OFF]		×		● Indicates the fuel pump relay control condition determined by ECM according to the input signals.	
THRTL RELAY [ON/OFF]		×*2		● Indicates the throttle control motor relay control condition determined by the ECM according to the input signals.	
COOLING FAN [ON/OFF]				● Indicates the condition of the cooling fan (determined by ECM according to the input signals). ON ... Operation OFF ... Stop	
HO2S1 HTR (B1) [ON/OFF]				● Indicates [ON/OFF] condition of heated oxygen sensor 1 heater determined by ECM according to the input signals.	
HO2S1 HTR (B2) [ON/OFF]*1					
HO2S2 HTR (B1) [ON/OFF]				● Indicates [ON/OFF] condition of heated oxygen sensor 2 heater determined by ECM according to the input signals.	
HO2S2 HTR (B2) [ON/OFF]*1					
VEHICLE SPEED [km/h] or [mph]	×			● The vehicle speed computed from the vehicle speed signal sent from TCM is displayed.	
IDL A/V LEARN [YET/CMPLT/ INCMP]				● Display the condition of idle air volume learning YET ... Idle air volume learning has not been performed yet. CMPLT ... Idle air volume learning has already been performed successfully. INCMP ... Idle air volume learning has not been performed successfully.	
TRVL AFTER MIL [km] or [mile]				● Distance traveled while MI is activated.	

Monitored item [Unit]	ECM INPUT SIG-NALS	MAIN SIG-NALS	CAN DIAG SUP-PORT MNTR	Description	Remarks
O2SEN HTR DTY [%]				● Indicates the heated oxygen sensor 1 heater control value computed by the ECM according to the input signals.	
AC PRESS SEN [V]	×*2			● The signal voltage from the refrigerant pressure sensor is displayed.	
Voltage [V]				● Voltage, frequency, duty cycle or pulse width measured by the probe.	● Only "#" is displayed if item is unable to be measured. ● Figures with "#"s are temporary ones. They are the same figures as an actual piece of data which was just previously measured.
Frequency [msec], [Hz] or [%]					
DUTY-HI					
DUTY-LOW					
PLS WIDTH-HI					
PLS WIDTH-LOW					
CAN COMM [OK/NG]			×	● Indicates the communication condition of CAN communication line.	● These items are not displayed in "SELECTION FROM MENU" mode.
CAN CIRC 1 [OK/UNKWN]			×		
CAN CIRC 2 [OK/UNKWN]			×		
CAN CIRC 3 [OK/UNKWN]			×		
CAN CIRC 4 [OK/UNKWN]			×		
CAN CIRC 5 [OK/UNKWN]			×		
CAN CIRC 6 [OK/UNKWN]			×		
CAN CIRC 7 [OK/UNKWN]			×		

*1: For QG18 engine models.
*2: For QG16 engine models.

NOTE:
- Any monitored item that does not match the vehicle being diagnosed is deleted from the display automatically.

DATA MONITOR (SPEC) MODE

Monitored Item

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
ENG SPEED [rpm]	×	×	● Indicates the engine speed computed from the signal of the crankshaft position sensor (POS).	
MAS A/F SE-B1 [V]	×	×	● The signal voltage of the mass air flow sensor specification is displayed.	● When engine is running specification range is indicated.
B/FUEL SCHDL [msec]		×	● "Base fuel schedule" indicates the fuel injection pulse width programmed into ECM, prior to any learned on board correction.	● When engine is running specification range is indicated.

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
A/F ALPHA-B1 [%]		×	● The mean value of the air-fuel ratio feedback correction factor per cycle is indicated.	● When engine is running specification range is indicated. ● This data also includes the data for the air-fuel ratio learning control.
A/F ALPHA-B2 [%]*1		×		

*1: For QG18 engine models

NOTE:

- Any monitored item that does not match the vehicle being diagnosed is deleted from the display automatically.

ACTIVE TEST MODE

Test Item

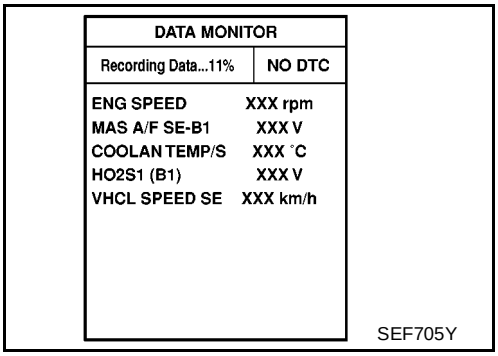
TEST ITEM	CONDITION	JUDGEMENT	CHECK ITEM (REMEDY)
FUEL INJECTION	● Engine: Return to the original trouble condition ● Change the amount of fuel injection using CONSULT-II.	If trouble symptom disappears, see CHECK ITEM.	● Harness and connectors ● Fuel injectors ● Heated oxygen sensor 1
IGNITION TIMING	● Engine: Return to the original trouble condition ● Timing light: Set ● Retard the ignition timing using CONSULT-II.	If trouble symptom disappears, see CHECK ITEM.	● Perform “Idle Air Volume Learning”.
POWER BALANCE	● Engine: After warming up, idle the engine. ● A/C switch “OFF” ● Shift lever “N” ● Cut off each injector signal one at a time using CONSULT-II.	Engine runs rough or dies.	● Harness and connectors ● Compression ● Fuel injectors ● Power transistor ● Spark plugs ● Ignition coils
COOLING FAN	● Ignition switch: ON ● Turn the cooling fan “ON” and “OFF” with CONSULT-II.	Cooling fan moves and stops.	● Harness and connectors ● Cooling fan relay ● Cooling fan motor
ENG COOLANT TEMP	● Engine: Return to the original trouble condition ● Change the engine coolant temperature using CONSULT-II.	If trouble symptom disappears, see CHECK ITEM.	● Harness and connectors ● Engine coolant temperature sensor ● Fuel injectors
FUEL PUMP RELAY	● Ignition switch: ON (Engine stopped) ● Turn the fuel pump relay “ON” and “OFF” using CONSULT-II and listen to operating sound.	Fuel pump relay makes the operating sound.	● Harness and connectors ● Fuel pump relay
PURG VOL CONT/V	● Engine: After warming up, run engine at 1,500 rpm. ● Change the EVAP canister purge volume control solenoid valve opening percent using CONSULT-II.	Engine speed changes according to the opening percent.	● Harness and connectors ● Solenoid valve
V/T ASSIGN ANGLE	● Engine: Return to the original trouble condition ● Change intake valve timing using CONSULT-II.	If trouble symptom disappears, see CHECK ITEM.	● Harness and connectors ● Intake valve timing control solenoid valve

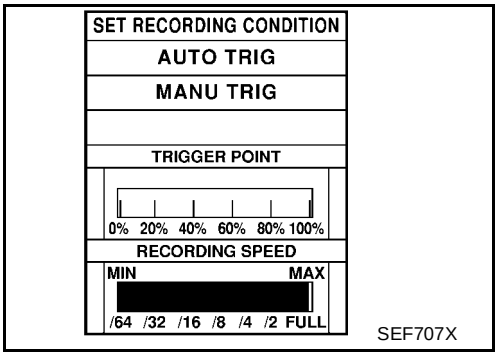
REAL TIME DIAGNOSIS IN DATA MONITOR MODE (RECORDING VEHICLE DATA)

Description

CONSULT-II has two kinds of triggers and they can be selected by touching “SETTING” in “DATA MONITOR” mode.

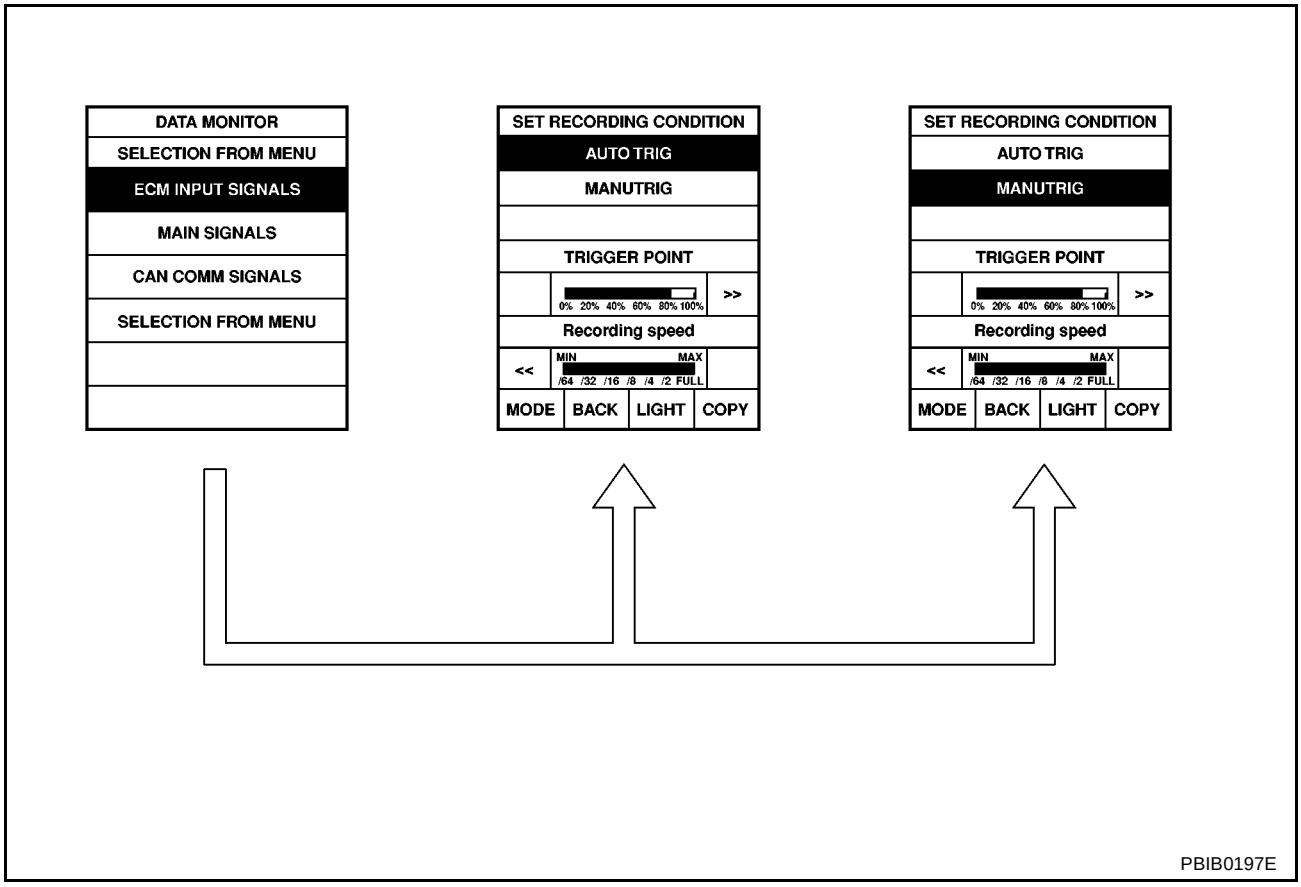
1. “AUTO TRIG” (Automatic trigger):
   - The malfunction will be identified on the CONSULT-II screen in real time.
     In other words, DTC/1st trip DTC and malfunction item will be displayed if the malfunction is detected by ECM.
     At the moment a malfunction is detected by ECM, “MONITOR” in “DATA MONITOR” screen is changed to “Recording Data ... xx%” as shown at right, and the data after the malfunction detection is recorded. Then when the percentage reached 100%, “REAL-TIME DIAG” screen is displayed. If “STOP” is touched on the screen during “Recording Data ... xx%”, “REAL-TIME DIAG” screen is also displayed.
     The recording time after the malfunction detection and the recording speed can be changed by “TRIGGER POINT” and “Recording Speed”. Refer to CONSULT-II OPERATION MANUAL.
2. “MANU TRIG” (Manual trigger):
   - DTC/1st trip DTC and malfunction item will not be displayed automatically on CONSULT-II screen even though a malfunction is detected by ECM.
     DATA MONITOR can be performed continuously even though a malfunction is detected.





Operation

1. “AUTO TRIG”
   - While trying to detect the DTC/1st trip DTC by performing the “DTC Confirmation Procedure”, be sure to select to “DATA MONITOR (AUTO TRIG)” mode. You can confirm the malfunction at the moment it is detected.
   - While narrowing down the possible causes, CONSULT-II should be set in “DATA MONITOR (AUTO TRIG)” mode, especially in case the incident is intermittent.
     When you are inspecting the circuit by gently shaking (or twisting) the suspicious connectors, components and harness in the “DTC Confirmation Procedure”, the moment a malfunction is found the DTC/1st trip DTC will be displayed. (Refer to “Incident Simulation Tests” in GI-24, "How to Perform Efficient Diagnosis for an Electrical Incident" .)
2. “MANU TRIG”
   - If the malfunction is displayed as soon as “DATA MONITOR” is selected, reset CONSULT-II to “MANU TRIG”. By selecting “MANU TRIG” you can monitor and store the data. The data can be utilized for further diagnosis, such as a comparison with the value for the normal operating condition.



CONSULT-II Reference Value in Data Monitor Mode

EBS00EUG

Remarks:
- Specification data are reference values.
- Specification data are output/input values which are detected or supplied by the ECM at the connector.
  * Specification data may not be directly related to their components signals/values/operations.
  i.e. Adjust ignition timing with a timing light before monitoring IGN TIMING, because the monitor may show the specification data in spite of the ignition timing not being adjusted to the specification data. This IGN TIMING monitors the data calculated by the ECM according to the signals input from the camshaft position sensor and other ignition timing related sensors.

MONITOR ITEM	CONDITION		SPECIFICATION
ENG SPEED	● Tachometer: Connect ● Run engine and compare tachometer indication with the CONSULT-II value.		Almost the same speed as the CONSULT-II value.
MAS A/F SE-B1	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: N ● No-load	Idle	Approx. 1.0 - 1.7V
		2,500 rpm	Approx. 1.5 - 2.1V
B/FUEL SCHDL	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	1.5 - 3.0 msec
		2,000 rpm	1.2 - 3.0 msec
A/F ALPHA-B1 A/F ALPHA-B2*	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	75% - 125%
COOLAN TEMP/S	● Engine: After warming up		More than 70°C (158°F)
HO2S1 (B1) HO2S1 (B2)*	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S2 (B1) HO2S2 (B2)*	● Engine: After warming up	Revving engine from idle to 3,000 rpm quickly.	0 - 0.3V ←→ Approx. 0.6 - 1.0V

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S1 MNTR (B1) HO2S1 MNTR (B2)*	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	LEAN ←→ RICH Changes more than 5 times during 10 seconds.
HO2S2 MNTR (B1) HO2S2 MNTR (B2)*	● Engine: After warming up	Revving engine from idle to 3,000 rpm quickly.	LEAN ←→ RICH
VEH SPEED SE	● Turn drive wheels and compare speedometer indication with the CONSULT-II value.		Almost the same speed as the CONSULT-II value
BATTERY VOLT	● Ignition switch: ON (Engine stopped)		11 - 14V
ACCEL SEN1 ACCEL SEN2	● Ignition switch: ON (engine stopped)	Accelerator pedal: Fully released	0.35 - 0.67V
		Accelerator pedal: Fully depressed	More than 3.9V
THRTL SEN1 THRTL SEN2	● Ignition switch: ON (Engine stopped) ● Shift lever: D (A/T model) 1st (M/T model)	Accelerator pedal: Fully released	More than 0.36V
		Accelerator pedal: Fully depressed	Less than 4.75V
START SIGNAL	● Ignition switch: ON → START → ON		OFF → ON → OFF
CLSD THL POS	● Ignition switch: ON	Accelerator pedal: Fully released	ON
		Accelerator pedal: Slightly depressed	OFF
AIR COND SIG	● Engine: After warming up, idle the engine	Air conditioner switch: OFF	OFF
		Air conditioner switch: ON (Compressor operates.)	ON
P/N POSI SW	● Ignition switch: ON	Shift lever: P or N (A/T model) Neutral (M/T model)	ON
		Shift lever: Except above	OFF
PW/ST SIGNAL	● Engine: After warming up, idle the engine	Steering wheel is in neutral position. (Forward direction)	OFF
		Steering wheel is turned.	ON
LOAD SIGNAL	● Ignition switch: ON	Rear window defogger switch is ON and/or lighting switch is in 2nd.	ON
		Rear window defogger switch is OFF and lighting switch is OFF.	OFF
IGNITION SW	● Ignition switch: ON → OFF → ON		ON → OFF → ON
HEATER FAN SW	● Engine: After warming up, idle the engine	Heater fan is operating.	ON
		Heater fan is not operating	OFF
BRAKE SW	● Ignition switch: ON	Brake pedal: Fully released	OFF
		Brake pedal: Slightly depressed	ON
INJ PULSE-B1 INJ PULSE-B2*	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	2.0 - 3.5 msec
		2,000 rpm	1.5 - 3.5 msec
IGN TIMING	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	M/T: 8°±5° BTDC A/T: 10°±5° BTDC
		2,000 rpm	25° - 45° BTDC
CAL/LD VALUE	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	10% - 35%
		2,500 rpm	10% - 35%

MONITOR ITEM	CONDITION		SPECIFICATION
MASS AIRFLOW	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	1.0 - 4.0 g·m/s
		2,500 rpm	5.0 - 10.0 g·m/s
PURG VOL C/V	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	0%
		2,000 rpm	15 - 30%
INT/V TIM (B1)	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	–5° - 5°CA
		2,000 rpm	Approx. 0° - 30°CA
INT/V SOL (B1)	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	0% - 2%
		2,000 rpm	Approx. 0% - 60%
AIR COND RLY	● Engine: After warming up, idle the engine	Air conditioner switch: OFF	OFF
		Air conditioner switch: ON (Compressor operates)	ON
FUEL PUMP RLY	● For 1 seconds after turning ignition switch ON ● Engine running or cranking		ON
	● Except above conditions		OFF
THRTL RELAY	● Ignition switch: ON		ON
COOLING FAN	● Engine: After warming up, idle the engine ● Air conditioner switch: OFF	Engine coolant temperature is 99°C (210°F) or less	OFF
		Engine coolant temperature is 100°C (212°F) or more	ON
HO2S1 HTR (B1) HO2S1 HTR (B2)*	● Engine: After warming up ● Engine speed: Below 3,600 rpm (M/T models) Below 3,200 rpm (A/T models)		ON
	● Engine speed: Above 3,600 rpm (M/T models) Above 3,200 rpm (A/T models)		OFF
HO2S2 HTR (B1) HO2S2 HTR (B2)*	● Engine speed: Below 3,600 rpm [After driving for 2 minutes at a speed of 70 km/h (43 MPH) or more]		ON
	● Engine speed: Above 3,600 rpm		OFF
TRVL AFTER MIL	● Ignition switch: ON	Vehicle has traveled after MI has turned ON.	0 - 65,280 km (0 - 40,565 mile)
O2SEN HTR DTY	● Engine coolant temperature when engine started: More than 80° (176°F) ● Engine speed: Below 3,600 rpm (M/T models) Below 3,200 rpm (A/T models)		Approx. 50%
AC PRESS SEN	● Ignition switch: ON (Engine stopped)		Approx. 0V
	● Engine: Idle ● Air conditioner switch: OFF		1.0 - 4.0V
VEH SPEED SE	● Turn drive wheels and compare speedometer indication with the CONSULT-II value.		Almost the same speed as the CONSULT-II value

MONITOR ITEM	CONDITION	SPECIFICATION
CAN COMM	● Ignition switch: ON	OK
CAN CIRC 1		OK
CAN CIRC 2		OK or UNKWN
CAN CIRC 3		UNKWN
CAN CIRC 4		OK
CAN CIRC 5		UNKWN
CAN CIRC 6		OK
CAN CIRC 7		UNKWN

*: These items are displayed with QG18DE engine models

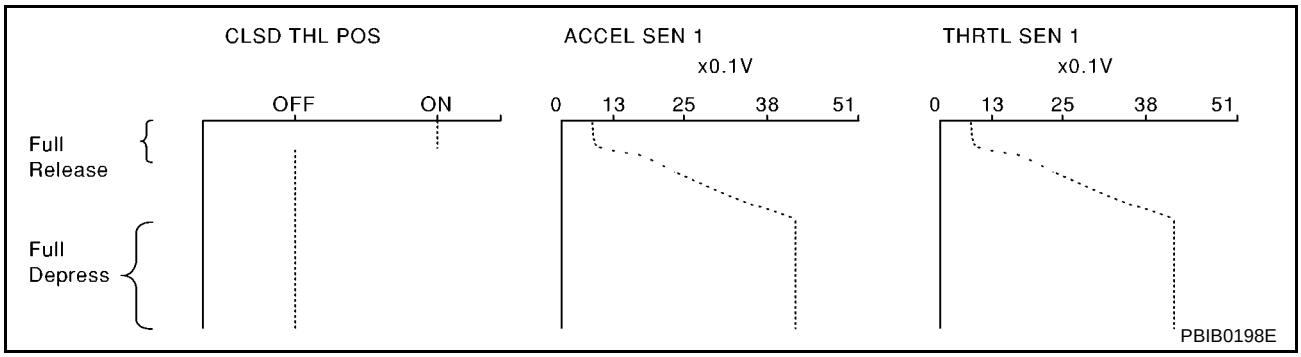
Major Sensor Reference Graph in Data Monitor Mode

EBS00EUH

The following are the major sensor reference graphs in “DATA MONITOR” mode.

CLSD THL POS, ACCEL SEN 1, THRTL SEN 1

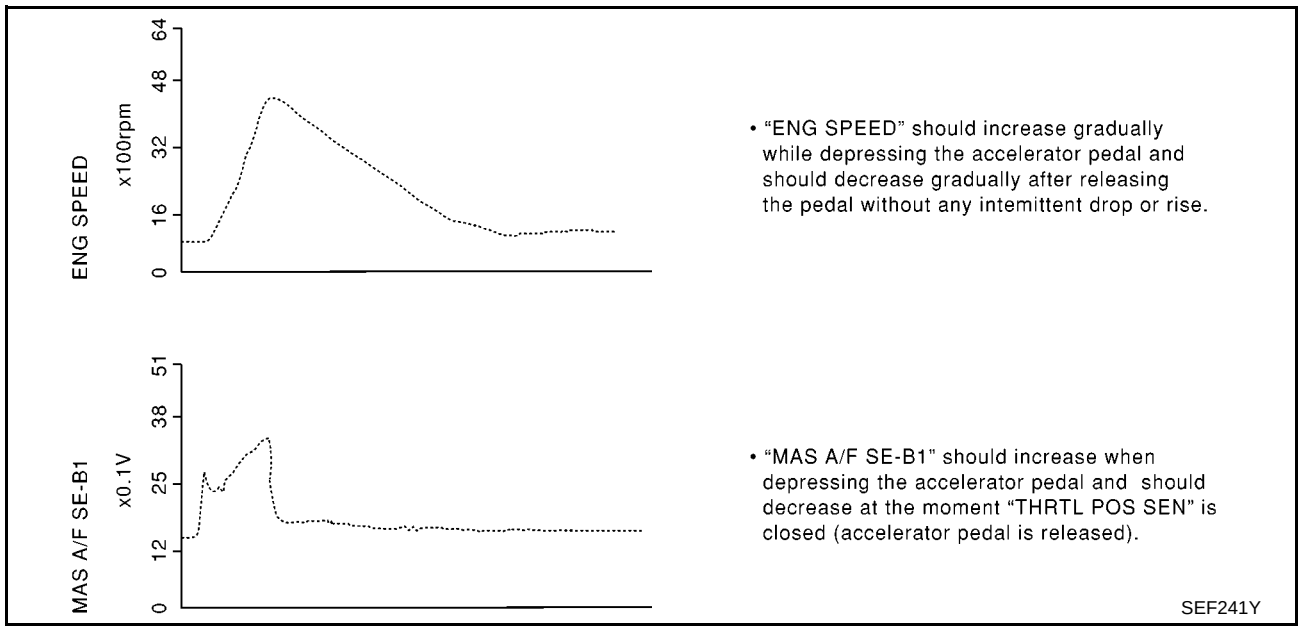
Below is the data for “CLSD THL POS”, “ACCEL SEN 1” and “THRTL SEN 1” when depressing the accelerator pedal with the ignition switch “ON” and with selector lever in “D” position (A/T models) or with shift lever in “1st” position (M/T models).
The signal of “ACCEL SEN 1” and “THRTL SEN 1” should rise gradually without any intermittent drop or rise after “CLSD THL POS” is changed from “ON” to “OFF”.

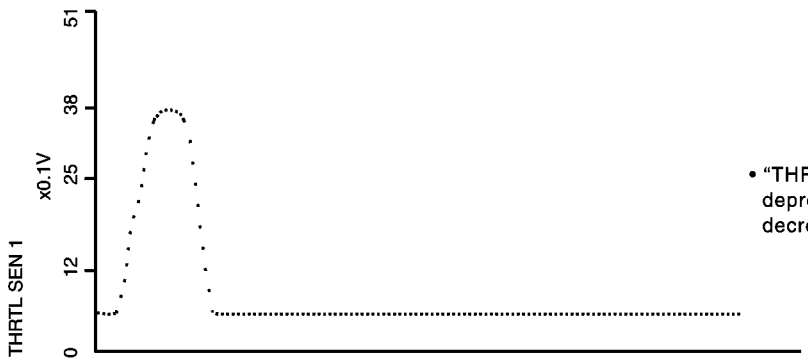


ENG SPEED, MAS A/F SE-B1, THRTL SEN 1, HO2S2 (B1), HO2S1 (B1), INJ PULSE-B1

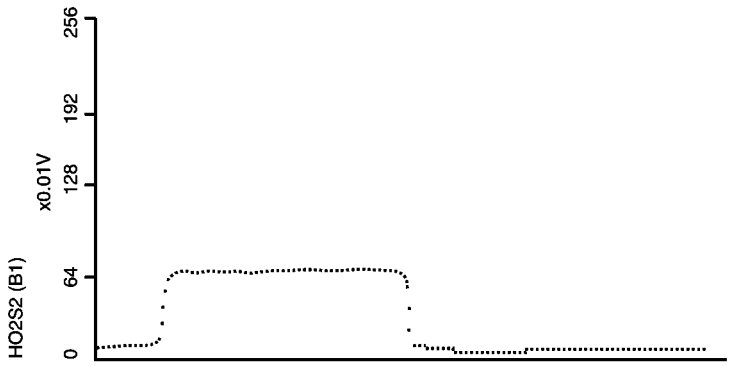
Below is the data for “ENG SPEED”, “MAS A/F SE-B1”, “THRTL SEN 1”, “HO2S2 (B1)”, “HO2S1 (B1)” and “INJ PULSE-B1” when revving engine quickly up to 4,800 rpm under no load after warming up engine sufficiently.

Each value is for reference, the exact value may vary.

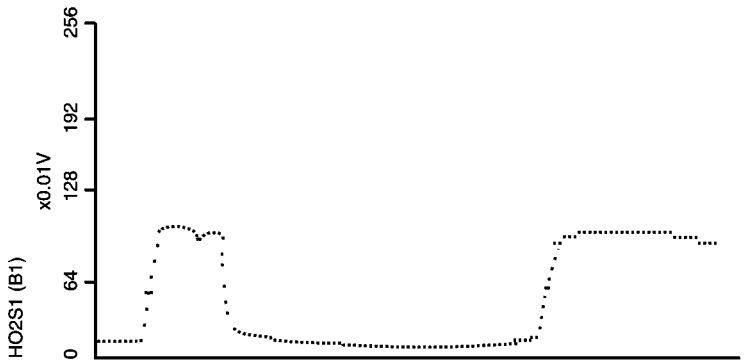




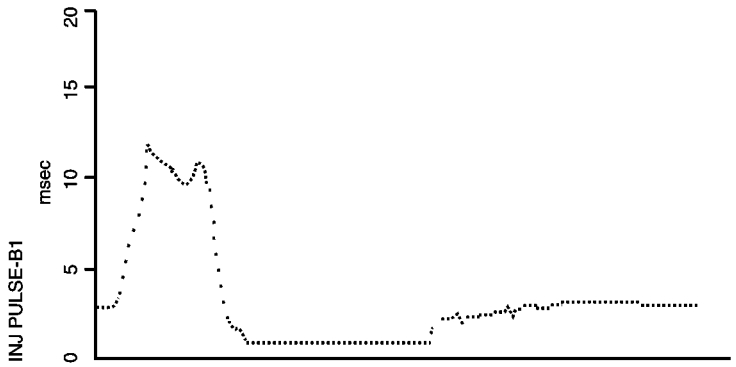
• "THRTL SEN 1" should increase while depressing the accelerator pedal and should decrease while releasing it.



• "HO2S2 (B1)" may increase immediately after depressing the accelerator pedal and may decrease after releasing the pedal.



• "HO2S1 (B1)" may increase immediately after depressing the accelerator pedal and may decrease after releasing the pedal.



• "INJ PULSE-B1" should increase when depressing the accelerator pedal and should decrease when the pedal is released.

PBIB0668E

TROUBLE DIAGNOSIS - SPECIFICATION VALUE

PFP:00031

Description

EBS00EUI

The specification (SP) value indicates the tolerance of the value that is displayed in “DATA MONITOR (SPEC)” mode of CONSULT-II during normal operation of the Engine Control System. When the value in “DATA MONITOR (SPEC)” mode is within the SP value, the Engine Control System is confirmed OK. When the value in “DATA MONITOR (SPEC)” mode is NOT within the SP value, the Engine Control System may have one or more malfunctions.
The SP value is used to detect malfunctions that may affect the Engine Control System, but will not light the MI.
The SP value will be displayed for the following three items:

- B/FUEL SCHDL (The fuel injection pulse width programmed into ECM prior to any learned on board correction)
- A/F ALPHA-B1/B2 (The mean value of air-fuel ratio feedback correction factor per cycle)
- MAS A/F SE-B1 (The signal voltage of the mass air flow sensor)

Testing Condition

EBS00EUJ

- Vehicle driven distance: More than 5,000 km (3,017 miles)
- Barometric pressure: 98.3 - 104.3 kPa (1.003 - 1.064 kg/cm^2 , 14.25 - 15.12 psi)
- Atmospheric temperature: 20 - 30°C (68 - 86°F)
- Engine coolant temperature: 75 - 95°C (167 - 203°F)
- Transmission: Warmed-up*1
- Electrical load: Not applied*2
- Engine speed: Idle

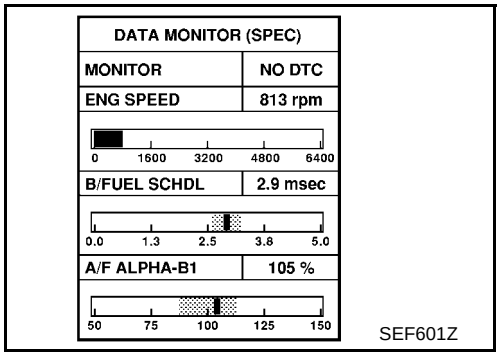
*1: For A/T models with CONSULT-II, after the engine is warmed up to normal operating temperature, drive vehicle until “FLUID TEMP SE” (A/T fluid temperature sensor signal) indicates more than 60°C (140°F).
For A/T models without CONSUT-II and M/T models, after the engine is warmed up to normal operating temperature, drive vehicle for 5 minutes.
*2: Rear window defogger switch, air conditioner switch, lighting switch are “OFF”. Steering wheel is straight ahead.

Inspection Procedure

EBS00EUK

NOTE:
Perform “DATA MONITOR (SPEC)” mode in maximum scale display.

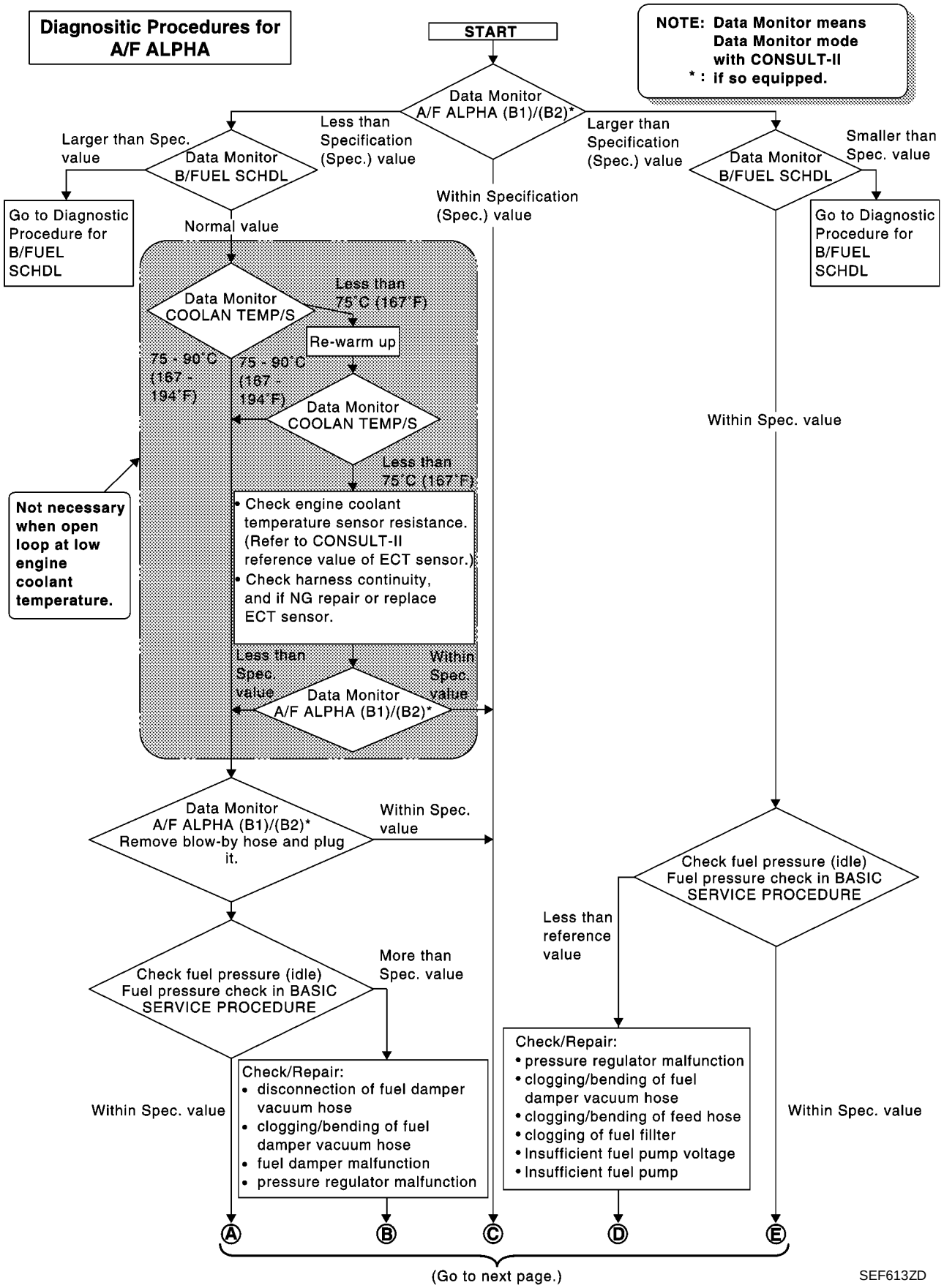
1. Perform EC-607, "Basic Inspection" .
2. Confirm that the testing conditions indicated above are met.
3. Select “B/FUEL SCHDL”, “A/F ALPHA-B1/B2” and “MAS A/F SE-B1” in “DATA MONITOR (SPEC)” mode with CONSULT-II.
4. Make sure that monitor items are within the SP value.
5. If NG, go to EC-653, "Diagnostic Procedure" .

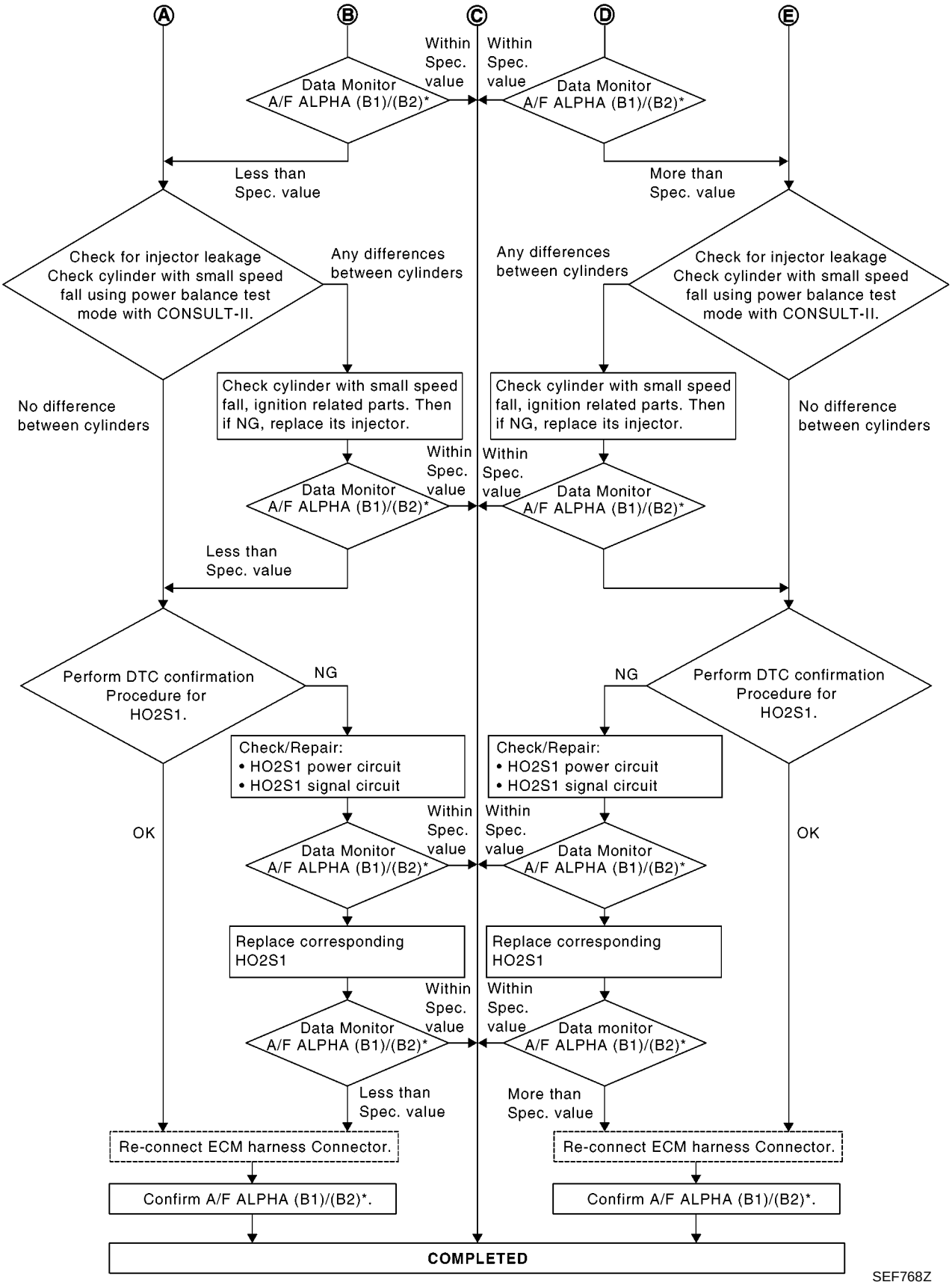


SEF601Z

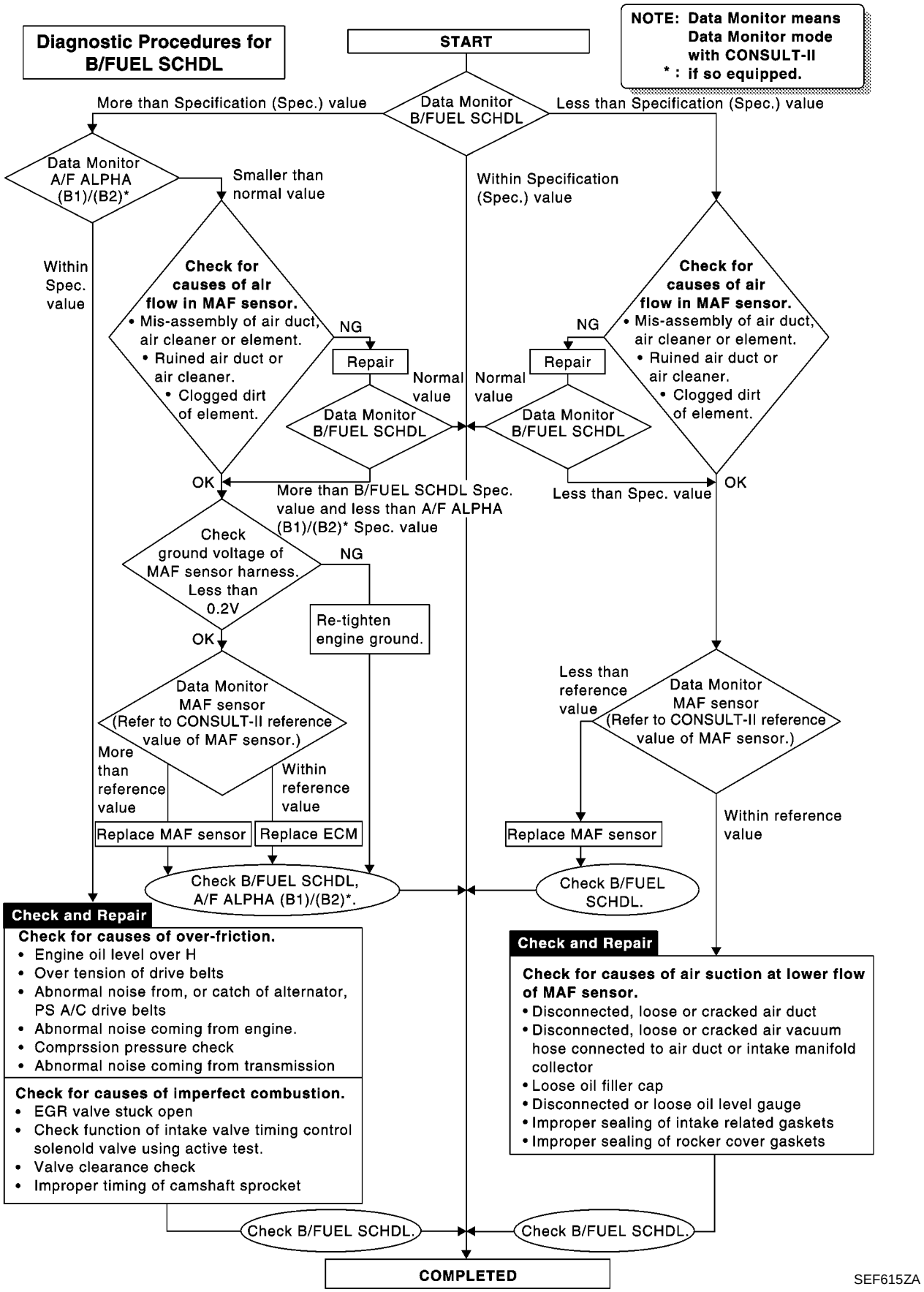
Diagnostic Procedure

EBS00EUL




Ⓐ
Ⓑ
Ⓒ
Ⓓ
Ⓔ
Within Spec. value
Within Spec. value
Data Monitor A/F ALPHA (B1)/(B2)*
Data Monitor A/F ALPHA (B1)/(B2)*
Less than Spec. value
More than Spec. value
Check for injector leakage Check cylinder with small speed fall using power balance test mode with CONSULT-II.
Any differences between cylinders
Any differences between cylinders
Check for injector leakage Check cylinder with small speed fall using power balance test mode with CONSULT-II.
No difference between cylinders
Check cylinder with small speed fall, ignition related parts. Then if NG, replace its injector.
Check cylinder with small speed fall, ignition related parts. Then if NG, replace its injector.
No difference between cylinders
Within Spec. value
Within Spec. value
Data Monitor A/F ALPHA (B1)/(B2)*
Data Monitor A/F ALPHA (B1)/(B2)*
Less than Spec. value
Perform DTC confirmation Procedure for HO2S1.
NG
NG
Perform DTC confirmation Procedure for HO2S1.
Check/Repair:
• HO2S1 power circuit
• HO2S1 signal circuit
Check/Repair:
• HO2S1 power circuit
• HO2S1 signal circuit
OK
Within Spec. value
Within Spec. value
OK
Data Monitor A/F ALPHA (B1)/(B2)*
Data Monitor A/F ALPHA (B1)/(B2)*
Replace corresponding HO2S1
Replace corresponding HO2S1
Within Spec. value
Within Spec. value
Data Monitor A/F ALPHA (B1)/(B2)*
Data monitor A/F ALPHA (B1)/(B2)*
Less than Spec. value
More than Spec. value
Re-connect ECM harness Connector.
Re-connect ECM harness Connector.
Confirm A/F ALPHA (B1)/(B2)*.
Confirm A/F ALPHA (B1)/(B2)*.
COMPLETED

SEF768Z


Diagnostic Procedures for B/FUEL SCHDL
START
NOTE: Data Monitor means Data Monitor mode with CONSULT-II
* : if so equipped.
Data Monitor B/FUEL SCHDL
More than Specification (Spec.) value
Less than Specification (Spec.) value
Within Specification (Spec.) value
Data Monitor A/F ALPHA (B1)/(B2)*
Smaller than normal value
Within Spec. value
Check for causes of air flow in MAF sensor.
• Mis-assembly of air duct, air cleaner or element.
• Ruined air duct or air cleaner.
• Clogged dirt of element.
NG
Repair
Normal value
Data Monitor B/FUEL SCHDL
OK
More than B/FUEL SCHDL Spec. value and less than A/F ALPHA (B1)/(B2)* Spec. value
Check ground voltage of MAF sensor harness. Less than 0.2V
NG
Re-tighten engine ground.
OK
Data Monitor MAF sensor (Refer to CONSULT-II reference value of MAF sensor.)
More than reference value
Within reference value
Replace MAF sensor
Replace ECM
Check B/FUEL SCHDL, A/F ALPHA (B1)/(B2)*.
Check and Repair
Check for causes of over-friction.
• Engine oil level over H
• Over tension of drive belts
• Abnormal noise from, or catch of alternator, PS A/C drive belts
• Abnormal noise coming from engine.
• Comprssion pressure check
• Abnormal noise coming from transmission
Check for causes of imperfect combustion.
• EGR valve stuck open
• Check function of intake valve timing control solenold valve using active test.
• Valve clearance check
• Improper timing of camshaft sprocket
Check B/FUEL SCHDL.
Check for causes of air flow in MAF sensor.
• Mis-assembly of air duct, air cleaner or element.
• Ruined air duct or air cleaner.
• Clogged dirt of element.
NG
Repair
Normal value
Data Monitor B/FUEL SCHDL
Less than Spec. value
OK
Less than reference value
Data Monitor MAF sensor (Refer to CONSULT-II reference value of MAF sensor.)
Within reference value
Replace MAF sensor
Check B/FUEL SCHDL.
Check and Repair
Check for causes of air suction at lower flow of MAF sensor.
• Disconnected, loose or cracked air duct
• Disconnected, loose or cracked air vacuum hose connected to air duct or intake manifold collector
• Loose oil filler cap
• Disconnected or loose oil level gauge
• Improper sealing of intake related gaskets
• Improper sealing of rocker cover gaskets
Check B/FUEL SCHDL.
COMPLETED
SEF615ZA

TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT

PFP:00006

Description

EBS00EUM

Intermittent incidents (I/I) may occur. In many cases, the problem resolves itself (the part or circuit function returns to normal without intervention). It is important to realize that the symptoms described in the customer's complaint often do not recur on (1st trip) DTC visits. Realize also that the most frequent cause of I/I occurrences is poor electrical connections. Because of this, the conditions under which the incident occurred may not be clear. Therefore, circuit checks made as part of the standard diagnostic procedure may not indicate the specific problem area.

Common I/I Report Situations

STEP in Work Flow	Situation
II	The CONSULT-II is used. The SELF-DIAG RESULTS screen shows time data other than “0” or “[1t]”.
III	The symptom described by the customer does not recur.
IV	(1st trip) DTC does not appear during the DTC Confirmation Procedure.
VI	The Diagnostic Procedure for PXXXX does not indicate the problem area.

Diagnostic Procedure

EBS00EUN

1. INSPECTION START

Erase (1st trip) DTCs. Refer to EC-594, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .

>> GO TO 2.

2. CHECK GROUND TERMINALS

Check ground terminals for corroding or loose connection.
Refer to GI-24, "How to Perform Efficient Diagnosis for an Electrical Incident" , “Incident Simulation Tests”.

OK or NG

OK >> GO TO 3.
NG >> Repair or replace.

3. SEARCH FOR ELECTRICAL INCIDENT

Perform GI-24, "How to Perform Efficient Diagnosis for an Electrical Incident" , “Incident Simulation Tests”.

OK or NG

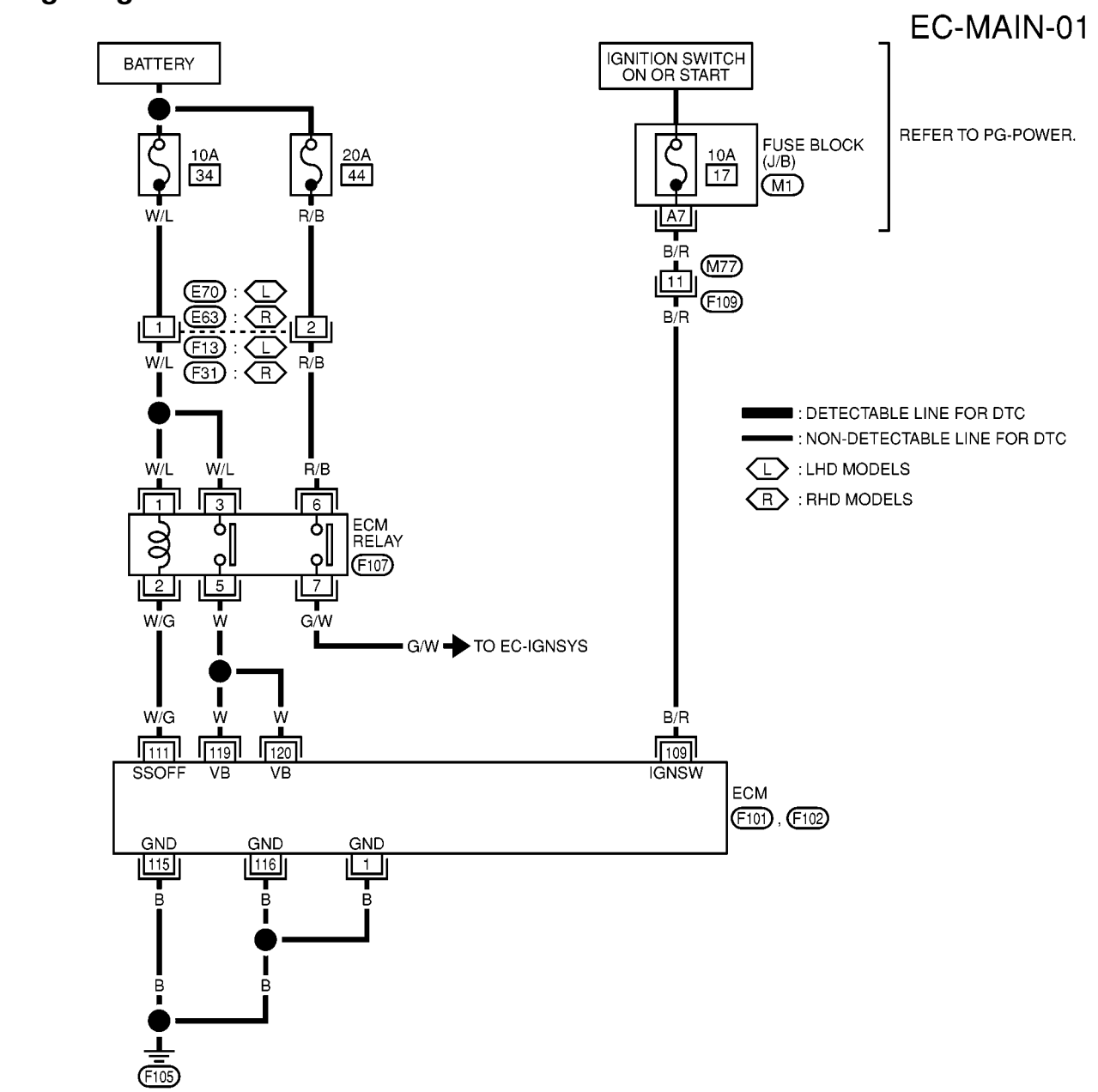
OK >> **INSPECTION END**
NG >> Repair or replace.

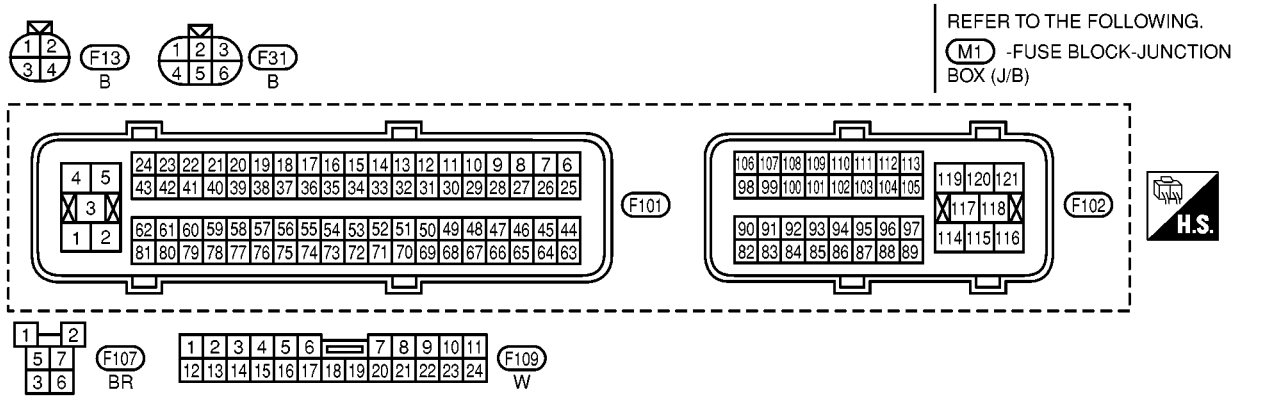
POWER SUPPLY CIRCUIT FOR ECM

PFP:24110

Wiring Diagram

EBS00EUO





MBWA0044E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
1	B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
109	B/R	Ignition switch	**[Ignition switch "OFF"]**	0V
			[Ignition switch "ON"]	BATTERY VOLTAGE (11 - 14V)
111	W/G	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch "OFF"]** ● For a few seconds after turning ignition switch "OFF"	0 - 1.0V
			[Ignition switch "OFF"] ● More than a few seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
115 116	B B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
119 120	W W	Power supply for ECM	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

EBS00EUP

1. INSPECTION START

Start engine.

Is engine running?

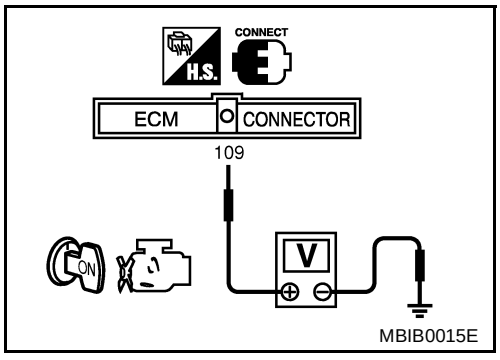
Yes or No

Yes >> GO TO 8.
No >> GO TO 2.

2. CHECK ECM POWER SUPPLY CIRCUIT-I

1. Turn ignition switch "OFF" and then "ON".
2. Check voltage between ECM terminal 109 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M77, F109
- Fuse block (J/B) connector M1
- 10A fuse
- Harness for open or short between ECM and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK ECM GROUND CIRCUIT FOR OPEN AND SHORT-I

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminals 1, 115, 116 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

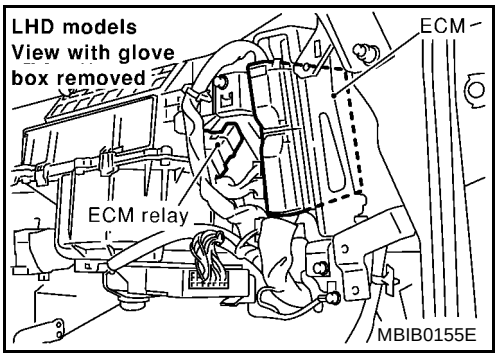
4. Also check harness for short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to power in harness or connectors.

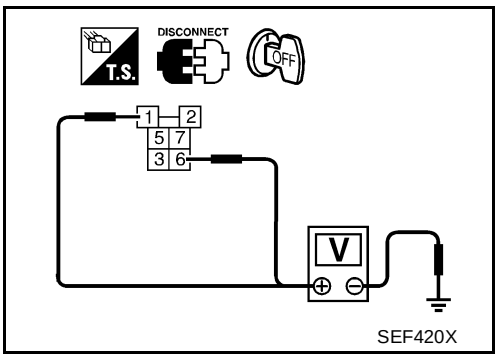
5. CHECK ECM POWER SUPPLY CIRCUIT-II

1. Disconnect ECM relay.



2. Check voltage between ECM relay terminals 1 and 6 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E70, F13 (LHD models)
- Harness connectors E63, F31 (RHD models)
- 10A fuse
- 20A fuse
- Harness for open or short between ECM relay and battery

>> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 111 and ECM relay terminal 2.
   Refer to Wiring Diagram.

   Continuity should exist.

2. Also check harness for short to ground and short to power.

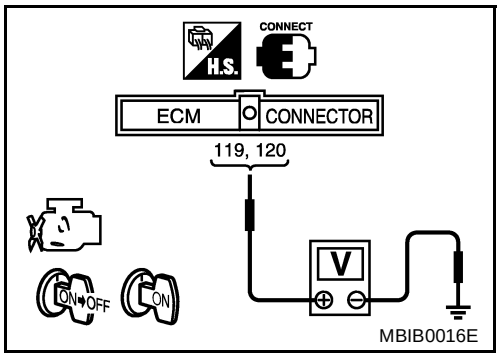
OK or NG

OK >> Go to EC-895, "IGNITION SIGNAL" .
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK ECM POWER SUPPLY CIRCUIT-III

1. Stop engine and wait at least 10 seconds.
2. Turn ignition switch “ON” and then “OFF”.
3. Check voltage between ECM terminals 119, 120 and ground with CONSULT-II or tester.

   Voltage: After turning ignition switch “OFF”, battery voltage will exist for a few seconds, then drop approximately 0V.

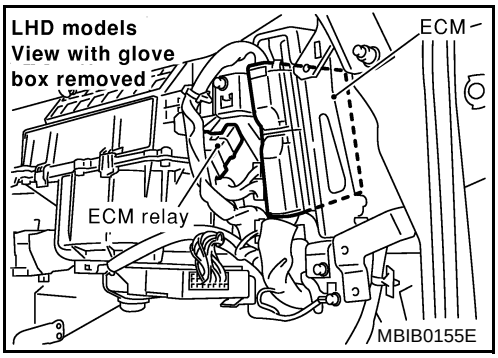


OK or NG

OK >> GO TO 13.
NG (Battery voltage does not exist.)>>GO TO 9.
NG (Battery voltage exists for more than a few seconds.)>>GO TO 12.

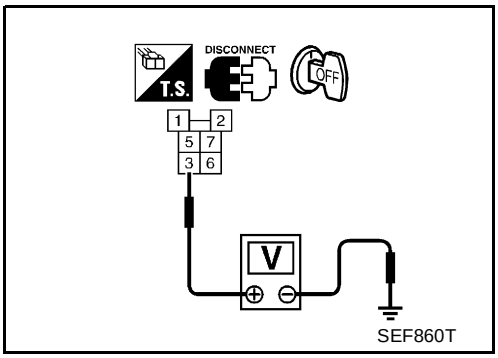
9. CHECK ECM POWER SUPPLY CIRCUIT-IV

1. Disconnect ECM relay.



2. Check voltage between ECM relay terminal 3 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 11.
NG >> GO TO 10.

10. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between ECM relay and F13 (LHD models)
- Harness for open or short between ECM relay and F31 (RHD models)

>> Repair open circuit or short to ground or short to power in harness or connectors.

11. CHECK ECM POWER SUPPLY CIRCUIT-V

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminals 119, 120 and ECM relay terminal 5. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 12.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

12. CHECK ECM RELAY

Refer to EC-662, "Component Inspection" .

OK or NG

OK >> GO TO 13.
NG >> Replace ECM relay.

13. CHECK ECM GROUND CIRCUIT FOR OPEN AND SHORT-II

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminals 1, 115, 116 and engine ground.
   Refer to Wiring Diagram.

   Continuity should exist.

4. Also check harness for short to power.

OK or NG

OK >> GO TO 14.
NG >> Repair open circuit or short to power in harness or connectors.

14. CHECK INTERMITTENT INCIDENT

Refer to EC-656, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

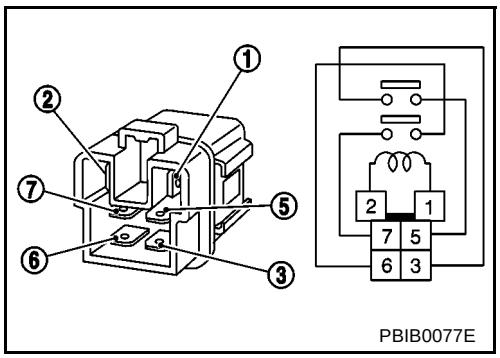
EBS00GKC

ECM RELAY

1. Apply 12V direct current between ECM relay terminals 1 and 2.
2. Check continuity between relay terminals 3 and 5, 6 and 7.

Condition	Continuity
12V direct current supply between terminals 1 and 2	Yes
OFF	No

3. If NG, replace ECM relay.



PBIB0077E

DTC U1000, U1001 CAN COMMUNICATION LINE

PFP:23710

Description

EBS00EUQ

CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent error detection ability. Many electronic control units are equipped onto a vehicle, and each control unit shares information and links with other control units during operation (not independent). In CAN communication, control units are connected with 2 communication lines (CAN H line, CAN L line) allowing a high rate of information transmission with less wiring. Each control unit transmits/receives data but selectively reads required data only.

On Board Diagnosis Logic

EBS00EUR

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
U1000 1000 U1001 1001	CAN communication line	● ECM cannot communicate to other control unit. ● ECM cannot communicate for more than the specified time.	● Harness or connectors (CAN communication line is open or shorted.)

DTC Confirmation Procedure

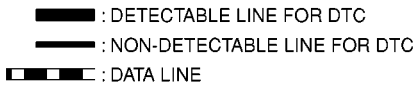
EBS00EUS

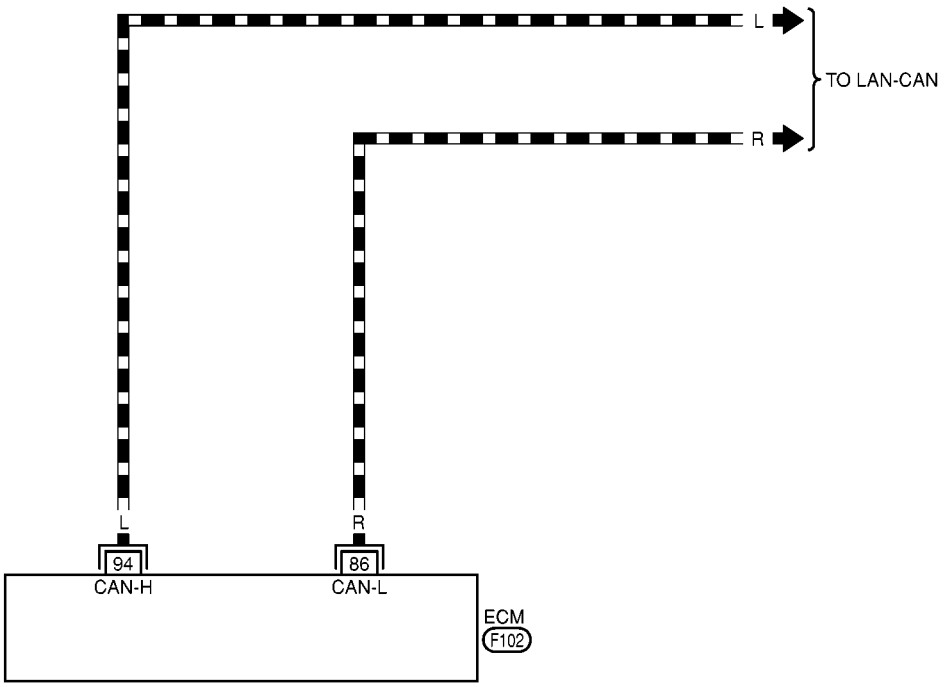
1. Turn ignition switch “ON” and wait at least 3 seconds.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. If 1st trip DTC is detected, go to EC-665, "Diagnostic Procedure" .

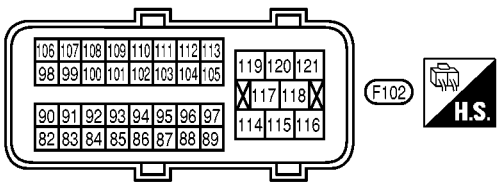
Wiring Diagram

EBS00EUT

EC-CAN-01







MBWA0038E

Diagnostic Procedure

EBS00EUU

1. INSPECTION START

1. Turn ignition switch “ON”.
2. Select “CAN DIAG SUPPORT MNTR” in “DATA MONITOR” mode with CONSULT-II.
3. Print out the CONSULT-II screen.

A/T models

OK data

DATA MONITOR	
MONITOR	NO DTC
CAN COMM	OK
CAN CIRC 1	OK
CAN CIRC 2	OK
CAN CIRC 3	UNKWN
CAN CIRC 4	OK
CAN CIRC 5	UNKWN
CAN CIRC 6	OK
CAN CIRC 7	UNKWN

NG data

DATA MONITOR	
MONITOR	NO DTC
CAN COMM	OK
CAN CIRC 1	UNKWN
CAN CIRC 2	UNKWN
CAN CIRC 3	UNKWN
CAN CIRC 4	UNKWN
CAN CIRC 5	UNKWN
CAN CIRC 6	UNKWN
CAN CIRC 7	UNKWN

MBIB0180E

M/T models

OK data

DATA MONITOR	
MONITOR	NO DTC
CAN COMM	OK
CAN CIRC 1	OK
CAN CIRC 2	UNKWN
CAN CIRC 3	UNKWN
CAN CIRC 4	OK
CAN CIRC 5	UNKWN
CAN CIRC 6	OK
CAN CIRC 7	UNKWN

NG data

DATA MONITOR	
MONITOR	NO DTC
CAN COMM	OK
CAN CIRC 1	UNKWN
CAN CIRC 2	UNKWN
CAN CIRC 3	UNKWN
CAN CIRC 4	UNKWN
CAN CIRC 5	UNKWN
CAN CIRC 6	UNKWN
CAN CIRC 7	UNKWN

MBIB0179E

>> Go to LAN-8, "CAN COMMUNICATION" .

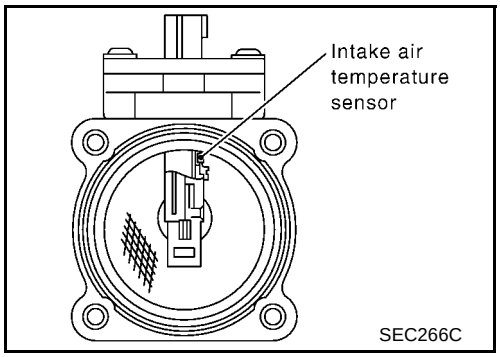
DTC P0102, P0103 MAF SENSOR

PFP:22680

Component Description

EBS00EUV

The mass air flow sensor is placed in the stream of intake air. It measures the intake flow rate by measuring a part of the entire intake flow. It consists of a hot film that is supplied with electric current from the ECM. The temperature of the hot film is controlled by the ECM a certain amount. The heat generated by the hot film is reduced as the intake air flows around it. The more air, the greater the heat loss.
Therefore, the ECM must supply more electric current to maintain the temperature of the hot film as air flow increases. The ECM detects the air flow by means of this current change.



CONSULT-II Reference Value in Data Monitor Mode

EBS00EUW

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
MAS A/F SE-B1	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: N ● No-load	Idle	Approx. 1.0 - 1.7V
		2,500 rpm	Approx. 1.5 - 2.1V
CAL/LD VALUE	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	10% - 35%
		2,500 rpm	10% - 35%
MASS AIRFLOW	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	1.0 - 4.0 g·m/s
		2,500 rpm	5.0 - 10.0 g·m/s

On Board Diagnosis Logic

EBS00EUX

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0102 0102	Mass air flow sensor circuit low input	An excessively low voltage from the sensor is sent to ECM when engine is running.	● Harness or connectors (The sensor circuit is open or shorted.) ● Intake air leaks ● Mass air flow sensor
P0103 0103	Mass air flow sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Mass air flow sensor

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MI lights up.

Detected items	Engine operating condition in fail-safe mode
Mass air flow sensor circuit	Engine speed will not rise more than 2,400 rpm due to the fuel cut.

DTC Confirmation Procedure

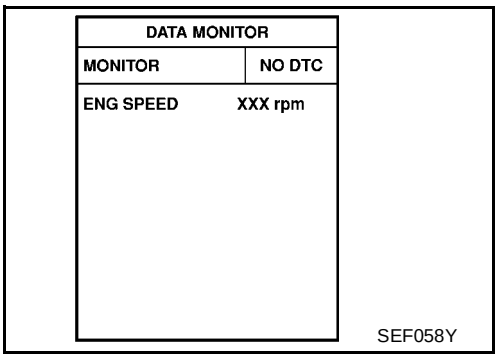
EBS00EUY

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

PROCEDURE FOR DTC P0102

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and wait 5 seconds at most.
4. If DTC is detected, go to EC-669, "Diagnostic Procedure" .



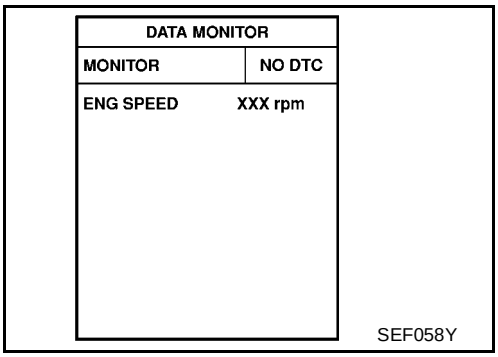
Without CONSULT-II

1. Start engine and wait 5 seconds at most.
2. Tarn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
3. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
4. If DTC is detected, go to EC-669, "Diagnostic Procedure" .

PROCEDURE FOR DTC P0103

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Wait at least 5 seconds.
4. If DTC is detected, go to EC-669, "Diagnostic Procedure" .
   If DTC is not detected, go to next step.
5. Start engine and wait at least 5 seconds.
6. If DTC is detected, go to EC-669, "Diagnostic Procedure" .



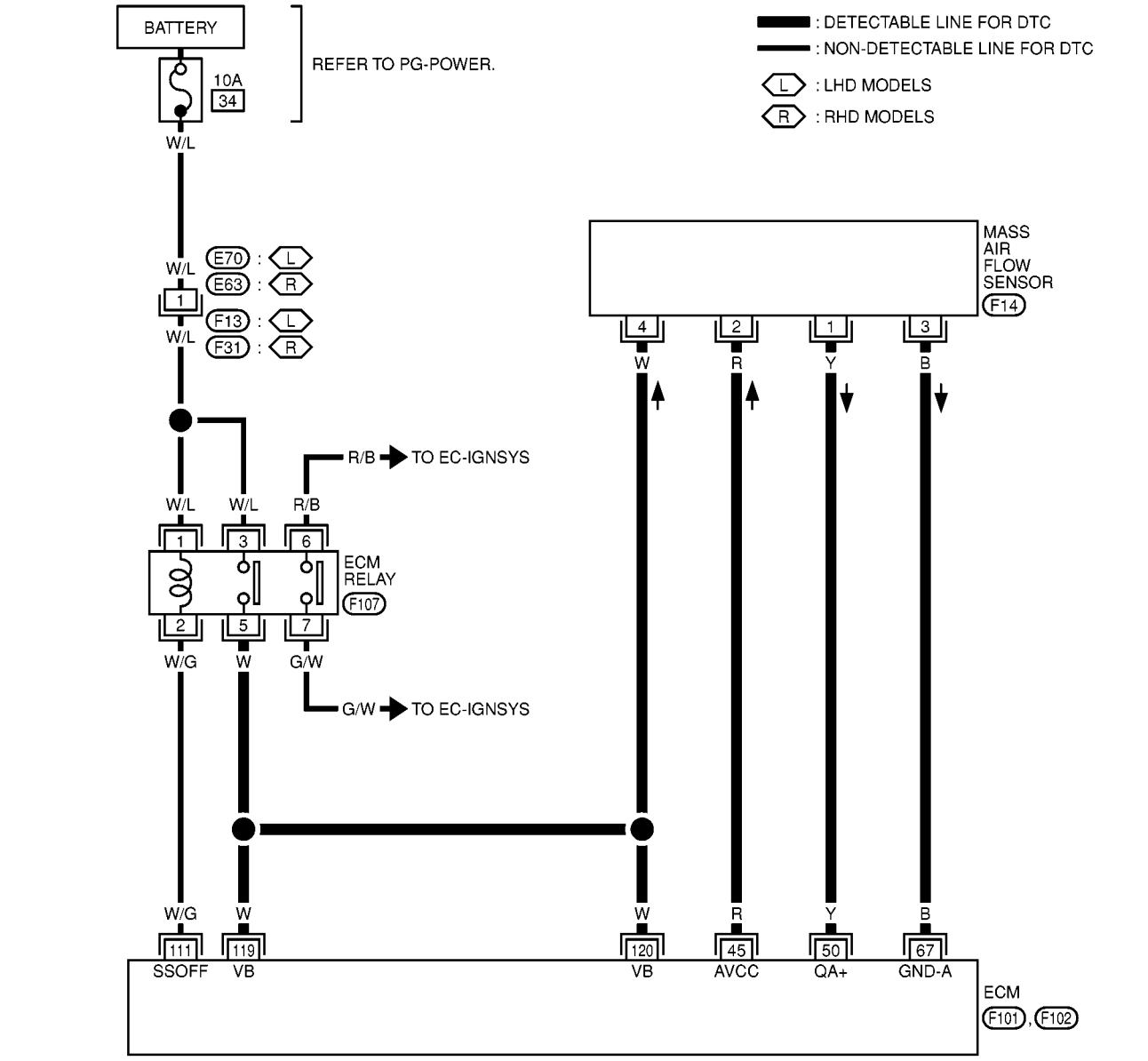
Without CONSULT-II

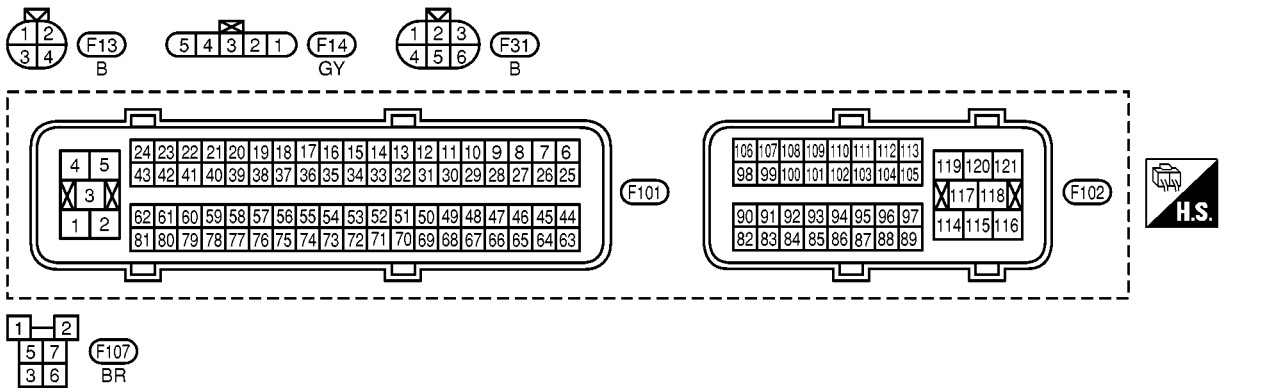
1. Turn ignition switch “ON” and wait at least 5 seconds.
2. Tarn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
3. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
4. If DTC is detected, go to EC-669, "Diagnostic Procedure" .
   If DTC is not detected, go to next step.
5. Turn ignition switch “OFF” and wait at least 10 seconds.
6. Start engine and wait at least 5 seconds.
7. Tarn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
8. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
9. If DTC is detected, go to EC-669, "Diagnostic Procedure" .

Wiring Diagram

EBS00EUZ

EC-MAFS-01





MBWA0045E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
45	R	Sensor power supply (Mass air flow sensor)	**[Ignition switch "ON"]**	Approximately 5V
50	Y	Mass air flow sensor	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.0 - 1.7V
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,500 rpm.	1.5 - 2.1V
67	B	Sensor ground (Mass air flow sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V

Diagnostic Procedure

EBS00EV0

1. INSPECTION START

Which malfunction (P0102 or P0103) is duplicated?

P0102 or P0103

P0102 >> GO TO 2.
P0103 >> GO TO 3.

2. CHECK INTAKE SYSTEM

Check the following for connection.

- Air duct
- Vacuum hoses
- Intake air passage between air duct to intake manifold

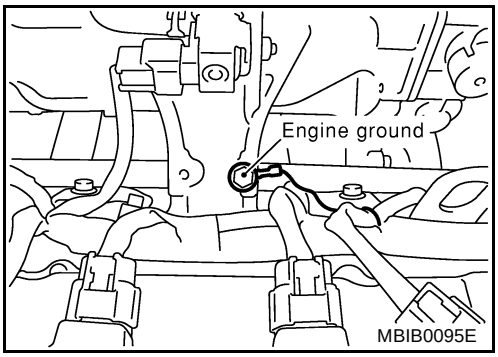
OK or NG

OK >> GO TO 3.
NG >> Reconnect the parts.

3. RETIGHTEN GROUND SCREWS

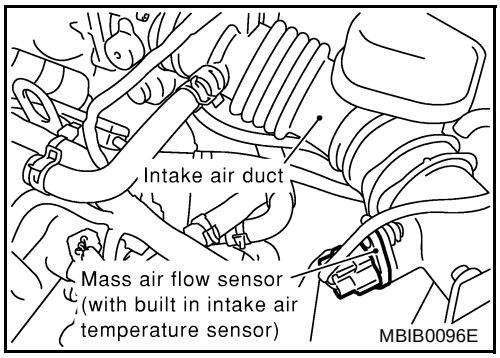
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 4.



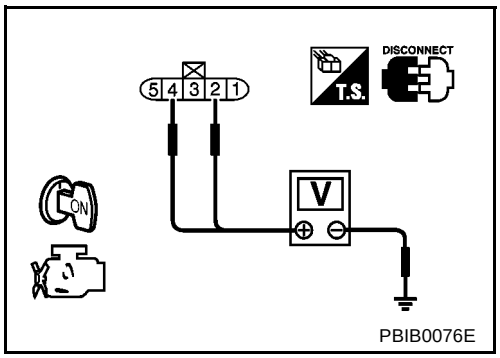
4. CHECK MAF SENSOR POWER SUPPLY CIRCUIT

1. Disconnect MAF sensor harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between MAF sensor terminals 2, 4 and ground with CONSULT-II or tester.

Terminal	Voltage
2	Approximately 5V
4	Battery voltage



OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between mass air flow sensor and ECM
- Harness for open or short between mass air flow sensor and ECM relay

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK MAF SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between MAF sensor terminal 3 and ECM terminal 67.
   Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK MAF SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between MAF sensor terminal 1 and ECM terminal 50.
   Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK MASS AIR FLOW SENSOR

Refer to EC-671, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> Replace mass air flow sensor.

9. CHECK INTERMITTENT INCIDENT

Refer to EC-656, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

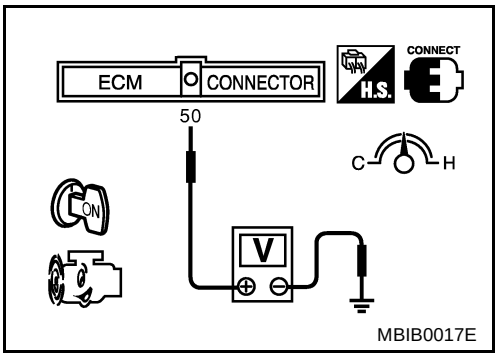
EBS00EV1

MASS AIR FLOW SENSOR

1. Reconnect harness connectors disconnected.
2. Start engine and warm it up to normal operating temperature.
3. Check voltage between ECM terminal 50 (Mass air flow sensor signal) and ground.

Condition	Voltage V
Ignition switch “ON” (Engine stopped.)	Approx. 1.0
Idle (Engine is warmed-up to normal operating temperature.)	1.0 - 1.7
2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.5 - 2.1
Idle to about 4,000 rpm*	1.0 - 1.7 to Approx. 4.0

*: Check for liner voltage rise in response to engine being increased to about 4,000 rpm.



4. If the voltage is out of specification, proceed the following.

a. Turn ignition switch “OFF”.
b. Disconnect mass air flow sensor harness connector and reconnect it again.
c. Perform steps 2 and 3 again.

5. If NG, remove mass air flow sensor from air duct. Check hot film for damage or dust.
6. If NG, clean or replace mass air flow sensor.

Removal and Installation

EBS00EV2

MASS AIR FLOW SENSOR

Refer to EM-17, "AIR CLEANER AND AIR DUCT" .

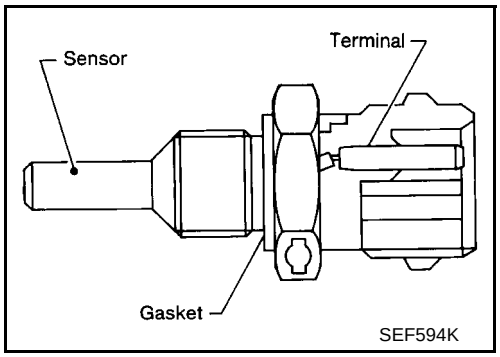
DTC P0117, P0118 ECT SENSOR

PFP:22630

Component Description

EBS00EV3

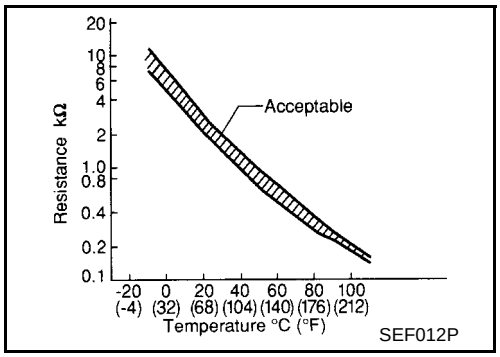
The engine coolant temperature sensor is used to detect the engine coolant temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine coolant temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.



<Reference data>

Engine coolant temperature °C (°F)	Voltage* V	Resistance kΩ
–10 (14)	4.4	7.0 - 11.4
20 (68)	3.5	2.1 - 2.9
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260

*: These data are reference values and are measured between ECM terminal 72 (Engine coolant temperature sensor) and ground.



CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

On Board Diagnosis Logic

EBS00EV4

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P0117 0117	Engine coolant temperature sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Engine coolant temperature sensor
P0118 0118	Engine coolant temperature sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	

FAIL-SAFE MODE

When this malfunction is detected, the ECM enters fail-safe mode and the MI lights up.

Detected items	Engine operating condition in fail-safe mode	
Engine coolant temperature sensor circuit	Engine coolant temperature will be determined by ECM based on the time after turning ignition switch “ON” or “START”. CONSULT-II displays the engine coolant temperature decided by ECM.	
	Condition	Engine coolant temperature decided (CONSULT-II display)
	Just as ignition switch is turned ON or Start	40°C (104°F)
	More than approx. 4 minutes after ignition ON or Start	80°C (176°F)
	Except as shown above	40 - 80°C (104 - 176°F) (Depends on the time)
	When the fail-safe system for engine coolant temperature sensor is activated, the cooling fan operates while engine is running.	

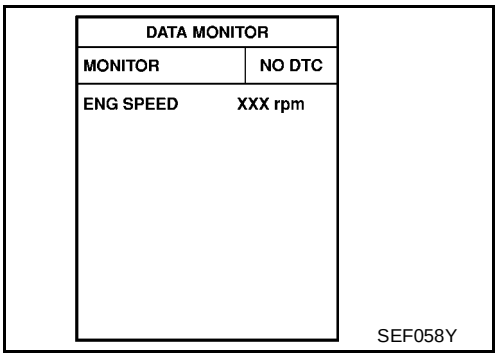
DTC Confirmation Procedure

EBS00EV5

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Wait at least 5 seconds.
4. If DTC is detected, go to EC-675, "Diagnostic Procedure" .



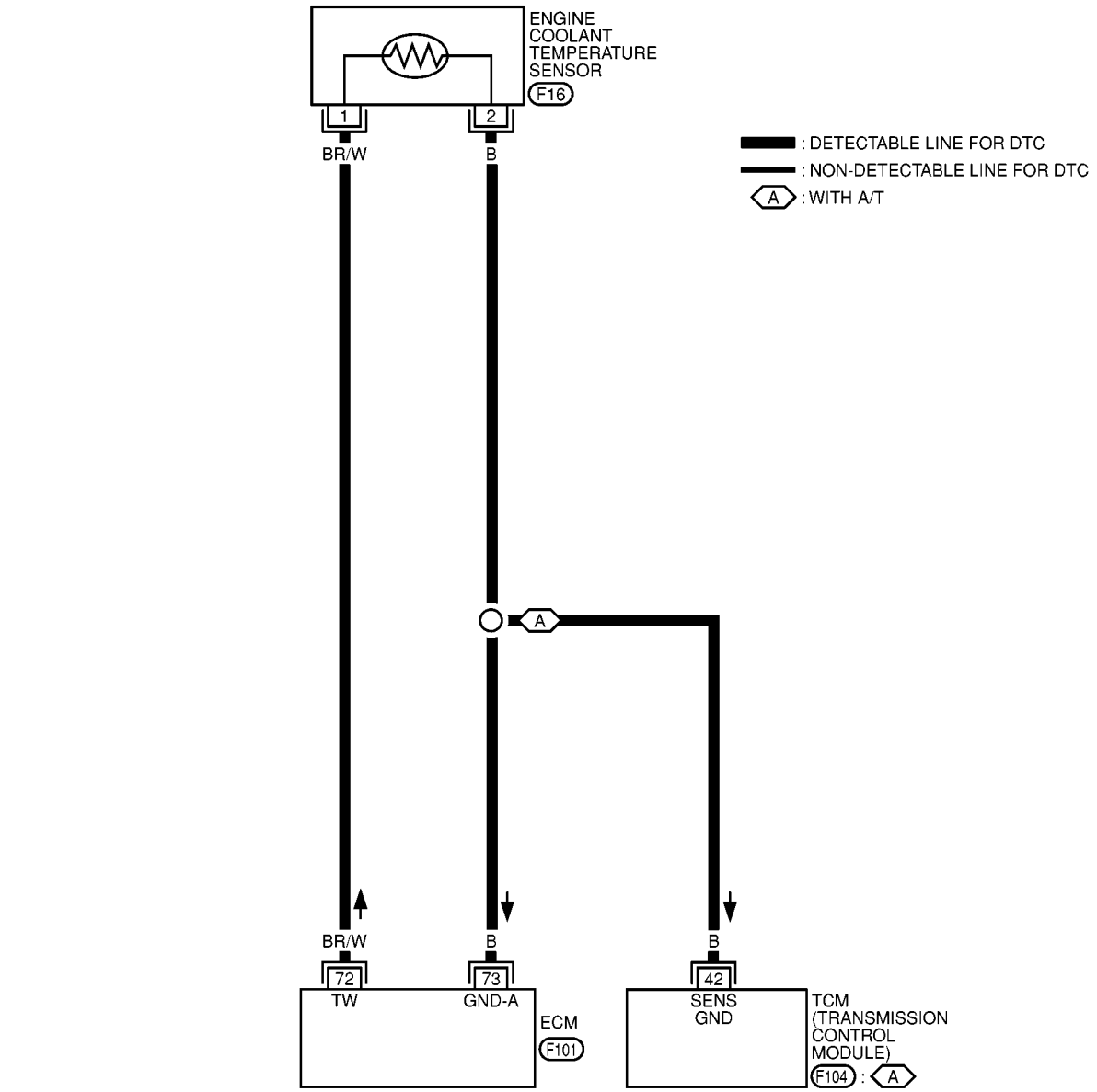
WITHOUT CONSULT-II

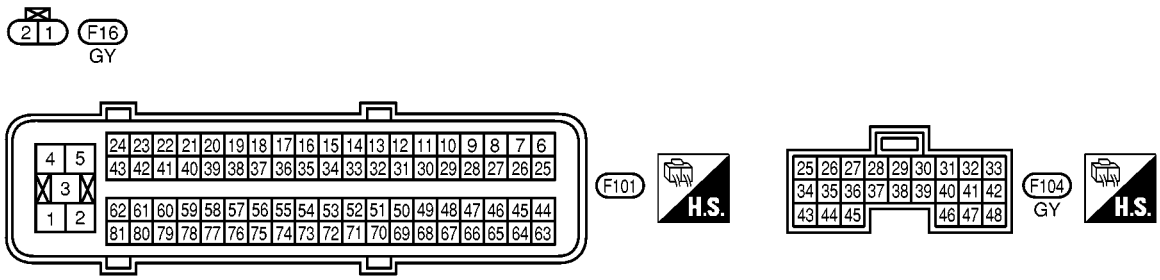
1. Turn ignition switch “ON” and wait at least 5 seconds.
2. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
3. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
4. If DTC is detected, go to EC-675, "Diagnostic Procedure" .

Wiring Diagram

EBS00EV6

EC-ECTS-01





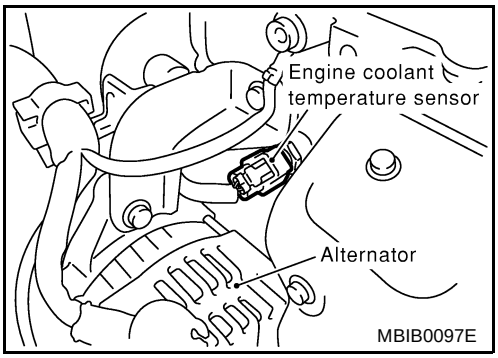
MBWA0047E

Diagnostic Procedure

EBS00EV7

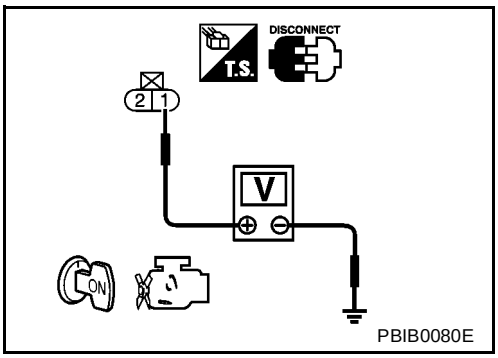
1. CHECK ECT SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect engine coolant temperature (ECT) sensor harness connector.
3. Turn ignition switch “ON”.



4. Check voltage between ECT sensor terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 2.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

2. CHECK ECT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between ECT sensor terminal 2 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between engine coolant temperature sensor and ECM
- Harness for open or short between engine coolant temperature sensor and TCM

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-676, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace engine coolant temperature sensor.

5. CHECK INTERMITTENT INCIDENT

Refer to EC-656, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

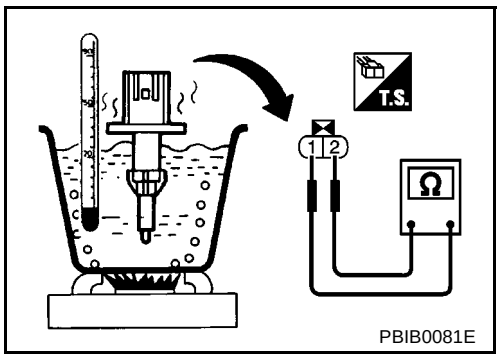
>> **INSPECTION END**

Component Inspection

EBS00EV8

ENGINE COOLANT TEMPERATURE SENSOR

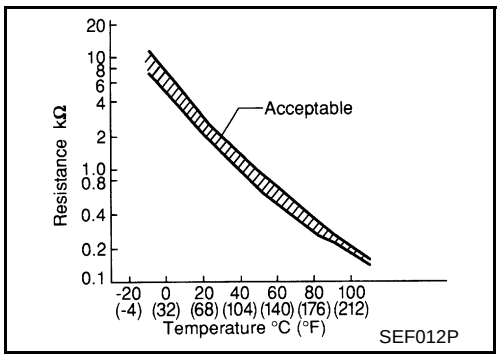
1. Check resistance between engine coolant temperature sensor terminals 1 and 2 as shown in the figure.



<Reference data>

Engine coolant temperature °C (°F)	Voltage* V	Resistance kΩ
–10 (14)	4.4	7.0 - 11.4
20 (68)	3.5	2.1 - 2.9
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260

*: These data are reference values and are measured between ECM terminal 72 (Engine coolant temperature sensor) and ground.



2. If NG, replace engine coolant temperature sensor.

Removal and Installation

EBS00EV9

ENGINE COOLANT TEMPERATURE SENSOR

Refer to CO-20, "THERMOSTAT AND THERMOSTAT HOUSING" .

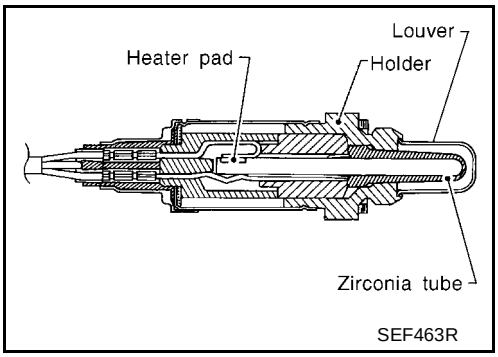
DTC P0132 HO2S1 (QG16DE)

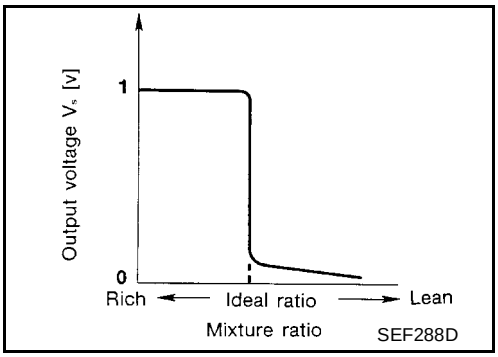
PFP:22690

Component Description

EBS00H66

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.





CONSULT-II Reference Value in Data Monitor Mode

EBS00H67

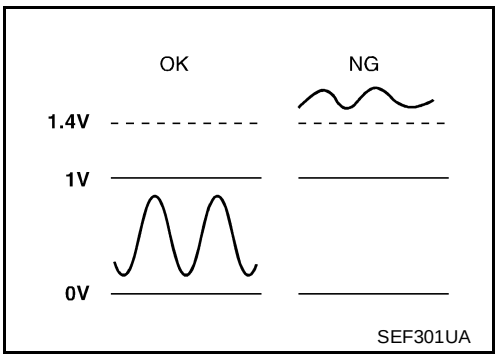
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S1 (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S1 MNTR (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	LEAN ←→ RICH Changes more than 5 times during 10 seconds.

On Board Diagnosis Logic

EBS00H68

To judge the malfunction, the diagnosis checks that the heated oxygen sensor 1 output is not inordinately high.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0132 0132	Heated oxygen sensor 1 circuit high voltage	An excessively high voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Heated oxygen sensor 1

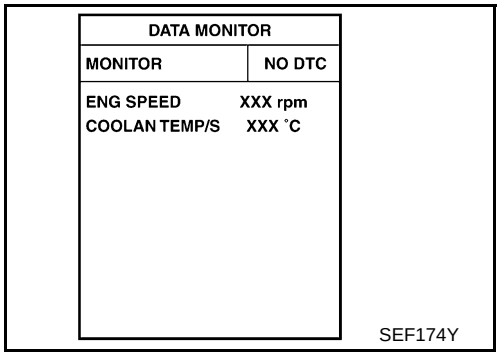
DTC Confirmation Procedure

EBS00H69

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Turn ignition switch “ON”.
4. Select “DATA MONITOR” mode with CONSULT-II.
5. Restart engine and let it idle for 2 minutes.
6. If 1st trip DTC is detected, go to EC-680, "Diagnostic Procedure" .



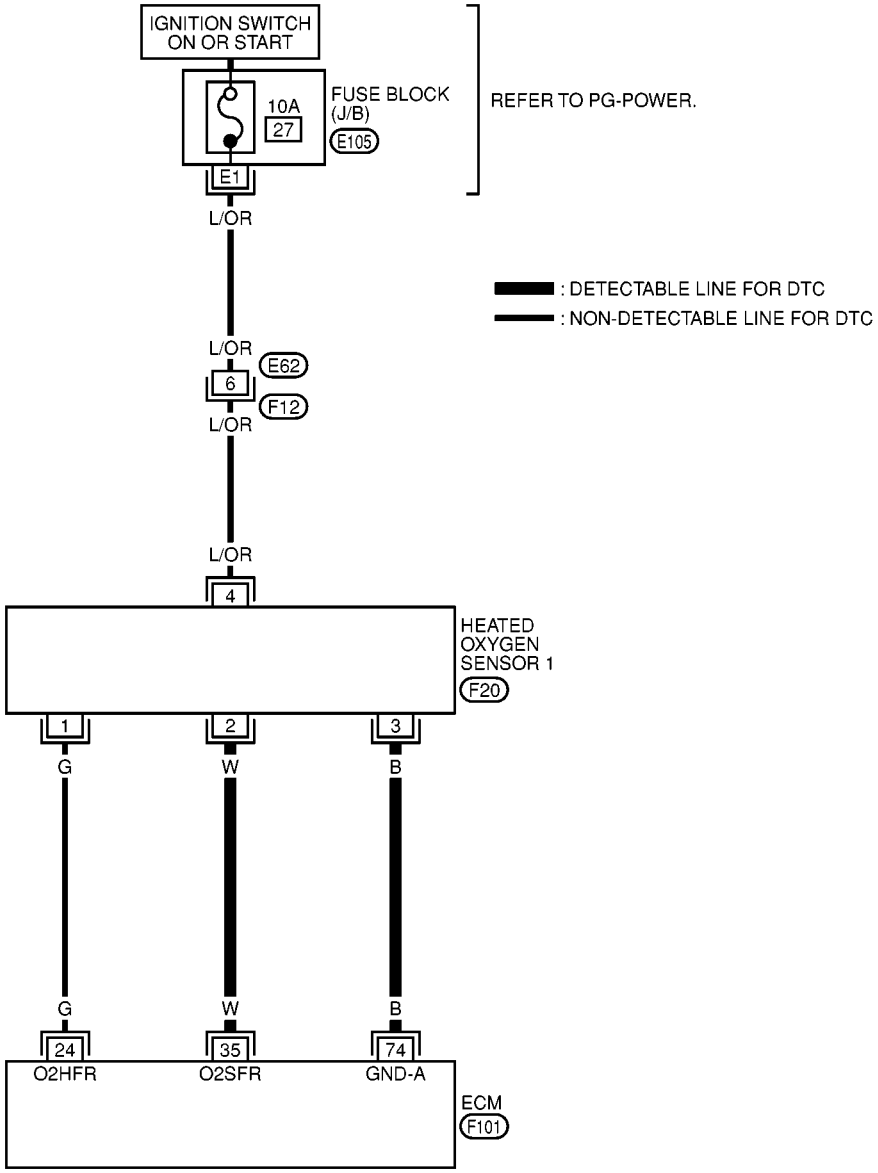
WITHOUT CONSULT-II

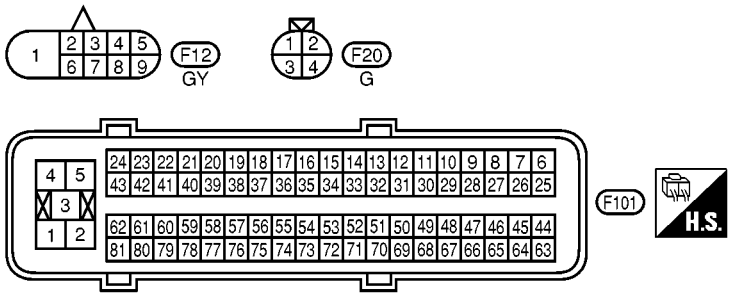
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Restart engine and let it idle for 2 minutes.
4. Turn ignition switch “OFF” and wait at least 10 seconds.
5. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
6. If 1st trip DTC is detected, go to EC-680, "Diagnostic Procedure" .

Wiring Diagram

EBS00H6A

EC-HO2S1-01





REFER TO THE FOLLOWING.
E105 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0048E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
35	W	Heated oxygen sensor 1	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V (Periodically change)
74	B	Heated oxygen sensor ground	**[Engine is running]** ● Idle speed	Approximately 0V

Diagnostic Procedure

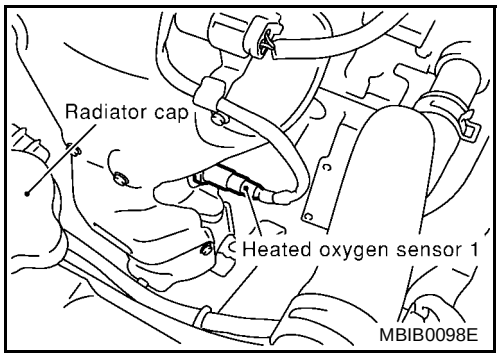
EBS00H6B

1. RETIGHTEN HEATED OXYGEN SENSOR 1

1. Turn ignition switch “OFF”.
2. Loosen and retighten heated oxygen sensor 1.

Tightening torque: 40 - 60 N·m (4.1 - 6.2 kg-m, 30 - 44 ft-lb)

>> GO TO 2.



2. CHECK HO2S1 GROUND CIRCUIT FOR OPEN AND SHORT

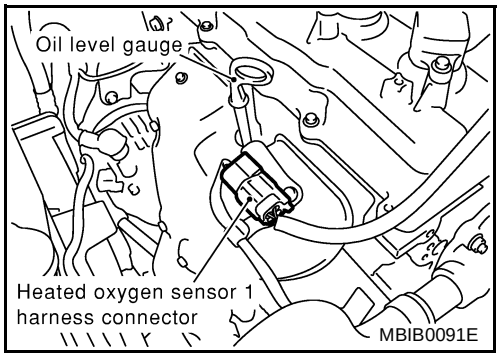
1. Disconnect heated oxygen sensor 1 harness connector.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 74 and HO2S1 terminal 3.
   Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.



3. CHECK HO2S1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 35 and HO2S1 terminal 2. Refer to Wiring Diagram.

Continuity should exist.

2. Check harness continuity between ECM terminal 35 or HO2S1 terminal 2 and ground. Refer to Wiring Diagram.

Continuity should not exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK HO2S1 CONNECTOR FOR WATER

Check heated oxygen sensor 1 connectors for water.

Water should not exist.

OK or NG

OK >> GO TO 5.
NG >> Repair or replace harness or connectors.

5. CHECK HEATED OXYGEN SENSOR 1

Refer to EC-681, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace heated oxygen sensor 1.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-656, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

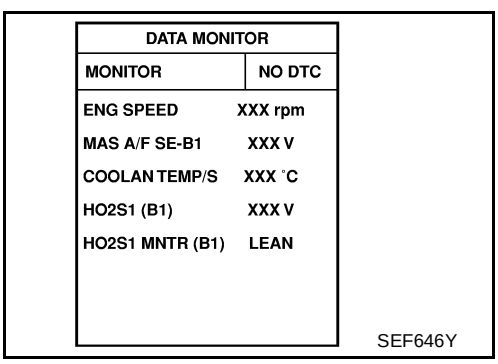
Component Inspection

EBS00H6C

HEATED OXYGEN SENSOR 1

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “MANU TRIG” and adjust “TRIGGER POINT” to 100% in “DATA MONITOR” mode with CONSULT-II.
3. Select “HO2S1 (B1)” and “HO2S1 MNTR (B1)”.
4. Hold engine speed at 2,000 rpm under no load during the following steps.
5. Touch “RECORD” on CONSULT-II screen.



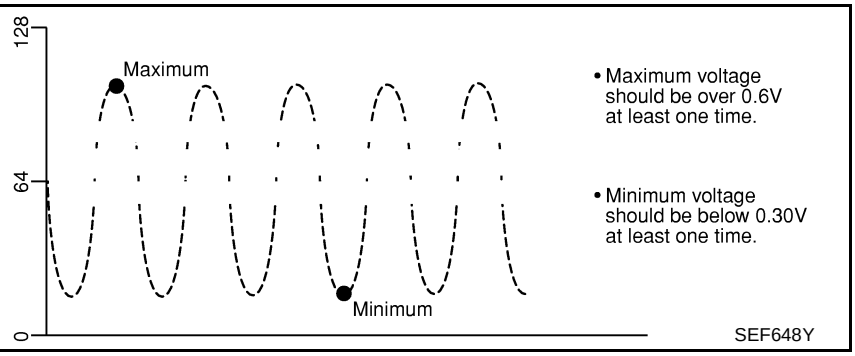
6. Check the following.
   - “HO2S1 MNTR (B1)” in “DATA MONITOR” mode changes from “RICH” to “LEAN” to “RICH” 5 times in 10 seconds.
     5 times (cycles) are counted as shown at right.
   - “HO2S1 (B1)” voltage goes above 0.6V at least once.
   - “HO2S1 (B1)” voltage goes below 0.3V at least once.
   - “HO2S1 (B1)” voltage never exceeds 1.0V.

cycle	1	2	3	4	5
HO2S1 MNTR (B1)	R-L-R-L-R-L-R-L-R-L-R				

R means HO2S1 MNTR (B1) indicates RICH
L means HO2S1 MNTR (B1) indicates LEAN

SEF217YA

Trigger	ENG SPEED	HO2S1 (B1)
	rpm	V
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX

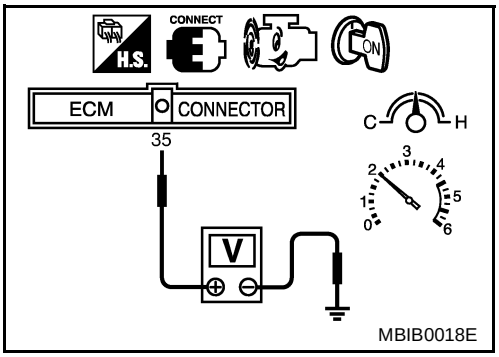


CAUTION:
- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 (HO2S1 signal) and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no load.
   - The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds.
   - The maximum voltage is over 0.6V at least one time.
   - The minimum voltage is below 0.3V at least one time.
   - The voltage never exceeds 1.0V.

   1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V
   2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V



CAUTION:
- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

EBS00H6D

HEATED OXYGEN SENSOR 1

Refer to EM-23, "EXHAUST MANIFOLD AND CATALYTIC CONVERTER" .

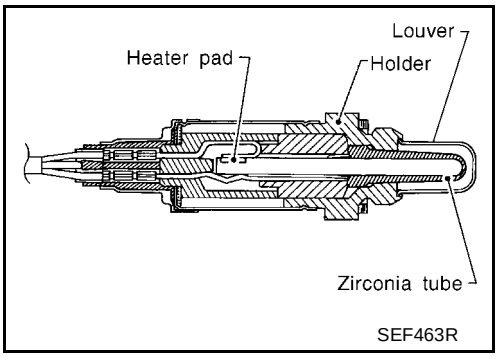
DTC P0132, P0152 HO2S1 (QG18DE)

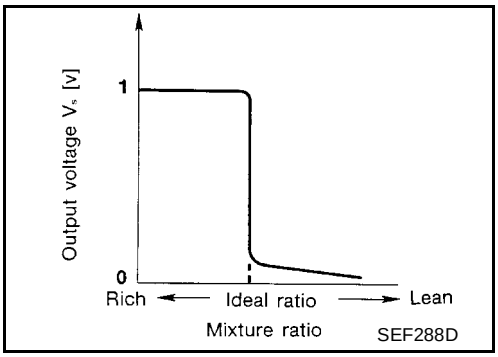
PFP:22690

Component Description

EBS00H6E

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.





CONSULT-II Reference Value in Data Monitor Mode

EBS00H6F

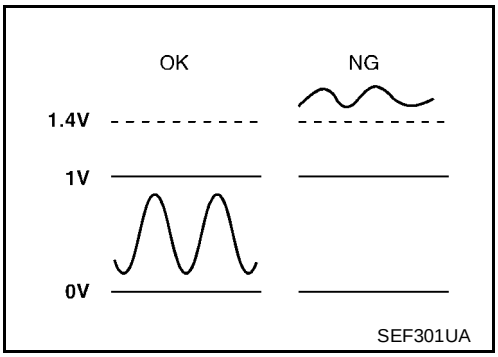
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S1 (B1) HO2S1 (B2)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ⟷ Approx. 0.6 - 1.0V
HO2S1 MNTR (B1) HO2S1 MNTR (B2)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	LEAN ⟷ RICH Changes more than 5 times during 10 seconds.

On Board Diagnosis Logic

EBS00H6G

To judge the malfunction, the diagnosis checks that the heated oxygen sensor 1 output is not inordinately high.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0132 0132 (Bank 1)	Heated oxygen sensor 1 circuit high voltage	An excessively high voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Heated oxygen sensor 1
P0152 0152 (Bank 2)			

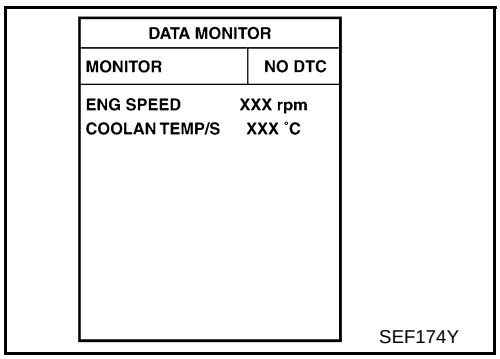
DTC Confirmation Procedure

EBS00H6H

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Turn ignition switch “ON”.
4. Select “DATA MONITOR” mode with CONSULT-II.
5. Restart engine and let it idle for 2 minutes.
6. If 1st trip DTC is detected, go to EC-688, "Diagnostic Procedure" .



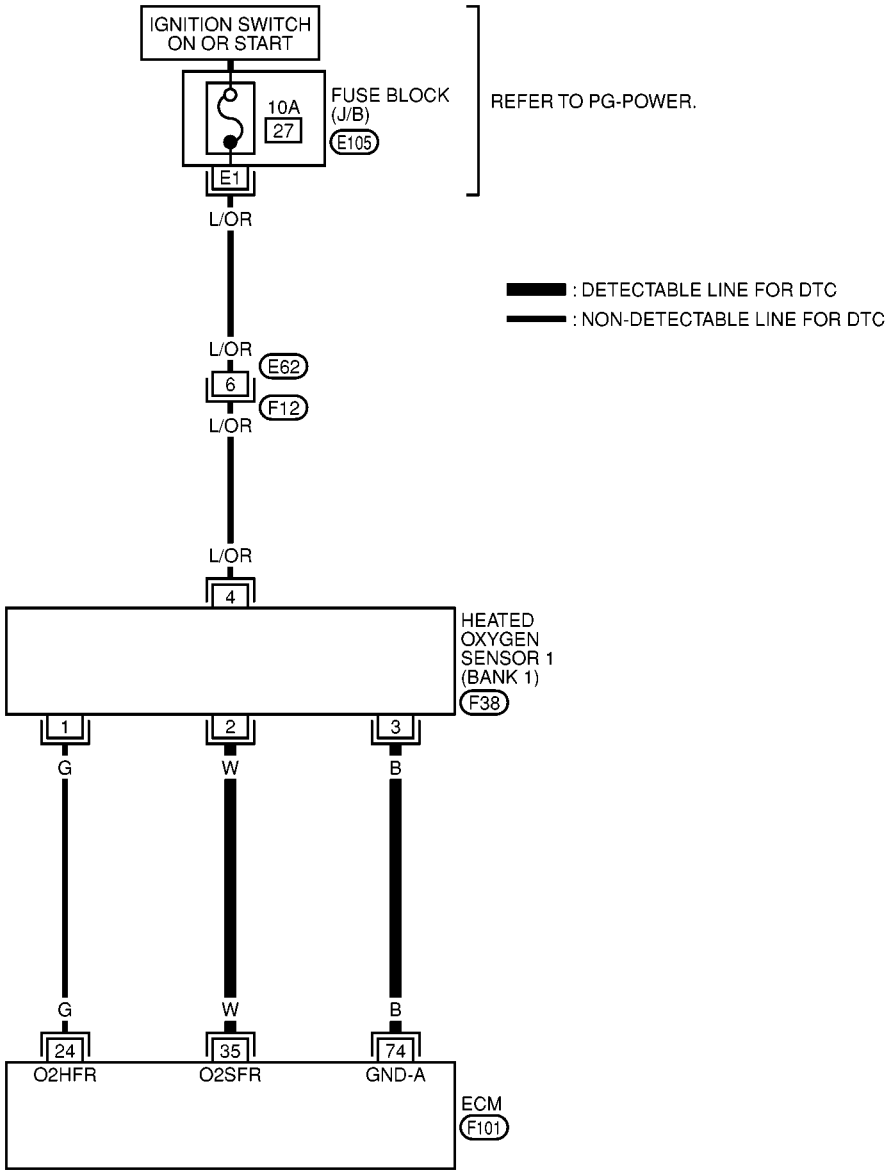
WITHOUT CONSULT-II

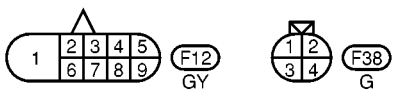
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Restart engine and let it idle for 2 minutes.
4. Turn ignition switch “OFF” and wait at least 10 seconds.
5. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
6. If 1st trip DTC is detected, go to EC-688, "Diagnostic Procedure" .

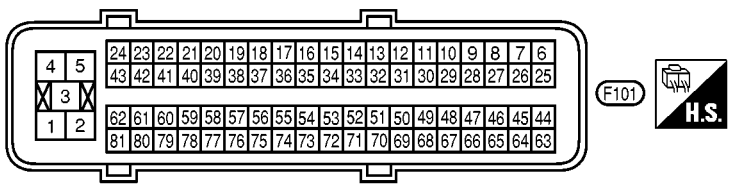
Wiring Diagram
BANK 1

EBS00H6I

EC-O2S1B1-01







REFER TO THE FOLLOWING.
E105 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0052E

Specification data are reference values and are measured between each terminal and ground.

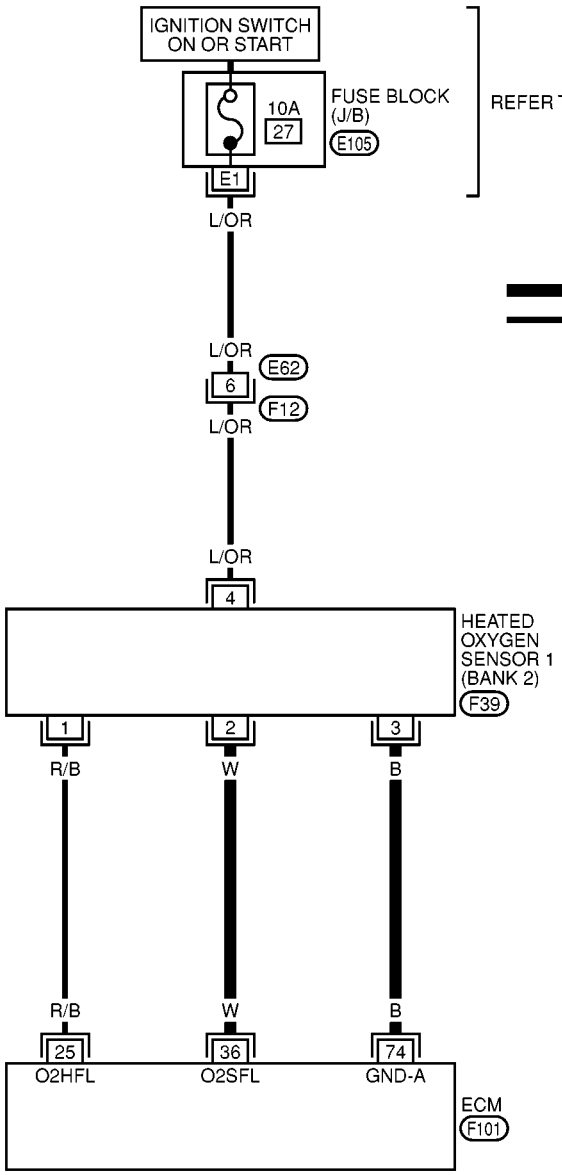
CAUTION:

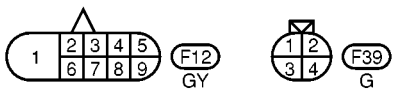
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

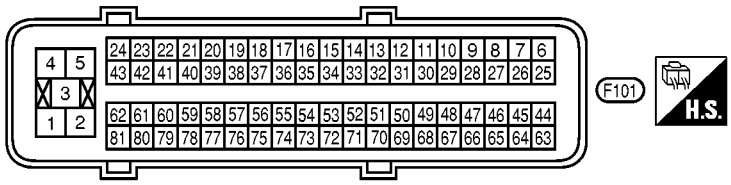
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
35	W	Heated oxygen sensor 1 (bank 1)	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V (Periodically change)
74	B	Heated oxygen sensor ground	**[Engine is running]** ● Idle speed	Approximately 0V

BANK 2

EC-O2S1B2-01







REFER TO THE FOLLOWING.
E105 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0054E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
36	W	Heated oxygen sensor 1 (bank 2)	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V (Periodically change)
74	B	Heated oxygen sensor ground	**[Engine is running]** ● Idle speed	Approximately 0V

Diagnostic Procedure

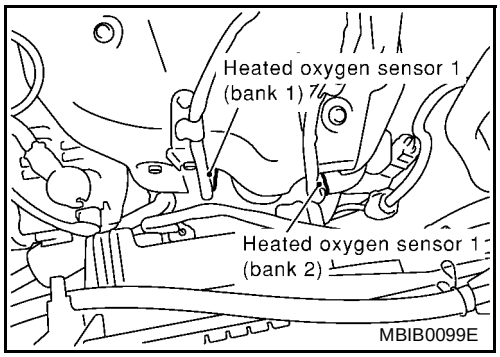
EBS00H6J

1. RETIGHTEN HEATED OXYGEN SENSOR 1

1. Turn ignition switch “OFF”.
2. Loosen and retighten corresponding heated oxygen sensor 1.

Tightening torque: 40 - 60 N·m (4.1 - 6.2 kg-m, 30 - 44 ft-lb)

>> GO TO 2.



2. CHECK HO2S1 GROUND CIRCUIT FOR OPEN AND SHORT

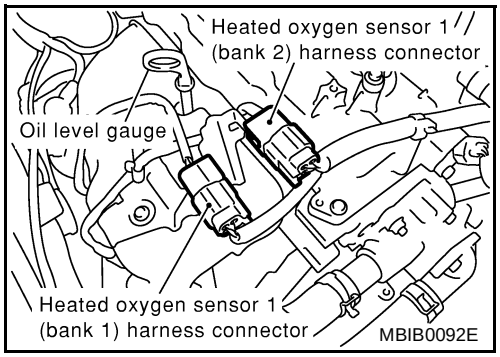
1. Disconnect heated oxygen sensor 1 harness connector.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 74 and HO2S1 terminal 3.
   Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.



3. CHECK HO2S1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal and HO2S1 terminal as follows. Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM	Sensor	
P0132	35	2	1
P0152	36	2	2

Continuity should exist.

2. Check harness continuity between the following terminals and ground. Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM	Sensor	
P0132	35	2	1
P0152	36	2	2

Continuity should not exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK HO2S1 CONNECTOR FOR WATER

Check heated oxygen sensor 1 connectors for water.

Water should not exist.

OK or NG

OK >> GO TO 5.
NG >> Repair or replace harness or connectors.

5. CHECK HEATED OXYGEN SENSOR 1

Refer to EC-689, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace malfunctioning heated oxygen sensor 1.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-656, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

EBS00H6K

HEATED OXYGEN SENSOR 1

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “MANU TRIG” and adjust “TRIGGER POINT” to 100% in “DATA MONITOR” mode with CONSULT-II.
3. Select “HO2S1 (B1)/(B2)” and “HO2S1 MNTR (B1)/(B2)”.
4. Hold engine speed at 2,000 rpm under no load during the following steps.

5. Touch “RECORD” on CONSULT-II screen.

DATA MONITOR	
MONITOR	NO DTC
ENG SPEED	XXX rpm
MAS A/F SE-B1	XXX V
COOLAN TEMP/S	XXX °C
HO2S1 (B1)	XXX V
HO2S1 MNTR (B1)	LEAN

SEF646Y

6. Check the following.
   - “HO2S1 MNTR (B1)/(B2)” in “DATA MONITOR” mode changes from “RICH” to “LEAN” to “RICH” 5 times in 10 seconds.
     5 times (cycles) are counted as shown at right.
   - “HO2S1 (B1)/(B2)” voltage goes above 0.6V at least once.
   - “HO2S1 (B1)/(B2)” voltage goes below 0.3V at least once.
   - “HO2S1 (B1)/(B2)” voltage never exceeds 1.0V.

Bank 1

cycle	1	2	3	4	5
HO2S1 MNTR (B1)	R-L	R-L	R-L	R-L	R-L

Bank 2

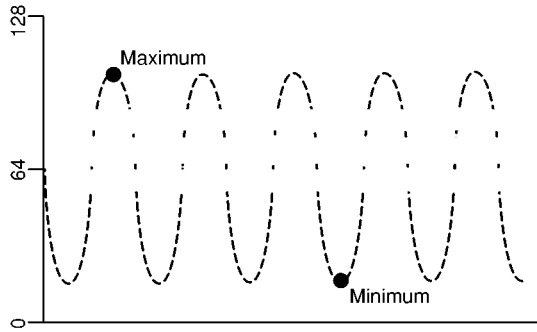
cycle	1	2	3	4	5
HO2S1 MNTR (B2)	R-L	R-L	R-L	R-L	R-L

R means HO2S1 MNTR (B1)/(B2) indicates RICH

L means HO2S1 MNTR (B1)/(B2) indicates LEAN

SEF647Y

Trigger	ENG SPEED	HO2S1 (B1)
	rpm	V
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX



SEF648Y

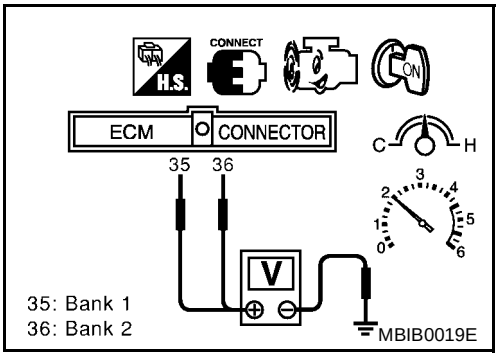
CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 [HO2S1 (B1) signal] or 36 [HO2S1 (B2) signal] and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no load.
   - The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds.
   - The maximum voltage is over 0.6V at least one time.
   - The minimum voltage is below 0.3V at least one time.
   - The voltage never exceeds 1.0V.

   1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V
   2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V



MBIB0019E

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

EBS00H6L

HEATED OXYGEN SENSOR 1

Refer to EM-23, "EXHAUST MANIFOLD AND CATALYTIC CONVERTER" .

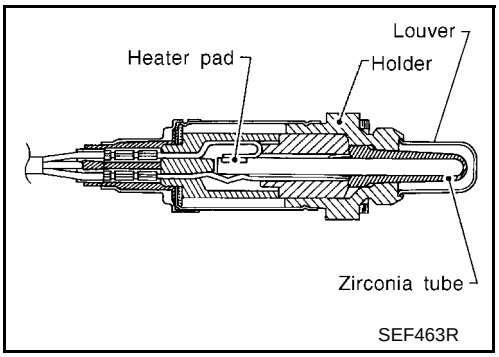
DTC P0134 HO2S1 (QG16DE)

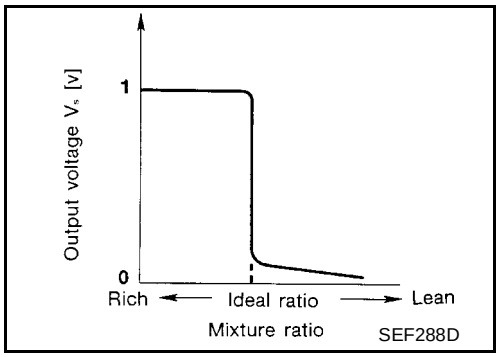
PFP:22690

Component Description

EBS00FUF

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.





CONSULT-II Reference Value in Data Monitor Mode

EBS00FUG

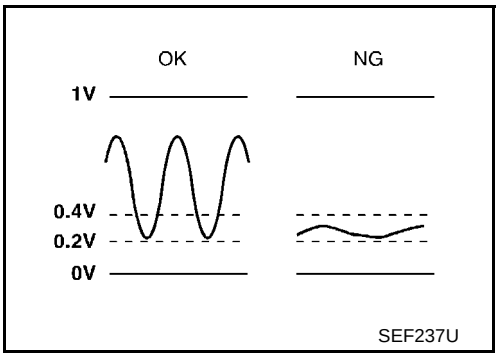
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S1 (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S1 MNTR (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	LEAN ←→ RICH Changes more than 5 times during 10 seconds.

On Board Diagnosis Logic

EBS00FUH

Under the condition in which the heated oxygen sensor 1 signal is not input, the ECM circuits will read a continuous approximately 0.3V. Therefore, for this diagnosis, the time that output voltage is within 200 to 400 mV range is monitored, and the diagnosis checks that this time is not inordinately long.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0134 0134	Heated oxygen sensor 1 circuit no activity detected	The voltage from the sensor is constantly approx. 0.3V.	● Harness or connectors (The sensor circuit is open or shorted.) ● Heated oxygen sensor 1

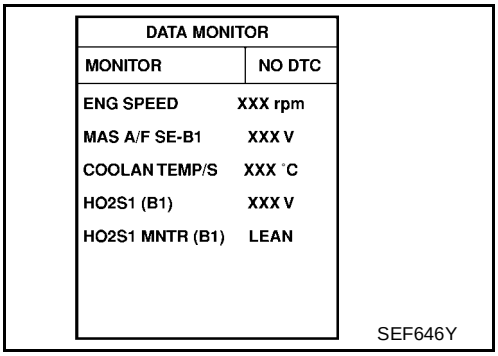
Overall Function Check

EBS00FUJ

Use this procedure to check the overall function of the heated oxygen sensor 1 circuit. During this check, a 1st trip DTC might not be confirmed.

WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “MANU TRIG” in “DATA MONITOR” mode with CONSULT-II, and select “HO2S1 (B1)”.
3. Hold engine speed at 2,000 rpm under no load.
4. Make sure that the indications do not remain in the range between 0.2 to 0.4V.
5. If NG, go to EC-695, "Diagnostic Procedure" .

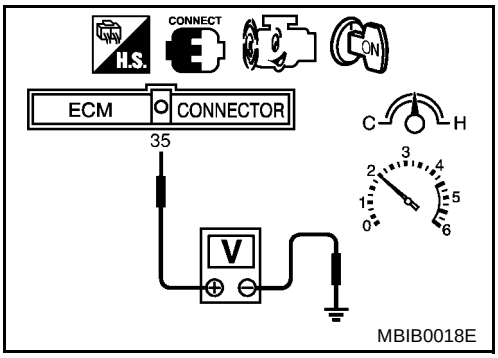


WITHOUT CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 (HO2S1 signal) and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no load.

– The voltage does not remain in the range of 0.2 - 0.4V.

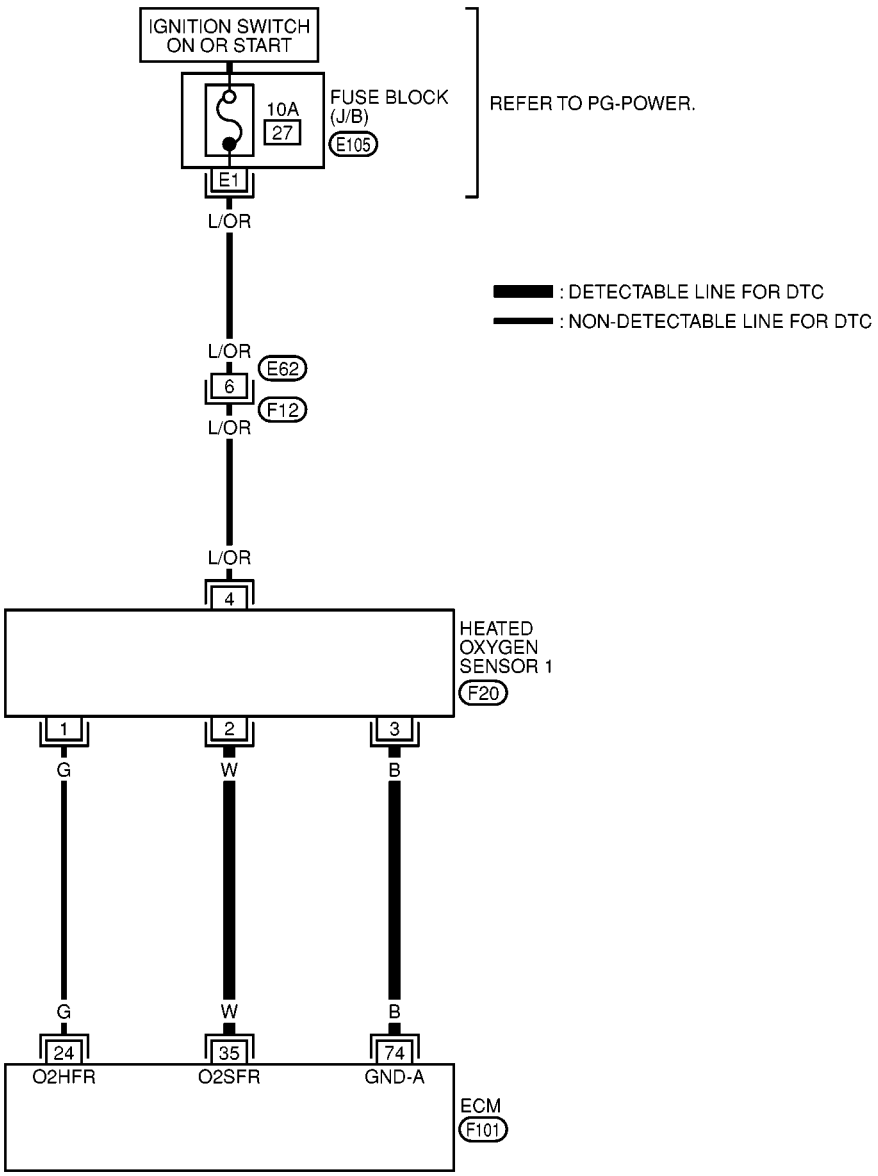
4. If NG, go to EC-695, "Diagnostic Procedure" .

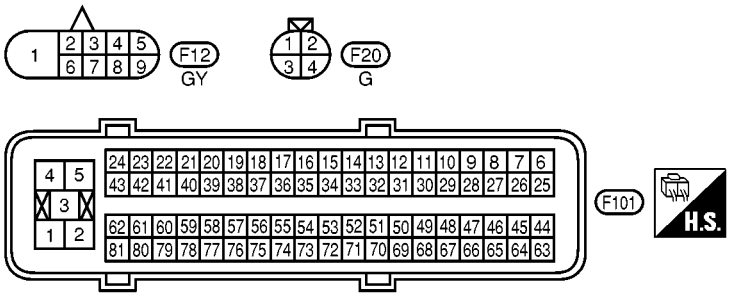


Wiring Diagram

EBS00FUK

EC-HO2S1-01





REFER TO THE FOLLOWING.
E105 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0048E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
35	W	Heated oxygen sensor 1	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V (Periodically change)
74	B	Heated oxygen sensor ground	**[Engine is running]** ● Idle speed	Approximately 0V

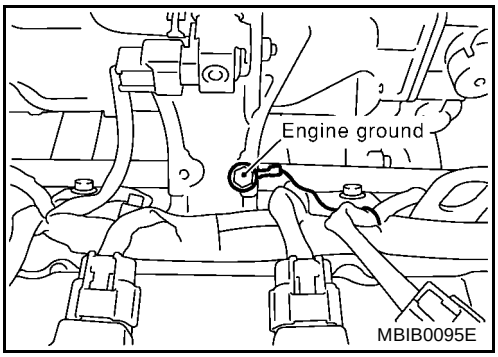
Diagnostic Procedure

EBS00FUL

1. INSPECTION START

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

>> GO TO 2.



2. CHECK HO2S1 GROUND CIRCUIT FOR OPEN AND SHORT

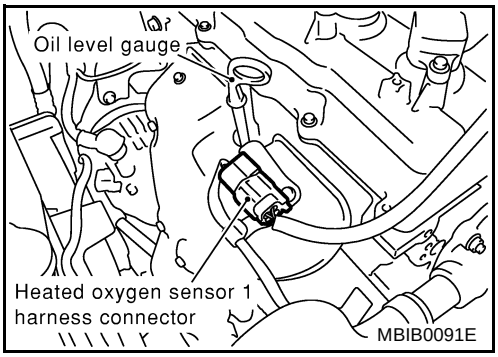
1. Disconnect heated oxygen sensor 1 harness connector.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 74 and HO2S1 terminal 3. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.



3. CHECK HO2S1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 35 and HO2S1 terminal 2.
   Refer to Wiring Diagram.

   Continuity should exist.

2. Check harness continuity between ECM terminal 35 or HO2S1 terminal 2 and ground.
   Refer to Wiring Diagram.

   Continuity should not exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK HEATED OXYGEN SENSOR 1

Refer to EC-695, "Diagnostic Procedure" .

OK or NG

OK >> GO TO 5.
NG >> Replace heated oxygen sensor 1.

5. CHECK INTERMITTENT INCIDENT

Refer to EC-656, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

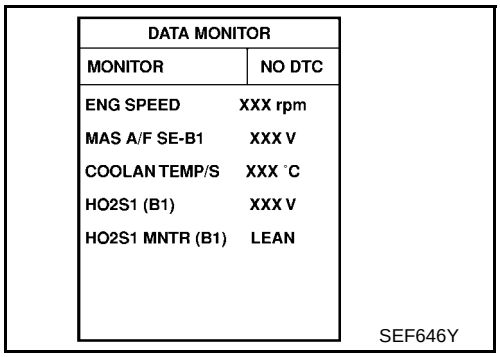
Component Inspection

EBS00FUM

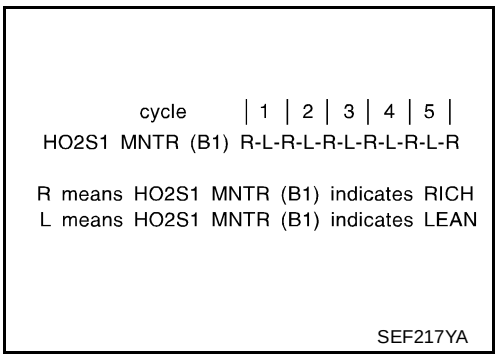
HEATED OXYGEN SENSOR 1

With CONSULT-II

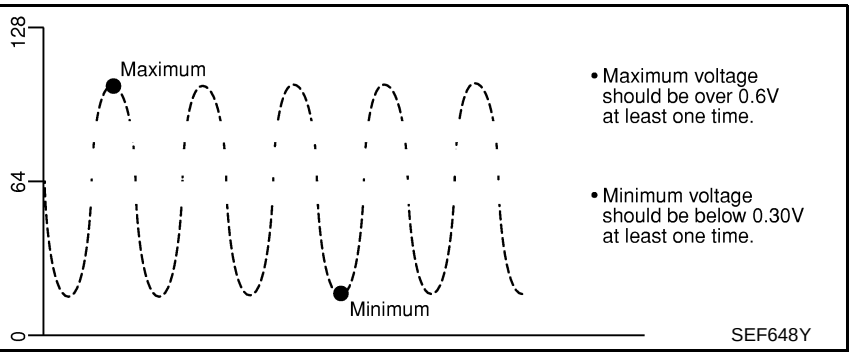
1. Start engine and warm it up to normal operating temperature.
2. Select “MANU TRIG” and adjust “TRIGGER POINT” to 100% in “DATA MONITOR” mode with CONSULT-II.
3. Select “HO2S1 (B1)” and “HO2S1 MNTR (B1)”.
4. Hold engine speed at 2,000 rpm under no load during the following steps.
5. Touch “RECORD” on CONSULT-II screen.



6. Check the following.
   - "HO2S1 MNTR (B1)" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" 5 times in 10 seconds.
     5 times (cycles) are counted as shown at right.
   - "HO2S1 (B1)" voltage goes above 0.6V at least once.
   - "HO2S1 (B1)" voltage goes below 0.3V at least once.
   - "HO2S1 (B1)" voltage never exceeds 1.0V.



Trigger	ENG SPEED	HO2S1 (B1)
	rpm	V
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX

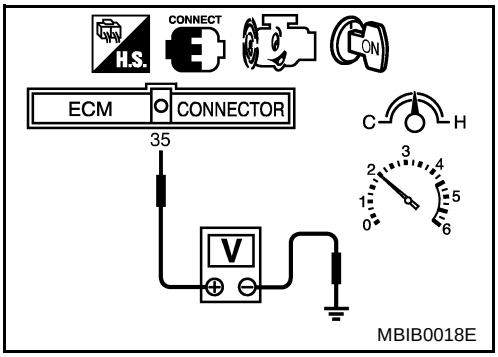


CAUTION:
- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

⊗ Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 (HO2S1 signal) and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no load.
   - The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds.
   - The maximum voltage is over 0.6V at least one time.
   - The minimum voltage is below 0.3V at least one time.
   - The voltage never exceeds 1.0V.

   1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V
   2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V



CAUTION:
- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

EBS00FUN

HEATED OXYGEN SENSOR 1

Refer to EM-23, "EXHAUST MANIFOLD AND CATALYTIC CONVERTER" .

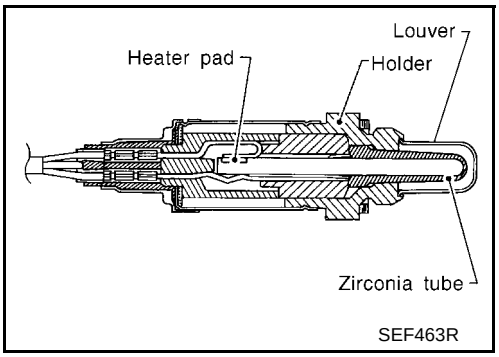
DTC P0134, P0154 HO2S1 (QG18DE)

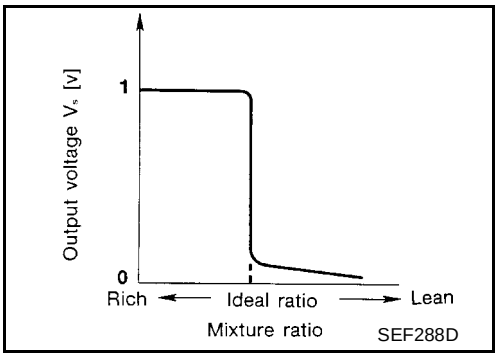
PFP:22690

Component Description

EBS00FUO

The heated oxygen sensor 1 is placed into the EXHAUST MANIFOLD. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.





CONSULT-II Reference Value in Data Monitor Mode

EBS00FUP

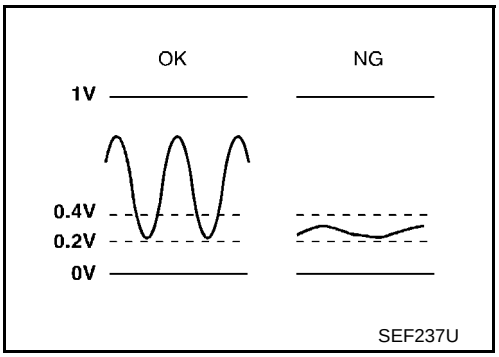
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S1 (B1) HO2S1 (B2)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ⟷ Approx. 0.6 - 1.0V
HO2S1 MNTR (B1) HO2S1 MNTR (B2)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	LEAN ⟷ RICH Changes more than 5 times during 10 seconds.

On Board Diagnosis Logic

EBS00FUQ

Under the condition in which the heated oxygen sensor 1 signal is not input, the ECM circuits will read a continuous approximately 0.3V. Therefore, for this diagnosis, the time that output voltage is within 200 to 400 mV range is monitored, and the diagnosis checks that this time is not inordinately long.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0134 0134 (Bank 1) P0154 0154 (Bank 2)	Heated oxygen sensor 1 circuit no activity detected	The voltage from the sensor is constantly approx. 0.3V.	● Harness or connectors (The sensor circuit is open or shorted.) ● Heated oxygen sensor 1

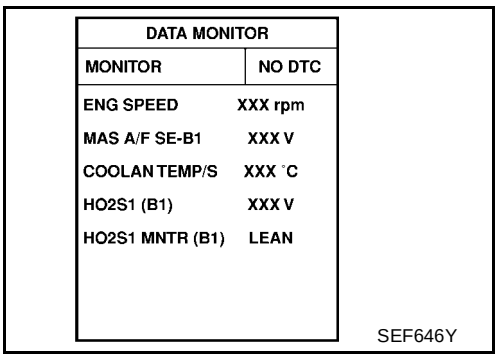
Overall Function Check

EBS00FUS

Use this procedure to check the overall function of the heated oxygen sensor 1 circuit. During this check, a 1st trip DTC might not be confirmed.

WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “MANU TRIG” in “DATA MONITOR” mode with CONSULT-II, and select “HO2S1 (B1)” and “HO2S1 (B2)”.
3. Hold engine speed at 2,000 rpm under no load.
4. Make sure that the indications do not remain in the range between 0.2 to 0.4V.
5. If NG, go to EC-703, "Diagnostic Procedure" .

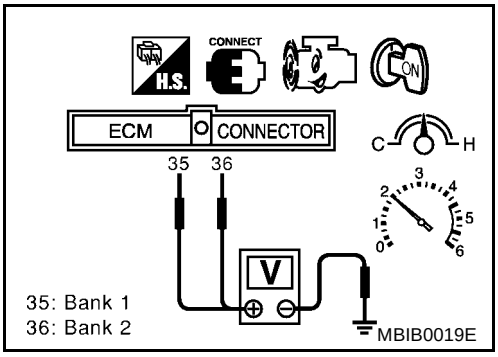


WITHOUT CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 [HO2S1 (B1) signal] or 36 [HO2S1 (B2) signal] and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no load.

– The voltage does not remain in the range of 0.2 - 0.4V.

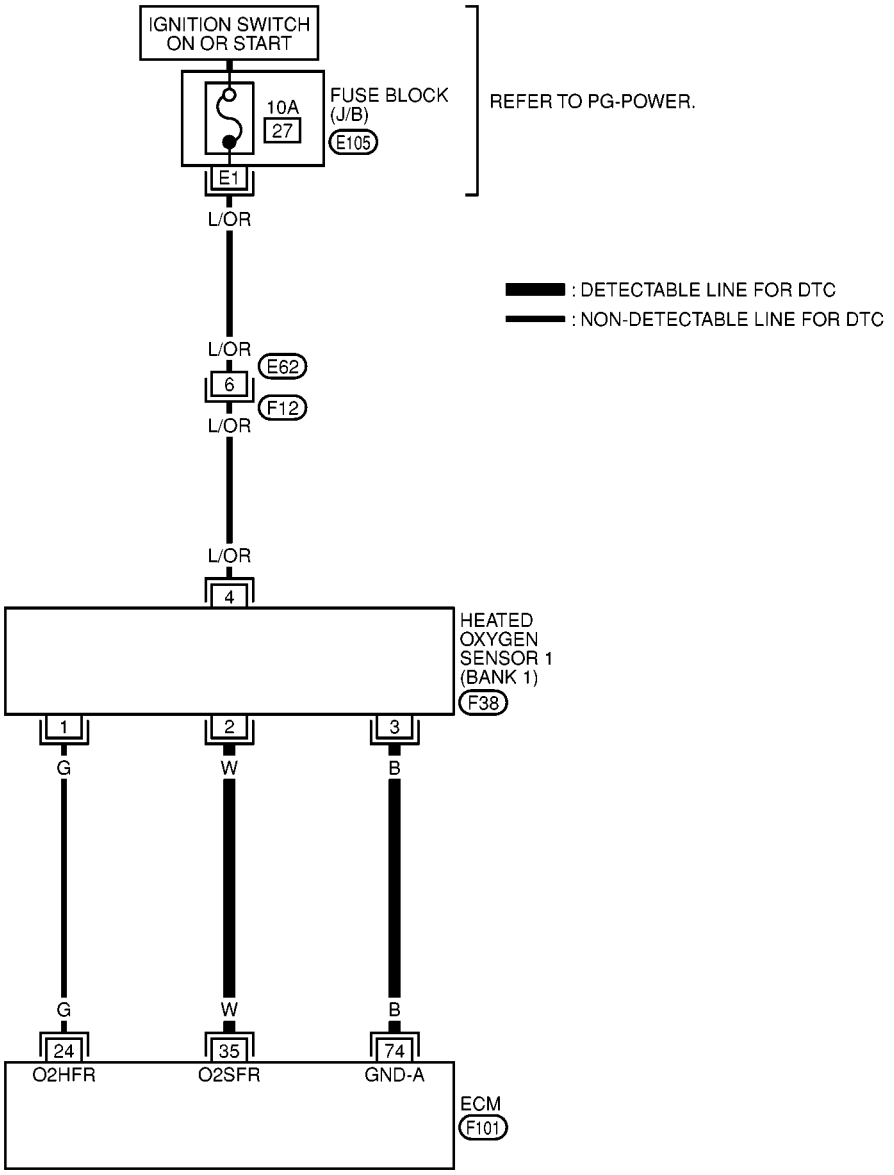
4. If NG, go to EC-703, "Diagnostic Procedure" .

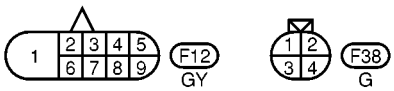


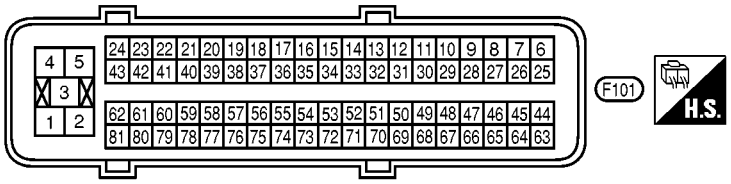
Wiring Diagram
BANK 1

EBS00FUT

EC-O2S1B1-01







REFER TO THE FOLLOWING.
E105 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0052E

Specification data are reference values and are measured between each terminal and ground.

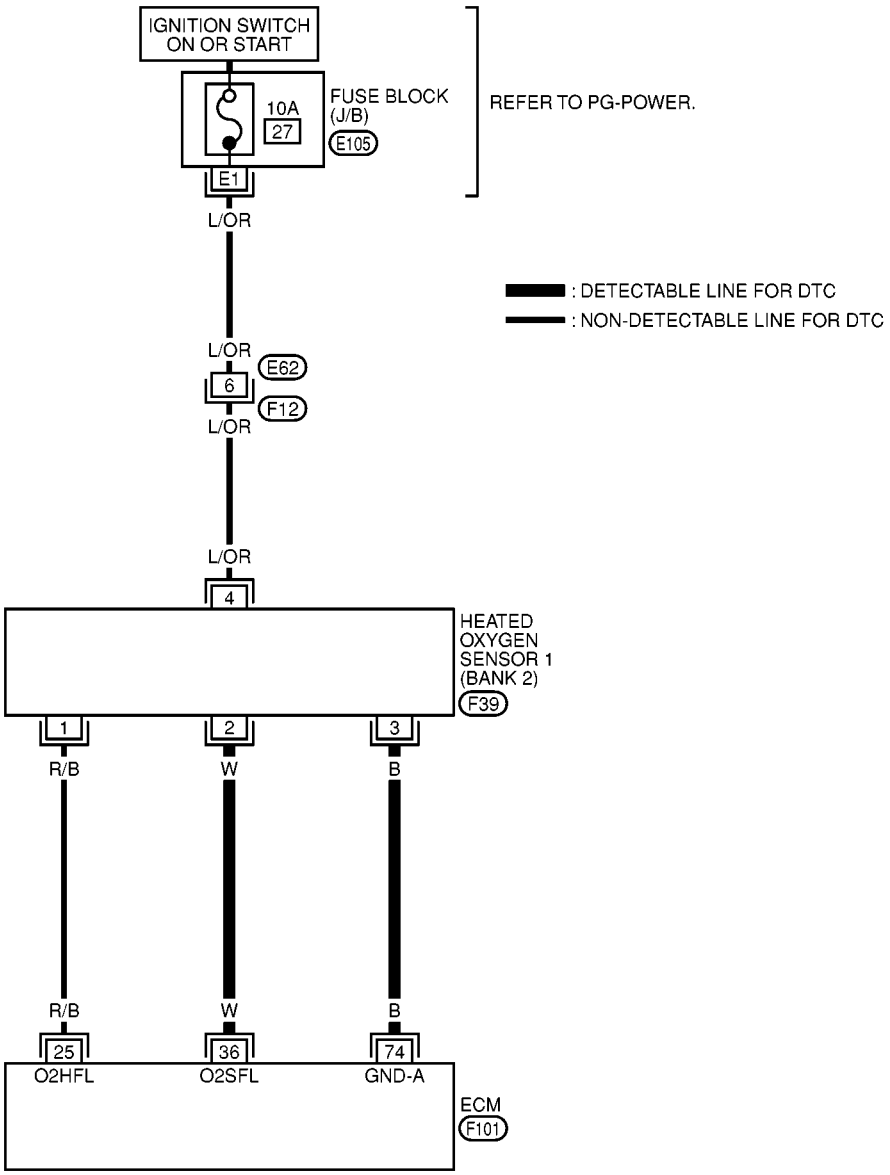
CAUTION:

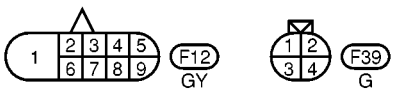
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

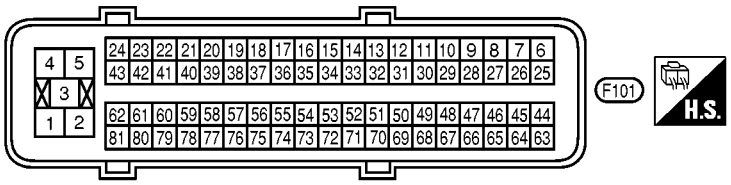
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
35	W	Heated oxygen sensor 1 (bank 1)	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V (Periodically change)
74	B	Heated oxygen sensor ground	**[Engine is running]** ● Idle speed	Approximately 0V

BANK 2

EC-O2S1B2-01







REFER TO THE FOLLOWING.
E105 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0054E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
36	W	Heated oxygen sensor 1 (bank 2)	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V (Periodically change)
74	B	Heated oxygen sensor ground	**[Engine is running]** ● Idle speed	Approximately 0V

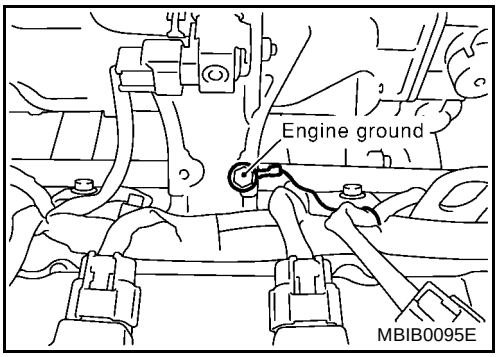
Diagnostic Procedure

EBS00FUU

1. INSPECTION START

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

>> GO TO 2.



2. CHECK HO2S1 GROUND CIRCUIT FOR OPEN AND SHORT

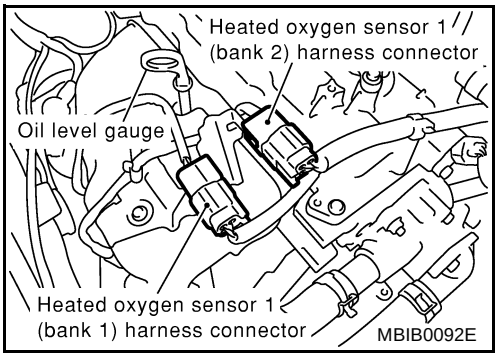
1. Disconnect heated oxygen sensor 1 harness connector.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 74 and HO2S1 terminal 3.
   Refer to Wiring Diagram.

   Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.



3. CHECK HO2S1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal and HO2S1 terminal as follows. Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM	Sensor	
P0134	35	2	1
P0154	36	2	2

Continuity should exist.

2. Check harness continuity between the following terminals and ground. Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM	Sensor	
P0134	35	2	1
P0154	36	2	2

Continuity should not exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK HEATED OXYGEN SENSOR 1

Refer to EC-704, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace malfunctioning heated oxygen sensor 1.

5. CHECK INTERMITTENT INCIDENT

Refer to EC-656, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

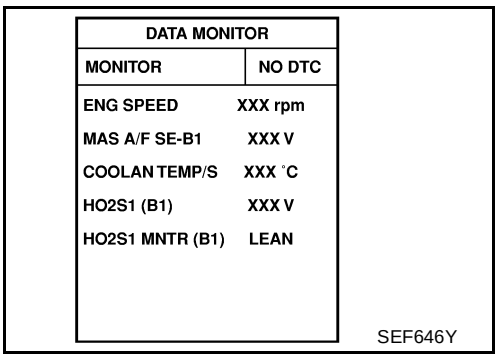
EBS00FUV

HEATED OXYGEN SENSOR 1

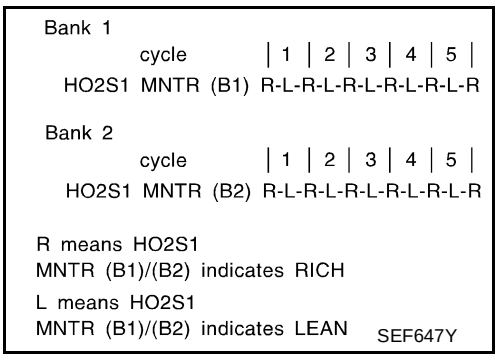
With CONSULT-II

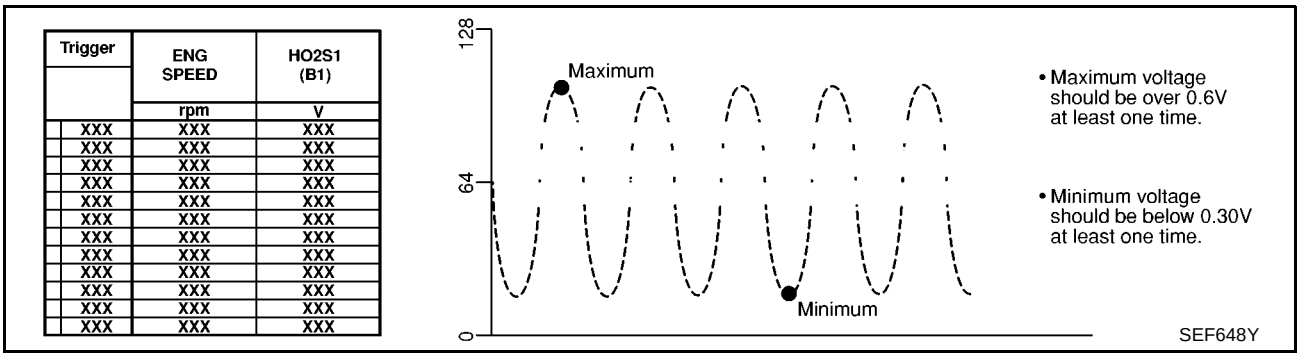
1. Start engine and warm it up to normal operating temperature.
2. Select “MANU TRIG” and adjust “TRIGGER POINT” to 100% in “DATA MONITOR” mode with CONSULT-II.
3. Select “HO2S1 (B1)/(B2)” and “HO2S1 MNTR (B1)/(B2)”.
4. Hold engine speed at 2,000 rpm under no load during the following steps.

5. Touch “RECORD” on CONSULT-II screen.



6. Check the following.
   - “HO2S1 MNTR (B1)/(B2)” in “DATA MONITOR” mode changes from “RICH” to “LEAN” to “RICH” 5 times in 10 seconds.
     5 times (cycles) are counted as shown at right.
   - “HO2S1 (B1)/(B2)” voltage goes above 0.6V at least once.
   - “HO2S1 (B1)/(B2)” voltage goes below 0.3V at least once.
   - “HO2S1 (B1)/(B2)” voltage never exceeds 1.0V.





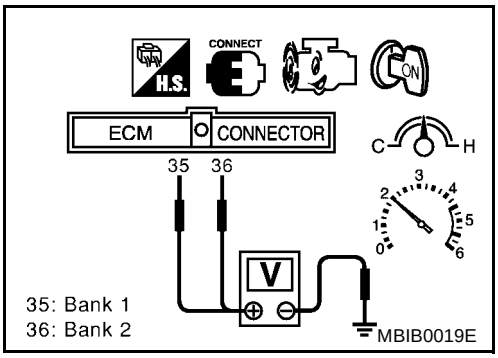
CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 [HO2S1 (B1) signal] or 36 [HO2S1 (B2) signal] and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no load.
   - The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds.
   - The maximum voltage is over 0.6V at least one time.
   - The minimum voltage is below 0.3V at least one time.
   - The voltage never exceeds 1.0V.

   1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V
   2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V



CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

EBS00FUW

HEATED OXYGEN SENSOR 1

Refer to EM-23, "EXHAUST MANIFOLD AND CATALYTIC CONVERTER" .

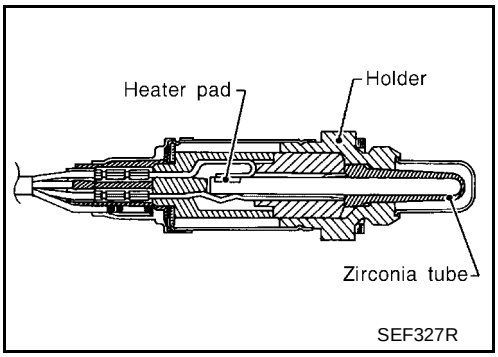
DTC P0138 HO2S2 (QG16DE)

PFP:226A0

Component Description

EBS00H6M

The heated oxygen sensor 2, after three way catalyst, monitors the oxygen level in the exhaust gas.
Even if switching characteristics of the heated oxygen sensor 1 are shifted, the air fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.
This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.
Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.



CONSULT-II Reference Value in Data Monitor Mode

EBS00H6N

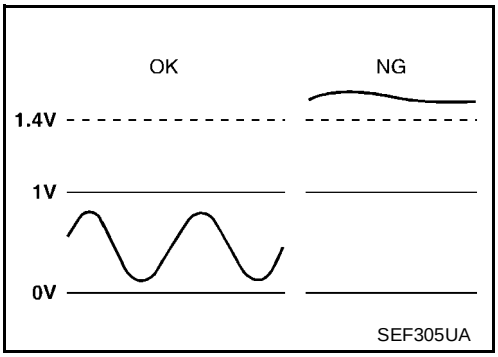
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S2 (B1)	● Engine: After warming up	Revving engine from idle to 3,000 rpm quickly.	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S2 MNTR (B1)	● Engine: After warming up	Revving engine from idle to 3,000 rpm quickly.	LEAN ←→ RICH

On Board Diagnosis Logic

EBS00H6O

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the heated oxygen sensor 1. The oxygen storage capacity before the three way catalyst causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the voltage is unusually high during the various driving condition such as fuel-cut.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0138 0138	Heated oxygen sensor 2 circuit high voltage	An excessively high voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Heated oxygen sensor 2

DTC Confirmation Procedure

EBS00H6P

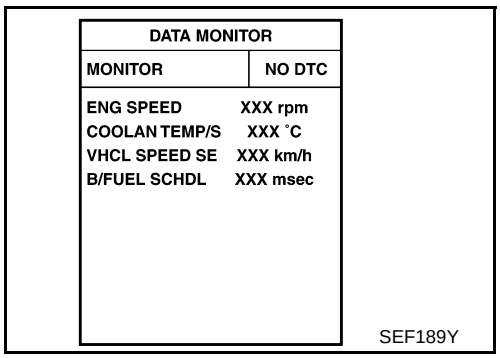
CAUTION:
Always drive vehicle at a safe speed.

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
3. Stop vehicle with engine running.

4. Let engine idle for 1 minute.
5. If 1st trip DTC is detected, go to EC-710, "Diagnostic Procedure" .



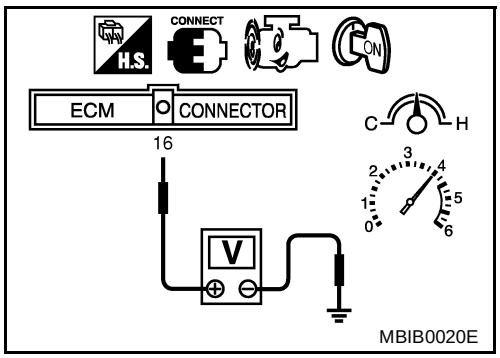
Overall Function Check

EBS00H6Q

Use this procedure to check the overall function of the heated oxygen sensor 2 circuit. During this check, a 1st trip DTC might not be confirmed.

WITHOUT CONSULT-II

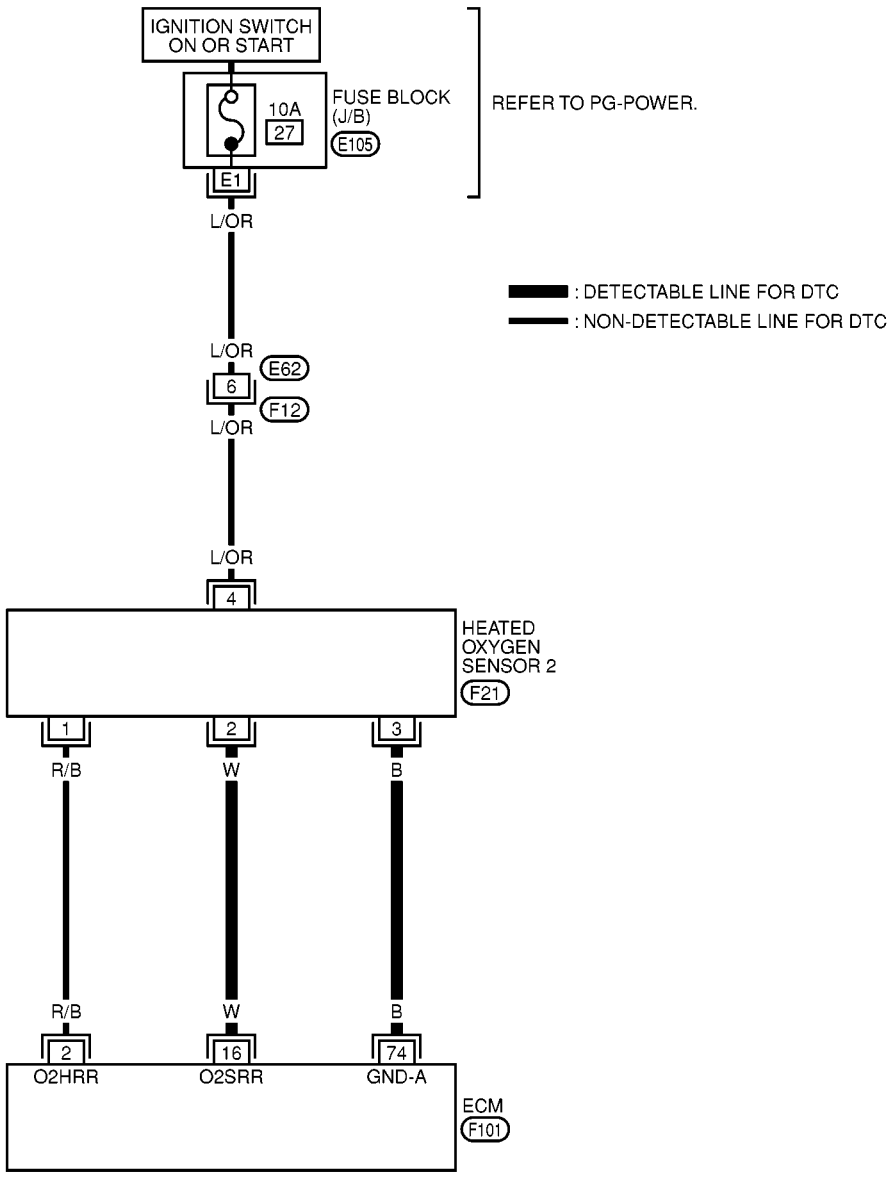
1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Set voltmeter probes between ECM terminal 16 (HO2S2 signal) and engine ground.
4. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be below 1.4V during this procedure.
5. If NG, go to EC-710, "Diagnostic Procedure" .

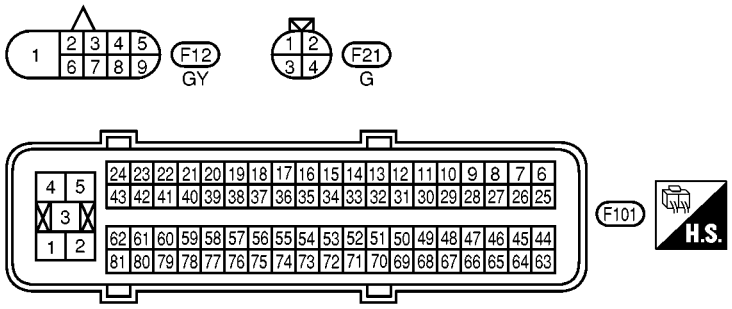


Wiring Diagram

EBS00H6R

EC-HO2S2-01





REFER TO THE FOLLOWING.
E105 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0050E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
16	W	Heated oxygen sensor 2	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V
74	B	Heated oxygen sensor ground	**[Engine is running]** ● Idle speed	Approximately 0V

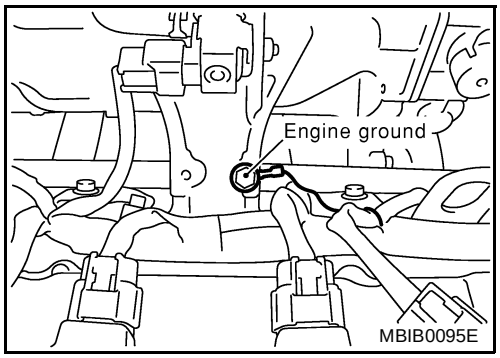
Diagnostic Procedure

EBS00H6S

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

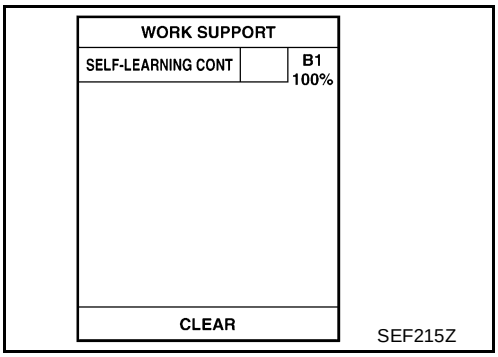
>> GO TO 2.



2. CLEAR THE SELF-LEARNING DATA

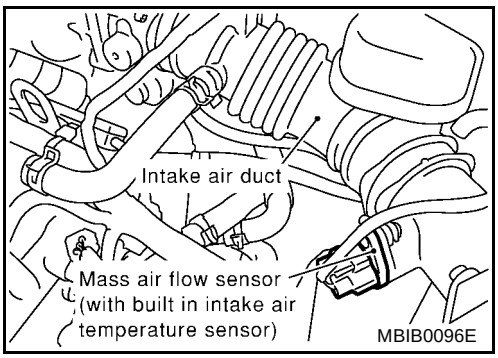
With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching “CLEAR”.
4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0172 detected?
   Is it difficult to start engine?



Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF”.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure that DTC P0102 is displayed.
6. Erase the DTC memory. Refer to EC-73, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
7. Make sure that DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0172 detected?
   Is it difficult to start engine?



Yes or No

Yes >> Perform trouble diagnosis for DTC P0172. Refer to EC-299 .
No >> GO TO 3.

3. CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

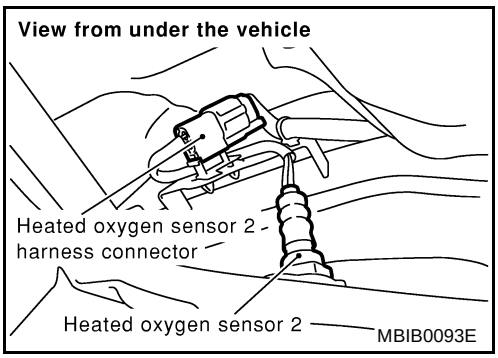
1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 2 harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminal 74 and HO2S2 terminal 3.
   Refer to Wiring Diagram.

   Continuity should exist.

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.



4. CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 16 and HO2S2 terminal 2.
   Refer to Wiring Diagram.

   Continuity should exist.

2. Check harness continuity between ECM terminal 16 or HO2S2 terminal 2 and ground.
   Refer to Wiring Diagram.

   Continuity should not exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK HEATED OXYGEN SENSOR 2

Refer to EC-712, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace heated oxygen sensor 2.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-656, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

EBS00H6T

HEATED OXYGEN SENSOR 2

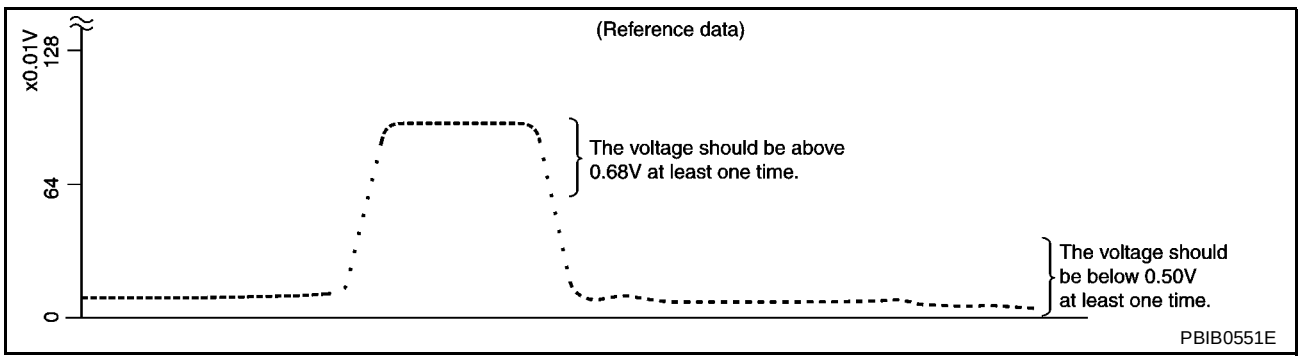
With CONSULT-II

1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)” as the monitor item with CONSULT-II.

ACTIVE TEST	
FUEL INJECTION	25 %
MONITOR	
ENG SPEED	XXX rpm
HO2S1 (B1)	XXX V
HO2S2 (B1)	XXX V
HO2S1 MNTR (B1)	RICH
HO2S2 MNTR (B1)	RICH

SEF662Y

4. Check “HO2S2 (B1)” at idle speed when adjusting “FUEL INJECTION” to ±25%.



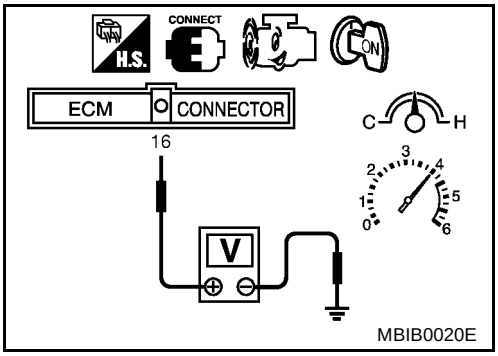
"HO2S2 (B1)" should be above 0.68V at least once when the "FUEL INJECTION" is +25%.
"HO2S2 (B1)" should be below 0.50V at least once when the "FUEL INJECTION" is −25%.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Set voltmeter probes between ECM terminal 16 (HO2S2 signal) and engine ground.
4. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be above 0.68V at least once during this procedure.
   If the voltage is above 0.68V at step 4, step 5 is not necessary.
5. Keep vehicle idling for 10 minutes, then check voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in 3rd gear position.
   The voltage should be below 0.50V at least once during this procedure.
6. If NG, replace heated oxygen sensor 2.



CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

EBS00H6U

HEATED OXYGEN SENSOR 2

Refer to EX-3, "EXHAUST SYSTEM" .

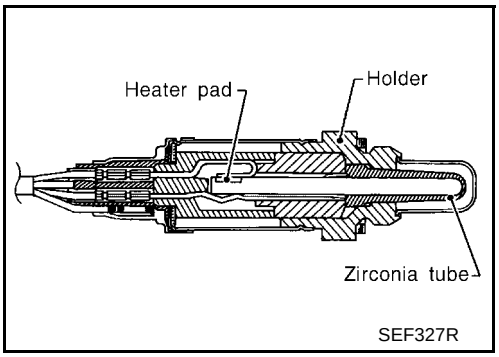
DTC P0138, P0158 HO2S2 (QG18DE)

PFP:226A0

Component Description

EBS00H6V

The heated oxygen sensor 2, after three way catalyst, monitors the oxygen level in the exhaust gas on each bank.
Even if switching characteristics of the heated oxygen sensor 1 are shifted, the air fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.
This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.
Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.



CONSULT-II Reference Value in Data Monitor Mode

EBS00H6W

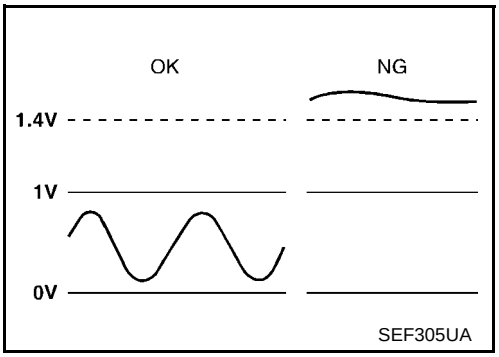
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S2 (B1) HO2S2 (B2)	● Engine: After warming up	Revving engine from idle to 3,000 rpm quickly.	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S2 MNTR (B1) HO2S2 MNTR (B2)	● Engine: After warming up	Revving engine from idle to 3,000 rpm quickly.	LEAN ←→ RICH

On Board Diagnosis Logic

EBS00H6X

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the heated oxygen sensor 1. The oxygen storage capacity before the three way catalyst causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the voltage is unusually high during the various driving condition such as fuel-cut.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0138 0138 (Bank 1)	Heated oxygen sensor 2 circuit high voltage	An excessively high voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Heated oxygen sensor 2
P0158 0158 (Bank 2)			

DTC Confirmation Procedure

EBS00H6Y

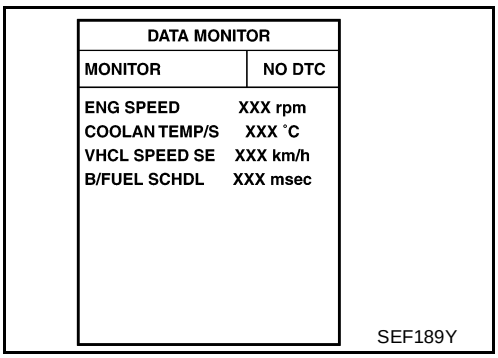
CAUTION:
Always drive vehicle at a safe speed.

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
3. Stop vehicle with engine running.

4. Let engine idle for 1 minute.
5. If 1st trip DTC is detected, go to EC-719, "Diagnostic Procedure" .



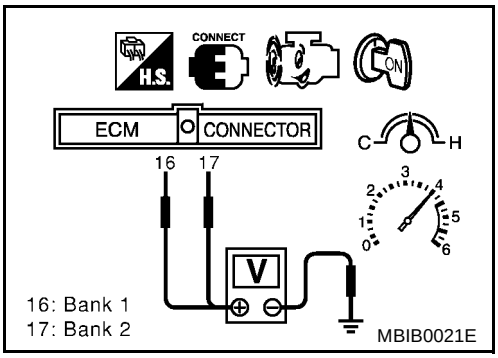
Overall Function Check

EBS00H6Z

Use this procedure to check the overall function of the heated oxygen sensor 2 circuit. During this check, a 1st trip DTC might not be confirmed.

WITHOUT CONSULT-II

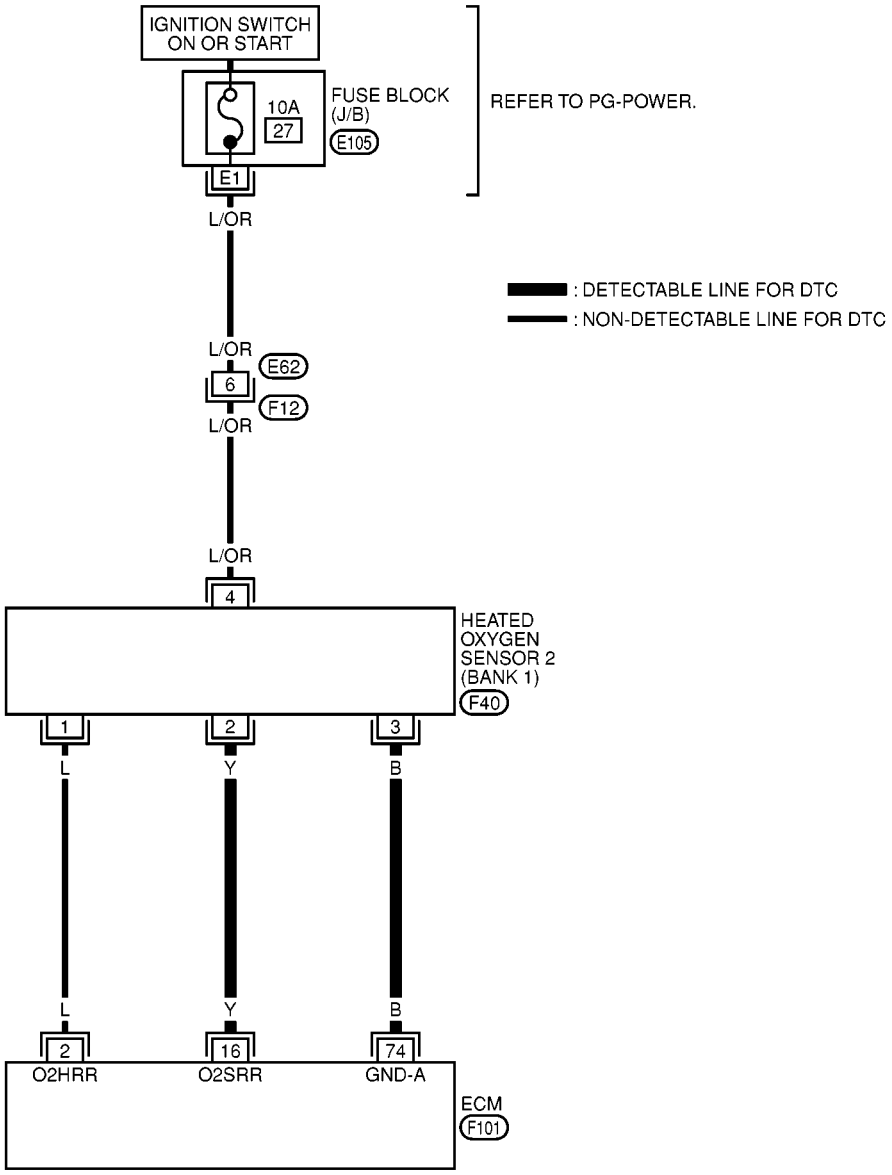
1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Set voltmeter probes between ECM terminal 16 [HO2S2 (B1) signal] or 17 [HO2S2 (B2) signal] and engine ground.
4. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be below 1.4V during this procedure.
5. If NG, go to EC-719, "Diagnostic Procedure" .

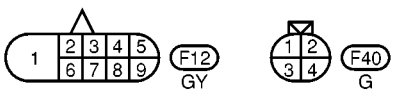


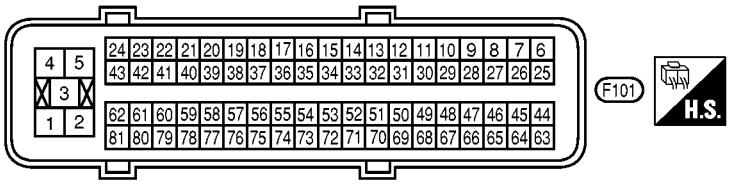
Wiring Diagram
BANK 1

EBS00H70

EC-O2S2B1-01







REFER TO THE FOLLOWING.
E105 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0056E

Specification data are reference values and are measured between each terminal and ground.

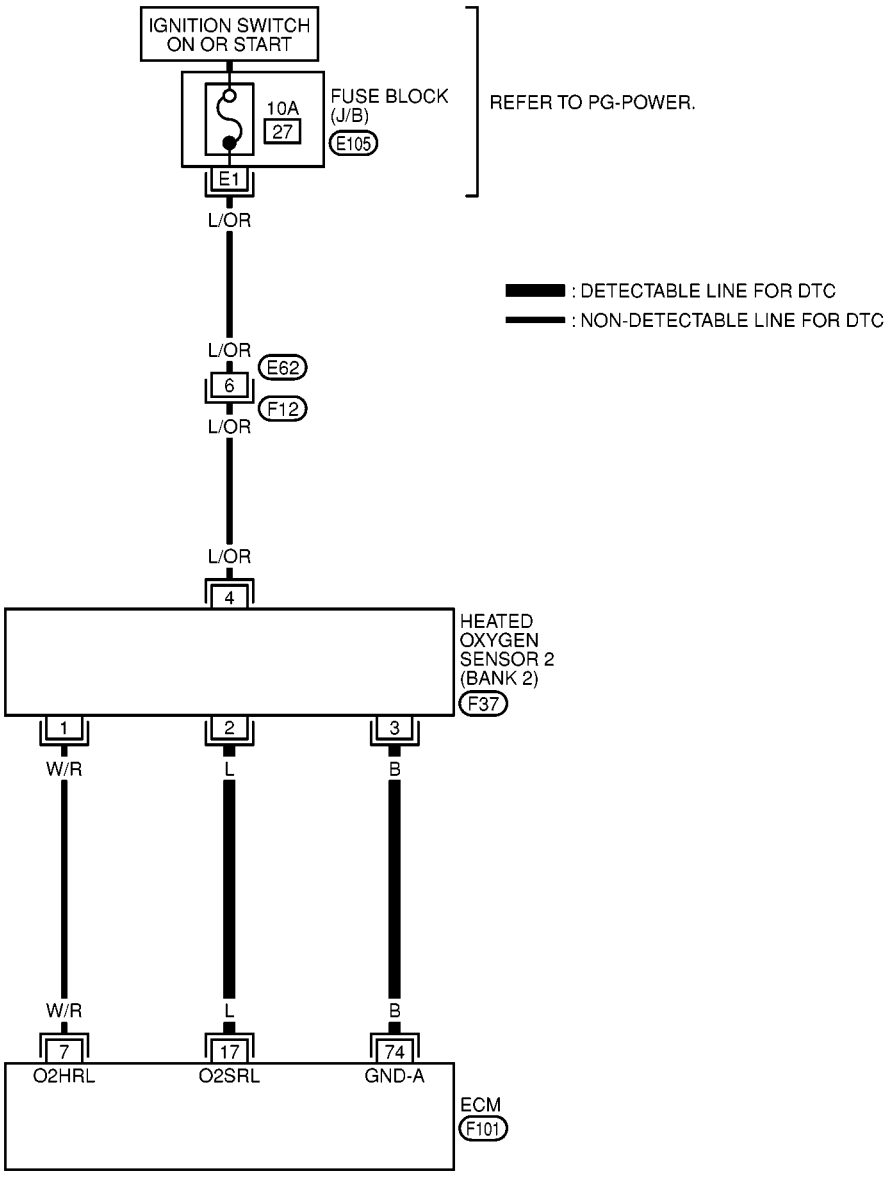
CAUTION:

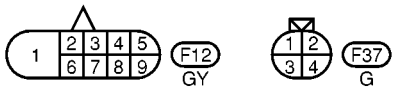
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

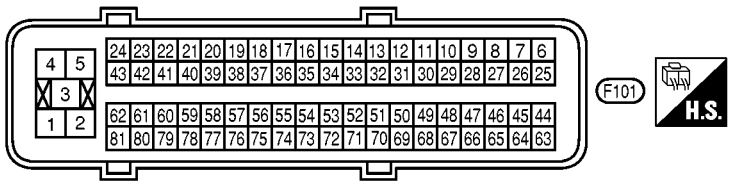
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
16	Y	Heated oxygen sensor 2 (bank 1)	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V
74	B	Heated oxygen sensor ground	**[Engine is running]** ● Idle speed	Approximately 0V

BANK 2

EC-O2S2B2-01







REFER TO THE FOLLOWING.
E105 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0058E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
17	L	Heated oxygen sensor 2 (bank 2)	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V
74	B	Heated oxygen sensor ground	**[Engine is running]** ● Idle speed	Approximately 0V

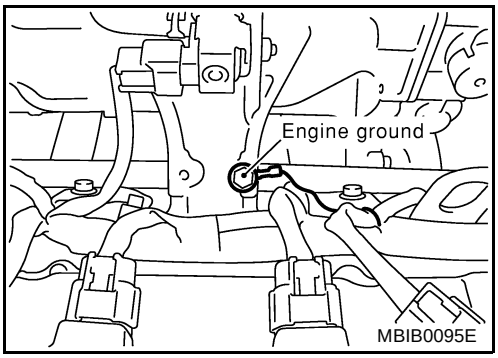
Diagnostic Procedure

EBS00H71

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

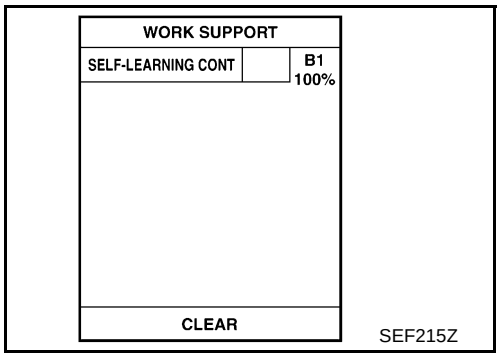
>> GO TO 2.



2. CLEAR THE SELF-LEARNING DATA

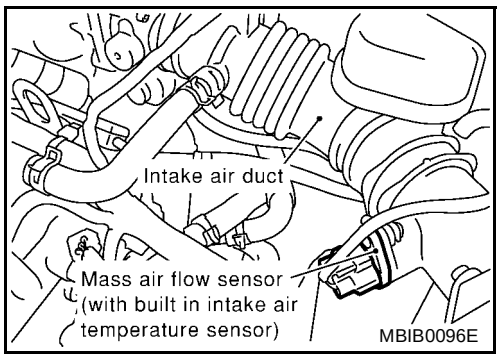
With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching “CLEAR”.
4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0172 or P0175 detected?
   Is it difficult to start engine?



Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF”.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure that DTC P0102 is displayed.
6. Erase the DTC memory. Refer to EC-73, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
7. Make sure that DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0172 or P0175 detected?
   Is it difficult to start engine?



Yes or No

Yes >> Perform trouble diagnosis for DTC P0172, P0175. Refer to EC-305 .
No >> GO TO 3.

3. CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

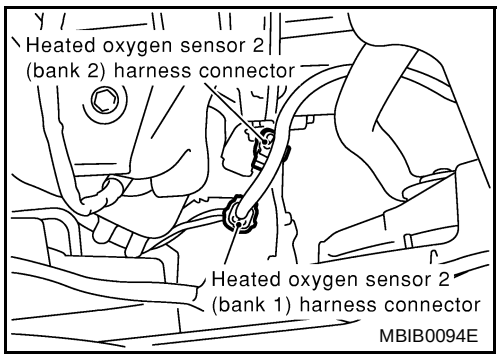
1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 2 harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminal 74 and HO2S2 terminal 3.
   Refer to Wiring Diagram.

   Continuity should exist.

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.



4. CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal and HO2S2 terminal as follows. Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM	Sensor	
P0138	16	2	1
P0158	17	2	2

Continuity should exist.

2. Check harness continuity between the following terminals and ground. Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM	Sensor	
P0138	16	2	1
P0158	17	2	2

Continuity should not exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK HEATED OXYGEN SENSOR 2

Refer to EC-721, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace heated oxygen sensor 2.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-656, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

EBS00H72

HEATED OXYGEN SENSOR 2

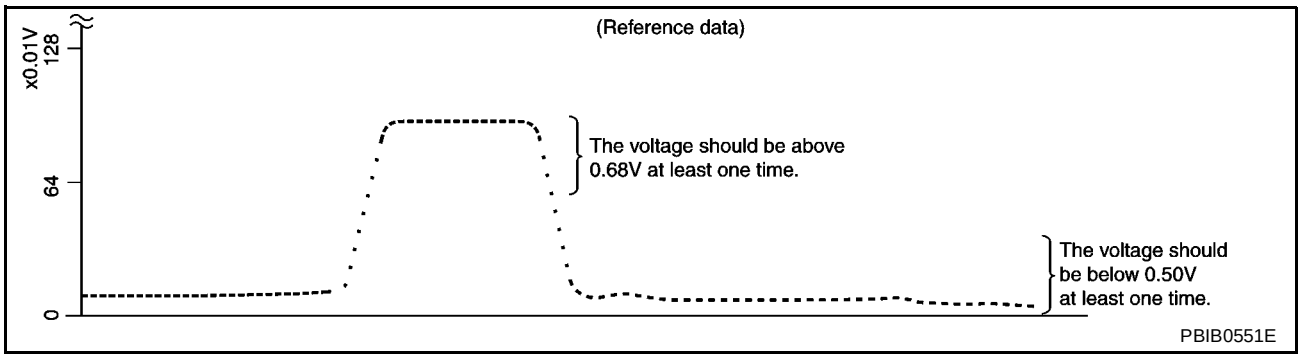
With CONSULT-II

1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)/(B2)” as the monitor item with CONSULT-II.

ACTIVE TEST	
FUEL INJECTION	25 %
MONITOR	
ENG SPEED	XXX rpm
HO2S1 (B1)	XXX V
HO2S2 (B1)	XXX V
HO2S1 MNTR (B1)	RICH
HO2S2 MNTR (B1)	RICH

SEF662Y

4. Check “HO2S2 (B1)/(B2)” at idle speed when adjusting “FUEL INJECTION” to ±25%.



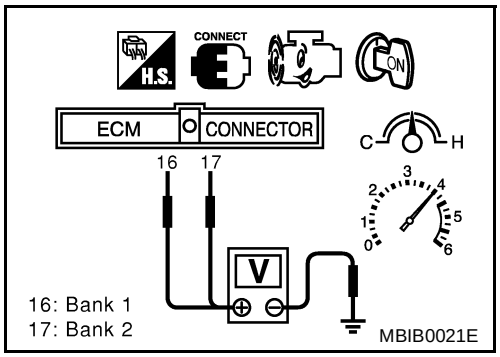
“HO2S2 (B1)/(B2)” should be above 0.68V at least once when the “FUEL INJECTION” is +25%.
“HO2S2 (B1)/(B2)” should be below 0.50V at least once when the “FUEL INJECTION” is −25%.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Set voltmeter probes between ECM terminal 16 [HO2S2 (B1) signal] or 17 [HO2S2 (B2) signal] and engine ground.
4. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be above 0.68V at least once during this procedure.
   If the voltage is above 0.68V at step 4, step 5 is not necessary.
5. Keep vehicle idling for 10 minutes, then check voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in “D” position with “OD” OFF (A/T), 3rd gear position (M/T).
   The voltage should be below 0.50V at least once during this procedure.
6. If NG, replace heated oxygen sensor 2.



CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

EBS00H73

HEATED OXYGEN SENSOR 2

Refer to EX-3, "EXHAUST SYSTEM"

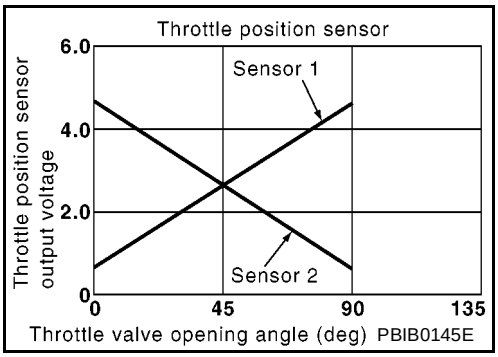
DTC P0221 TP SENSOR

PFP:16119

Component Description

EBS00EVA

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.
The throttle position sensor has the two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.



CONSULT-II Reference Value in Data Monitor Mode

EBS00EVB

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
THRTL SEN1 THRTL SEN2	● Ignition switch: ON (Engine stopped) ● Shift lever: D (A/T model) 1st (M/T model)	Accelerator pedal: Fully released	More than 0.36V
		Accelerator pedal: Fully depressed	Less than 4.75V

On Board Diagnosis Logic

EBS00EVC

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0221 0221	Throttle position sensor circuit range/performance problem	Rationally incorrect voltage is sent to ECM compared with the signals from TP sensor 1 and TP sensor 2.	● Harness or connector (The TP sensor 1 and 2 circuit is open or shorted.) ● Electric throttle control actuator (TP sensor 1 and 2)

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MI lights up.

Engine operation condition in fail-safe mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.

DTC Confirmation Procedure

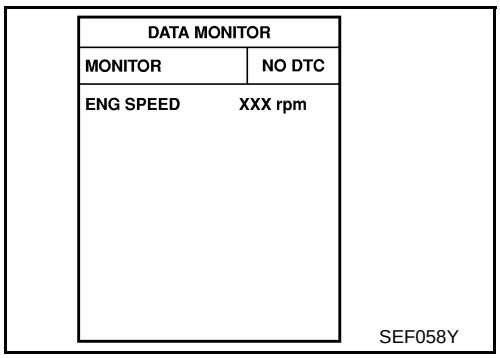
EBS00EVD

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 8V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.

2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-726, "Diagnostic Procedure" .



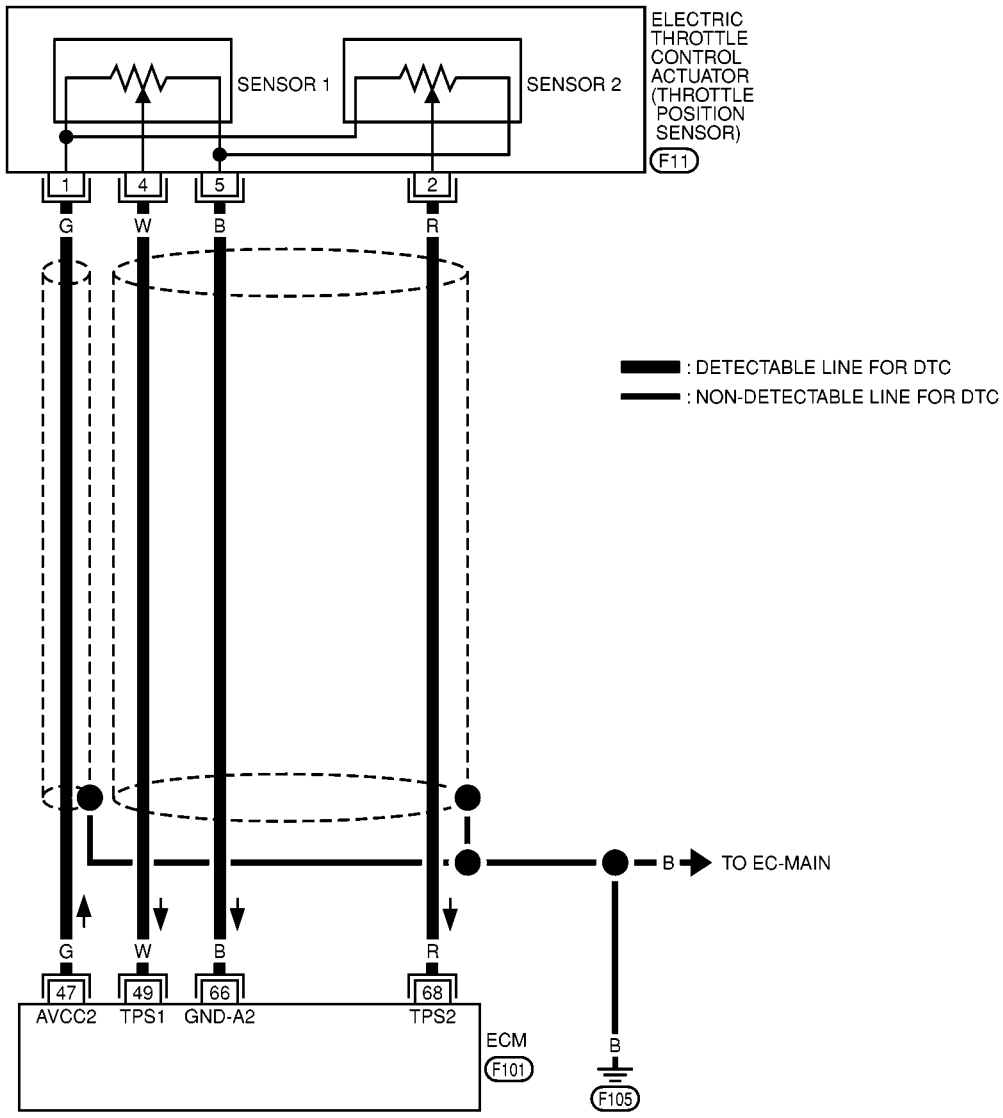
WITHOUT CONSULT-II

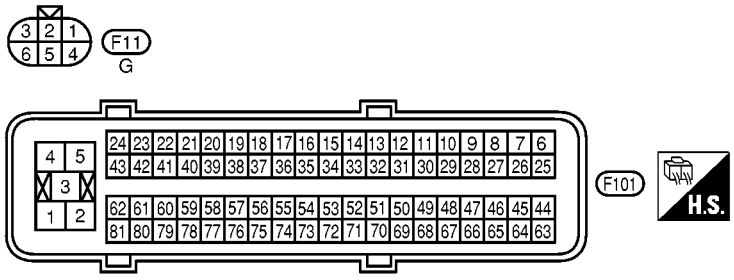
1. Start engine and let it idle for 1 second.
2. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
3. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
4. If DTC is detected, go to EC-726, "Diagnostic Procedure" .

Wiring Diagram

EBS00EVE

EC-TPS3-01





MBWA0138E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
47	G	Sensor power supply (Throttle position sensor)	**[Ignition switch "ON"]**	Approximately 5V
49	W	Throttle position sensor 1	**[Ignition switch "ON"]** ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully released	More than 0.36V
			[Ignition switch "ON"] ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully depressed	Less than 4.75V
66	B	Sensor ground (Throttle position sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
68	R	Throttle position sensor 2	**[Ignition switch "ON"]** ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully released	Less than 4.75V
			[Ignition switch "ON"] ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully depressed	More than 0.36V

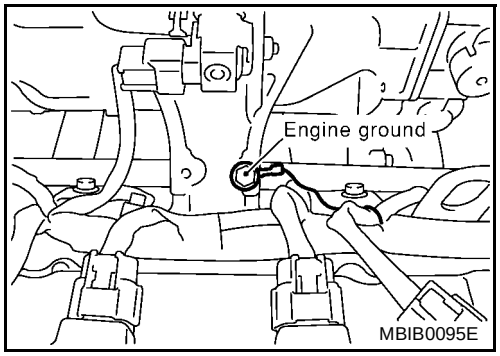
Diagnostic Procedure

EBS00EVF

1. RETIGHTEN GROUND SCREWS

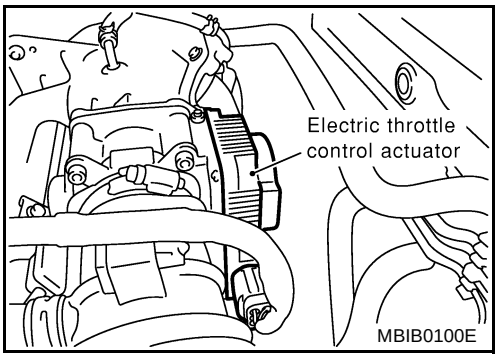
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



2. CHECK THROTTLE POSITION SENSOR POWER SUPPLY CIRCUIT

1. Disconnect electric throttle control actuator harness connector.
2. Turn ignition switch “ON”.

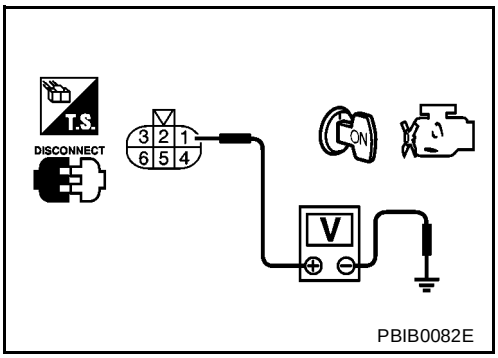


3. Check voltage between electric throttle control actuator terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 5V

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.



3. CHECK THROTTLE POSITION SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 66 and electric throttle control actuator terminal 5. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK THROTTLE POSITION SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 49 and electric throttle control actuator terminal 4, ECM terminal 68 and electric throttle control actuator terminal 2. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK THROTTLE POSITION SENSOR

Refer to EC-728, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-589, "Throttle Valve Closed Position Learning" .
3. Perform EC-589, "Idle Air Volume Learning" .

>> **INSPECTION END**

7. CHECK INTERMITTENT INCIDENT

Refer to EC-656, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

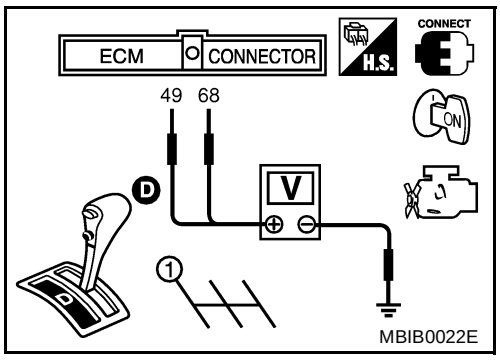
Component Inspection

EBS00EVG

THROTTLE POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Perform EC-589, "Throttle Valve Closed Position Learning" .
3. Turn ignition switch “ON”.
4. Set selector lever to “D” position (A/T models) or “1st” position (M/T models).
5. Check voltage between ECM terminals 49 (TP sensor 1 signal), 68 (TP sensor 2 signal) and engine ground under the following conditions.

Terminal	Accelerator pedal	Voltage
49 (Throttle position sensor 1)	Fully released	More than 0.36V
	Fully depressed	Less than 4.75V
68 (Throttle position sensor 2)	Fully released	Less than 4.75V
	Fully depressed	More than 0.36V



6. If NG, replace electric throttle control actuator and go to the next step.
7. Perform EC-589, "Throttle Valve Closed Position Learning" .
8. Perform EC-589, "Idle Air Volume Learning" .

Remove and Installation

EBS00EVH

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-19, "INTAKE MANIFOLD" .

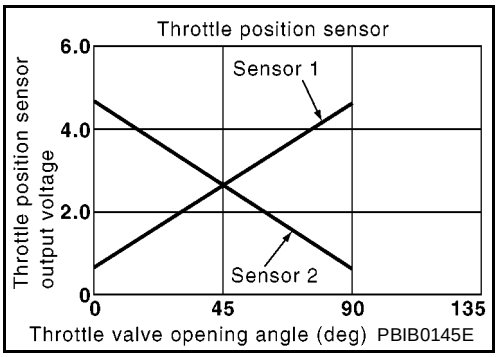
DTC P0222, P0223 TP SENSOR

PFP:16119

Component Description

EBS00EVI

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.
The throttle position sensor has the two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.



CONSULT-II Reference Value in Data Monitor Mode

EBS00EVJ

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
THRTL SEN1	● Ignition switch: ON (Engine stopped) ● Shift lever: D (A/T model) 1st (M/T model)	Accelerator pedal: Fully released	More than 0.36V
		Accelerator pedal: Fully depressed	Less than 4.75V

On Board Diagnosis Logic

EBS00EVK

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0222 0222	Throttle position sensor 1 circuit low input	An excessively low voltage from the TP sensor 1 is sent to ECM.	● Harness or connectors (The TP sensor 1 circuit is open or shorted.) ● Electric throttle control actuator (TP sensor 1)
P0223 0223	Throttle position sensor 1 circuit high input	An excessively high voltage from the TP sensor 1 is sent to ECM.	

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters in fail-safe mode and the MI lights up.

Engine operation condition in fail-safe mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.

DTC Confirmation Procedure

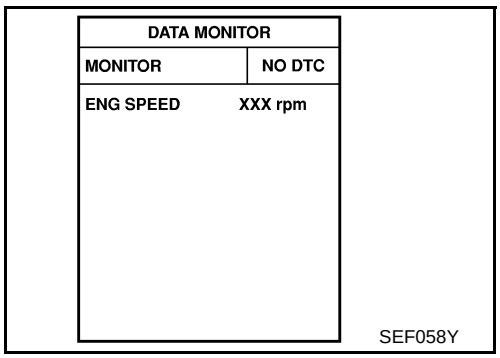
EBS00EVL

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 8V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.

2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-732, "Diagnostic Procedure" .



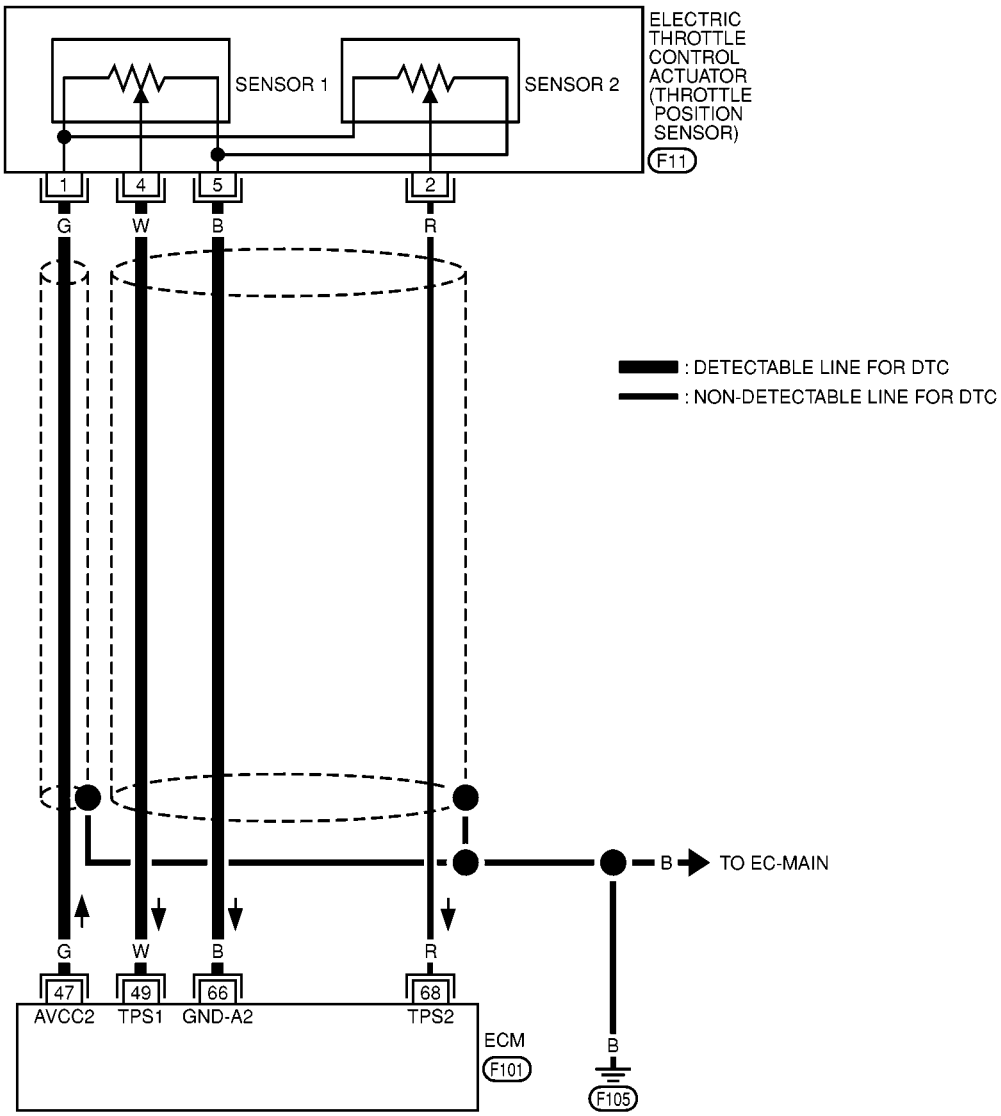
WITHOUT CONSULT-II

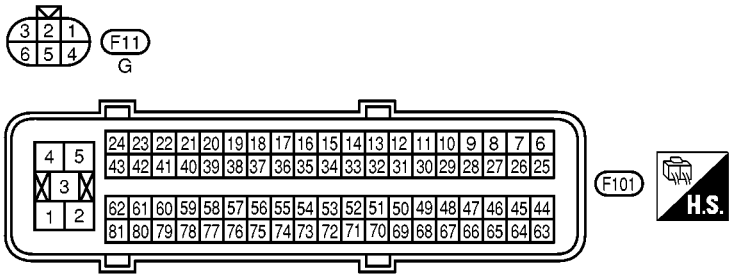
1. Start engine and let it idle for 1 second.
2. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
3. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
4. If DTC is detected, go to EC-732, "Diagnostic Procedure" .

Wiring Diagram

EBS00EVM

EC-TPS1-01





MBWA0136E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
47	G	Throttle position sensor power supply	**[Ignition switch "ON"]**	Approximately 5V
49	W	Throttle position sensor 1	**[Ignition switch "ON"]** ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully released	More than 0.36V
			[Ignition switch "ON"] ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully depressed	Less than 4.75V
66	B	Throttle position sensor ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
68	R	Throttle position sensor 2	**[Ignition switch "ON"]** ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully released	Less than 4.75V
			[Ignition switch "ON"] ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully depressed	More than 0.36V

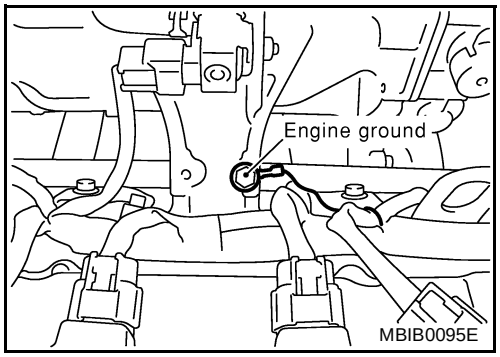
Diagnostic Procedure

EBS00EVN

1. RETIGHTEN GROUND SCREWS

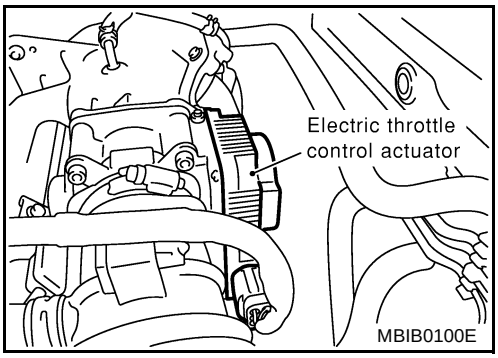
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



2. CHECK THROTTLE POSITION SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect electric throttle control actuator harness connector.
2. Turn ignition switch “ON”.

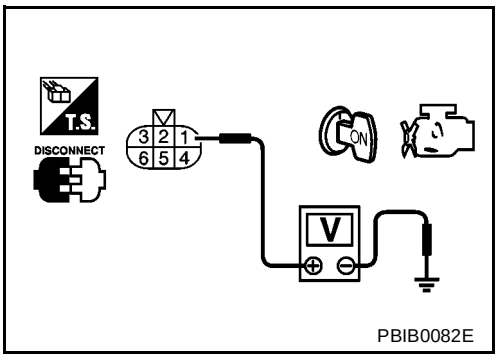


3. Check voltage between electric throttle control actuator terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 5V

OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.



3. CHECK THROTTLE POSITION SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 66 and electric throttle control actuator terminal 5. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK THROTTLE POSITION SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 49 and electric throttle control actuator terminal 4. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK THROTTLE POSITION SENSOR

Refer to EC-734, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-589, "Throttle Valve Closed Position Learning" .
3. Perform EC-589, "Idle Air Volume Learning" .

>> **INSPECTION END**

7. CHECK INTERMITTENT INCIDENT

Refer to EC-656, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

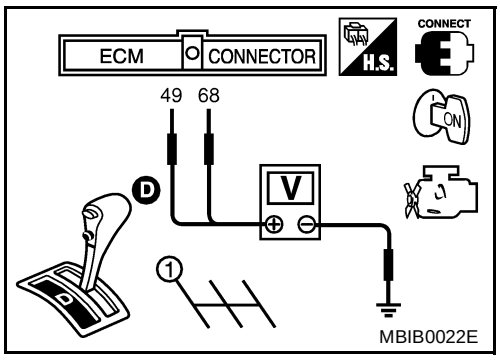
Component Inspection

EBS00EVO

THROTTLE POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Perform EC-589, "Throttle Valve Closed Position Learning" .
3. Turn ignition switch “ON”.
4. Set selector lever to “D” position (A/T models) or “1st” position (M/T models).
5. Check voltage between ECM terminals 49 (TP sensor 1 signal), 68 (TP sensor 2 signal) and engine ground under the following conditions.

Terminal	Accelerator pedal	Voltage
49 (Throttle position sensor 1)	Fully released	More than 0.36V
	Fully depressed	Less than 4.75V
68 (Throttle position sensor 2)	Fully released	Less than 4.75V
	Fully depressed	More than 0.36V



6. If NG, replace electric throttle control actuator and go to the next step.
7. Perform EC-589, "Throttle Valve Closed Position Learning" .
8. Perform EC-589, "Idle Air Volume Learning" .

Remove and Installation

EBS00EVP

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-19, "INTAKE MANIFOLD" .

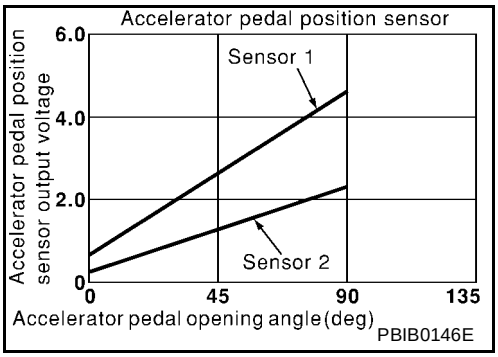
DTC P0226 APP SENSOR

PFP:18002

Component Description

EBS00EVQ

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.
Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometers which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the accelerator pedal and feed the voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.
Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for the engine operation such as fuel cut.



CONSULT-II Reference Value in Data Monitor Mode

EBS00EVR

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
ACCEL SEN1 ACCEL SEN2	● Ignition switch: ON (engine stopped)	Accelerator pedal: Fully released	0.35 - 0.67V
		Accelerator pedal: Fully depressed	More than 3.9V
CLSD THL POS	● Ignition switch: ON	Accelerator pedal: Fully released	ON
		Accelerator pedal: Slightly depressed	OFF

On Board Diagnosis Logic

EBS00EVS

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0226 0226	Accelerator pedal position sensor circuit range/performance problem	Rationally incorrect voltage is sent to ECM compared with the signals from APP sensor 1 and APP sensor 2.	● Harness or connector (The APP sensor 1 and 2 circuit is open or shorted.) ● Accelerator pedal position sensor 1 and 2

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters in fail-safe mode and the MI lights up.

Engine operating condition in fail-safe mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of throttle valve to be slower than the normal condition. So, the acceleration will be poor.

DTC Confirmation Procedure

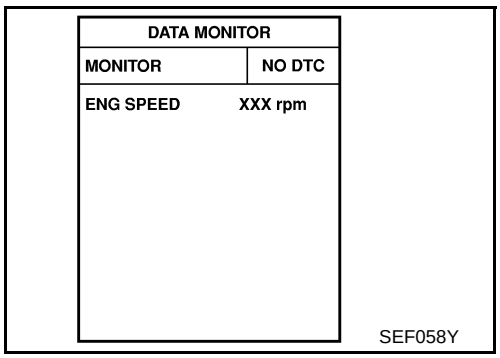
EBS00EVT

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 8V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.

2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-738, "Diagnostic Procedure" .

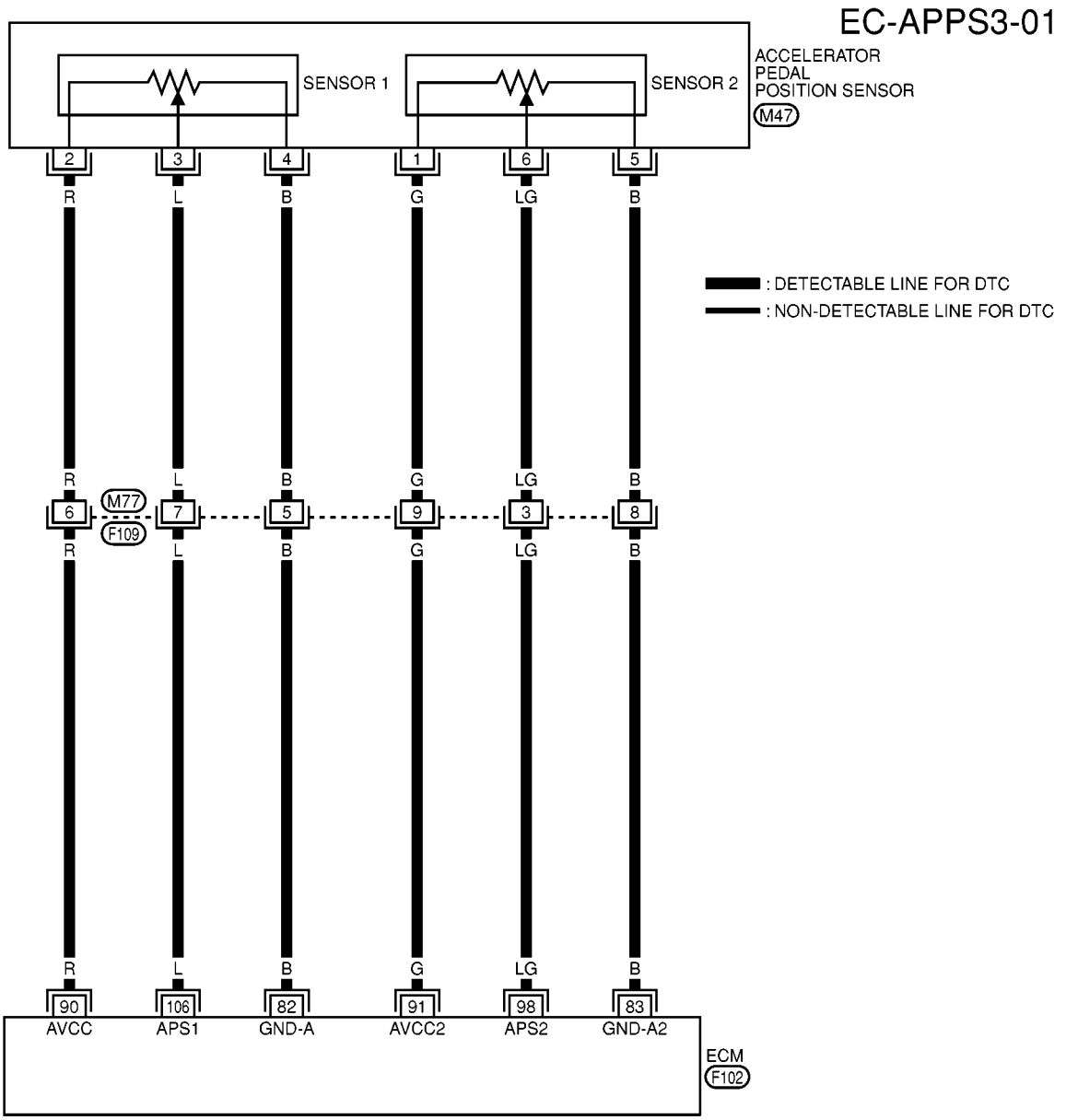


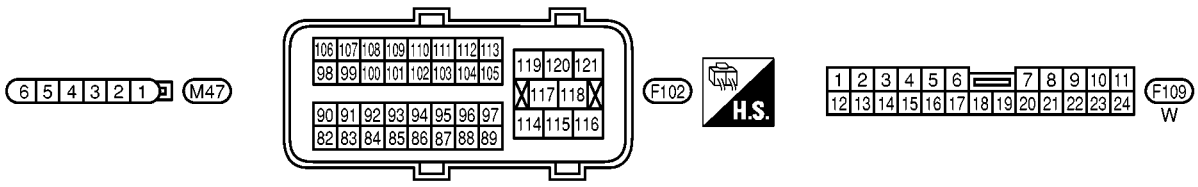
WITHOUT CONSULT-II

1. Start engine and let it idle for 1 second.
2. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
3. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
4. If DTC is detected, go to EC-738, "Diagnostic Procedure" .

Wiring Diagram

EBS00EVU





MBWA0142E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
82	B	Sensor ground (Accelerator pedal position sensor 1)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
83	B	Sensor ground (Accelerator pedal position sensor 2)	**[Ignition switch "ON"]**	Approximately 0V
90	R	Sensor power supply (Accelerator pedal position sensor 1)	**[Ignition switch "ON"]**	Approximately 5V
91	G	Sensor power supply (Accelerator pedal position sensor 2)	**[Ignition switch "ON"]**	Approximately 5V
98	LG	Accelerator pedal position sensor 2	**[Ignition switch "ON"]** ● Accelerator pedal fully released	0.175 - 0.335V
			[Ignition switch "ON"] ● Accelerator pedal fully depressed	More than 1.95V
106	L	Accelerator pedal position sensor 1	**[Ignition switch "ON"]** ● Accelerator pedal fully released	0.35 - 0.67V
			[Ignition switch "ON"] ● Accelerator pedal fully depressed	More than 3.9V

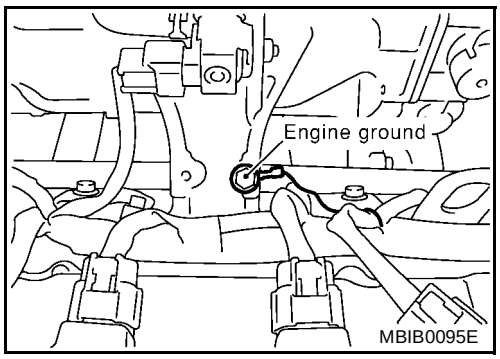
Diagnostic Procedure

EBS00EVV

1. RETIGHTEN GROUND SCREWS

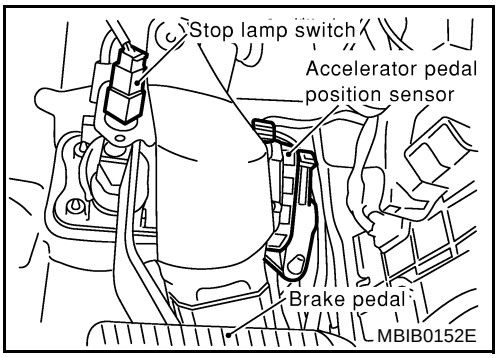
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



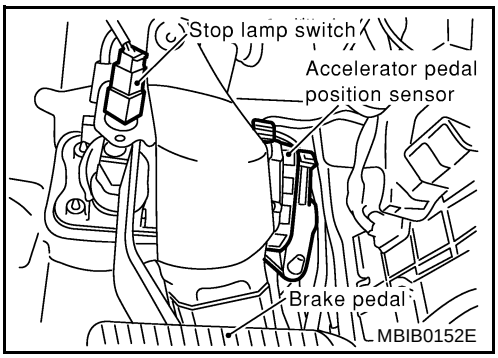
2. CHECK APP SENSOR POWER SUPPLY CIRCUIT

1. Disconnect accelerator pedal position (APP) sensor harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between APP sensor terminals 1, 2 and ground with CONSULT-II or tester.

APP sensor terminal	Voltage (V)
1	Approximately 2.5
2	Approximately 5



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M77, F109
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK APP SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 82 and APP sensor terminal 4, ECM terminal 83 and APP sensor terminal 5.
   Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M77, F109
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK APP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 106 and APP sensor terminal 3, ECM terminal 98 and APP sensor terminal 6.
   Refer to Wiring Diagram.

   Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M77, F109
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK APP SENSOR

Refer to EC-740, "Component Inspection" .

OK or NG

OK >> GO TO 10.
NG >> GO TO 9.

9. REPLACE APP SENSOR

1. Replace the accelerator pedal position sensor.
2. Perform EC-589, "Accelerator Pedal Released Position Learning" .
3. Perform EC-589, "Throttle Valve Closed Position Learning" .
4. Perform EC-589, "Idle Air Volume Learning" .

>> **INSPECTION END**

10. CHECK INTERMITTENT INCIDENT

Refer to EC-656, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

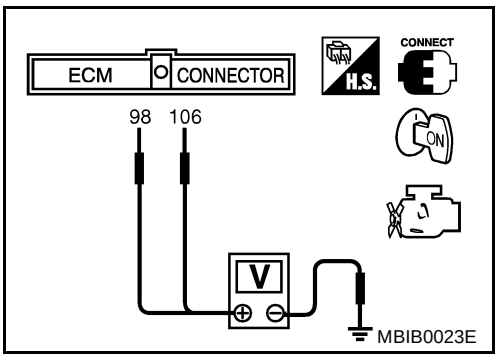
EBS00EVW

ACCELERATOR PEDAL POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Turn ignition switch “ON”.

3. Check voltage between ECM terminals 106 (APP sensor 1 signal), 98 (APP sensor 2 signal) and engine ground under the following conditions.

Terminal	Accelerator pedal	Voltage
106 (Accelerator pedal position sensor 1)	Fully released	0.35 - 0.67V
	Fully depressed	More than 3.9V
98 (Accelerator pedal position sensor 2)	Fully released	0.175 - 0.335V
	Fully depressed	More than 1.195V



4. If NG, replace accelerator pedal assembly and go to the next step.
5. Perform EC-589, "Accelerator Pedal Released Position Learning" .
6. Perform EC-589, "Throttle Valve Closed Position Learning" .
7. Perform EC-589, "Idle Air Volume Learning" .

Remove and Installation

EBS00EVX

ACCELERATOR PEDAL

Refer to ACC-2, "ACCELERATOR CONTROL SYSTEM" .

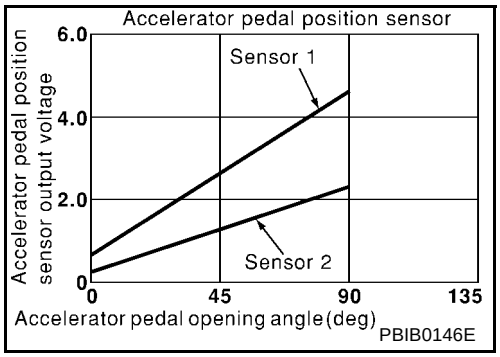
DTC P0227, P0228 APP SENSOR

PFP:18002

Component Description

EBS00EVY

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.
Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometers which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the accelerator pedal and feed the voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.



Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for the engine operation such as fuel cut.

CONSULT-II Reference Value in Data Monitor Mode

EBS00EVZ

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
ACCEL SEN1	● Ignition switch: ON (engine stopped)	Accelerator pedal: Fully released	0.35 - 0.67V
		Accelerator pedal: Fully depressed	More than 3.9V
CLSD THL POS	● Ignition switch: ON	Accelerator pedal: Fully released	ON
		Accelerator pedal: Slightly depressed	OFF

On Board Diagnosis Logic

EBS00EW0

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0227 0227	Accelerator pedal position sensor 1 circuit low input	An excessively low voltage from the APP sensor 1 is sent to ECM.	● Harness or connectors (The APP sensor 1 circuit is open or shorted.) ● Accelerator pedal position sensor (Accelerator pedal position sensor 1)
P0228 0228	Accelerator pedal position sensor 1 circuit high input	An excessively high voltage from the APP sensor 1 is sent to ECM.	

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters in fail-safe mode and the MI lights up.

Engine operating condition in fail-safe mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of throttle valve to be slower than the normal condition. So, the acceleration will be poor.

DTC Confirmation Procedure

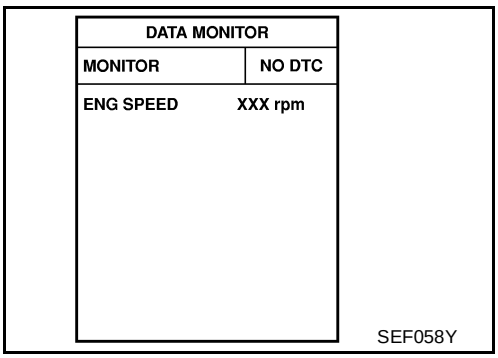
EBS00EW1

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 8V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.

2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-745, "Diagnostic Procedure" .

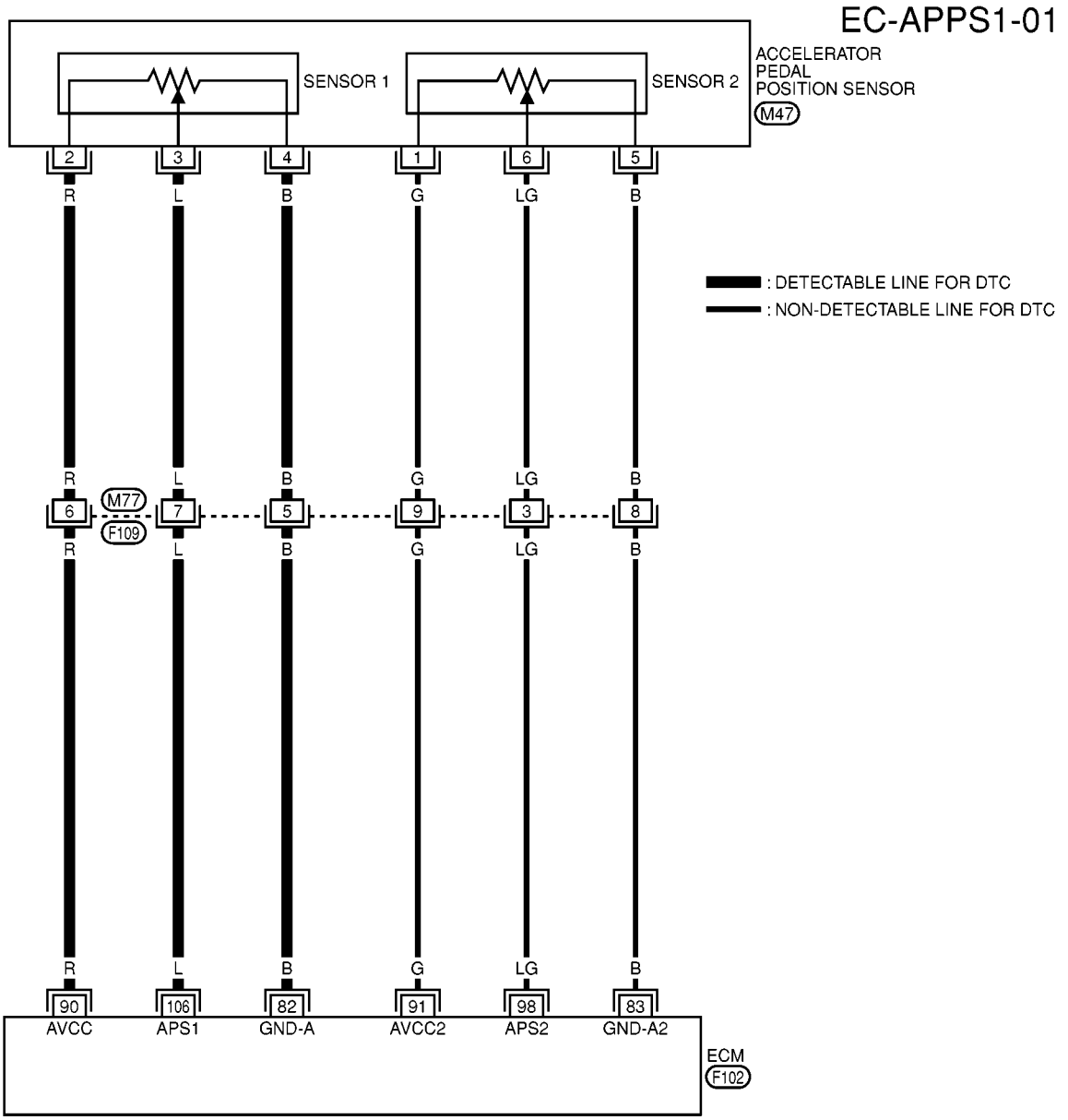


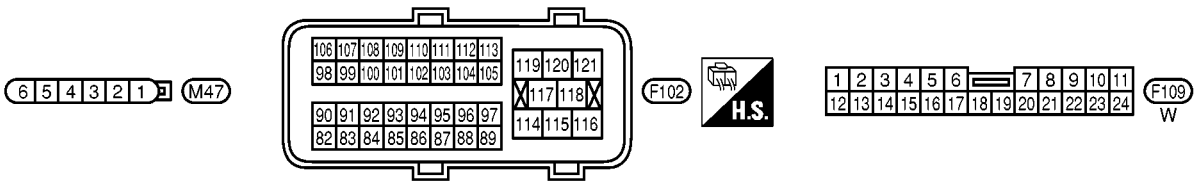
WITHOUT CONSULT-II

1. Start engine and let it idle for 1 second.
2. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
3. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
4. If DTC is detected, go to EC-745, "Diagnostic Procedure" .

Wiring Diagram

EBS00EW2





MBWA0140E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
82	B	Sensor ground (Accelerator pedal position sensor 1)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
83	B	Sensor ground (Accelerator pedal position sensor 2)	**[Ignition switch "ON"]**	Approximately 0V
90	R	Sensor power supply (Accelerator pedal position sensor 1)	**[Ignition switch "ON"]**	Approximately 5V
91	G	Sensor power supply (Accelerator pedal position sensor 2)	**[Ignition switch "ON"]**	Approximately 5V
98	LG	Accelerator pedal position sensor 2	**[Ignition switch "ON"]** ● Accelerator pedal fully released	0.175 - 0.335V
			[Ignition switch "ON"] ● Accelerator pedal fully depressed	More than 1.95V
106	L	Accelerator pedal position sensor 1	**[Ignition switch "ON"]** ● Accelerator pedal fully released	0.35 - 0.67V
			[Ignition switch "ON"] ● Accelerator pedal fully depressed	More than 3.9V

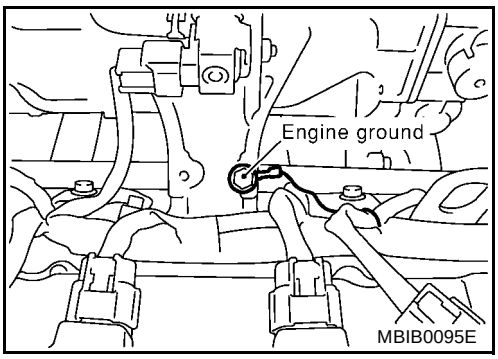
Diagnostic Procedure

EBS00EW3

1. RETIGHTEN GROUND SCREWS

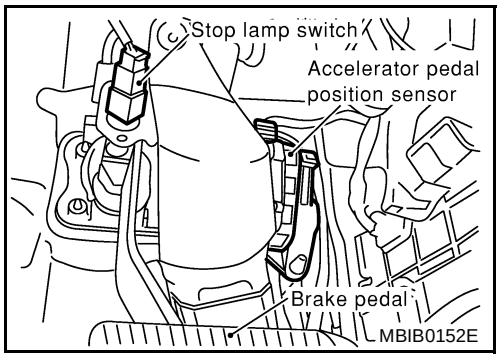
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



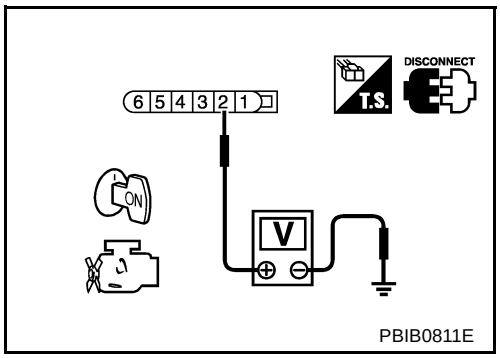
2. CHECK APP SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect accelerator pedal position (APP) sensor harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between APP sensor terminal 2 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M77, F109
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK APP SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 82 and APP sensor terminal 4. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M77, F109
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK APP SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 106 and APP sensor terminal 3. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M77, F109
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK APP SENSOR

Refer to EC-747, "Component Inspection" .

OK or NG

OK >> GO TO 10.
NG >> GO TO 9.

9. REPLACE APP SENSOR

1. Replace the accelerator pedal position sensor.
2. Perform EC-589, "Accelerator Pedal Released Position Learning" .
3. Perform EC-589, "Throttle Valve Closed Position Learning" .
4. Perform EC-589, "Idle Air Volume Learning" .

>> **INSPECTION END**

10. CHECK INTERMITTENT INCIDENT

Refer to EC-656, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

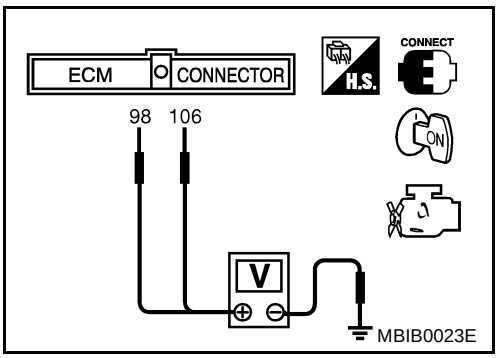
Component Inspection

EBS00EW4

ACCELERATOR PEDAL POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Turn ignition switch “ON”.
3. Check voltage between ECM terminals 106 (APP sensor 1 signal), 98 (APP sensor 2 signal) and engine ground under the following conditions.

Terminal	Accelerator pedal	Voltage
106 (Accelerator pedal position sensor 1)	Fully released	0.35 - 0.67V
	Fully depressed	More than 3.9V
98 (Accelerator pedal position sensor 2)	Fully released	0.175 - 0.335V
	Fully depressed	More than 1.195V



4. If NG, replace accelerator pedal assembly and go to the next step.
5. Perform EC-589, "Accelerator Pedal Released Position Learning" .
6. Perform EC-589, "Throttle Valve Closed Position Learning" .
7. Perform EC-589, "Idle Air Volume Learning" .

Remove and Installation

EBS00EW5

ACCELERATOR PEDAL

Refer to ACC-2, "ACCELERATOR CONTROL SYSTEM" .

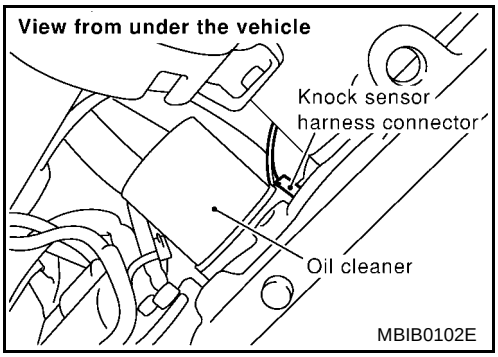
DTC P0327, P0328 KS

PFP:22060

Component Description

EBS00EW6

The knock sensor is attached to the cylinder block. It senses engine knocking using a piezoelectric element. A knocking vibration from the cylinder block is sensed as vibrational pressure. This pressure is converted into a voltage signal and sent to the ECM.



On Board Diagnosis Logic

EBS00EW7

The MI will not light for knock sensor malfunction.

DTC No.	Trouble Diagnosis Name	DTC Detected Condition	Possible Cause
P0327 0327	Knock sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Knock sensor
P0328 0328	Knock sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	

DTC Confirmation Procedure

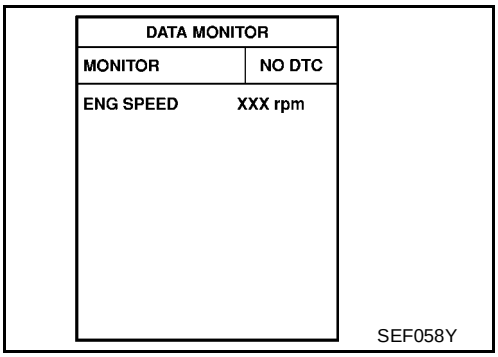
EBS00EW8

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2. Start engine and run it for at least 5 seconds at idle speed.
3. If 1st trip DTC is detected, go to EC-751, "Diagnostic Procedure" .



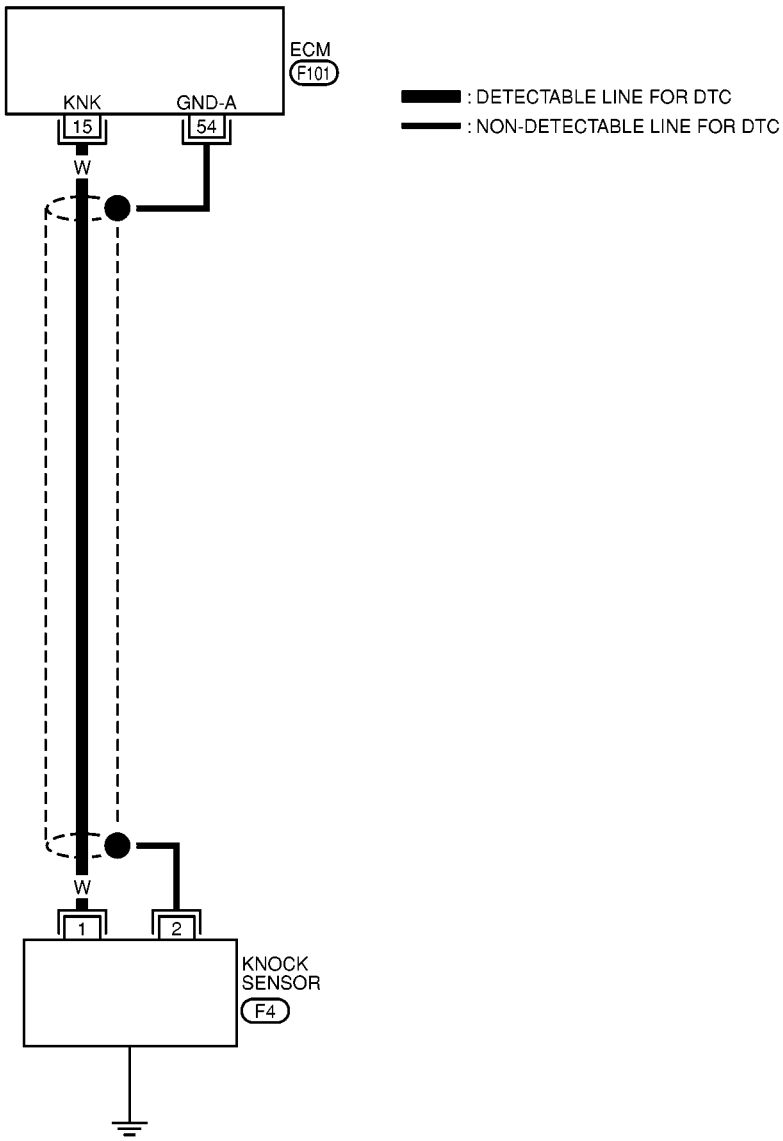
WITHOUT CONSULT-II

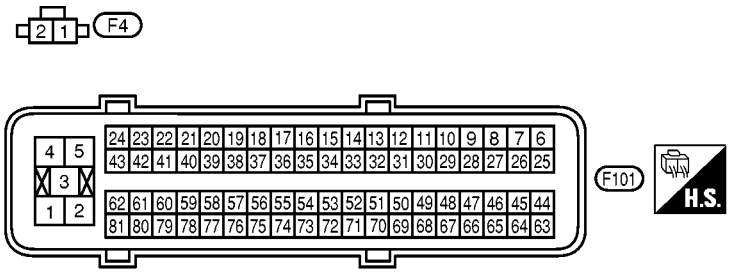
1. Start engine and run it for at least 5 seconds at idle speed.
2. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
3. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
4. If 1st trip DTC is detected, go to EC-751, "Diagnostic Procedure" .

Wiring Diagram

EBS00EW9

EC-KS-01





MBWA0063E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
15	W	Knock sensor	**[Engine is running]** ● Idle speed	Approximately 2.5V
54	—	Knock sensor shield circuit ground	**[Engine is running]** ● Idle speed	Approximately 0V

Diagnostic Procedure

EBS00EWA

1. CHECK KNOCK SENSOR INPUT SIGNAL CIRCUIT-I

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check resistance between ECM terminal 15 and engine ground. Refer to Wiring Diagram.

   NOTE:
   It is necessary to use an ohmmeter which can measure more than 10 MΩ.

   Resistance: Approximately 530 - 590kΩ [at 20°C (68°F)]

4. Also check harness for short to ground and short to power.

OK or NG

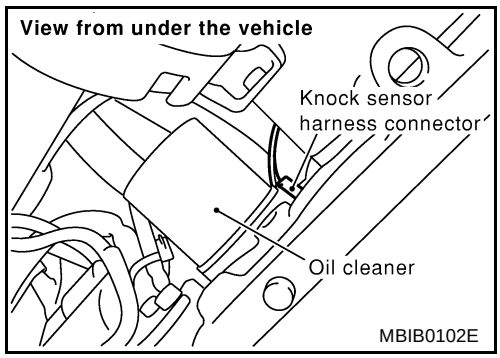
OK >> GO TO 4.
NG >> GO TO 2.

2. CHECK KNOCK SENSOR INPUT SIGNAL CIRCUIT-II

1. Disconnect knock sensor harness connector.
2. Check harness continuity between ECM terminal 15 and knock sensor terminal 1.
   Refer to Wiring Diagram.

   Continuity should exist.

3. Also check harness for short to ground and short to power.



OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK KNOCK SENSOR

Refer to EC-752, "Component Inspection" .

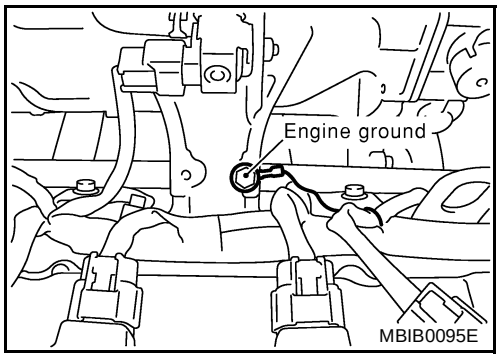
OK or NG

OK >> GO TO 5.
NG >> Replace knock sensor.

4. RETIGHTEN GROUND SCREWS

Loosen and retighten engine ground screws.

>> GO TO 5.



5. CHECK INTERMITTENT INCIDENT

Refer to EC-656, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

EBS00EWB

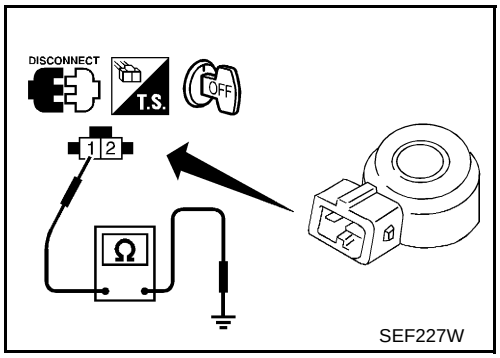
KNOCK SENSOR

Check resistance between knock sensor terminal 1 and ground.

NOTE:
It is necessary to use an ohmmeter which can measure more than 10 MΩ.

Resistance: Approximately 530 - 590kΩ [at 20°C (68°F)]

CAUTION:
Do not use any knock sensors that have been dropped or physically damaged. Use only new ones.



Removal and Installation

EBS00EWC

KNOCK SENSOR

Refer to EM-70, "CYLINDER BLOCK" .

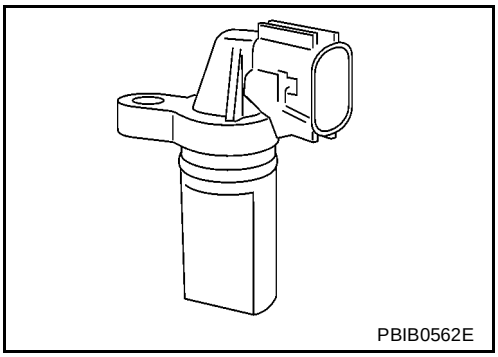
DTC P0335 CKP SENSOR (POS)

PFP:23731

Component Description

EBS00EWD

The crankshaft position sensor (POS) is located on the cylinder block rear housing facing the gear teeth (cogs) of the signal plate at the end of the crankshaft. It detects the fluctuation of the engine revolution.
The sensor consists of a permanent magnet and Hall IC.
When the engine is running, the high and low parts of the teeth cause the gap with the sensor change.
The changing gap causes the magnetic field near the sensor to change.
Due to the changing magnetic field, the voltage from the sensor changes.
The ECM receives the voltage signal and detects the fluctuation of the engine revolution.


PBIB0562E

CONSULT-II Reference Value in Data Monitor Mode

EBS00EWE

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
ENG SPEED	● Tachometer: Connect ● Run engine and compare tachometer indication with the CONSULT-II value.	Almost the same speed as the CONSULT-II value.

On Board Diagnosis Logic

EBS00EWF

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0335 0335	Crankshaft position sensor (POS) circuit	● The crankshaft position sensor (POS) signal is not detected by the ECM during the first few seconds of engine cranking. ● The proper pulse signal from the crankshaft position sensor (POS) is not sent to ECM while the engine is running. ● The crankshaft position sensor (POS) signal is not in the normal pattern during engine running.	● Harness or connectors (The sensor circuit is open or shorted.) ● Crankshaft position sensor (POS) ● Signal plate

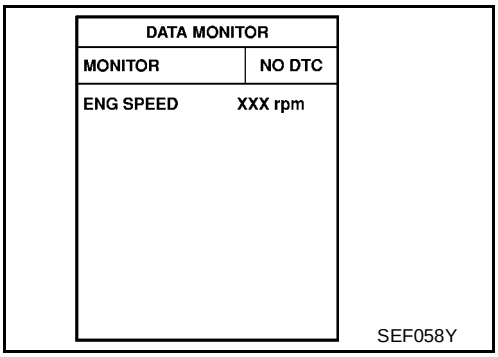
DTC Confirmation Procedure

EBS00EWG

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10.5V with ignition switch “ON”.

WITH CONSULT-II

1. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2. Crank engine for at least 2 seconds and run it for at least 5 seconds at idle speed.
3. If 1st trip DTC is detected, go to EC-756, "Diagnostic Procedure" .



SEF058Y

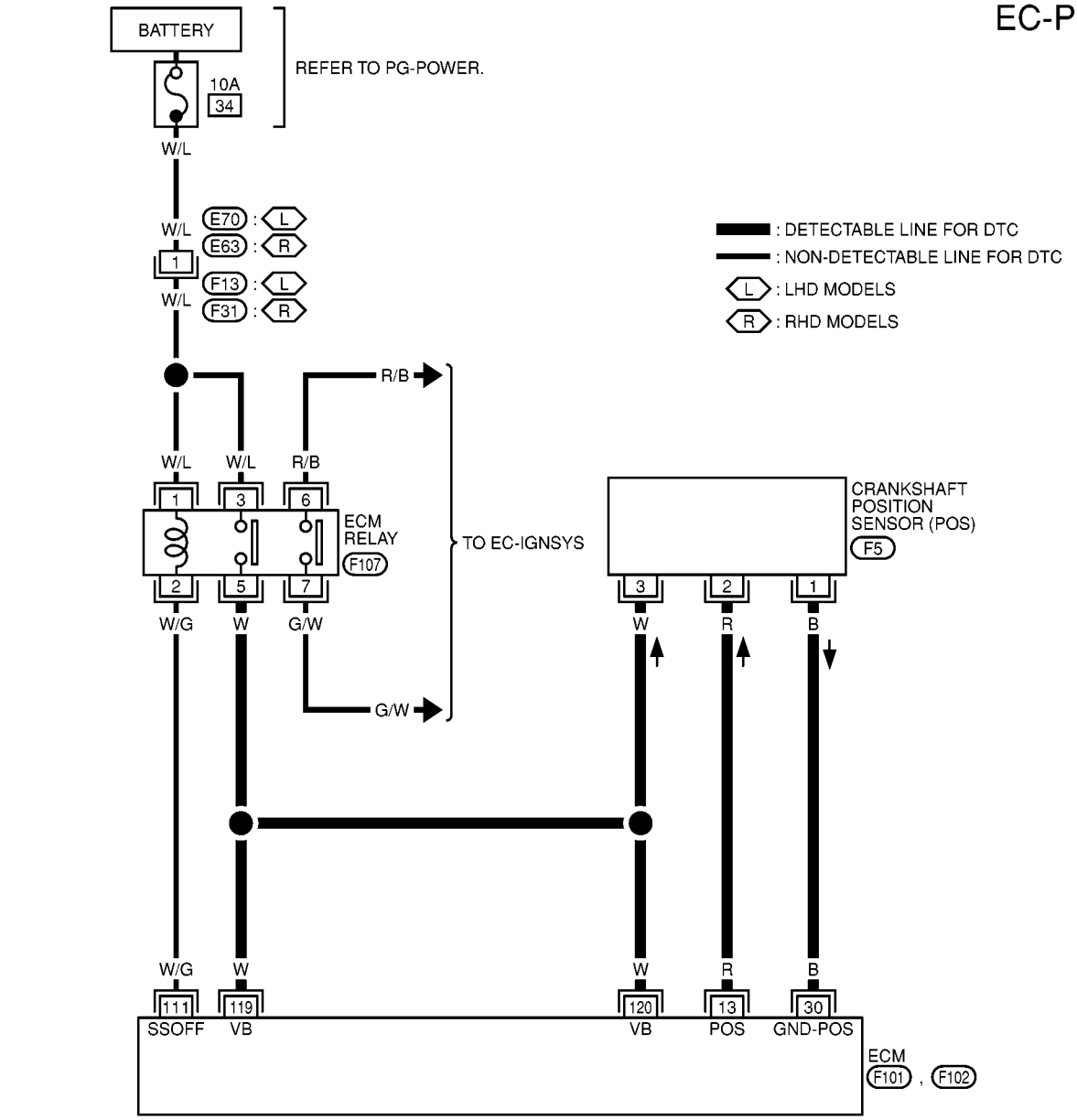
WITHOUT CONSULT-II

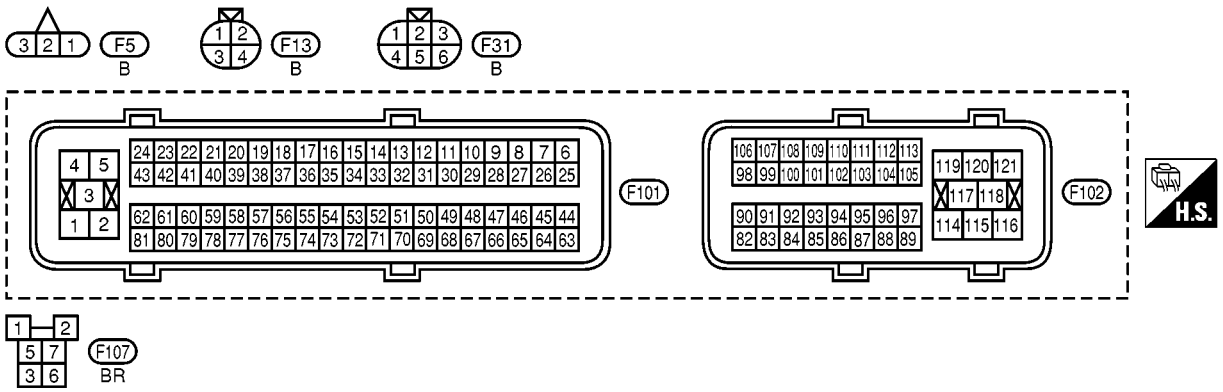
1. Crank engine for at least 2 seconds and run it for at least 5 seconds at idle speed.
2. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
3. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
4. If 1st trip DTC is detected, go to EC-756, "Diagnostic Procedure" .

Wiring Diagram

EBS00EWH

EC-POS-01



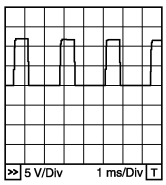
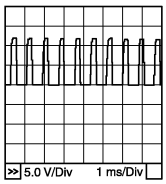


MBWA0064E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
13	W	Crankshaft position sensor (POS)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 3V★  PBIB0527E
			[Engine is running] ● Engine speed is 2,000 rpm	Approximately 3V★  PBIB0528E
30	B	Crankshaft position sensor (POS) ground	**[Engine is running]** ● Idle speed	Approximately 0V

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

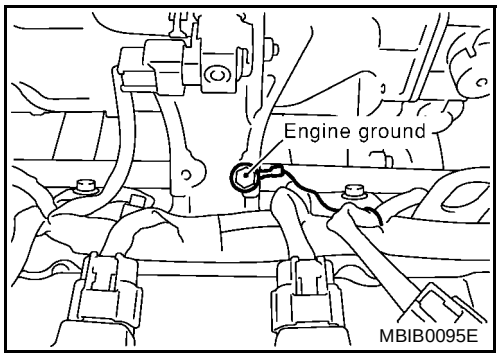
Diagnostic Procedure

EBS00EWI

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

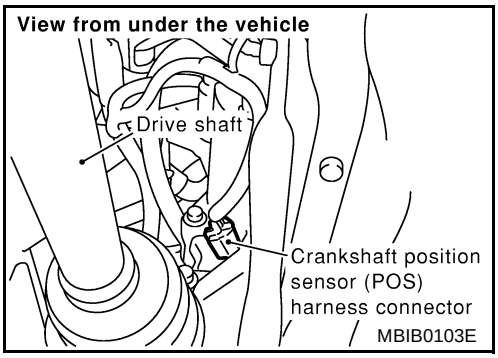
>> GO TO 2.



MBIB0095E

2. CHECK CKP SENSOR (POS) POWER SUPPLY CIRCUIT

1. Disconnect crankshaft position (CKP) sensor (POS) harness connector.
2. Turn ignition switch “ON”.



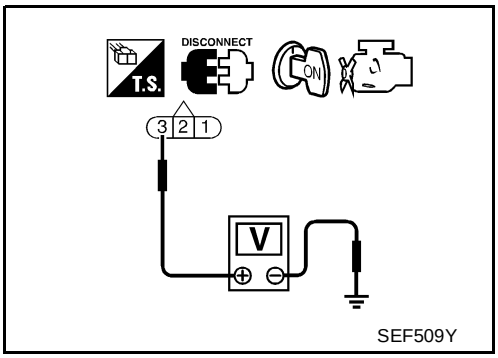
3. Check voltage between CKP sensor (POS) terminal 3 and ground with CONSULT-II or tester.

Voltage: Battery voltage

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> GO TO 3.



3. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between crankshaft position sensor (POS) and ECM
- Harness for open or short between crankshaft position sensor (POS) and ECM relay

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK CKP SENSOR (POS) GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 30 and CKP sensor (POS) terminal 1 Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for and short to ground and short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK CKP SENSOR (POS) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 13 and CKP sensor (POS) terminal 2. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK CRANKSHAFT POSITION SENSOR (POS)

Refer to EC-758, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace crankshaft position sensor (POS).

7. CHECK GEAR TOOTH

Visually check for chipping signal plate gear tooth.

OK or NG

OK >> GO TO 8.
NG >> Replace the signal plate.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-656, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

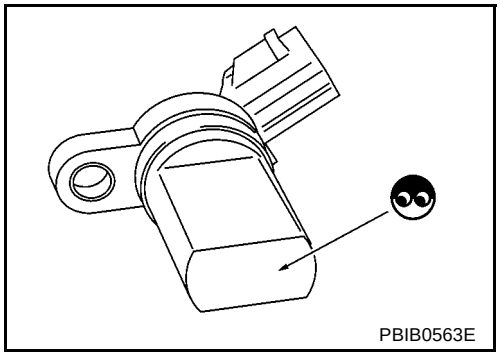
>> **INSPECTION END**

Component Inspection

EBS00EWJ

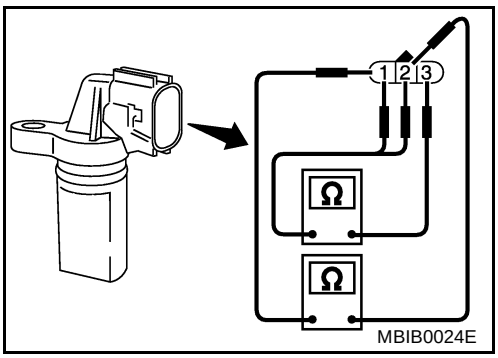
CRANKSHAFT POSITION SENSOR (POS)

1. Loosen the fixing bolt of the sensor.
2. Disconnect crankshaft position sensor (POS) harness connector.
3. Remove the sensor.
4. Visually check the sensor for chipping.



5. Check resistance as shown in the figure.

Terminal No. (Polarity)	Resistance Ω [at 25°C (77°F)]
3 (+) - 1 (-)	Except 0 or ∞
3 (+) - 2 (-)	
2 (+) - 1 (-)	



6. If NG, replace crankshaft position sensor (POS).

Removal and Installation

CRANKSHAFT POSITION SENSOR (POS)

EBS00EWK

Refer to EM-70, "CYLINDER BLOCK" .

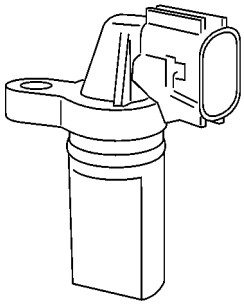
DTC P0340 CMP SENSOR (PHASE)

PFP:23731

Component Description

EBS00EWL

The camshaft position sensor (PHASE) senses the retraction with intake valve camshaft to identify a particular cylinder. The camshaft position sensor (PHASE) senses the piston position.
When the crankshaft position sensor (POS) system becomes inoperative, the camshaft position sensor (PHASE) provides various controls of engine parts instead, utilizing timing of cylinder identification signals.
The sensor consists of a permanent magnet and Hall IC.
When engine is running, the high and low parts of the teeth cause the gap with the sensor to change.
The changing gap causes the magnetic field near the sensor to change.
Due to the changing magnetic field, the voltage from the sensor changes.


PBIB0562E

On Board Diagnosis Logic

EBS00EWM

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0340 0340	Camshaft position sensor (PHASE) circuit	● The cylinder No. signal is not sent to ECM for the first few seconds during engine cranking. ● The cylinder No. signal is not set to ECM during engine running. ● The cylinder No. signal is not in the normal pattern during engine running.	● Harness or connectors (The sensor circuit is open or shorted.) ● Camshaft position sensor (PHASE) ● Camshaft (Intake) ● Starter motor (Refer to SC-22 .) ● Starting system circuit (Refer to SC-22 .) ● Dead (Weak) battery

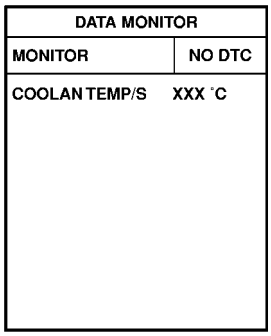
DTC Confirmation Procedure

EBS00EWN

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10.5V with ignition switch “ON”.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Crank engine for at least 2 seconds and run it for at least 5 seconds at idle speed.
4. If 1st trip DTC is detected, go to EC-763, "Diagnostic Procedure" .
   If 1st trip DTC is not detected, go to next step.
5. Maintain engine speed at more than 800 rpm for at least 5 seconds.
6. If 1st trip DTC is detected, go to EC-763, "Diagnostic Procedure" .



SEF013Y

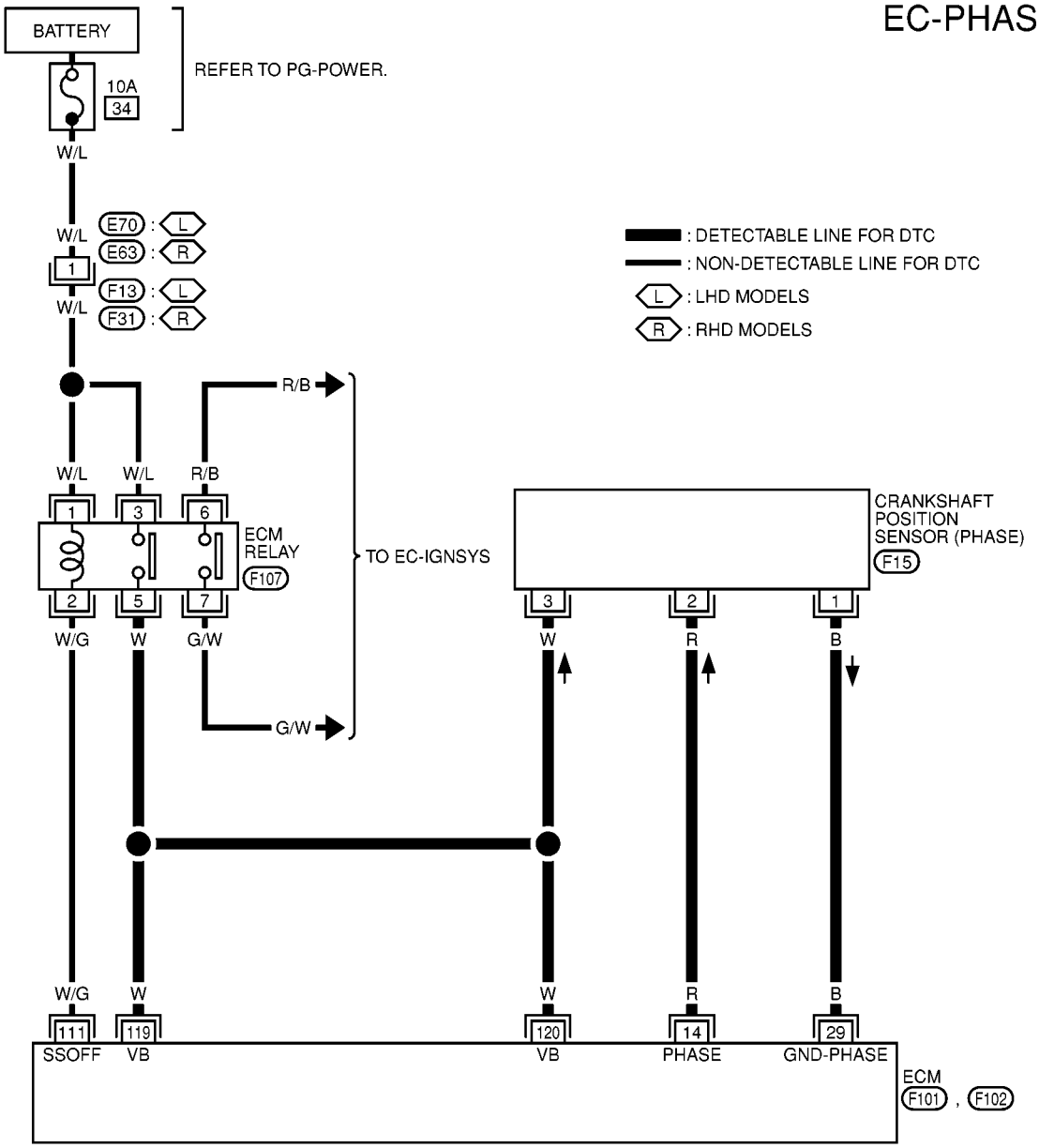
WITHOUT CONSULT-II

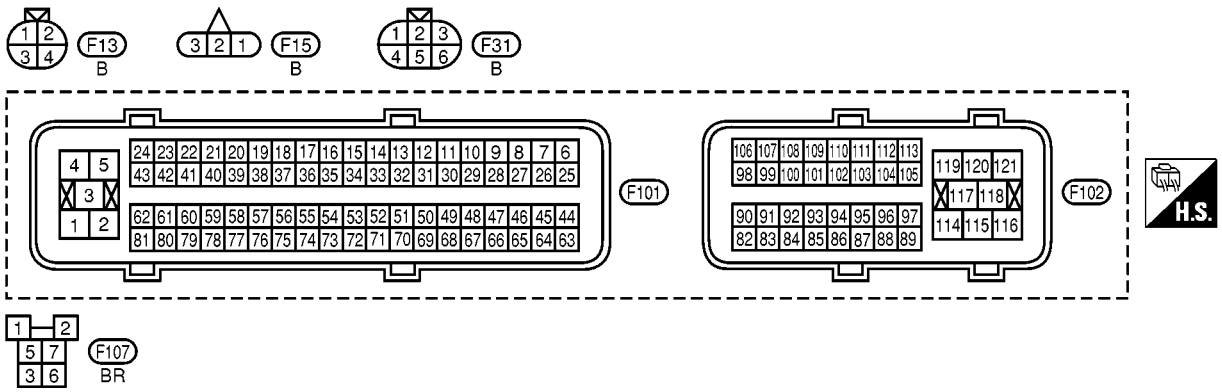
1. Crank engine for at least 2 seconds and run it for at least 5 seconds at idle speed.
2. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
3. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
4. If 1st trip DTC is detected, go to EC-763, "Diagnostic Procedure" .
   If 1st trip DTC is not detected, go to next step.
5. Turn ignition switch “OFF” and wait at least 10 seconds.

6. Start engine and maintain engine speed at more than 800 rpm for at least 5 seconds.
7. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
8. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
9. If 1st trip DTC is detected, go to EC-763, "Diagnostic Procedure" .

Wiring Diagram

EBS00EWO



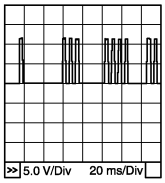
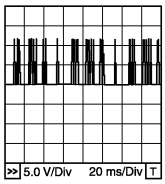


MBWA0065E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
14	R	Camshaft position sensor (PHASE)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.0 - 4.0V★  PBIB0525E
			[Engine is running] ● Engine speed is 2,000 rpm.	1.0 - 4.0V★  PBIB0526E
29	B	Camshaft position sensor (PHASE) ground	**[Engine is running]** ● Idle speed	Approximately 0V

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnostic Procedure

EBS00EWP

1. CHECK STARTING SYSTEM

Turn ignition switch to “START” position.

Does the engine turn over?

Does the starter motor operate?

Yes or No

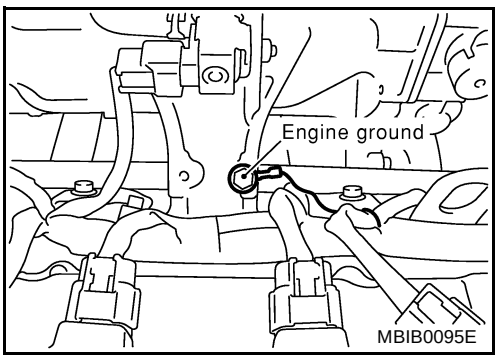
Yes >> GO TO 2.

No >> Check starting system. (Refer to SC-22, "STARTING SYSTEM" .)

2. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

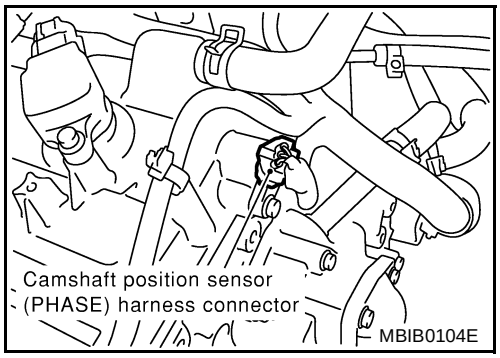
>> GO TO 3.



MBIB0095E

3. CHECK CMP SENSOR (PHASE) POWER SUPPLY CIRCUIT

1. Disconnect camshaft position (CMP) sensor (PHASE) harness connector.
2. Turn ignition switch “ON”.



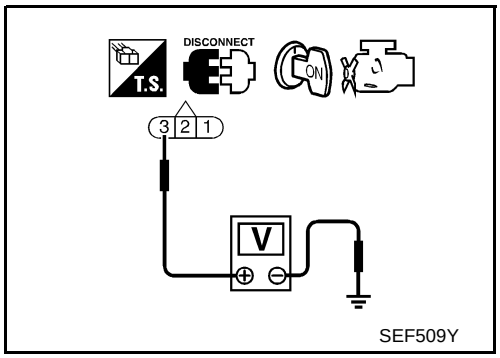
3. Check voltage between CMP sensor (PHASE) terminal 3 and ground with CONSULT-II or tester.

Voltage: Battery voltage

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.



4. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between camshaft position sensor (PHASE) and ECM
- Harness for open or short between camshaft position sensor (PHASE) and ECM relay

>> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK CMP SENSOR (PHASE) GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 29 and CMP sensor (PHASE) terminal 1.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK CMP SENSOR (PHASE) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 14 and CMP sensor (PHASE) terminal 2. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground or short to power.

OK or NG

OK >> GO TO 7.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK CAMSHAFT POSITION SENSOR (PHASE)

Refer to EC-765, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> Replace camshaft position sensor (PHASE).

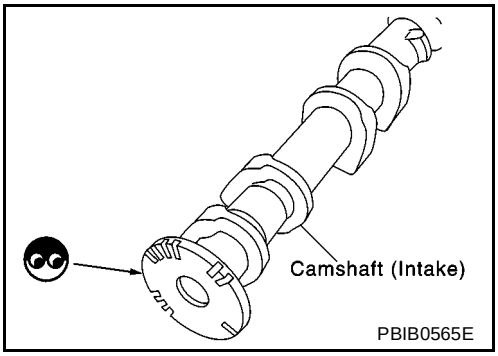
8. CHECK CAMSHAFT (INTAKE)

Check the following.

- Accumulation of debris to the signal plate of camshaft rear end
- Chipping signal plate of camshaft rear end

OK or NG

OK >> GO TO 9.
NG >> Remove debris and clean the signal plate of camshaft rear end or replace camshaft.



9. CHECK INTERMITTENT INCIDENT

Refer to EC-656, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

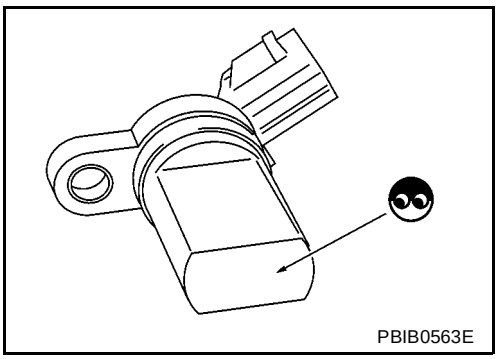
>> **INSPECTION END**

Component Inspection

EBS00EWQ

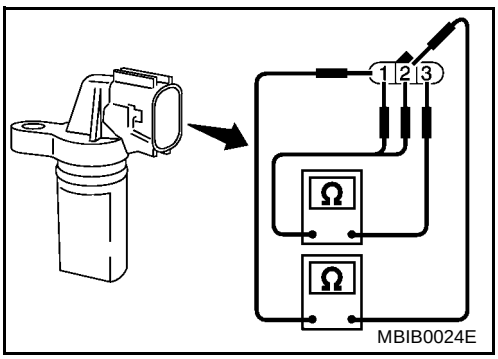
CAMSHAFT POSITION SENSOR (PHASE)

1. Loosen the fixing bolt of the sensor.
2. Disconnect camshaft position sensor (PHASE) harness connector.
3. Remove the sensor.
4. Visually check the sensor for chipping.



5. Check resistance as shown in the figure.

Terminal No. (Polarity)	Resistance Ω [at 25°C (77°F)]
3 (+) - 1 (-)	Except 0 or ∞
3 (+) - 2 (-)	
2 (+) - 1 (-)	



Removal and Installation

EBS00EWR

CAMSHAFT POSITION SENSOR (PHASE)

Refer to EM-36, "CAMSHAFT" .

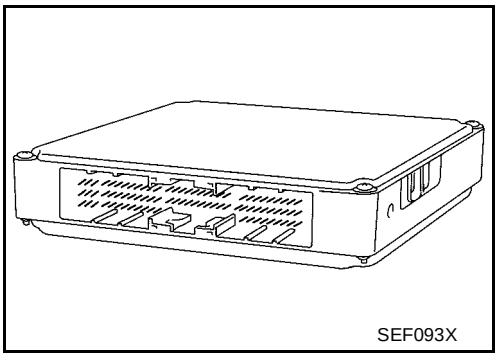
DTC P0605 ECM

PFP:23710

Component Description

EBS00EWX

The ECM consists of a microcomputer and connectors for signal input and output and for power supply. The ECM controls the engine.


SEF093X

On Board Diagnosis Logic

EBS00EWY

DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause
P0605 0605	Engine control module	A)	ECM calculation function is malfunctioning.	● ECM
		B)	ECM EEP-ROM system is malfunctioning.	
		C)	ECM self shut-off function is malfunctioning.	

FAIL-SAFE MODE

ECM enters fail-safe mode when malfunction A is detected.

Detected items	Engine operation condition in fail-safe mode
Malfunction A	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

DTC Confirmation Procedure

EBS00EWZ

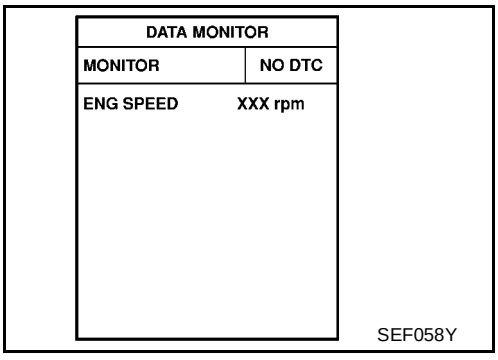
Perform “PROCEDURE FOR MALFUNCTION A” first. If the 1st trip DTC cannot be confirmed, perform “PROCEDURE FOR MALFUNCTION B”. If there is no problem on “PROCEDURE FOR MALFUNCTION B”, perform “PROCEDURE FOR MALFUNCTION C”.

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

PROCEDURE FOR MALFUNCTION A

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. If 1st trip DTC is detected, go to EC-769, "Diagnostic Procedure" .



SEF058Y

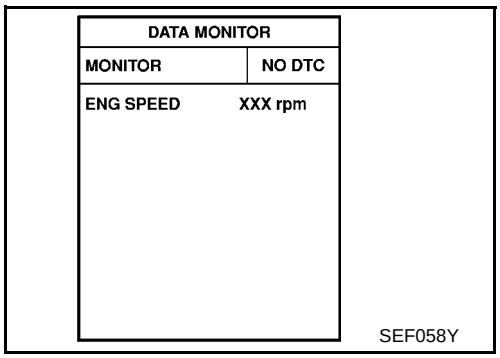
Without CONSULT-II

1. Turn ignition switch “ON”.
2. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
3. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
4. If DTC is detected, go to EC-769, "Diagnostic Procedure" .

PROCEDURE FOR MALFUNCTION B

With CONSULT-II

1. Turn ignition switch “ON” and wait at least 1 second.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Turn ignition switch “OFF”, wait at least 10 seconds, and then turn “ON”.
4. If 1st trip DTC is detected, go to EC-769, "Diagnostic Procedure" .



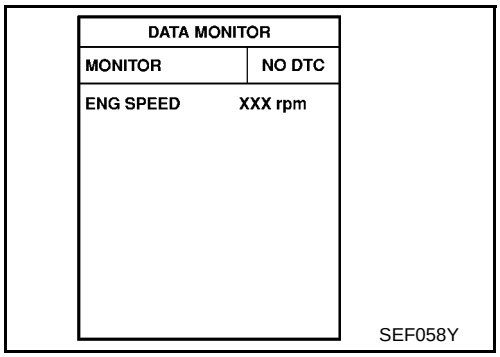
Without CONSULT-II

1. Turn ignition switch “ON” and wait at least 1 second.
2. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
3. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
4. If 1st trip DTC is detected, go to EC-769, "Diagnostic Procedure" .

PROCEDURE FOR MALFUNCTION C

With CONSULT-II

1. Turn ignition switch “ON” and wait at least 1 second.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Turn ignition switch “OFF”, wait at least 10 seconds, and then turn “ON”.
4. Repeat step 3 procedure, 32 times.
5. If 1st trip DTC is detected, go to EC-769, "Diagnostic Procedure" .



Without CONSULT-II

1. Turn ignition switch “ON” and wait at least 1 second.
2. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
3. Repeat step 2 procedure, 32 times.
4. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
5. If 1st trip DTC is detected, go to EC-769, "Diagnostic Procedure" .

Diagnostic Procedure

EBS00EX0

1. INSPECTION START

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “SELF DIAG RESULTS” mode with CONSULT-II.
3. Touch “ERASE”.
4. **Perform “DTC Confirmation Procedure”.**
   See EC-767 .
5. Is the 1st trip DTC P0605 displayed again?

Without CONSULT-II

1. Turn ignition switch “ON”.
2. Erase the “Diagnostic Test Mode II (Self-diagnostic results)” memory. Refer to EC-594, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
3. **Perform “DTC Confirmation Procedure”.**
   See EC-767 .
4. Is the 1st trip DTC P0605 displayed again?

Yes or No

Yes >> GO TO 2.
No >> **INSPECTION END**

2. REPLACE ECM

1. Replace ECM.
2. Perform initialization of NATS system and registration of all NATS ignition key IDs. Refer to EC-595, "NATS (Nissan Anti-theft System)" .
3. Perform EC-589, "Accelerator Pedal Released Position Learning" .
4. Perform EC-589, "Throttle Valve Closed Position Learning" .
5. Perform EC-589, "Idle Air Volume Learning" .

>> **INSPECTION END**

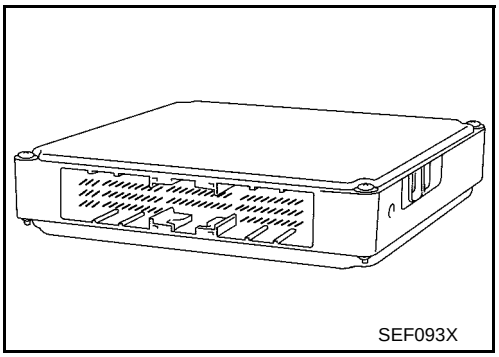
DTC P1065 ECM POWER SUPPLY

PFP:23710

Component Description

EBS00EX1

Battery voltage is supplied to the ECM even when the ignition switch is turned OFF for the ECM memory function of the DTC memory, the air fuel ratio feedback compensation value memory, the idle air volume learning value memory, etc.


SEF093X

On Board Diagnosis Logic

EBS00EX2

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1065 1065	ECM power supply circuit	ECM back up RAM system does not function properly.	● Harness or connectors [ECM power supply (back-up) circuit is open or shorted.] ● ECM

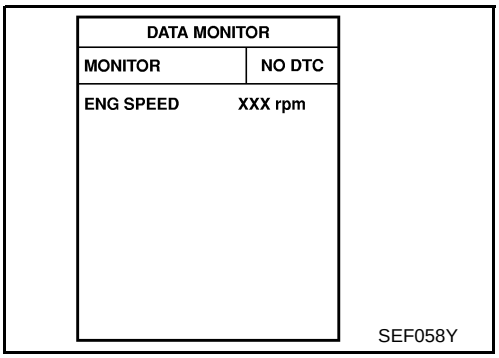
DTC Confirmation Procedure

EBS00EX3

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON” and wait at least 1 second.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. Turn ignition switch “OFF”, wait at least 10 seconds, and then turn “ON”.
5. Repeat steps 3 and 4 four times.
6. If 1st trip DTC is detected, go to EC-772, "Diagnostic Procedure" .



SEF058Y

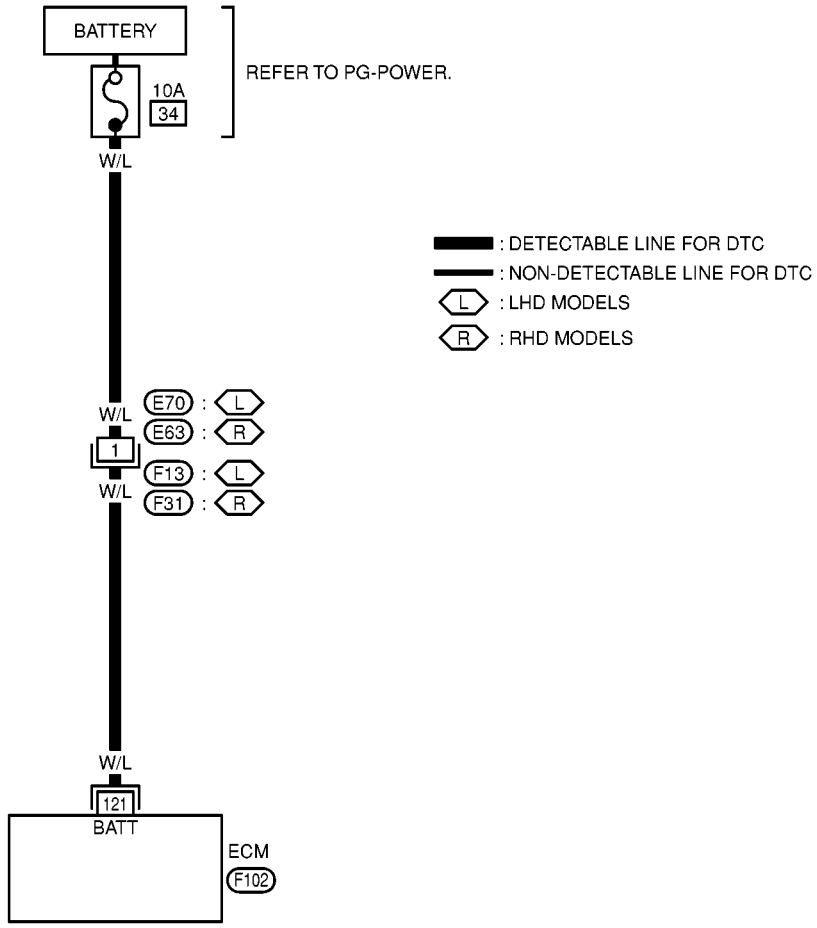
WITHOUT CONSULT-II

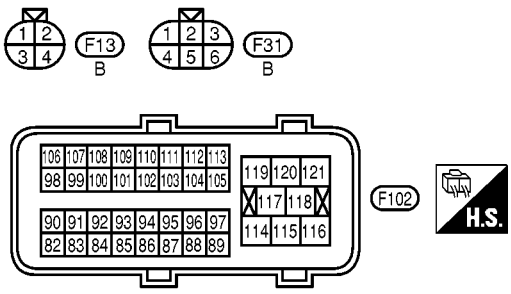
1. Turn ignition switch “ON” and wait at least 1 second.
2. Start engine and let it idle for 1 second.
3. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
4. Repeat steps 2 and 3 four times.
5. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
6. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
7. If 1st trip DTC is detected, go to EC-772, "Diagnostic Procedure" .

Wiring Diagram

EBS00EX4

EC-ECM/PW-01





MBWA0094E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
121	W/L	Power supply for ECM (Buck-up)	**[Ignition switch "OFF"]**	BATTERY VOLTAGE (11 - 14V)

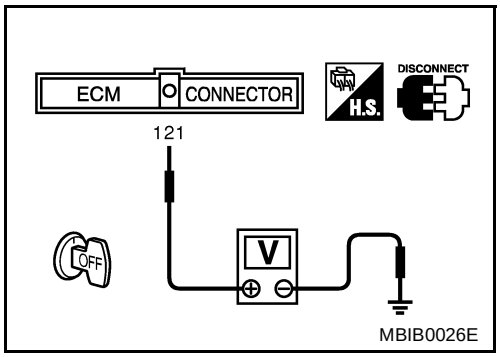
Diagnostic Procedure

EBS00EX5

1. CHECK ECM POWER SUPPLY

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check voltage between ECM terminal 121 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E70, F13 (LHD models)
- Harness connectors E63, F31 (RHD models)
- 10A fuse
- Harness for open or short between ECM and battery

>> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK INTERMITTENT INCIDENT

Refer to EC-656, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. PERFORM DTC CONFIRMATION PROCEDURE

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “SELF DIAG RESULTS” mode with CONSULT-II.
3. Touch “ERASE”.
4. **Perform “DTC Confirmation Procedure”.**
   See EC-770 .
5. Is the 1st trip DTC P1065 displayed again?

Without CONSULT-II

1. Turn ignition switch “ON”.
2. Erase the “Diagnostic Test Mode II (Self-diagnostic results)” memory. Refer to EC-594, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
3. **Perform “DTC Confirmation Procedure”.**
   See EC-770 .
4. Is the 1st trip DTC P1065 displayed again?

Yes or No

Yes >> GO TO 5.
No >> **INSPECTION END**

5. REPLACE ECM

1. Replace ECM.
2. Perform initialization of NATS system and registration of all NATS ignition key IDs. Refer to EC-595, "NATS (Nissan Anti-theft System)" .
3. Perform EC-589, "Accelerator Pedal Released Position Learning" .
4. Perform EC-589, "Throttle Valve Closed Position Learning" .
5. Perform EC-589, "Idle Air Volume Learning" .

>> **INSPECTION END**

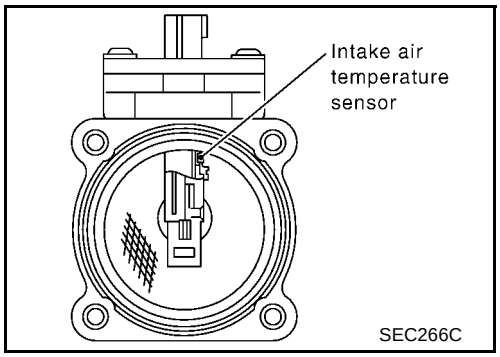
DTC P1102 MAF SENSOR

PFP:22680

Component Description

EBS00H74

The mass air flow sensor is placed in the stream of intake air. It measures the intake flow rate by measuring a part of the entire intake flow. It consists of a hot film that is supplied with electric current from the ECM. The temperature of the hot film is controlled by the ECM a certain amount. The heat generated by the hot film is reduced as the intake air flows around it. The more air, the greater the heat loss.
Therefore, the ECM must supply more electric current to maintain the temperature of the hot film as air flow increases. The ECM detects the air flow by means of this current change.



CONSULT-II Reference Value in Data Monitor Mode

EBS00H75

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
MAS A/F SE-B1	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: N ● No-load	Idle	Approx. 1.0 - 1.7V
		2,500 rpm	Approx. 1.5 - 2.1V
CAL/LD VALUE	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	10% - 35%
		2,500 rpm	10% - 35%
MASS AIRFLOW	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	1.0 - 4.0 g·m/s
		2,500 rpm	5.0 - 10.0 g·m/s

On Board Diagnosis Logic

EBS00H76

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1102 1102	Mass air flow sensor circuit range/performance problem	A voltage from the sensor is constantly approx.1.0V when engine is running.	● Harness or connectors (The sensor circuit is open or shorted.) ● Mass air flow sensor

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MI lights up.

Detected items	Engine operating condition in fail-safe mode
Mass air flow sensor circuit	Engine speed will not rise more than 2,400 rpm due to the fuel cut.

DTC Confirmation Procedure

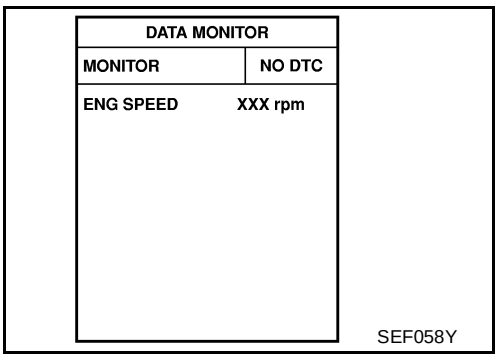
EBS00H77

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON”.

2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and wait 5 seconds at most.
4. If DTC is detected, go to EC-777, "Diagnostic Procedure" .



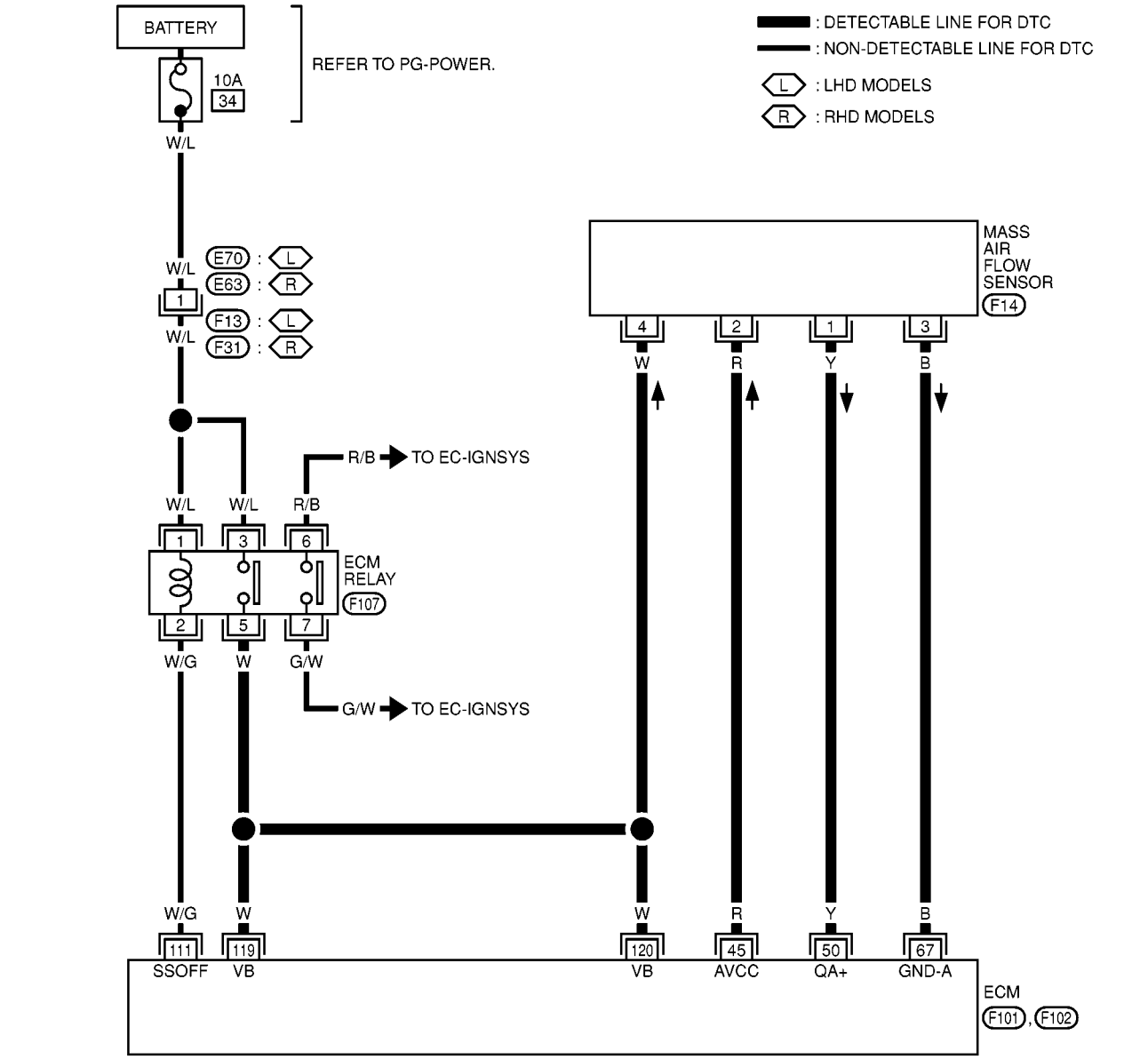
WITHOUT CONSULT-II

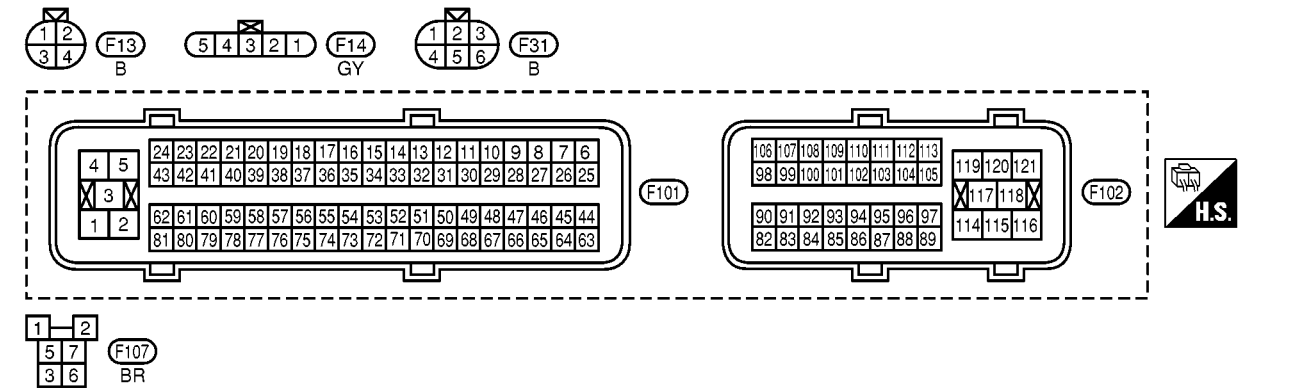
1. Start engine and wait 5 seconds at most.
2. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
3. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
4. If DTC is detected, go to EC-777, "Diagnostic Procedure" .

Wiring Diagram

EBS00H78

EC-MAFS-01





MBWA0045E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
45	R	Sensor power supply (Mass air flow sensor sensor)	**[Ignition switch "ON"]**	Approximately 5V
50	Y	Mass air flow sensor	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.0 - 1.7V
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,500 rpm.	1.5 - 2.1V
67	B	Sensor ground (Mass air flow sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V

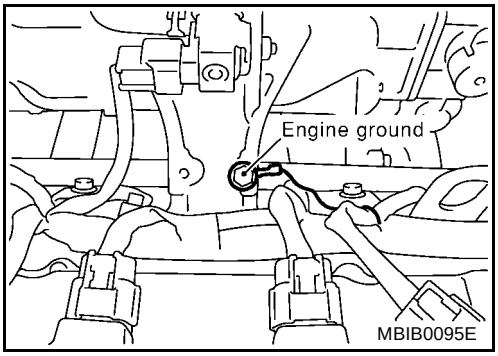
Diagnostic Procedure

EBS00H79

1. RETIGHTEN GROUND SCREWS

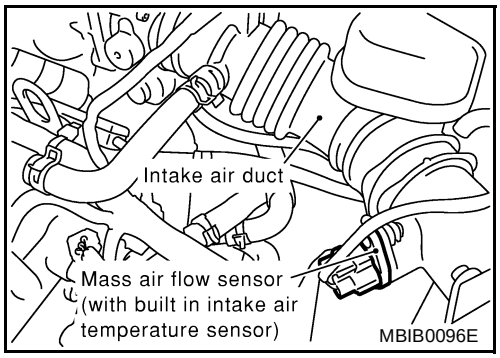
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



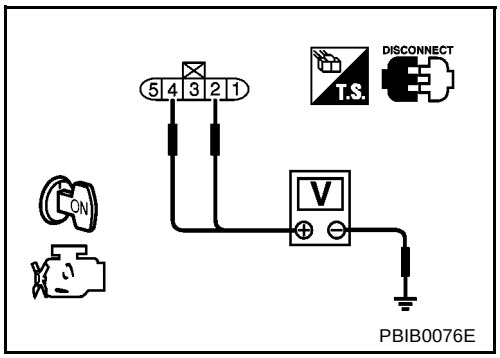
2. CHECK MAF SENSOR POWER SUPPLY CIRCUIT

1. Disconnect MAF sensor harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between MAF sensor terminals 2, 4 and ground with CONSULT-II or tester.

Terminal	Voltage
2	Approximately 5V
4	Battery voltage



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between mass air flow sensor and ECM
- Harness for open or short between mass air flow sensor and ECM relay

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK MAF SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 67 and MAF sensor terminal 3. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK MAF SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 50 and MAF sensor terminal 1. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK MASS AIR FLOW SENSOR

Refer to EC-779, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace mass air flow sensor.

7. CHECK INTERMITTENT INCIDENT

Refer to EC-656, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

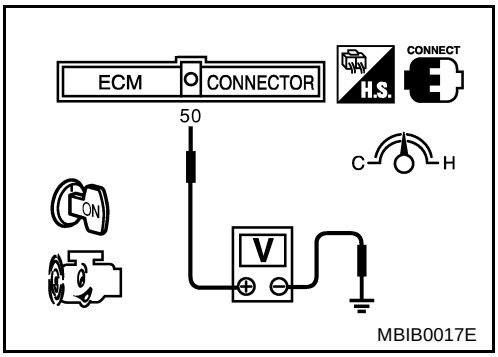
EBS00H7A

MASS AIR FLOW SENSOR

1. Reconnect harness connectors disconnected.
2. Start engine and warm it up to normal operating temperature.
3. Check voltage between ECM terminal 50 (Mass air flow sensor signal) and ground.

Condition	Voltage V
Ignition switch “ON” (Engine stopped.)	Approx. 1.0
Idle (Engine is warmed-up to normal operating temperature.)	1.0 - 1.7
2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.5 - 2.1
Idle to about 4,000 rpm*	1.0 - 1.7 to Approx. 4.0

*: Check for liner voltage rise in response to engine being increased to about 4,000 rpm.



4. If the voltage is out of specification, proceed the following.

a. Turn ignition switch “OFF”.
b. Disconnect mass air flow sensor harness connector and reconnect it again.
c. Perform steps 2 and 3 again.

5. If NG, remove mass air flow sensor from air duct. Check hot film for damage or dust.
6. If NG, clean or replace mass air flow sensor.

Removal and Installation

EBS00H7B

MASS AIR FLOW SENSOR

Refer to EM-17, "AIR CLEANER AND AIR DUCT" .

DTC P1121 ELECTRIC THROTTLE CONTROL ACTUATOR

PFP:16119

Component Description

EBS00EX6

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc.
The throttle control motor is operated by the ECM and it opens and closes the throttle valve.
The throttle position sensor detects the throttle valve position, and the opening and closing speed of the throttle valve and feeds the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

On Board Diagnosis Logic

EBS00EX7

DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause
P1121 1121	Electric throttle control actuator	A)	Electric throttle control actuator does not function properly due to the return spring malfunction.	● Electric throttle control actuator
		B)	Throttle valve opening angle in fail-safe mode is not in specified range.	
		C)	ECM detect the throttle valve is stuck open. **This self-diagnosis has the one trip detection logic.**	

FAIL-SAFE MODE

When the malfunction A or B is detected in the two consecutive trips, the ECM enters in fail-safe mode and MI lights up.
When the malfunction C is detected even in the 1st trip, the ECM enters in fail-safe mode and the MI lights up.

Detected items	Engine operating condition in fail-safe mode
Malfunction A	The ECM controls the electric throttle actuator by regulating the throttle opening around the idle position. The engine speed will not rise more than 2,000 rpm.
Malfunction B	ECM controls the electric throttle control actuator by regulating the throttle opening to 20 degrees or less.
Malfunction C	While the vehicle is driving, it slows down gradually by fuel cut. After the vehicle stops, the engine stalls. The engine can restart in “N” or “P” position, and engine speed will not exceed 1,000 rpm or more.

DTC Confirmation Procedure

EBS00EX8

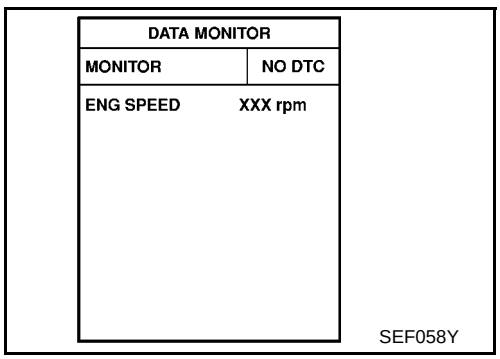
NOTE:

- **Perform “PROCEDURE FOR MALFUNCTION A AND B” first. If the 1st trip DTC cannot be confirmed, perform “PROCEDURE FOR MALFUNCTION C”.**
  If there is no problem on “PROCEDURE FOR MALFUNCTION A AND B”, perform “PROCEDURE FOR MALFUNCTION C”.
- If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

PROCEDURE FOR MALFUNCTION A AND B

With CONSULT-II

1. Turn ignition witch “ON” and wait at least 1 second.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Shift selector lever to “D” position (A/T), “1st” position (M/T) and wait at least 2 seconds.
4. Turn ignition switch “OFF”, wait at least 10 seconds, and then turn “ON”.
5. If 1st trip DTC is detected, go to EC-781, "Diagnostic Procedure"
   .



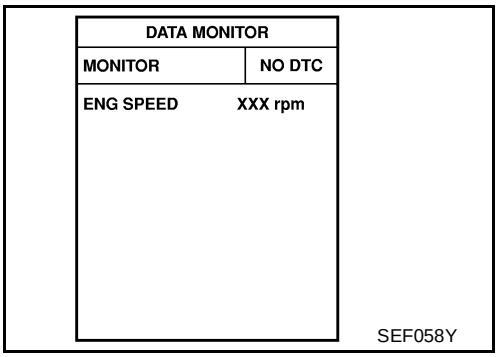
Without CONSULT-II

1. Turn ignition switch “ON” and wait at least 1 second.
2. Shift selector lever to “D” position (A/T), “1st” position (M/T) and wait at least 2 seconds.
3. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
4. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
5. If 1st trip DTC is detected, go to EC-781, "Diagnostic Procedure" .

PROCEDURE FOR MALFUNCTION C

With CONSULT-II

1. Turn ignition switch “ON” and wait at least 1 second.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Shift selector lever to “D” position (A/T), “1st” position (M/T) and wait at least 2 seconds.
4. Shift selector lever to “N” or “P” position.
5. Start engine and let it idle for 3 seconds.
6. If DTC is detected, go to EC-781, "Diagnostic Procedure" .



Without CONSULT-II

1. Turn ignition switch “ON” and wait at least 1 second.
2. Shift selector lever to “D” position (A/T), “1st” position (M/T) and wait at least 2 seconds.
3. Shift selector lever to “N” or “P” position.
4. Start engine and let it idle for the 3 seconds.
5. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
6. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
7. If DTC is detected, go to EC-781, "Diagnostic Procedure" .

Diagnostic Procedure

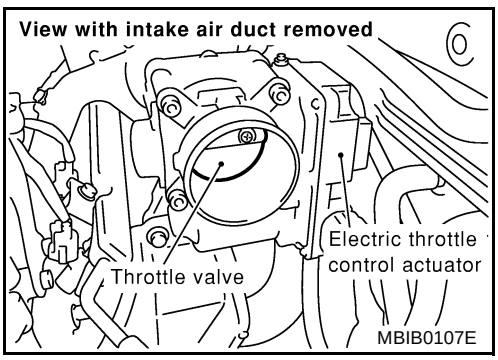
EBS00EX9

1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Remove the intake air duct.
2. Check if a foreign matter is caught between the throttle valve and the housing.

OK or NG

OK >> GO TO 2.
NG >> Remove the foreign matter and clean the electric throttle control actuator inside.



2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-589, "Throttle Valve Closed Position Learning" .
3. Perform EC-589, "Idle Air Volume Learning" .

>> **INSPECTION END**

Remove and Installation

EBS00HBZ

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-19, "INTAKE MANIFOLD" .

DTC P1122 ELECTRIC THROTTLE CONTROL FUNCTION

PFP:16119

Description

EBS00EXA

NOTE:
If DTC P1122 is displayed with DTC P1121 or 1126, first perform the trouble diagnosis for DTC P1121 or P1126. Refer to EC-780 or EC-790 .

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc.
The throttle control motor is operated by the ECM and it opens and closes the throttle valve.
The current opening angle of the throttle valve is detected by the throttle position sensor and it provides feedback to the ECM to control the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

On Board Diagnosis Logic

EBS00EXB

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1122 1122	Electric throttle control performance problem	Electric throttle control function does not operate properly.	● Harness or connectors (Throttle control motor circuit is open or shorted.) ● Harness or connectors (Throttle control motor relay circuit is open or shorted.) ● Electric throttle control actuator ● Throttle control motor relay

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MI lights up.

Engine operating condition in fail-safe mode
ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

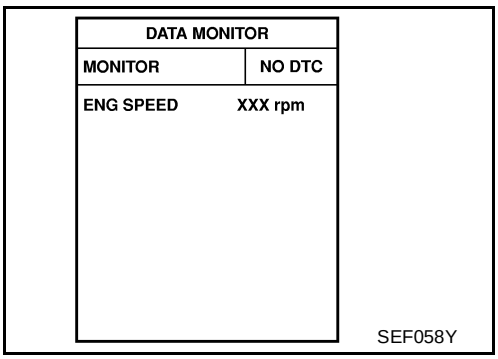
DTC Confirmation Procedure

EBS00EXC

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON” and wait at least 2 seconds.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 5 seconds.
4. If DTC is detected, go to EC-785, "Diagnostic Procedure" .



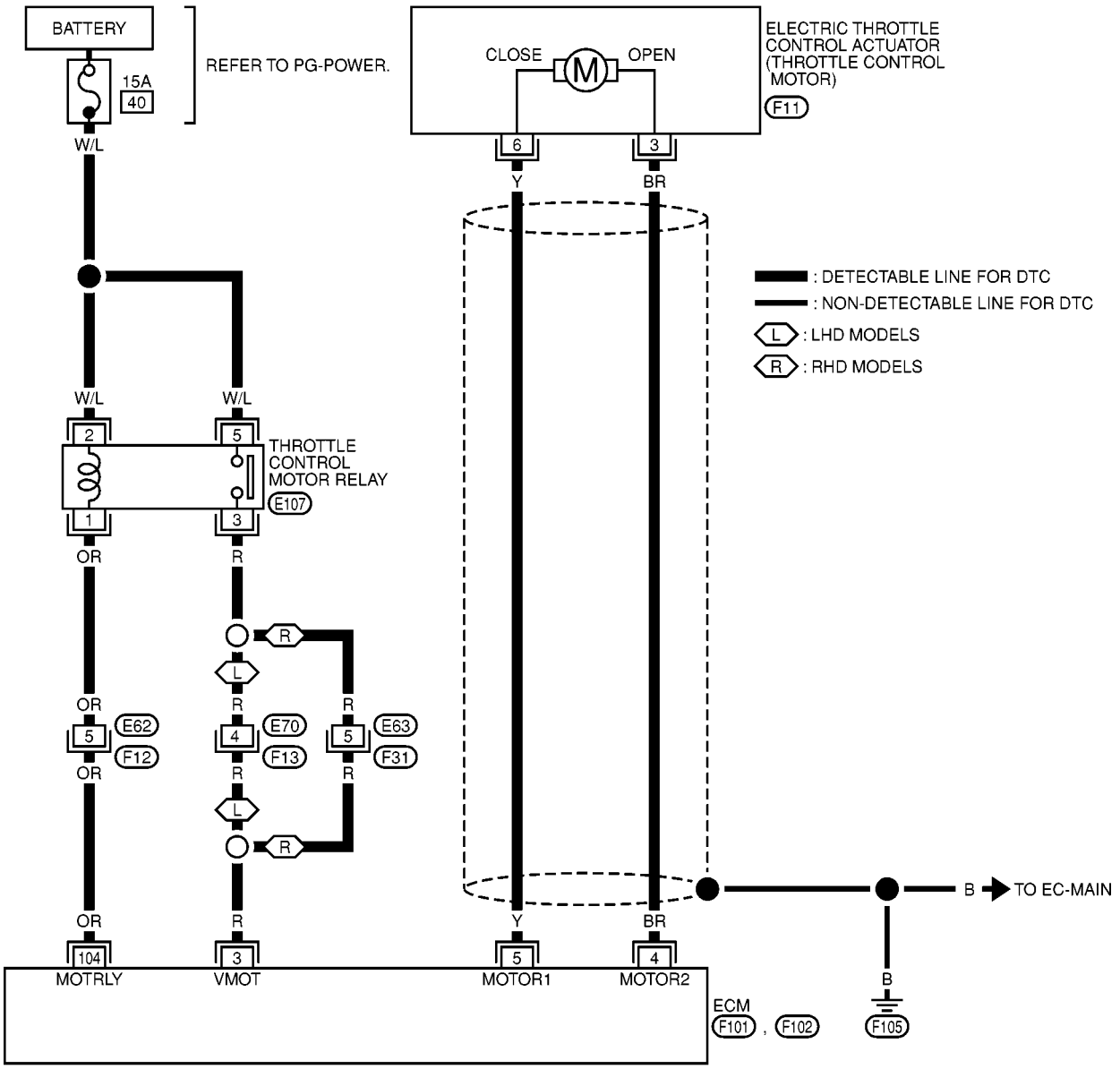
WITHOUT CONSULT-II

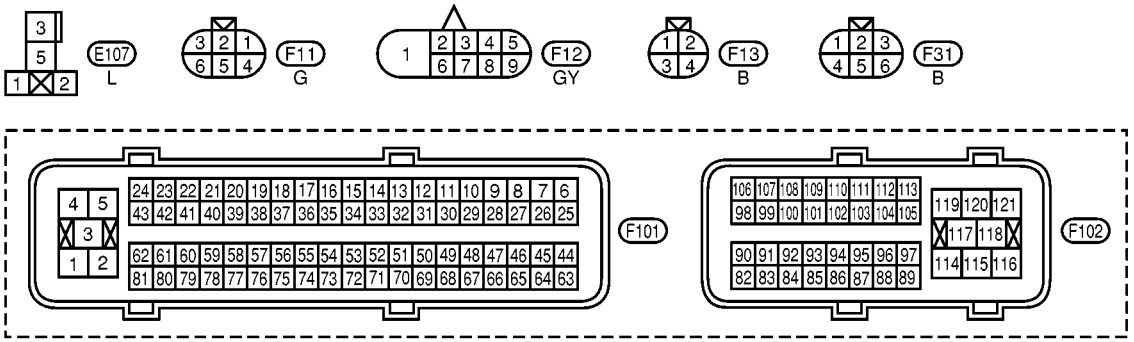
1. Turn ignition switch “ON” and wait at least 2 seconds.
2. Start engine and let it idle for 5 seconds.
3. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
4. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
5. If DTC is detected, go to EC-785, "Diagnostic Procedure" .

Wiring Diagram

EBS00EXD

EC-ETC1-01



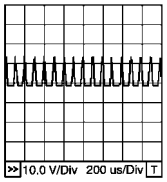
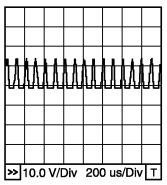


MBWA0143E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
3	R	Throttle control motor power supply	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)
4	BR	Throttle control motor (Close)	**[Ignition switch "ON"]** ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal is releasing	0 - 14V★  PBIB0534E
5	Y	Throttle control motor (Open)	**[Ignition switch "ON"]** ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal is depressing	0 - 14V★  PBIB0533E
104	OR	Throttle control motor relay	**[Ignition switch "OFF"]**	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"]	0 - 1.0V

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

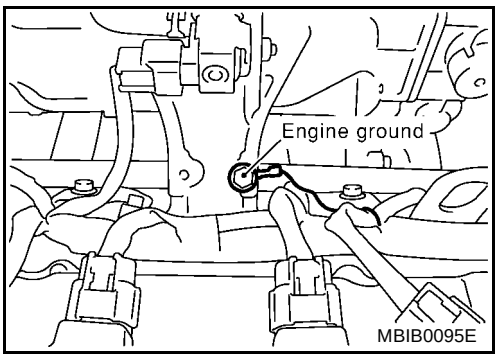
Diagnostic Procedure

EBS00EXE

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.

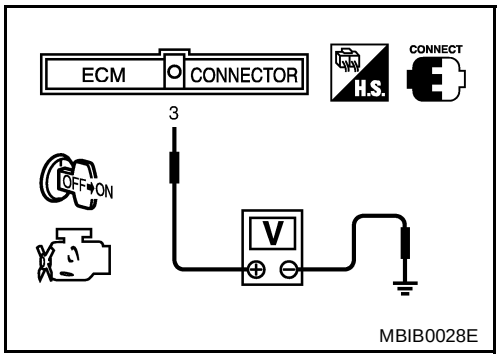


MBIB0095E

2. CHECK THROTTLE CONTROL MOTOR RELAY SIGNAL CIRCUIT

Check voltage between ECM terminal 3 and ground under the following conditions with CONSULT-II or tester.

Ignition switch	Voltage
OFF	Approximately 0V
ON	Battery voltage (11 - 14V)

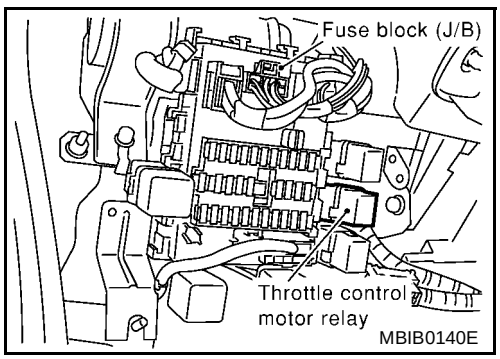


OK or NG

OK >> GO TO 10.
NG >> GO TO 3.

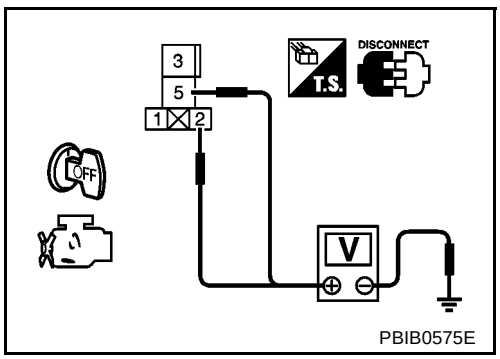
3. CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect throttle control motor relay.



3. Check voltage between throttle control motor relay terminals 2, 5 and ground.

Voltage: Battery voltage



OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

- 15A fuse
- Harness for open or short between throttle control motor relay and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 3 and throttle control motor relay terminal 3. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E70, F13 (LHD models)
- Harness connectors E63, F31 (RHD models)
- Harness for open or short between ECM and throttle control motor relay

>> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK THROTTLE CONTROL MOTOR RELAY OUTPUT SIGNAL CIRCUIT

1. Check continuity between ECM terminal 104 and throttle control motor relay terminal 1. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 9.
NG >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E62, F12
- Harness for open or short between ECM and throttle control motor relay

>> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK THROTTLE CONTROL MOTOR RELAY

Refer to EC-789, "Component Inspection" .

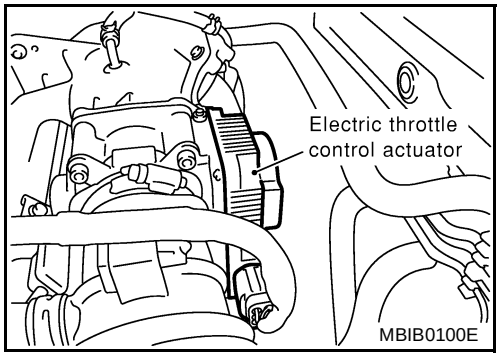
OK or NG

OK >> GO TO 13.
NG >> Replace throttle control motor relay.

10. CHECK THROTTLE CONTROL MOTOR OUTPUT SIGNAL CIRCUIT FOR OPEN OR SHORT

1. Turn ignition switch “OFF”.
2. Disconnect electric throttle control actuator harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between the following terminals. Refer to Wiring Diagram.

Electric throttle control actuator terminal	ECM terminal	Continuity
3	4	Should exist
	5	Should not exist
6	4	Should not exist
	5	Should exist



5. Also check harness for short to ground and short to power.

OK or NG

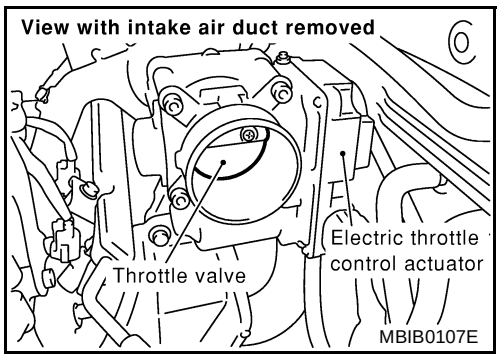
OK >> GO TO 11.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

11. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Remove the intake air duct.
2. Check if foreign matter is caught between the throttle valve and the housing.

OK or NG

OK >> GO TO 12.
NG >> Remove the foreign matter and clean the electric throttle control actuator inside.



12. CHECK THROTTLE CONTROL MOTOR

Refer to EC-789, "Component Inspection" .

OK or NG

OK >> GO TO 13.
NG >> GO TO 14.

13. CHECK INTERMITTENT INCIDENT

Refer to EC-656, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

OK or NG

OK >> GO TO 14.
NG >> Repair or replace harness or connectors.

14. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-589, "Throttle Valve Closed Position Learning" .
3. Perform EC-589, "Idle Air Volume Learning" .

>> **INSPECTION END**

Component Inspection

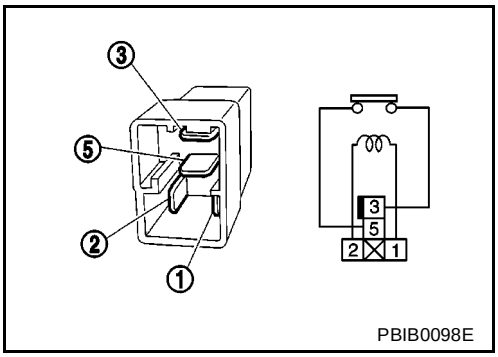
EBS00EXF

THROTTLE CONTROL MOTOR RELAY

1. Apply 12V direct current between relay terminals 1 and 2.
2. Check continuity between relay terminals 3 and 5.

Conditions	Continuity
12V direct current supply between terminals 1 and 2	Yes
No current supply	No

3. If NG, replace throttle control motor relay.



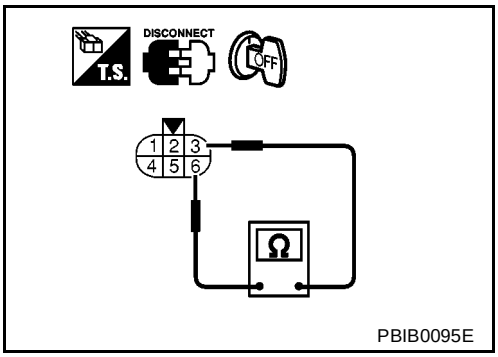
PBIB0098E

THROTTLE CONTROL MOTOR

1. Disconnect electric throttle control actuator harness connector.
2. Check resistance between terminals 3 and 6.

Resistance: Approximately 1 - 15 Ω [at 25 °C (77°F)]

3. If NG, replace electric throttle control actuator and go to next step.
4. Perform EC-589, "Throttle Valve Closed Position Learning" .
5. Perform EC-589, "Idle Air Volume Learning" .



PBIB0095E

Remove and Installation

EBS00EXG

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-19, "INTAKE MANIFOLD" .

DTC P1124, P1126 THROTTLE CONTROL MOTOR RELAY

PFP:16119

Component Description

EBS00EXH

Power supply for the Throttle Control motor is provided to the ECM via throttle control motor relay. The throttle control motor relay is ON/OFF controlled by the ECM. When the ignition switch is turned ON, the ECM sends an ON signal to throttle control motor relay and battery voltage is provided to the ECM. When the ignition switch is turned OFF, the ECM sends an OFF signal to throttle control motor relay and battery voltage is not provided to the ECM.

CONSULT-II Reference Value in Data Monitor Mode

EBS00EXI

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
THRTL RELAY	● Ignition switch: ON	ON

On Board Diagnosis Logic

EBS00EXJ

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1124 1124	Throttle control motor relay circuit short	ECM detect the throttle control motor relay is stuck ON.	● Harness or connectors (Throttle control motor relay circuit is shorted.) ● Throttle control motor relay
P1126 1126	Throttle control motor relay circuit open	ECM detects a voltage of power source for throttle control motor is excessively low. **This self-diagnosis has the one trip detection logic.**	● Harness or connectors (Throttle control motor relay circuit is open.) ● Throttle control motor relay

FAIL-SAFE MODE

When the DTC P1124 is detected in the two consecutive trips, the ECM enters fail-safe mode and the MI lights up.
When the DTC P1126 is detected even in the 1st trip, the ECM enters fail-safe mode and the MI lights up.

Engine operating condition in fail-safe mode
ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

DTC Confirmation Procedure

EBS00EXK

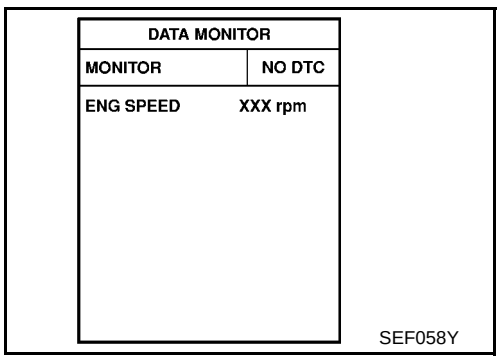
NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

PROCEDURE FOR DTC P1124

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

With CONSULT-II

1. Turn ignition switch “ON” and wait at least 1 second.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. If 1st trip DTC is detected, go to EC-793, "Diagnostic Procedure"
   .



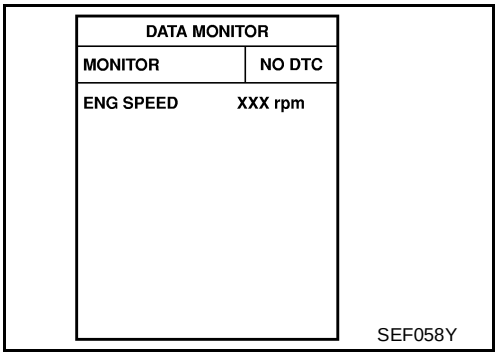
Without CONSULT-II

1. Turn ignition switch “ON” and wait at least 1 second.
2. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
3. If 1st trip DTC is detected, go to EC-793, "Diagnostic Procedure" .

PROCEDURE FOR DTC P1126

With CONSULT-II

1. Turn ignition switch “ON” and wait at least 2 seconds.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 5 seconds.
4. If DTC is detected, go to EC-793, "Diagnostic Procedure" .



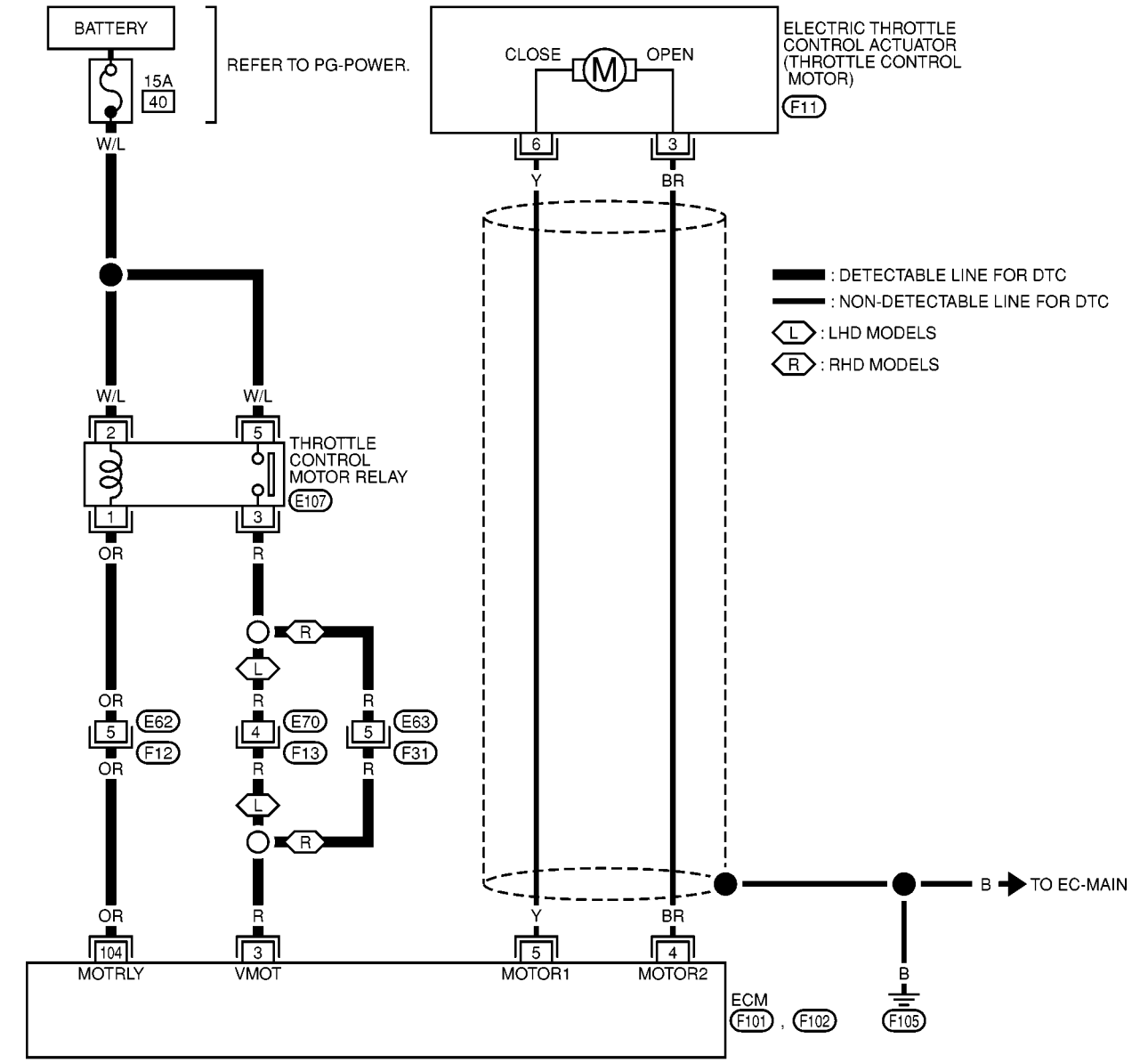
Without CONSULT-II

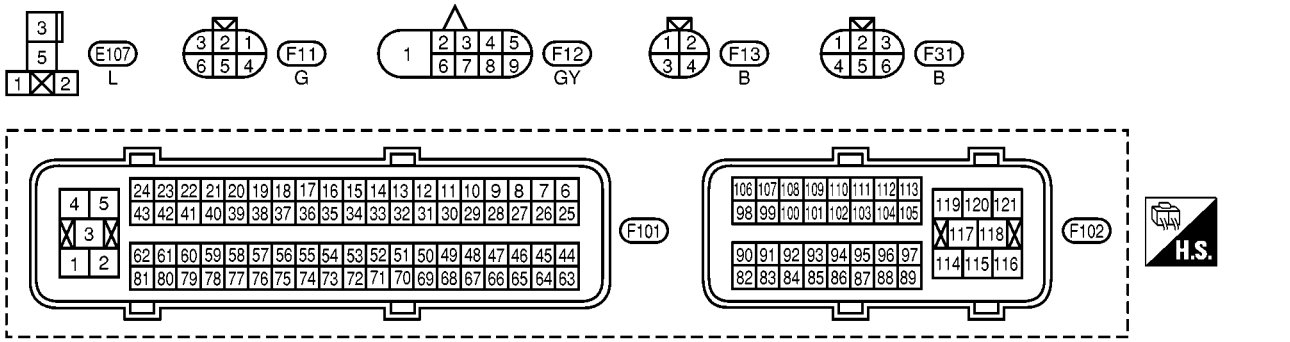
1. Turn ignition switch “ON” and wait at least 2 second.
2. Start engine and let it idle for 5 seconds.
3. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
4. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
5. If DTC is detected, go to EC-793, "Diagnostic Procedure" .

Wiring Diagram

EBS00EXL

EC-ETC2-01





MBWA0144E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

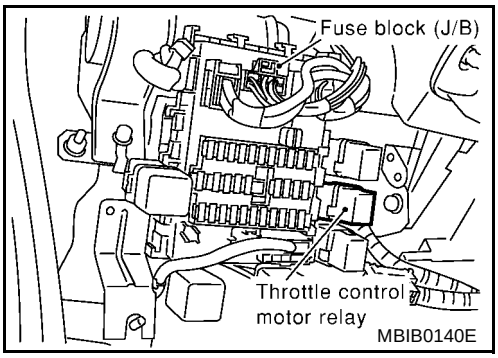
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
104	OR	Throttle control motor relay	**[Ignition switch "OFF"]**	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"]	0 - 1.0V
3	R	Throttle control motor power supply	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

EBS00EXM

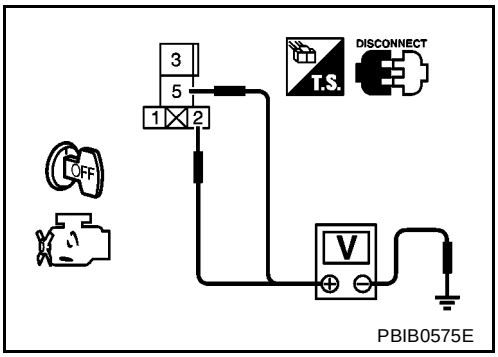
1. CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect throttle control motor relay.



3. Check voltage between throttle control motor relay terminals 2, 5 and ground.

Voltage: Battery voltage



OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

- 15A fuse
- Harness for open or short between throttle control motor relay and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 3 and throttle control motor relay terminal 3. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E70, F13 (LHD models)
- Harness connectors E63, F31 (RHD models)
- Harness for open or short between ECM and throttle control motor relay

>> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK THROTTLE CONTROL MOTOR RELAY OUTPUT SIGNAL CIRCUIT

1. Check continuity between ECM terminal 104 and throttle control motor relay terminal 1. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E62, F12
- Harness for open or short between ECM and throttle control motor relay

>> Repair open circuit or short to ground short to power in harness or connectors.

7. CHECK THROTTLE CONTROL MOTOR RELAY

Refer to EC-794, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> Replace throttle control motor relay.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-656, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

EBS00GKD

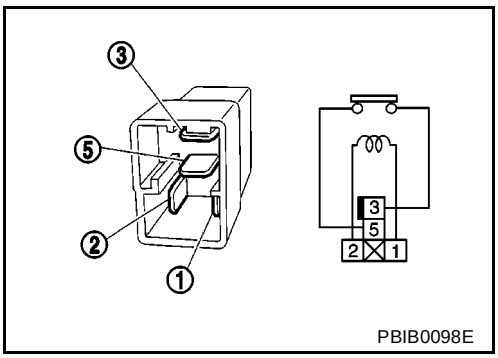
THROTTLE CONTROL MOTOR RELAY

1. Apply 12V direct current between relay terminals 1 and 2.

2. Check continuity between relay terminals 3 and 5.

Conditions	Continuity
12V direct current supply between terminals 1 and 2	Yes
No current supply	No

3. If NG, replace throttle control motor relay.



PBIB0098E

DTC P1128 THROTTLE CONTROL MOTOR

PFP:16119

Component Description

EBS00EXN

The throttle control motor is operated by the ECM and it opens and closes the throttle valve.
The current opening angle of the throttle valve is detected by the throttle position sensor and it provides feedback to the ECM to control the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

On Board Diagnosis Logic

EBS00EXO

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1128 1128	Throttle control motor circuit short	ECM detects short both circuits between ECM and throttle control motor.	● Harness or connectors (Throttle control motor circuit is shorted.) ● Electric throttle control actuator (Throttle control motor)

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MI lights up.

Engine operating condition in fail-safe mode
ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

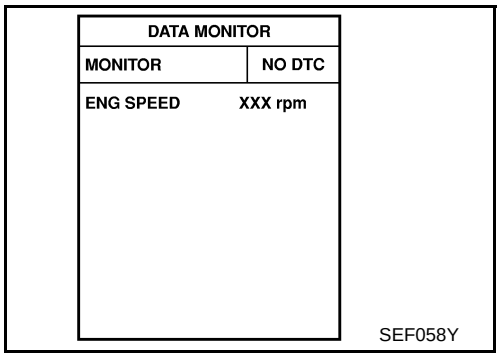
DTC Confirmation Procedure

EBS00EXP

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON” and wait at least 2 seconds.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 5 seconds.
4. If DTC is detected, go to EC-798, "Diagnostic Procedure" .



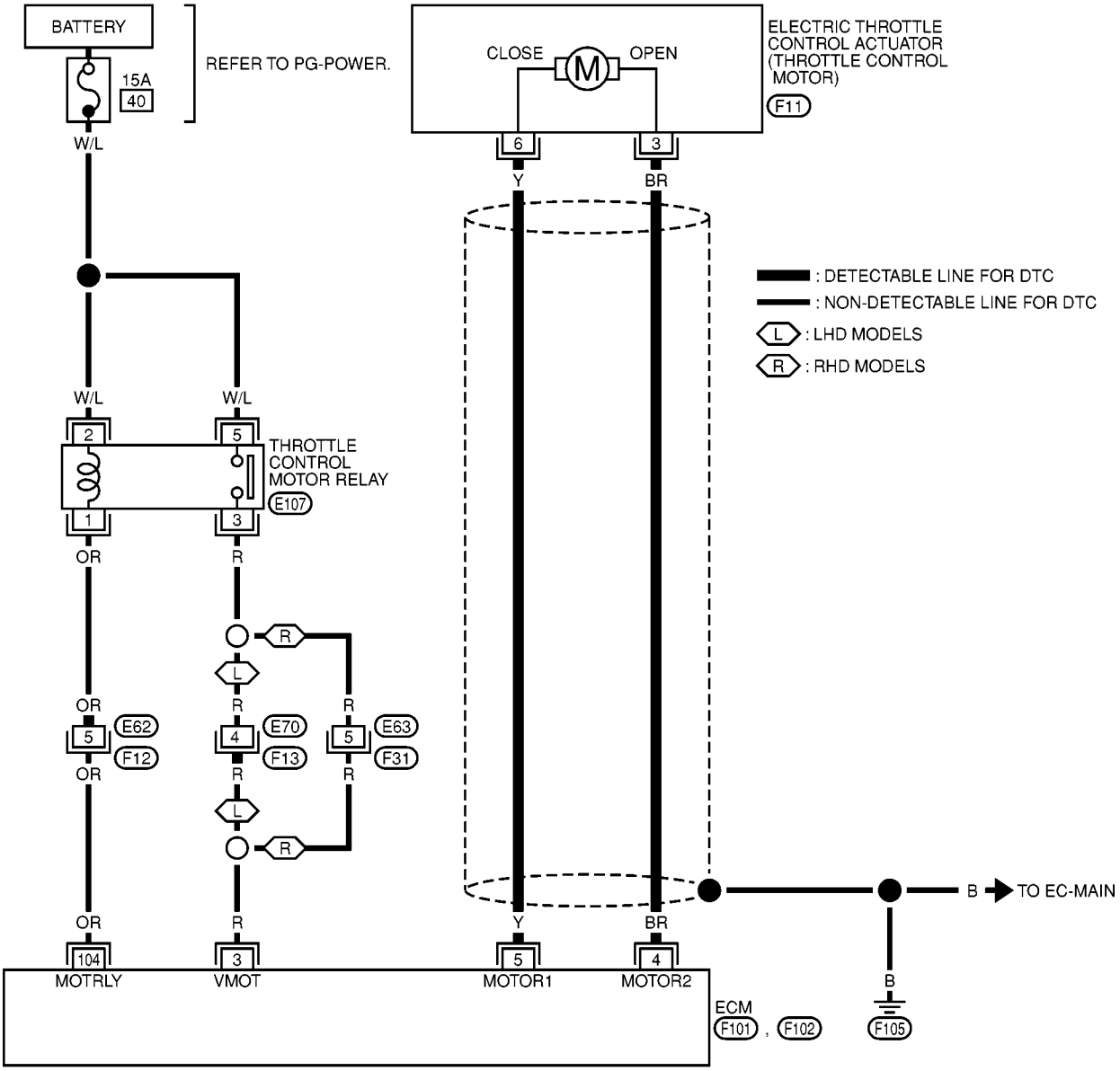
WITHOUT CONSULT-II

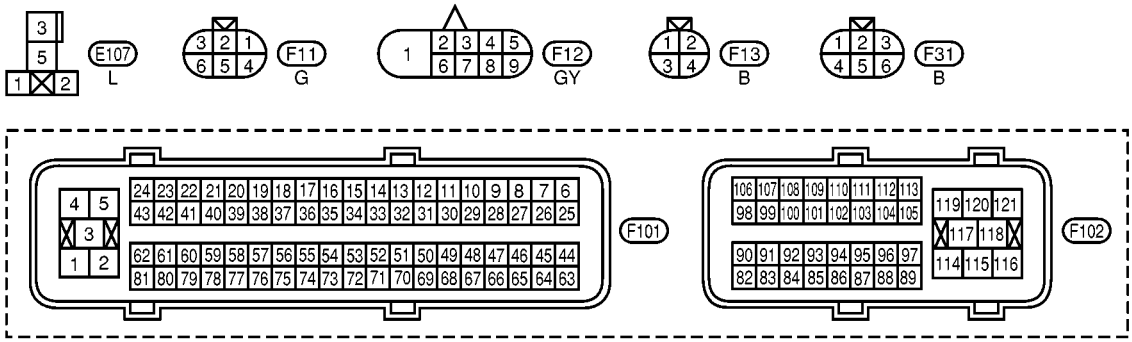
1. Turn ignition switch “ON” and wait at least 2 second.
2. Start engine and let it idle for 5 seconds.
3. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
4. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
5. If DTC is detected, go to EC-798, "Diagnostic Procedure" .

Wiring Diagram

EBS00EXQ

EC-ETC3-01



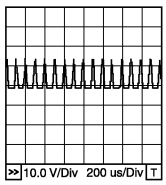
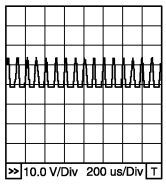


MBWA0145E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
4	BR	Throttle control motor (Close)	**[Ignition switch "ON"]** ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal is releasing	0 - 14V★  PBIB0534E
5	Y	Throttle control motor (Open)	**[Ignition switch "ON"]** ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal is depressing	0 - 14V★  PBIB0533E

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

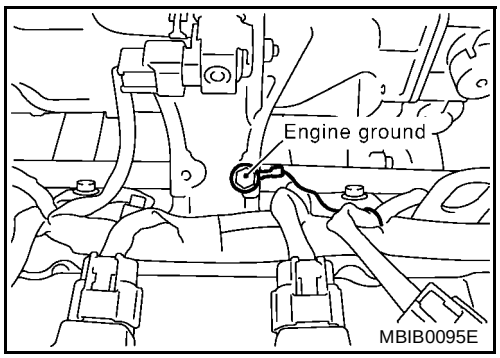
Diagnostic Procedure

EBS00EXR

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

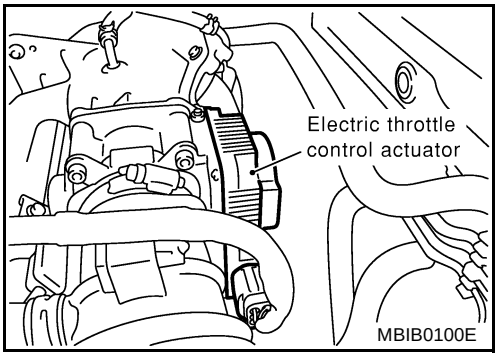
>> GO TO 2.



MBIB0095E

2. CHECK THROTTLE CONTROL MOTOR OUTPUT SIGNAL CIRCUIT FOR OPEN OR SHORT

1. Turn ignition switch “OFF”.
2. Disconnect electric throttle control actuator harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between the following terminals. Refer to Wiring Diagram.



Electric throttle control actuator terminal	ECM terminal	Continuity
3	4	Should exist
	5	Should not exist
6	4	Should not exist
	5	Should exist

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to ground or short to power in harness connectors.

3. CHECK THROTTLE CONTROL MOTOR

Refer to EC-799, "Component Inspection" .

OK or NG

OK >> GO TO 4.
NG >> GO TO 5.

4. CHECK INTERMITTENT INCIDENT

Refer to EC-656, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

OK or NG

OK >> GO TO 5.
NG >> Repair or replace harness or connectors.

5. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-589, "Throttle Valve Closed Position Learning" .
3. Perform EC-589, "Idle Air Volume Learning" .

>> **INSPECTION END**

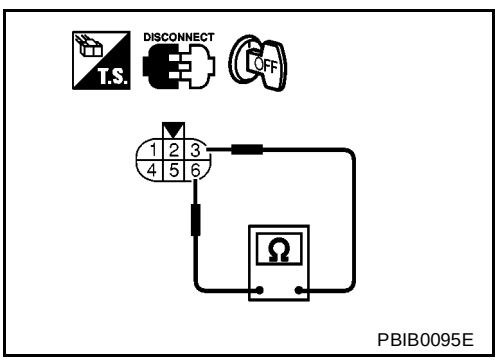
Component Inspection

EBS00EXS

THROTTLE CONTROL MOTOR

1. Disconnect electric throttle control actuator harness connector.
2. Check resistance between terminals 3 and 6.

Resistance: Approximately 1 - 15 Ω [at 25 °C (77°F)]



3. If NG, replace electric throttle control actuator and go to next step.
4. Perform EC-589, "Throttle Valve Closed Position Learning" .
5. Perform EC-589, "Idle Air Volume Learning" .

Remove and Installation

EBS00EXT

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-19, "INTAKE MANIFOLD" .

DTC P1217 ENGINE OVER TEMPERATURE

PFP:00000

System Description

EBS00EXU

NOTE:
If DTC P1217 is displayed with DTC U1000, U1001, first perform the trouble diagnosis for DTC U1000, U1001. Refer to EC-663, "DTC U1000, U1001 CAN COMMUNICATION LINE" .

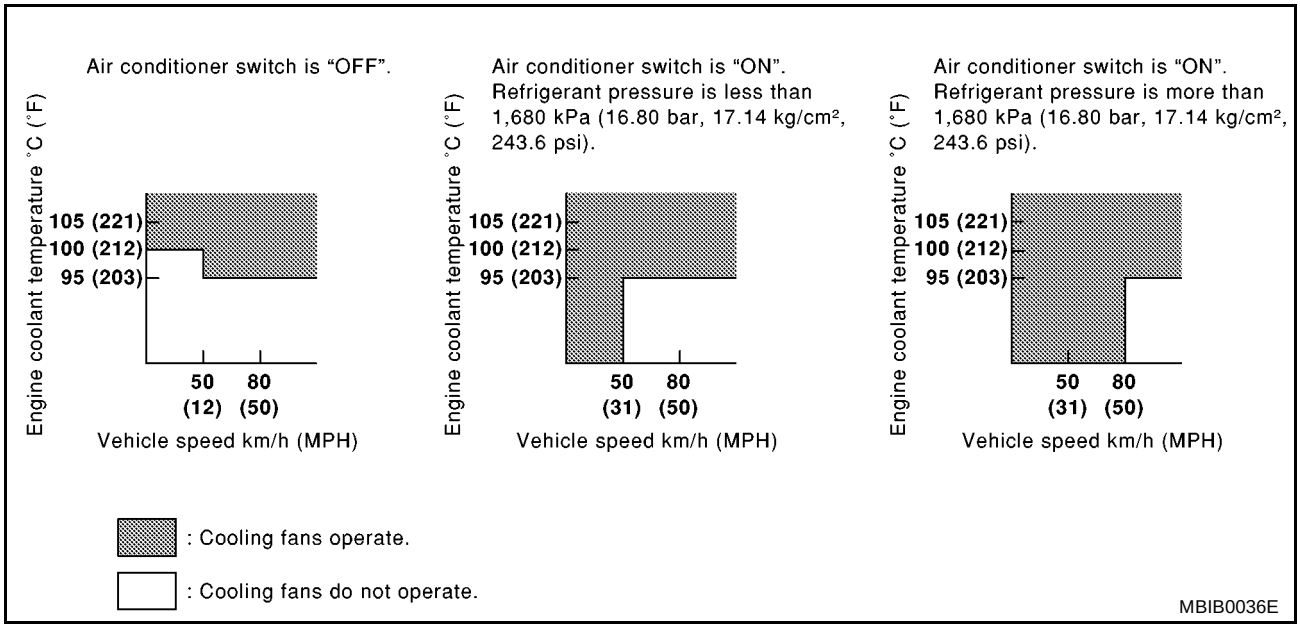
COOLING FAN CONTROL

Sensor	Input Signal to ECM	ECM Function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*1	Cooling fan control	Cooling fan relay
Battery	Battery voltage*1		
Vehicle speed signal	Vehicle speed*2		
Engine coolant temperature sensor	Engine coolant temperature		
Air conditioner switch	Air conditioner “ON” signal*2		
Refrigerant pressure sensor	Refrigerant pressure		

*1: The ECM determines the start signal status by the signals of engine speed and battery voltage.
*2: These signals are sent to the ECM through CAN communication line.

The ECM controls the cooling fan corresponding to the vehicle speed, engine coolant temperature, refrigerant pressure, and air conditioner ON signal. The control system has 2-step control [ON/OFF].
The ECM sends a cooling fan control signal to the smart entrance control unit through CAN communication line, and the smart entrance control unit controls cooling fan relay.

OPERATION



CONSULT-II Reference Value in Data Monitor Mode

EBS00EXV

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
AIR COND SIG	● Engine: After warming up, idle the engine	Air conditioner switch: OFF	OFF
		Air conditioner switch: ON (Compressor operates.)	ON
COOLING FAN	● Engine: After warming up, idle the engine ● Air conditioner switch: OFF	Engine coolant temperature is 99°C (210°F) or less	OFF
		Engine coolant temperature is 100°C (212°F) or more	ON

On Board Diagnosis Logic

EBS00EXW

If the cooling fan or another component in the cooling system malfunctions, engine coolant temperature will rise. When the engine coolant temperature reaches an abnormally high temperature condition, a malfunction is indicated.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1217 1217	Engine over temperature (Overheat)	● Cooling fan does not operate properly (Overheat). ● Cooling fan system does not operate properly (Overheat). ● Engine coolant was not added to the system using the proper filling method.	● Harness or connectors (The cooling fan circuit is open or shorted.) ● Harness or connectors (The CAN communication line is open or shorted.) ● Cooling fan ● Radiator hose ● Radiator ● Radiator cap ● Water pump ● Thermostat For more information, refer to EC-809, "Main 12 Causes of Overheating" .

CAUTION:

When a malfunction is indicated, be sure to replace the coolant. Refer to CO-8, "Changing Engine Coolant" . Also, replace the engine oil. Refer to LU-7, "Changing Engine Oil" .

1. **Fill radiator with coolant up to specified level with a filling speed of 2 liters per minute. Be sure to use coolant with the proper mixture ratio. Refer to MA-18, "Engine Coolant Mixture Ratio" .**
2. **After refilling coolant, run engine to ensure that no water-flow noise is emitted.**

Overall Function Check

EBS00EXX

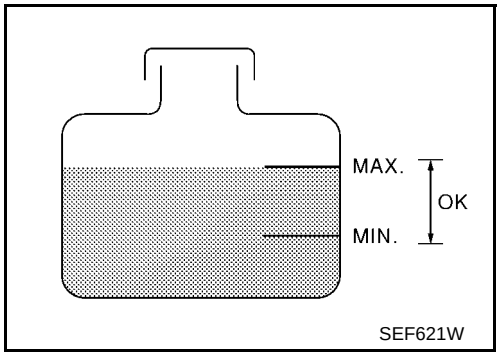
Use this procedure to check the overall function of the cooling fan. During this check, a DTC might not be confirmed.

WARNING:

Never remove the radiator cap when the engine is hot. Serious burns could be caused by high pressure fluid escaping from the radiator.
Wrap a thick cloth around cap. Carefully remove the cap by turning it a quarter turn to allow built-up pressure to escape. Then turn the cap all the way off.

WITH CONSULT-II

1. Check the coolant level in the reservoir tank and radiator.
   Allow engine to cool before checking coolant level.
   If the coolant level in the reservoir tank and/or radiator is below the proper range, skip the following steps and go to EC-805, "Diagnostic Procedure" .
2. Confirm whether customer filled the coolant or not. If customer filled the coolant, skip the following steps and go to EC-805, "Diagnostic Procedure" .
3. Turn ignition switch “ON”.



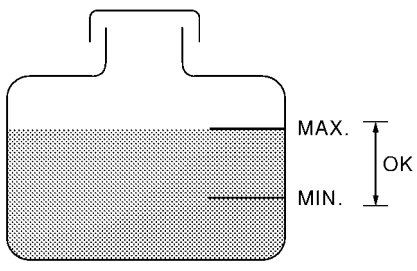
4. Perform “COOLING FAN” in “ACTIVE TEST” mode with CONSULT-II.
5. If the results are NG, go to EC-805, "Diagnostic Procedure" .

ACTIVE TEST	
COOLING FAN	ON
MONITOR	
COOLAN TEMP/S	XXX °C

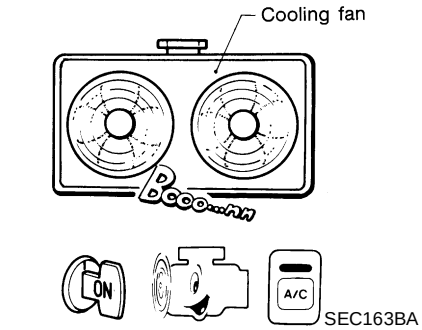
MBIB0037E

WITHOUT CONSULT-II

1. Check the coolant level in the reservoir tank and radiator.
   Allow engine to cool before checking coolant level.
   If the coolant level in the reservoir tank and/or radiator is below the proper range, skip the following steps and go to EC-805, "Diagnostic Procedure" .
2. Confirm whether customer filled the coolant or not. If customer filled the coolant, skip the following steps and go to EC-805, "Diagnostic Procedure" .
3. Start engine and let it idle.
   Be careful not to overheat engine.
4. Turn air conditioner switch “ON”.
5. Turn blower fan switch “ON”.
6. Make sure that cooling fans operate.
   If NG, go to EC-805, "Diagnostic Procedure" .



SEF621W

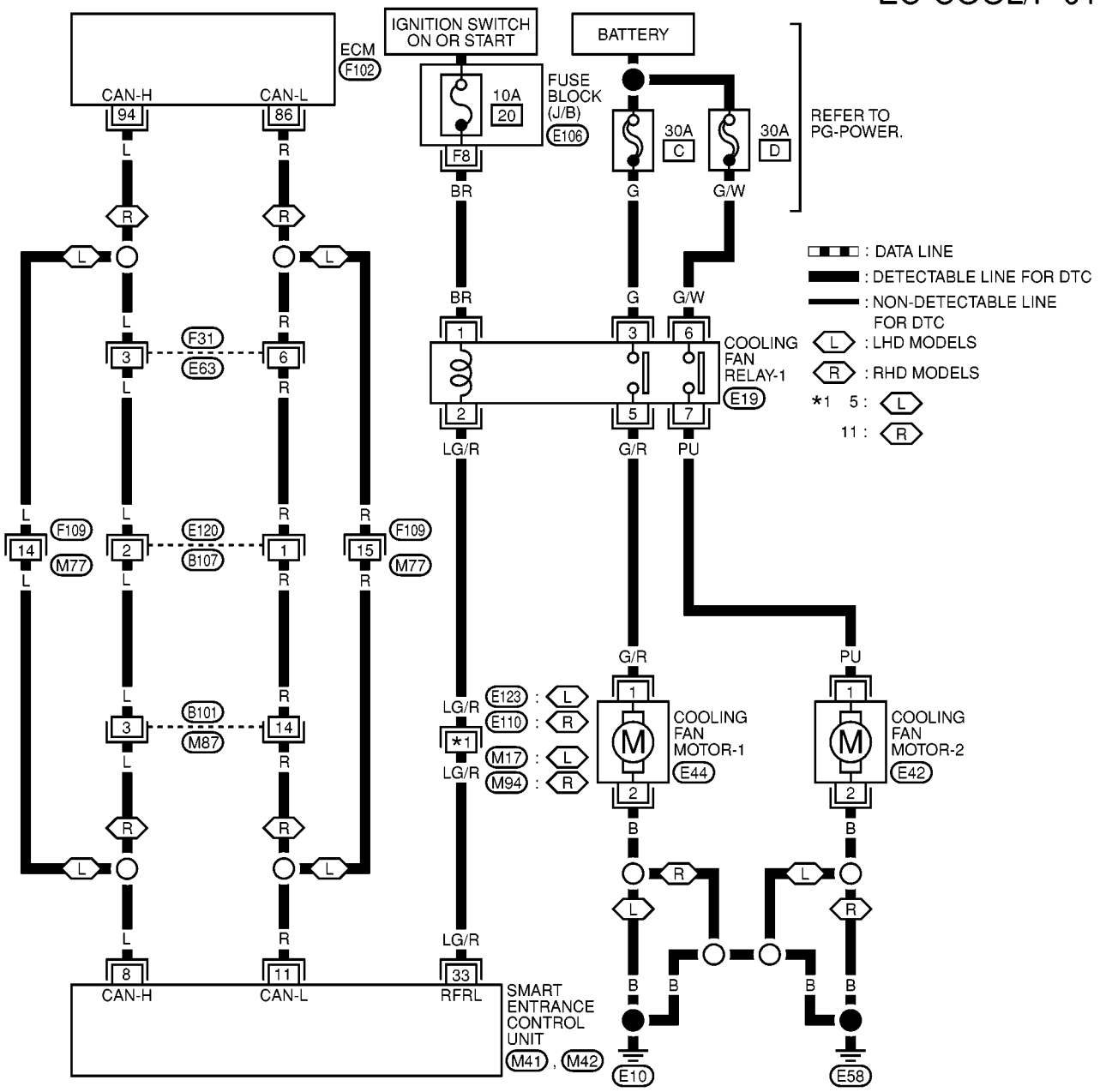


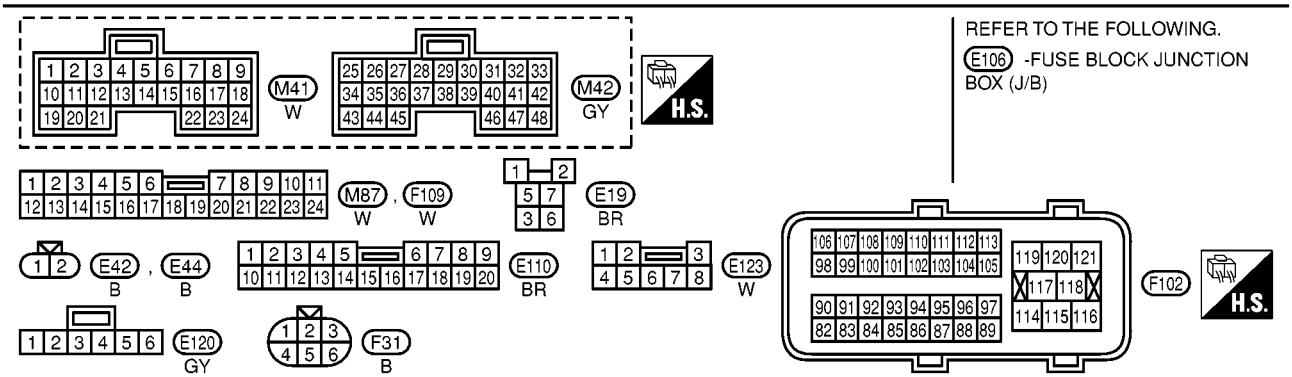
SEC163BA

Wiring Diagram

EBS00EXY

EC-COOL/F-01





MBWA0068E

Diagnostic Procedure

EBS00EXZ

1. INSPECTION START

Do you have CONSULT-II?

Yes or No

Yes >> GO TO 2.
No >> GO TO 3.

2. CHECK COOLING FAN OPERATION

With CONSULT-II

1. Start engine and let it idle.
2. Select “COOLING FAN” in “ACTIVE TEST” mode with CONSULT-II and touch “ON” on the CONSULT-II screen.
3. Make sure that cooling fans-1 and -2 operate.

OK or NG

OK >> GO TO 4.
NG >> Check cooling fan control circuit. (Go to EC-807, "PROCEDURE A" .)

ACTIVE TEST	
COOLING FAN	ON
MONITOR	
COOLAN TEMP/S	XXX °C

MBIB0037E

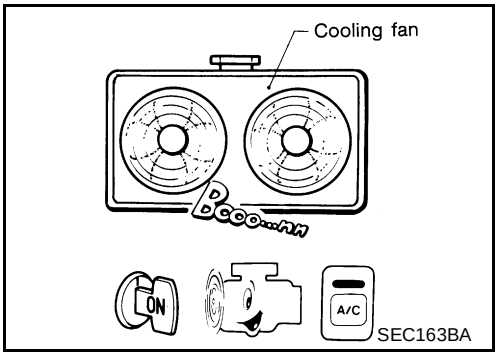
3. CHECK COOLING FAN OPERATION

Without CONSULT-II

1. Start engine and let it idle.
2. Turn air conditioner switch “ON”.
3. Turn blower fan switch “ON”.
4. Make sure that cooling fans-1 and -2 operate.

OK or NG

OK >> GO TO 4.
NG >> Check cooling fan control circuit. (Go to EC-807, "PROCEDURE A" .)

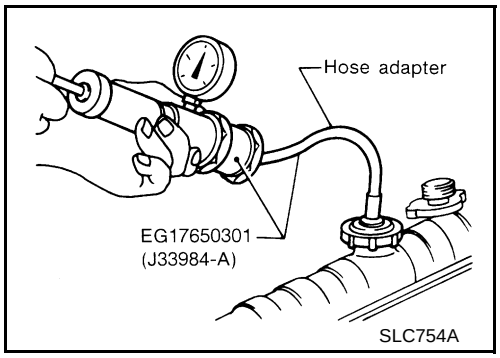


SEC163BA

4. CHECK COOLING SYSTEM FOR LEAK

Apply pressure to the cooling system with a tester, and check if the pressure drops.

Testing pressure: 157 kPa (1.6 kg/cm^2 , 23 psi)



CAUTION:
Higher than the specified pressure may cause radiator damage.
Pressure should not drop.

OK or NG

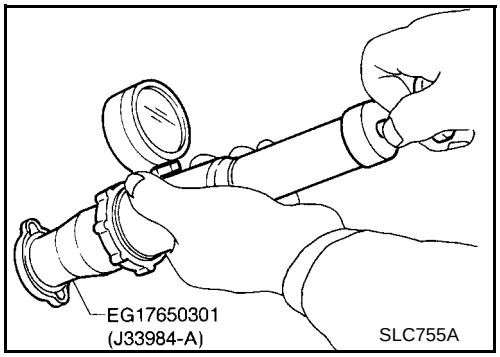
OK >> GO TO 5.
NG >> Check the following for leak

- Hose
- Radiator
- Water pump
  Refer to CO-18, "WATER PUMP" .

5. CHECK RADIATOR CAP

Apply pressure to cap with a tester.

Radiator cap relief pressure: 59 - 98 kPa (0.6 - 1.0 kg/cm^2 , 9 - 14 psi)



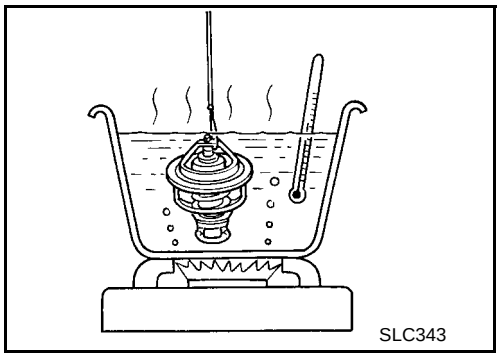
OK or NG

OK >> GO TO 6.
NG >> Replace radiator cap.

6. CHECK THERMOSTAT

1. Check valve seating condition at normal room temperatures.
   It should seat tightly.
2. Check valve opening temperature and valve lift.

Valve opening temperature: 82°C (180°F) [standard]
Valve lift: More than 8 mm/95°C (0.31 in/203°F)



3. Check if valve is closed at 5°C (9°F) below valve opening temperature.

For details, refer to CO-20, "THERMOSTAT AND THERMOSTAT HOUSING" .

OK or NG

OK >> GO TO 7.
NG >> Replace thermostat

7. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-676, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> Replace engine coolant temperature sensor.

8. CHECK MAIN 12 CAUSES

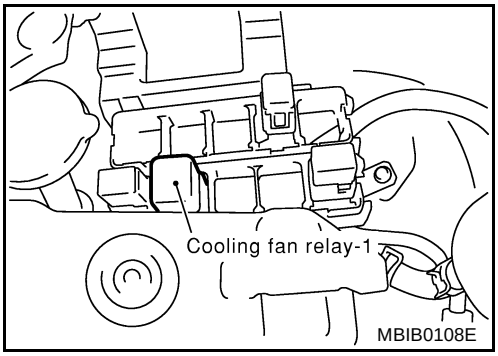
If the cause cannot be isolated, go to EC-809, "Main 12 Causes of Overheating" .

>> **INSPECTION END**

PROCEDURE A

1. CHECK COOLING FAN POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect cooling fan relay-1.
3. Turn ignition switch “ON”.

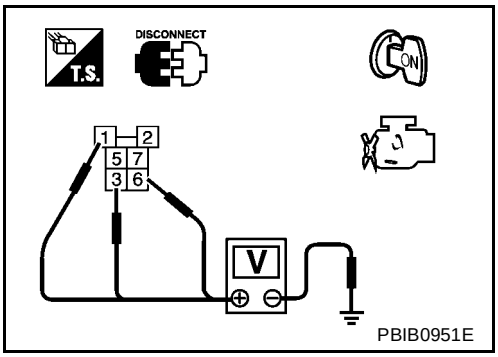


4. Check voltage between cooling fan relay-1 terminals 1, 3, 6 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 3.
NG >> GO TO 2.



2. DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector E106
- 10A fuse
- 30A fusible links
- Harness for open or short between cooling fan relay-1 and fuse
- Harness for open or short between cooling fan relay-1 and battery

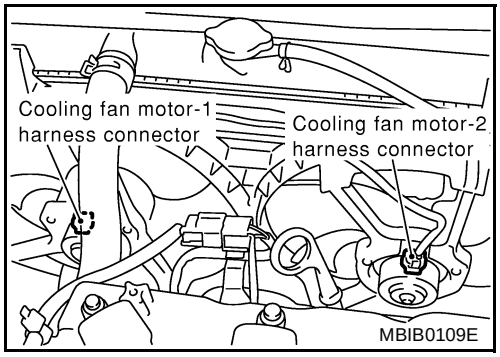
>> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK COOLING FAN MOTORS CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect cooling fan motor-1 harness connector and cooling fan motor-2 harness connector.
3. Check harness continuity between cooling fan relay-1 terminal 5 and cooling fan motor-1 terminal 1, cooling fan motor-1 terminal 2 and body ground.
   Refer to wiring diagram.

   Continuity should exist.
4. Also check harness for short to ground and short to power.
5. Check harness continuity between cooling fan relay-1 terminal 7 and cooling fan motor-2 terminal 1, cooling fan motor-2 terminal 2 and body ground.
   Refer to wiring diagram.

   Continuity should exist.
6. Also check harness for short to ground and short to power.



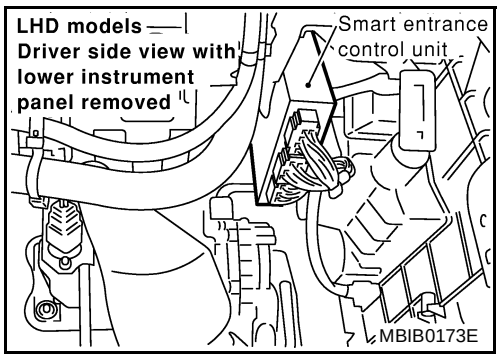
OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK COOLING FAN OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect smart entrance control unit.
2. Check harness continuity between smart entrance control unit terminal 33 and cooling fan relay-1 terminal 2.
   Refer to Wiring Diagram.

   Continuity should exist.
3. Also check harness for short to ground and short to power.



OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E123, M17 (LHD models)
- Harness connectors E110, M94 (RHD models)
- Harness for open or short between smart entrance control unit and cooling fan relay-1

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK COOLING FAN RELAY-1

Refer to EC-810, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace cooling fan relay.

7. CHECK COOLING FAN MOTORS

Refer to EC-810, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> Replace cooling fan motors.

8. CHECK SMART ENTRANCE CONTROL UNIT

Refer to BCS-3, "SMART ENTRANCE CONTROL SYSTEM" .

OK or NG

OK >> GO TO 9.
NG >> Replace cooling fan motors.

9. CHECK INTERMITTENT INCIDENT

Perform EC-656, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Main 12 Causes of Overheating

EBS00EY0

Engine	Step	Inspection item	Equipment	Standard	Reference page
OFF	1	● Blocked radiator ● Blocked condenser ● Blocked radiator grille ● Blocked bumper	● Visual	No blocking	—
	2	● Coolant mixture	● Coolant tester	50 - 50% coolant mixture	See MA-18, "Engine Coolant Mixture Ratio" .
	3	● Coolant level	● Visual	Coolant up to MAX level in reservoir tank and radiator filler neck	See MA-20, "Changing Engine Coolant" .
	4	● Radiator cap	● Pressure tester	59 - 98 kPa (0.6 - 1.0 kg/cm^2 , 9 - 14 psi) (Limit)	See MA-22, "CHECKING RADIATOR CAP" .
ON*2	5	● Coolant leaks	● Visual	No leaks	See MA-23, "CHECKING COOLING SYSTEM FOR LEAKS" .
ON*2	6	● Thermostat	● Touch the upper and lower radiator hoses	Both hoses should be hot	See CO-20, "THERMOSTAT AND THERMOSTAT HOUSING" , and CO-11, "RADIATOR" .
ON*1	7	● Cooling fan	● CONSULT-II	Operating	See trouble diagnosis for DTC P1217 (EC-801).
OFF	8	● Combustion gas leak	● Color checker chemical tester 4 Gas analyzer	Negative	—
ON*3	9	● Coolant temperature gauge	● Visual	Gauge less than 3/4 when driving	—
		● Coolant overflow to reservoir tank	● Visual	No overflow during driving and idling	See MA-20, "Changing Engine Coolant" .
OFF*4	10	● Coolant return from reservoir tank to radiator	● Visual	Should be initial level in reservoir tank	See CO-8, "LEVEL CHECK" .

Engine	Step	Inspection item	Equipment	Standard	Reference page
OFF	11	● Cylinder head	● Straight gauge feeler gauge	0.1 mm (0.004 in) Maximum distortion (warping)	See EM-57, "CYLINDER HEAD" .
	12	● Cylinder block and pistons	● Visual	No scuffing on cylinder walls or piston	See EM-57, "CYLINDER HEAD" .

*1: Turn the ignition switch ON.
*2: Engine running at 3,000 rpm for 10 minutes.
*3: Drive at 90 km/h (55 MPH) for 30 minutes and then let idle for 10 minutes.
*4: After 60 minutes of cool down time.
For more information, refer to CO-5, "OVERHEATING CAUSE ANALYSIS" .

Component Inspection

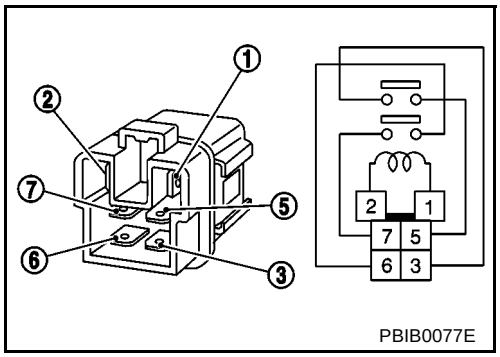
EBS00EY1

COOLING FAN RELAY-1

1. Apply 12V direct current between relay terminals 1 and 2.
2. Check continuity between relay terminals 3 and 5, 6 and 7.

Condition	Continuity
12V direct current supply between terminals 1 and 2	Yes
OFF	No

3. If NG, replace cooling fan relay.



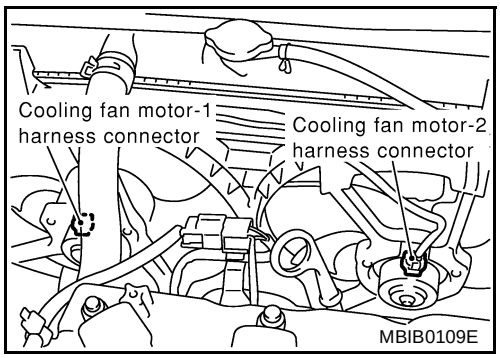
PBIB0077E

COOLING FAN MOTORS-1 AND -2

1. Disconnect cooling fan motor harness connectors.
2. Supply cooling fan motor terminals with battery voltage and check operation.

	Terminals	
	(+)	(–)
Cooling fan motor	1	2

Cooling fan motor should operate.
If NG, replace cooling fan motor.



MBIB0109E

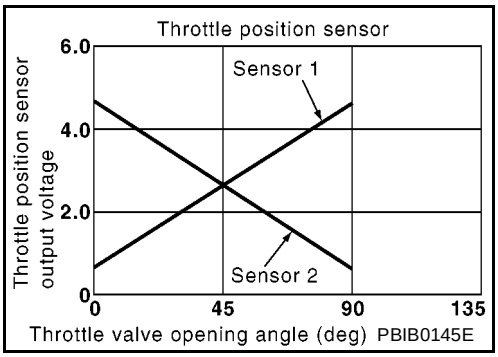
DTC P1223, P1224 TP SENSOR

PFP:16119

Component Description

EBS00EY2

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.
The throttle position sensor has the two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.



CONSULT-II Reference Value in Data Monitor Mode

EBS00EY3

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
THRTL SEN2	● Ignition switch: ON (Engine stopped) ● Shift lever: D (A/T model) 1st (M/T model)	Accelerator pedal: Fully released	More than 0.36V
		Accelerator pedal: Fully depressed	Less than 4.75V

On Board Diagnosis Logic

EBS00EY4

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1223 1223	Throttle position sensor 2 circuit low input	An excessively low voltage from the TP sensor 2 is sent to ECM.	● Harness or connectors (The TP sensor 2 circuit is open or shorted.) ● Electric throttle control actuator (TP sensor 2)
P1224 1224	Throttle position sensor 2 circuit high input	An excessively high voltage from the TP sensor 2 is sent to ECM.	

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters in fail-safe mode and the MI lights up.

Engine operation condition in fail-safe mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.

DTC Confirmation Procedure

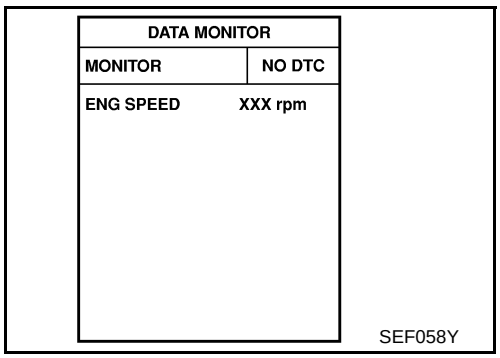
EBS00EY5

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.

2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-814, "Diagnostic Procedure" .



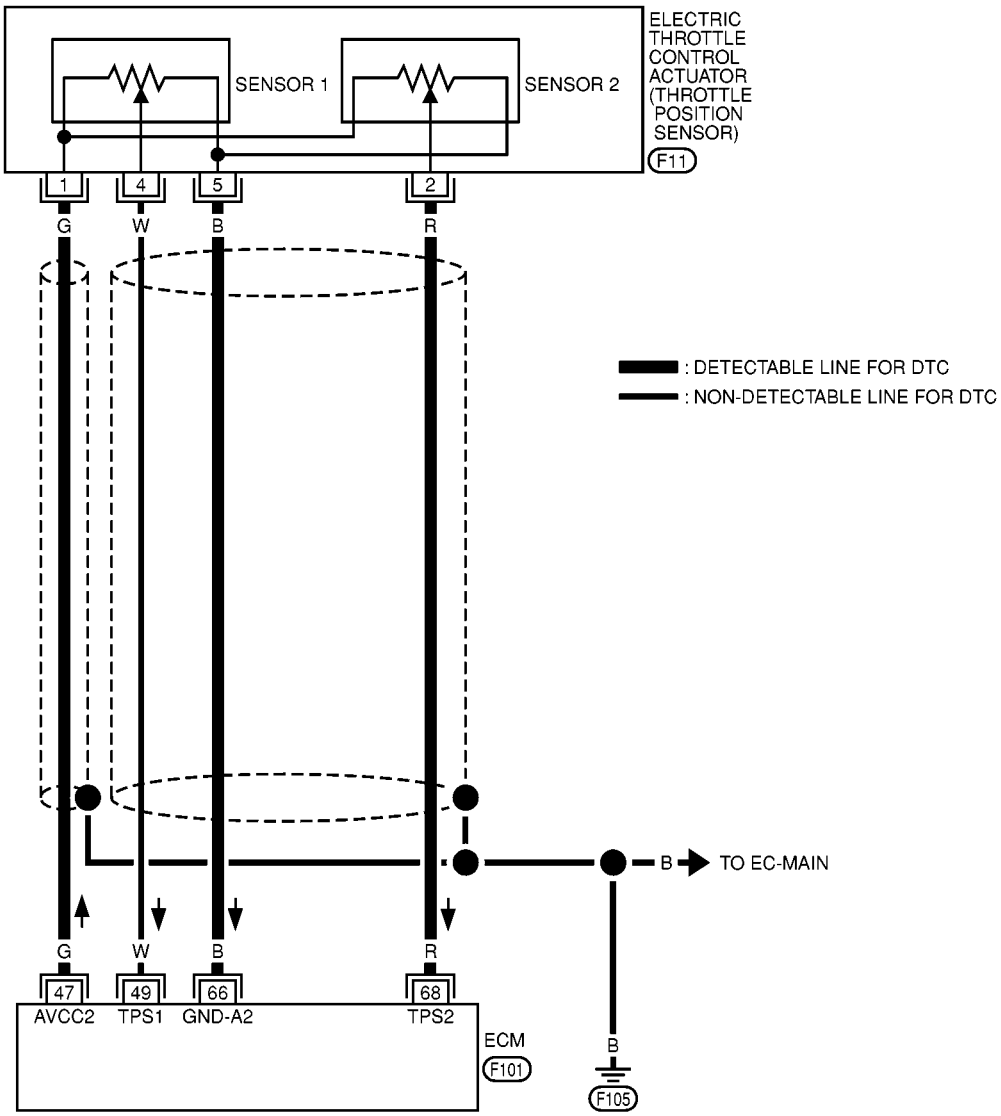
WITHOUT CONSULT-II

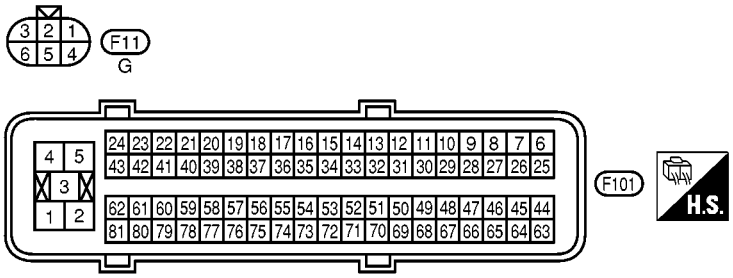
1. Start engine and let it idle for 1 second.
2. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
3. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
4. If DTC is detected, go to EC-816, "Component Inspection" .

Wiring Diagram

EBS00EY6

EC-TPS2-01





MBWA0137E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
47	G	Throttle position sensor power supply	**[Ignition switch "ON"]**	Approximately 5V
49	W	Throttle position sensor 1	**[Ignition switch "ON"]** ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully released	More than 0.36V
			[Ignition switch "ON"] ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully depressed	Less than 4.75V
66	B	Throttle position sensor ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
68	R	Throttle position sensor 2	**[Ignition switch "ON"]** ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully released	Less than 4.75V
			[Ignition switch "ON"] ● Shift lever position is "D" (A/T model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully depressed	More than 0.36V

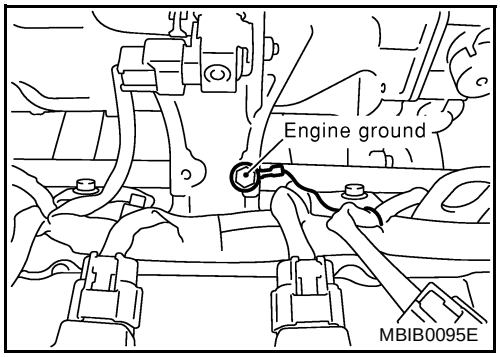
Diagnostic Procedure

EBS00EY7

1. RETIGHTEN GROUND SCREWS

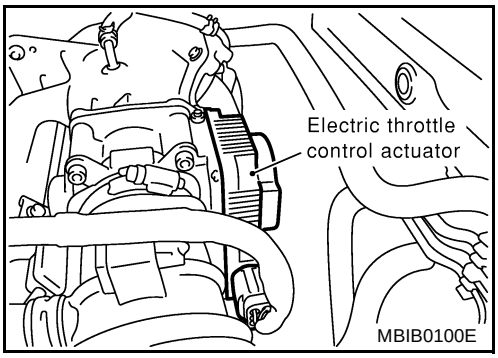
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



2. CHECK THROTTLE POSITION SENSOR 2 POWER SUPPLY CIRCUIT

1. Disconnect electric throttle control actuator harness connector.
2. Turn ignition switch “ON”.

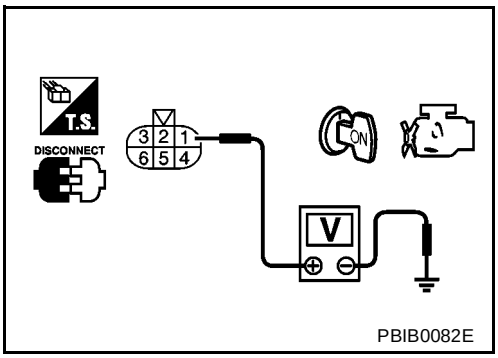


3. Check voltage between electric throttle control actuator terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 5V

OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.



3. CHECK THROTTLE POSITION SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 66 and electric throttle control actuator terminal 5. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK THROTTLE POSITION SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 68 and electric throttle control actuator terminal 2. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK THROTTLE POSITION SENSOR

Refer to EC-816, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-589, "Throttle Valve Closed Position Learning" .
3. Perform EC-589, "Idle Air Volume Learning" .

>> **INSPECTION END**

7. CHECK INTERMITTENT INCIDENT

Refer to EC-656, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

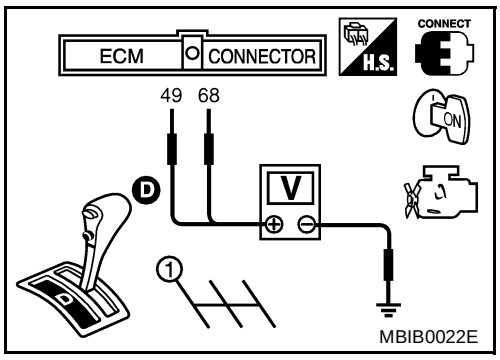
Component Inspection

EBS00EY8

THROTTLE POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Perform EC-589, "Throttle Valve Closed Position Learning" .
3. Turn ignition switch “ON”.
4. Set selector lever to “D” position (A/T models) or “1st” position (M/T models).
5. Check voltage between ECM terminals 49 (TP sensor 1 signal), 68 (TP sensor 2 signal) and engine ground under the following conditions.

Terminal	Accelerator pedal	Voltage
49 (Throttle position sensor 1)	Fully released	More than 0.36V
	Fully depressed	Less than 4.75V
68 (Throttle position sensor 2)	Fully released	Less than 4.75V
	Fully depressed	More than 0.36V



6. If NG, replace electric throttle control actuator and go to the next step.
7. Perform EC-589, "Throttle Valve Closed Position Learning" .
8. Perform EC-589, "Idle Air Volume Learning" .

Remove and Installation

EBS00EY9

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-19, "INTAKE MANIFOLD" .

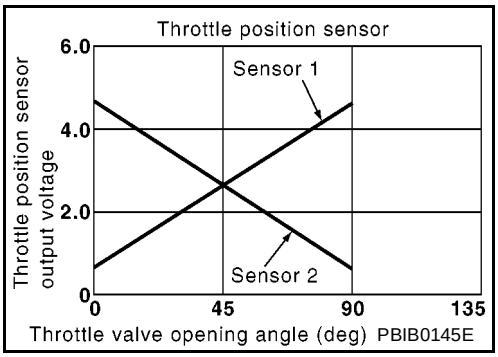
DTC P1225 TP SENSOR

PFP:16119

Component Description

EBS00EYA

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.
The throttle position sensor has the two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.



On Board Diagnosis Logic

EBS00EYB

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1225 1225	Closed throttle position learning performance problem	Closed throttle position learning value is excessively low.	● Electric throttle control actuator (TP sensor 1 and 2)

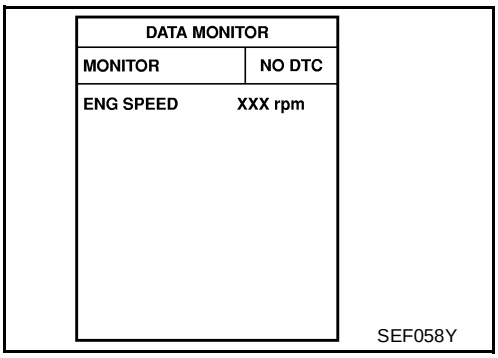
DTC Confirmation Procedure

EBS00EYC

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Turn ignition switch “OFF”, wait at least 10 seconds.
4. Turn ignition switch “ON”.
5. If 1st trip DTC is detected, go to EC-818, "Diagnostic Procedure" .



WITHOUT CONSULT-II

1. Turn ignition switch “ON”.
2. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
3. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
4. If 1st trip DTC is detected, go to EC-818, "Diagnostic Procedure" .

Diagnostic Procedure

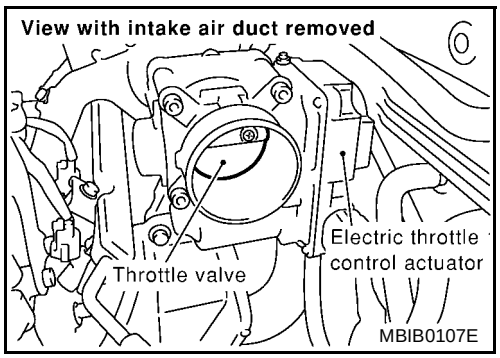
EBS00EYD

1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Turn ignition switch “OFF”.
2. Remove the intake air duct.
3. Check if foreign matter is caught between the throttle valve and the housing.

OK or NG

OK >> GO TO 2.
NG >> Remove the foreign matter and clean the electric throttle control actuator inside.



2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-589, "Throttle Valve Closed Position Learning" .
3. Perform EC-589, "Idle Air Volume Learning" .

>> **INSPECTION END**

Remove and Installation

EBS00EYE

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-19, "INTAKE MANIFOLD" .

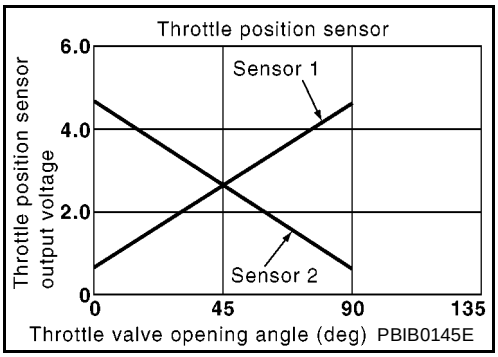
DTC P1226 TP SENSOR

PFP:16119

Component Description

EBS00EYF

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.
The throttle position sensor has the two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.



On Board Diagnosis Logic

EBS00EYG

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1226 1226	Closed throttle position learning performance problem	Closed throttle position learning is not performed successfully, repeatedly.	● Electric throttle control actuator (TP sensor 1 and 2)

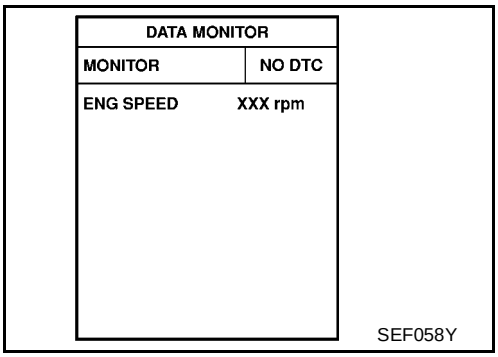
DTC Confirmation Procedure

EBS00EYH

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Turn ignition switch “OFF”, wait at least 10 seconds.
4. Turn ignition switch “ON”.
5. Repeat steps 3 and 4, 32 times.
6. If 1st trip DTC is detected, go to EC-820, "Diagnostic Procedure" .



WITHOUT CONSULT-II

1. Turn ignition switch “ON”.
2. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
3. Repeat step 2, 32 times.
4. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
5. If 1st trip DTC is detected, go to EC-820, "Diagnostic Procedure" .

Diagnostic Procedure

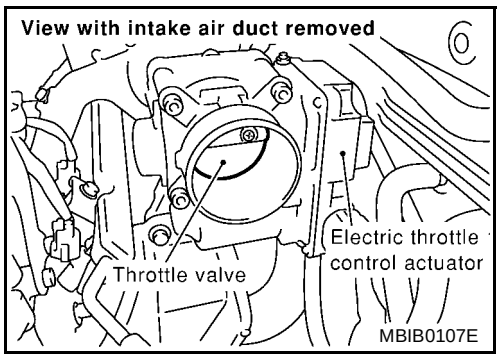
EBS00EYI

1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Turn ignition switch “OFF”.
2. Remove the intake air duct.
3. Check if foreign matter is caught between the throttle valve and the housing.

OK or NG

OK >> GO TO 2.
NG >> Remove the foreign matter and clean the electric throttle control actuator inside.



2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-589, "Throttle Valve Closed Position Learning" .
3. Perform EC-589, "Idle Air Volume Learning" .

>> **INSPECTION END**

Remove and Installation

EBS00EYJ

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-19, "INTAKE MANIFOLD" .

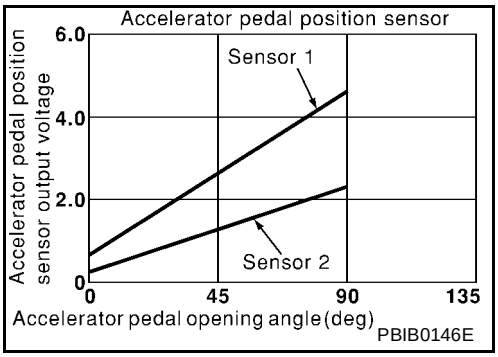
DTC P1227, P1228 APP SENSOR

PFP:18002

Component Description

EBS00EYK

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.
Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometers which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the accelerator pedal and feed the voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.



Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for the engine operation such as fuel cut.

CONSULT-II Reference Value in Data Monitor Mode

EBS00EYL

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
ACCEL SEN2	● Ignition switch: ON (engine stopped)	Accelerator pedal: Fully released	0.35 - 0.67V
		Accelerator pedal: Fully depressed	More than 3.9V
CLSD THL POS	● Ignition switch: ON	Accelerator pedal: Fully released	ON
		Accelerator pedal: Slightly depressed	OFF

On Board Diagnosis Logic

EBS00EYM

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1227 1227	Accelerator pedal position sensor 2 circuit low input	An excessively low voltage from the APP sensor 2 is sent to ECM.	● Harness or connectors (The APP sensor 2 circuit is open or shorted.) ● Accelerator pedal position sensor (Accelerator pedal position sensor 2)
P1228 1228	Accelerator pedal position sensor 2 circuit high input	An excessively high voltage from the APP sensor 2 is sent to ECM.	

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters in fail-safe mode and the MI lights up.

Engine operating condition in fail-safe mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of throttle valve to be slower than the normal condition. So, the acceleration will be poor.

DTC Confirmation Procedure

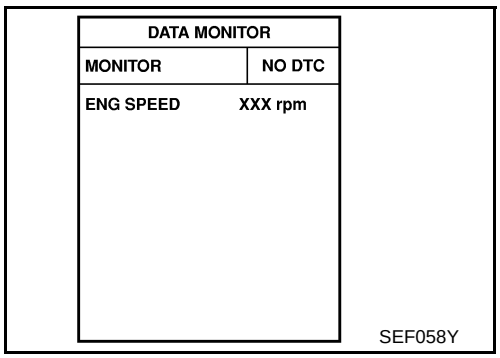
EBS00EYN

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.

2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-824, "Diagnostic Procedure" .

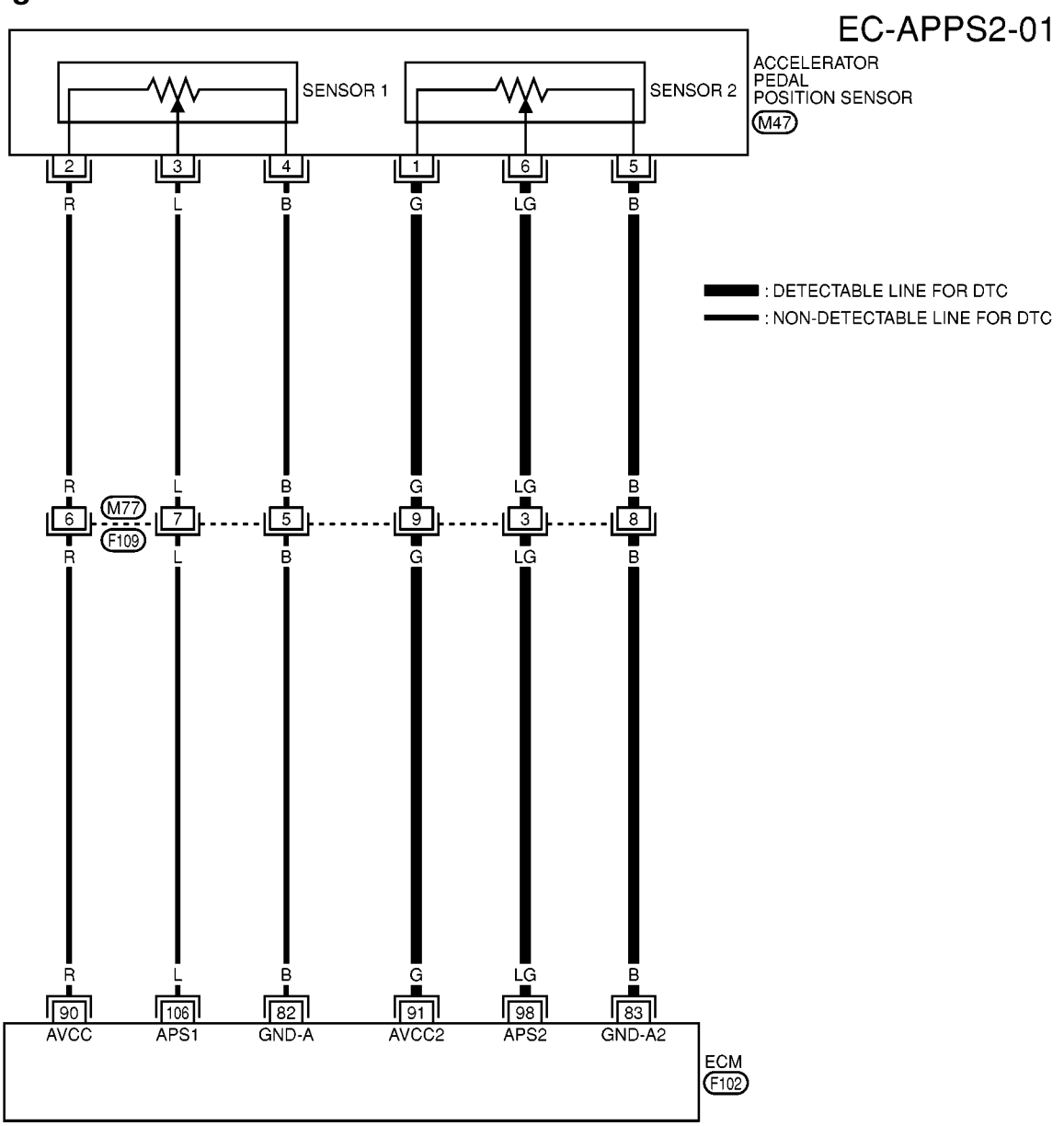


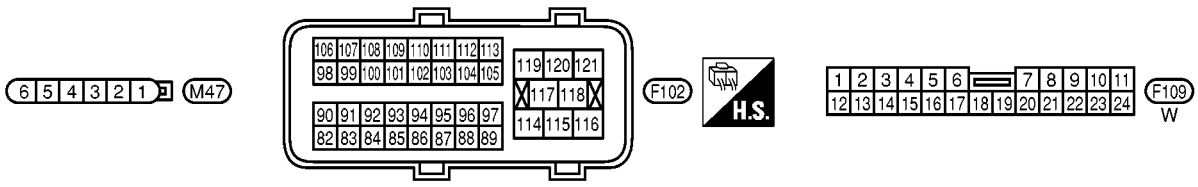
WITHOUT CONSULT-II

1. Start engine and let it idle for 1 second.
2. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
3. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
4. If DTC is detected, go to EC-824, "Diagnostic Procedure" .

Wiring Diagram

EBS00EYO





MBWA0141E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
82	B	Sensor ground (Accelerator pedal position sensor 1)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
83	B	Sensor ground (Accelerator pedal position sensor 2)	**[Ignition switch "ON"]**	Approximately 0V
90	R	Sensor power supply (Accelerator pedal position sensor 1)	**[Ignition switch "ON"]**	Approximately 5V
91	G	Sensor power supply (Accelerator pedal position sensor 2)	**[Ignition switch "ON"]**	Approximately 5V
98	LG	Accelerator pedal position sensor 2	**[Ignition switch "ON"]** ● Accelerator pedal fully released	0.175 - 0.335V
			[Ignition switch "ON"] ● Accelerator pedal fully depressed	More than 1.95V
106	L	Accelerator pedal position sensor 1	**[Ignition switch "ON"]** ● Accelerator pedal fully released	0.35 - 0.67V
			[Ignition switch "ON"] ● Accelerator pedal fully depressed	More than 3.9V

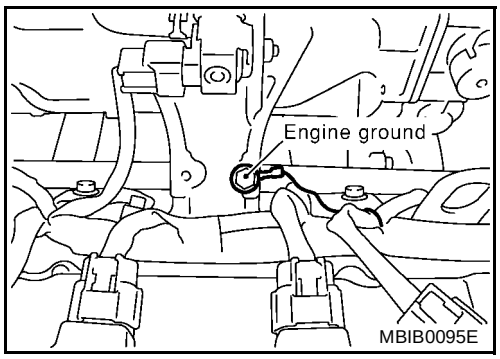
Diagnostic Procedure

EBS00EYP

1. RETIGHTEN GROUND SCREWS

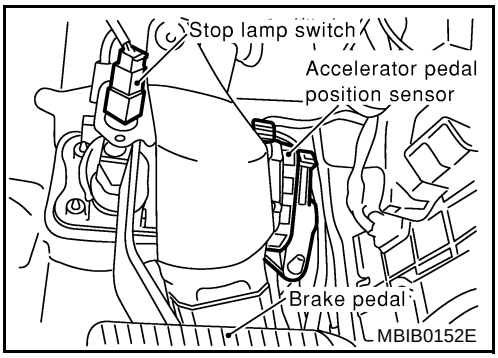
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



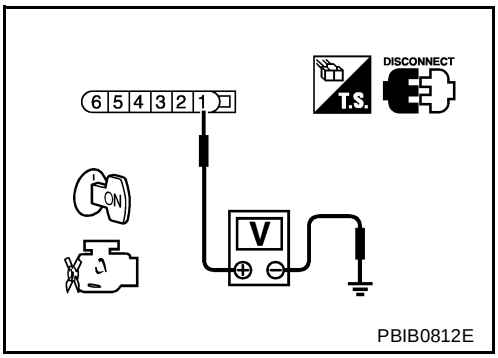
2. CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT

1. Disconnect accelerator pedal position (APP) sensor harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between APP sensor terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M77, F109
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK APP SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 83 and APP sensor terminal 5. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M77, F109
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK APP SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 98 and APP sensor terminal 6. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M77, F109
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK APP SENSOR

Refer to EC-826, "Component Inspection" .

OK or NG

OK >> GO TO 10.
NG >> GO TO 9.

9. REPLACE APP SENSOR

1. Replace the accelerator pedal position sensor.
2. Perform EC-589, "Accelerator Pedal Released Position Learning" .
3. Perform EC-589, "Throttle Valve Closed Position Learning" .
4. Perform EC-589, "Idle Air Volume Learning" .

>> **INSPECTION END**

10. CHECK INTERMITTENT INCIDENT

Refer to EC-656, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

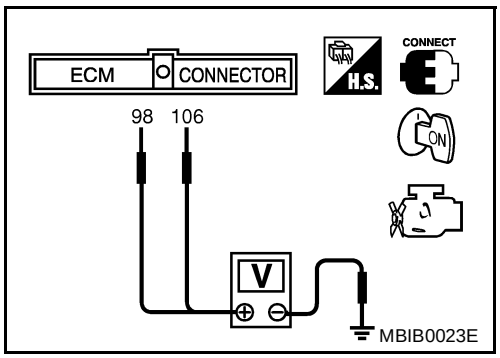
Component Inspection

EBS00EYQ

ACCELERATOR PEDAL POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Turn ignition switch “ON”.
3. Check voltage between ECM terminals 106 (APP sensor 1 signal), 98 (APP sensor 2 signal) and engine ground under the following conditions.

Terminal	Accelerator pedal	Voltage
106 (Accelerator pedal position sensor 1)	Fully released	0.35 - 0.67V
	Fully depressed	More than 3.9V
98 (Accelerator pedal position sensor 2)	Fully released	0.175 - 0.335V
	Fully depressed	More than 1.195V



4. If NG, replace accelerator pedal assembly and go to the next step.
5. Perform EC-589, "Accelerator Pedal Released Position Learning" .
6. Perform EC-589, "Throttle Valve Closed Position Learning" .
7. Perform EC-589, "Idle Air Volume Learning" .

Remove and Installation

EBS00EYR

ACCELERATOR PEDAL

Refer to ACC-2, "ACCELERATOR CONTROL SYSTEM" .

DTC P1229 SENSOR POWER SUPPLY

PFP:16119

On Board Diagnosis Logic

EBS00EYS

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1229 1229	Sensor power supply circuit short	ECM detects a voltage of power source for sensor is excessively low or high.	● Harness or connectors (The TP sensor 1 and 2 circuit is shorted.) ● Electric throttle control actuator (TP sensor 1 and 2)

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters in fail-safe mode and the MI lights up.

Engine operation condition in fail-safe mode
ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

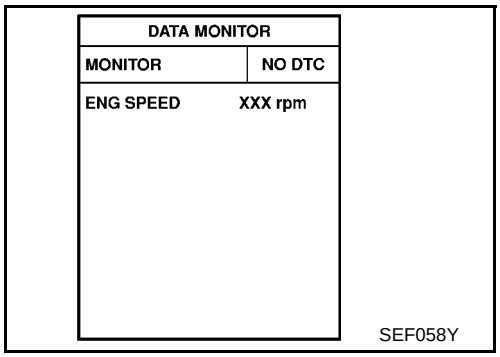
DTC Confirmation Procedure

EBS00EYT

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-830, "Diagnostic Procedure" .



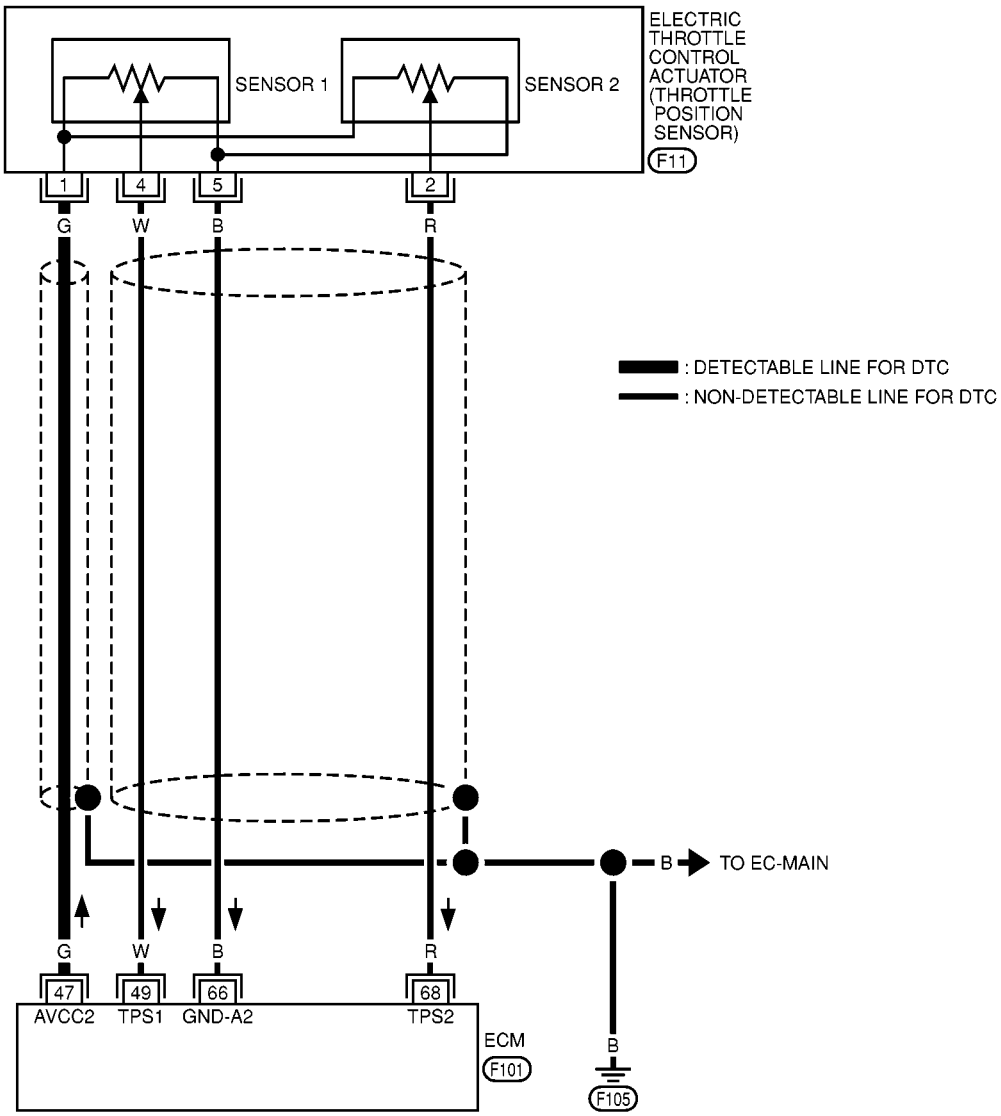
WITHOUT CONSULT-II

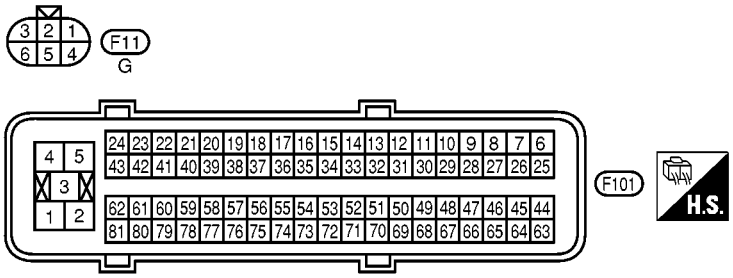
1. Start engine and let it idle for 1 seconds.
2. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
3. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
4. If DTC is detected, go to EC-830, "Diagnostic Procedure" .

Wiring Diagram

EBS00EYU

EC-SEN/PW-01





MBWA0139E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
47	G	Throttle position sensor power supply	**[Ignition switch "ON"]**	Approximately 5V

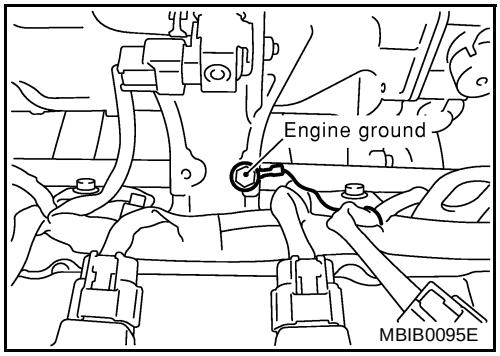
Diagnostic Procedure

EBS00EYV

1. RETIGHTEN GROUND SCREWS

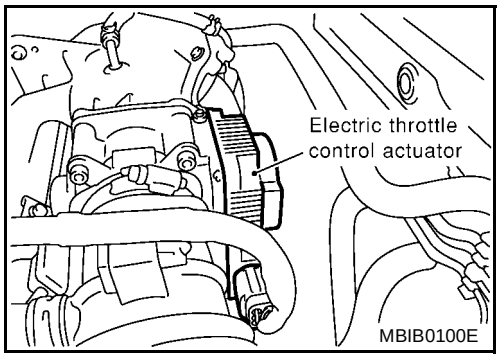
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



2. CHECK THROTTLE POSITION SENSOR POWER SUPPLY CIRCUIT

1. Disconnect electric throttle control actuator harness connector.
2. Turn ignition switch "ON".

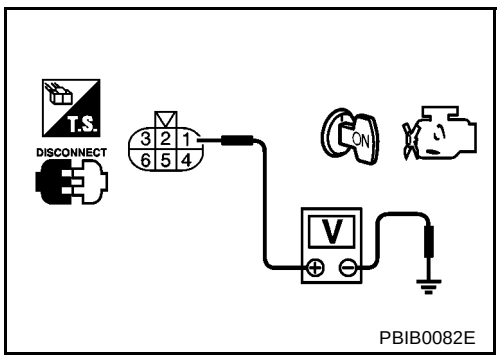


3. Check voltage between electric throttle control actuator terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 5V

OK or NG

OK >> GO TO 4.
NG >> GO TO 3.



3. CHECK SENSOR POWER SUPPLY CIRCUITS FOR SHORT

Check the following.

- Harness for short to power and short to ground between ECM terminal 47 and electric throttle control actuator terminal 1.
- ECM pin terminal.

OK or NG

OK >> GO TO 4.
NG >> Repair short to ground or short to power in harness or connectors.

4. CHECK THROTTLE POSITION SENSOR

Refer to EC-728, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace electric throttle control actuator.
2. Perform EC-589, "Throttle Valve Closed Position Learning" .
3. Perform EC-589, "Idle Air Volume Learning" .

>> **INSPECTION END**

6. CHECK INTERMITTENT INCIDENT

Refer to EC-656, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

DTC P1805 BRAKE SWITCH

PFP:25320

Description

EBS00EYW

Brake switch signal is applied to the ECM through the stop lamp switch when the brake pedal is depressed. This signal is used mainly to decrease the engine speed when the vehicle is driving.

CONSULT-II Reference Value in Data Monitor Mode

EBS00EYX

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
BRAKE SW	● Ignition switch: ON	Brake pedal: Fully released	OFF
		Brake pedal: Slightly depressed	ON

On Board Diagnosis Logic

EBS00EYY

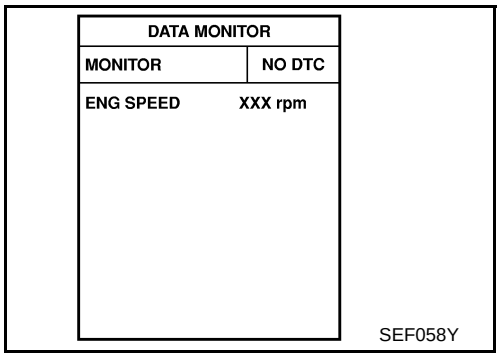
DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1805 1805	Brake switch	A brake switch signal is not sent to ECM for an extremely long time while the vehicle is driving.	● Harness or connectors (Stop lamp switch circuit is open or shorted.) ● Stop lamp switch

DTC Confirmation Procedure

EBS00EYZ

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Fully depress the brake pedal for at least 5 seconds.
3. Erase the DTC with CONSULT-II.
4. Select “DATA MONITOR” mode with CONSULT-II.
5. If 1st trip DTC is detected, go to EC-834, "Diagnostic Procedure" .



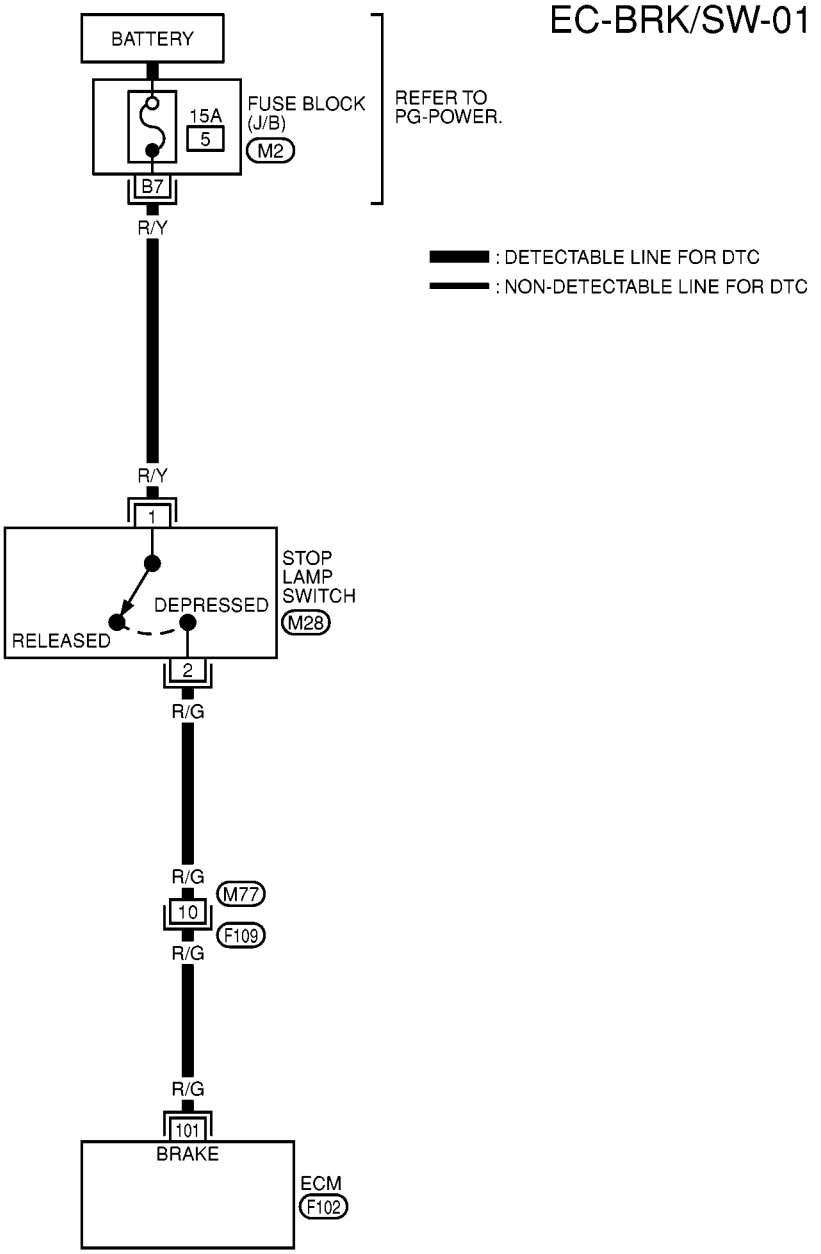
WITHOUT CONSULT-II

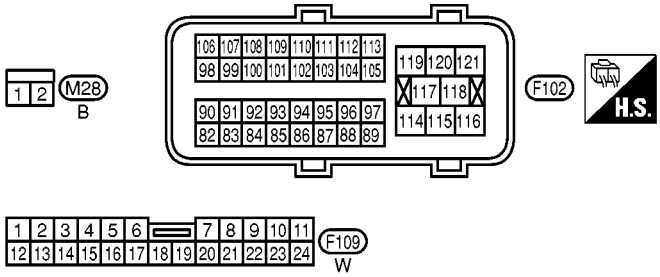
1. Turn ignition switch “ON”.
2. Fully depress the brake pedal at least 5 seconds.
3. Erase the “Diagnostic Test Mode II (Self-diagnostic results)” memory. Refer to EC-594 .
4. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
5. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
6. If 1st trip DTC is detected, go to EC-834, "Diagnostic Procedure" .

Wiring Diagram

EBS00EZ0

EC-BRK/SW-01





REFER TO THE FOLLOWING.
M2 -FUSE BLOCK-
JUNCTION BOX (J/B)

MBWA0091E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
101	R/G	Stop lamp switch	**[Engine is running]** ● Brake pedal fully released	Approximately 0V
			[Engine is running] ● Brake pedal depressed	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

EBS00EZ1

1. CHECK STOP LAMP SWITCH CIRCUIT

1. Turn ignition switch “OFF”.
2. Check the stop lamp when depressing and releasing the brake pedal.

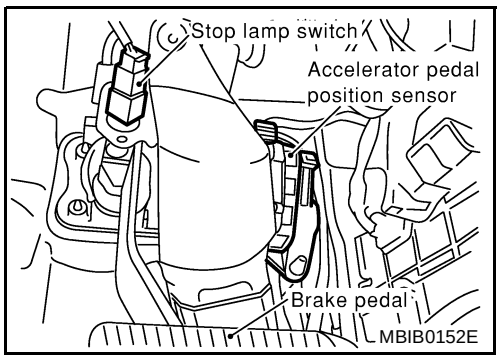
Brake pedal	Stop lamp
Fully released	Not illuminated
Depressed	Illuminated

OK or NG

OK >> GO TO 4.
NG >> GO TO 2.

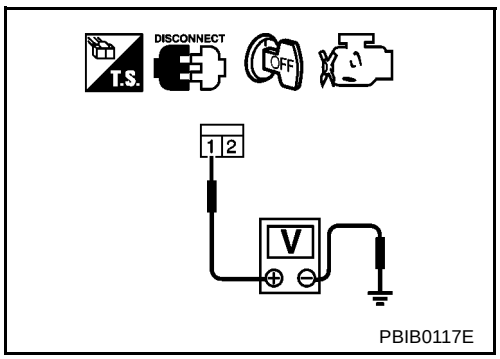
2. CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT

1. Disconnect stop lamp switch harness connector.



2. Check voltage between stop lamp switch terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

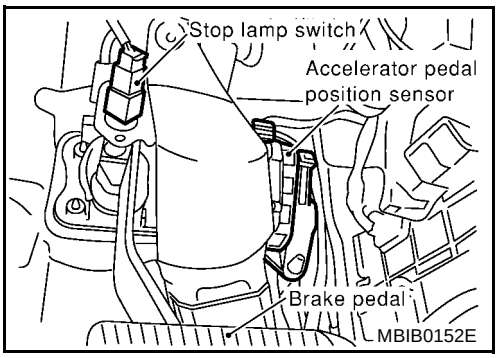
- 15A fuse
- Fuse block (J/B) connector M2
- Harness for open and short between stop lamp switch and battery

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK STOP LAMP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Disconnect stop lamp switch harness connector.
4. Check harness continuity between ECM terminal 101 and stop lamp switch terminal 2.
   Refer to Wiring Diagram.

   Continuity should exist.
5. Also check harness for short to ground and short to power.



OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M77, F109
- Harness for open or short between ECM and stop lamp switch

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK STOP LAMP SWITCH

Refer to EC-836, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace stop lamp switch.

7. CHECK INTERMITTENT INCIDENT

Refer to EC-656, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

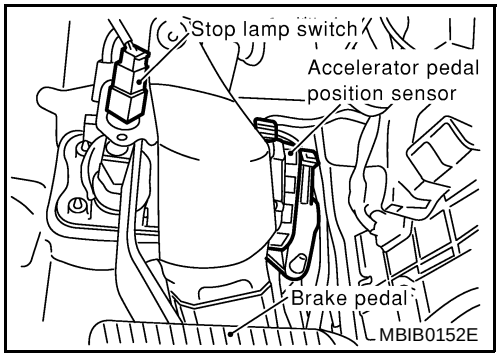
>> **INSPECTION END**

Component Inspection

EBS00EZ2

STOP LAMP SWITCH

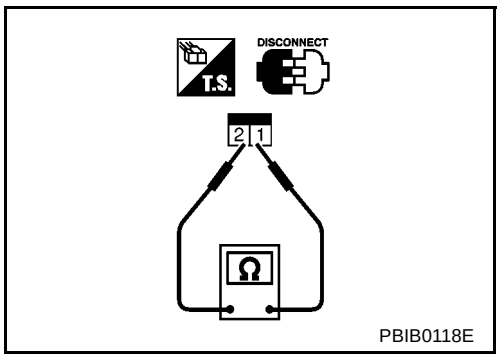
1. Disconnect stop lamp switch harness connector.



2. Check continuity between stop lamp switch terminals 1 and 2 under the following conditions.

Conditions	Continuity
Brake pedal fully released	Should not exist.
Brake pedal depressed	Should exist.

If NG, adjust brake pedal installation, refer to BR-6, "BRAKE PEDAL" , and perform step 2 again.



HO2S1 HEATER (QG16DE)

PFP:22690

Description

EBS00FV4

SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM function	Actuator
Camshaft position sensor (PHASE) Crankshaft position sensor (POS)	Engine speed	Heated oxygen sensor 1 heater control	Heated oxygen sensor 1 heater
Engine coolant temperature sensor	Engine coolant temperature		

The ECM performs ON/OFF duty control of the heated oxygen sensor 1 heater corresponding to the engine speed and engine coolant temperature. The duty percent varies with engine coolant temperature when engine is started.

OPERATION

Engine speed rpm	Heated oxygen sensor 1 heater
Above 3,600	OFF
Below 3,600	ON

CONSULT-II Reference Value in Data Monitor Mode

EBS00FV5

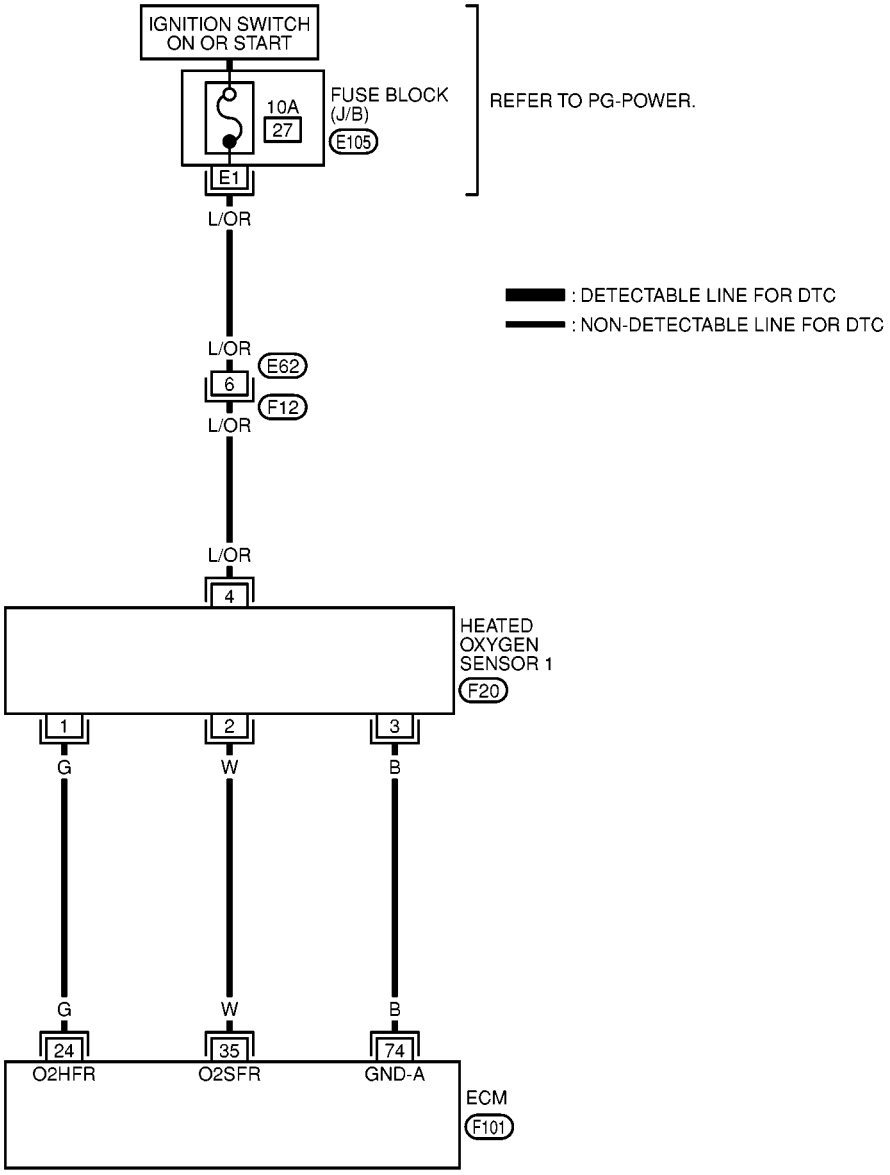
Specification data are reference values.

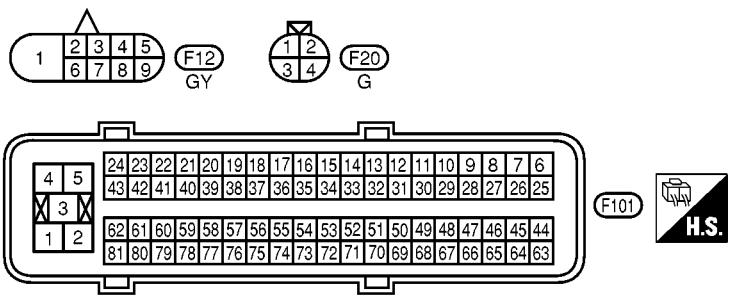
MONITOR ITEM	CONDITION	SPECIFICATION
HO2S1 HTR (B1)	● Engine: After warming up ● Engine speed: Below 3,600 rpm	ON
	● Engine speed: Above 3,600 rpm	OFF

Wiring Diagram

EBS00FV7

EC-FRO2-01





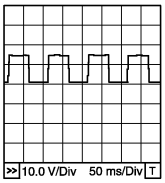
REFER TO THE FOLLOWING.
E105 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0071E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
24	G	Heated oxygen sensor 1 heater	**[Engine is running]** ● **Warm-up condition.** ● Engine speed is below 3,600 rpm.	Approximately 7.0V★  PBIB0519E
			[Ignition switch "ON"] ● Engine stopped. **[Engine is running]** ● Engine speed is above 3,600 rpm.	BATTERY VOLTAGE (11 - 14V)

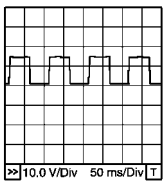
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

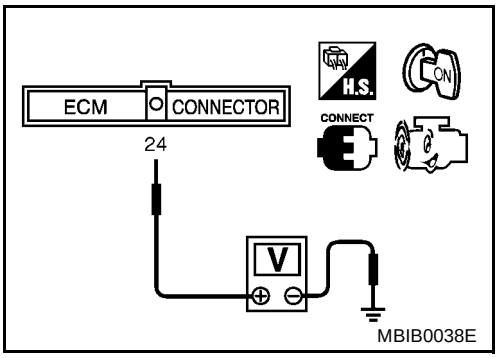
Diagnostic Procedure

EBS00FV8

1. CHECK OVERALL FUNCTION CHECK

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch "OFF" and wait at least 10 seconds.
3. Turn ignition switch "ON".
4. Set the tester probe between ECM terminal 24 (HO2S1 heater signal) and ground.
5. Start engine and let it idle.
6. Check the voltage under the following conditions.
   Verify that the oscilloscope screen shows the signal wave as shown below.

Conditions	Voltage
At idle	Approximately 7.0V★  PBIB0519E
Engine speed is above 3,600 rpm	BATTERY VOLTAGE (11 - 14V)



MBIB0038E

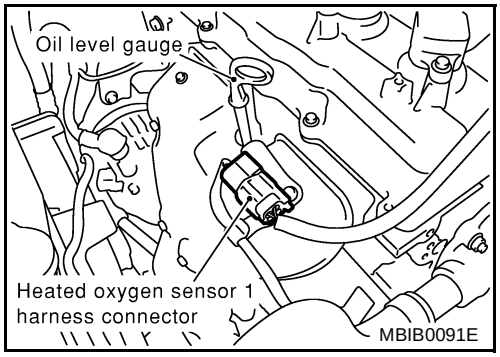
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

OK or NG

OK >> **INSPECTION END.**
NG >> GO TO 2.

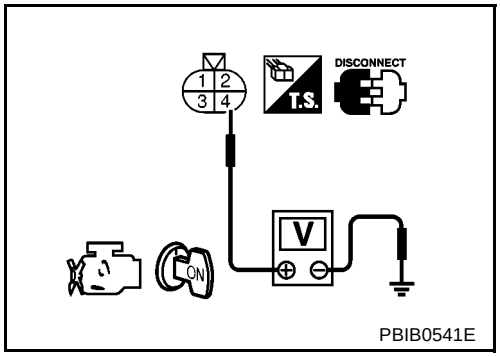
2. CHECK HO2S1 POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 1 harness connector.
3. Turn ignition switch “ON”.



4. Check voltage between HO2S1 terminal 4 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E62, F12
- Fuse block (J/B) connector E105
- 10A fuse
- Harness for open or short between heated oxygen sensor 1 and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK HO2S1 OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 24 and HO2S1 terminal 1.
   Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK HEATED OXYGEN SENSOR 1 HEATER

Refer to EC-841, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace heated oxygen sensor 1.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-656, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

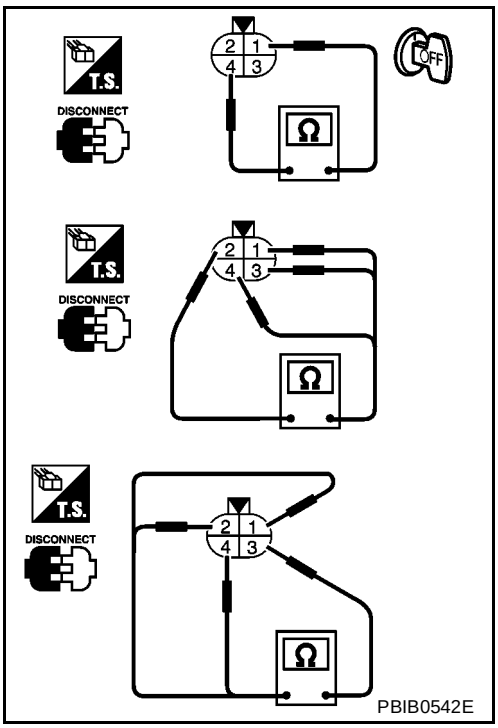
Component Inspection

EBS00FV9

HEATED OXYGEN SENSOR 1 HEATER

1. Check resistance between HO2S1 terminals as follows.

Terminal No.	Resistance
1 and 4	8 - 10 Ω at 20°C (68°F)
2 and 3, 4	∞ Ω (Continuity should not exist)
3 and 1, 2, 4	



2. If NG, replace heated oxygen sensor 1.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

EBS00FVA

HEATED OXYGEN SENSOR 1

Refer to EM-23, "EXHAUST MANIFOLD AND CATALYTIC CONVERTER" .

HO2S1 HEATER (QG18DE)

PFP:22690

Description

EBS00FVB

SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM function	Actuator
Camshaft position sensor (PHASE) Crankshaft position sensor (POS)	Engine speed	Heated oxygen sensor 1 heater control	Heated oxygen sensor 1 heater
Engine coolant temperature sensor	Engine coolant temperature		

The ECM performs ON/OFF duty control of the heated oxygen sensor 1 heater corresponding to the engine speed and engine coolant temperature. The duty percent varies with engine coolant temperature when engine is started.

OPERATION

Engine speed rpm	Heated oxygen sensor 1 heater
Above 3,200 (A/T models) Above 3,600 (M/T models)	OFF
Below 3,200 (A/T models) Below 3,600 (M/T models)	ON

CONSULT-II Reference Value in Data Monitor Mode

EBS00FVC

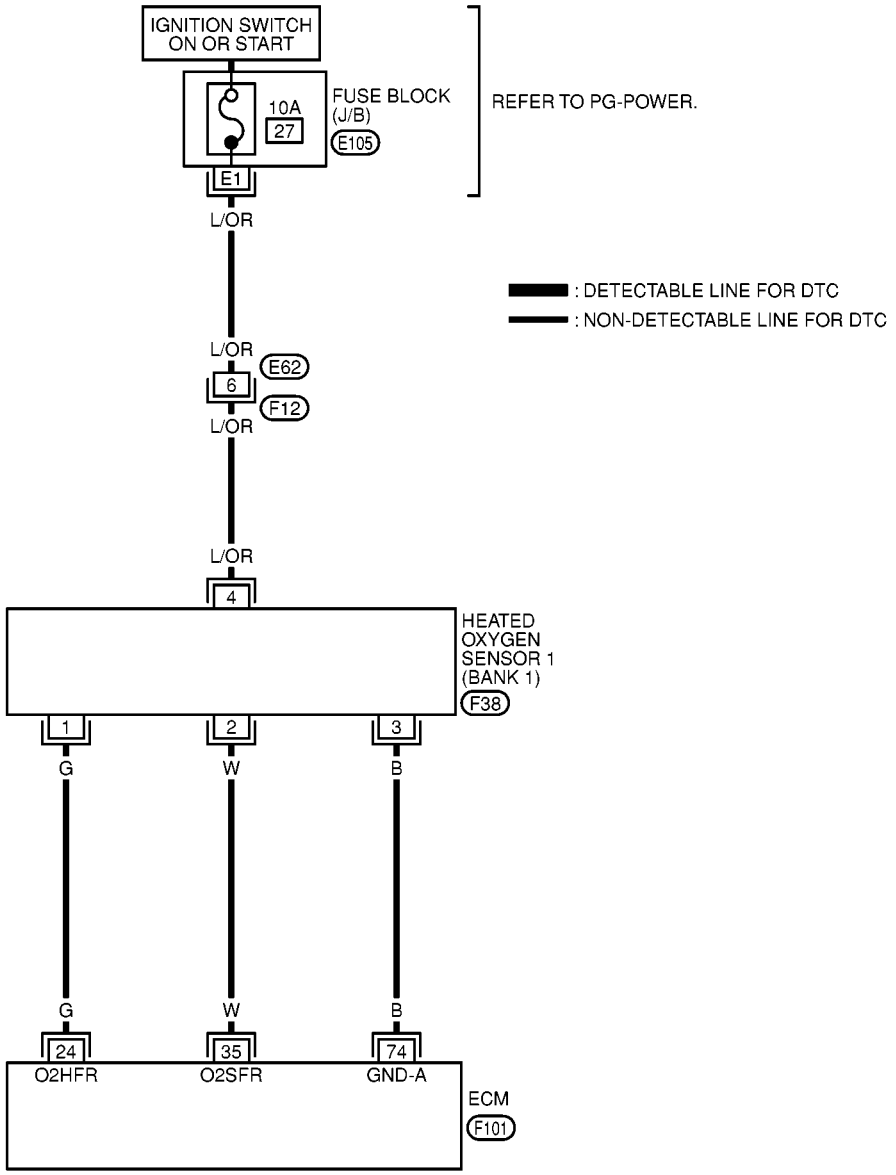
Specification data are reference values.

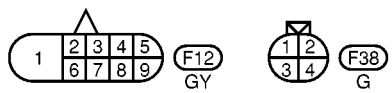
MONITOR ITEM	CONDITION	SPECIFICATION
HO2S1 HTR (B1) HO2S1 HTR (B2)	● Engine: After warming up ● Engine speed: Below 3,200 rpm (A/T models) Below 3,600 rpm (M/T models)	ON
	● Engine speed: Above 3,200 rpm (A/T models) Above 3,600 rpm (M/T models)	OFF

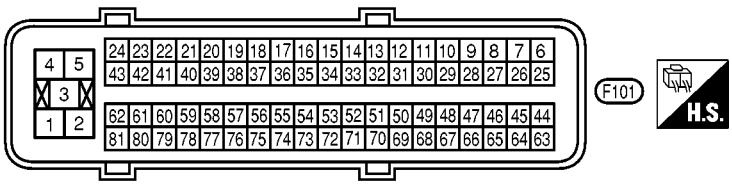
Wiring Diagram
BANK 1

EBS00FVE

EC-FRO2B1-01







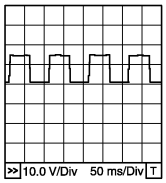
REFER TO THE FOLLOWING.
E105 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0076E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

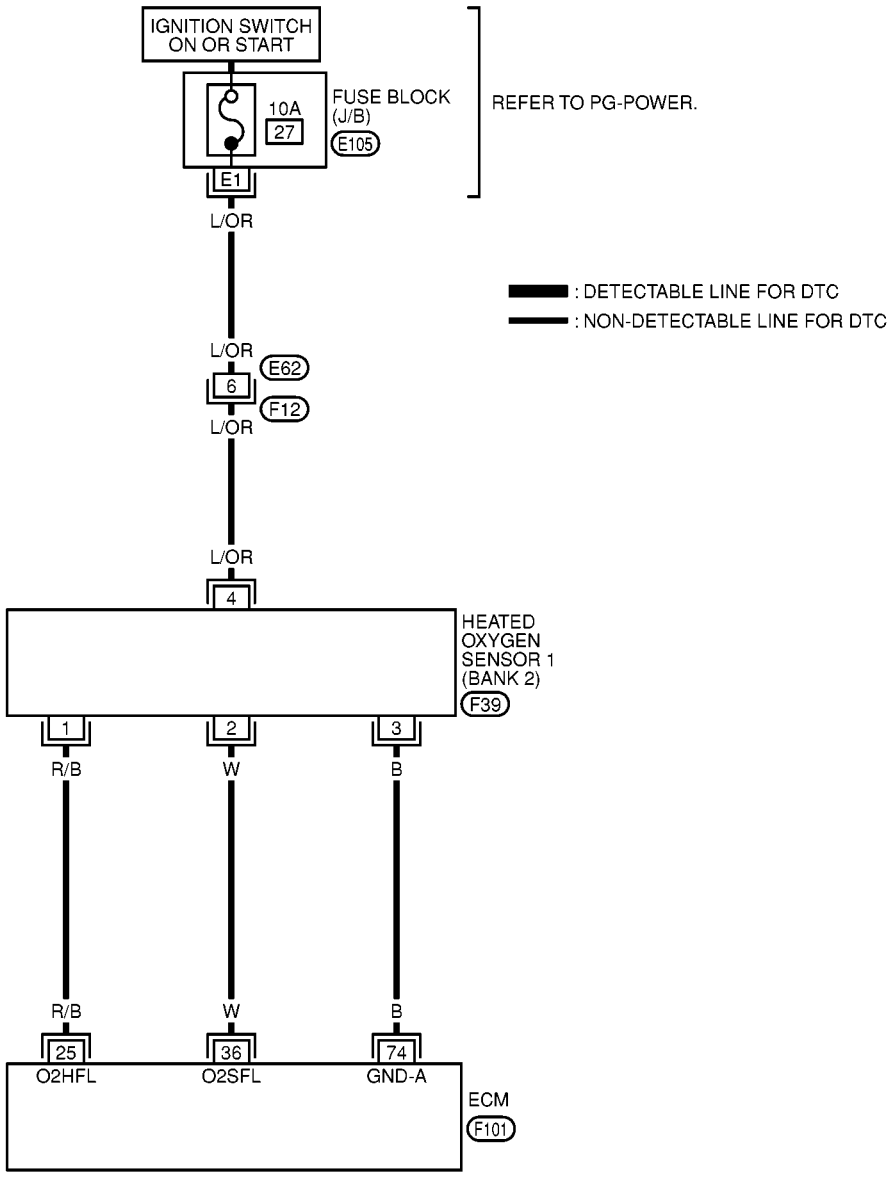
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

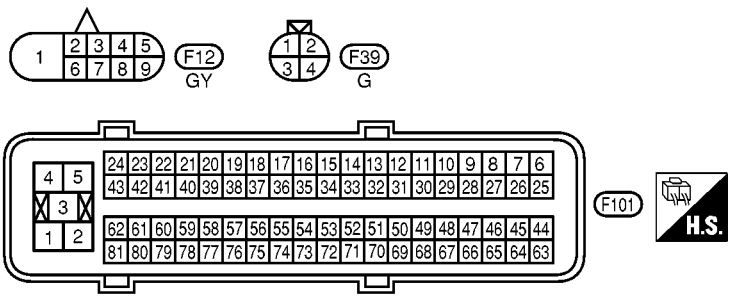
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
24	G	Heated oxygen sensor 1 heater (bank 1)	**[Engine is running]** ● **Warm-up condition.** ● Engine speed is below 3,200 rpm (A/T models). ● Engine speed is below 3,600 rpm (M/T models).	Approximately 7.0V★  PBIB0519E
			[Ignition switch "ON"] ● Engine stopped. **[Engine is running]** ● Engine speed is above 3,200 rpm (A/T models). ● Engine speed is above 3,600 rpm (M/T models).	BATTERY VOLTAGE (11 - 14V)

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

BANK 2

EC-FRO2B2-01





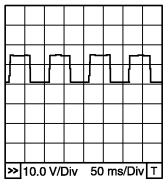
REFER TO THE FOLLOWING.
E105 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0078E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
25	R/B	Heated oxygen sensor 1 heater (bank 2)	**[Engine is running]** ● **Warm-up condition.** ● Engine speed is below 3,200 rpm (A/T models). ● Engine speed is below 3,600 rpm (M/T models).	Approximately 7.0V★  PBIB0519E
			[Ignition switch "ON"] ● Engine stopped. **[Engine is running]** ● Engine speed is above 3,200 rpm (A/T models). ● Engine speed is above 3,600 rpm (M/T models).	BATTERY VOLTAGE (11 - 14V)

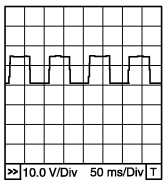
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

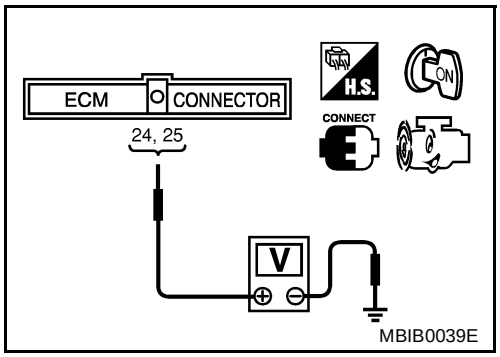
Diagnostic Procedure

EBS00FVF

1. CHECK OVERALL FUNCTION CHECK

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch "OFF" and wait at least 10 seconds.
3. Turn ignition switch "ON".
4. Set the tester probe between ECM terminal 24 [HO2S1 (B1) heater signal] or 25 [HO2S1 (B2) heater signal] and ground.
5. Start engine and let it idle.
6. Check the voltage under the following conditions.
   Verify that the oscilloscope screen shows the signal wave as shown below.

Conditions	Voltage
At idle	Approximately 7.0V★  PBIB0519E
Engine speed is above 3,600 rpm	BATTERY VOLTAGE (11 - 14V)



MBIB0039E

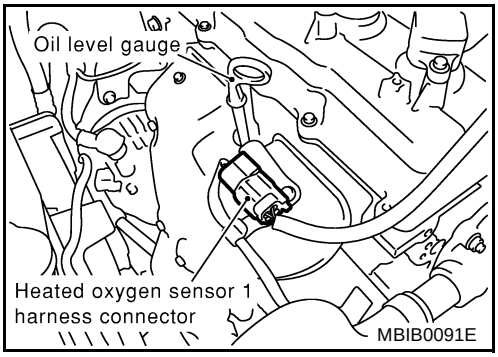
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

OK or NG

OK >> **INSPECTION END.**
NG >> GO TO 2.

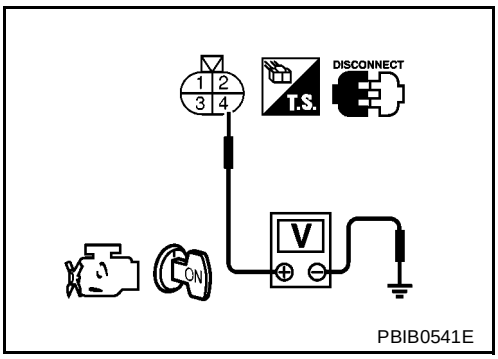
2. CHECK HO2S1 POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 1 harness connector.
3. Turn ignition switch “ON”.



4. Check voltage between HO2S1 terminal 4 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E62, F12
- Fuse block (J/B) connector E105
- 10A fuse
- Harness for open or short between heated oxygen sensor 1 and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK HO2S1 OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminals 24, 25 and HO2S1 terminal 1. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK HEATED OXYGEN SENSOR 1 HEATER

Refer to EC-848, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace heated oxygen sensor 1.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-656, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

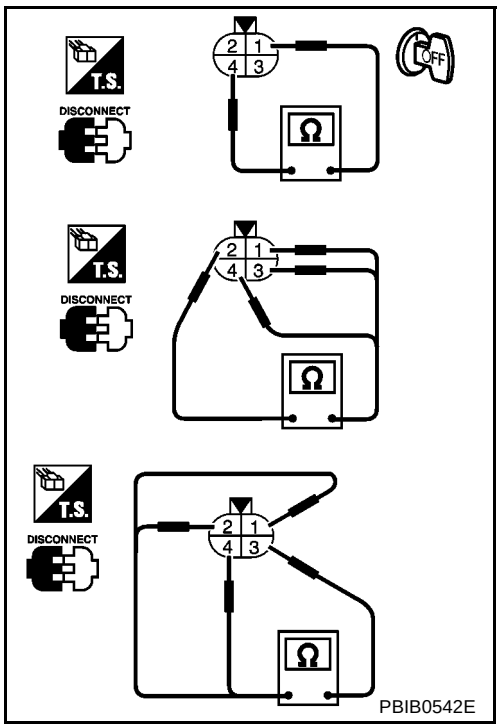
EBS00FVG

HEATED OXYGEN SENSOR 1 HEATER

1. Check resistance between HO2S1 terminals as follows.

Terminal No.	Resistance
1 and 4	8 - 10 Ω at 20°C (68°F)
2 and 3, 4	∞ Ω (Continuity should not exist)
3 and 1, 2, 4	

2. If NG, replace heated oxygen sensor 1.



CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

EBS00FVH

HEATED OXYGEN SENSOR 1

Refer to EM-23, "EXHAUST MANIFOLD AND CATALYTIC CONVERTER" .

HO2S2 HEATER (QG16DE)

PFP:226A0

Description

EBS00FVI

SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM function	Actuator
Camshaft position sensor (PHASE)	Engine speed	Heated oxygen sensor 2 heater control	Heated oxygen sensor 2 heater
Crankshaft position sensor (POS)			

The ECM performs ON/OFF control of the heated oxygen sensor 2 heater corresponding to the engine speed.

OPERATION

Engine speed rpm	Heated oxygen sensor 2 heater
Above 3,600	OFF
Below 3,600	ON

CONSULT-II Reference Value in Data Monitor Mode

EBS00FVJ

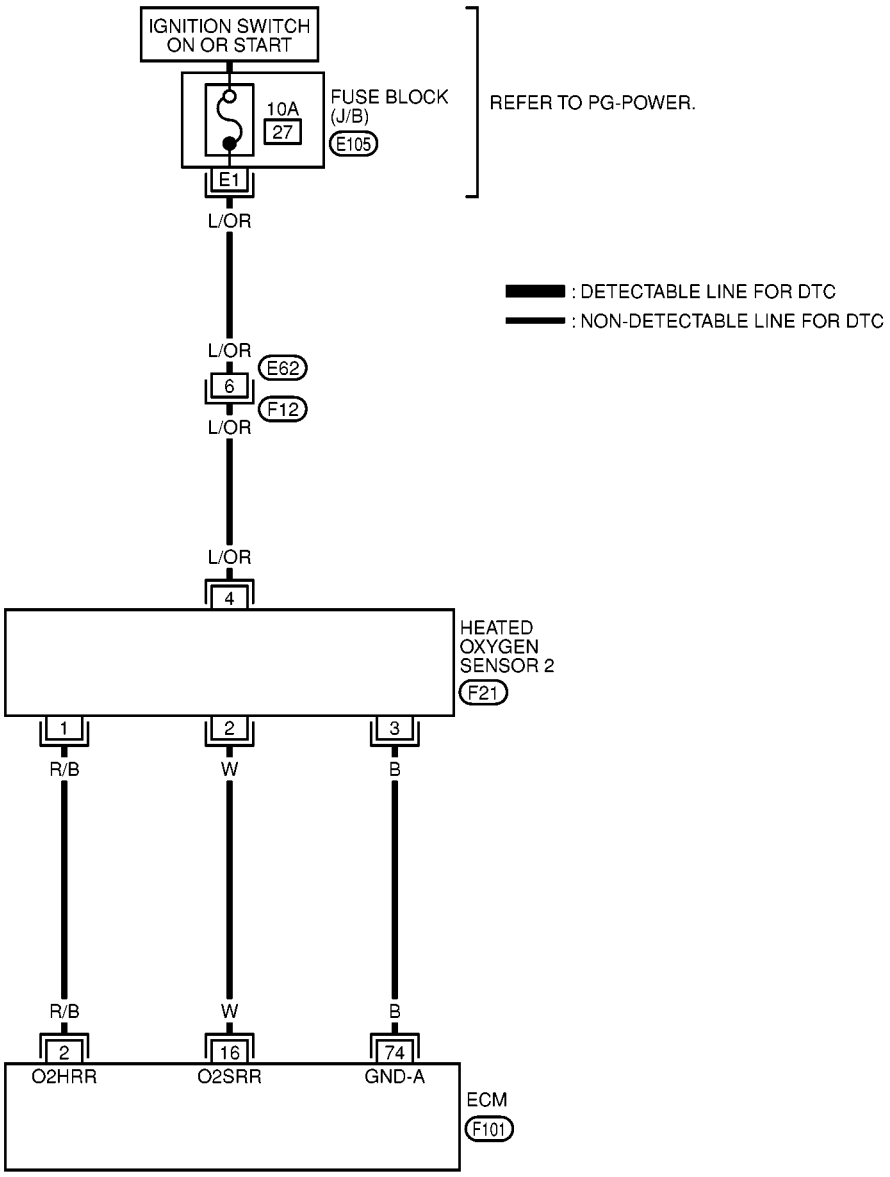
Specification data are reference values.

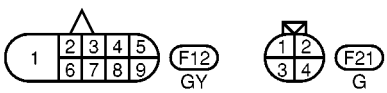
MONITOR ITEM	CONDITION	SPECIFICATION
HO2S2 HTR (B1)	● Engine speed: Below 3,600 rpm [After driving for 2 minutes at a speed of 70 km/h (43 MPH) or more]	ON
	● Engine speed: Above 3,600 rpm	OFF

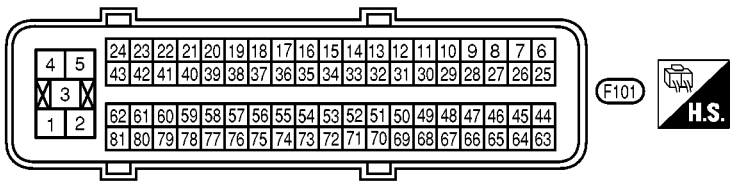
Wiring Diagram

EBS00FVL

EC-RRO2-01







REFER TO THE FOLLOWING.
E105 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0073E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
2	R/B	Heated oxygen sensor 2 heater	**[Engine is running]** ● Engine speed is below 3,600 rpm. ● After driving for 2 minutes at a speed of 70 km/h (43 MPH) or more.	0 - 1.0V
			[Ignition switch "ON"] ● Engine stopped **[Engine is running]** ● Engine speed is above 3,600 rpm.	BATTERY VOLTAGE (11 - 14V)

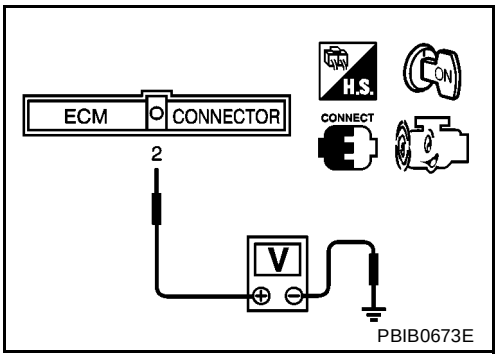
Diagnostic Procedure

EBS00FVM

1. CHECK OVERALL FUNCTION CHECK

1. Start engine and drive the vehicle at over 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle and keep the engine running.
3. Set the voltmeter probe between ECM terminal 2 (HO2S2 heater signal) and ground.
4. Check the voltage under the following conditions.

Conditions	Voltage
At idle	0 - 1V
Engine speed is above 3,600 rpm	Battery voltage



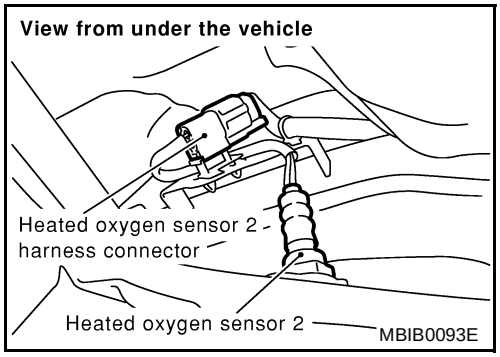
PBIB0673E

OK or NG

OK >> **INSPECTION END.**
NG >> GO TO 2.

2. CHECK HO2S2 POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 2 harness connector.
3. Turn ignition switch “ON”.

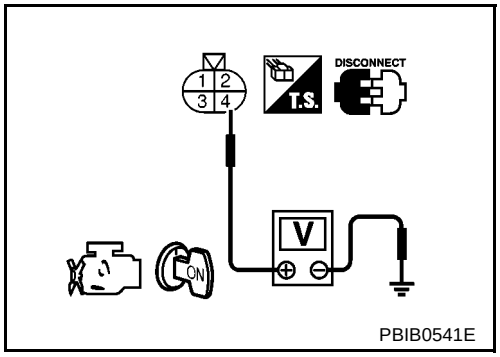


4. Check voltage between HO2S2 terminal 4 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 4.
NG >> GO TO 3.



3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E62, F12
- Fuse block (J/B) connector E105
- 10A fuse
- Harness for open or short between heated oxygen sensor 2 and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK HO2S2 OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 2 and HO2S2 terminal 1. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK HEATED OXYGEN SENSOR 2 HEATER

Refer to EC-853, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace heated oxygen sensor 2.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-656, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

EBS00FVN

HEATED OXYGEN SENSOR 2 HEATER

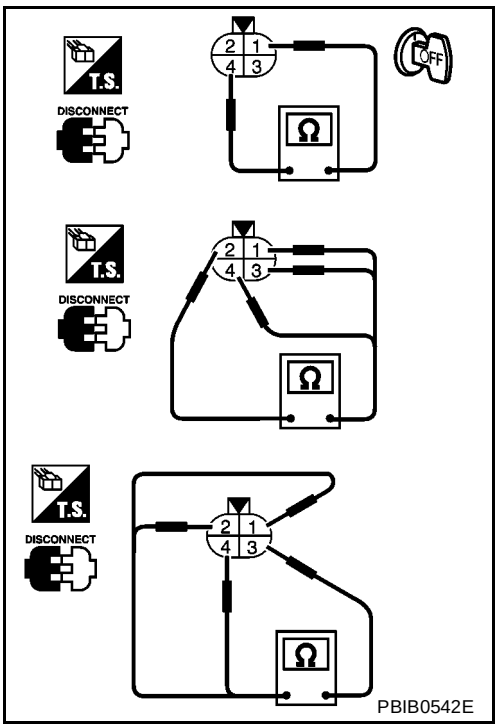
1. Check resistance between HO2S2 terminals as follows.

Terminal No.	Resistance
1 and 4	2.3 - 4.3 Ω at 25°C (77°F)
2 and 1, 3, 4	∞ Ω (Continuity should not exist)
3 and 1, 2, 4	

2. If NG, replace heated oxygen sensor 2.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**



Removal and Installation

EBS00FVO

HEATED OXYGEN SENSOR 2

Refer to EX-3, "EXHAUST SYSTEM" .

HO2S2 HEATER (QG18DE)

PFP:226A0

Description

EBS00FVP

SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM function	Actuator
Camshaft position sensor (PHASE)	Engine speed	Heated oxygen sensor 2 heater control	Heated oxygen sensor 2 heaters
Crankshaft position sensor (POS)			

The ECM performs ON/OFF control of the heated oxygen sensor 2 heaters corresponding to the engine speed.

OPERATION

Engine speed rpm	Heated oxygen sensor 2 heaters
Above 3,600	OFF
Below 3,600	ON

CONSULT-II Reference Value in Data Monitor Mode

EBS00FVQ

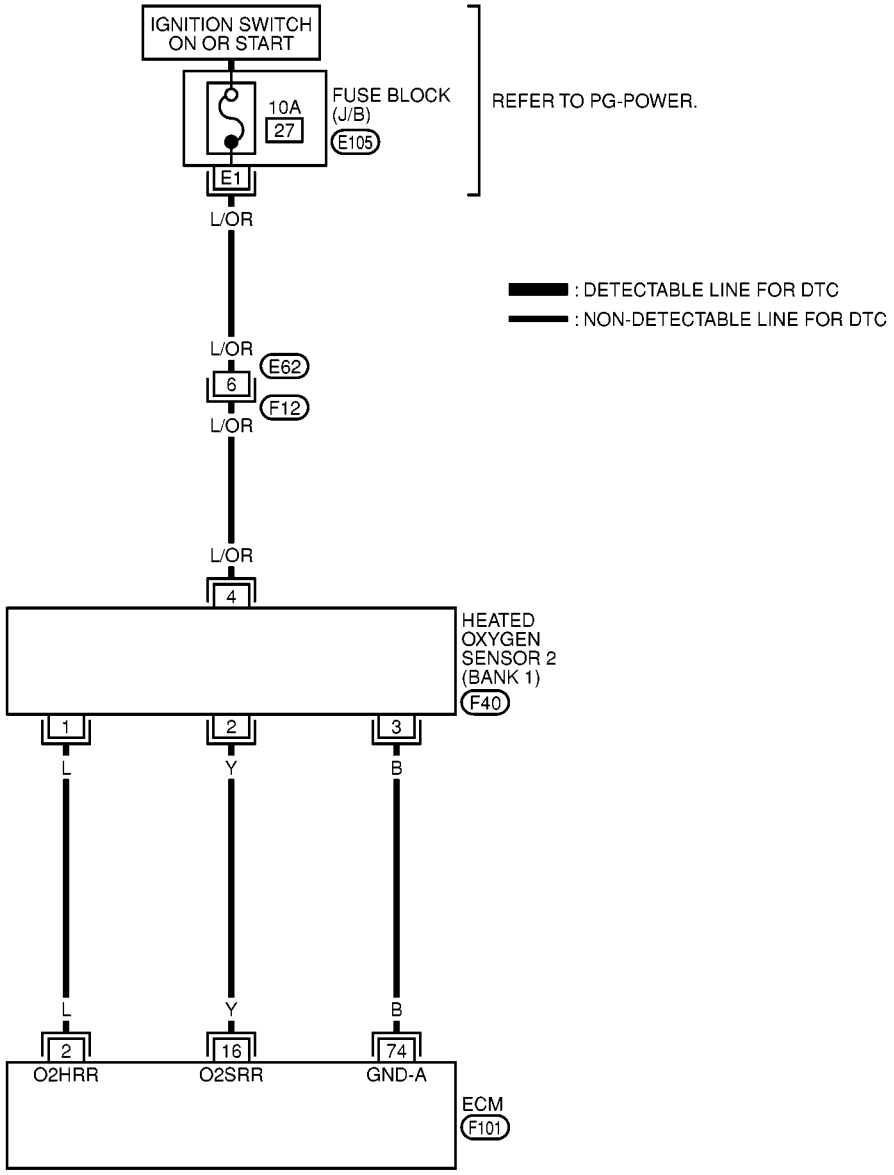
Specification data are reference values.

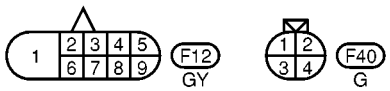
MONITOR ITEM	CONDITION	SPECIFICATION
HO2S2 HTR (B1) HO2S2 HTR (B2)	● Ignition switch: ON (Engine stopped) ● Engine is running above 3,600 rpm.	OFF
	● Engine is running below 3,600 rpm after driving for 2 minutes at a speed of 70 km/h (43 MPH) or more.	ON

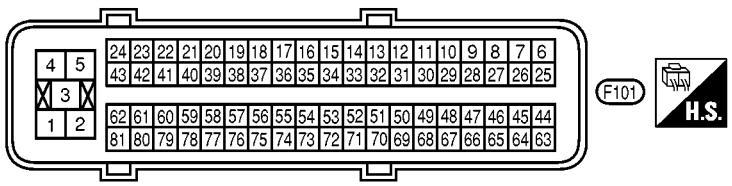
Wiring Diagram
BANK 1

EBS00FVR

EC-RRO2B1-01







REFER TO THE FOLLOWING.
E105 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0080E

Specification data are reference values and are measured between each terminal and ground.

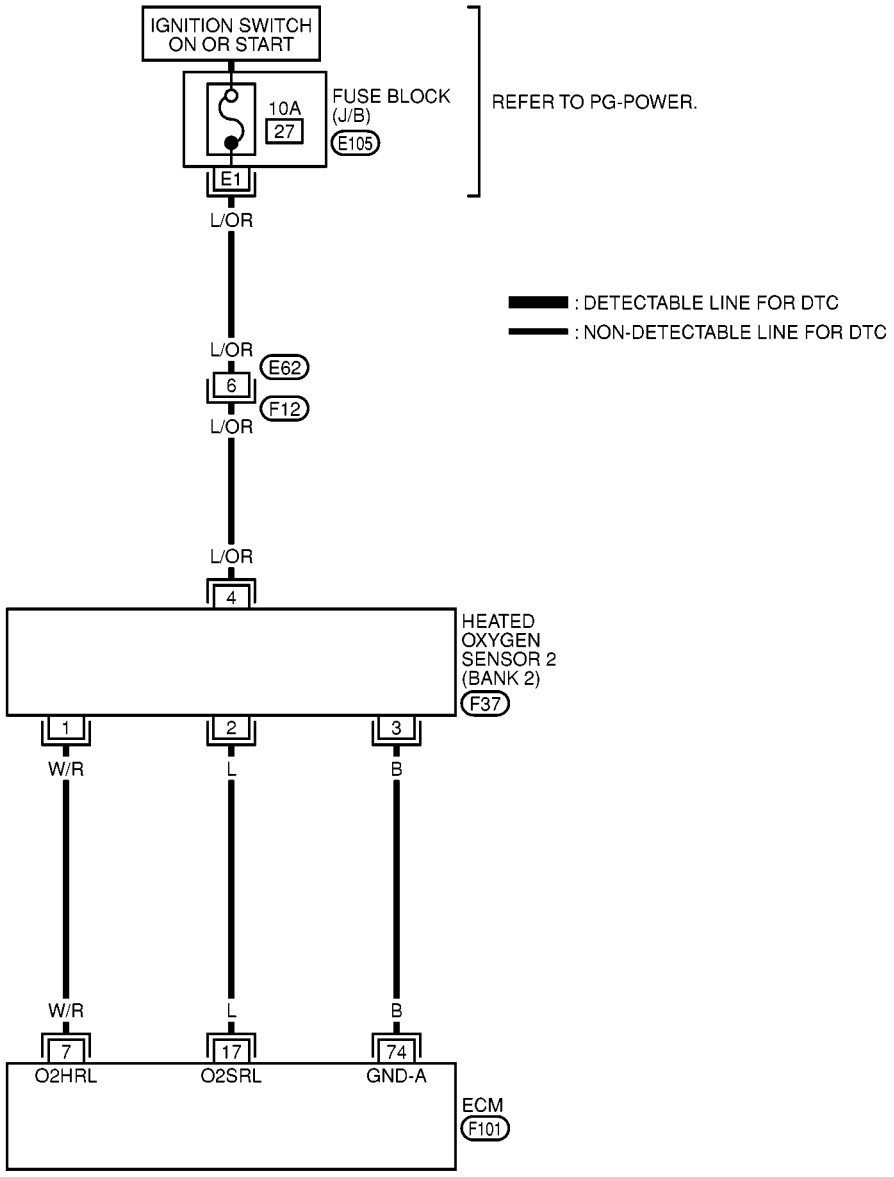
CAUTION:

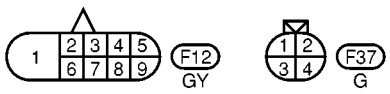
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

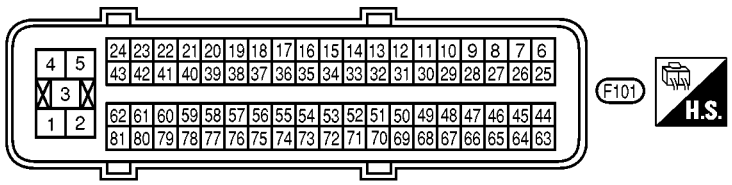
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
2	L	Heated oxygen sensor 2 heater (bank 1)	**[Engine is running]** ● Engine speed is below 3,600 rpm. ● After driving for 2 minutes at a speed of 70 km/h (43 MPH) or more.	0 - 1.0V
			[Ignition switch "ON"] ● Engine stopped **[Engine is running]** ● Engine speed is above 3,600 rpm.	BATTERY VOLTAGE (11 - 14V)

BANK 2

EC-RRO2B1-01







REFER TO THE FOLLOWING.
E105 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0082E

Specification data are reference values and are measured between each terminal and body ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
7	W/R	Heated oxygen sensor 2 heater (bank 2)	**[Engine is running]** ● Engine speed is below 3,600 rpm. ● After driving for 2 minutes at a speed of 70 km/h (43 MPH) or more.	0 - 1.0V
			[Ignition switch "ON"] ● Engine stopped **[Engine is running]** ● Engine speed is above 3,600 rpm.	BATTERY VOLTAGE (11 - 14V)

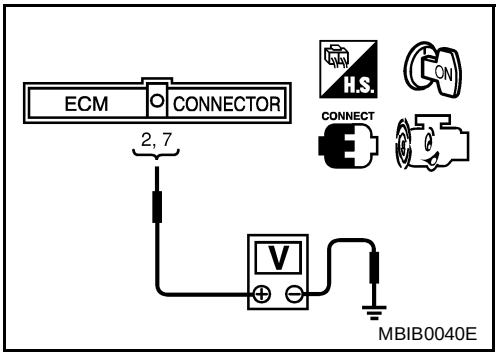
Diagnostic Procedure

EBS00FVS

1. CHECK OVERALL FUNCTION

1. Start engine and drive the vehicle at 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle and keep the engine running.
3. Set voltmeter probes between ECM terminal 2 [HO2S2(B1) heater signal] or 7 [HO2S2(B2) heater signal] and ground.
4. Check the voltage under the following conditions.

Conditions	voltage
At idle	0 - 1V
Engine speed is above 3,600 rpm.	Battery voltage



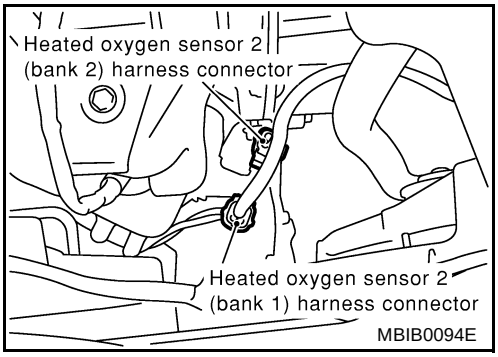
OK or NG

OK >> **INSPECTION END**

NG >> GO TO 2.

2. CHECK HO2S2 POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 2 harness connector.
3. Turn ignition switch “ON”.

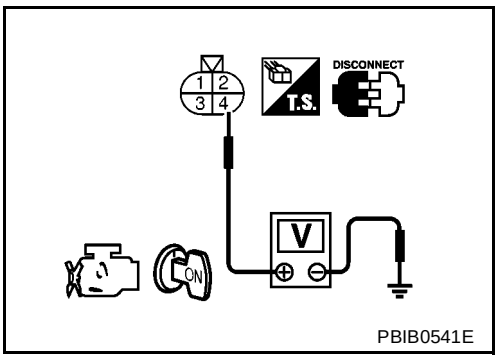


4. Check voltage between HO2S2 terminal 4 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 4.
NG >> GO TO 3.



3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E62, F12
- Fuse block (J/B) connector E105
- 10A fuse
- Harness for open or short between heated oxygen sensor 2 and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK HO2S2 OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 2 and HO2S2 (B1) terminal 1, ECM terminal 7 and HO2S2 (B2) terminal 1. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK HEATED OXYGEN SENSOR 2 HEATER

Refer to EC-860, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace malfunctioning heated oxygen sensor 2.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-656, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

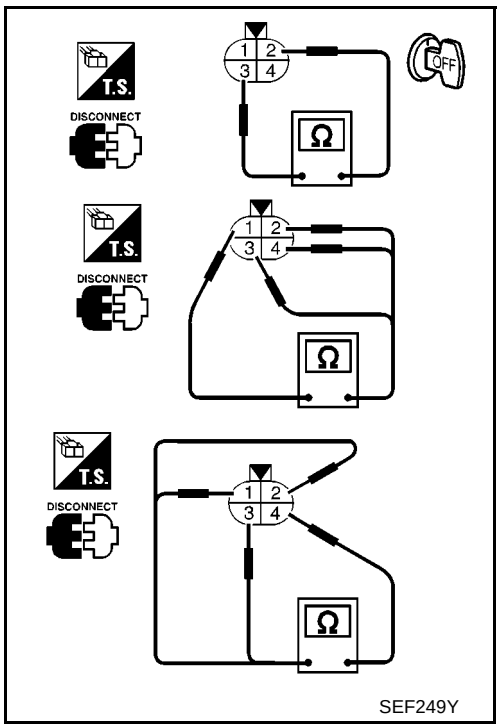
EBS00FVT

HEATED OXYGEN SENSOR 2 HEATER

1. Check resistance between HO2S2 terminals as follows.

Terminal No.	Resistance
2 and 3	2.3 - 4.3 Ω at 25°C (77°F)
1 and 2, 3, 4	∞ Ω (Continuity should not exist)
4 and 1, 2, 3	

2. If NG, replace heated oxygen sensor 2.



SEF249Y

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

EBS00FVU

HATED OXYGEN SENSOR 2

Refer to EX-3, "EXHAUST SYSTEM" .

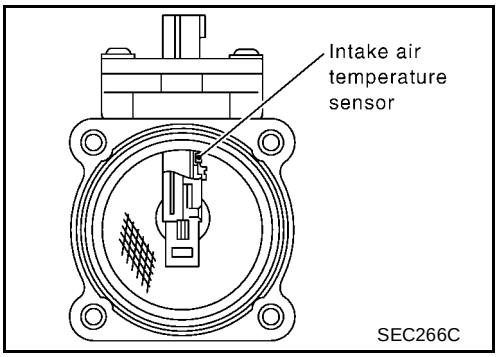
IAT SENSOR

PFP:22630

Component Description

EBS00EZ3

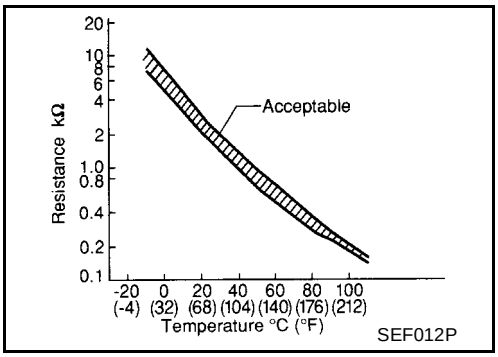
The intake air temperature sensor is built into mass air flow sensor. The sensor detects intake air temperature and transmits a signal to the ECM.
The temperature sensing unit uses a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the temperature rise.



<Reference data>

Intake air temperature °C (°F)	Voltage* V	Resistance kΩ
25 (77)	3.32	1.9 - 2.1
80 (176)	1.23	0.31 - 0.37

*: These data are reference values and are measured between ECM terminal 34 (Intake air temperature sensor) and body ground.

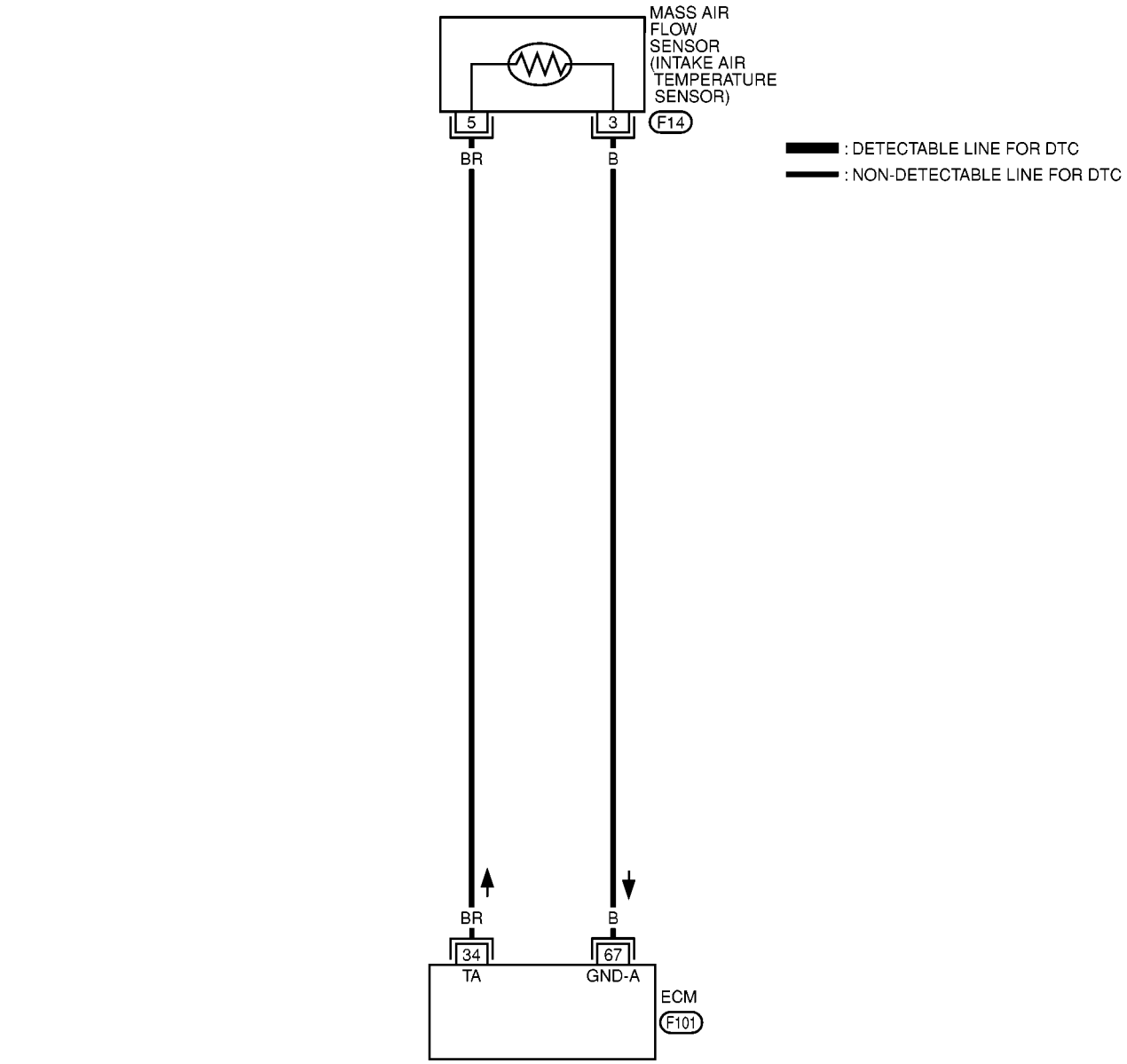


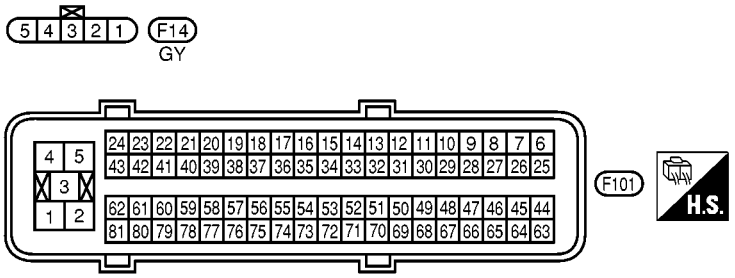
CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

Wiring Diagram

EBS00EZ4

EC-IATSEN-01





MBWA0070E

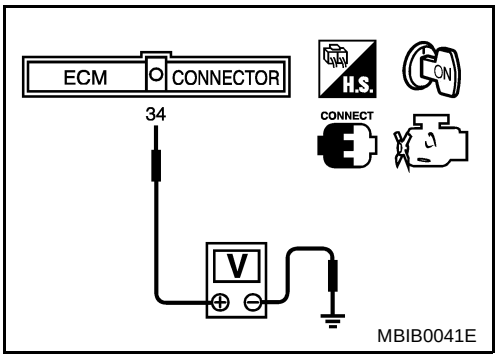
Diagnostic Procedure

EBS00EZ5

1. CHECK OVERALL FUNCTION

1. Turn ignition switch “ON”.
2. Check voltage between ECM terminal 34 and ground with CONSULT-II or tester.

Voltage: 0.04 - 4.84V

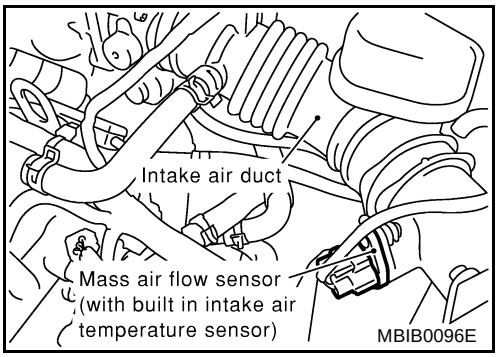


OK or NG

OK >> **INSPECTION END.**
NG >> GO TO 2.

2. CHECK INTAKE AIR TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect mass air flow sensor (intake air temperature sensor is built-into) harness connector.
3. Turn ignition switch “ON”.

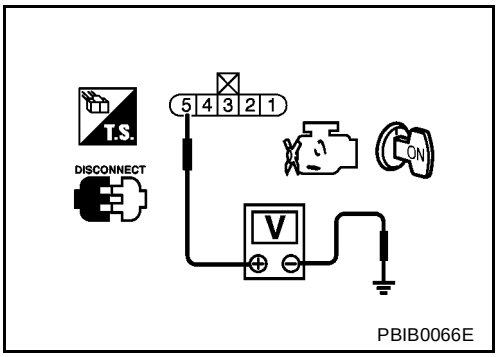


4. Check voltage between MAF sensor terminal 5 and ground.

Voltage: Approximately 5V

OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.



3. CHECK INTAKE AIR TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 67 and mass air flow sensor terminal 3. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK INTAKE AIR TEMPERATURE SENSOR

Refer to EC-864, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace mass air flow sensor (with intake air temperature sensor).

5. CHECK INTERMITTENT INCIDENT

Refer to EC-656, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

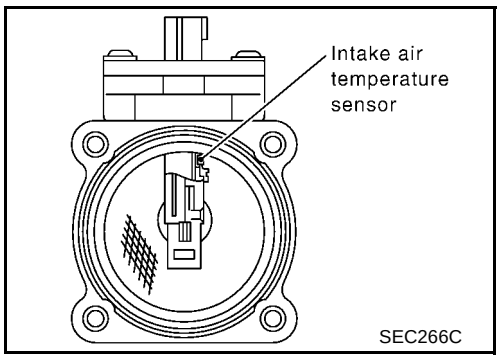
EBS00EZ6

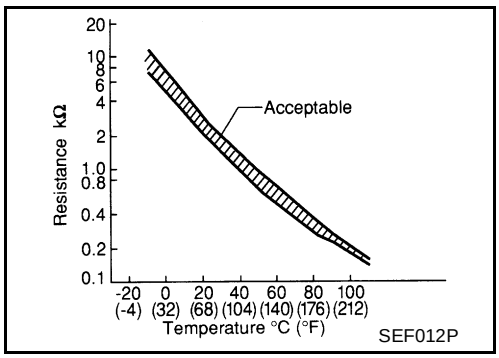
INTAKE AIR TEMPERATURE SENSOR

1. Check resistance between intake air temperature sensor terminals 3 and 5 under the following conditions.

Intake air temperature °C (°F)	Resistance kΩ
25 (77)	1.9 - 2.1

2. If NG, replace mass air flow sensor (with intake air temperature sensor).





Removal and Installation

EBS00EZ7

MASS AIR FLOW SENSOR

Refer to EM-17, "AIR CLEANER AND AIR DUCT" .

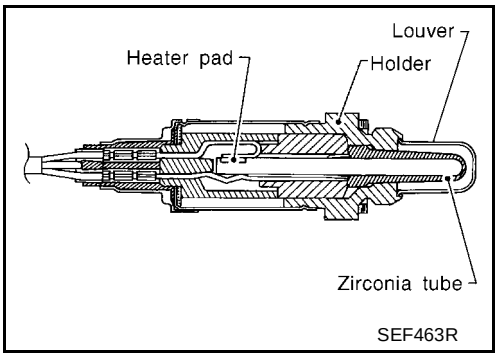
HO2S1 (QG16DE)

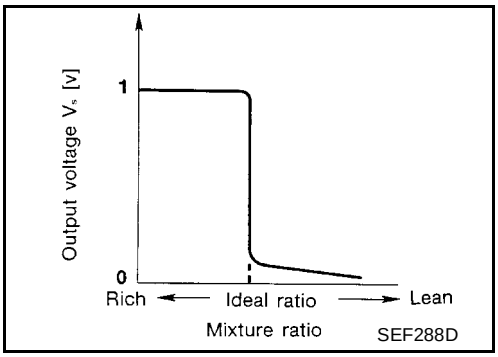
PFP:22690

Component Description

EBS00FVV

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.





CONSULT-II Reference Value in Data Monitor Mode

EBS00FVW

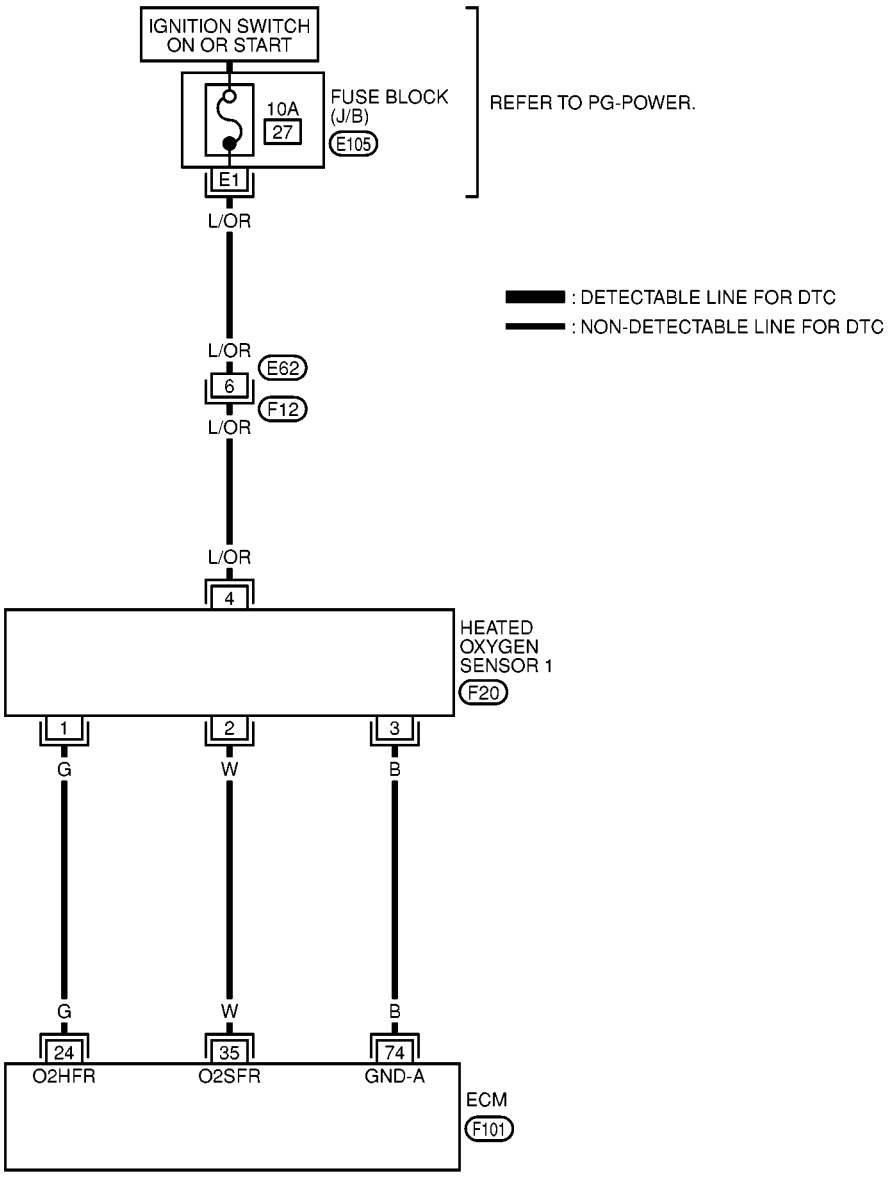
Specification data are reference values.

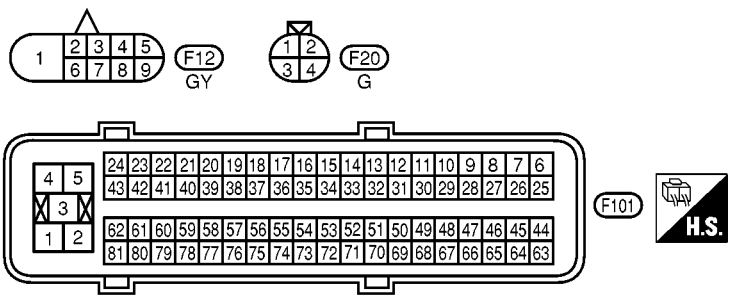
MONITOR ITEM	CONDITION		SPECIFICATION
HO2S1 (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S1 MNTR (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	LEAN ←→ RICH Changes more than 5 times during 10 seconds.

Wiring Diagram

EBS00FVY

EC-FRO2-01





REFER TO THE FOLLOWING.
E105 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0071E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
35	W	Heated oxygen sensor 1	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V (Periodically change)
74	B	Heated oxygen sensor ground	**[Engine is running]** ● Idle speed	Approximately 0V

Diagnostic Procedure

EBS00FVZ

1. INSPECTION START

Do you have CONSULT-II?

Yes or No

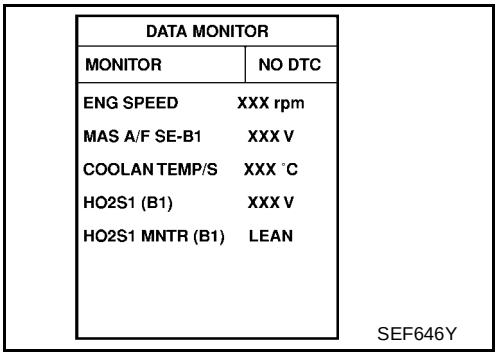
Yes >> GO TO 2.
No >> GO TO 3.

2. CHECK OVERALL FUNCTION

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “HO2S1 MNTR (B1)” in “DATA MONITOR” mode with CONSULT-II.
3. Keep the engine speed at 2,000 rpm under no load, and make sure that the monitors fluctuate between LEAN and RICH more than five times in 10 seconds.

   1 time: RICH → LEAN → RICH
   2 times: RICH → LEAN → RICH → LEAN → RICH



OK or NG

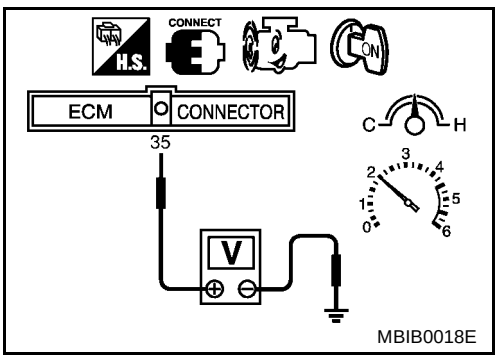
OK >> **INSPECTION END**
NG >> GO TO 4.

3. CHECK OVERALL FUNCTION

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 (HO2S1 signal) and engine ground.
3. Keep the engine speed at 2,000 rpm under no load, and make sure that the voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than five times in 10 seconds.

   1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V
   2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V



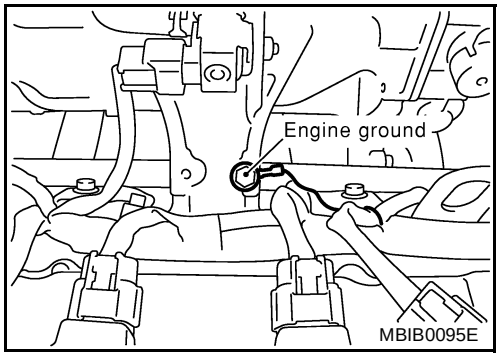
OK or NG

OK >> **INSPECTION END**
NG >> GO TO 4.

4. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

>> GO TO 5.

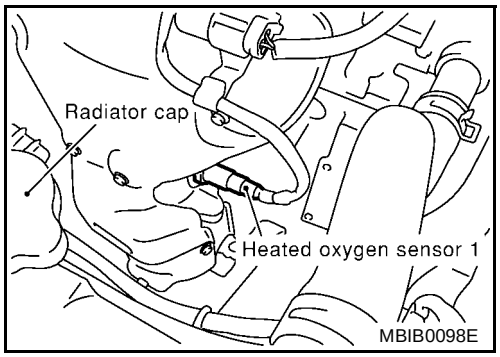


5. RETIGHTEN HEATED OXYGEN SENSOR 1

Loosen and retighten heated oxygen sensor 1.

Tightening torque: **40 - 60 N·m (4.1 - 6.2 kg-m, 30**

>> GO TO 6.

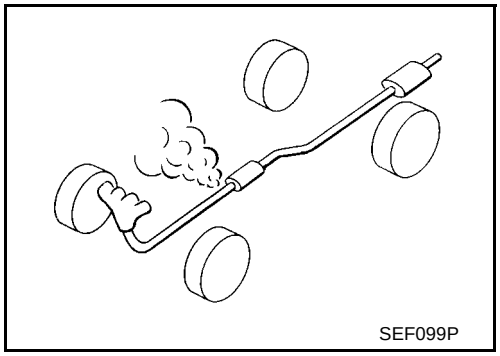


6. CHECK FOR EXHAUST AIR LEAK

1. Start engine and run it at idle.
2. Listen for an exhaust air leak before three way catalyst (Manifold).

OK or NG

OK >> GO TO 7.
NG >> Repair or replace.



7. CHECK FOR INTAKE AIR LEAK

Listen for an intake air leak after the mass air flow sensor.

OK or NG

OK >> GO TO 8.
NG >> Repair or replace.

8. CHECK HO2S1 GROUND CIRCUIT FOR OPEN AND SHORT

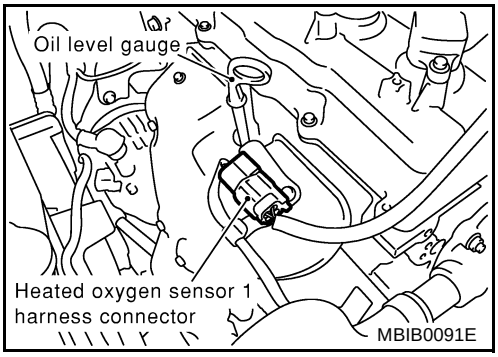
1. Turn ignition switch “OFF”.
2. Disconnect HO2S1 harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminal 74 and HO2S1 terminal 3. Refer to Wiring Diagram.

Continuity should exist.

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 9.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.



9. CHECK HO2S1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 35 and HO2S1 terminal 2. Refer to Wiring Diagram.

Continuity should exist.

2. Check harness continuity between ECM terminal 35 or HO2S1 terminal 2 and ground. Refer to Wiring Diagram.

Continuity should not exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 10.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

10. CHECK HEATED OXYGEN SENSOR 1 HEATER

Refer to EC-841, "Component Inspection" .

OK or NG

OK >> GO TO 11.
NG >> Replace malfunctioning heated oxygen sensor 1.

11. CHECK MASS AIR FLOW SENSOR

Refer to EC-671, "Component Inspection" .

OK or NG

OK >> GO TO 12.
NG >> Replace mass air flow sensor.

12. CHECK PCV VALVE

Refer to EC-955, "Component Inspection" .

OK or NG

OK >> GO TO 13.
NG >> Replace PCV valve.

13. CHECK HEATED OXYGEN SENSOR 1

Refer to EC-870, "Component Inspection" .

OK or NG

OK >> GO TO 14.
NG >> Replace malfunctioning heated oxygen sensor 1.

14. CHECK INTERMITTENT INCIDENT

Refer to EC-656, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

EBS00FW0

HEATED OXYGEN SENSOR 1

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “MANU TRIG” and adjust “TRIGGER POINT” to 100% in “DATA MONITOR” mode with CONSULT-II.
3. Select “HO2S1 (B1)” and “HO2S1 MNTR (B1)”.
4. Hold engine speed at 2,000 rpm under no load during the following steps.
5. Touch “RECORD” on CONSULT-II screen.

DATA MONITOR	
MONITOR	NO DTC
ENG SPEED	XXX rpm
MAS A/F SE-B1	XXX V
COOLAN TEMP/S	XXX °C
HO2S1 (B1)	XXX V
HO2S1 MNTR (B1)	LEAN

SEF646Y

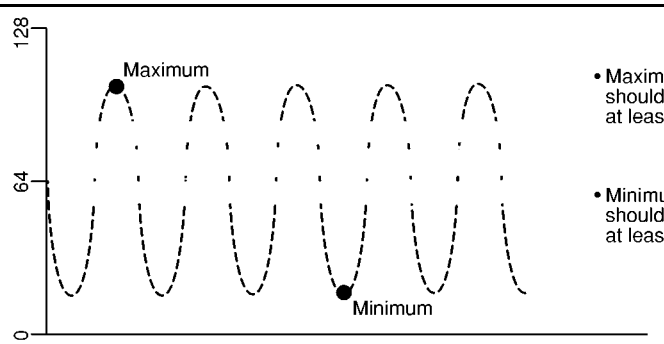
6. Check the following.
   - “HO2S1 MNTR (B1)” in “DATA MONITOR” mode changes from “RICH” to “LEAN” to “RICH” 5 times in 10 seconds.
     5 times (cycles) are counted as shown at right.
   - “HO2S1 (B1)” voltage goes above 0.6V at least once.
   - “HO2S1 (B1)” voltage goes below 0.3V at least once.
   - “HO2S1 (B1)” voltage never exceeds 1.0V.

cycle	1	2	3	4	5
HO2S1 MNTR (B1)	R-L	R-L	R-L	R-L	R-L

R means HO2S1 MNTR (B1) indicates RICH
L means HO2S1 MNTR (B1) indicates LEAN

SEF217YA

Trigger	ENG SPEED	HO2S1 (B1)
	rpm	V
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX



SEF648Y

CAUTION:

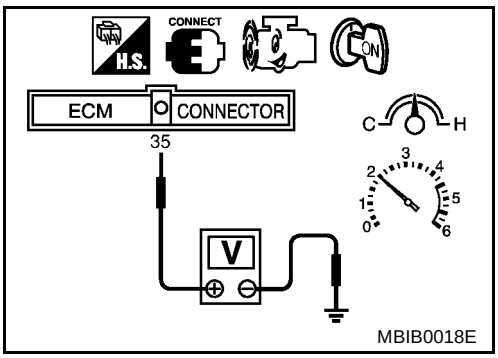
- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**

- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 (HO2S1 signal) and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no load.
   - The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds.
   - The maximum voltage is over 0.6V at least one time.
   - The minimum voltage is below 0.3V at least one time.
   - The voltage never exceeds 1.0V.

   1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V
   2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V



CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

EBS00FW1

HEATED OXYGEN SENSOR 1

Refer to EM-23, "EXHAUST MANIFOLD AND CATALYTIC CONVERTER" .

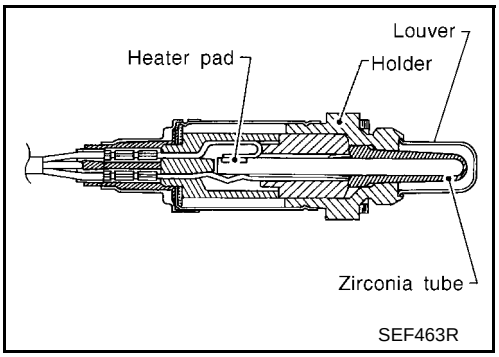
HO2S1 (QG18DE)

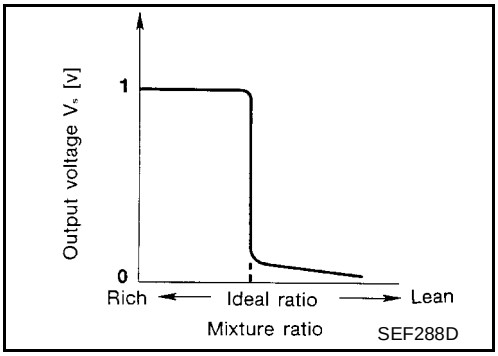
PFP:22690

Component Description

EBS00FW2

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.





CONSULT-II Reference Value in Data Monitor Mode

EBS00FW3

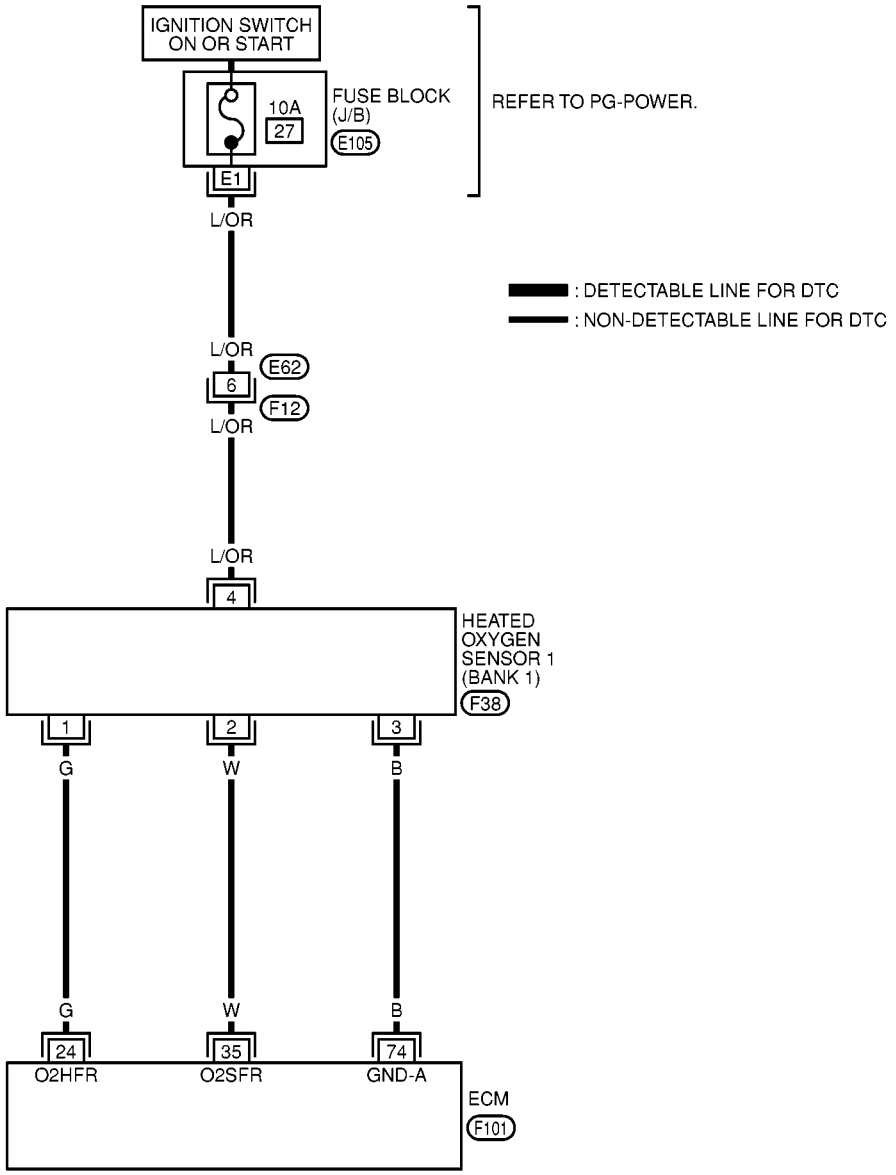
Specification data are reference values.

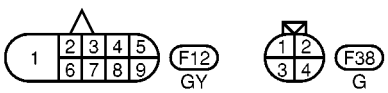
MONITOR ITEM	CONDITION		SPECIFICATION
HO2S1 (B1) HO2S1 (B2)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S1 MNTR (B1) HO2S1 MNTR (B2)			LEAN ←→ RICH Changes more than 5 times during 10 seconds.

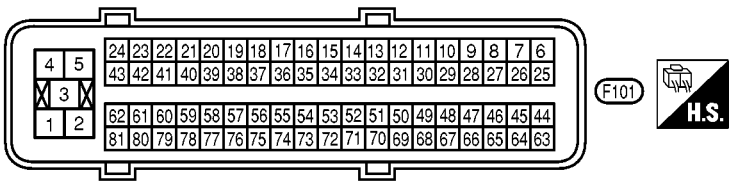
Wiring Diagram
BANK 1

EBS00FW4

EC-FRO2B1-01







REFER TO THE FOLLOWING.
E105 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0076E

Specification data are reference values and are measured between each terminal and ground.

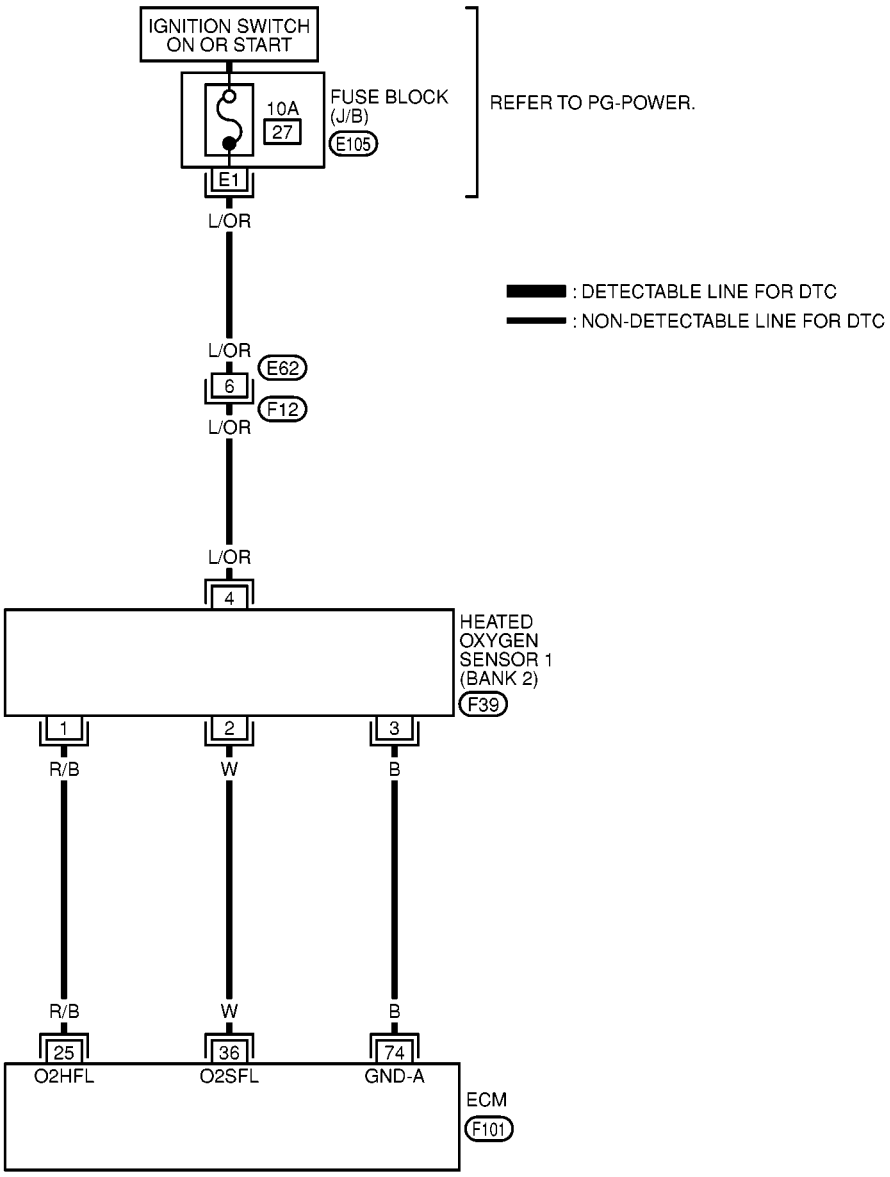
CAUTION:

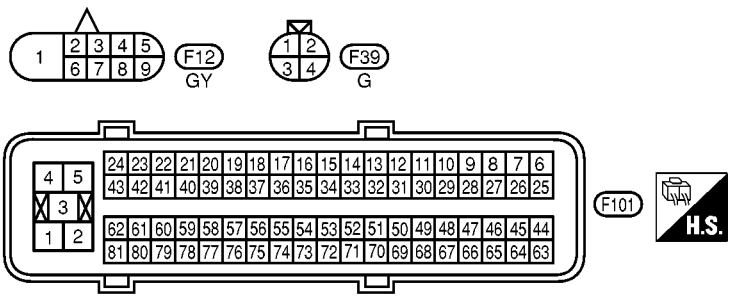
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
35	W	Heated oxygen sensor 1 (bank 1)	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V (Periodically change)
74	B	Heated oxygen sensor ground	**[Engine is running]** ● Idle speed	Approximately 0V

BANK 2

EC-FRO2B2-01





REFER TO THE FOLLOWING.
E105 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0078E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
36	W	Heated oxygen sensor 1 (bank 2)	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V (Periodically change)
74	B	Heated oxygen sensor ground	**[Engine is running]** ● Idle speed	Approximately 0V

Diagnostic Procedure

EBS00FW5

1. INSPECTION START

Do you have CONSULT-II?

Yes or No

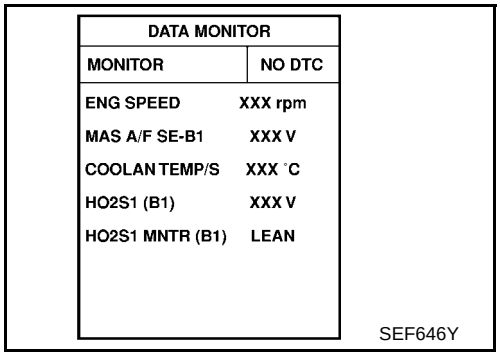
Yes >> GO TO 2.
No >> GO TO 3.

2. CHECK OVERALL FUNCTION

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “HO2S1 MNTR (B1)” and“HO2S1 MNTR (B2)” in “DATA MONITOR” mode with CONSULT-II.
3. Keep the engine speed at 2,000 rpm under no load, and make sure that the monitors fluctuate between LEAN and RICH more than five times in 10 seconds.

   1 time: RICH → LEAN → RICH
   2 times: RICH → LEAN → RICH → LEAN → RICH



OK or NG

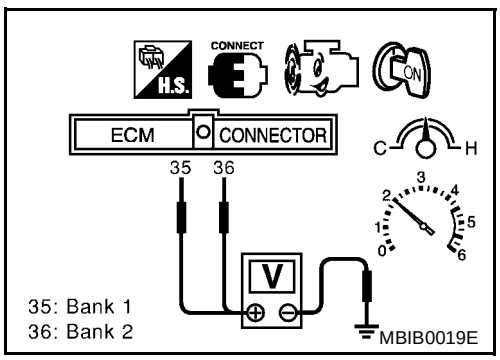
OK >> **INSPECTION END**
NG >> GO TO 4.

3. CHECK OVERALL FUNCTION

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 [HO2S1(B1) signal] or 36 [HO2S1(B2) signal] and engine ground.
3. Keep the engine speed at 2,000 rpm under no load, and make sure that the voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than five times in 10 seconds.

   1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V
   2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V



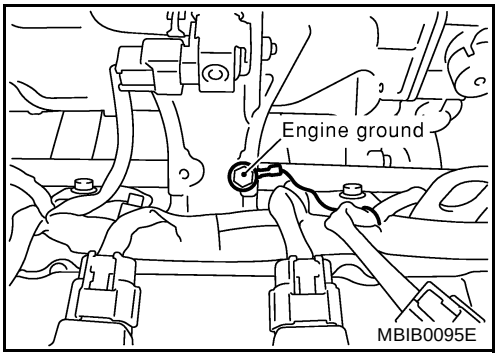
OK or NG

OK >> **INSPECTION END**
NG >> GO TO 4.

4. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

>> GO TO 5.

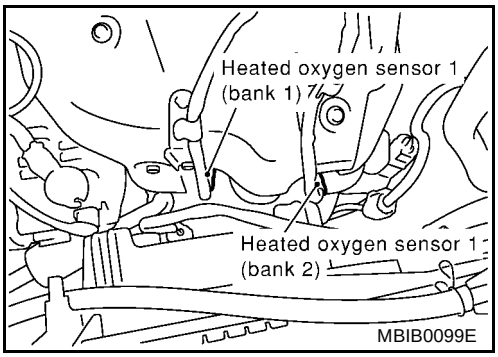


5. RETIGHTEN HEATED OXYGEN SENSOR 1

Loosen and retighten heated oxygen sensor 1.

Tightening torque: **40 - 60 N·m (4.1 - 6.2 kg-m, 30**

>> GO TO 6.

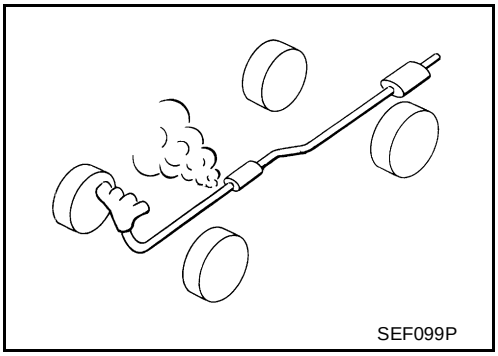


6. CHECK FOR EXHAUST AIR LEAK

1. Start engine and run it at idle.
2. Listen for an exhaust air leak before three way catalyst (Manifold).

OK or NG

OK >> GO TO 7.
NG >> Repair or replace.



7. CHECK FOR INTAKE AIR LEAK

Listen for an intake air leak after the mass air flow sensor.

OK or NG

OK >> GO TO 8.
NG >> Repair or replace.

8. CHECK HO2S1 GROUND CIRCUIT FOR OPEN AND SHORT

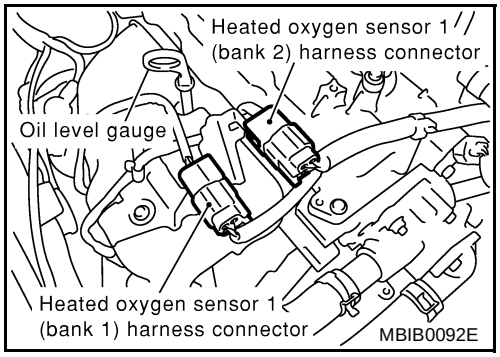
1. Turn ignition switch “OFF”.
2. Disconnect HO2S1 harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminal 74 and HO2S1 terminal 3. Refer to Wiring Diagram.

Continuity should exist.

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 9.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.



9. CHECK HO2S1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 35 and HO2S1 (B1) terminal 2, ECM terminal 36 and HO2S1 (B2) terminal 2. Refer to Wiring Diagram.

Continuity should exist.

2. Check harness continuity between ECM terminals 35, 36 or HO2S1 terminal 2 and ground. Refer to Wiring Diagram.

Continuity should not exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 10.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

10. CHECK HEATED OXYGEN SENSOR 1 HEATER

Refer to EC-848, "Component Inspection" .

OK or NG

OK >> GO TO 11.
NG >> Replace malfunctioning heated oxygen sensor 1.

11. CHECK MASS AIR FLOW SENSOR

Refer to EC-671, "Component Inspection" .

OK or NG

OK >> GO TO 12.
NG >> Replace mass air flow sensor.

12. CHECK PCV VALVE

Refer to EC-955, "Component Inspection" .

OK or NG

OK >> GO TO 13.
NG >> Replace PCV valve.

13. CHECK HEATED OXYGEN SENSOR 1

Refer to EC-879, "Component Inspection" .

OK or NG

OK >> GO TO 14.
NG >> Replace malfunctioning heated oxygen sensor 1.

14. CHECK INTERMITTENT INCIDENT

Refer to EC-656, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

EBS00FW6

HEATED OXYGEN SENSOR 1

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “MANU TRIG” and adjust “TRIGGER POINT” to 100% in “DATA MONITOR” mode with CONSULT-II.
3. Select “HO2S1 (B1)/(B2)” and “HO2S1 MNTR (B1)/(B2)”.
4. Hold engine speed at 2,000 rpm under no load during the following steps.
5. Touch “RECORD” on CONSULT-II screen.

DATA MONITOR	
MONITOR	NO DTC
ENG SPEED	XXX rpm
MAS A/F SE-B1	XXX V
COOLAN TEMP/S	XXX °C
HO2S1 (B1)	XXX V
HO2S1 MNTR (B1)	LEAN

SEF646Y

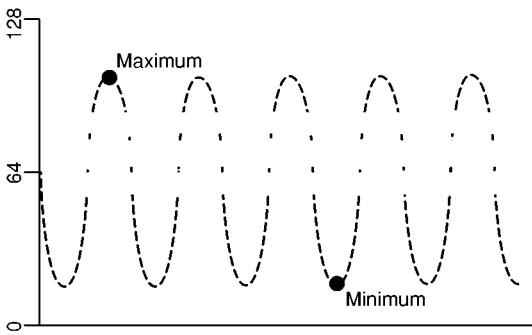
6. Check the following.
   - “HO2S1 MNTR (B1)/(B2)” in “DATA MONITOR” mode changes from “RICH” to “LEAN” to “RICH” 5 times in 10 seconds.
     5 times (cycles) are counted as shown at right.
   - “HO2S1 (B1)/(B2)” voltage goes above 0.6V at least once.
   - “HO2S1 (B1)/(B2)” voltage goes below 0.3V at least once.
   - “HO2S1 (B1)/(B2)” voltage never exceeds 1.0V.

Bank 1						
	cycle	1	2	3	4	5
HO2S1 MNTR (B1)	R-L-R-L-R-L-R-L-R-L-R					
Bank 2						
	cycle	1	2	3	4	5
HO2S1 MNTR (B2)	R-L-R-L-R-L-R-L-R-L-R					

R means HO2S1 MNTR (B1)/(B2) indicates RICH
L means HO2S1 MNTR (B1)/(B2) indicates LEAN

SEF647Y

Trigger	ENG SPEED	HO2S1 (B1)
	rpm	V
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX



SEF648Y

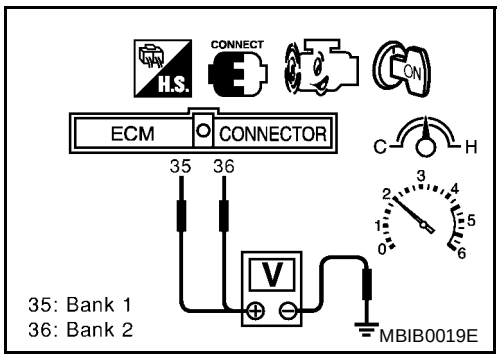
CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 [HO2S1 (B1) signal] or 36 [HO2S1 (B2) signal] and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no load.
   - The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds.
   - The maximum voltage is over 0.6V at least one time.
   - The minimum voltage is below 0.3V at least one time.
   - The voltage never exceeds 1.0V.

   1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V
   2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V



CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

EBS00FW7

HEATED OXYGEN SENSOR 1

Refer to EM-23, "EXHAUST MANIFOLD AND CATALYTIC CONVERTER" .

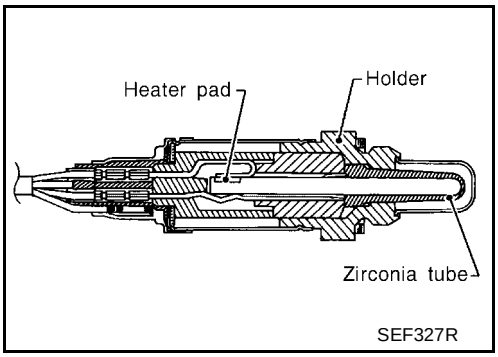
HO2S2 (QG16DE)

PFP:226A0

Component Description

EBS00FW8

The heated oxygen sensor 2, after three way catalyst, monitors the oxygen level in the exhaust gas.
Even if switching characteristics of the heated oxygen sensor 1 are shifted, the air fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.
This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.
Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.



CONSULT-II Reference Value in Data Monitor Mode

EBS00FW9

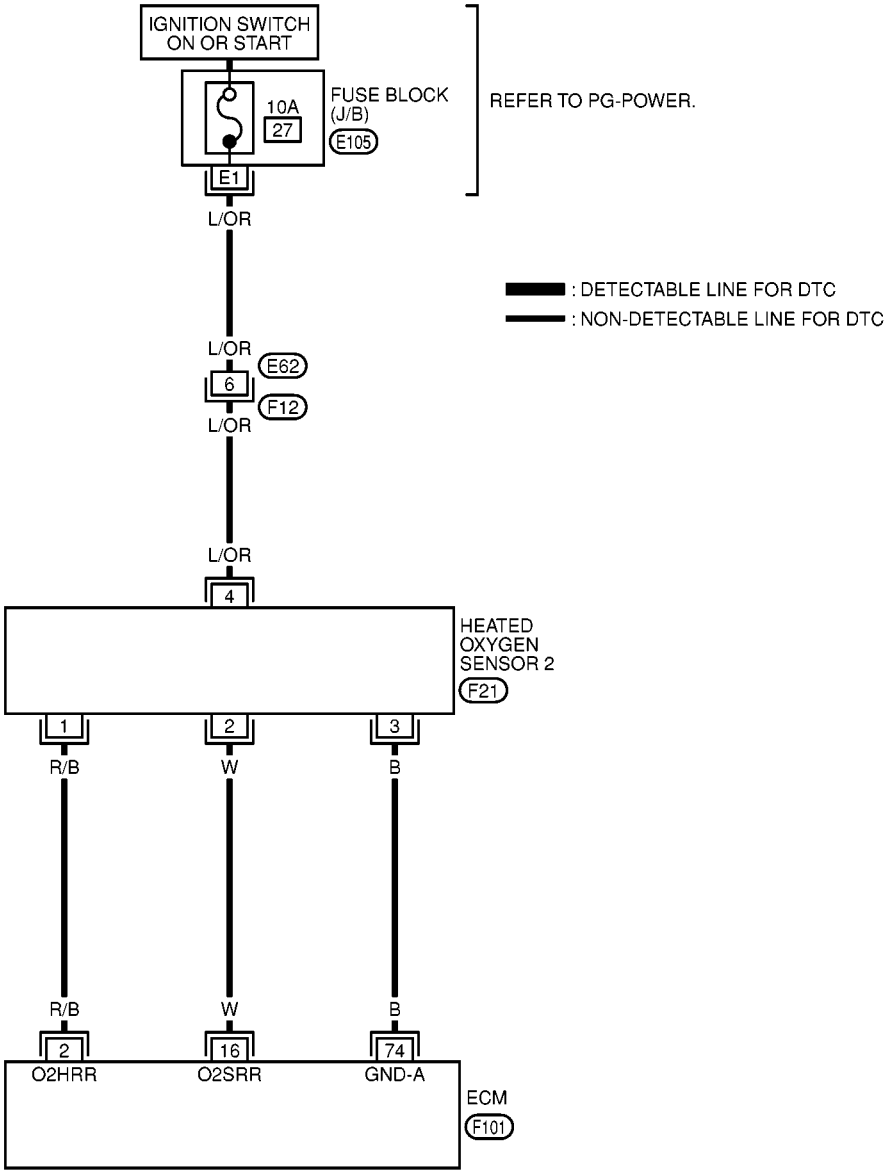
Specification data are reference values.

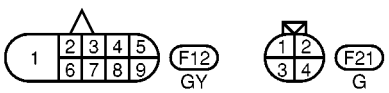
MONITOR ITEM	CONDITION		SPECIFICATION
HO2S2 (B1)	● Engine: After warming up	Revving engine from idle to 3,000 rpm quickly.	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S2 MNTR (B1)	● Engine: After warming up	Revving engine from idle to 3,000 rpm quickly.	LEAN ←→ RICH

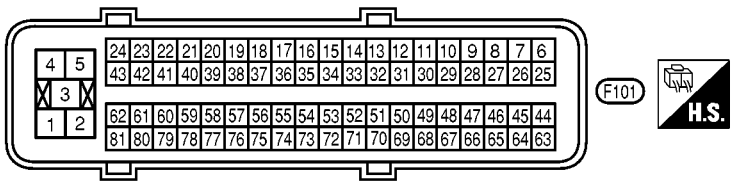
Wiring Diagram

EBS00FWB

EC-RRO2-01







REFER TO THE FOLLOWING.
E105 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0073E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
16	W	Heated oxygen sensor 2	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V
74	B	Heated oxygen sensor ground	**[Engine is running]** ● Idle speed	Approximately 0V

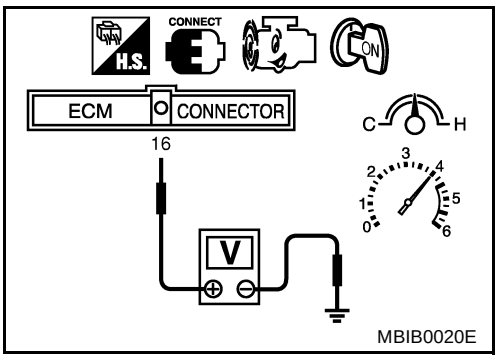
Diagnostic Procedure

EBS00FWC

1. CHECK OVERALL FUNCTION-I

1. Start engine and drive the vehicle at over 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle and keep the engine running.
3. Set voltmeter probes between ECM terminal 16 (HO2S2 signal) and ground.
4. Check the voltage while revving up to 4,000 rpm under no load at least 10 times. (Depress and release the accelerator pedal as quickly as possible.)

The voltage does not remain in the range of 0.2 -0.4V



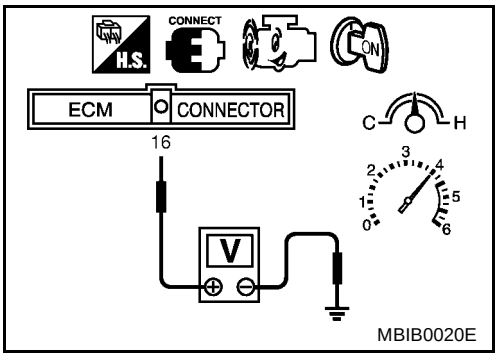
OK or NG

OK >> **INSPECTION END**
NG >> GO TO 2.

2. CHECK OVERALL FUNCTION-II

Keep engine at idle for 10 minutes, then check the voltage between ECM terminal 16 and ground, or check voltage when coasting 80 km/h (50 MPH) in 3rd gear.

The voltage does not remain in the range of 0.2 -0.4V



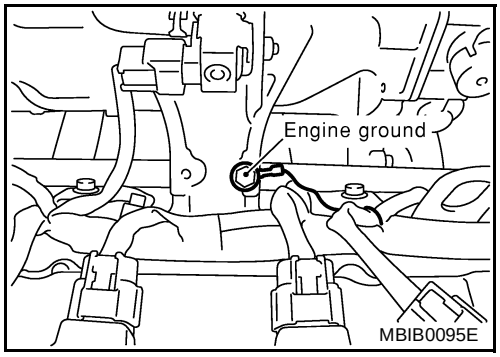
OK or NG

OK >> **INSPECTION END**
NG >> GO TO 3.

3. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

>> GO TO 4.



4. CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

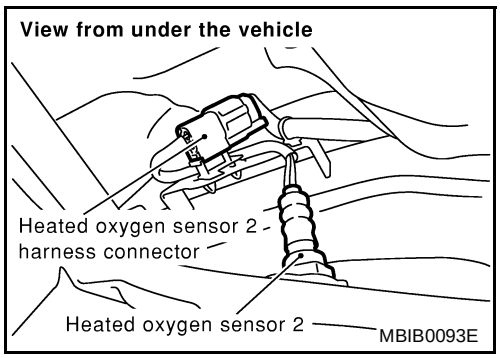
1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 2 harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminal 74 and HO2S2 terminal 3.
   Refer to Wiring Diagram.

   Continuity should exist.

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.



5. CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 16 and HO2S2 terminal 2.
   Refer to Wiring Diagram.

   Continuity should exist.

2. Check harness continuity between ECM terminal 16 or HO2S2 terminal 2 and ground.
   Refer to Wiring Diagram.

   Continuity should not exist.

3. Also check harness for short to ground or short to power.

OK or NG

OK >> GO TO 6.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK HEATED OXYGEN SENSOR 2

Refer to EC-885, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace heated oxygen sensor 2.

7. CHECK INTERMITTENT INCIDENT

Refer to EC-656, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

EBS00FWD

HEATED OXYGEN SENSOR 2

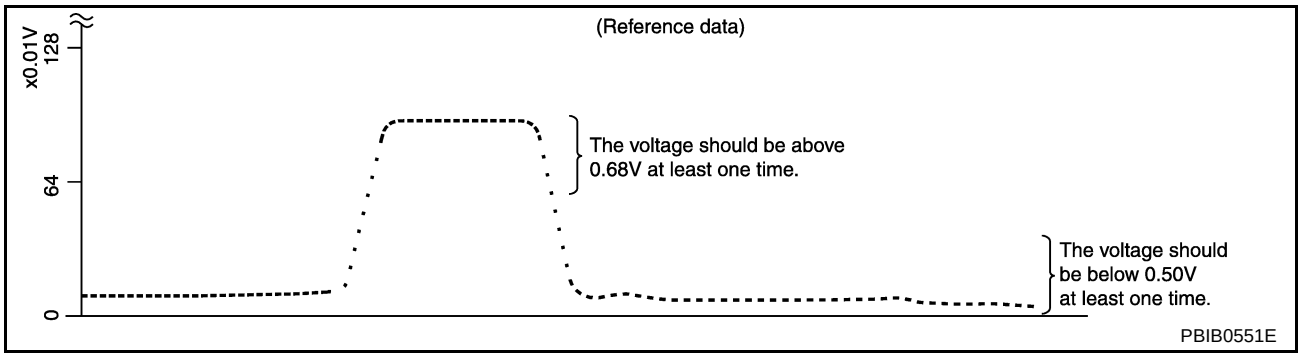
With CONSULT-II

1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)” as the monitor item with CONSULT-II.

ACTIVE TEST	
FUEL INJECTION	25 %
MONITOR	
ENG SPEED	XXX rpm
HO2S1 (B1)	XXX V
HO2S2 (B1)	XXX V
HO2S1 MNTR (B1)	RICH
HO2S2 MNTR (B1)	RICH

SEF662Y

4. Check “HO2S2 (B1)” at idle speed when adjusting “FUEL INJECTION” to ±25%.



“HO2S2 (B1)” should be above 0.68V at least once when the “FUEL INJECTION” is +25%.
“HO2S2 (B1)” should be below 0.50V at least once when the “FUEL INJECTION” is −25%.

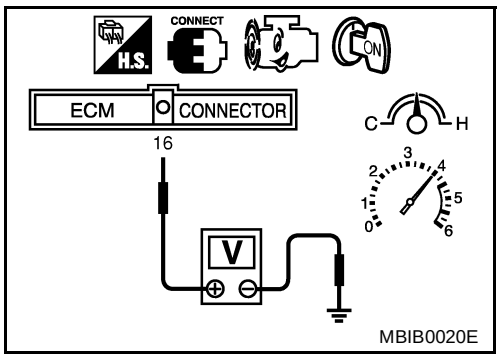
CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Set voltmeter probes between ECM terminal 16 (HO2S2 signal) and engine ground.

4. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be above 0.68V at least once during this procedure.
   If the voltage is above 0.68V at step 4, step 5 is not necessary.
5. Keep vehicle at idling for 10 minutes, then check voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in 3rd gear position.
   The voltage should be below 0.50V at least once during this procedure.
6. If NG, replace heated oxygen sensor 2.



CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

EBS00FWE

HEATED OXYGEN SENSOR 2

Refer to EX-3, "EXHAUST SYSTEM" .

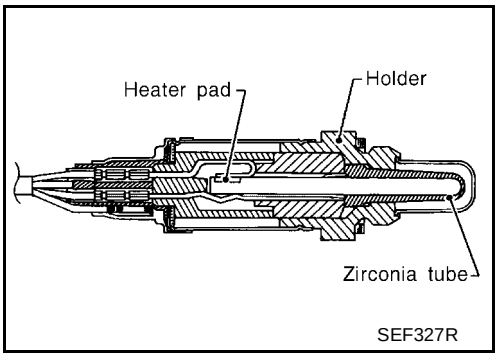
HO2S2 (QG18DE)

PFP:226A0

Component Description

EBS00FWF

The heated oxygen sensor 2, after three way catalyst, monitors the oxygen level in the exhaust gas on each bank.
Even if switching characteristics of the heated oxygen sensor 1 are shifted, the air fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.
This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.
Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.



CONSULT-II Reference Value in Data Monitor Mode

EBS00FWG

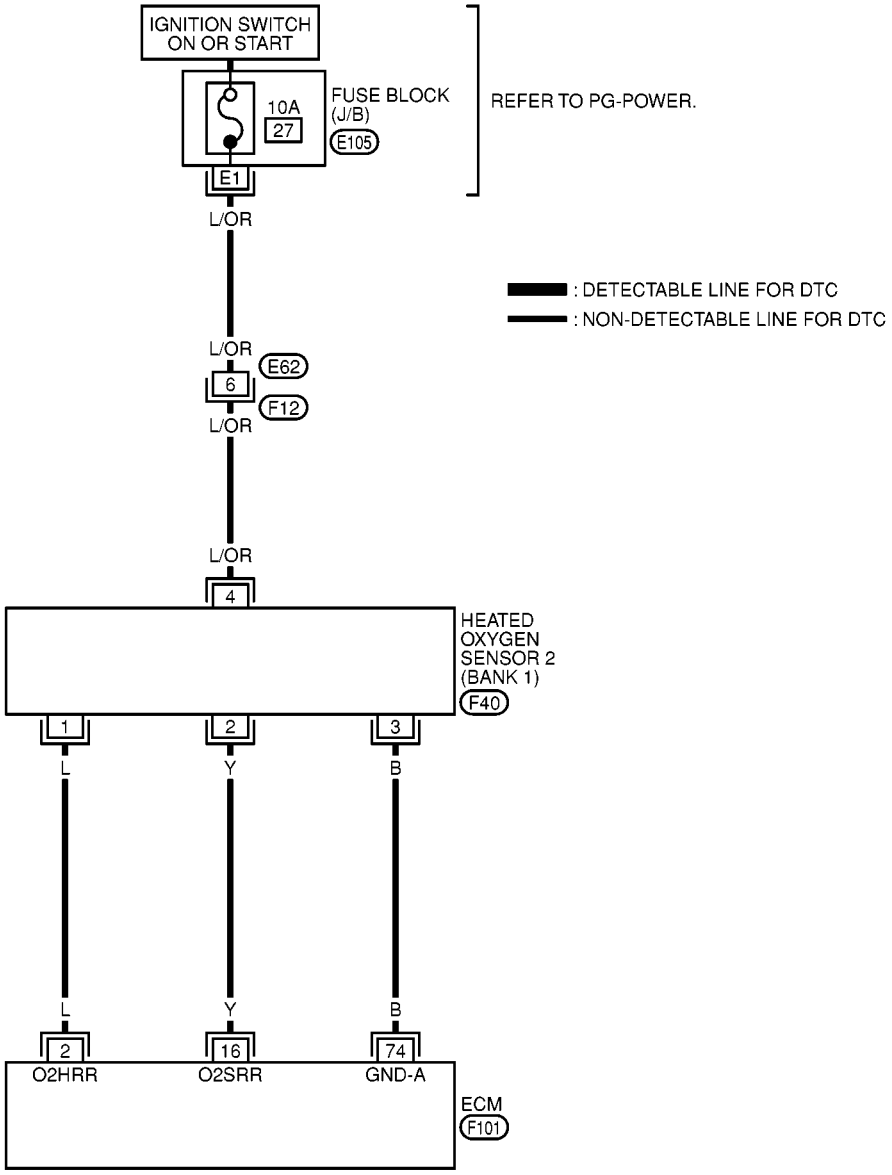
Specification data are reference values.

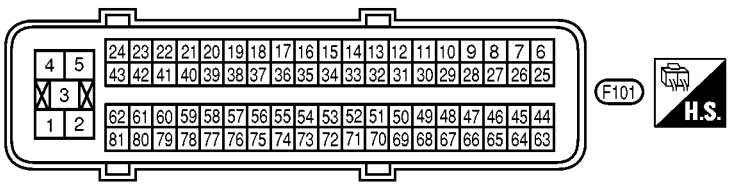
MONITOR ITEM	CONDITION		SPECIFICATION
HO2S2 (B1) HO2S2 (B2)	● Engine: After warming up	Revving engine from idle up to 2,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S2 MNTR (B1) HO2S2 MNTR (B2)			LEAN ←→ RICH

Wiring Diagram
BANK 1

EBS00FWH

EC-RRO2B1-01





REFER TO THE FOLLOWING.
E105 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0080E

Specification data are reference values and are measured between each terminal and body ground.

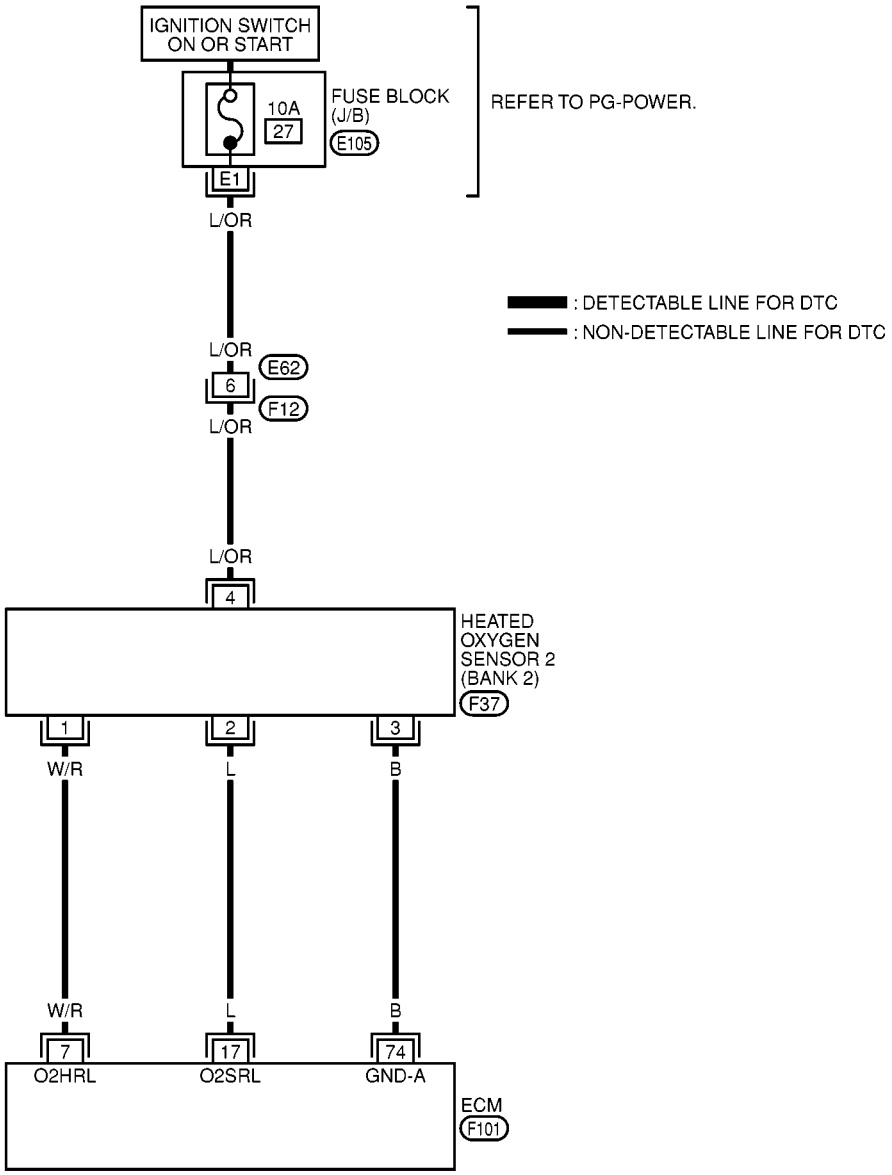
CAUTION:

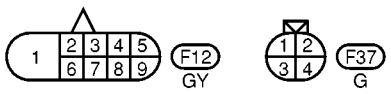
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

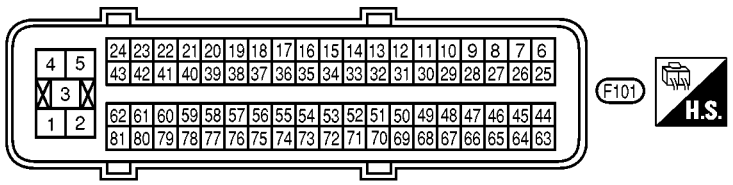
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
16	Y	Heated oxygen sensor 2 (bank 1)	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V
74	B	Heated oxygen sensor ground	**[Engine is running]** ● Idle speed	Approximately 0V

BANK 2

EC-RRO2B1-01







REFER TO THE FOLLOWING.
E105 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0082E

Specification data are reference values and are measured between each terminal and body ground.

CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
17	L	Heated oxygen sensor 2 (bank 2)	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V
74	B	Heated oxygen sensor ground	**[Engine is running]** ● Idle speed	Approximately 0V

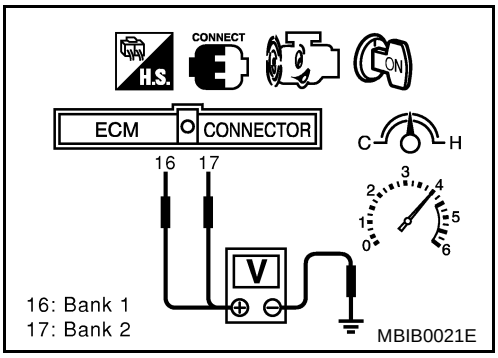
Diagnostic Procedure

EBS00FWI

1. CHECK OVERALL FUNCTION - I

1. Start engine and drive the vehicle at 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle and keep the engine running.
3. Set voltmeter probes between ECM terminal 16 [HO2S2 (B1) signal] or 17 [HO2S2 (B2) signal] and ground.
4. Check the voltage while revving engine up to 4,000 rpm under no load at least 10 times.
   (Depress and release the accelerator pedal as quickly as possible.)

The voltage does not remain in the range of 0.2 - 0.4V



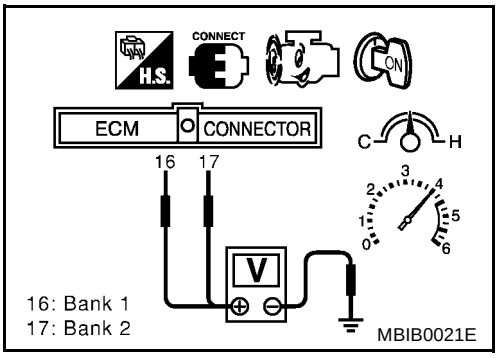
OK or NG

OK >> **INSPECTION END**
NG >> GO TO 2.

2. CHECK OVERALL FUNCTION - II

Keep engine at idle for 10 minutes, then check the voltage between ECM terminal 16 [HO2S2 (B1) signal] or 17 [HO2S2 (B2) signal] and ground, or check the voltage when coasting at 80 km/h (50 MPH) in “D” position with OD “OFF” (A/T), 3rd gear position (M/T).

The voltage does not remain in the range of 0.2 - 0.4V



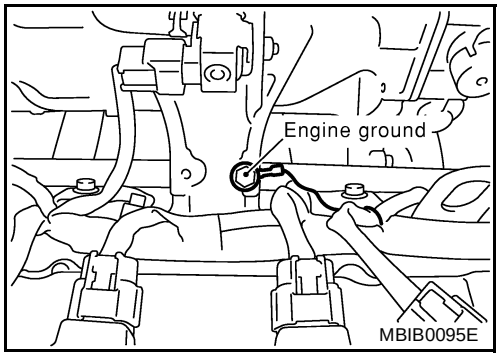
OK or NG

OK >> **INSPECTION END**
NG >> GO TO 3.

3. RETIGHTEN GROUND SCREWS

1. Stop vehicle and turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

>> GO TO 4.



4. CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

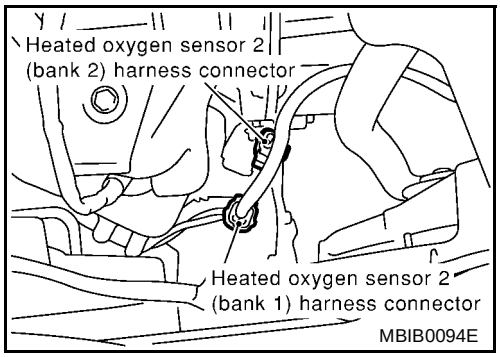
1. Disconnect heated oxygen sensor 2 harness connector.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 74 and HO2S2 terminal 3.
   Refer to Wiring Diagram.

   Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.



5. CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 16 and HO2S2 (B1) terminal 2, ECM terminal 17 and HO2S2 (B2) terminal 2. Refer to Wiring Diagram.

   Continuity should exist.

2. Check harness continuity between ECM terminals 16, 17 or HO2S2 terminal 1 and ground.
   Refer to Wiring Diagram.

   Continuity should not exist.

3. Also check harness for short to ground or short to power.

OK or NG

OK >> GO TO 6.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK HEATED OXYGEN SENSOR 2

Refer to EC-893, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> Replace malfunctioning heated oxygen sensor 2.

7. CHECK INTERMITTENT INCIDENT

Refer to EC-656, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

EBS00FWJ

HEATED OXYGEN SENSOR 2

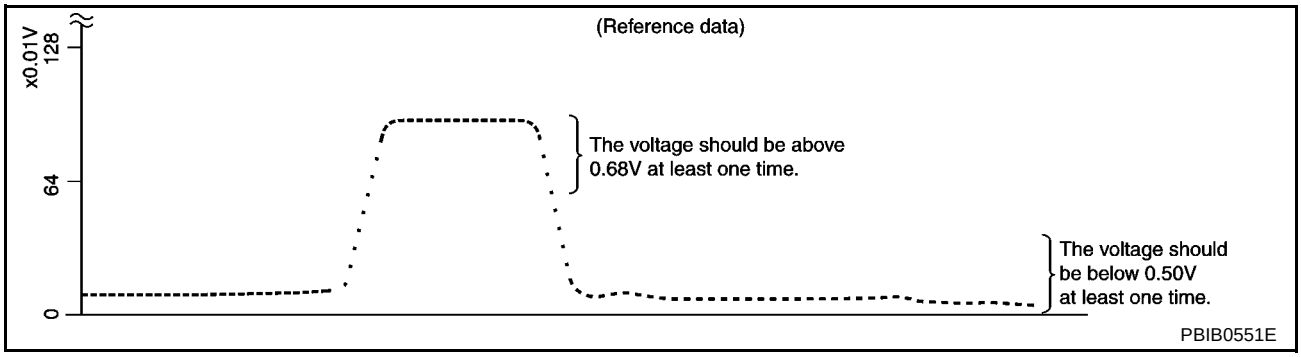
With CONSULT-II

1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)/(B2)” as the monitor item with CONSULT-II.

ACTIVE TEST	
FUEL INJECTION	25 %
MONITOR	
ENG SPEED	XXX rpm
HO2S1 (B1)	XXX V
HO2S2 (B1)	XXX V
HO2S1 MNTR (B1)	RICH
HO2S2 MNTR (B1)	RICH

SEF662Y

4. Check “HO2S2 (B1)/(B2)” at idle speed when adjusting “FUEL INJECTION” to ±25%.



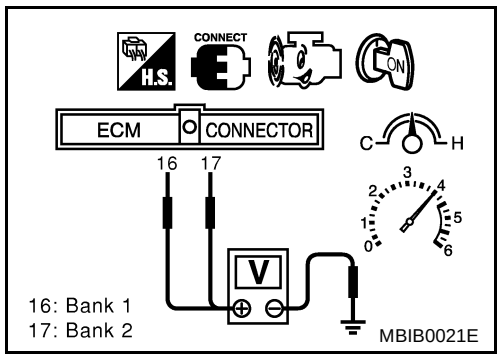
“HO2S2 (B1)/(B2)” should be above 0.68V at least once when the “FUEL INJECTION” is +25%.
“HO2S2 (B1)/(B2)” should be below 0.50V at least once when the “FUEL INJECTION” is −25%.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Set voltmeter probes between ECM terminal 16 [HO2S2 (B1) signal] or 17 [HO2S2 (B2) signal] and engine ground.
4. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be above 0.68V at least once during this procedure.
   If the voltage is above 0.68V at step 4, step 5 is not necessary.
5. Keep vehicle at idling for 10 minutes, then check voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in “D” position with “OD” OFF (A/T), 3rd gear position (M/T).
   The voltage should be below 0.50V at least once during this procedure.
6. If NG, replace heated oxygen sensor 2.



CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

EBS00FWK

HEATED OXYGEN SENSOR 2

Refer to EX-3, "EXHAUST SYSTEM" .

IGNITION SIGNAL

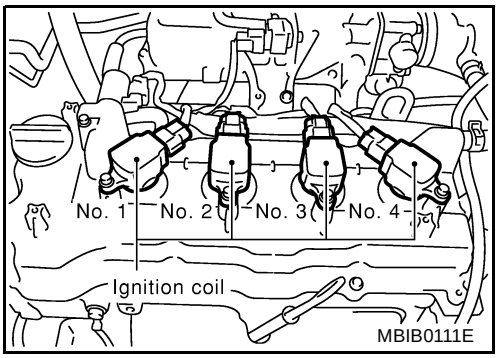
PFP:22448

Component Description

EBS00EZ8

IGNITION COIL & POWER TRANSISTOR

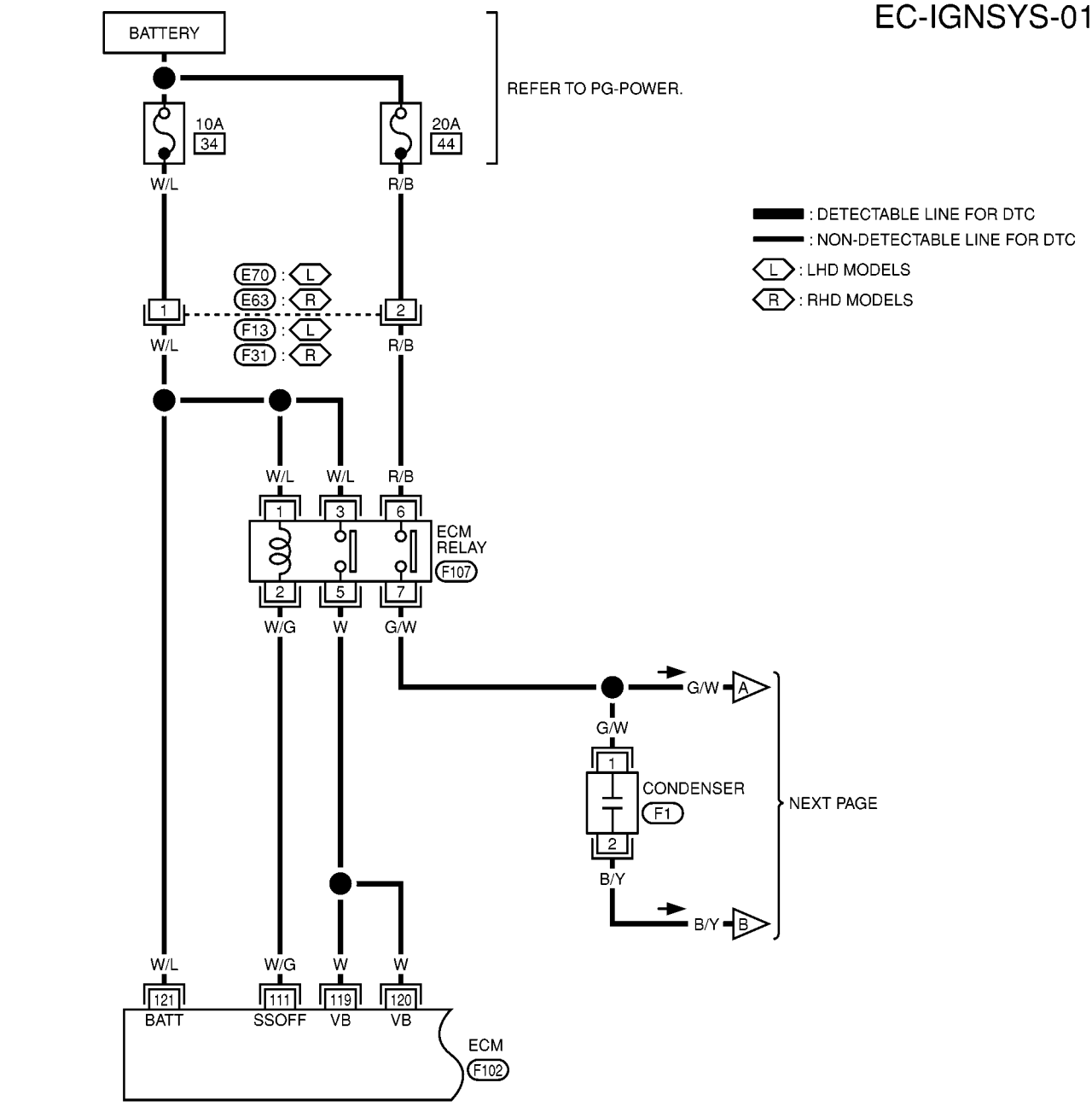
The ignition signal from the ECM is sent to and amplified by the power transistor. The power transistor turns on and off the ignition coil primary circuit. This on-off operation induces the proper high voltage in the coil secondary circuit.

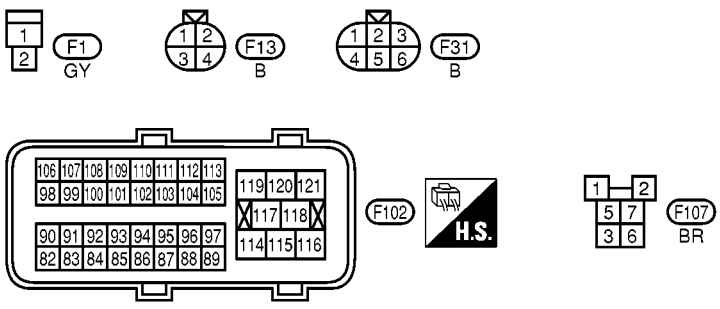


Wiring Diagram

EBS00EZ9

EC-IGNSYS-01





MBWA0087E

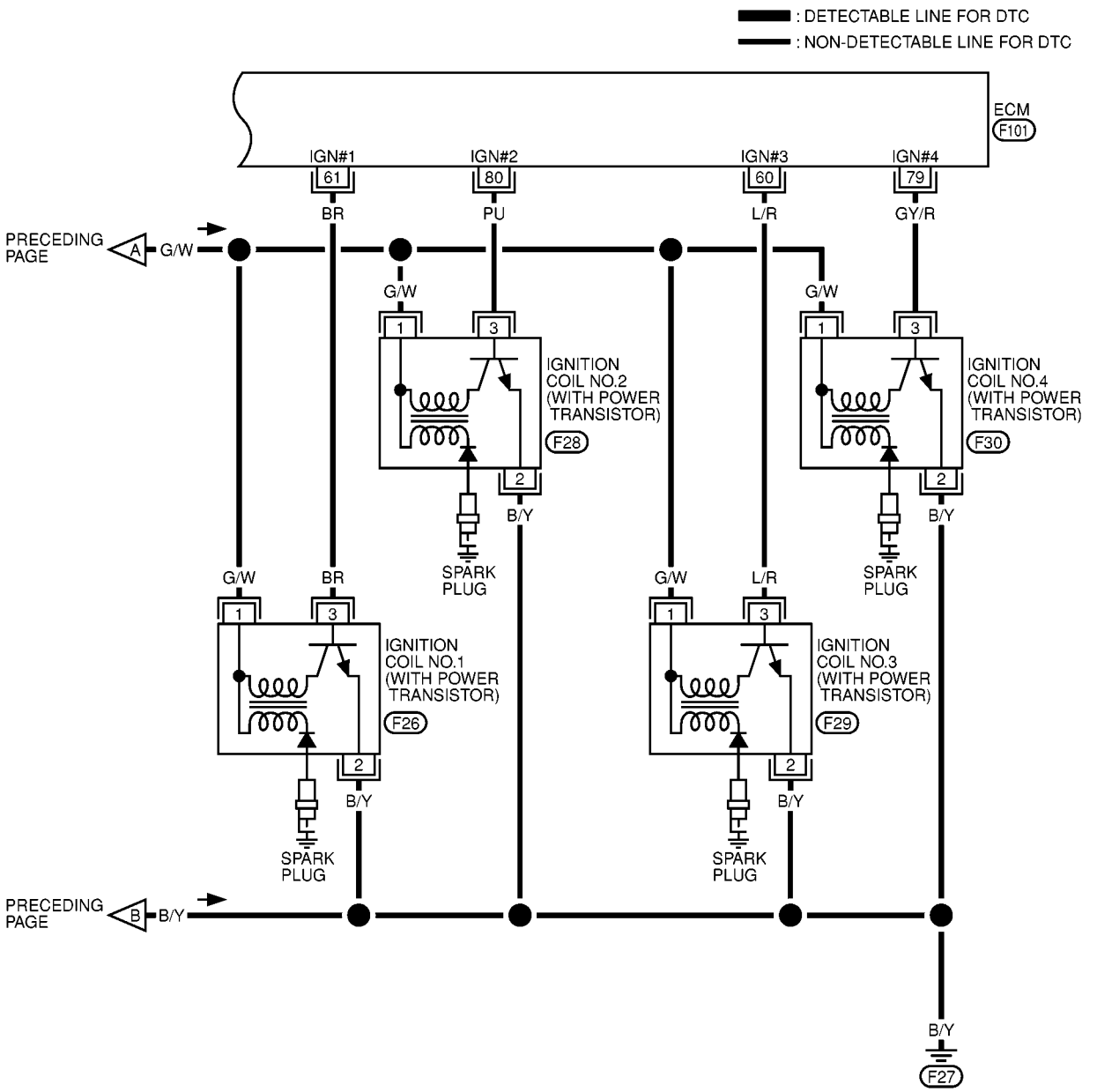
Specification data are reference values and are measured between each terminal and ground.

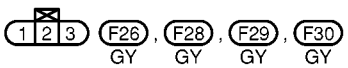
CAUTION:

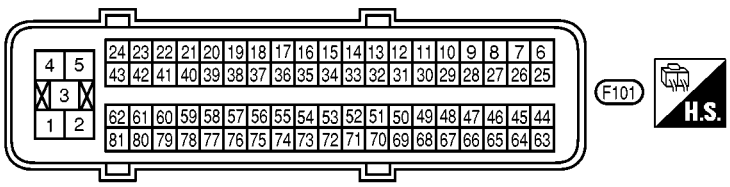
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
111	W/G	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch "OFF"]** ● For a few seconds after turning ignition switch "OFF"	0 - 1.0V
			[Ignition switch "OFF"] ● More than a few seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
119 120	W W	Power supply for ECM	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)

EC-IGNSYS-02



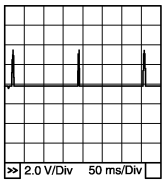
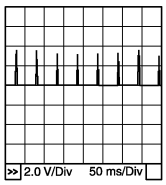




MBWA0088E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
60 61 79 80	L/R BR GY/R PU	Ignition signal No. 3 Ignition signal No. 1 Ignition signal No. 4 Ignition signal No. 2	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0 - 0.1V★  PBIB0521E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - 0.2V★  PBIB0522E

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnostic Procedure

EBS00EZA

1. CHECK ENGINE START

Turn ignition switch “OFF”, and restart engine.
Is engine running?

Yes or No

Yes (With CONSULT-II)>>GO TO 2.
Yes (Without CONSULT-II)>>GO TO 3.
No >> GO TO 4.

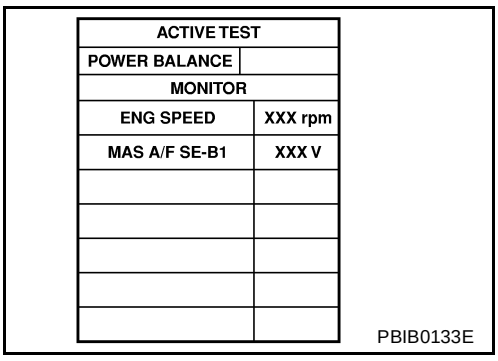
2. CHECK OVERALL FUNCTION

With CONSULT-II

1. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT-II.
2. Make sure that each circuit produces a momentary engine speed drop.

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 10.

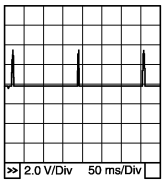


PBIB0133E

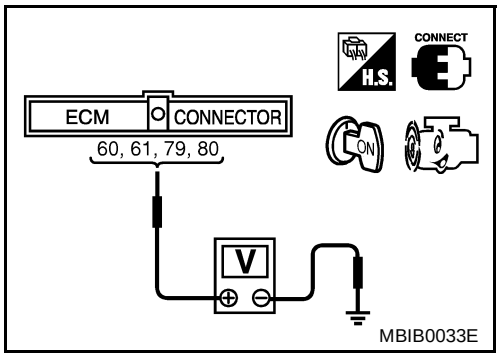
3. CHECK OVERALL FUNCTION

Without CONSULT-II

1. Let engine idle.
2. Read the voltage signal between ECM terminals 60, 61, 79, 80 and ground with an oscilloscope.
3. Verify that the oscilloscope screen shows the signal wave as shown below.



PBIB0521E



MBIB0033E

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 10.

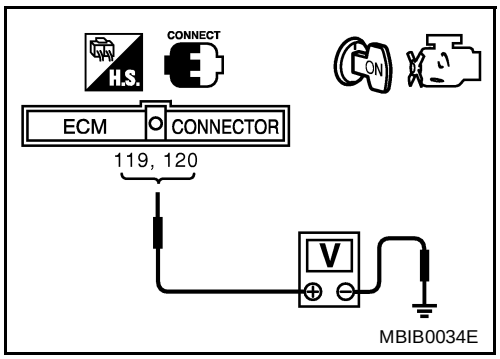
4. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-I

1. Turn ignition switch “ON”.
2. Check voltage between ECM terminals 119, 120 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 5.
NG >> Go to EC-657, "POWER SUPPLY CIRCUIT FOR ECM"
.



MBIB0034E

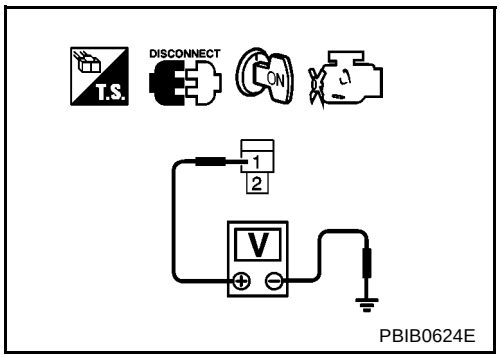
5. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-II

1. Turn ignition switch “OFF”.
2. Disconnect condenser harness connector.
3. Turn ignition switch “ON”.
4. Check voltage between condenser terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 10.
NG >> GO TO 6.



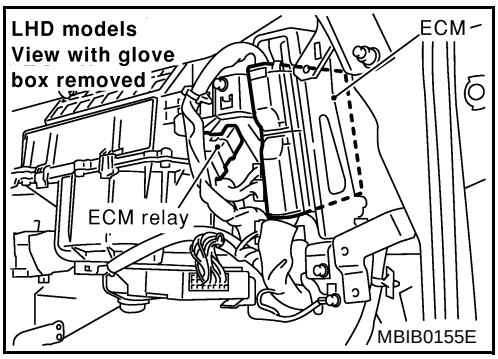
PBIB0624E

6. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-III

1. Turn ignition switch “OFF”.
2. Disconnect ECM relay.
3. Check harness continuity between ECM relay terminal 7 and condenser terminal 1.
   Refer to Wiring Diagram.

   Continuity should exist.

4. Also check harness for short to ground and short to power.



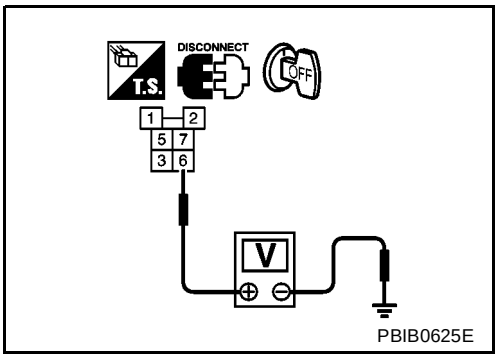
OK or NG

OK >> GO TO 7.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-IV

Check voltage between ECM relay terminal 6 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 9.
NG >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E70, F13 (LHD models)
- Harness connectors E63, F31 (RHD models)
- 20A fuse
- Harness for open or short between ECM relay and battery

>> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK ECM RELAY

Refer to EC-903, "Component Inspection" .

OK or NG

OK >> GO TO 17.
NG >> Replace ECM relay.

10. CHECK CONDENSER GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect condenser harness connector.
3. Check harness continuity between condenser terminal 2 and ground.
   Refer to Wiring diagram.

   Continuity should exist.

4. Also check harness for short to power.

OK or NG

OK >> GO TO 11.
NG >> Repair open circuit or short to power in harness or connector.

11. CHECK CONDENSER

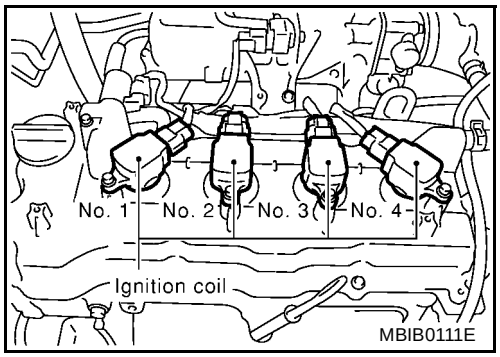
Refer to EC-903, "Component Inspection" .

OK or NG

OK >> GO TO 12.
NG >> Replace condenser.

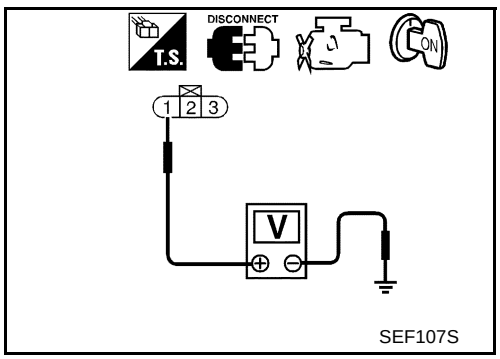
12. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-V

1. Turn ignition switch “OFF”.
2. Reconnect all harness connectors disconnected.
3. Disconnect ignition coil harness connector.
4. Turn ignition switch “ON”.



5. Check voltage between ignition coil terminal 1 and ground with CONSULT-II or tester.

   Voltage: Battery voltage



OK or NG

OK >> GO TO 14.
NG >> GO TO 13.

13. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between ignition coil and ECM relay

>> Repair open circuit or short to ground or short to power in harness or connectors.

14. CHECK IGNITION COIL GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between ignition coil terminal 2 and engine ground.
   Refer to Wiring Diagram.

   Continuity should exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 15.
NG >> Repair open circuit or short to power in harness or connectors.

15. CHECK IGNITION COIL OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminals 60, 61, 79, 80 and ignition coil terminal 1.
   Refer to Wiring Diagram.

   Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 16.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

16. CHECK IGNITION COIL WITH POWER TRANSISTOR

Refer to EC-903, "Component Inspection" .

OK or NG

OK >> GO TO 17.
NG >> Replace ignition coil with power transistor.

17. CHECK INTERMITTENT INCIDENT

Refer to EC-656, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

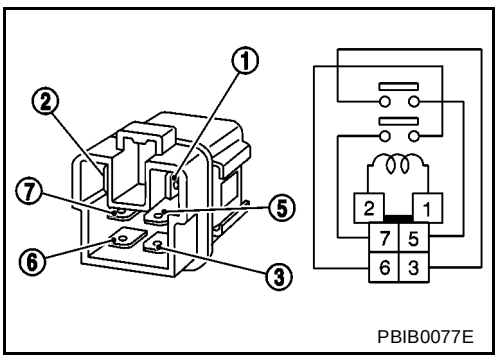
EBS00EZB

ECM RELAY

1. Apply 12V direct current between ECM relay terminals 1 and 2.
2. Check continuity between relay terminals 3 and 5, 6 and 7.

Condition	Continuity
12V direct current supply between terminals 1 and 2	Yes
OFF	No

3. If NG, replace ECM relay.

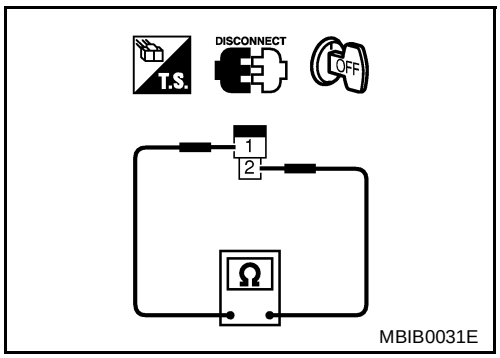


CONDENSER

1. Turn ignition switch “OFF”.
2. Disconnect condenser harness connector.

3. Check resistance between condenser terminals 1 and 2.

Resistance: Above 1 MΩ at 25°C (77°F)

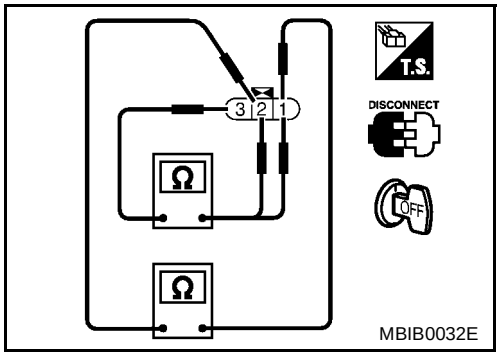


MBIB0031E

IGNITION COIL WITH POWER TRANSISTOR

1. Turn ignition switch “OFF”.
2. Disconnect ignition coil harness connector.
3. Check resistance between ignition coil terminals as follows.

Terminal No.	Resistance Ω [at 25°C (77°F)]
3 and 1	Except 0 or ∞
3 and 2	Except 0
1 and 2	



MBIB0032E

EBS00EZC

Removal and Installation

IGNITION COIL WITH POWER TRANSISTOR

Refer to EM-29, "IGNITION COIL" .

EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

PFP:14920

Description

EBS00EZD

SYSTEM DESCRIPTION

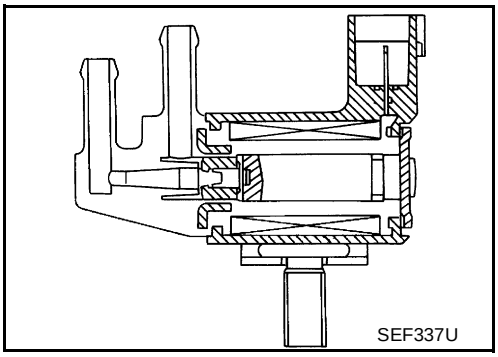
Sensor	Input Signal to ECM	ECM Function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*2	EVAP canister purge flow control	EVAP canister purge volume control solenoid valve
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Battery	Battery voltage*2		
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Closed throttle position		
Heated oxygen sensors 1	Density of oxygen in exhaust gas (Mixture ratio feedback signal)		
Vehicle speed signal*1	Vehicle speed		

*: This signal is sent to the ECM through CAN communication line.
*2: The ECM determines the start signal status by the signals of engine speed and battery voltage.

This system controls flow rate of fuel vapor from the EVAP canister. The opening of the vapor by-pass passage in the EVAP canister purge volume control solenoid valve changes to control the flow rate. The EVAP canister purge volume control solenoid valve repeats ON/OFF operation according to the signal sent from the ECM. The opening of the valve varies for optimum engine control. The optimum value stored in the ECM is determined by considering various engine conditions. When the engine is operating, the flow rate of fuel vapor from the EVAP canister is regulated as the air flow changes.

COMPONENT DESCRIPTION

The EVAP canister purge volume control solenoid valve uses a ON/OFF duty to control the flow rate of fuel vapor from the EVAP canister. The EVAP canister purge volume control solenoid valve is moved by ON/OFF pulses from the ECM. The longer the ON pulse, the greater the amount of fuel vapor that will flow through the valve.



CONSULT-II Reference Value in Data Monitor Mode

EBS00EZE

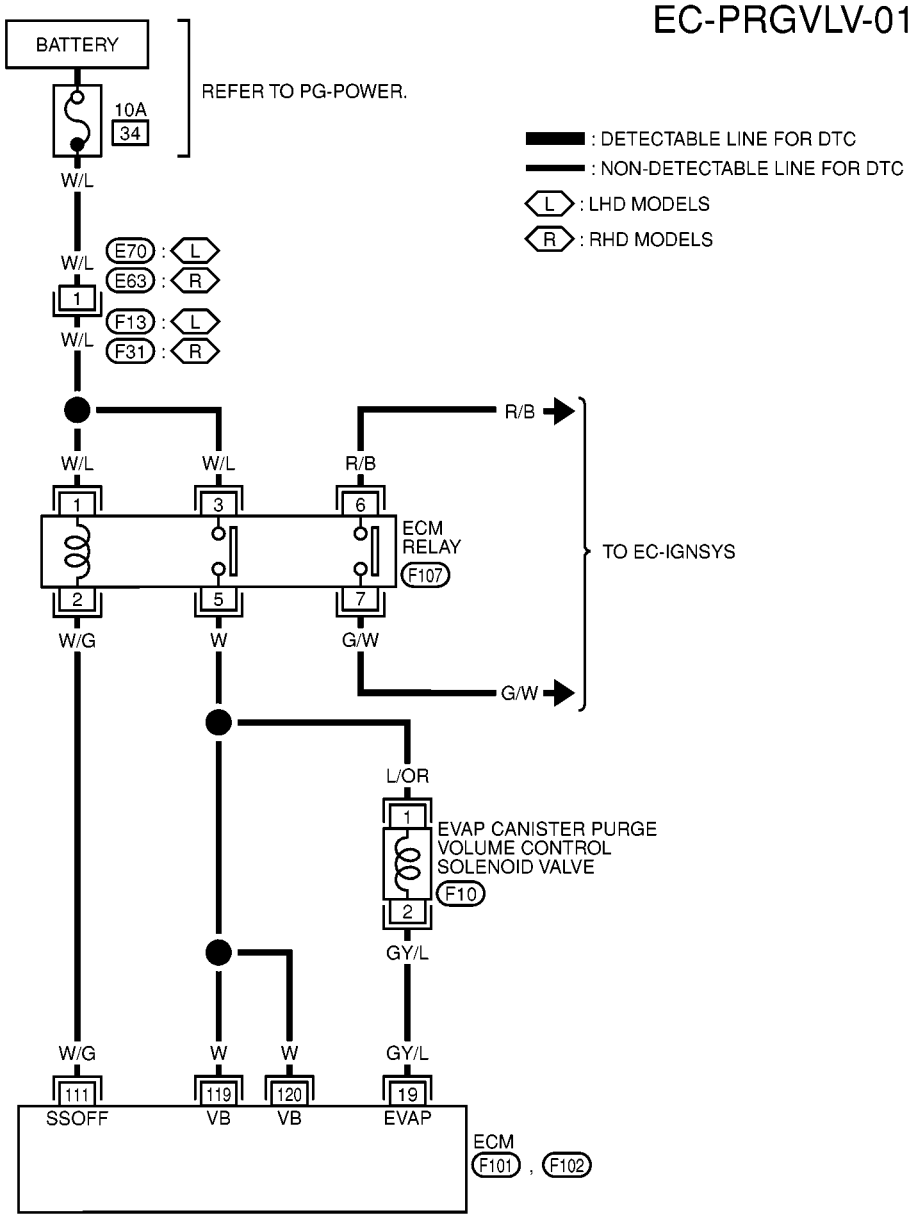
Specification data are reference values.

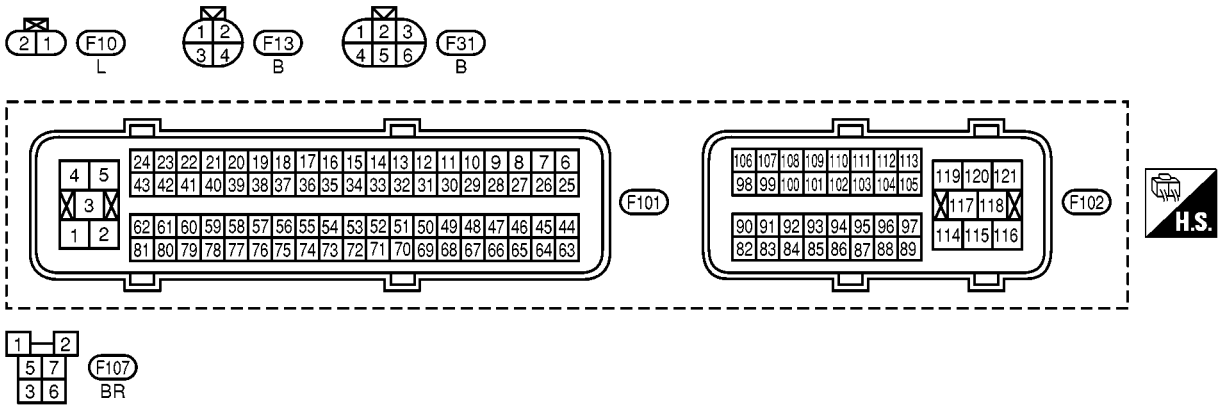
MONITOR ITEM	CONDITION		SPECIFICATION
PURG VOL C/V	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	0%
		2,000 rpm	15 - 30%

Wiring Diagram

EBS00EZG

EC-PRGVLV-01



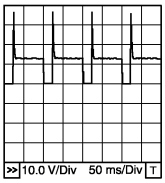


MBWA0083E

Specification data are reference values and are measured between each terminal and body ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
19	GY/L	EVAP canister purge volume control solenoid valve	**[Engine is running]** ● Idle speed	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● Engine speed is about 2,000 rpm	Approximately 10V★  PBIB0520E

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnostic Procedure

EBS00EZH

1. CHECK OVERALL FUNCTION

With CONSULT-II

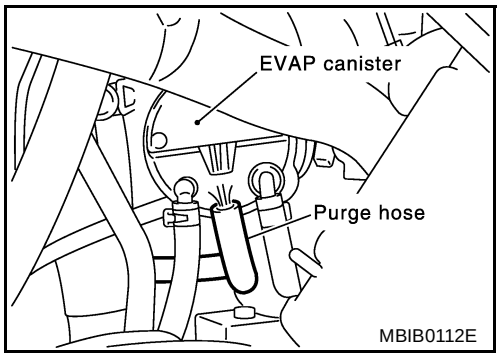
1. Turn ignition switch “OFF”.
2. Disconnect the EVAP purge hose connected to the EVAP canister.
3. Turn ignition switch “ON”.
4. Select “PURG VOL CONT/V” in “ACTIVE TEST” mode with CONSULT-II.
5. Start engine and let it idle.

ACTIVE TEST	
PURG VOL CONT/V	XXX %
MONITOR	
ENG SPEED	XXX rpm
A/F ALPHA-B1	XXX %
HO2S1 MNTR (B1)	LEAN

PBIB0569E

6. Change the valve opening percentage with touching “Qu” or “Qd” on CONSULT-II screen, and check for vacuum existence at the EVAP purge hose under the following conditions.

Conditions	Vacuum
At idle	Should not exist.
Engine speed is about 2,000 rpm.	Should exist.

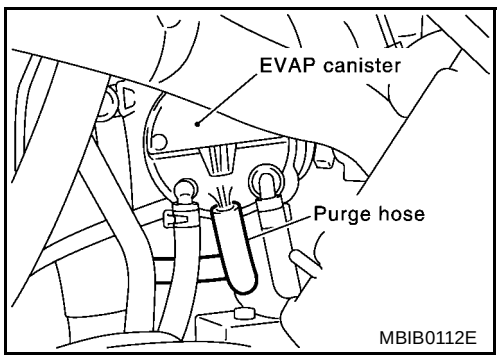


MBIB0112E

Without CONSULT-II

1. Turn ignition switch “OFF”.
2. Disconnect the EVAP purge hose connected to the EVAP canister.
3. Start engine and let it idle for at least 80 seconds.
4. Check for vacuum existence at the EVAP purge hose under the following conditions.

Conditions	Vacuum
At idle	Should not exist.
Engine speed is about 2,000 rpm.	Should exist.



MBIB0112E

OK or NG

OK >> GO TO 2.
NG >> GO TO 3.

2. CHECK EVAP CANISTER

Refer to EC-954, "Component Inspection" .

OK or NG

OK >> **INSPECTION END**
NG >> Replace EVAP canister.

3. CHECK EVAP PURGE LINE

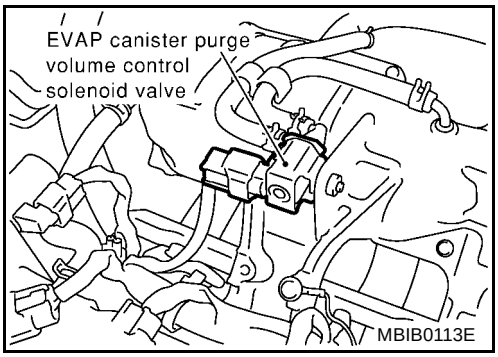
Check EVAP purge line (pipe, rubber tube, fuel tank and EVAP canister) for cracks or improper connection. Refer to EC-953, "EVAPORATIVE EMISSION LINE DRAWING" .

OK or NG

OK >> GO TO 4.
NG >> Repair or reconnect the hose.

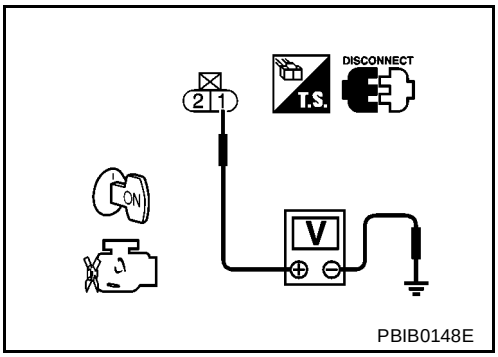
4. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect EVAP canister purge volume control solenoid valve harness connector.
3. Turn ignition switch “ON”.



4. Check voltage between EVAP canister purge volume control solenoid valve terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between EVAP canister purge volume control solenoid valve and ECM
- Harness for open or short between EVAP canister purge volume control solenoid valve and ECM relay

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 19 and EVAP canister purge volume control solenoid valve terminal 2. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

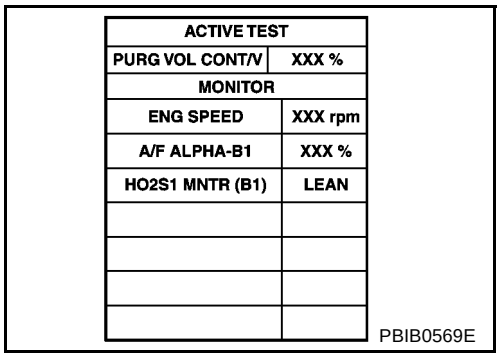
OK or NG

OK (With CONSULT-II)>>GO TO 7.
OK (Without CONSULT-II)>>GO TO 8.
NG >> Repair open circuit or short to ground and short to power in harness or connectors.

7. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

With CONSULT-II

1. Reconnect all harness connectors disconnected.
2. Start engine.
3. Perform “PURG VOL CONT/V” in “ACTIVE TEST” mode with CONSULT-II. Check that engine speed varies according to the valve opening.



OK or NG

OK >> GO TO 9.
NG >> GO TO 8.

8. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-911, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> Replace EVAP canister purge volume control solenoid valve.

9. CHECK INTERMITTENT INCIDENT

Refer to EC-656, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

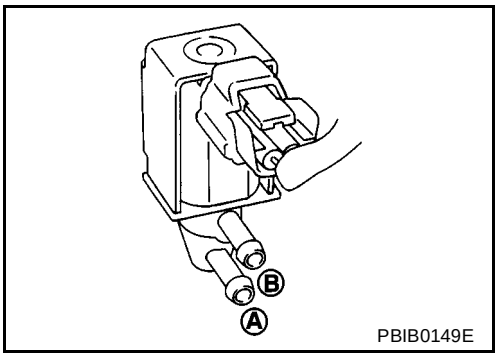
EBS00EZI

EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT-II

Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

Condition (PURG VOL CONT/V value)	Air passage continuity between A and B
100.0%	Yes
0.0%	No

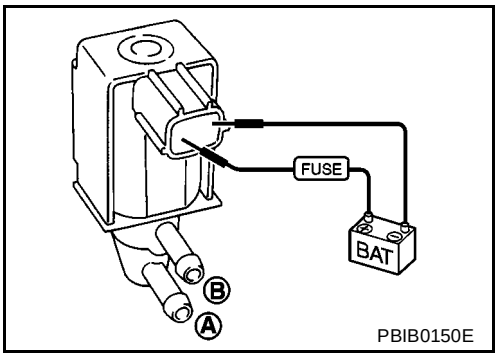


PBIB0149E

Without CONSULT-II

Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

Condition	Air passage continuity between A and B
12V direct current supply between terminals 1 and 2	Yes
No supply	No



PBIB0150E

Removal and Installation

EBS00EZJ

EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EM-19, "INTAKE MANIFOLD" .

VSS

PFP:32702

Description

EBS00H9O

NOTE:
If DTC U1000 or U1001 is displayed, first perform the trouble diagnosis for DTC U1000, U1001. Refer to EC-663, "DTC U1000, U1001 CAN COMMUNICATION LINE" .
The vehicle speed signal is sent to the combination meter from ABS actuator and electric unit (control unit) through CAN communication line. The combination meter then sends a signal to the ECM through CAN communication line.

Diagnostic Procedure

EBS00H9Q

1. CHECK VEHICLE SPEED SIGNAL OVERALL FUNCTION

With CONSULT-II

1. Lift up the vehicle.
2. Start engine.
3. Select “VHCL SPEED SE” in “DATA MONITOR” mode with CONSULT-II.
4. Make sure that “VHCL SPEED SE” indication exceeds 10 km/h (6 MPH) when rotating wheels with suitable gear position.

DATA MONITOR	
MONITOR	NO DTC
ENG SPEED	XXX rpm
COOLAN TEMP/S	XXX °C
B/FUEL SCHDL	XXX msec
PW/ST SIGNAL	OFF
VHCL SPEED SE	XXX km/h

SEF196Y

Without CONSULT-II

1. Lift up the vehicle.
2. Start engine.
3. Read vehicle speed with combination meter.
   Make sure that vehicle speed indication exceeds 10 km/h (6 MPH) when rotating wheels with suitable gear position.

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 2.

2. CHECK DTC

Check DTC with ABS actuator and electric unit (control unit), Refer to BRC-17, "TROUBLE DIAGNOSIS" .

OK or NG

OK >> GO TO 2.
NG >> Repair or replace.

3. CHECK COMBINATION METER

Check combination meter function.
Refer to DI-5, "COMBINATION METERS (LHD MODELS)" or DI-34, "COMBINATION METERS (RHD MODELS)" .

>> **INSPECTION END**

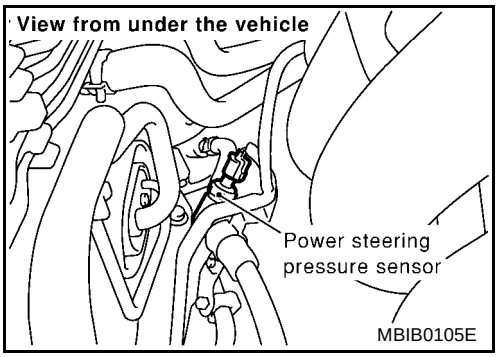
POWER STEERING PRESSURE SENSOR

PFP:49763

Component Description

EBS00H7C

Power steering pressure (PSP) sensor is installed to the power steering high-pressure tube and detects a power steering load. This sensor is a potentiometer which transforms the power steering load into output voltage, and emits the voltage signal to the ECM. The ECM controls the electric throttle control actuator and adjusts the throttle valve opening angle to increase the engine speed and adjusts the idle speed for the increased load.



CONSULT-II Reference Value in Data Monitor Mode

EBS00H7D

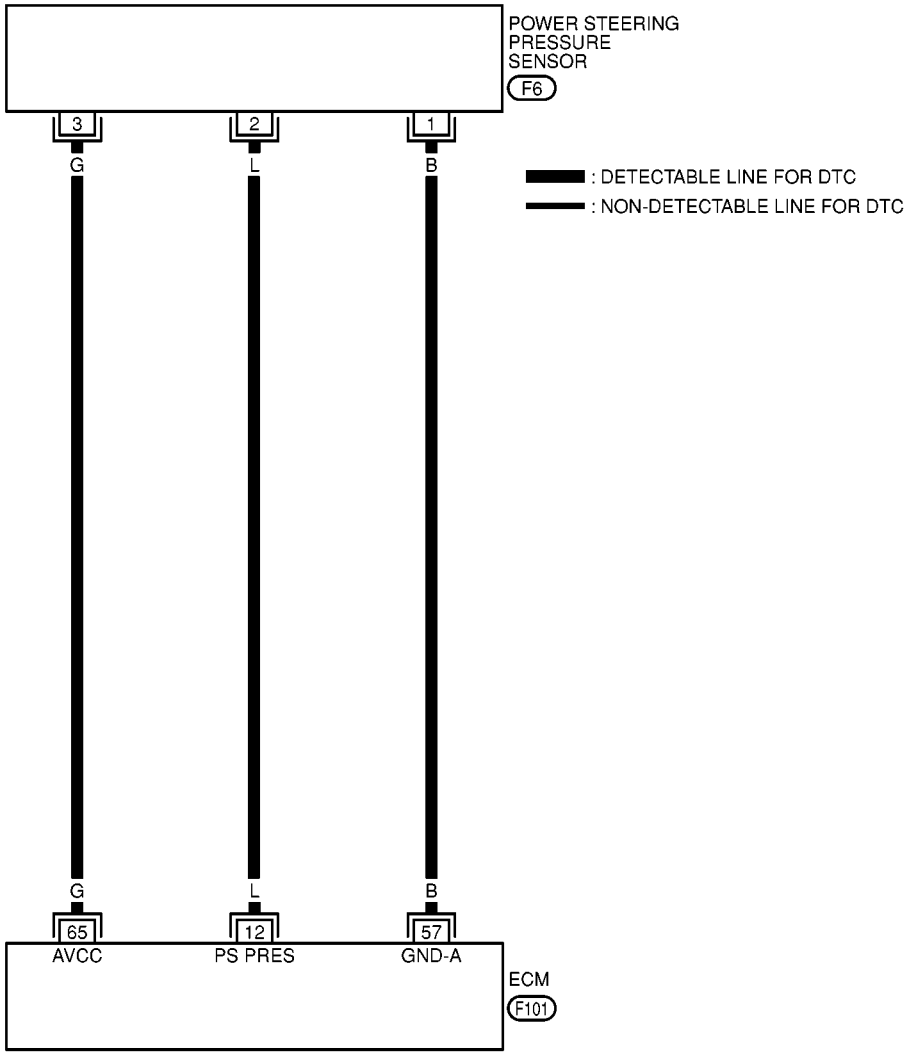
Specification data are reference values.

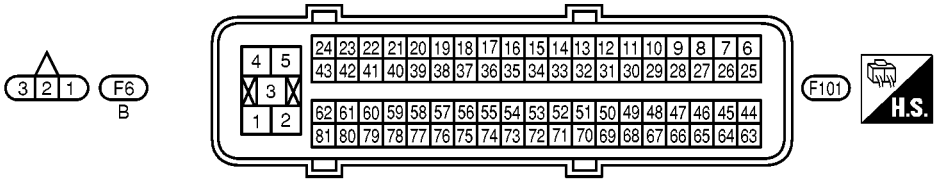
MONITOR ITEM	CONDITION		SPECIFICATION
PW/ST SIGNAL	● Engine: After warming up, idle the engine	Steering wheel is in neutral position. (Forward direction)	OFF
		Steering wheel is turned.	ON

Wiring Diagram

EBS00H7G

EC-PS/SEN-01





MBWA0089E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
12	L	Power steering pressure sensor	**[Engine is running]** ● Steering wheel is being turned.	0.5 - 4.0V
			[Engine is running] ● Steering wheel is not being turned.	0.4 - 0.8V
57	B	Sensor ground (Power steering pressure sensor)	**[Engine is running]** ● Idle speed	Approximately 0V
65	G	Sensor power supply (Power steering pressure sensor)	**[Ignition switch "ON"]**	Approximately 5V

Diagnostic Procedure

EBS00H7H

1. INSPECTION START

Do you have CONSULT-II?

Yes or No

Yes >> GO TO 2.
No >> GO TO 3.

2. CHECK POWER STEERING PRESSURE SENSOR OVERALL FUNCTION

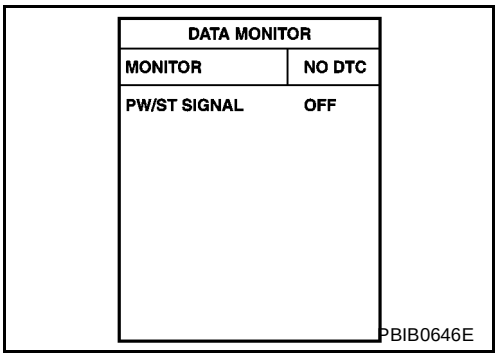
With CONSULT-II

1. Start engine.
2. Check "PW/ST SIGNAL" in "DATA MONITOR" mode with CONSULT-II under the following conditions.

Steering in neutral position	OFF
Steering is turned	ON

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 4.

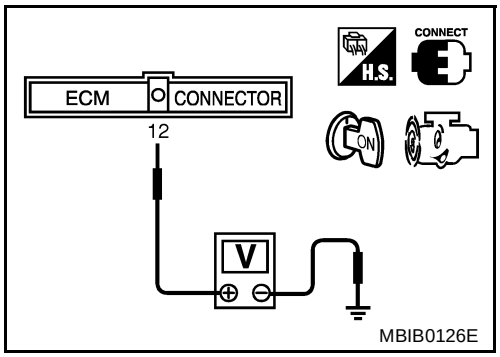


3. CHECK POWER STEERING PRESSURE SENSOR OVERALL FUNCTION

Without CONSULT-II

1. Start engine.
2. Check voltage between ECM terminal 12 and ground under the following conditions.

Condition	Voltage
Steering wheel is being turned.	0.5 - 4.0V
Steering wheel is not being turned.	0.4 - 0.8V



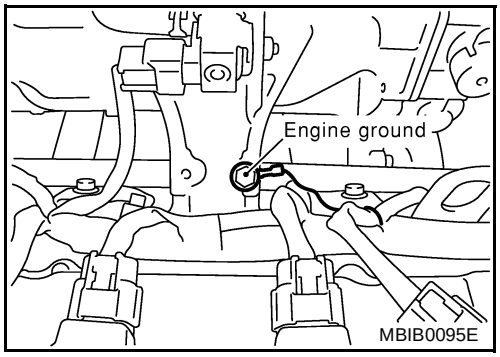
OK or NG

OK >> **INSPECTION END**
NG >> GO TO 4.

4. RETIGHTEN GROUND SCREWS

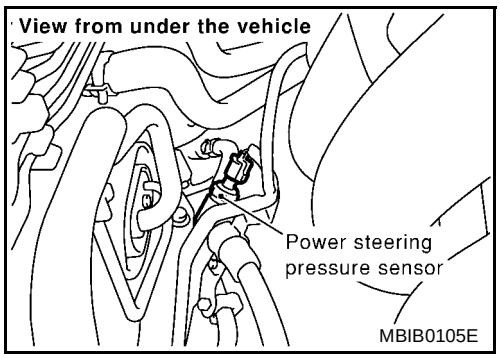
1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

>> GO TO 5.



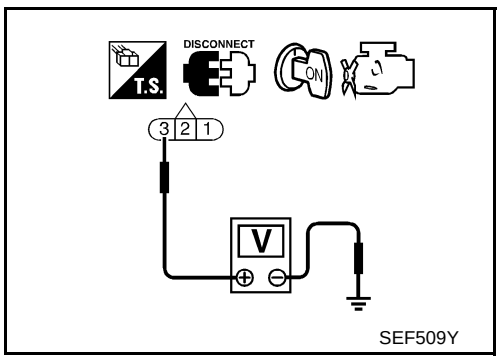
5. CHECK PSP SENSOR POWER SUPPLY CIRCUIT

1. Disconnect PSP sensor harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between PSP sensor terminal 3 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 6.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK PSP SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 57 and PSP sensor terminal 1. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK PSP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 12 and PSP sensor terminal 2.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK PSP SENSOR

Refer to EC-917, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> Replace PSP sensor.

9. CHECK INTERMITTENT INCIDENT

Refer to EC-656, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

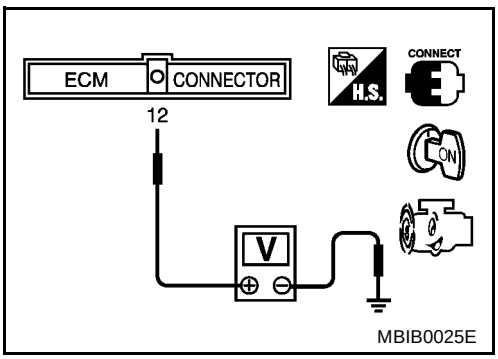
Component Inspection

EBS00H7I

POWER STEERING PRESSURE SENSOR

1. Reconnect all harness connectors disconnected.
2. Start engine and let it idle.
3. Check voltage between ECM terminal 12 and ground under the following conditions.

Condition	Voltage
Steering wheel is being turned fully.	0.5 - 4.0V
Steering wheel is not being turned.	0.4 - 0.8V



IVT CONTROL SOLENOID VALVE

PFP:23796

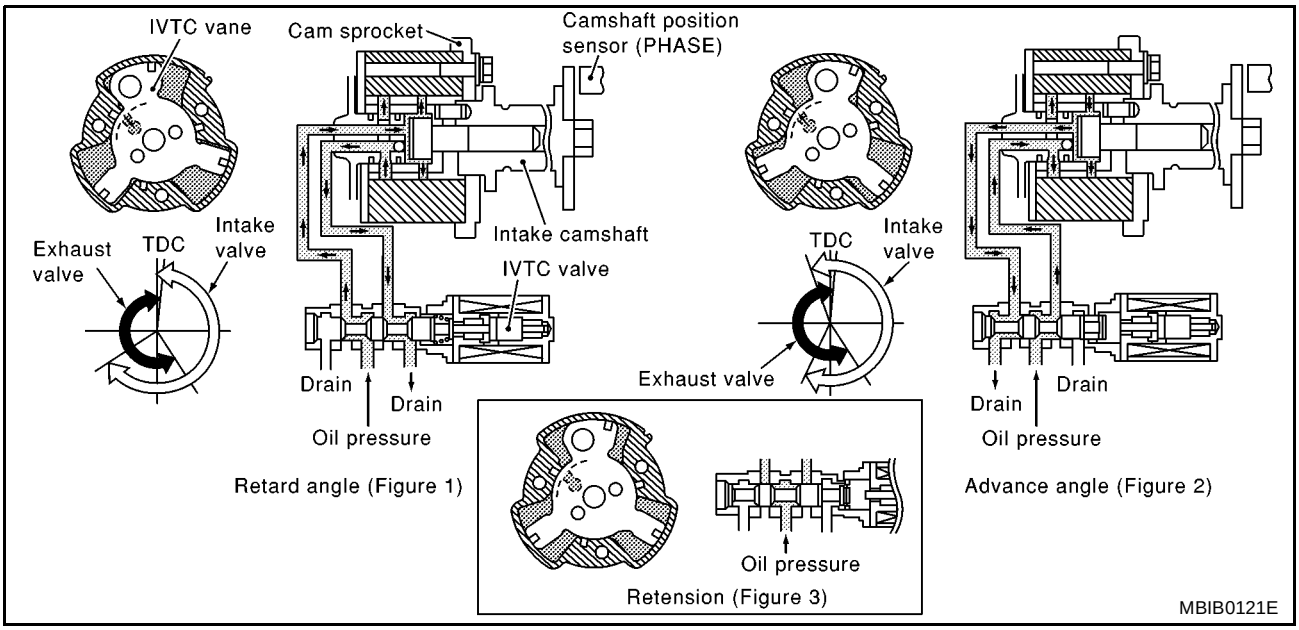
Description

EBS00EZK

SYSTEM DESCRIPTION

Sensor	Input signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed	Intake valve timing control	Intake valve timing control solenoid valve
Camshaft position sensor (PHASE)			
Engine coolant temperature sensor	Engine coolant temperature		
Vehicle speed signal*	Vehicle speed		

*: This signal is sent to the ECM through CAN communication line.



This mechanism hydraulically controls cam phases continuously with the fixed operating angle of the intake valve.

The ECM receives signals such as crankshaft position, camshaft position, engine speed, and engine coolant temperature. Then, the ECM sends ON/OFF pulse duty signals to the intake valve timing control solenoid valve depending on driving status. This makes it possible to control the shut/open timing of the intake valve to increase engine torque in low/mid speed range and output in high-speed range.

COMPONENT DESCRIPTION

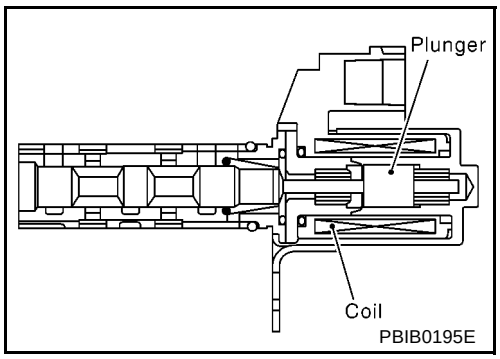
Intake valve timing control solenoid valve is activated by ON/OFF pulse duty (ratio) signals from the ECM.

The intake valve timing control solenoid valve changes the oil amount and direction of flow through intake valve timing control unit or stops oil flow.

The longer pulse width advances valve angle.

The shorter pulse width retards valve angle.

When ON and OFF pulse widths become equal, the solenoid valve stops oil pressure flow to fix the intake valve angle at the control position.



CONSULT-II Reference Value in Data Monitor Mode

EBS00EZL

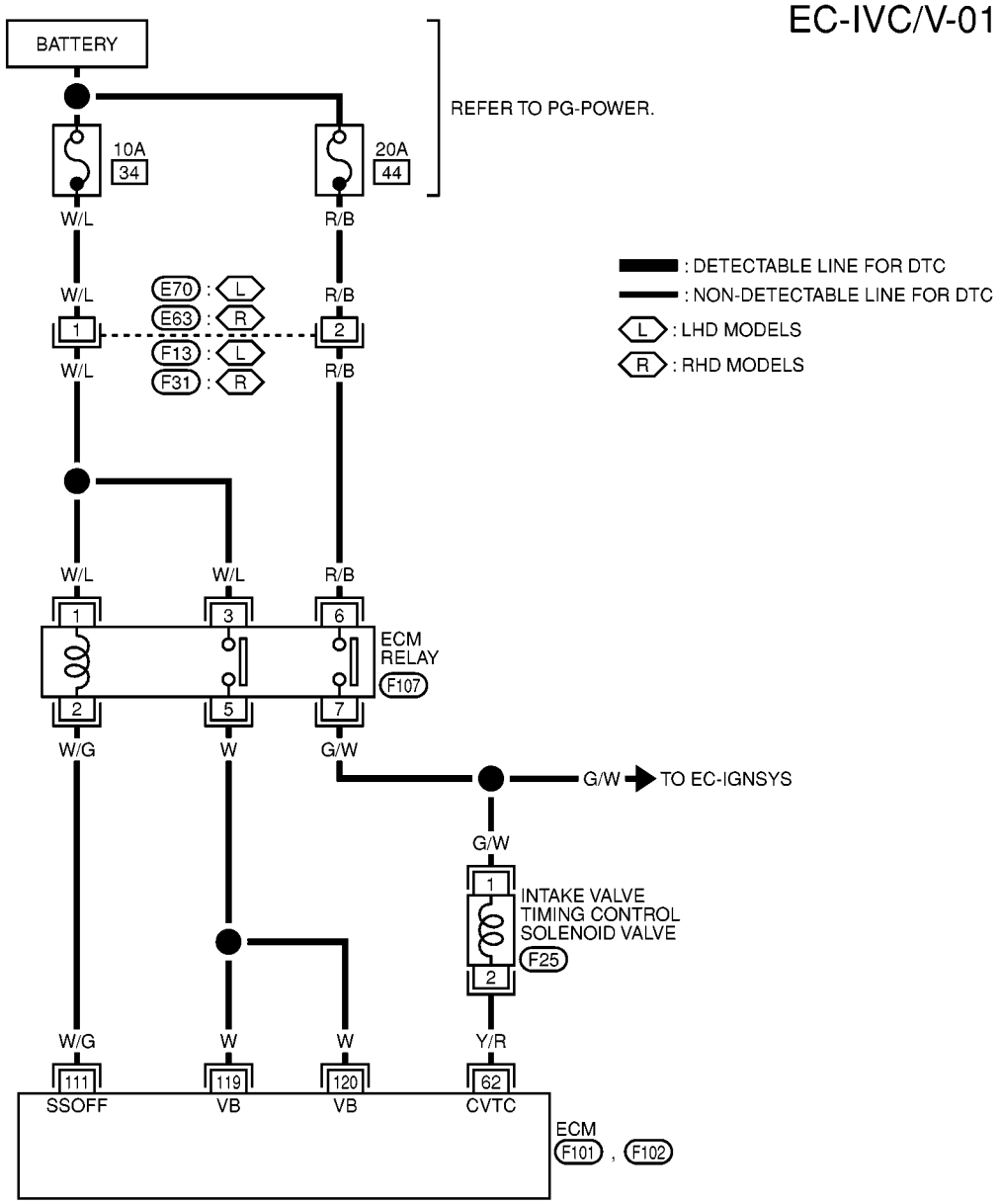
Specification data are reference values.

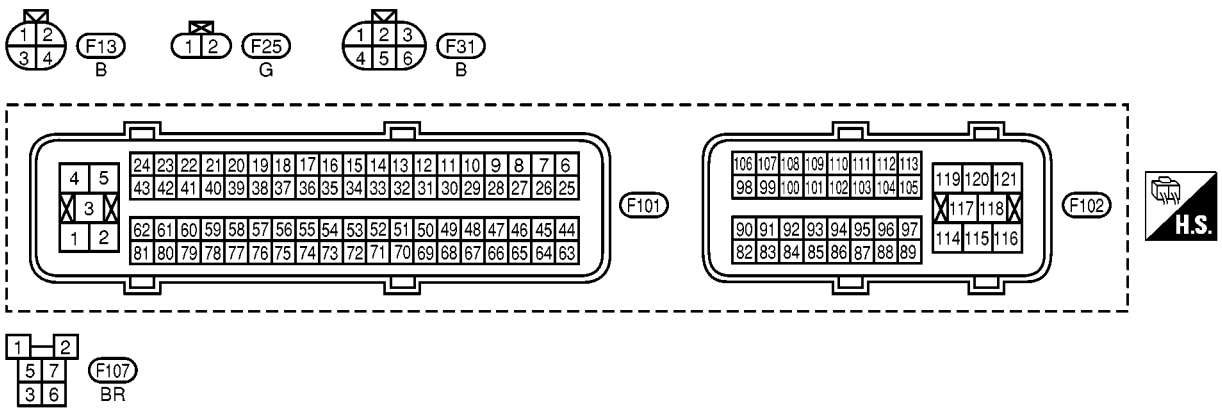
MONITOR ITEM	CONDITION		SPECIFICATION
INT/V TIM (B1)	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	–5° - 5°CA
		When revving engine up to 2,000 rpm quickly	Approx. 0° - 30°CA
INT/V SOL (B1)	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	0% - 2%
		When revving engine up to 2,000 rpm quickly	Approx. 0% - 60%

Wiring Diagram

EBS00EZN

EC-IVC/V-01



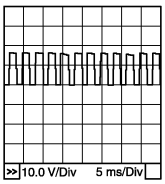


MBWA0084E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
62	Y/R	Intake valve timing control solenoid valve	**[Engine is running]** ● **Warm-up condition** ● Idle speed	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● **Warm-up condition** ● When revving engine up to 2,000 rpm quickly	Approximately 9V★  PBIB0532E

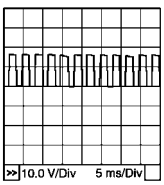
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

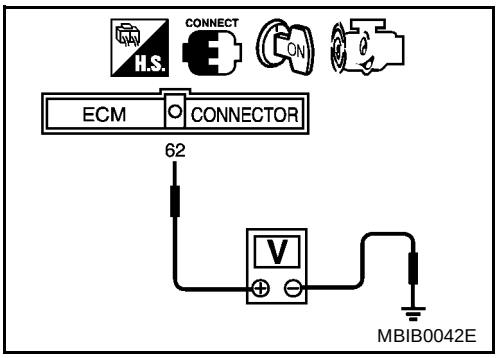
Diagnostic Procedure

EBS00EZO

1. CHECK IVT CONTROL SOLENOID VALVE OVERALL FUNCTION CHECK

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Turn ignition switch “ON”.
4. Set the tester probe between ECM terminals 62 (IVT control solenoid valve signal) and ground.
5. Start engine and let it idle.
6. Check the voltage under the following conditions.
   Verify that the oscilloscope screen shows the signal wave as shown below.

Conditions	Voltage
At idle	BATTERY VOLTAGE (11 - 14V)
When revving engine up to 2,000 rpm quickly	Approximately 9V★  PBIB0532E



MBIB0042E

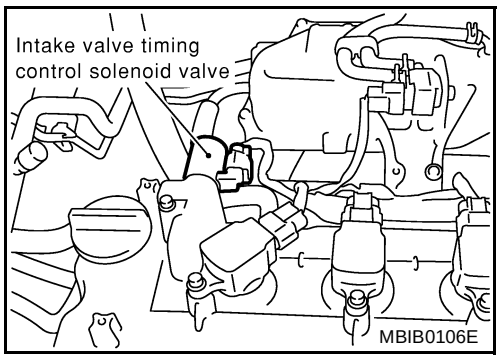
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 2.

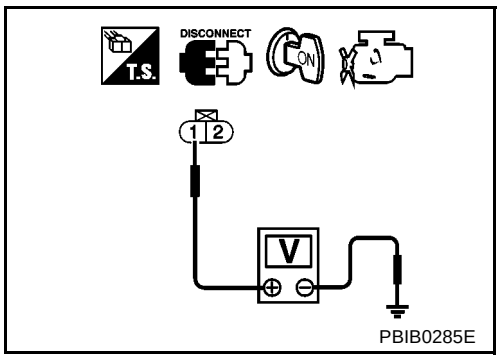
2. CHECK IVT CONTROL SOLENOID VALVE POWER SUPPLY CIRCIUT

1. Turn ignition switch “OFF”.
2. Disconnect intake valve timing control solenoid valve harness connector.
3. Turn ignition switch “ON”.



4. Check voltage between intake valve timing control solenoid valve terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTION PART

Check harness for open or short between intake valve timing control solenoid valve and ECM relay.

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK IVT CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 62 and intake valve timing control solenoid valve terminal 2. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE

Refer to EC-923, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace intake valve timing control solenoid valve.

6. CHECK CRANKSHAFT POSITION SENSOR (POS)

Refer to EC-758, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace crankshaft position sensor (POS).

7. CHECK CAMSHAFT POSITION SENSOR (PHASE)

Refer to EC-765, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> Replace camshaft position sensor (PHASE).

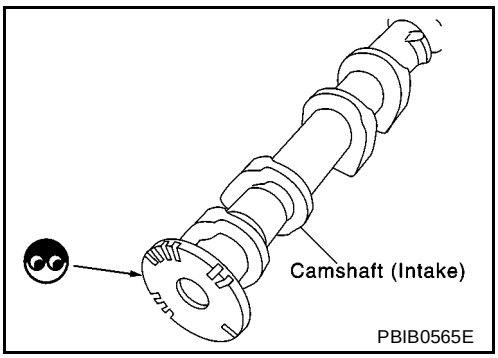
8. CHECK CAMSHAFT (INTAKE)

Check the following.

- Accumulation of debris to the signal plate of camshaft rear end
- Chipping signal plate of camshaft rear end

OK or NG

OK >> GO TO 9.
NG >> Remove debris and clean the signal plate of camshaft rear end or replace camshaft.



9. CHECK INTERMITTENT INCIDENT

Refer to EC-656, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

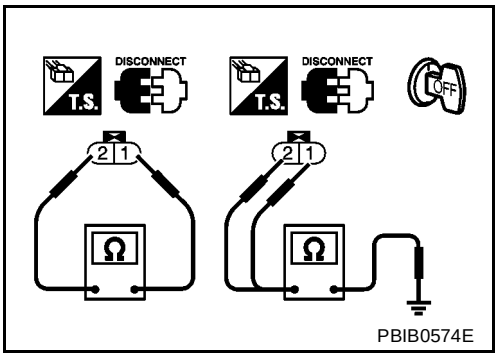
Component Inspection

EBS00EZP

INTAKE VALVE TIMING CONTROL SOLENOID VALVE

1. Disconnect intake valve timing control solenoid valve harness connector.
2. Check resistance between intake valve timing control solenoid valve terminals 1 and 2.

Terminals	Resistance
1 and 2	Approximately 8Ω at 20°C (68°F)
1 or 2 and ground	∞Ω (Continuity should not exist)



Removal and Installation

EBS00EZQ

INTAKE VALVE TIMING CONTROL SOLENOID VALVE

Refer to EM-49, "TIMING CHAIN" .

PNP SWITCH

PFP:32006

Component Description

EBS00EZR

When the gear position is “P” (A/T models only) or “N”, park/neutral position (PNP) switch is “ON”.
ECM detects the position because the continuity of the line (the “ON” signal) exists.

CONSULT-II Reference Value in Data Monitor Mode

EBS00EZS

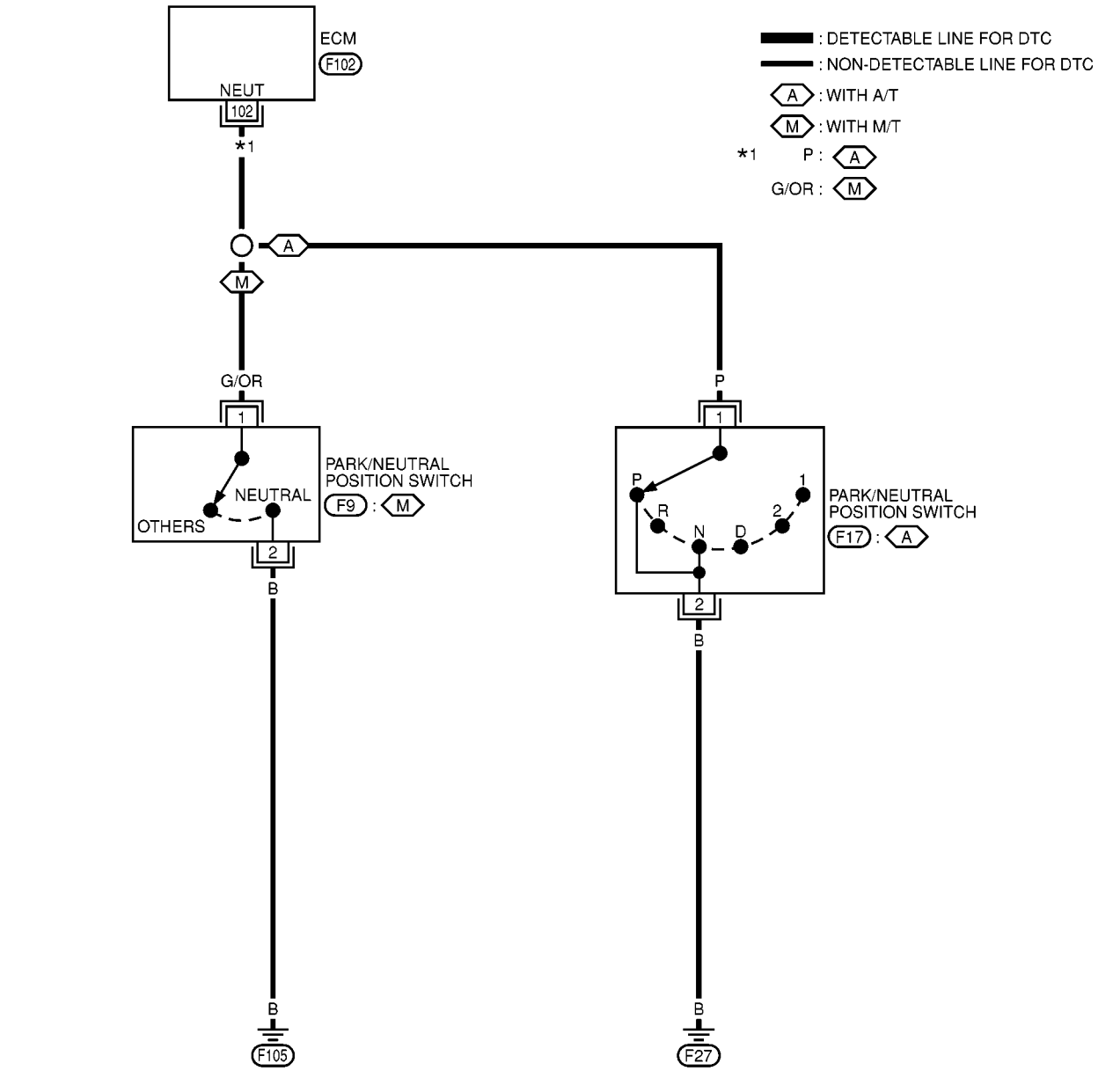
Specification data are reference values.

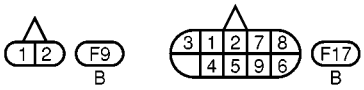
MONITOR ITEM	CONDITION		SPECIFICATION
P/N POSI SW	● Ignition switch: ON	Shift lever: P or N (A/T model) Neutral (M/T model)	ON
		Shift lever: Except above	OFF

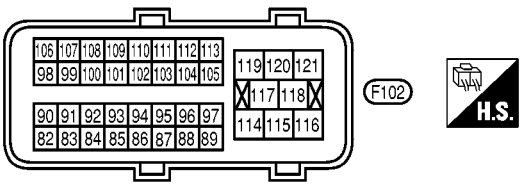
Wiring Diagram

EBS00EZU

EC-PNPSW1-01







MBWA0085E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
102	P (A/T) G/OR (M/T)	PNP switch	**[Ignition switch "ON"]** ● Shift lever position is "P" or "N" (A/T models), "Neutral" (M/T models).	Approximately 0V
			[Ignition switch "ON"] ● Except the above gear position	**A/T models** BATTERY VOLTAGE (11 - 14V) **M/T models** Approximately 5V

Diagnostic Procedure

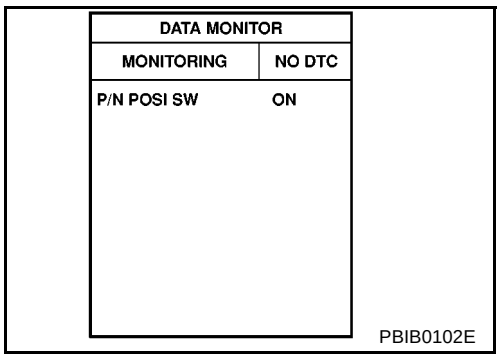
EBS00EZV

1. CHECK OVERALL FUNCTION

With CONSULT-II

1. Turn ignition switch "ON".
2. Select "P/N POSI SW" in "DATA MONITOR" mode with CONSULT-II.
3. Check the "P/N POSI SW" signal under the following conditions.

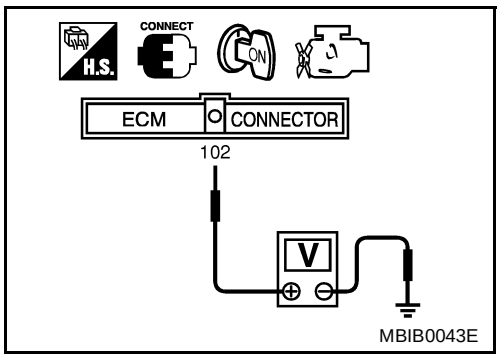
Selector lever position	P/N POSI SW signal
"P" and "N" position	ON
Except the above position	OFF



Without CONSULT-II

1. Turn ignition switch "ON".
2. Check voltage between ECM terminal 102 and ground under the following conditions.

Selector lever position	Voltage
"P" and "N" position	Approximately 0V
Except the above position	A/T models: Battery voltage M/T models: Approximately 5V



OK or NG

OK >> **INSPECTION END**
NG >> GO TO 2.

2. CHECK PNP SWITCH GROUND CIRCUIT FOR OPEN AND SHORT

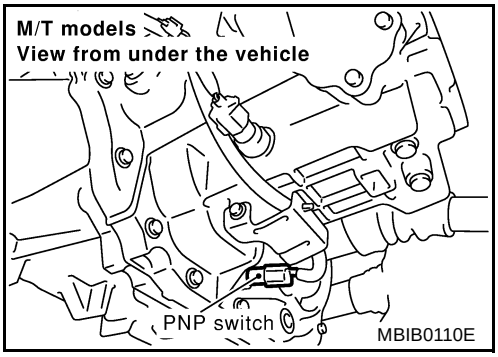
1. Turn ignition switch “OFF”.
2. Disconnect PNP switch harness connector.
3. Check harness continuity between PNP switch terminal 2 and body ground. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to power.

OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to power in harness or connectors.



3. CHECK PNP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 102 and PNP switch terminal 1. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK PNP SWITCH

Refer to AT-404, "ON-VEHICLE SERVICE" (A/T models) or MT-14, "POSITION SWITCH" , MT-62, "POSITION SWITCH" (M/T models).

OK or NG

OK >> GO TO 5.
NG >> Replace PNP switch.

5. CHECK INTERMITTENT INCIDENT

Refer to EC-656, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

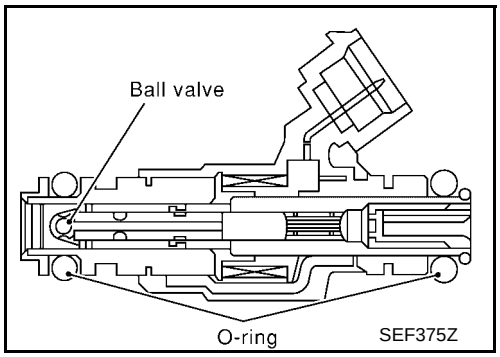
INJECTOR CIRCUIT

PFP:16600

Component Description

EBS00EZW

The fuel injector is a small, precise solenoid valve. When the ECM supplies a ground to the injector circuit, the coil in the injector is energized. The energized coil pulls the needle valve back and allows fuel to flow through the injector into the intake manifold. The amount of fuel injected depends upon the injection pulse duration. Pulse duration is the length of time the injector remains open. The ECM controls the injection pulse duration based on engine fuel needs.



CONSULT-II Reference Value in Data Monitor Mode

EBS00EZX

Specification data are reference values.

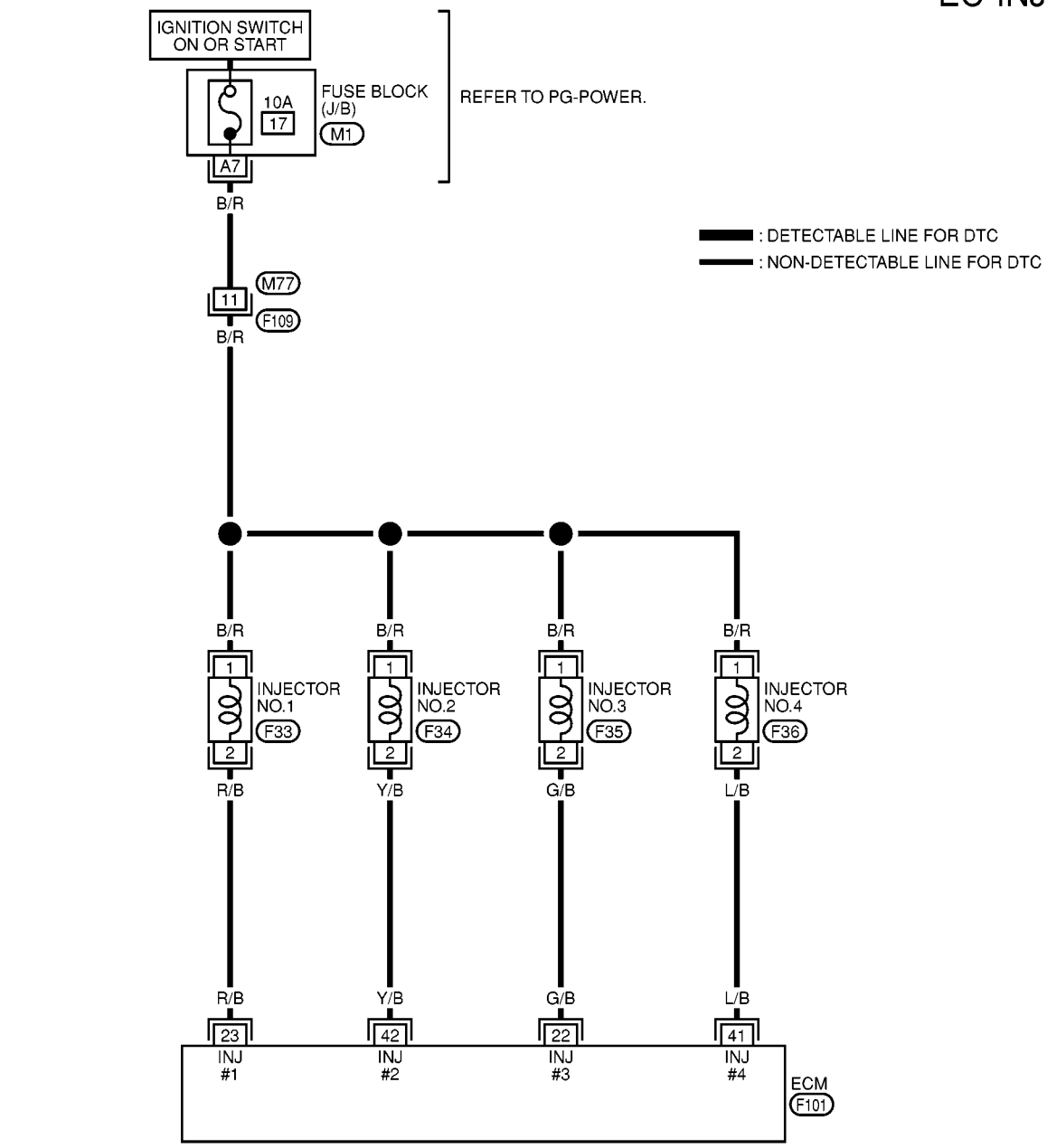
MONITOR ITEM	CONDITION		SPECIFICATION
B/FUEL SCHDL	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	1.5 - 3.0 msec
		2,000 rpm	1.2 - 3.0 msec
INJ PULSE-B1 INJ PULSE-B2*	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	2.0 - 3.5 msec
		2,000 rpm	1.5 - 3.5 msec

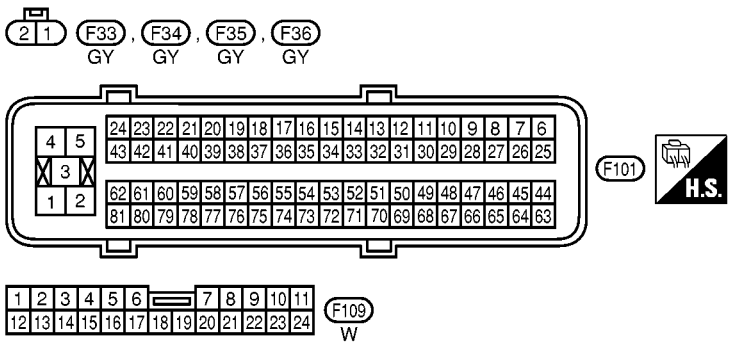
*: This item is displayed with QG18DE engine models.

Wiring Diagram

EBS00EZY

EC-INJECT-01





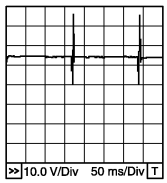
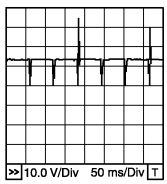
REFER TO THE FOLLOWING.
M1 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0086E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
22 23 41 42	G/B R/B L/B Y/B	Injector No. 3 Injector No. 1 Injector No. 4 Injector No. 2	**[Engine is running]** ● **Warm-up condition** ● Idle speed	BATTERY VOLTAGE (11 - 14V)★  PBIB0529E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	BATTERY VOLTAGE (11 - 14V)★  PBIB0530E

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnostic Procedure

EBS00EZZ

1. INSPECTION START

Turn ignition switch to “START”.

Is any cylinder ignited?

Yes or No

Yes >> GO TO 2.

No >> GO TO 3.

2. CHECK OVERALL FUNCTION

With CONSULT-II

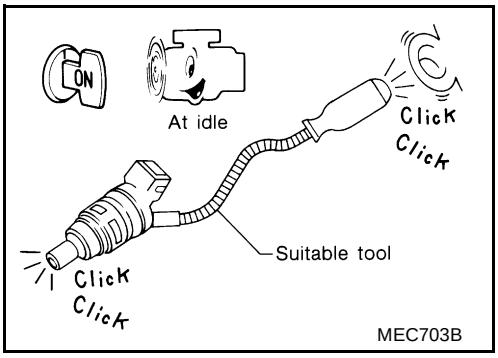
1. Start engine.
2. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT-II.
3. Make sure that each circuit produces a momentary engine speed drop.

ACTIVE TEST	
POWER BALANCE	
MONITOR	
ENG SPEED	XXX rpm
MAS A/F SE-B1	XXX V

PBIB0133E

Without CONSULT-II

1. Start engine.
2. Listen to each injector operating sound.
   Clicking noise should be heard.



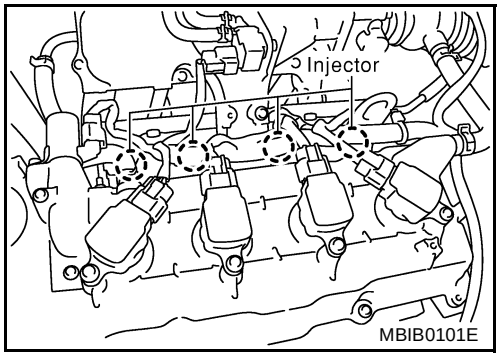
MEC703B

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 3.

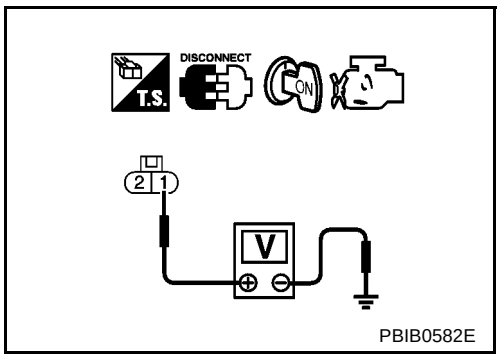
3. CHECK INJECTOR POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect injector harness connector.
3. Turn ignition switch “ON”.



4. Check voltage between injector terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M77, F109
- Fuse block (J/B) connector M1
- 10A fuse
- Harness for open or short between injector and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK INJECTOR OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between injector terminal 2 and ECM terminals 22, 23, 41, 42. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK INJECTOR

Refer to EC-933, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace injector.

7. CHECK INTERMITTENT INCIDENT

Refer to EC-656, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

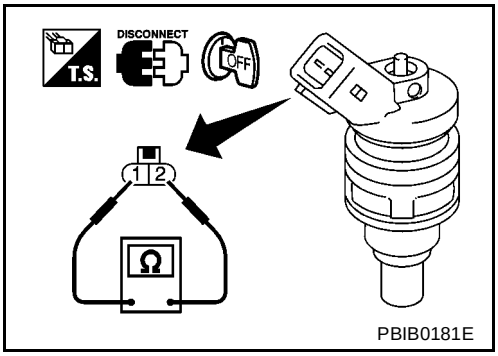
Component Inspection

EBS00F00

INJECTOR

1. Disconnect injector harness connector.
2. Check resistance between terminals as shown in the figure.

Resistance: 13.5 - 17.5Ω [at 20°C (68°F)]



Removal and Installation

EBS00F01

INJECTOR

Refer to EM-31, "FUEL INJECTOR AND FUEL TUBE" .

FUEL PUMP CIRCUIT

PFP:17042

Description

EBS00F05

SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM Function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*	Fuel pump control	Fuel pump relay
Battery	Battery voltage*		

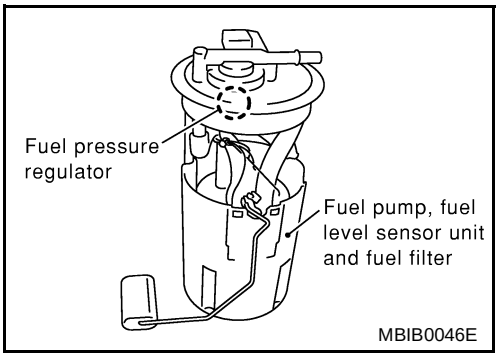
*: The ECM determines the start signal status by the signals of engine speed and battery voltage.

The ECM activates the fuel pump for several seconds after the ignition switch is turned on to improve engine startability. If the ECM receives a engine speed signal from the crankshaft position sensor (POS) and camshaft position sensor (PHASE), it knows that the engine is rotating, and causes the pump to operate. If the engine speed signal is not received when the ignition switch is ON, the engine stalls. The ECM stops pump operation and prevents battery discharging, thereby improving safety. The ECM does not directly drive the fuel pump. It controls the ON/OFF fuel pump relay, which in turn controls the fuel pump.

Condition	Fuel pump operation
Ignition switch is turned to ON.	Operates for 1 second.
Engine running and cranking	Operates.
When engine is stopped	Stops in 1.5 seconds.
Except as shown above	Stops.

COMPONENT DESCRIPTION

A turbine type design fuel pump is used in the fuel tank.



CONSULT-II Reference Value in Data Monitor Mode

EBS00F06

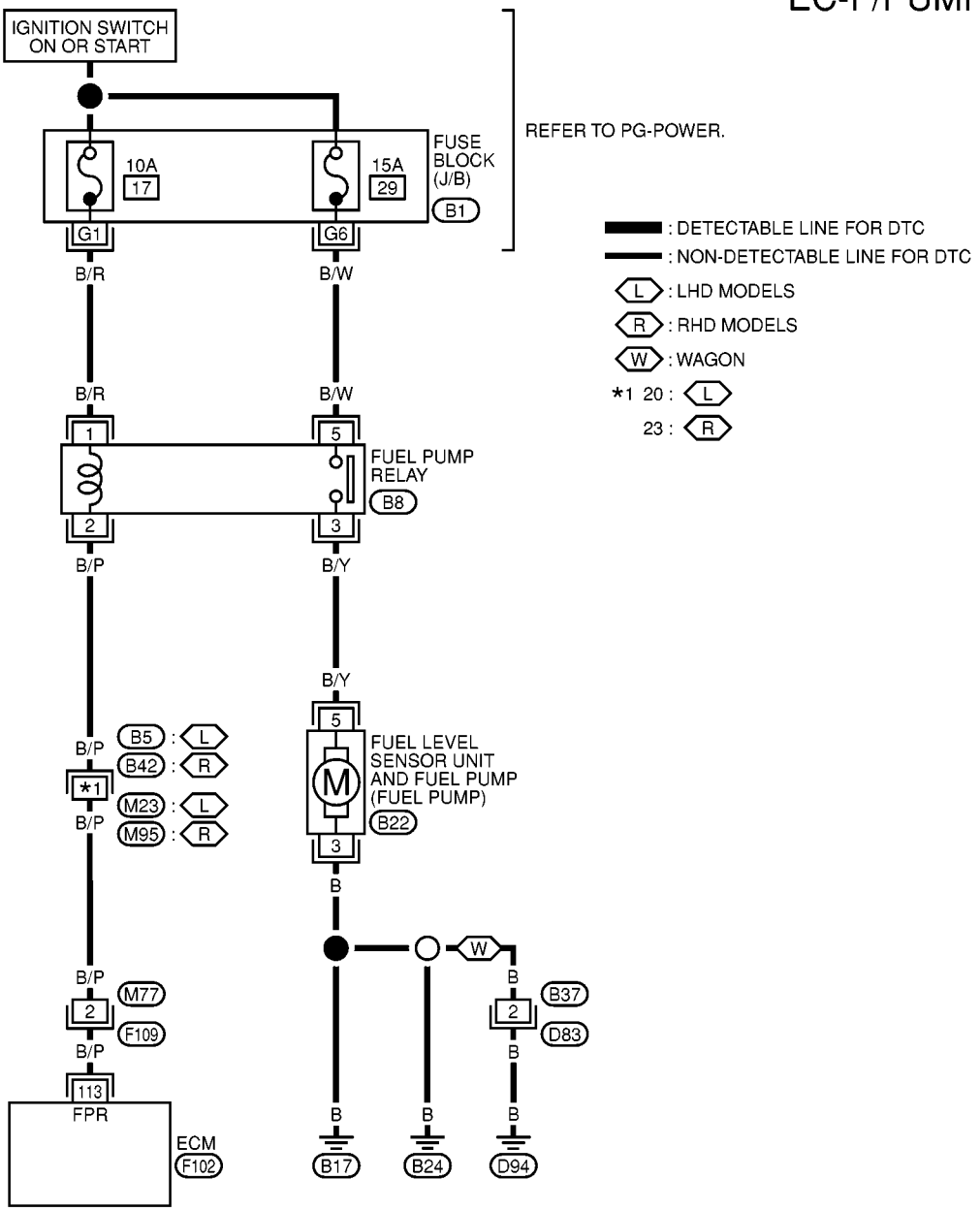
Specification data are reference values.

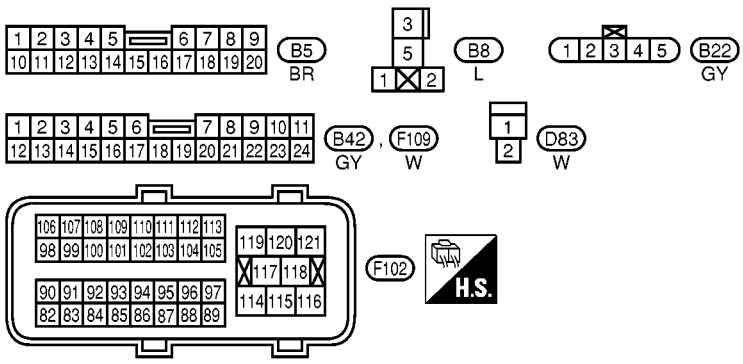
MONITOR ITEM	CONDITION	SPECIFICATION
FUEL PUMP RLY	● For 1 seconds after turning ignition switch ON ● Engine running or cranking	ON
	● Except above conditions	OFF

Wiring Diagram

EBS00F07

EC-F/PUMP-01





REFER TO THE FOLLOWING.
B1 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0031E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

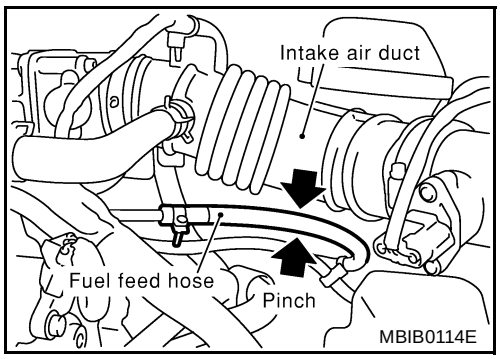
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
113	B/P	Fuel pump relay	**[Ignition switch "ON"]** ● For 1 seconds after turning ignition switch "ON" **[Engine is running]**	0 - 1.0V
			[Ignition switch "ON"] ● More than 1 seconds after turning ignition switch "ON".	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

EBS00F08

1. CHECK OVERALL FUNCTION

1. Turn ignition switch "ON".
2. Pinch fuel feed hose with two fingers.
   Fuel pressure pulsation should be felt on the fuel hose for 1 second after ignition switch is turned "ON".

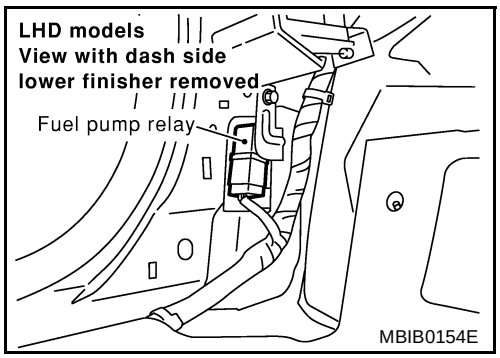


OK or NG

OK >> **INSPECTION END**
NG >> GO TO 2.

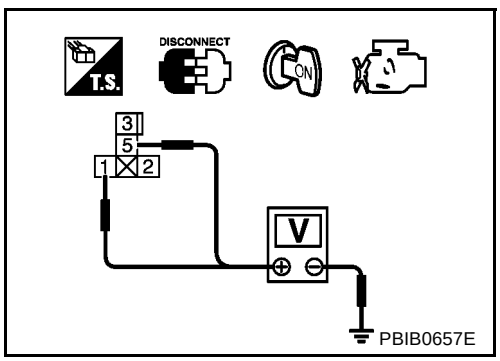
2. CHECK FUEL PUMP RELAY POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect fuel pump relay.
3. Turn ignition switch "ON".



4. Check voltage between fuel pump relay terminals 1, 5 and ground with CONSULT-II or tester.

   Voltage: Battery voltage



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector B1
- 10A fuse
- 15A fuse
- Harness for open or short between fuel pump relay and fuse

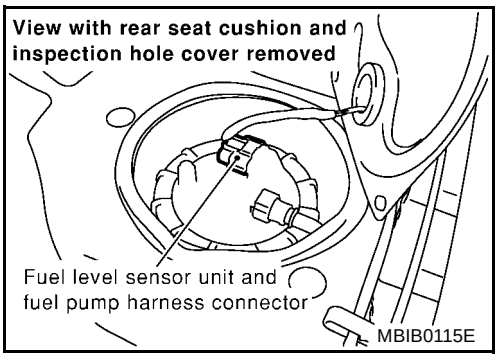
>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK FUEL PUMP POWER SUPPLY AND GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect fuel level sensor unit and fuel pump harness connector.
3. Check harness continuity between fuel pump relay terminal 3 and fuel level sensor unit and fuel pump terminal 5, fuel level sensor unit and fuel pump terminal 3 and body ground.
   Refer to Wiring Diagram.

   Continuity should exist.

4. Also check harness for short to ground and short to power.



OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors B37, D83
- Harness for open or short between fuel level sensor unit and fuel pump and fuel pump relay
- Harness for open or short between fuel level sensor unit and fuel pump and body ground

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK FUEL PUMP RELAY OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 113 and fuel pump relay terminal 2.
   Refer to Wiring Diagram.

   Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M77, F109
- Harness connectors B5, M23 (LHD models)
- Harness connectors B42, M95 (RHD models)
- Harness for open or short between ECM and fuel pump relay

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK FUEL PUMP RELAY

Refer to EC-938, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> Replace fuel pump relay.

9. CHECK FUEL PUMP

Refer to EC-938, "Component Inspection" .

OK or NG

OK >> GO TO 10.
NG >> Replace fuel pump.

10. CHECK INTERMITTENT INCIDENT

Refer to EC-656, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

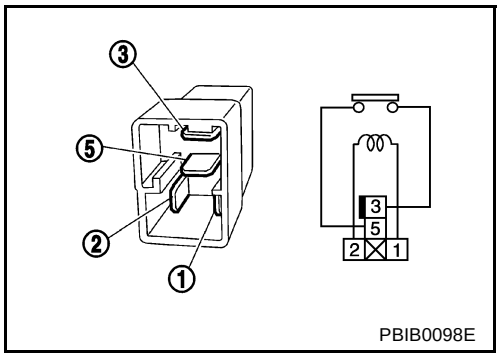
Component Inspection

EBS00F09

FUEL PUMP RELAY

Check continuity between terminals 3 and 5 under the following conditions.

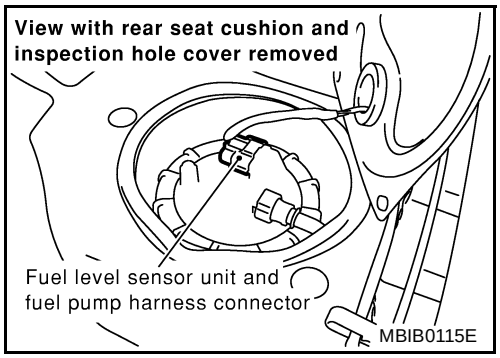
Conditions	Continuity
12V direct current supply between terminals 1 and 2	Yes
No current supply	No



PBIB0098E

FUEL PUMP

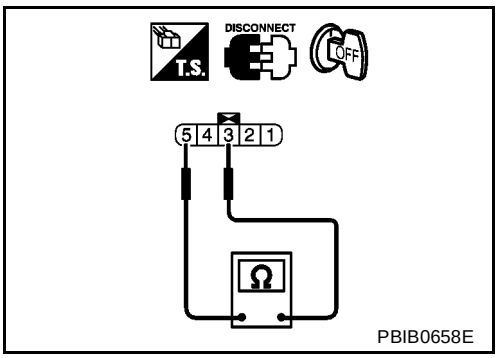
1. Disconnect fuel level sensor unit and fuel pump harness connector.



MBIB0115E

2. Check resistance between fuel level sensor unit and fuel pump terminals 3 and 5.

Resistance: Approximately 1.0Ω [at 25°C (77°F)]



Removal and Installation

EBS00F0A

FUEL PUMP

Refer to FL-6, "FUEL LEVEL SENSOR UNIT, FUEL FILTER AND FUEL PUMP ASSEMBLY (EXCEPT YD22DDTi)" .

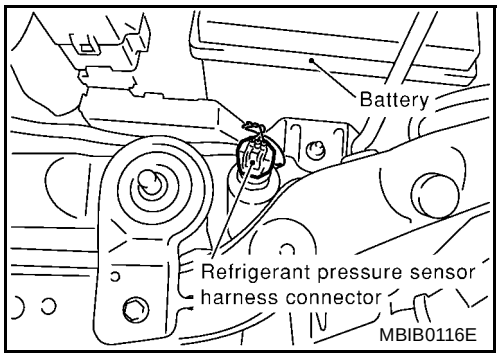
REFRIGERANT PRESSURE SENSOR

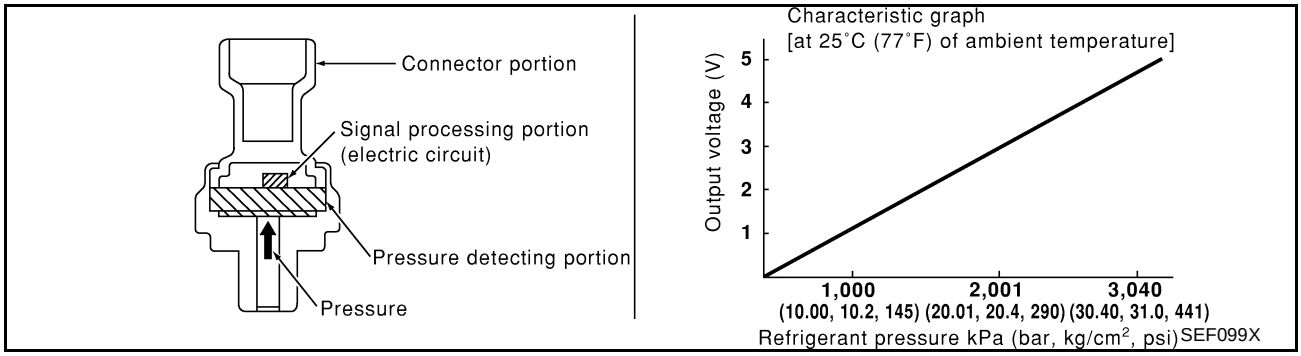
PFP:92136

Component Description

EBS00F0H

The refrigerant pressure sensor is installed at the liquid tank of the air conditioner system. The sensor uses an electrostatic volume pressure transducer to convert refrigerant pressure to voltage. The voltage signal is sent to ECM, and ECM controls cooling fan system.

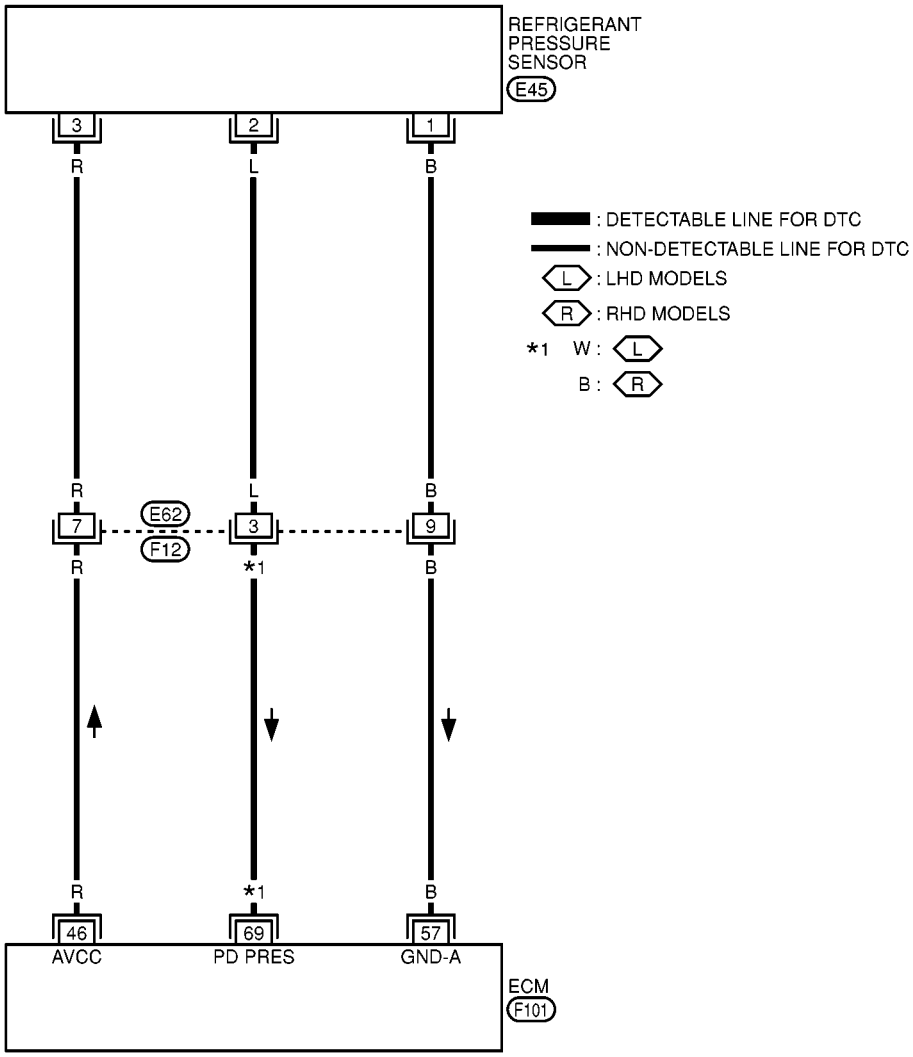


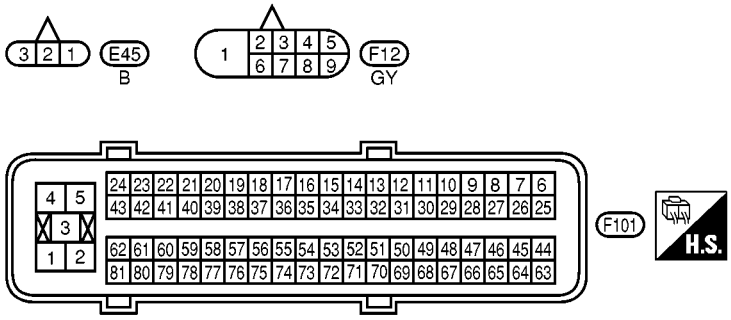


Wiring Diagram

EBS00F0I

EC-RP/SEN-01





MBWA0090E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
46	R	Sensor power supply (Refrigerant pressure sensor)	**[Ignition switch "ON"]**	Approximately 5V
57	B	Sensor ground (Refrigerant pressure sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
69	W (LHD) B (RHD)	Refrigerant pressure sensor	**[Engine is running]** ● **Warm-up condition** ● Both A/C switch and blower switch are "ON". (Compressor operates.)	1.0 - 4.0V

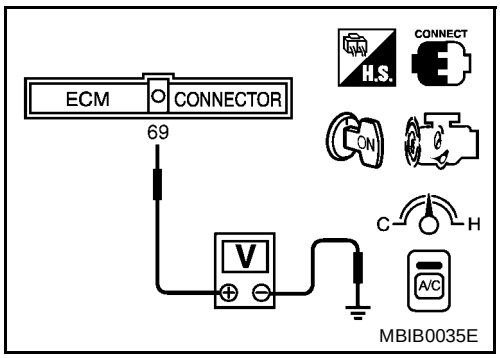
Diagnostic Procedure

EBS00F0J

1. CHECK REFRIGERANT PRESSURE SENSOR OVERALL FUNCTION

1. Start engine and warm it up to normal operating temperature.
2. Turn A/C switch and blower switch "ON".
3. Check voltage between ECM terminal 69 and ground with CONSULT-II or tester.

Voltage: 1.0 - 4.0V

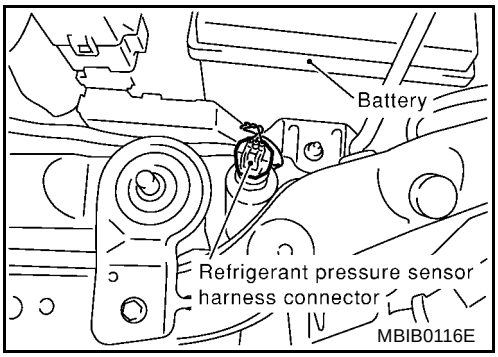


OK or NG

OK >> **INSPECTION END**
NG >> GO TO 2.

2. CHECK REFRIGERANT PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Turn A/C switch and blower switch “OFF”.
2. Stop engine.
3. Disconnect refrigerant pressure sensor harness connector.
4. Turn ignition switch “ON”.

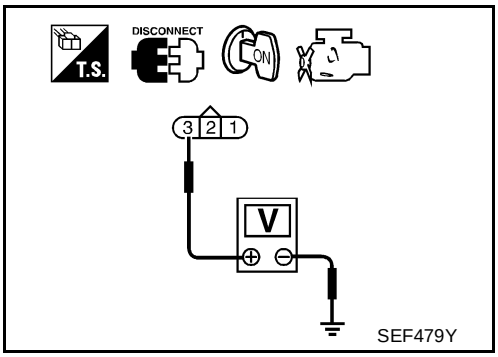


5. Check voltage between refrigerant pressure sensor terminal 3 and ground with CONSULT-II or tester.

Voltage: Approximately 5V

OK or NG

OK >> GO TO 4.
NG >> GO TO 3.



3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E62, F12
- Harness for open or short between ECM and refrigerant pressure sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK REFRIGERANT PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 57 and refrigerant pressure sensor terminal 1. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E62, F12
- Harness for open or short between ECM and refrigerant pressure sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK REFRIGERANT PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 69 and refrigerant pressure sensor terminal 2. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E62, F12
- Harness for open or short between ECM and refrigerant pressure sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-656, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

OK or NG

OK >> Replace refrigerant pressure sensor.
NG >> Repair or replace.

Removal and Installation

EBS00F0K

REFRIGERANT PRESSURE SENSOR

Refer to ATC-127, "REFRIGERANT LINES" .

ELECTRICAL LOAD SIGNAL

PFP:25350

Description

EBS00H8J

The electrical load signals except headlamp switch signal are transferred through the CAN communication line.

CONSULT-II Reference Value in Data Monitor Mode

EBS00H8K

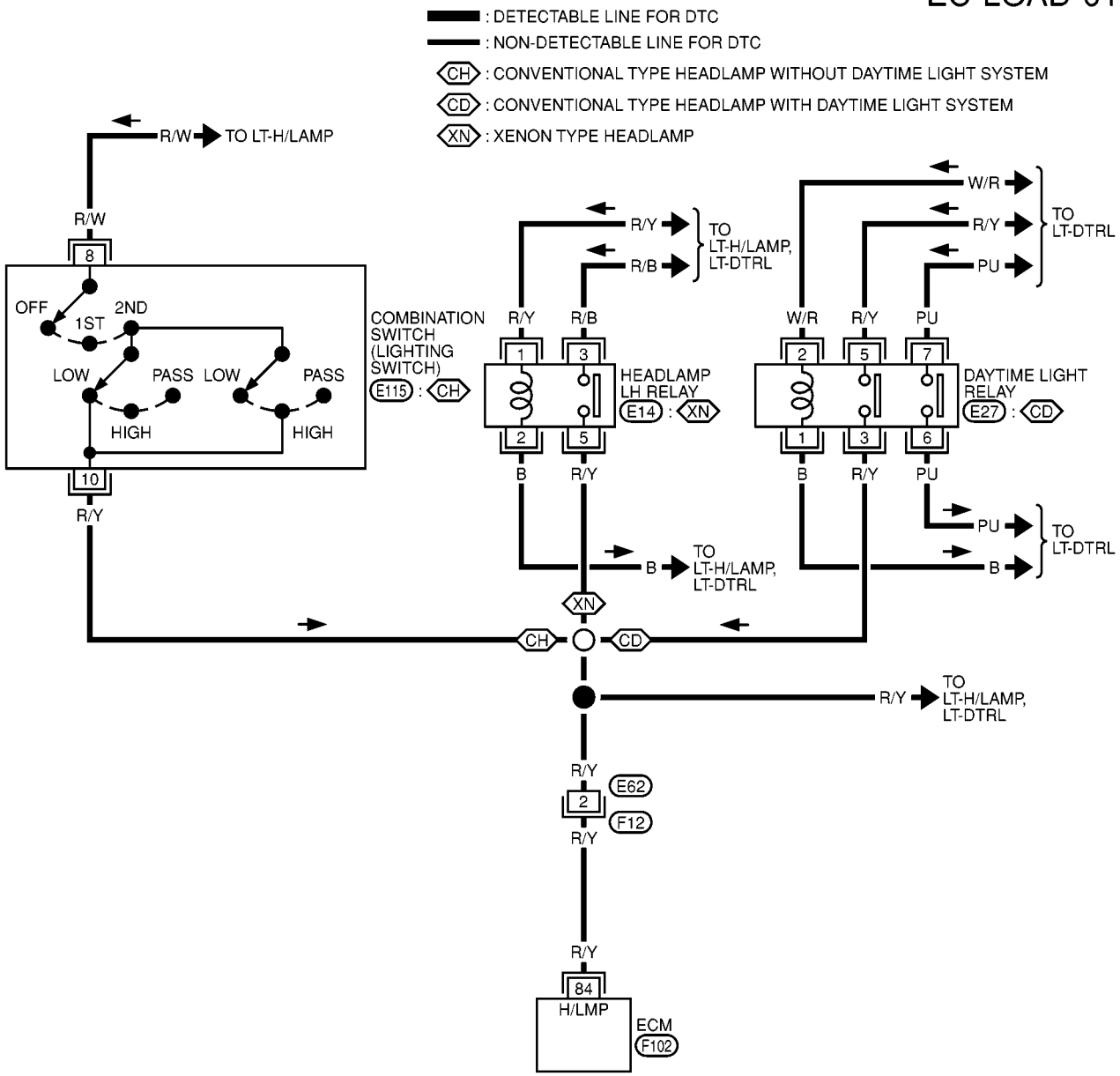
Specification data are reference values.

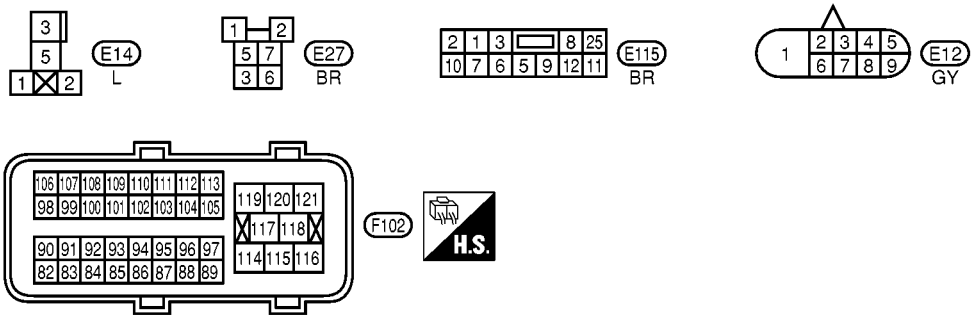
MONITOR ITEM	CONDITION		SPECIFICATION
LOAD SIGNAL	● Ignition switch: ON	Rear window defogger switch is ON and/or lighting switch is 2nd.	ON
		Rear window defogger switch is OFF and lighting switch is OFF.	OFF

Wiring Diagram

EBS00H8L

EC-LOAD-01





MBWA0147E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
84	R/Y	Electrical load signal (Headlamp signal)	**[Ignition switch "ON"]** ● Lighting switch is "2ND" position	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"] ● Lighting switch is "OFF"	Approximately 0V

Diagnostic Procedure

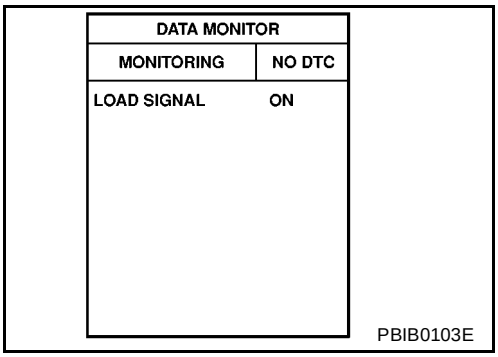
EBS00H8M

1. CHECK LOAD SIGNAL CIRCUIT OVERALL FUNCTION-I

With CONSULT-II

1. Turn ignition switch "ON".
2. Connect CONSULT-II and select "DATA MONITOR" mode.
3. Select "LOAD SIGNAL" and check indication under the following conditions.

Condition	Indication
Rear window defogger switch "ON"	ON
Rear window defogger switch "OFF"	OFF



OK or NG

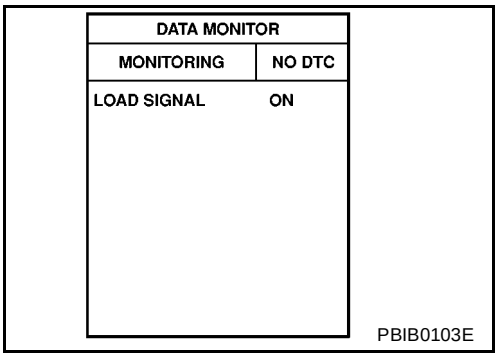
OK (With CONSULT-II)>>GO TO 2.
OK (Without CONSULT-II)>>GO TO 3.
NG >> GO TO 4.

2. CHECK LOAD SIGNAL CIRCUIT OVERALL FUNCTION-II

With CONSULT-II

Check "LOAD SIGNAL" indication under the following conditions.

Condition	Indication
Lighting switch "ON" at 2nd position	ON
Lighting switch "OFF"	OFF



OK or NG

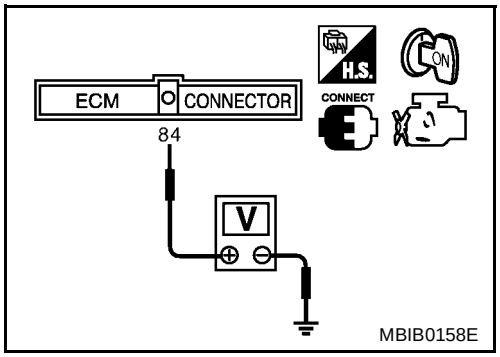
OK >> **INSPECTION END**
NG >> GO TO 5.

3. CHECK LOAD SIGNAL CIRCUIT OVERALL FUNCTION-II

Without CONSULT-II

Check voltage between ECM terminal 84 and ground under the following conditions.

Condition	Voltage
Lighting switch “ON” at 2nd position	Battery voltage
Lighting switch “OFF”	Approximately 0V



OK or NG

OK >> **INSPECTION END**
NG >> GO TO 5.

4. CHECK REAR WINDOW DEFOGGER SYSTEM

Refer to GW-40, "REAR WINDOW DEFOGGER" .

>> **INSPECTION END**

5. CHECK HEADLAMP FUNCTION

1. Turn lighting switch “ON” at 2nd position.
2. Check that headlamps are illuminated.

OK or NG

OK >> GO TO 6.
NG >> Refer to LT-5, "HEADLAMP -CONVENTIONAL TYPE-" , LT-10, "HEADLAMP - XENON TYPE -" , LT-18, "HEADLAMP (WITH DAYTIME) - CONVENTIONAL TYPE -" or LT-25, "HEADLAMP (WITH DAYTIME) - XENON TYPE -" .

6. CHECK HEADLAMP INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

CONVENTIONAL TYPE HEADLAMP WITHOUT DAYTIME LIGHT SYSTEM

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Disconnect lighting switch harness connector.
4. Check harness continuity between ECM terminal 84 and lighting switch terminal 10. Refer to Wiring Diagram.

Continuity should exist.

5. Also check harness for short to ground and short to power.

CONVENTIONAL TYPE HEADLAMP WITH DAYTIME LIGHT SYSTEM

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Disconnect daytime light relay.
4. Check harness continuity between ECM terminal 84 and daytime light relay terminal 3. Refer to Wiring Diagram.

Continuity should exist.

5. Also check harness for short to ground and short to power.

XENON TYPE HEADLAMP

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Disconnect headlamp LH relay.
4. Check harness continuity between ECM terminal 84 and headlamp LH relay terminal 5. Refer to Wiring Diagram.

Continuity should exist.

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E62, F12
- harness for open and short between ECM and lighting switch
- harness for open and short between ECM and daytime light relay
- harness for open and short between ECM and headlamp LH relay

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-656, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

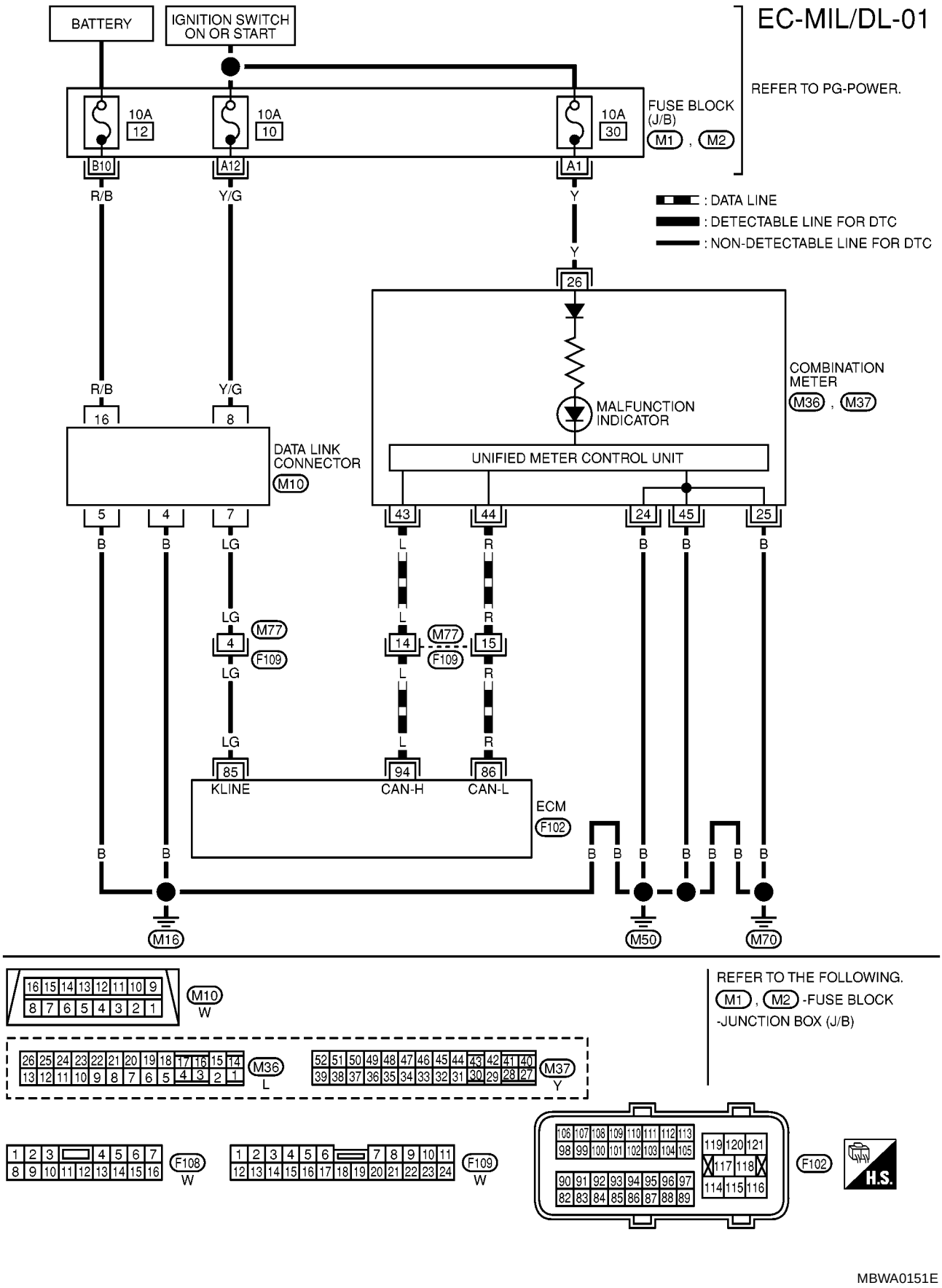
>> **INSPECTION END**

MI & DATA LINK CONNECTORS

PFP:24814

Wiring Diagram—LHD Models

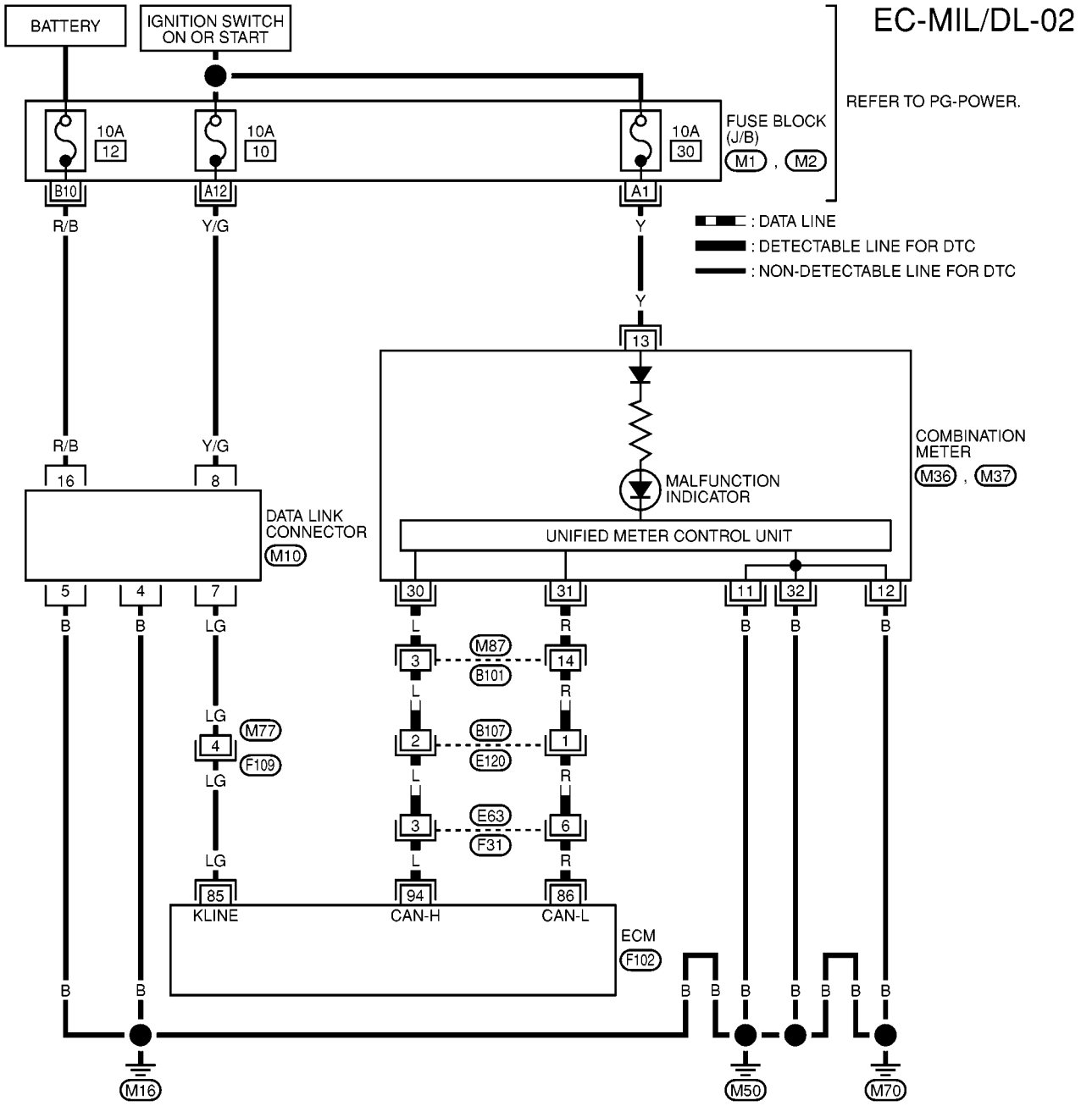
EBS00F0N

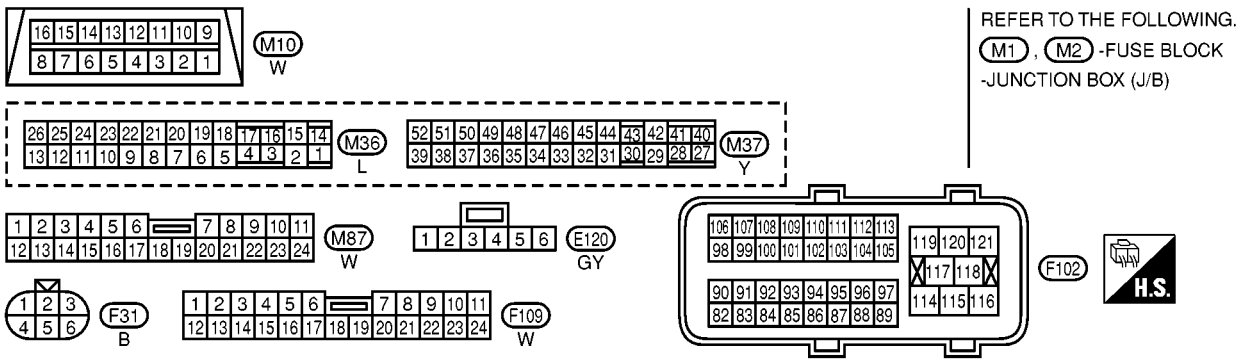


MBWA0151E

Wiring Diagram—RHD Models

EBS00H9T





MBWA0152E

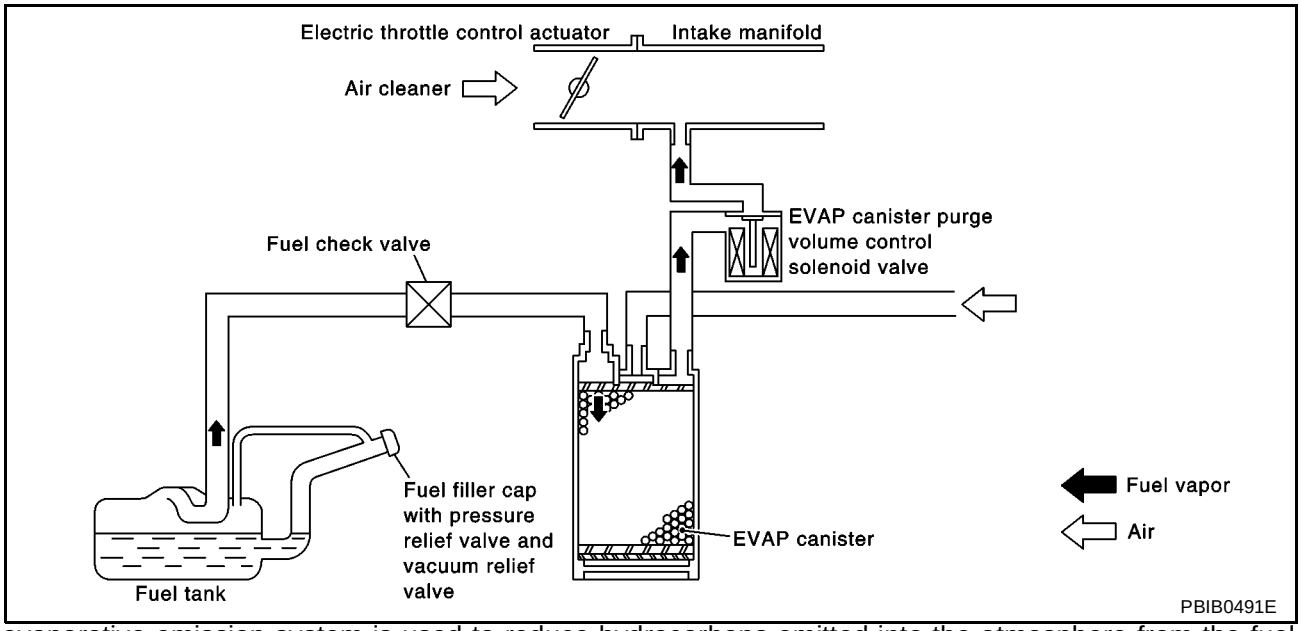
EVAPORATIVE EMISSION SYSTEM

PFP:14950

Description

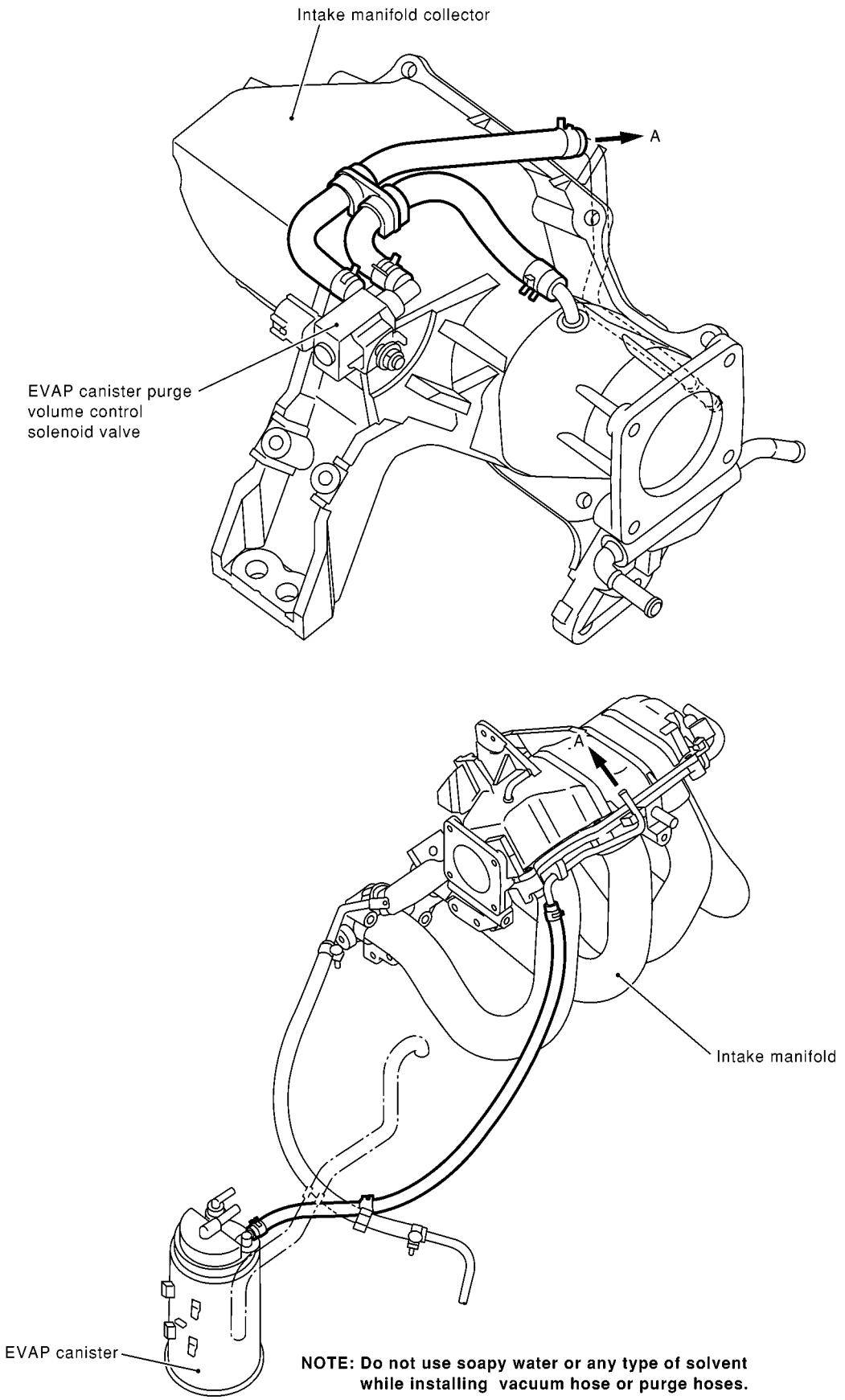
EBS00F0O

SYSTEM DESCRIPTION



The evaporative emission system is used to reduce hydrocarbons emitted into the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the EVAP canister.
The fuel vapor in the sealed fuel tank is led into the EVAP canister which contains activated carbon and the vapor is stored there when the engine is not operating or when refueling to the fuel tank.
The vapor in the EVAP canister is purged by the air through the purge line to the intake manifold when the engine is operating. EVAP canister purge volume control solenoid valve is controlled by ECM. When the engine operates, the flow rate of vapor controlled by EVAP canister purge volume control solenoid valve is proportionally regulated as the air flow increases.
EVAP canister purge volume control solenoid valve also shuts off the vapor purge line during decelerating and idling.

EVAPORATIVE EMISSION LINE DRAWING



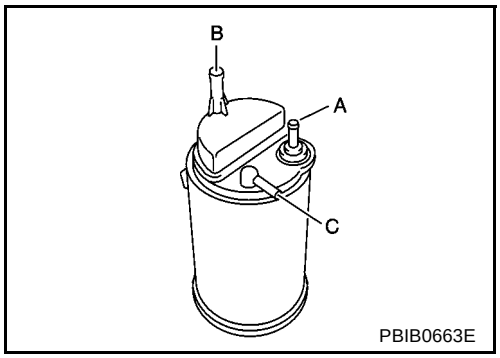
Component Inspection

EBS00F0P

EVAP CANISTER

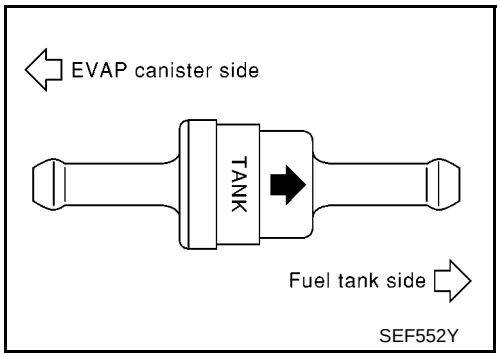
Check EVAP canister as follows:

1. Block port **B** . Orally blow air through port **A** . Check that air flows freely through port **C** .
2. Block port **A** . Orally blow air through port **B** . Check that air flows freely through port **C** .



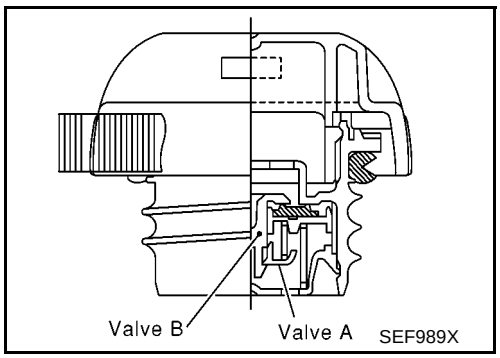
FUEL CHECK VALVE

1. Blow air through connector on fuel tank side. A considerable resistance should be felt and a portion of air flow should be directed toward the EVAP canister side.
2. Blow air through connector on EVAP canister side. Air flow should be smoothly directed toward fuel tank side.
3. If fuel check valve is suspected of not properly functioning in steps 1 and 2 above, replace it.



FUEL TANK VACUUM RELIEF VALVE (BUILT INTO FUEL FILLER CAP)

1. Wipe clean valve housing.

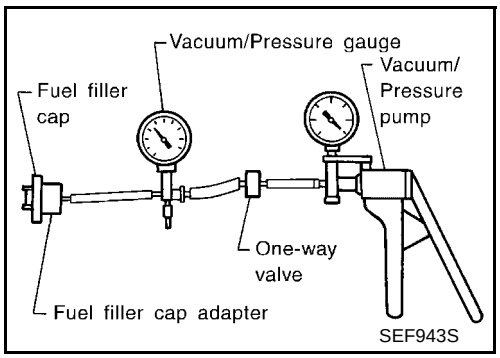


2. Check valve opening pressure and vacuum.

Pressure: 15.3 - 20.0 kPa (0.153 - 0.200 bar, 0.156 - 0.204 kg/cm^2 , 2.22 - 2.90 psi)

Vacuum: –6.0 to –3.3 kPa (–0.060 to –0.033 bar, –0.061 to –0.034 kg/cm^2 , –0.87 to –0.48 psi)

3. If out of specification, replace fuel filler cap as an assembly.



EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-911, "Component Inspection" .

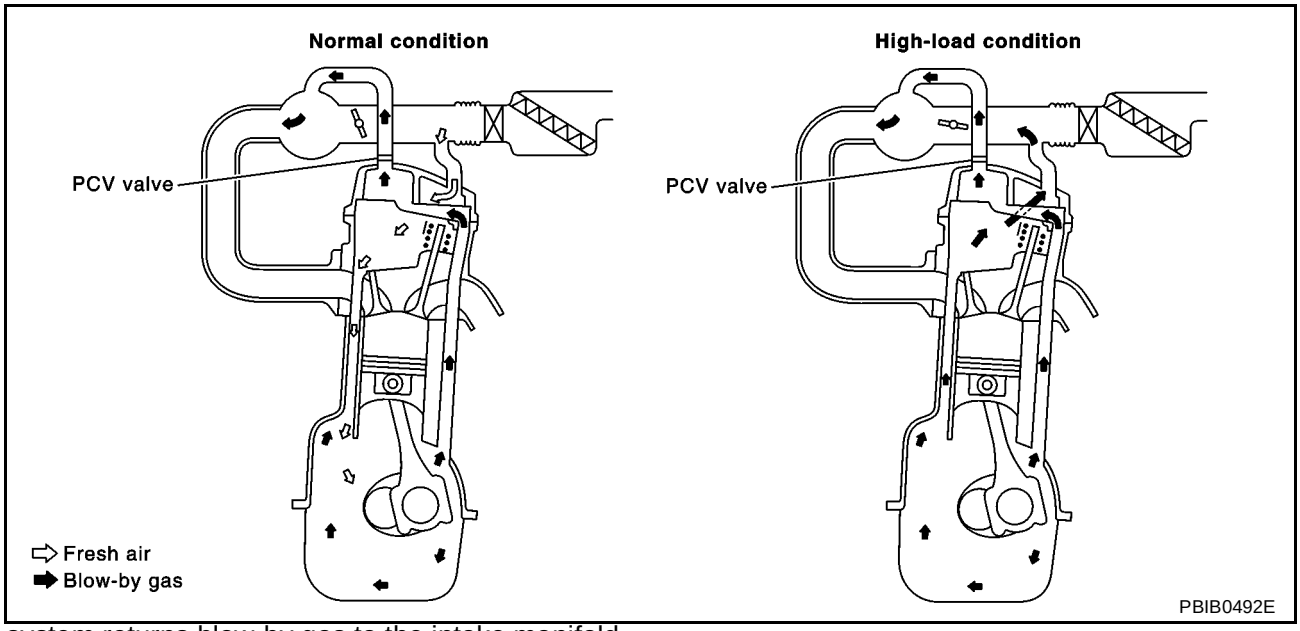
POSITIVE CRANKCASE VENTILATION

PFP:11810

Description

EBS00F0Q

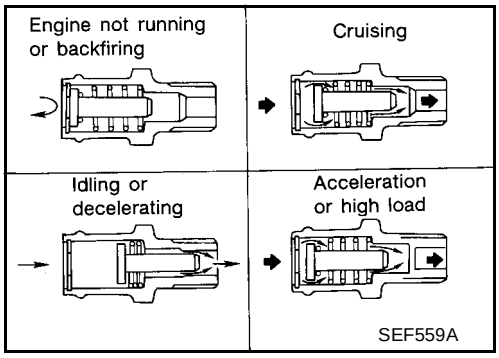
SYSTEM DESCRIPTION



This system returns blow-by gas to the intake manifold.

The positive crankcase ventilation (PCV) valve is provided to conduct crankcase blow-by gas to the intake manifold. During partial throttle operation of the engine, the intake manifold sucks the blow-by gas through the PCV valve. Normally, the capacity of the valve is sufficient to handle any blow-by and a small amount of ventilating air. The ventilating air is then drawn from the air inlet tubes into the crankcase. In this process the air passes through the hose connecting air inlet tubes to rocker cover. Under full-throttle condition, the manifold vacuum is insufficient to draw the blow-by flow through the valve. The flow goes through the hose connection in the reverse direction.

On vehicles with an excessively high blow-by, the valve does not meet the requirement. This is because some of the flow will go through the hose connection to the air inlet tubes under all conditions.

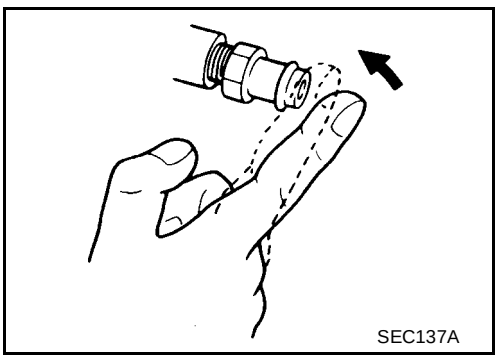


Component Inspection

EBS00F0R

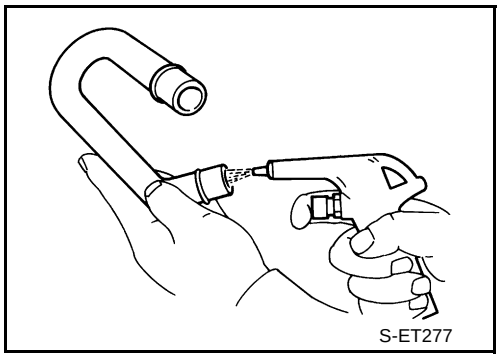
PCV (POSITIVE CRANKCASE VENTILATION) VALVE

With engine running at idle, remove PCV valve from rocker cover. A properly working valve makes a hissing noise as air passes through it. A strong vacuum should be felt immediately when a finger is placed over valve inlet.



PCV VALVE VENTILATION HOSE

1. Check hoses and hose connections for leaks.
2. Disconnect all hoses and clean with compressed air. If any hose cannot be freed of obstructions, replace.


S-ET277

SERVICE DATA AND SPECIFICATIONS (SDS)

PFP:00030

Fuel Pressure

EBS00F0S

Fuel pressure at idle	Approximately 350 kPa (3.7kg/cm^2 , 51psi)

Idle Speed and Ignition Timing

EBS00F0T

Target idle speed	No-load*1 (in “P” or N” position)	A/T: 800±50 rpm M/T: 700±50 rpm
Air conditioner: ON	In “P” or N” position	825 rpm or more
Ignition timing	In “P” or N” position	A/T: 10°±5° BTDC M/T: 8°±5° BTDC

*1: Under the following conditions:

- Air conditioner switch: OFF
- Electric load: OFF (Lights, heater fan & rear window defogger)
- Steering wheel: Kept in straight-ahead position

Calculated Load Value

EBS00F0U

	Calculated load value % (Using CONSULT-II)
At idle	10 - 35
At 2,500 rpm	10 - 35

Mass Air Flow Sensor

EBS00F0V

Supply voltage	Battery voltage (11 - 14V)
Output voltage at idle	1.0 - 1.7*V
Mass air flow (Using CONSULT-II)	1.0 - 4.0 g·m/sec at idle* 5.0 - 10.0 g·m/sec at 2,500 rpm*

*: Engine is warmed up to normal operating temperature and running under no-load.

Intake Air Temperature Sensor

EBS00F0W

Temperature °C (°F)	Resistance kΩ
25 (77)	1.9 - 2.1
80 (176)	0.31 - 0.37

Engine Coolant Temperature Sensor

EBS00F0X

Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.00
90 (194)	0.236 - 0.260

Heated Oxygen Sensor 1 Heater

EBS00F0Y

Resistance [at 20°C (68°F)]	8 - 10Ω

Heated Oxygen sensor 2 Heater

EBS00F0Z

Resistance [at 25°C (77°F)]	2.3 - 4.3Ω

Crankshaft Position Sensor (POS)

EBS00F10

Refer to EC-758, "Component Inspection" .

Camshaft Position Sensor (PHASE)

EBS00F11

Refer to EC-765, "Component Inspection" .

Throttle Control Motor

EBS00F12

Resistance [at 25°C (77°F)]	Approximately 1 - 15Ω

Injector

EBS00F13

Resistance [at 20°C (68°F)]	13.5 - 17.5Ω

Fuel Pump

EBS00F14

Resistance [at 25°C (77°F)]	Approximately 1.0Ω

INDEX FOR DTC

PFP:00024

Alphabetical Index

EBS00F15

Check if the vehicle is a model with Euro-OBD (E-OBD) system or not by the “Type approval number” on the identification plate. Refer to GI-46, "IDENTIFICATION PLATE" .

NOTE:
If DTC U1000 or U1001 is displayed with other DTC, first perform the trouble diagnosis for DTC U1000, U1001. Refer to EC-1083, "DTC U1000, U1001 CAN COMMUNICATION LINE" .

Items (CONSULT-II screen terms)	DTC*1		Reference page
	CONSULT-II GST*2	ECM*3	
ACC COMMAND VALUE*7	P1568	1568	EC-1340
APP SEN 1/CIRC*5	P0227	0227	EC-1188
APP SEN 1/CIRC*5	P0228	0228	EC-1188
APP SEN 2/CIRC*5	P1227	1227	EC-1322
APP SEN 2/CIRC*5	P1228	1228	EC-1322
APP SENSOR*5	P0226	0226	EC-1181
ASCD BRAKE SW*7	P1572	1572	EC-1341
ASCD SW*7	P1564	1564	EC-1333
ASCD VHL SPD SEN*7	P1574	1574	EC-1351
BRAKE SW/CIRCUIT	P1805	1805	EC-1360
CAN COMM CIRCUIT	U1000	1000*6	EC-1083
CAN COMM CIRCUIT	U1001	1001*6	EC-1083
CKP SEN/CIRCUIT	P0335	0335	EC-1205
CMP SEN/CIRC-B1	P0340	0340	EC-1212
CTP LEARNING	P1225	1225	EC-1318
CTP LEARNING	P1226	1226	EC-1320
CYL 1 MISFIRE	P0301	0301	EC-1195
CYL 2 MISFIRE	P0302	0302	EC-1195
CYL 3 MISFIRE	P0303	0303	EC-1195
CYL 4 MISFIRE	P0304	0304	EC-1195
ECM	P0605	0605	EC-1235
ECM BACK UP/CIRC	P1065	1065	EC-1238
ECT SEN/CIRCUIT*5	P0117	0117	EC-1111
ECT SEN/CIRCUIT*5	P0118	0118	EC-1111
ENG OVER TEMP	P1217	1217	EC-1295
ETC ACTR*5	P1121	1121	EC-1246
ETC FUNCTION/CIRC*5	P1122	1122	EC-1248
ETC MOT*5	P1128	1128	EC-1261
ETC MOT PWR*5	P1124	1124	EC-1255
ETC MOT PWR*5	P1126	1126	EC-1255
FUEL SYS-LEAN-B1	P0171	0171	EC-1157
FUEL SYS-RICH-B1	P0172	0172	EC-1163
HO2S1 (B1)	P0132	0132	EC-1119

Items (CONSULT-II screen terms)	DTC*1		Reference page
	CONSULT-II GST*2	ECM*3	
HO2S1 (B1)	P0133	0133	EC-1125
HO2S1 (B1)	P0134	0134	EC-1135
HO2S1 (B1)	P1143	1143	EC-1266
HO2S1 (B1)	P1144	1144	EC-1272
HO2S1 HTR (B1)	P0031	0031	EC-1090
HO2S1 HTR (B1)	P0032	0032	EC-1090
HO2S2 (B1)	P0138	0138	EC-1142
HO2S2 (B1)	P0139	0139	EC-1149
HO2S2 (B1)	P1146	1146	EC-1278
HO2S2 (B1)	P1147	1147	EC-1286
HO2S2 HTR (B1)	P0037	0037	EC-1095
HO2S2 HTR (B1)	P0038	0038	EC-1095
IAT SEN/CIRCUIT	P0112	0112	EC-1106
IAT SEN/CIRCUIT	P0113	0113	EC-1106
IAT SENSOR	P0127	0127	EC-1116
IN PULY SPEED	P1715	1715	
IN PY SPD SEN/CIRC	P0715	0715	CVT-78
INT/V TIM CONT-B1	P0011	0011	EC-1087
INT/V TIM V/CIR-B1	P1111	1111	EC-1242
KNOCK SEN/CIRC-B1	P0327	0327	EC-1201
KNOCK SEN/CIRC-B1	P0328	0328	EC-1201
L/PRESS SOL/CIRC	P0745	0745	CVT-94
LINE PRESS SEN	P1791	1791	CVT-113
MAF SEN/CIRCUIT*5	P0102	0102	EC-1100
MAF SEN/CIRCUIT*5	P0103	0103	EC-1100
MULTI CYL MISFIRE	P0300	0300	EC-1195
NATS MALFUNCTION	P1610 - P1615	1610 - 1615	EC-1016
NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	No DTC	Flashing*4	EC-1448
NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	**P0000**	**0000**	**—**
OUT PULY SPEED	P1720	1720	EC-1358
P-N POS SW/CIRCUIT	P1706	1706	EC-1353
PURG VOLUME CONT/V	P0444	0444	EC-1222
PURG VOLUME CONT/V	P0445	0445	EC-1222
PW ST P SEN/CIRC	P0550	0550	EC-1230
SENSOR POWER/CIRC*5	P1229	1229	EC-1329
STEP MOTR CIRC	P1777	1777	CVT-108
STEP MOTR FNC	P1778	1778	CVT-111
TCC SOLENOID/CIRC	P0740	0740	CVT-89
TCS/CIRC*8	P1212	1212	EC-1294

Items (CONSULT-II screen terms)	DTC*1		Reference page
	CONSULT-II GST*2	ECM*3	
TP SEN 1/CIRC*5	P0222	0222	EC-1175
TP SEN 1/CIRC*5	P0223	0223	EC-1175
TP SEN 2/CIRC*5	P1223	1223	EC-1312
TP SEN 2/CIRC*5	P1224	1224	EC-1312
TP SENSOR*5	P0221	0221	EC-1169
TW CATALYST SYS-B1	P0420	0420	EC-1218
VEH SPEED SEN/CIRC	P0500	0500	EC-1228

*1: 1st trip DTC No. is the same as DTC No.
*2: These numbers are prescribed by ISO 15031-5.
*3: In Diagnostic Test Mode II (Self-diagnostic results), these numbers are controlled by NISSAN.
*4: When engine is running.
*5: When the fail-safe operation occurs, the MI illuminates.
*6: The troubleshooting for these DTCs needs CONSULT-II.
*7: For models with ICC system.
*8: For models with ESP/TCS/ABS system.

DTC No. Index

EBS00F16

NOTE:
If DTC U1000 or U1001 is displayed with other DTC, first perform the trouble diagnosis for DTC U1000, U1001. Refer to EC-1083, "DTC U1000, U1001 CAN COMMUNICATION LINE" .

DTC*1		Items (CONSULT-II screen terms)	Reference page
CONSULT-II GST*2	ECM*3		
No DTC	Flashing*4	NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	EC-1448
U1000	1000*6	CAN COMM CIRCUIT	EC-1083
U1001	1001*6	CAN COMM CIRCUIT	EC-1083
P0000	**0000**	**NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.**	—
P0011	0011	INT/V TIM CONT-B1	EC-1087
P0031	0031	HO2S1 HTR (B1)	EC-1090
P0032	0032	HO2S1 HTR (B1)	EC-1090
P0037	0037	HO2S2 HTR (B1)	EC-1095
P0038	0038	HO2S2 HTR (B1)	EC-1095
P0102	0102	MAF SEN/CIRCUIT*5	EC-1100
P0103	0103	MAF SEN/CIRCUIT*5	EC-1100
P0112	0112	IAT SEN/CIRCUIT	EC-1106
P0113	0113	IAT SEN/CIRCUIT	EC-1106
P0117	0117	ECT SEN/CIRCUIT*5	EC-1111
P0118	0118	ECT SEN/CIRCUIT*5	EC-1111
P0127	0127	IAT SENSOR	EC-1116
P0132	0132	HO2S1 (B1)	EC-1119
P0133	0133	HO2S1 (B1)	EC-1125

DTC*1		Items (CONSULT-II screen terms)	Reference page
CONSULT-II GST*2	ECM*3		
P0134	0134	HO2S1 (B1)	EC-1135
P0138	0138	HO2S2 (B1)	EC-1142
P0139	0139	HO2S2 (B1)	EC-1149
P0171	0171	FUEL SYS-LEAN-B1	EC-1157
P0172	0172	FUEL SYS-RICH-B1	EC-1163
P0221	0221	TP SENSOR*5	EC-1169
P0222	0222	TP SEN 1/CIRC*5	EC-1175
P0223	0223	TP SEN 1/CIRC*5	EC-1175
P0226	0226	APP SENSOR*5	EC-1181
P0227	0227	APP SEN 1/CIRC*5	EC-1188
P0228	0228	APP SEN 1/CIRC*5	EC-1188
P0300	0300	MULTI CYL MISFIRE	EC-1195
P0301	0301	CYL 1 MISFIRE	EC-1195
P0302	0302	CYL 2 MISFIRE	EC-1195
P0303	0303	CYL 3 MISFIRE	EC-1195
P0304	0304	CYL 4 MISFIRE	EC-1195
P0327	0327	KNOCK SEN/CIRC-B1	EC-1201
P0328	0328	KNOCK SEN/CIRC-B1	EC-1201
P0335	0335	CKP SEN/CIRCUIT	EC-1205
P0340	0340	CMP SEN/CIRC-B1	EC-1212
P0420	0420	TW CATALYST SYS-B1	EC-1218
P0444	0444	PURG VOLUME CONT/V	EC-1222
P0445	0445	PURG VOLUME CONT/V	EC-1222
P0500	0500	VEH SPEED SEN/CIRC	EC-1228
P0550	0550	PW ST P SEN/CIRC	EC-1230
P0605	0605	ECM	EC-1235
P0715	0715	IN PY SPD SEN/CIRC	CVT-78
P0740	0740	TCC SOLENOID/CIRC	CVT-89
P0745	0745	L/PRESS SOL/CIRC	CVT-94
P1065	1065	ECM BACK UP/CIRC	EC-1238
P1111	1111	INT/V TIM V/CIR-B1	EC-1242
P1121	1121	ETC ACTR*5	EC-1246
P1122	1122	ETC FUNCTION/CIRC*5	EC-1248
P1124	1124	ETC MOT PWR*5	EC-1255
P1126	1126	ETC MOT PWR*5	EC-1255
P1128	1128	ETC MOT*5	EC-1261
P1143	1143	HO2S1 (B1)	EC-1266
P1144	1144	HO2S1 (B1)	EC-1272
P1146	1146	HO2S2 (B1)	EC-1278
P1147	1147	HO2S2 (B1)	EC-1286

DTC*1		Items (CONSULT-II screen terms)	Reference page
CONSULT-II GST*2	ECM*3		
P1212	1212	TCS/CIRC*8	EC-1294
P1217	1217	ENG OVER TEMP	EC-1295
P1223	1223	TP SEN 2/CIRC*5	EC-1312
P1224	1224	TP SEN 2/CIRC*5	EC-1312
P1225	1225	CTP LEARNING	EC-1318
P1226	1226	CTP LEARNING	EC-1320
P1227	1227	APP SEN 2/CIRC*5	EC-1322
P1228	1228	APP SEN 2/CIRC*5	EC-1322
P1229	1229	SENSOR POWER/CIRC*5	EC-1329
P1564	1564	ASCD SW*7	EC-1333
P1568	1568	ACC COMMAND VALUE*7	EC-1340
P1572	1572	ASCD BRAKE SW*7	EC-1341
P1574	1574	ASCD VHL SPD SEN*7	EC-1351
P1610 - P1615	1610 - 1615	NATS MALFUNCTION	EC-1016
P1706	1706	P-N POS SW/CIRCUIT	EC-1353
P1715	1715	IN PULY SPEED	
P1720	1720	OUT PULY SPEED	EC-1358
P1777	1777	STEP MOTR CIRC	CVT-108
P1778	1778	STEP MOTR FNC	CVT-111
P1791	1791	LINE PRESS SEN	CVT-113
P1805	1805	BRAKE SW/CIRCUIT	EC-1360

*1: 1st trip DTC No. is the same as DTC No.
*2: These numbers are prescribed by ISO 15031-5.
*3: In Diagnostic Test Mode II (Self-diagnostic results), these numbers are controlled by NISSAN.
*4: When engine is running.
*5: When the fail-safe operation occurs, the MI illuminates.
*6: The troubleshooting for these DTCs needs CONSULT-II.
*7: For models with ICC system.
*8: For models with ESP/TCS/ABS system.

PRECAUTIONS

PFP:00001

Precautions for Supplemental Restraint System (SRS) “AIR BAG” and “SEAT BELT PRE-TENSIONER”

EBS00F17

The Supplemental Restraint System such as "AIR BAG" and "SEAT BELT PRE-TENSIONER", used along with a front seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. Information necessary to service the system safely is included in the SRS and SB section of this Service Manual.

WARNING:

- **To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance must be performed by an authorized NISSAN/INFINITI dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system. For removal of Spiral Cable and Air Bag Module, see the SRS section.**
- **Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses can be identified by yellow and/or orange harness connectors.**

On Board Diagnostic (OBD) System of Engine and CVT

EBS00F18

The ECM has an on board diagnostic system. It will light up the malfunction indicator (MI) to warn the driver of a malfunction causing emission deterioration.

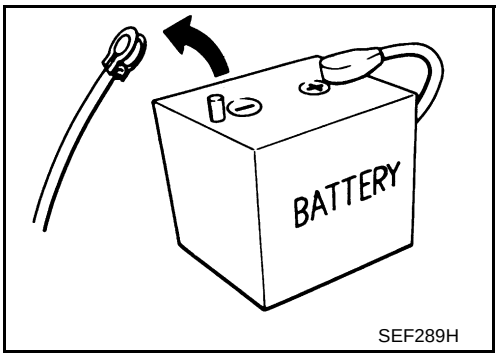
CAUTION:

- **Be sure to turn the ignition switch OFF and disconnect the battery ground cable before any repair or inspection work. The open/short circuit of related switches, sensors, solenoid valves, etc. will cause the MI to light up.**
- **Be sure to connect and lock the connectors securely after work. A loose (unlocked) connector will cause the MI to light up due to the open circuit. (Be sure the connector is free from water, grease, dirt, bent terminals, etc.)**
- **Certain systems and components, especially those related to OBD, may use a new style slide-locking type harness connector. For description and how to disconnect, refer to PG-86, "HARNESS CONNECTOR" .**
- **Be sure to route and secure the harnesses properly after work. The interference of the harness with a bracket, etc. may cause the MI to light up due to the short circuit.**
- **Be sure to connect rubber tubes properly after work. A misconnected or disconnected rubber tube may cause the MI to light up due to the malfunction of the fuel injection system, etc.**
- **Be sure to erase the unnecessary malfunction information (repairs completed) from the ECM and TCM (Transmission control module) before returning the vehicle to the customer.**

Precaution

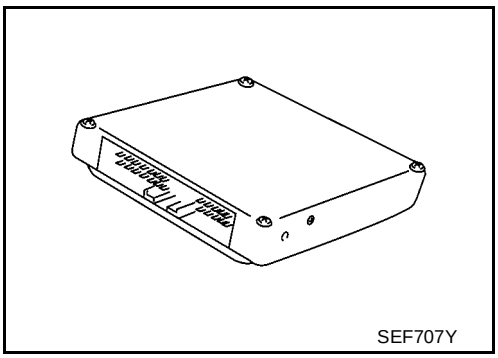
EBS00F19

- **Always use a 12 volt battery as power source.**
- **Do not attempt to disconnect battery cables while engine is running.**
- **Before connecting or disconnecting the ECM harness connector, turn ignition switch OFF and disconnect battery ground cable. Failure to do so may damage the ECM because battery voltage is applied to ECM even if ignition switch is turned off.**
- **Before removing parts, turn ignition switch OFF and then disconnect battery ground cable.**

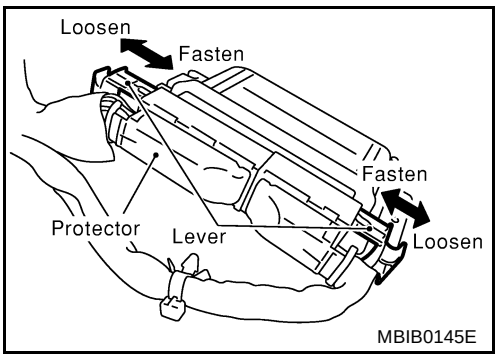


SEF289H

- **Do not disassemble ECM.**
- **If battery cable is disconnected, the memory will return to the initial ECM values.**
  The ECM will now start to self-control at its initial values. Engine operation can vary slightly when the cable is disconnected. However, this is not an indication of a problem. Do not replace parts because of a slight variation.

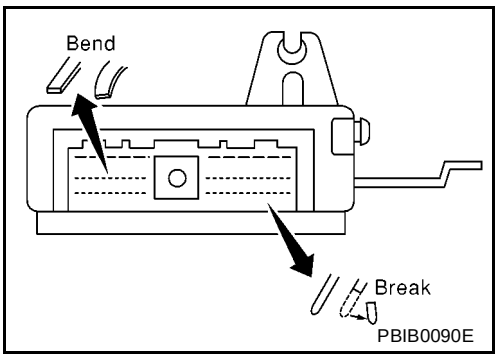

SEF707Y

- **When connecting ECM harness connector, fasten it securely with levers as far as they will go as shown at right.**



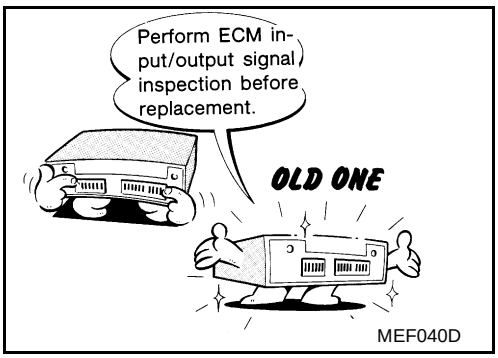
MBIB0145E

- **When connecting or disconnecting pin connectors into or from ECM, take care not to damage pin terminals (bend or break).**
  Make sure that there are not any bends or breaks on ECM pin terminal, when connecting pin connectors.
- **Securely connect ECM harness connectors.**
  A poor connection can cause an extremely high (surge) voltage to develop in coil and condenser, thus resulting in damage to ICs.
- **Keep engine control system harness at least 10 cm (4 in) away from adjacent harness, to prevent engine control system malfunctions due to receiving external noise, degraded operation of ICs, etc.**
- **Keep engine control system parts and harness dry.**



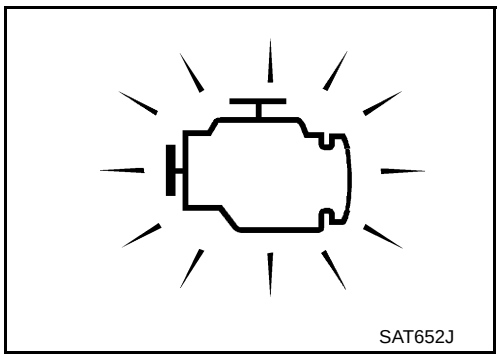
PBIB0090E

- **Before replacing ECM, perform “ECM Terminals and Reference Value” inspection and make sure ECM functions properly. Refer to EC-1047 .**
- **Handle mass air flow sensor carefully to avoid damage.**
- **Do not disassemble mass air flow sensor.**
- **Do not clean mass air flow sensor with any type of detergent.**
- **Do not disassemble electric throttle control actuator.**
- **Even a slight leak in the air intake system can cause serious problems.**
- **Do not shock or jar the camshaft position sensor (PHASE), crankshaft position sensor (POS).**

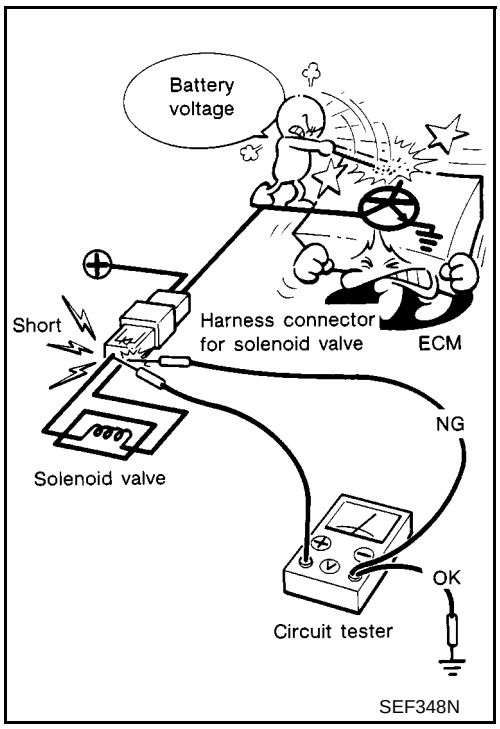


MEF040D

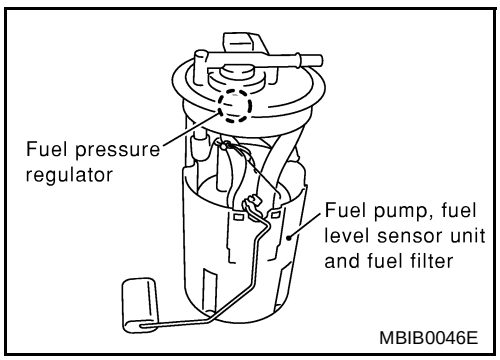
- **After performing each TROUBLE DIAGNOSIS, perform "DTC Confirmation Procedure" or "Overall Function Check".**
  The DTC should not be displayed in the "DTC Confirmation Procedure" if the repair is completed. The "Overall Function Check" should be a good result if the repair is completed.



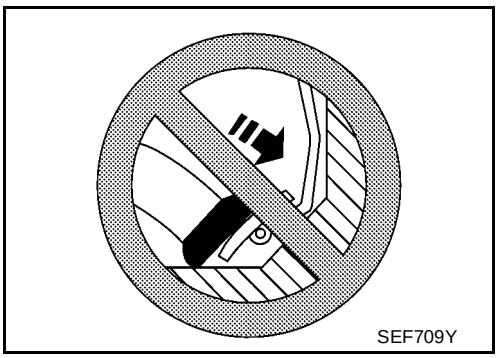
- **When measuring ECM signals with a circuit tester, connect a break-out box (SST) and Y-cable adapter (SST) between the ECM and ECM harness connector.**
- **When measuring ECM signals with a circuit tester, never allow the two tester probes to contact.**
  Accidental contact of probes will cause a short circuit and damage the ECM power transistor.
- **Do not use ECM ground terminals when measuring input/ output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**



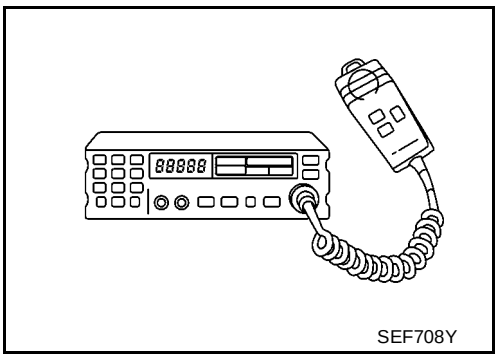
- **Do not operate fuel pump when there is no fuel in lines.**
- **Tighten fuel hose clamps to the specified torque.**



- **Do not depress accelerator pedal when starting.**
- **Immediately after starting, do not rev up engine unnecessarily.**
- **Do not rev up engine just prior to shutdown.**


SEF709Y

- **When installing C.B. ham radio or a mobile phone, be sure to observe the following as it may adversely affect electronic control systems depending on installation location.**
  - **Keep the antenna as far as possible from the electronic control units.**
  - **Keep the antenna feeder line more than 20 cm (8 in) away from the harness of electronic controls.**
    Do not let them run parallel for a long distance.
  - **Adjust the antenna and feeder line so that the standing-wave radio can be kept smaller.**
  - **Be sure to ground the radio to vehicle body.**


SEF708Y

Wiring Diagrams and Trouble Diagnosis

EBS00F1A

When you read wiring diagrams, refer to the following:

- GI-14, "How to Read Wiring Diagrams"
- PG-3, "POWER SUPPLY ROUTING" for power distribution circuit

When you perform trouble diagnosis, refer to the following:

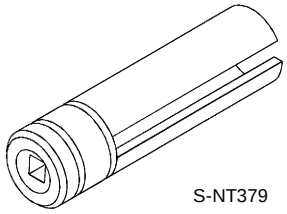
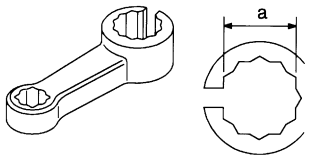
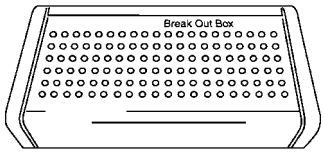
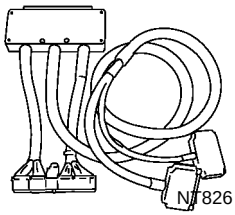
- GI-11, "HOW TO FOLLOW TEST GROUPS IN TROUBLE DIAGNOSES"
- GI-24, "How to Perform Efficient Diagnosis for an Electrical Incident"

PREPARATION

PFP:00002

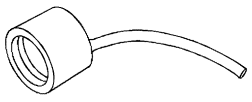
Special Service Tools

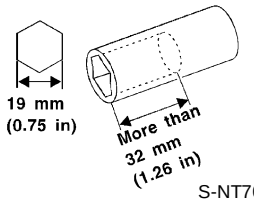
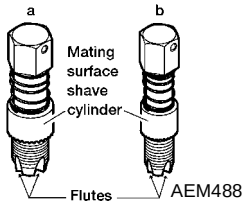
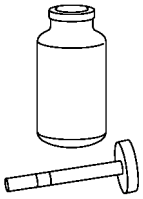
EBS00F1B

Tool number Tool name	Description	
KV10117100 Heated oxygen sensor wrench	 S-NT379	Loosening or tightening heated oxygen sensors with 22 mm (0.87 in) hexagon nut
KV10114400 Heated oxygen sensor wrench	 S-NT636	Loosening or tightening heated oxygen sensors **a: 22 mm (0.87 in)**
KV109E0010 Break-out box	 NT825	Measuring ECM signals with a circuit tester
KV109E0080 Y-cable adapter	 NT826	Measuring ECM signals with a circuit tester

Commercial Service Tools

EBS00F1C

Tool name	Description	
Quick connector release	 PBIC0198E	Removing fuel tube quick connectors in engine room (Available in SEC. 164 of PARTS CATALOG: Part No. 16441 6N210)
Fuel filler cap adapter	 S-NT653	Checking fuel tank vacuum relief valve opening pressure

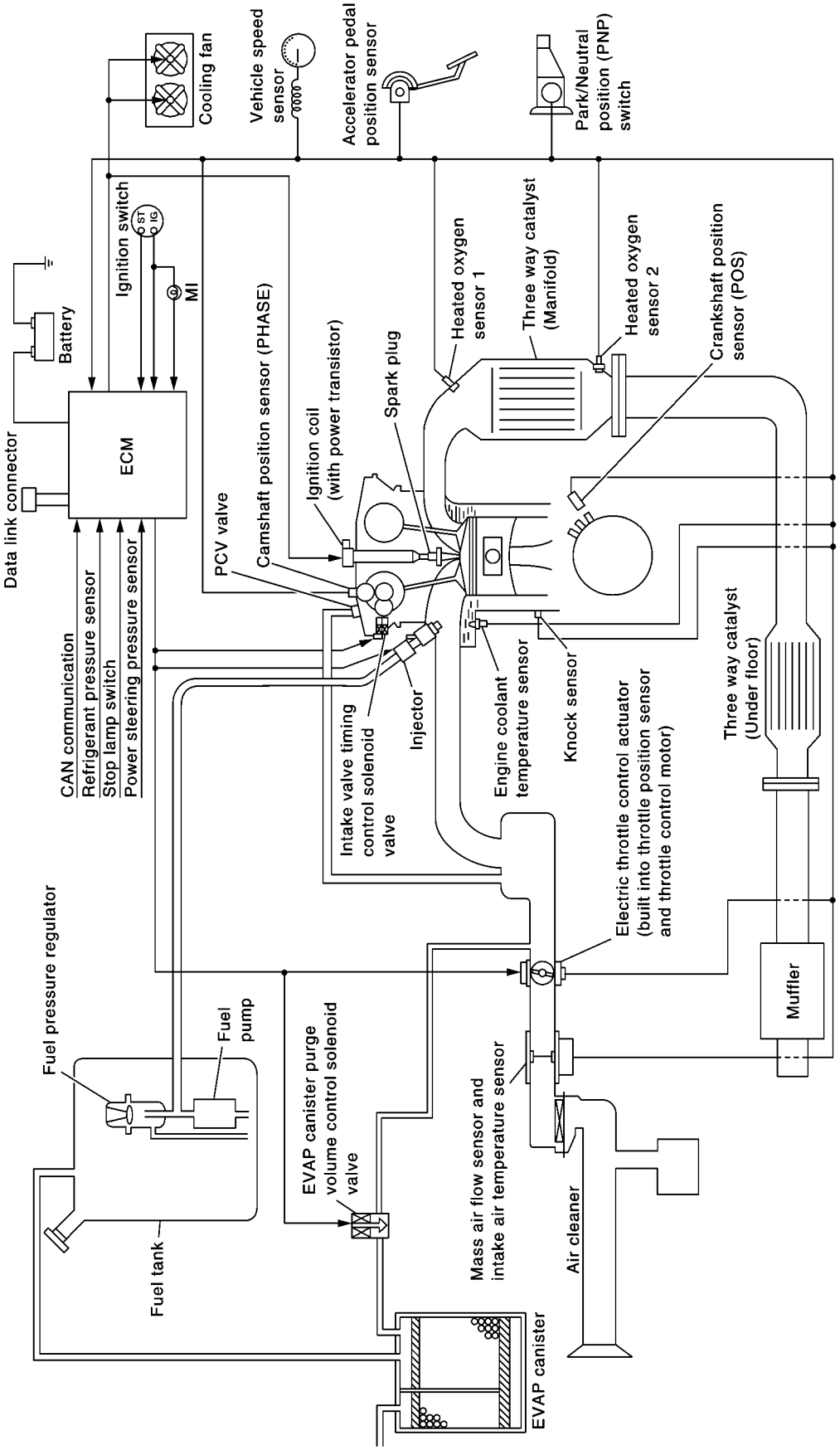
Tool name	Description	
Socket wrench	 S-NT705	Removing and installing engine coolant temperature sensor
Oxygen sensor thread cleaner ie: (J-43897-18) (J-43897-12)	 AEM488	Reconditioning the exhaust system threads before installing a new oxygen sensor. Use with anti-seize lubricant shown below. **a: 18 mm diameter with pitch 1.5 mm for Zirconia Oxygen Sensor** **b: 12 mm diameter with pitch 1.25 mm for Titania Oxygen Sensor**
Anti-seize lubricant i.e.: (Permatex™ 133AR or equivalent meeting MIL specification MIL-A-907)	 S-NT779	Lubricating oxygen sensor thread cleaning tool when reconditioning exhaust system threads.

ENGINE CONTROL SYSTEM

PFP:23710

System Diagram

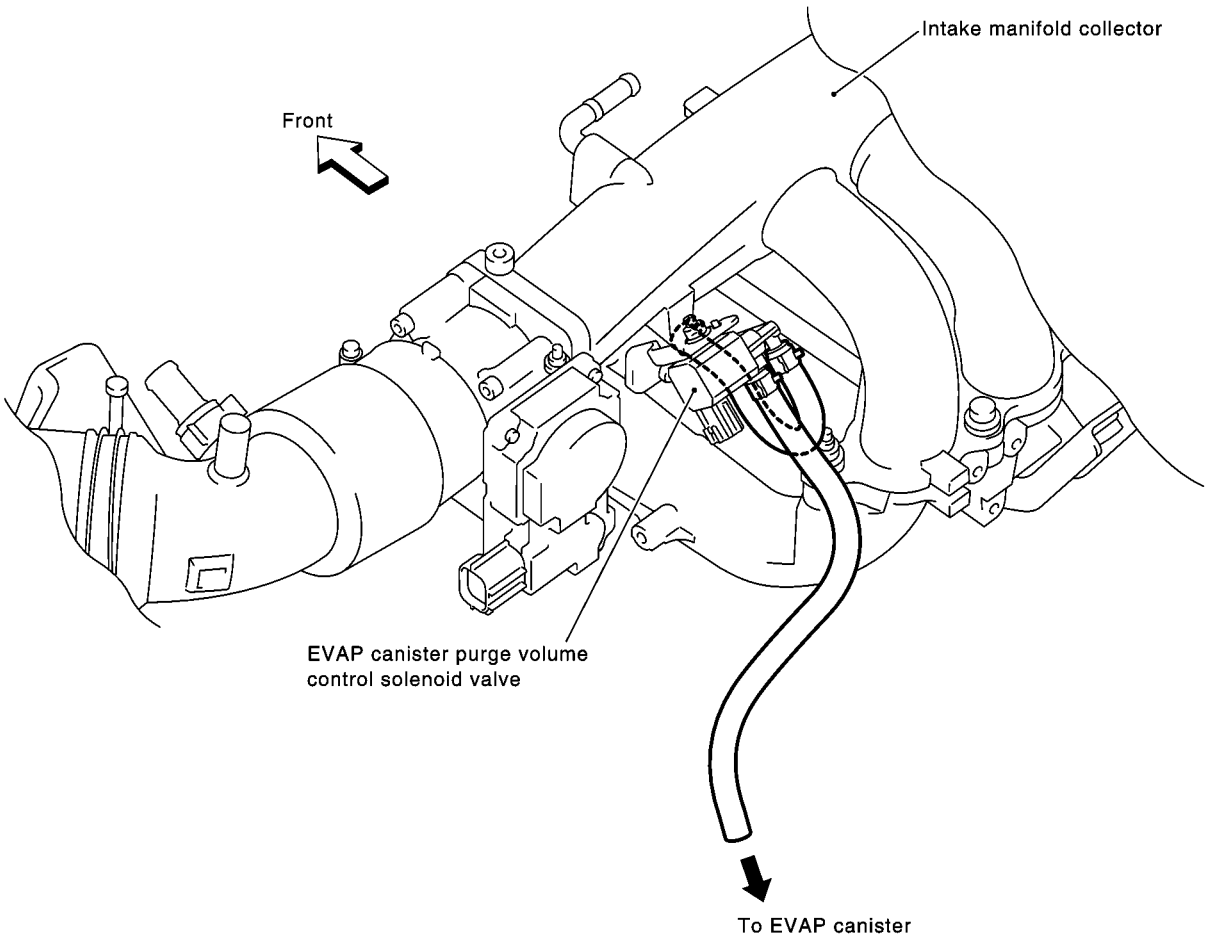
EBS00F1D



MBIB0051E

Vacuum Hose Drawing

EBS00F1E



NOTE: Do not use soapy water or any type of solvent while installing vacuum hose or purge hoses.

PBIB0489E

Refer to for Vacuum Control System.

System Chart

EBS00F1F

Input (Sensor)	ECM Function	Output (Actuator)
● Camshaft position sensor (PHASE) ● Crankshaft position sensor (POS) ● Mass air flow sensor ● Engine coolant temperature sensor ● Heated oxygen sensor 1 ● Throttle position sensor ● Accelerator pedal position sensor ● Park/neutral position (PNP) switch ● Intake air temperature sensor ● Power steering pressure sensor ● Ignition switch ● Battery voltage ● Knock sensor ● Refrigerant pressure sensor ● Stop lamp switch ● ICC steering switch ● Heated oxygen sensor 2 *1 ● TCM (Transmission control module) *2 ● ESP/TCS/ABS control unit *2 ● ICC unit *2 ● Air conditioner switch *2 ● Vehicle speed signal *2 ● Electrical load signal *2	Fuel injection & mixture ratio control	Fuel injectors
	Electronic ignition system	Power transistor
	Fuel pump control	Fuel pump relay
	ICC vehicle speed control	Electric throttle control actuator
	On board diagnostic system	MI (On the instrument panel) *3
	Heated oxygen sensor 1 heater control	Heated oxygen sensor 1 heater
	Heated oxygen sensor 2 heater control	Heated oxygen sensor 2 heater
	EVAP canister purge flow control	EVAP canister purge volume control solenoid valve
	Air conditioning cut control	Air conditioner relay *3
	Cooling fan control	Cooling fan relays *3

*1: This sensor is not used to control the engine system under normal conditions.
*2: These input signals are sent to the ECM through CAN communication line.
*3: These output signals are sent from the ECM through CAN communication line.

Multiport Fuel Injection (MFI) System

EBS00F1G

INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed *3 and piston position	Fuel injection & mixture ratio control	Fuel injectors
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Heated oxygen sensor 1	Density of oxygen in exhaust gas		
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Accelerator pedal position		
Park/neutral position (PNP) switch	Gear position		
Knock sensor	Engine knocking condition		
Battery	Battery voltage *3		
Power steering pressure sensor	Power steering operation		
Heated oxygen sensor 2 *1	Density of oxygen in exhaust gas		
Vehicle speed signal *2	Vehicle speed		
Air conditioner switch *2	Air conditioner operation		

*1: Under normal conditions, this sensor is not for engine control operation.
*2: These signals are sent to the ECM through CAN communication line.

*3: ECM determines the start signal status by the signals of engine speed and battery voltage.

SYSTEM DESCRIPTION

The amount of fuel injected from the fuel injector is determined by the ECM. The ECM controls the length of time the valve remains open (injection pulse duration). The amount of fuel injected is a program value in the ECM memory. The program value is preset by engine operating conditions. These conditions are determined by input signals (for engine speed and intake air) from both the crankshaft position sensor and the mass air flow sensor.

VARIOUS FUEL INJECTION INCREASE/DECREASE COMPENSATION

In addition, the amount of fuel injected is compensated to improve engine performance under various operating conditions as listed below.

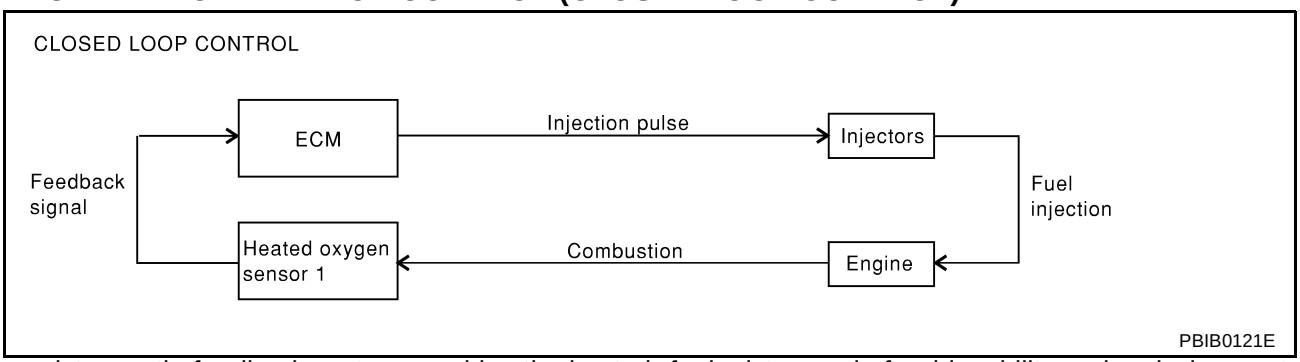
<Fuel increase>

- During warm-up
- When starting the engine
- During acceleration
- Hot-engine operation
- When selector lever is changed from “N” to “D” (CVT models)
- High-load, high-speed operation

<Fuel decrease>

- During deceleration
- During high engine speed operation

MIXTURE RATIO FEEDBACK CONTROL (CLOSED LOOP CONTROL)



The mixture ratio feedback system provides the best air-fuel mixture ratio for driveability and emission control. The three way catalyst (manifold) can then better reduce CO, HC and NOx emissions. This system uses heated oxygen sensor 1 in the exhaust manifold to monitor if the engine operation is rich or lean. The ECM adjusts the injection pulse width according to the sensor voltage signal. For more information about heated oxygen sensor 1, refer to EC-1119 . This maintains the mixture ratio within the range of stoichiometric (ideal air-fuel mixture).

This stage is referred to as the closed loop control condition.

Heated oxygen sensor 2 is located downstream of the three way catalyst (manifold). Even if the switching characteristics of heated oxygen sensor 1 shift, the air-fuel ratio is controlled to stoichiometric by the signal from heated oxygen sensor 2.

Open Loop Control

The open loop system condition refers to when the ECM detects any of the following conditions. Feedback control stops in order to maintain stabilized fuel combustion.

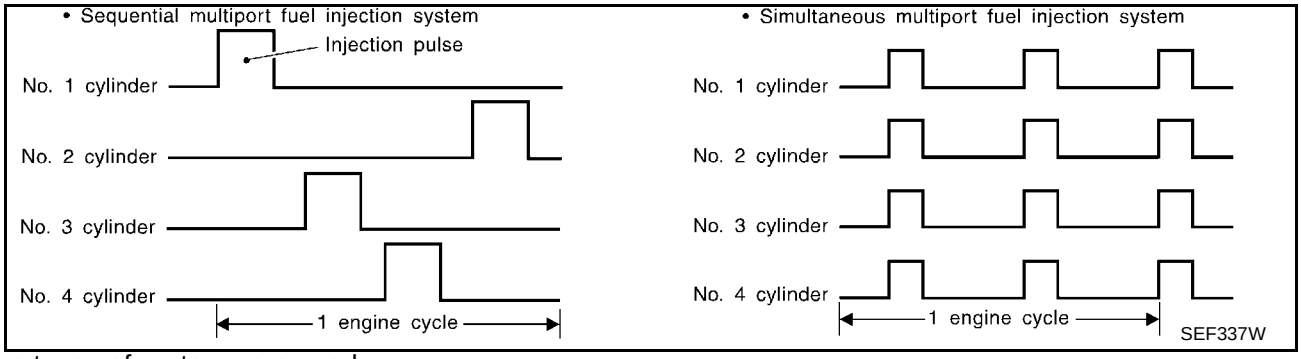
- Deceleration and acceleration
- High-load, high-speed operation
- Malfunction of heated oxygen sensor 1 or its circuit
- Insufficient activation of heated oxygen sensor 1 at low engine coolant temperature
- High engine coolant temperature
- During warm-up
- After shifting from “N” to “D” (CVT models)

- When starting the engine

MIXTURE RATIO SELF-LEARNING CONTROL

The mixture ratio feedback control system monitors the mixture ratio signal transmitted from heated oxygen sensor 1. This feedback signal is then sent to the ECM. The ECM controls the basic mixture ratio as close to the theoretical mixture ratio as possible. However, the basic mixture ratio is not necessarily controlled as originally designed. Both manufacturing differences (i.e., mass air flow sensor hot film) and characteristic changes during operation (i.e., injector clogging) directly affect mixture ratio.
Accordingly, the difference between the basic and theoretical mixture ratios is monitored in this system. This is then computed in terms of “injection pulse duration” to automatically compensate for the difference between the two ratios.
“Fuel trim” refers to the feedback compensation value compared against the basic injection duration. Fuel trim includes short term fuel trim and long term fuel trim.
“Short term fuel trim” is the short-term fuel compensation used to maintain the mixture ratio at its theoretical value. The signal from heated oxygen sensor 1 indicates whether the mixture ratio is RICH or LEAN compared to the theoretical value. The signal then triggers a reduction in fuel volume if the mixture ratio is rich, and an increase in fuel volume if it is lean.
“Long term fuel trim” is overall fuel compensation carried out long-term to compensate for continual deviation of the short term fuel trim from the central value. Such deviation will occur due to individual engine differences, wear over time and changes in the usage environment.

FUEL INJECTION TIMING



Two types of systems are used.

Sequential Multiport Fuel Injection System

Fuel is injected into each cylinder during each engine cycle according to the firing order. This system is used when the engine is running.

Simultaneous Multiport Fuel Injection System

Fuel is injected simultaneously into all four cylinders twice each engine cycle. In other words, pulse signals of the same width are simultaneously transmitted from the ECM.
The four injectors will then receive the signals two times for each engine cycle.
This system is used when the engine is being started and/or if the fail-safe system (CPU) is operating.

FUEL SHUT-OFF

Fuel to each cylinder is cut off during deceleration or operation of the engine at excessively high speeds.

Electronic Ignition (EI) System

EBS00F1H

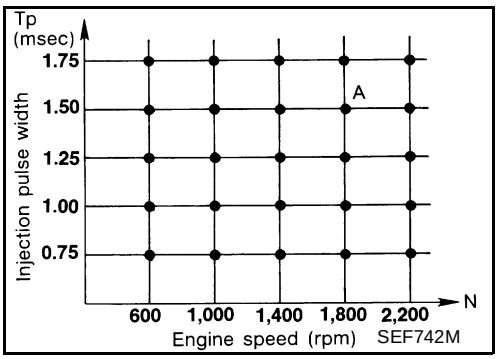
INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed *2 and piston position	Ignition timing control	Power transistor
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Accelerator pedal position		
Knock sensor	Engine knocking		
Park/neutral position (PNP) switch	Gear position		
Battery	Battery voltage *2		
Vehicle speed signal *1	Vehicle speed		

*1: This signal is sent to the ECM through CAN communication line.
*2: ECM determines the start signal status by the signals of engine speed and battery voltage.

SYSTEM DESCRIPTION

The ignition timing is controlled by the ECM to maintain the best air-fuel ratio for every running condition of the engine. The ignition timing data is stored in the ECM. This data forms the map shown.
The ECM receives information such as the injection pulse width and camshaft position sensor signal. Computing this information, ignition signals are transmitted to the power transistor.
e.g., N: 1,800 rpm, Tp: 1.50 msec
A °BTDC
During the following conditions, the ignition timing is revised by the ECM according to the other data stored in the ECM.



- At starting
- During warm-up
- At idle
- At low battery voltage
- During acceleration

The knock sensor retard system is designed only for emergencies. The basic ignition timing is programmed within the anti-knocking zone, if recommended fuel is used under dry conditions. The retard system does not operate under normal driving conditions. If engine knocking occurs, the knock sensor monitors the condition. The signal is transmitted to the ECM. The ECM retards the ignition timing to eliminate the knocking condition.

Air Conditioning Cut Control

EBS00F1I

INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM function	Actuator
Air conditioner switch *1	Air conditioner “ON” signal	Air conditioner cut control	Air conditioner relay
Throttle position sensor	Throttle valve opening angle		
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed *2		
Engine coolant temperature sensor	Engine coolant temperature		
Refrigerant pressure sensor	Refrigerant pressure		
Power steering pressure sensor	Power steering operation		
Vehicle speed signal *1	Vehicle speed		

*1: These signals are sent to the ECM through CAN communication line.
*2: ECM determines the start signal status by the signals of engine speed and battery voltage.

SYSTEM DESCRIPTION

This system improves engine operation when the air conditioner is used.
Under the following conditions, the air conditioner is turned off.

- When the accelerator pedal is fully depressed.
- When cranking the engine.
- At high engine speeds.
- When the engine coolant temperature becomes excessively high.
- When operating power steering during low engine speed or low vehicle speed.
- When engine speed is excessively low.
- When refrigerant pressure is excessively low or high.

Fuel Cut Control (at No Load and High Engine Speed)

EBS00F1J

INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM function	Actuator
Park/neutral position (PNP) switch	Neutral position	Fuel cut control	Fuel injectors
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Accelerator pedal position		
Engine coolant temperature sensor	Engine coolant temperature		
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed		
Vehicle speed signal*1	Vehicle speed		

*1: This signal is sent to the ECM through CAN communication line.

SYSTEM DESCRIPTION

If the engine speed is above 1,800 rpm with no load (for example, in neutral and engine speed over 1,800 rpm) fuel will be cut off after some time. The exact time when the fuel is cut off varies based on engine speed. Fuel cut will operate until the engine speed reaches 1,500 rpm, then fuel cut is cancelled.

NOTE:
This function is different from deceleration control listed under “Multiport Fuel Injection (MFI) System”, EC-972
.

CAN communication

EBS00F1K

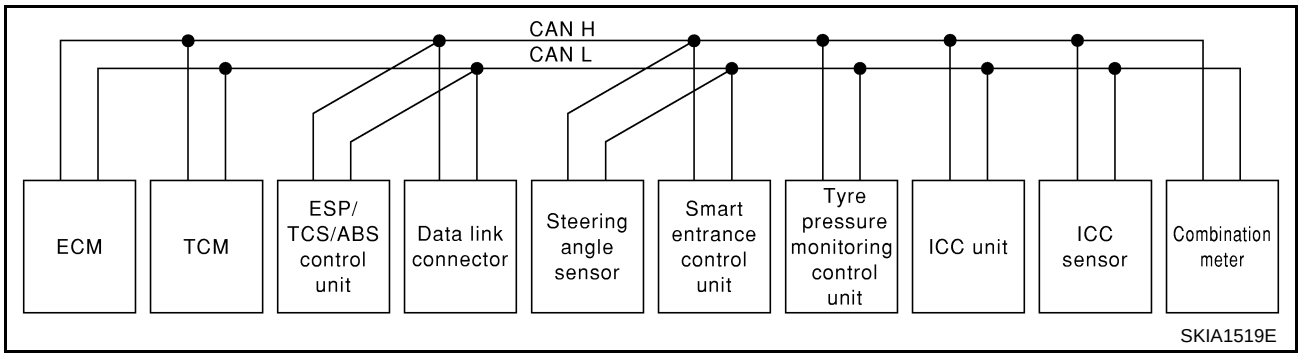
SYSTEM DESCRIPTION

CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent error detection ability. Many electronic control units are equipped onto a vehicle, and each control unit shares information and links with other control units during operation (not independent). In CAN communication, control units are connected with 2 communication lines (CAN H line, CAN L line) allowing a high rate of information transmission with less wiring. Each control unit transmits/receives data but selectively reads required data only.

CAN COMMUNICATION UNIT FOR LHD MODELS WITH TYRE PRESSURE MONITORING SYSTEM

CVT Models with ESP and ICC

SYSTEM DIAGRAM



INPUT/OUTPUT SIGNAL CHART

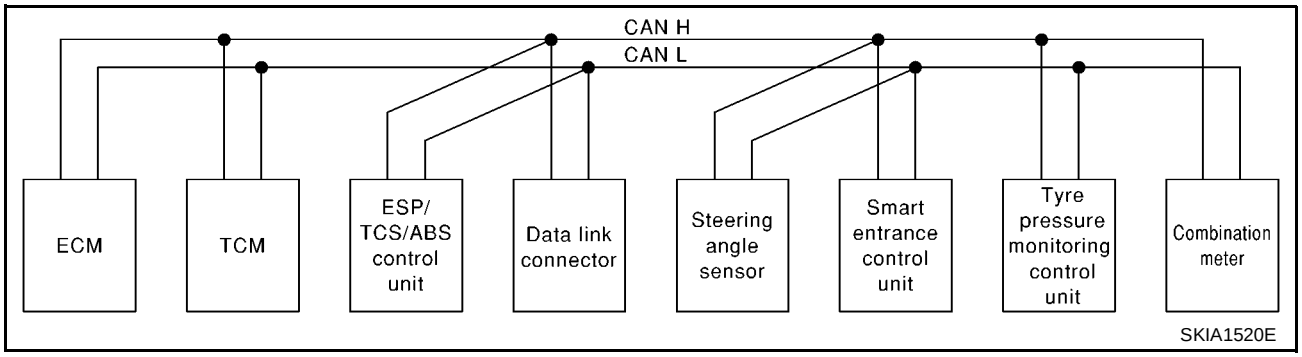
T: Transmit R: Receive

Signals	ECM	TCM	ESP/ TCS / ABS control unit	Steering angle sensor	Smart entrance control unit	Tyre pressure monitoring control unit	ICC unit	ICC sensor	Combination meter
Engine speed signal	T	R	R				R		R
Accelerator pedal position signal	T	R	R				R		
Closed throttle position signal	T						R		
ICC steering switch signal	T						R		
Shift pattern signal		T					R		
Parking brake switch signal			T				R		
ICC system display signal							T		R
ICC sensor signal							R	T	
ESP operation signal	R		T				R		
TCS operation signal	R		T				R		
ABS operation signal	R	R	T				R		
Stop lamp switch signal		R	T						
Steering wheel angle sensor signal			R	T					
Wheel speed sensor signal			T				R		
Rear window defogger signal	R				T				
Heater fan switch signal	R								T
Air conditioner switch signal	R								T
Primary pulley revolution signal	R	T					R		
Secondary pulley revolution signal	R	T					R		
ICC operation signal	R						T		
Brake switch signal	R						T		
MI signal	T								R
Current gear position signal		T							R
Engine coolant temperature signal	T						R		R
Fuel consumption signal	T								R

Signals	ECM	TCM	ESP/ TCS / ABS control unit	Steering angle sensor	Smart entrance control unit	Tyre pressure monitoring control unit	ICC unit	ICC sensor	Combination meter
Vehicle speed signal			T						R
	R								T
Seat belt reminder signal					R				T
Headlamp switch signal					T				R
Flashing indicator signal					T				R
Engine cooling fan speed signal	T				R				
Child lock indicator signal					T				R
Door switches state signal					T				R
Key ID signal	R				T				
	T				R				
A/C compressor signal	T				R				
Tire pressure signal						T			R

CVT Models with ESP without ICC

SYSTEM DIAGRAM



INPUT/OUTPUT SIGNAL CHART

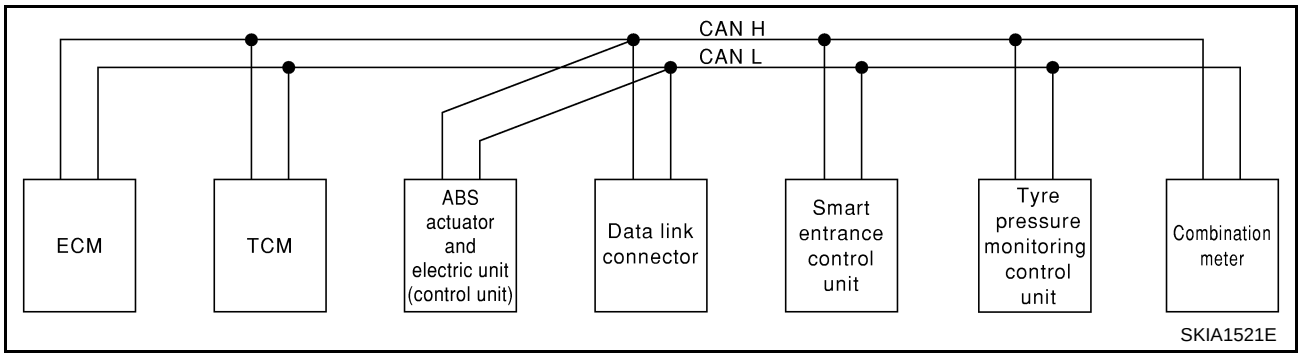
T: Transmit R: Receive

Signals	ECM	TCM	ESP/ TCS / ABS control unit	Steering angle sensor	Smart entrance control unit	Tyre pressure monitoring control unit	Combination meter
Engine speed signal	T	R	R				R
Accelerator pedal position signal	T	R	R				
ESP operation signal	R		T				
TCS operation signal	R		T				
ABS operation signal	R	R	T				
Stop lamp switch signal		R	T				
Steering wheel angle sensor signal			R	T			
Rear window defogger signal	R				T		
Heater fan switch signal	R						T
Air conditioner switch signal	R						T
Primary pulley revolution signal	R	T					
Secondary pulley revolution signal	R	T					

Signals	ECM	TCM	ESP/ TCS / ABS control unit	Steering angle sensor	Smart entrance control unit	Tyre pressure monitoring control unit	Combination meter
MI signal	T						R
Current gear position signal		T					R
Engine coolant temperature signal	T						R
Fuel consumption signal	T						R
Vehicle speed signal			T				R
	R						T
Seat belt reminder signal					R		T
Headlamp switch signal					T		R
Flashing indicator signal					T		R
Engine cooling fan speed signal	T				R		
Child lock indicator signal					T		R
Door switches state signal					T		R
Key ID signal	R				T		
	T				R		
A/C compressor signal	T				R		
Tire pressure signal						T	R

CVT Models without ESP and ICC

SYSTEM DIAGRAM



INPUT/OUTPUT SIGNAL CHART

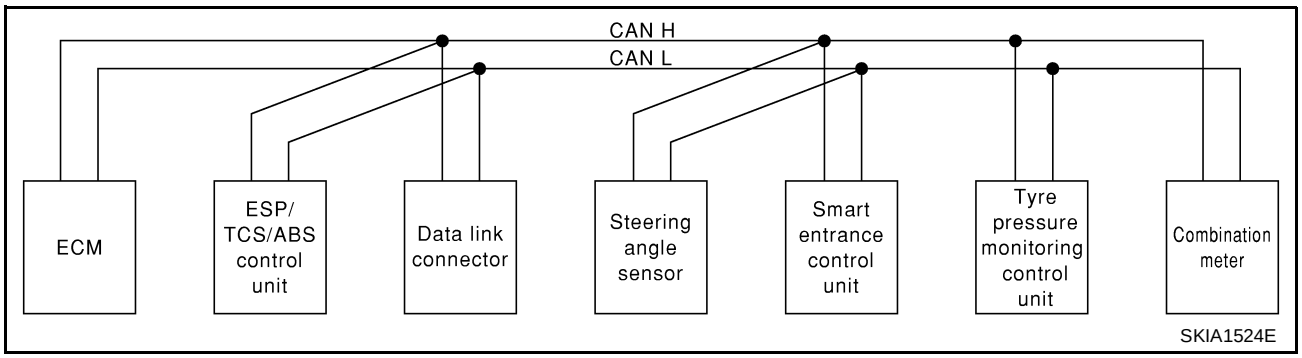
T: Transmit R: Receive

Signals	ECM	TCM	ABS actuator and electric unit (control unit)	Smart entrance control unit	Tyre pressure monitoring control unit	Combination meter
Engine speed signal	T	R				R
Stop lamp switch signal		R	T			
Rear window defogger signal	R			T		
Heater fan switch signal	R					T
Air conditioner switch signal	R					T
Primary pulley revolution signal	R	T				
Secondary pulley revolution signal	R	T				
MI signal	T					R
Current gear position signal		T				R
Engine coolant temperature signal	T					R

Signals	ECM	TCM	ABS actuator and electric unit (control unit)	Smart entrance control unit	Tyre pressure monitoring control unit	Combination meter
Fuel consumption signal	T					R
Vehicle speed signal			T			R
	R					T
Seat belt reminder signal				R		T
Headlamp switch signal				T		R
Flashing indicator signal				T		R
Engine cooling fan speed signal	T			R		
Child lock indicator signal				T		R
Door switches state signal				T		R
Key ID signal	R			T		
	T			R		
A/C compressor signal	T			R		
Tire pressure signal					T	R

M/T Models with ESP

SYSTEM DIAGRAM



INPUT/OUTPUT SIGNAL CHART

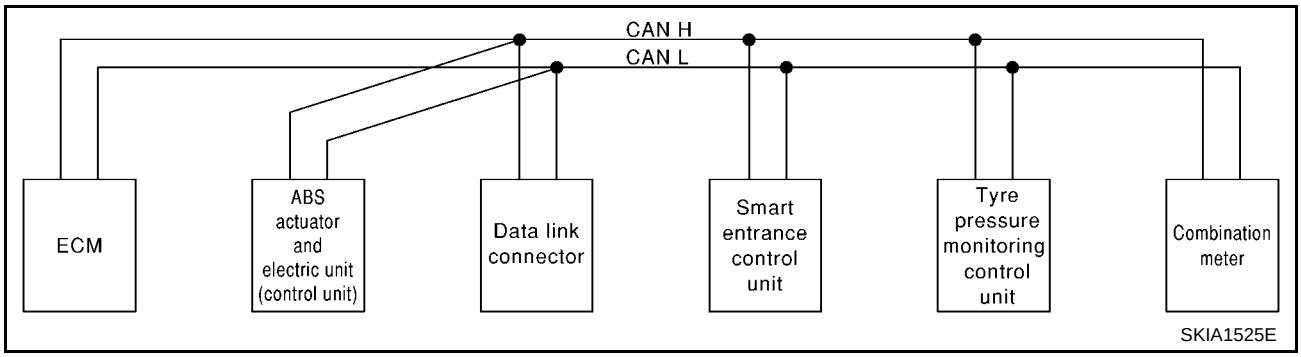
T: Transmit R: Receive

Signals	ECM	ESP/ TCS / ABS control unit	Steering angle sensor	Smart entrance control unit	Tyre pressure monitoring control unit	Combination meter
Engine speed signal	T	R				R
Accelerator pedal position signal	T	R				
ESP operation signal	R	T				
TCS operation signal	R	T				
ABS operation signal	R	T				
Steering wheel angle sensor signal		R	T			
Rear window defogger signal	R			T		
Heater fan switch signal	R					T
Air conditioner switch signal	R					T
MI signal	T					R
Engine coolant temperature signal	T					R
Fuel consumption signal	T					R

Signals	ECM	ESP/ TCS / ABS control unit	Steering angle sensor	Smart entrance control unit	Tyre pressure monitoring control unit	Combination meter
Vehicle speed signal		T				R
	R					T
Seat belt reminder signal				R		T
Headlamp switch signal				T		R
Flashing indicator signal				T		R
Engine cooling fan speed signal	T			R		
Child lock indicator signal				T		R
Door switches state signal				T		R
Key ID signal	R			T		
	T			R		
A/C compressor signal	T			R		
Tire pressure signal					T	R

M/T Models without ESP

SYSTEM DIAGRAM



INPUT/OUTPUT SIGNAL CHART

T: Transmit R: Receive

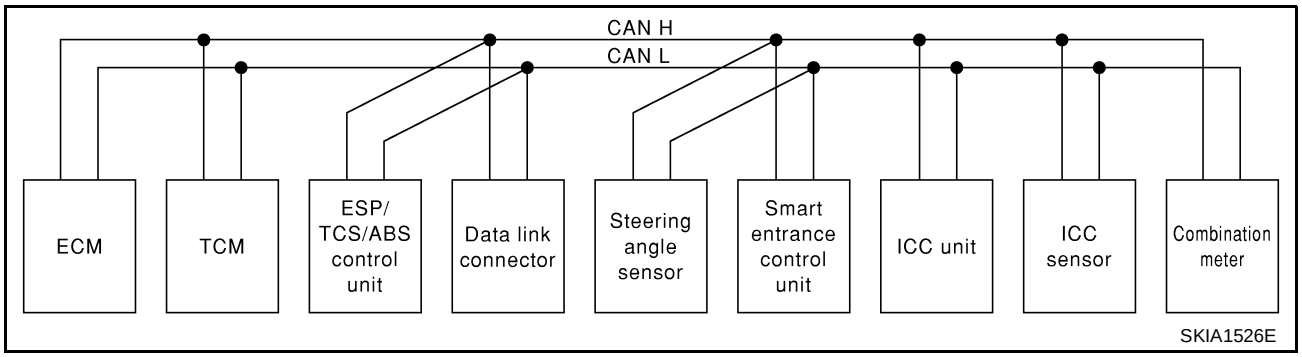
Signals	ECM	ABS actuator and electric unit (control unit)	Smart entrance control unit	Tyre pressure monitoring control unit	Combination meter
Engine speed signal	T				R
Rear window defogger signal	R		T		
Heater fan switch signal	R				T
Air conditioner switch signal	R				T
MI signal	T				R
Engine coolant temperature signal	T				R
Fuel consumption signal	T				R
Vehicle speed signal		T			R
	R				T
Seat belt reminder signal			R		T
Headlamp switch signal			T		R
Flashing indicator signal			T		R
Engine cooling fan speed signal	T		R		
Child lock indicator signal			T		R

Signals	ECM	ABS actuator and electric unit (control unit)	Smart entrance control unit	Tyre pressure monitoring control unit	Combination meter
Door switches state signal			T		R
Key ID signal	R		T		
	T		R		
A/C compressor signal	T		R		
Tire pressure signal				T	R

CAN COMMUNICATION UNIT FOR LHD MODELS WITHOUT TYRE PRESSURE MONITORING SYSTEM

CVT Models with ESP and ICC

SYSTEM DIAGRAM



INPUT/OUTPUT SIGNAL CHART

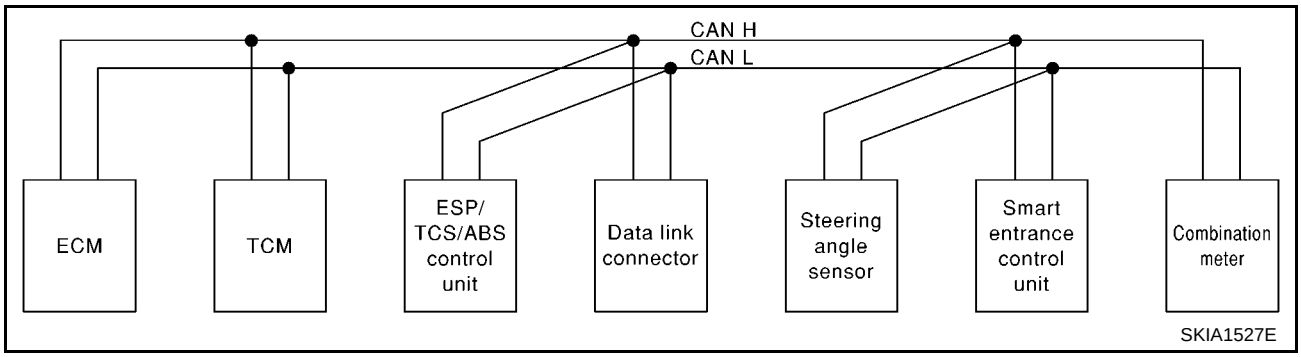
T: Transmit R: Receive

Signals	ECM	TCM	ESP/ TCS / ABS control unit	Steering angle sensor	Smart entrance control unit	ICC unit	ICC sensor	Combination meter
Engine speed signal	T	R	R			R		R
Accelerator pedal position signal	T	R	R			R		
Closed throttle position signal	T					R		
ICC steering switch signal	T					R		
Shift pattern signal		T				R		
Parking brake switch signal			T			R		
ICC system display signal						T		R
ICC sensor signal						R	T	
ESP operation signal	R		T			R		
TCS operation signal	R		T			R		
ABS operation signal	R	R	T			R		
Stop lamp switch signal		R	T					
Steering wheel angle sensor signal			R	T				
Wheel speed sensor signal			T			R		
Rear window defogger signal	R				T			
Heater fan switch signal	R							T
Air conditioner switch signal	R							T
Primary pulley revolution signal	R	T				R		
Secondary pulley revolution signal	R	T				R		
ICC operation signal	R					T		

Signals	ECM	TCM	ESP/ TCS / ABS control unit	Steering angle sensor	Smart entrance control unit	ICC unit	ICC sensor	Combination meter
Brake switch signal	R					T		
MI signal	T							R
Current gear position signal		T						R
Engine coolant temperature signal	T					R		R
Fuel consumption signal	T							R
Vehicle speed signal			T					R
	R							T
Seat belt reminder signal					R			T
Headlamp switch signal					T			R
Flashing indicator signal					T			R
Engine cooling fan speed signal	T				R			
Child lock indicator signal					T			R
Door switches state signal					T			R
Key ID signal	R				T			
	T				R			
A/C compressor signal	T				R			

CVT Models with ESP without ICC

SYSTEM DIAGRAM



INPUT/OUTPUT SIGNAL CHART

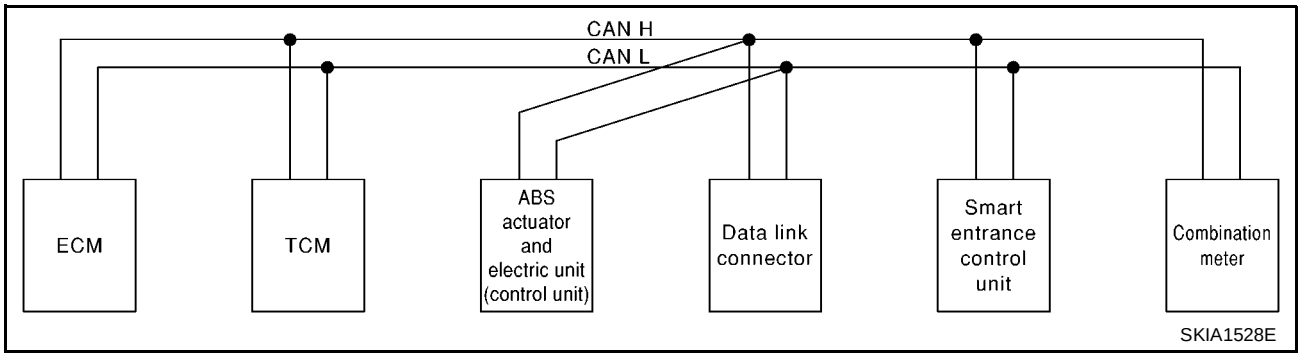
T: Transmit R: Receive

Signals	ECM	TCM	ESP/ TCS / ABS control unit	Steering angle sensor	Smart entrance control unit	Combination meter
Engine speed signal	T	R	R			R
Accelerator pedal position signal	T	R	R			
ESP operation signal	R		T			
TCS operation signal	R		T			
ABS operation signal	R	R	T			
Stop lamp switch signal		R	T			
Steering wheel angle sensor signal			R	T		
Rear window defogger signal	R				T	
Heater fan switch signal	R					T
Air conditioner switch signal	R					T
Primary pulley revolution signal	R	T				

Signals	ECM	TCM	ESP/ TCS / ABS control unit	Steering angle sensor	Smart entrance control unit	Combination meter
Secondary pulley revolution signal	R	T				
MI signal	T					R
Current gear position signal		T				R
Engine coolant temperature signal	T					R
Fuel consumption signal	T					R
Vehicle speed signal			T			R
	R					T
Seat belt reminder signal					R	T
Headlamp switch signal					T	R
Flashing indicator signal					T	R
Engine cooling fan speed signal	T				R	
Child lock indicator signal					T	R
Door switches state signal					T	R
Key ID signal	R				T	
	T				R	
A/C compressor signal	T				R	

CVT Models without ESP and ICC

SYSTEM DIAGRAM



INPUT/OUTPUT SIGNAL CHART

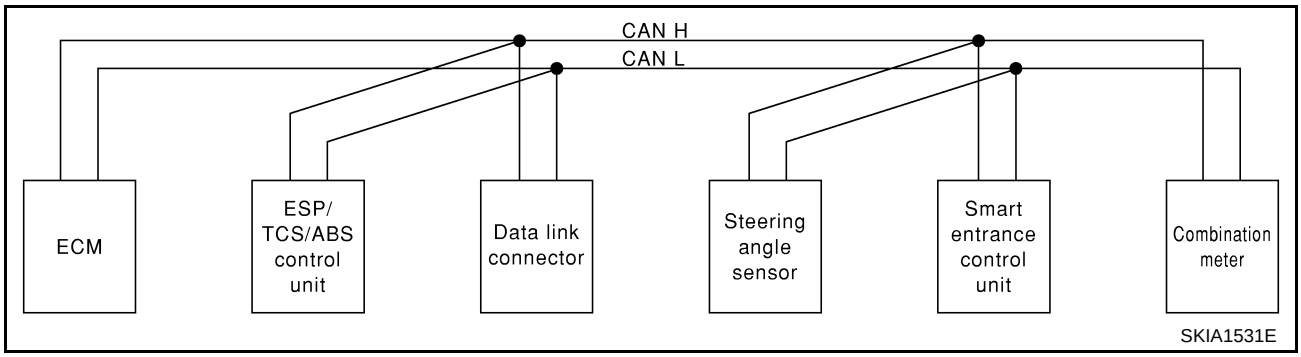
T: Transmit R: Receive

Signals	ECM	TCM	ABS actuator and electric unit (control unit)	Smart entrance control unit	Combination meter
Engine speed signal	T	R			R
Stop lamp switch signal		R	T		
Rear window defogger signal	R			T	
Heater fan switch signal	R				T
Air conditioner switch signal	R				T
Primary pulley revolution signal	R	T			
Secondary pulley revolution signal	R	T			
MI signal	T				R
Current gear position signal		T			R
Engine coolant temperature signal	T				R
Fuel consumption signal	T				R

Signals	ECM	TCM	ABS actuator and electric unit (control unit)	Smart entrance control unit	Combination meter
Vehicle speed signal			T		R
	R				T
Seat belt reminder signal				R	T
Headlamp switch signal				T	R
Flashing indicator signal				T	R
Engine cooling fan speed signal	T			R	
Child lock indicator signal				T	R
Door switches state signal				T	R
Key ID signal	R			T	
	T			R	
A/C compressor signal	T			R	

M/T Models with ESP

SYSTEM DIAGRAM



INPUT/OUTPUT SIGNAL CHART

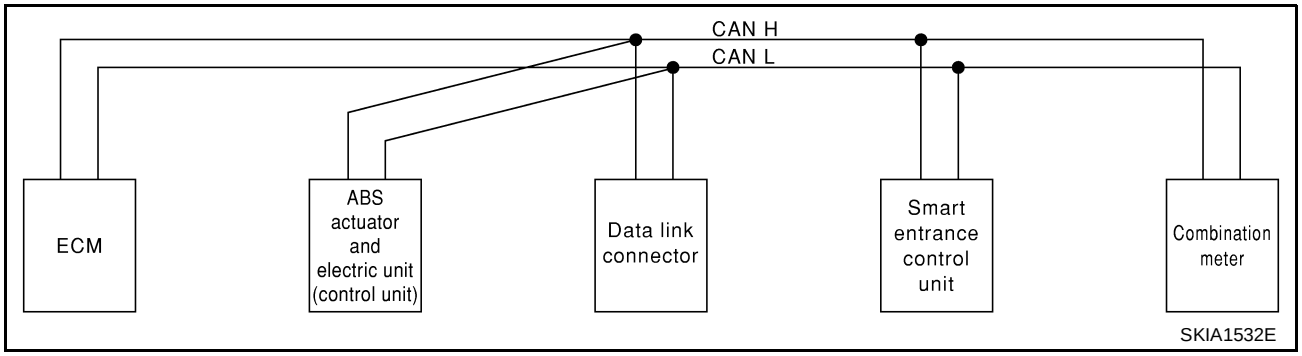
T: Transmit R: Receive

Signals	ECM	ESP/ TCS / ABS control unit	Steering angle sensor	Smart entrance control unit	Combination meter
Engine speed signal	T	R			R
Accelerator pedal position signal	T	R			
ESP operation signal	R	T			
TCS operation signal	R	T			
ABS operation signal	R	T			
Steering wheel angle sensor signal		R	T		
Rear window defogger signal	R			T	
Heater fan switch signal	R				T
Air conditioner switch signal	R				T
MI signal	T				R
Engine coolant temperature signal	T				R
Fuel consumption signal	T				R
Vehicle speed signal		T			R
	R				T
Seat belt reminder signal				R	T
Headlamp switch signal				T	R

Signals	ECM	ESP/ TCS / ABS control unit	Steering angle sensor	Smart entrance control unit	Combination meter
Flashing indicator signal				T	R
Engine cooling fan speed signal	T			R	
Child lock indicator signal				T	R
Door switches state signal				T	R
Key ID signal	R			T	
	T			R	
A/C compressor signal	T			R	

M/T Models without ESP

SYSTEM DIAGRAM



INPUT/OUTPUT SIGNAL CHART

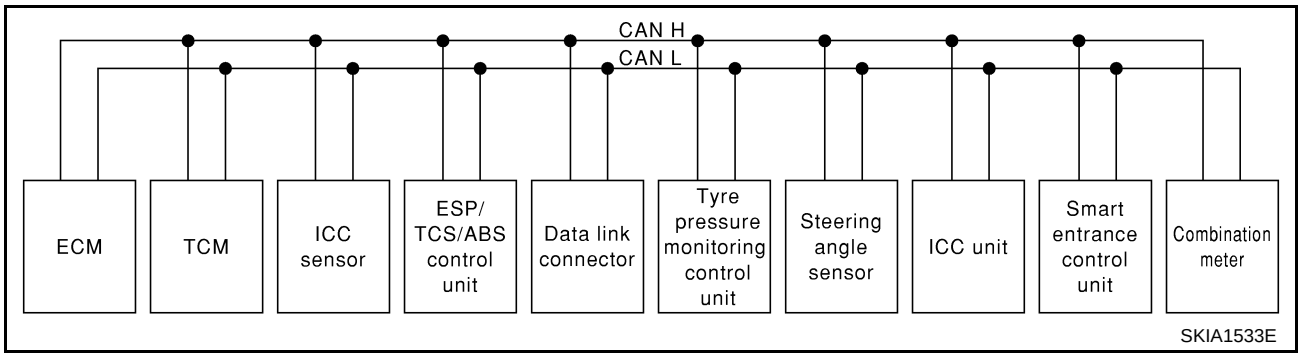
T: Transmit R: Receive

Signals	ECM	ABS actuator and electric unit (control unit)	Smart entrance control unit	Combination meter
Engine speed signal	T			R
Rear window defogger signal	R		T	
Heater fan switch signal	R			T
Air conditioner switch signal	R			T
MI signal	T			R
Engine coolant temperature signal	T			R
Fuel consumption signal	T			R
Vehicle speed signal		T		R
	R			T
Seat belt reminder signal			R	T
Headlamp switch signal			T	R
Flashing indicator signal			T	R
Engine cooling fan speed signal	T		R	
Child lock indicator signal			T	R
Door switches state signal			T	R
Key ID signal	R		T	
	T		R	
A/C compressor signal	T		R	

CAN COMMUNICATION UNIT FOR RHD MODELS WITH TYRE PRESSURE MONITORING SYSTEM

CVT Models with ESP and ICC

SYSTEM DIAGRAM



INPUT/OUTPUT SIGNAL CHART

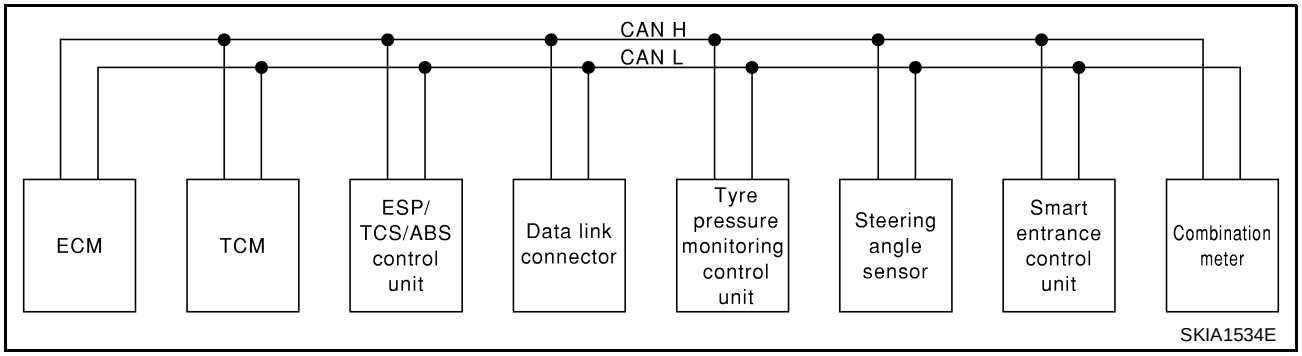
T: Transmit R: Receive

Signals	ECM	TCM	ICC sensor	ESP/ TCS / ABS control unit	Tyre pressure monitoring control unit	Steering angle sensor	ICC unit	Smart entrance control unit	Combination meter
Engine speed signal	T	R		R			R		R
Accelerator pedal position signal	T	R		R			R		
Closed throttle position signal	T						R		
ICC steering switch signal	T						R		
Shift pattern signal		T					R		
Parking brake switch signal				T			R		
ICC system display signal							T		
ICC sensor signal			T				R		
ESP operation signal	R			T			R		
TCS operation signal	R			T			R		
ABS operation signal	R	R		T			R		
Stop lamp switch signal		R		T					
Steering wheel angle sensor signal				R		T			
Wheel speed sensor signal				T			R		
Rear window defogger signal	R							T	
Heater fan switch signal	R								T
Air conditioner switch signal	R								T
Primary pulley revolution signal	R	T					R		
Secondary pulley revolution signal	R	T					R		
ICC operation signal	R						T		
Brake switch signal	R						T		
MI signal	T								R
Current gear position signal		T							R
Engine coolant temperature signal	T						R		R
Fuel consumption signal	T								R
Vehicle speed signal				T					R
	R								T

Signals	ECM	TCM	ICC sensor	ESP/ TCS / ABS control unit	Tyre pressure monitoring control unit	Steering angle sensor	ICC unit	Smart entrance control unit	Combination meter
Seat belt reminder signal								R	T
Headlamp switch signal								T	R
Flashing indicator signal								T	R
Engine cooling fan speed signal	T							R	
Child lock indicator signal								T	R
Door switches state signal								T	R
Key ID signal	R							T	
	T							R	
A/C compressor signal	T							R	
Tire pressure signal					T				R

CVT Models with ESP without ICC

SYSTEM DIAGRAM



INPUT/OUTPUT SIGNAL CHART

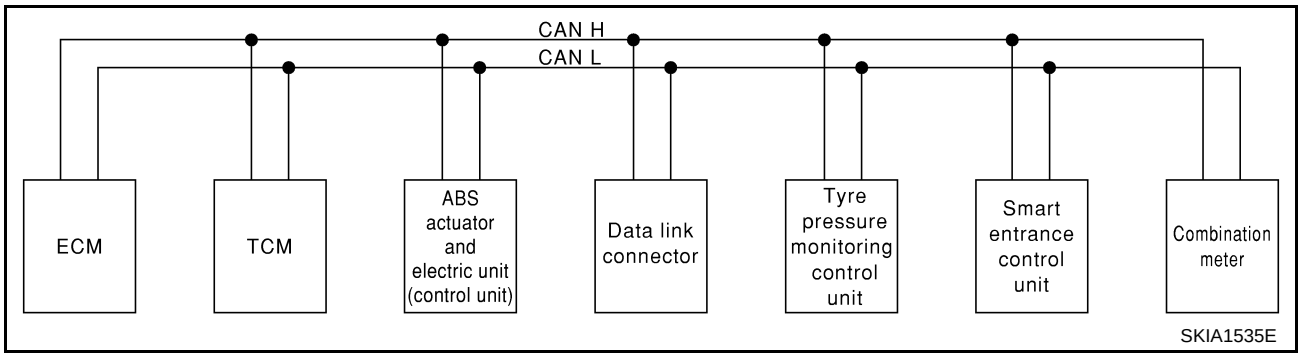
T: Transmit R: Receive

Signals	ECM	TCM	ESP/ TCS / ABS control unit	Tyre pressure monitoring control unit	Steering angle sensor	Smart entrance control unit	Combination meter
Engine speed signal	T	R	R				R
Accelerator pedal position signal	T	R	R				
ESP operation signal	R		T				
TCS operation signal	R		T				
ABS operation signal	R	R	T				
Stop lamp switch signal		R	T				
Steering wheel angle sensor signal			R		T		
Rear window defogger signal	R					T	
Heater fan switch signal	R						T
Air conditioner switch signal	R						T
Primary pulley revolution signal	R	T					
Secondary pulley revolution signal	R	T					
MI signal	T						R
Current gear position signal		T					R

Signals	ECM	TCM	ESP/ TCS / ABS control unit	Tyre pressure monitoring control unit	Steering angle sensor	Smart entrance control unit	Combination meter
Engine coolant temperature	T						R
Fuel consumption signal	T						R
Vehicle speed signal			T				R
	R						T
Seat belt reminder signal						R	T
Headlamp switch signal						T	R
Flashing indicator signal						T	R
Engine cooling fan speed signal	T					R	
Child lock indicator signal						T	R
Door switches state signal						T	R
Key ID signal	R					T	
	T					R	
A/C compressor signal	T					R	
Tire pressure signal				T			R

CVT Models without ESP and ICC

SYSTEM DIAGRAM



INPUT/OUTPUT SIGNAL CHART

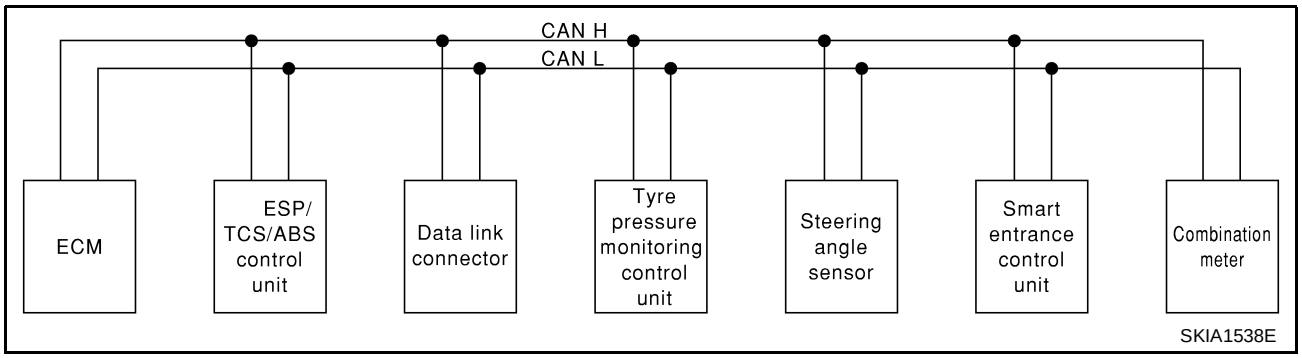
T: Transmit R: Receive

Signals	ECM	TCM	ABS actuator and electric unit (control unit)	Tyre pressure monitoring control unit	Smart entrance control unit	Combination meter
Engine speed signal	T	R				R
Stop lamp switch signal		R	T			
Rear window defogger signal	R				T	
Heater fan switch signal	R					T
Air conditioner switch signal	R					T
Primary pulley revolution signal	R	T				
Secondary pulley revolution signal	R	T				
MI signal	T					R
Current gear position signal		T				R
Engine coolant temperature signal	T					R
Fuel consumption signal	T					R

Signals	ECM	TCM	ABS actuator and electric unit (control unit)	Tyre pressure monitoring control unit	Smart entrance control unit	Combination meter
Vehicle speed signal			T			R
	R					T
Seat belt reminder signal					R	T
Headlamp switch signal					T	R
Flashing indicator signal					T	R
Engine cooling fan speed signal	T				R	
Child lock indicator signal					T	R
Door switches state signal					T	R
Key ID signal	R				T	
	T				R	
A/C compressor signal	T				R	
Tire pressure signal				T		R

M/T Models with ESP

SYSTEM DIAGRAM



INPUT/OUTPUT SIGNAL CHART

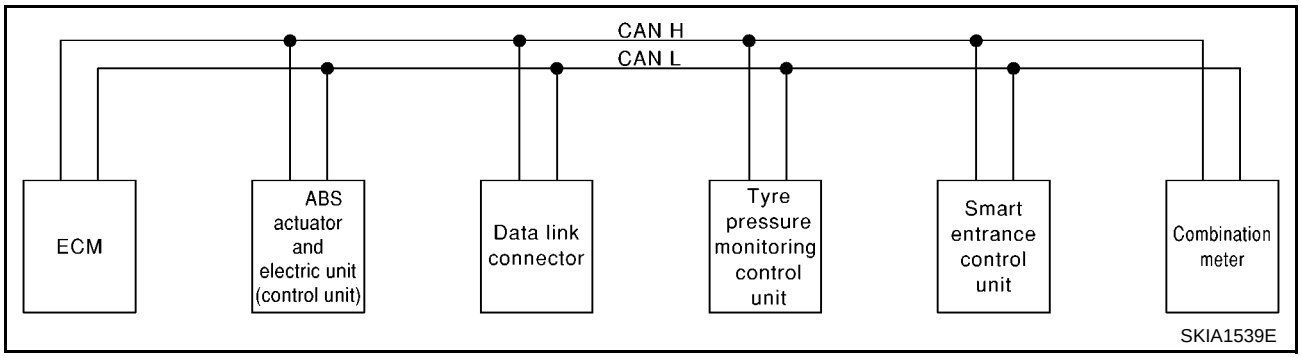
T: Transmit R: Receive

Signals	ECM	ESP/ TCS / ABS control unit	Tyre pressure monitoring control unit	Steering angle sensor	Smart entrance control unit	Combination meter
Engine speed signal	T	R				R
Accelerator pedal position signal	T	R				
ESP operation signal	R	T				
TCS operation signal	R	T				
ABS operation signal	R	T				
Steering wheel angle sensor signal		R		T		
Rear window defogger signal	R				T	
Heater fan switch signal	R					T
Air conditioner switch signal	R					T
MI signal	T					R
Engine coolant temperature signal	T					R
Fuel consumption signal	T					R
Vehicle speed signal		T				R
	R					T

Signals	ECM	ESP/ TCS / ABS control unit	Tyre pressure monitoring control unit	Steering angle sensor	Smart entrance control unit	Combination meter
Seat belt reminder signal					R	T
Headlamp switch signal					T	R
Flashing indicator signal					T	R
Engine cooling fan speed signal	T				R	
Child lock indicator signal					T	R
Door switches state signal					T	R
Key ID signal	R				T	
	T				R	
A/C compressor signal	T				R	
Tire pressure signal			T			R

M/T Models without ESP

SYSTEM DIAGRAM



INPUT/OUTPUT SIGNAL CHART

T: Transmit R: Receive

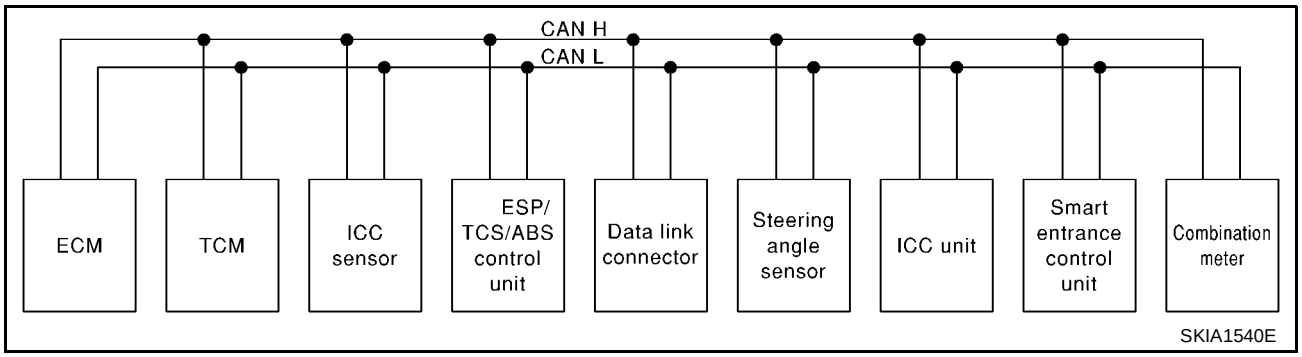
Signals	ECM	ABS actuator and electric unit (control unit)	Tyre pressure monitoring control unit	Smart entrance control unit	Combination meter
Engine speed signal	T				R
Rear window defogger signal	R			T	
Heater fan switch signal	R				T
Air conditioner switch signal	R				T
MI signal	T				R
Engine coolant temperature signal	T				R
Fuel consumption signal	T				R
Vehicle speed signal		T			R
	R				T
Seat belt reminder signal				R	T
Headlamp switch signal				T	R
Flashing indicator signal				T	R
Engine cooling fan speed signal	T			R	
Child lock indicator signal				T	R
Door switches state signal				T	R

Signals	ECM	ABS actuator and electric unit (control unit)	Tyre pressure monitoring control unit	Smart entrance control unit	Combination meter
Key ID signal	R			T	
	T			R	
A/C compressor signal	T			R	
Tire pressure signal			T		R

CAN COMMUNICATION UNIT FOR RHD MODELS WITHOUT TYRE PRESSURE MONITORING SYSTEM

CVT Models with ESP and ICC

SYSTEM DIAGRAM



INPUT/OUTPUT SIGNAL CHART

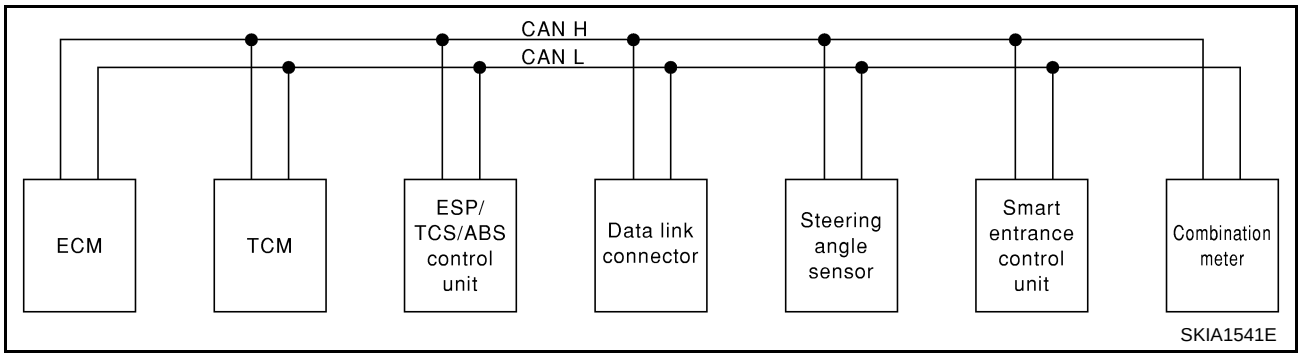
T: Transmit R: Receive

Signals	ECM	TCM	ICC sensor	ESP/ TCS / ABS control unit	Steering angle sensor	ICC unit	Smart entrance control unit	Combination meter
Engine speed signal	T	R		R		R		R
Accelerator pedal position signal	T	R		R		R		
Closed throttle position signal	T					R		
ICC steering switch signal	T					R		
Shift pattern signal		T				R		
Parking brake switch signal				T		R		
ICC system display signal						T		R
ICC sensor signal			T			R		
ESP operation signal	R			T		R		
TCS operation signal	R			T		R		
ABS operation signal	R	R		T		R		
Stop lamp switch signal		R		T				
Steering wheel angle sensor signal				R	T			
Wheel speed sensor signal				T		R		
Rear window defogger signal	R						T	
Heater fan switch signal	R							T
Air conditioner switch signal	R							T
Primary pulley revolution signal	R	T				R		
Secondary pulley revolution signal	R	T				R		
ICC operation signal	R					T		

Signals	ECM	TCM	ICC sensor	ESP/ TCS / ABS control unit	Steering angle sensor	ICC unit	Smart entrance control unit	Combination meter
Brake switch signal	R					T		
MI signal	T							R
Current gear position signal		T						R
Engine coolant temperature signal	T					R		R
Fuel consumption signal	T							R
Vehicle speed signal				T				R
	R							T
Seat belt reminder signal							R	T
Headlamp switch signal							T	R
Flashing indicator signal							T	R
Engine cooling fan speed signal	T						R	
Child lock indicator signal							T	R
Door switches state signal							T	R
Key ID signal	R						T	
	T						R	
A/C compressor signal	T						R	

CVT Models with ESP without ICC

SYSTEM DIAGRAM



INPUT/OUTPUT SIGNAL CHART

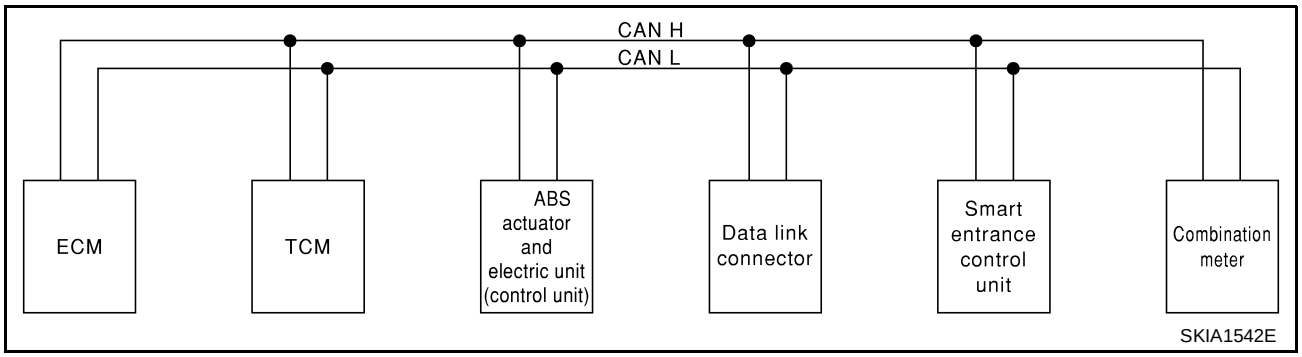
T: Transmit R: Receive

Signals	ECM	TCM	ESP/ TCS / ABS control unit	Steering angle sensor	Smart entrance control unit	Combination meter
Engine speed signal	T	R	R			R
Accelerator pedal position signal	T	R	R			
ESP operation signal	R		T			
TCS operation signal	R		T			
ABS operation signal	R	R	T			
Stop lamp switch signal		R	T			
Steering wheel angle sensor signal			R	T		
Rear window defogger signal	R				T	
Heater fan switch signal	R					T
Air conditioner switch signal	R					T

Signals	ECM	TCM	ESP/TCS / ABS control unit	Steering angle sensor	Smart entrance control unit	Combination meter
Primary pulley revolution signal	R	T				
Secondary pulley revolution signal	R	T				
MI signal	T					R
Current gear position signal		T				R
Engine coolant temperature signal	T					R
Fuel consumption signal	T					R
Vehicle speed signal			T			R
	R					T
Seat belt reminder signal					R	T
Headlamp switch signal					T	R
Flashing indicator signal					T	R
Engine cooling fan speed signal	T				R	
Child lock indicator signal					T	R
Door switches state signal					T	R
Key ID signal	R				T	
	T				R	
A/C compressor signal	T				R	

CVT Models without ESP and ICC

SYSTEM DIAGRAM



INPUT/OUTPUT SIGNAL CHART

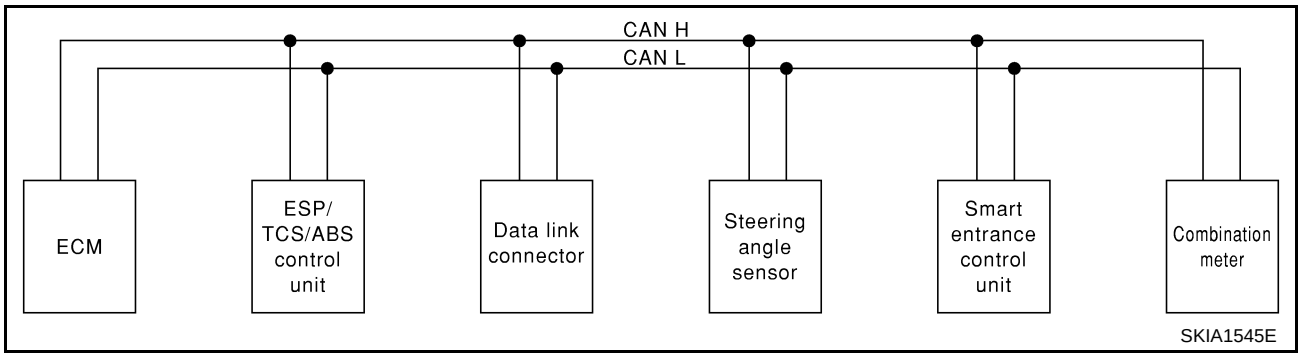
T: Transmit R: Receive

Signals	ECM	TCM	ABS actuator and electric unit (control unit)	Smart entrance control unit	Combination meter
Engine speed signal	T	R			R
Stop lamp switch signal		R	T		
Rear window defogger signal	R			T	
Heater fan switch signal	R				T
Air conditioner switch signal	R				T
Primary pulley revolution signal	R	T			
Secondary pulley revolution signal	R	T			
MI signal	T				R
Current gear position signal		T			R
Engine coolant temperature signal	T				R

Signals	ECM	TCM	ABS actuator and electric unit (control unit)	Smart entrance control unit	Combination meter
Fuel consumption signal	T				R
Vehicle speed signal			T		R
	R				T
Seat belt reminder signal				R	T
Headlamp switch signal				T	R
Flashing indicator signal				T	R
Engine cooling fan speed signal	T			R	
Child lock indicator signal				T	R
Door switches state signal				T	R
Key ID signal	R			T	
	T			R	
A/C compressor signal	T			R	

M/T Models with ESP

SYSTEM DIAGRAM



INPUT/OUTPUT SIGNAL CHART

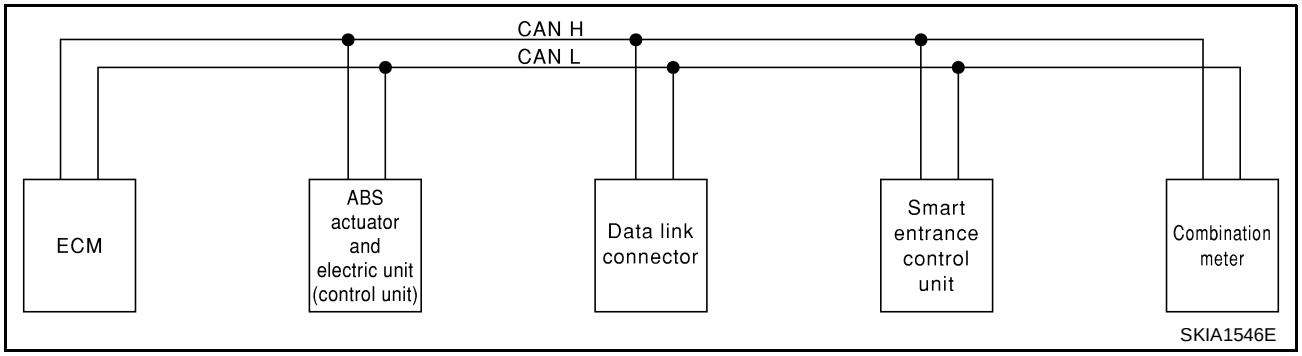
T: Transmit R: Receive

Signals	ECM	ESP/ TCS / ABS control unit	Steering angle sensor	Smart entrance control unit	Combina-tion meter
Engine speed signal	T	R			R
Accelerator pedal position signal	T	R			
ESP operation signal	R	T			
TCS operation signal	R	T			
ABS operation signal	R	T			
Steering wheel angle sensor signal		R	T		
Rear window defogger signal	R			T	
Heater fan switch signal	R				T
Air conditioner switch signal	R				T
MI signal	T				R
Engine coolant temperature signal	T				R
Fuel consumption signal	T				R
Vehicle speed signal		T			R
	R				T
Seat belt reminder signal				R	T
Headlamp switch signal				T	R

Signals	ECM	ESP/ TCS / ABS control unit	Steering angle sensor	Smart entrance control unit	Combination meter
Flashing indicator signal				T	R
Engine cooling fan speed signal	T			R	
Child lock indicator signal				T	R
Door switches state signal				T	R
Key ID signal	R			T	
	T			R	
A/C compressor signal	T			R	

M/T Models without ESP

SYSTEM DIAGRAM



INPUT/OUTPUT SIGNAL CHART

T: Transmit R: Receive

Signals	ECM	ABS actuator and electric unit (control unit)	Smart entrance control unit	Combination meter
Engine speed signal	T			R
Rear window defogger signal	R		T	
Heater fan switch signal	R			T
Air conditioner switch signal	R			T
MI signal	T			R
Engine coolant temperature signal	T			R
Fuel consumption signal	T			R
Vehicle speed signal		T		R
	R			T
Seat belt reminder signal			R	T
Headlamp switch signal			T	R
Flashing indicator signal			T	R
Engine cooling fan speed signal	T		R	
Child lock indicator signal			T	R
Door switches state signal			T	R
Key ID signal	R		T	
	T		R	
A/C compressor signal	T		R	

BASIC SERVICE PROCEDURE

PFP:00018

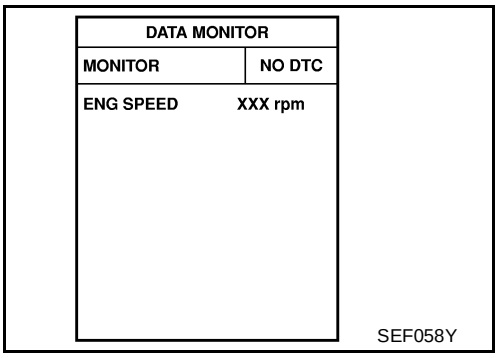
Idle Speed and Ignition Timing Check

EBS00F1L

IDLE SPEED

With CONSULT-II

Check idle speed in “DATA MONITOR” mode with CONSULT-II.



With GST

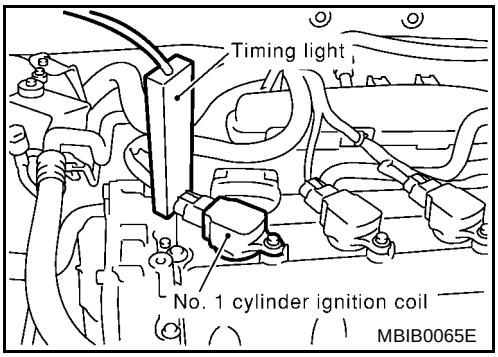
Check idle speed in "MODE 1" with GST.

IGNITION TIMING

Any of following two methods may be used.

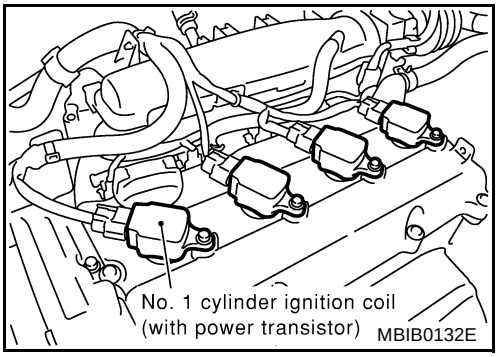
Method A

1. Slide the harness protector of ignition coil No.1 to clear the wires.
2. Attach timing light to the wires as shown in the figure.
3. Check ignition timing.

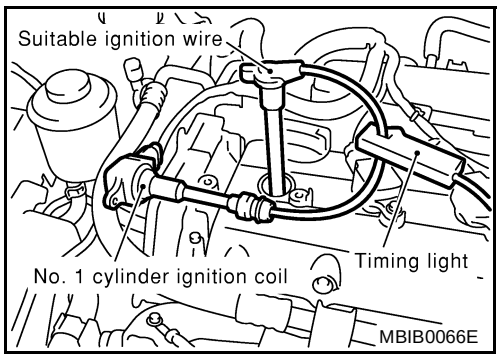


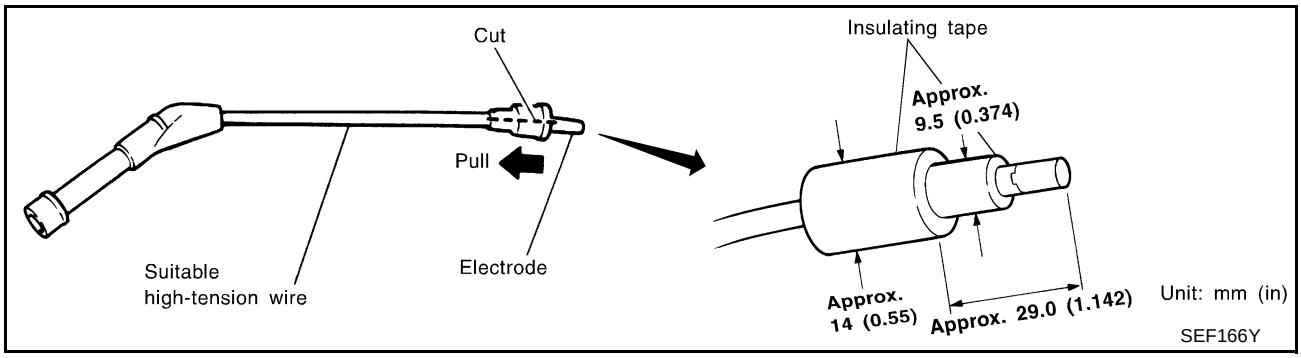
Method B

1. Remove No. 1 ignition coil.

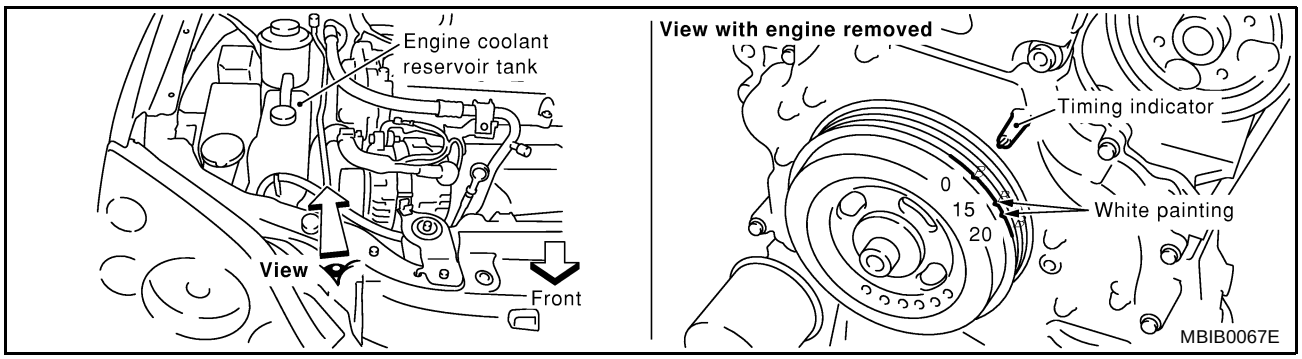


2. Connect No. 1 ignition coil and No. 1 spark plug with suitable high-tension wire as shown, and attach timing light clamp to this wire.





3. Check ignition timing.



Accelerator Pedal Released Position Learning

EBS00F1N

DESCRIPTION

"Accelerator Pedal Released Position Learning" is an operation to learn the fully released position of the accelerator pedal by monitoring the accelerator pedal position sensor output signal. It must be performed each time harness connector of accelerator pedal position sensor or ECM is disconnected.

OPERATION PROCEDURE

1. Make sure that accelerator pedal is fully released.
2. Turn ignition switch "ON" and wait at least 2 seconds.
3. Turn ignition switch "OFF" wait at least 10 seconds.
4. Turn ignition switch "ON" and wait at least 2 seconds.
5. Turn ignition switch "OFF" wait at least 10 seconds.

Throttle Valve Closed Position Learning

EBS00F1O

DESCRIPTION

"Throttle Valve Closed Position Learning" is an operation to learn the fully closed position of the throttle valve by monitoring the throttle position sensor output signal. It must be performed each time harness connector of electric throttle control actuator or ECM is disconnected.

OPERATION PROCEDURE

1. Make sure that accelerator pedal is fully released.
2. Turn ignition switch "ON".

3. Turn ignition switch “OFF” and wait at least 10 seconds.
   Make sure that throttle valve moves during above 10 seconds by confirming the operating sound.

Idle Air Volume Learning

EBS00F1P

DESCRIPTION

“Idle Air Volume Learning” is an operation to learn the idle air volume that keeps each engine within the specific range. It must be performed under any of the following conditions:

- Each time electric throttle control actuator or ECM is replaced.
- Idle speed or ignition timing is out of specification.

PREPARATION

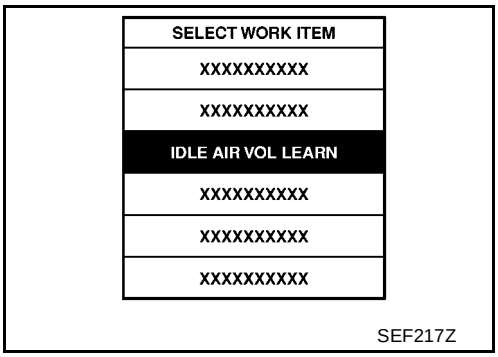
Before performing “Idle Air Volume Learning”, make sure that all of the following conditions are satisfied. Learning will be cancelled if any of the following conditions are missed for even a moment.

- Battery voltage: More than 12.9V (At idle)
- Engine coolant temperature: 70 - 95°C (158 - 203°F)
- PNP switch: ON
- Electric load switch: OFF
  (Air conditioner, headlamp, rear window defogger)
  On vehicles equipped with daytime light systems, set lighting switch to the 1st position to light only small lamps.
- Steering wheel: Neutral (Straight-ahead position)
- Vehicle speed: Stopped
- Transmission: Warmed-up
  For CVT models with CONSULT-II, drive vehicle until “FLUID TEMP SE” in “DATA MONITOR” mode of “CVT” system indicates less than 0.9V.
  For CVT models without CONSULT-II and M/T models, drive vehicle for 10 minutes.

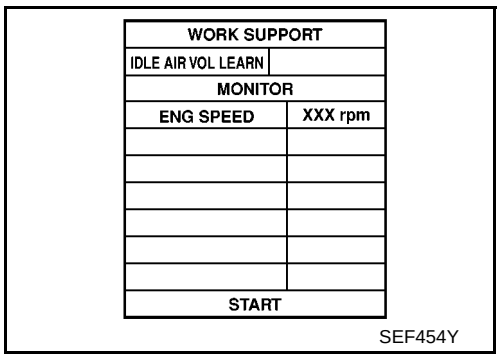
OPERATION PROCEDURE

With CONSULT-II

1. Perform EC-998, "Accelerator Pedal Released Position Learning" .
2. Perform EC-998, "Throttle Valve Closed Position Learning" .
3. Start engine and warm it up to normal operating temperature.
4. Check that all items listed under the topic “PRE-CONDITIONING” (previously mentioned) are in good order.
5. Select “IDLE AIR VOL LEARN” in “WORK SUPPORT” mode.

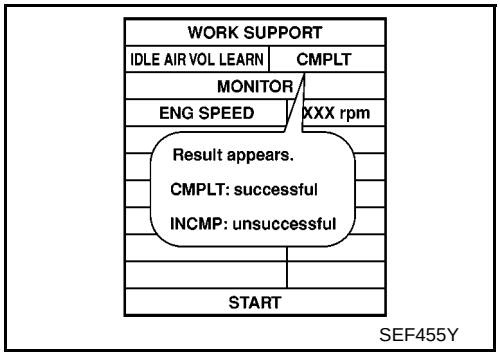


6. Touch “START” and wait 20 seconds.



SEF454Y

7. Make sure that “CMPLT” is displayed on CONSULT-II screen. If “INCMP” is displayed, “Idle Air Volume Learning” will not be carried out successfully. In this case, find the cause of the problem by referring to the “Diagnostic Procedure” below.
8. Rev up the engine two or three times and make sure that idle speed and ignition timing are within the specifications.



SEF455Y

ITEM	SPECIFICATION
Idle speed	M/T: 600±50 rpm CVT: 650±50 rpm (in “P” or “N” position)
Ignition timing	M/T: 14±5° BTDC CVT: 15±5° BTDC (in “P” or “N” position)

Without CONSULT-II

NOTE:

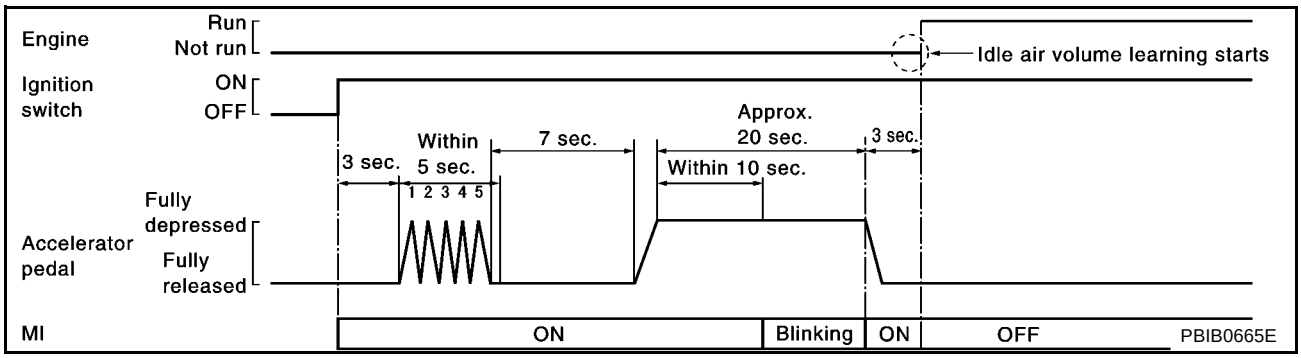
- **It is better to count the time accurately with a clock.**
- **It is impossible to switch the diagnostic mode when an accelerator pedal position sensor circuit has a malfunction.**

1. Perform EC-998, "Accelerator Pedal Released Position Learning" .
2. Perform EC-998, "Throttle Valve Closed Position Learning" .
3. Start engine and warm it up to normal operating temperature.
4. Check that all items listed under the topic “PRE-CONDITIONING” (previously mentioned) are in good order.
5. Turn ignition switch “OFF” and wait at least 10 seconds.
6. Confirm that accelerator pedal is fully released, turn ignition switch “ON” and wait 3 seconds.
7. Repeat the following procedure quickly five times within 5 seconds.

a. Fully depress the accelerator pedal.
b. Fully release the accelerator pedal.

8. Wait 7 seconds, fully depress the accelerator pedal and keep it for approx. 20 seconds until the MI stops blinking and turned ON.
9. Fully release the accelerator pedal within 3 seconds after the MI goes off.
10. Start engine and let it idle.

11. Wait 20 seconds.



12. Rev up the engine two or three times and make sure that idle speed and ignition timing are within the specifications.

ITEM	SPECIFICATION
Idle speed	M/T: 600±50 rpm CVT: 650±50 rpm (in “P” or “N” position)
Ignition timing	M/T: 14±5° BTDC CVT: 15±5° BTDC (in “P” or “N” position)

13. If idle speed and ignition timing are not within the specification, the result will be incomplete. In this case, find the cause of the problem by referring to the “Diagnostic Procedure” below.

DIAGNOSTIC PROCEDURE

If idle air volume learning cannot be performed successfully, proceed as follows:

1. **Check that throttle valve is fully closed.**
2. **Check PCV valve operation.**
3. **Check that downstream of throttle valve is free from air leakage.**
4. **When the above three items check out OK, engine component parts and their installation condition are questionable. Check and eliminate the cause of the problem.**
   It is useful to perform EC-1072, "TROUBLE DIAGNOSIS - SPECIFICATION VALUE" .
5. **If any of the following conditions occur after the engine has started, eliminate the cause of the problem and perform “Idle air volume learning” all over again:**
   - **Engine stalls.**
   - **Erroneous idle.**

Fuel Pressure Check

EBS00F1Q

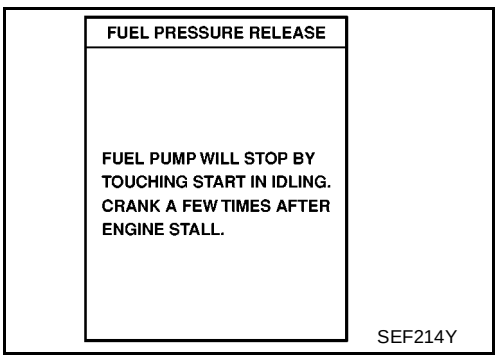
FUEL PRESSURE RELEASE

Before disconnecting fuel line, release fuel pressure from fuel line to eliminate danger.

NOTE:
Prepare pans or saucers under the disconnected fuel line because the fuel may spill out. The fuel pressure cannot be completely released because QR engine models do not have fuel return system.

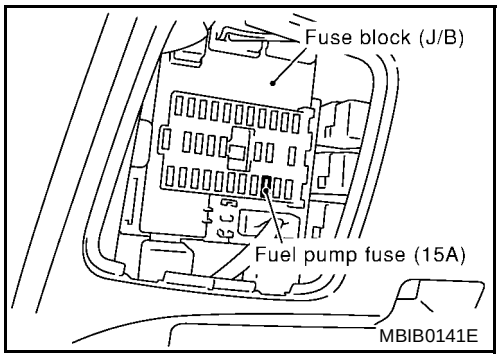
With CONSULT-II

1. Turn ignition switch “ON”.
2. Perform “FUEL PRESSURE RELEASE” in “WORK SUPPORT” mode with CONSULT-II.
3. Start engine.
4. After engine stalls, crank it two or three times to release all fuel pressure.
5. Turn ignition switch “OFF”.



Without CONSULT-II

1. Remove fuel pump fuse located in fuse box.
2. Start engine.
3. After engine stalls, crank it two or three times to release all fuel pressure.
4. Turn ignition switch “OFF”.
5. Reinstall fuel pump fuse after servicing fuel system.



FUEL PRESSURE CHECK

CAUTION:

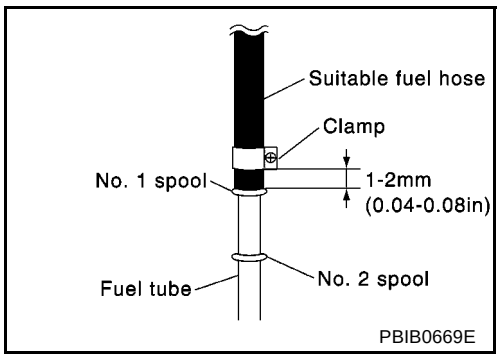
- **The fuel hose connection method used when taking fuel pressure check must not be used for other purposes.**
- **Be careful not to scratch or put debris around connection area when servicing, so that the quick connector maintains sealability with O-rings inside.**
- **When installing fuel hose quick connetor, refer to EM-116, "INTAKE MANIFOLD" .**

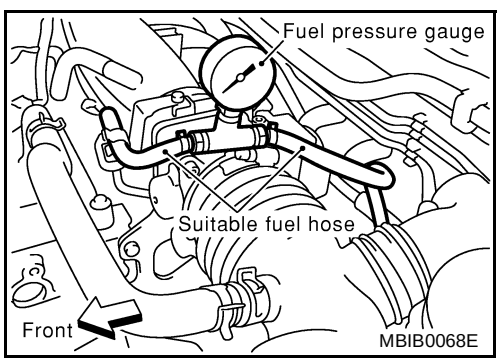
1. Release fuel pressure to zero. Refer to EC-1001, "FUEL PRESSURE RELEASE" .
2. Prepare fuel hose and fuel hose clamp for fuel pressure check, and connect fuel pressure gauge.
   - Use suitable fuel hose for fuel pressure check (genuine NISSAN fuel hose without quick connector).
   - To avoid unnecessary force or tension to hose, use moderately long fuel hose for fuel pressure check.
   - Do not use the fuel hose for checking fuel pressure with damage or cracks on it.
   - Use Pressure Gauge to check fuel pressure.
3. Remove fuel hose. Refer to EM-116, "INTAKE MANIFOLD" .
   - Do not twist or kink fuel hose because it is plastic hose.
   - Do not remove fuel hose from quick connector.
   - Keep the original fuel hose to be free from intrusion of dust or foreign substances with a suitable cover.
4. Install the fuel pressure gauge as shown in the figure.
   - Wipe off oil or dirt from hose insertion part using cloth moistened with gasoline.
   - Apply proper amount of gasoline between top of the fuel tube and No.1 spool.
   - Insert fuel hose for fuel pressure check until it touches the No.1 spool on fuel tube.
   - Use NISSAN genuine hose clamp (part number: 16439 N4710 or 16439 40U00).
   - When reconnecting fuel line, always use new clamps.
   - When reconnecting fuel hose, check the original fuel hose for damage and abnormality.
   - Use a torque driver to tighten clamps.
   - Install hose clamp to the position within 1 - 2 mm (0.04 - 0.08 in).

     Tightening torque:

     1 - 1.5 N·m (0.1 - 0.15 kg-m, 9 - 13 in-lb)

   - Make sure that clamp screw does not contact adjacent parts.
5. After connecting fuel hose for fuel pressure check, pull the hose with a force of approximately 98 N (10 kg, 22 lb) to confirm fuel tube does not come off.
6. Turn ignition switch "ON", and check for fuel leakage.





7. Start engine and check for fuel leakage.
8. Read the indication of fuel pressure gauge.
   - Do not perform fuel pressure check with system operating. Fuel pressure gauge may indicate false readings.
   - During fuel pressure check, confirm for fuel leakage from fuel connection every 3 minutes.

   At idling: Approximately 350 kPa (3.5 bar, 3.7 kg/cm^2 , 51 psi)
9. If result is unsatisfactory, go to next step.
10. Check the following.
    - Fuel hoses and fuel tubes for clogging
    - Fuel filter for clogging
    - Fuel pump
    - Fuel pressure regulator for clogging

    If OK, replace fuel pressure regulator.
    If NG, repair or replace.

ON BOARD DIAGNOSTIC (OBD) SYSTEM

PFP:00028

Introduction

EBS00F1R

The ECM has an on board diagnostic system, which detects malfunctions related to engine sensors or actuators. The ECM also records various emission-related diagnostic information including:

Emission-related diagnostic information	ISO Standard
Diagnostic Trouble Code (DTC)	Mode 3 of ISO 15031-5
Freeze Frame data	Mode 2 of ISO 15031-5
System Readiness Test (SRT) code	Mode 1 of ISO 15031-5
1st Trip Diagnostic Trouble Code (1st Trip DTC)	Mode 7 of ISO 15031-5
1st Trip Freeze Frame data	
Test values and Test limits	Mode 6 of ISO 15031-5
Calibration ID	Mode 9 of ISO 15031-5

The above information can be checked using procedures listed in the table below.

×: Applicable —: Not applicable

	DTC	1st trip DTC	Freeze Frame data	1st trip Freeze Frame data	SRT code	Test value
CONSULT-II	×	×	×	×	×	—
GST	×	×*1	×	—	×	×
ECM	×	×*2	—	—	—	—

*1: 1st trip DTCs for self-diagnoses concerning SRT items cannot be shown on the GST display.
*2: When DTC and 1st trip DTC simultaneously appear on the display, they cannot be clearly distinguished from each other.

The malfunction indicator (MI) on the instrument panel lights up when the same malfunction is detected in two consecutive trips (Two trip detection logic), or when the ECM enters fail-safe mode. (Refer to EC-1030 .)

Two Trip Detection Logic

EBS00F1S

When a malfunction is detected for the first time, 1st trip DTC and 1st trip Freeze Frame data are stored in the ECM memory. The MI will not light up at this stage. <1st trip>
If the same malfunction is detected again during the next drive, the DTC and Freeze Frame data are stored in the ECM memory, and the MI lights up. The MI lights up at the same time when the DTC is stored. <2nd trip>
The “trip” in the “Two Trip Detection Logic” means a driving mode in which self-diagnosis is performed during vehicle operation. Specific on board diagnostic items will cause the ECM to light up or blink the MI, and store DTC and Freeze Frame data, even in the 1st trip, as shown below.

×: Applicable —: Not applicable

Items	MI				DTC		1st trip DTC	
	1st trip		2nd trip		1st trip displaying	2nd trip displaying	1st trip displaying	2nd trip displaying
	Blinking	Lighting up	Blinking	Lighting up				
Misfire (Possible three way catalyst damage) — DTC: P0300 - P0304 is being detected	×	—	—	—	—	—	×	—
Misfire (Possible three way catalyst damage) — DTC: P0300 - P0304 is being detected	—	—	×	—	—	×	—	—
Fail-safe items (Refer to EC-1030 .)	—	×	—	—	×*1	—	×*1	—
Except above	—	—	—	×	—	×	×	—

*1: Except “ECM”

Emission-related Diagnostic Information

EBS00F1T

EMISSION-RELATED DIAGNOSTIC INFORMATION ITEMS

Items (CONSULT-II screen terms)	DTC*1		SRT code	Test Valve/ Test Limit (GST only)	1st trip DTC	Reference page
	CONSULT-II GST*2	ECM*3				
CAN COMM CIRCUIT	U1000	1000*6	—	—	×	EC-1083
CAN COMM CIRCUIT	U1001	1001*6	—	—	×	EC-1083
NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	**P0000**	**0000**	—	—	—	—
INT/V TIM CONT-B1	P0011	0011	—	—	×	EC-1087
HO2S1 HTR (B1)	P0031	0031	×	×	×*5	EC-1090
HO2S1 HTR (B1)	P0032	0032	×	×	×*5	EC-1090
HO2S2 HTR (B1)	P0037	0037	×	×	×*5	EC-1095
HO2S2 HTR (B1)	P0038	0038	×	×	×*5	EC-1095
MAF SEN/CIRCUIT*4	P0102	0102	—	—	—	EC-1100
MAF SEN/CIRCUIT*4	P0103	0103	—	—	—	EC-1100
IAT SEN/CIRCUIT	P0112	0112	—	—	×	EC-1106
IAT SEN/CIRCUIT	P0113	0113	—	—	×	EC-1106
ECT SEN/CIRCUIT*4	P0117	0117	—	—	—	EC-1111
ECT SEN/CIRCUIT*4	P0118	0118	—	—	—	EC-1111
IAT SENSOR	P0127	0127	—	—	×	EC-1116
HO2S1 (B1)	P0132	0132	×	×	×*5	EC-1119
HO2S1 (B1)	P0133	0133	×	×	×*5	EC-1125
HO2S1 (B1)	P0134	0134	×	×	×*5	EC-1135
HO2S2 (B1)	P0138	0138	×	×	×*5	EC-1142
HO2S2 (B1)	P0139	0139	×	×	×*5	EC-1149
FUEL SYS-LEAN-B1	P0171	0171	—	—	×	EC-1157
FUEL SYS-RICH-B1	P0172	0172	—	—	×	EC-1163
TP SENSOR*4	P0221	0221	—	—	—	EC-1169
TP SEN 1/CIRC*4	P0222	0222	—	—	—	EC-1175
TP SEN 1/CIRC*4	P0223	0223	—	—	—	EC-1175
APP SENSOR*4	P0226	0226	—	—	—	EC-1181
APP SEN 1/CIRC*4	P0227	0227	—	—	—	EC-1188
APP SEN 1/CIRC*4	P0228	0228	—	—	—	EC-1188
MULTI CYL MISFIRE	P0300	0300	—	—	×	EC-1195
CYL 1 MISFIRE	P0301	0301	—	—	×	EC-1195
CYL 2 MISFIRE	P0302	0302	—	—	×	EC-1195
CYL 3 MISFIRE	P0303	0303	—	—	×	EC-1195
CYL 4 MISFIRE	P0304	0304	—	—	×	EC-1195
KNOCK SEN/CIRC-B1	P0327	0327	—	—	×	EC-1201
KNOCK SEN/CIRC-B1	P0328	0328	—	—	×	EC-1201
CKP SEN/CIRCUIT	P0335	0335	—	—	×	EC-1205

Items (CONSULT-II screen terms)	DTC*1		SRT code	Test Valve/ Test Limit (GST only)	1st trip DTC	Reference page
	CONSULT-II GST*2	ECM*3				
CMP SEN/CIRC-B1	P0340	0340	—	—	×	EC-1212
TW CATALYST SYS-B1	P0420	0420	×	×	×*5	EC-1218
PURG VOLUME CONT/V	P0444	0444	—	—	×	EC-1222
PURG VOLUME CONT/V	P0445	0445	—	—	×	EC-1222
VEH SPEED SEN/CIRC	P0500	0500	—	—	×	EC-1228
PW ST P SEN/CIRC	P0550	0550	—	—	×	EC-1230
ECM	P0605	0605	—	—	×	EC-1235
IN PY SPD SEN/CIRC	P0715	0715	—	—	×	CVT-78
TCC SOLENOID/CIRC	P0740	0740	—	—	×	CVT-89
L/PRESS SOL/CIRC	P0745	0745	—	—	×	CVT-94
ECM BACK UP/CIRC	P1065	1065	—	—	×	EC-1238
INT/V TIM V/CIR-B1	P1111	1111	—	—	×	EC-1242
ETC ACTR*4	P1121	1121	—	—	—	EC-1246
ETC FUNCTION/CIRC*4	P1122	1122	—	—	—	EC-1248
ETC MOT PWR*4	P1124	1124	—	—	×	EC-1255
ETC MOT PWR*4	P1126	1126	—	—	—	EC-1255
ETC MOT*4	P1128	1128	—	—	—	EC-1261
HO2S1 (B1)	P1143	1143	×	×	×*5	EC-1266
HO2S1 (B1)	P1144	1144	×	×	×*5	EC-1272
HO2S2 (B1)	P1146	1146	×	×	×*5	EC-1278
HO2S2 (B1)	P1147	1147	×	×	×*5	EC-1286
TCS/CIRC*8	P1212	1212	—	—	×	EC-1294
ENG OVER TEMP	P1217	1217	—	—	×	EC-1295
TP SEN 2/CIRC*4	P1223	1223	—	—	—	EC-1312
TP SEN 2/CIRC*4	P1224	1224	—	—	—	EC-1312
CTP LEARNING	P1225	1225	—	—	×	EC-1318
CTP LEARNING	P1226	1226	—	—	×	EC-1320
APP SEN 2/CIRC*4	P1227	1227	—	—	—	EC-1322
APP SEN 2/CIRC*4	P1228	1228	—	—	—	EC-1322
SENSOR POWER/CIRC*4	P1229	1229	—	—	—	EC-1329
ASCD SW*7	P1564	1564	—	—	×	EC-1333
ACC COMMAND VALUE*7	P1568	1568	—	—	—	EC-1340
ASCD BRAKE SW*7	P1572	1572	—	—	×	EC-1341
ASCD VHL SPD SEN*7	P1574	1574	—	—	×	EC-1351
NATS MALFUNCTION	P1610 - P1615	1610 - 1615	—	—	×	EC-1016
P-N POS SW/CIRCUIT	P1706	1706	—	—	×	EC-1353
IN PULY SPEED	P1715	1715	—	—	×	
OUT PULY SPEED	P1720	1720	—	—	×	EC-1358

Items (CONSULT-II screen terms)	DTC*1		SRT code	Test Valve/ Test Limit (GST only)	1st trip DTC	Reference page
	CONSULT-II GST*2	ECM*3				
STEP MOTR CIRC	P1777	1777	—	—	×	CVT-108
STEP MOTR FNC	P1778	1778	—	—	×	CVT-111
LINE PRESS SEN	P1791	1791	—	—	×	CVT-113
BRAKE SW/CIRCUIT	P1805	1805	—	—	×	EC-1360

*1: 1st trip DTC No. is the same as DTC No.
*2: These numbers are prescribed by ISO 15031-5.
*3: In Diagnostic Test Mode II (Self-diagnostic results), these numbers are controlled by NISSAN.
*4: When the fail-safe operation occurs, the MI illuminates.
*5: These are not displayed with GST.
*6: The troubleshooting for these DTCs needs CONSULT-II.
*7: For models with ICC system.
*8: For models with ESP system.

DTC AND 1ST TRIP DTC

The 1st trip DTC (whose number is the same as the DTC number) is displayed for the latest self-diagnostic result obtained. If the ECM memory was cleared previously, and the 1st trip DTC did not reoccur, the 1st trip DTC will not be displayed.
If a malfunction is detected during the 1st trip, the 1st trip DTC is stored in the ECM memory. The MI will not light up (two trip detection logic). If the same malfunction is not detected in the 2nd trip (meeting the required driving pattern), the 1st trip DTC is cleared from the ECM memory. If the same malfunction is detected in the 2nd trip, both the 1st trip DTC and DTC are stored in the ECM memory and the MI lights up. In other words, the DTC is stored in the ECM memory and the MI lights up when the same malfunction occurs in two consecutive trips. If a 1st trip DTC is stored and a non-diagnostic operation is performed between the 1st and 2nd trips, only the 1st trip DTC will continue to be stored. For malfunctions that blink or light up the MI during the 1st trip, the DTC and 1st trip DTC are stored in the ECM memory.
Procedures for clearing the DTC and the 1st trip DTC from the ECM memory are described in EC-1015, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
For malfunctions in which 1st trip DTCs are displayed, refer to EC-1005 . These items are required by legal regulations to continuously monitor the system/component. In addition, the items monitored non-continuously are also displayed on CONSULT-II.
1st trip DTC is specified in Mode 7 of ISO 15031-5. 1st trip DTC detection occurs without lighting up the MI and therefore does not warn the driver of a problem. However, 1st trip DTC detection will not prevent the vehicle from being tested, for example during Inspection/Maintenance (I/M) tests.
When a 1st trip DTC is detected, check, print out or write down and erase (1st trip) DTC and Freeze Frame data as specified in “Work Flow” procedure Step II, refer to EC-1026 . Then perform “DTC Confirmation Procedure” or “Overall Function Check” to try to duplicate the problem. If the malfunction is duplicated, the item requires repair.

How to Read DTC and 1st Trip DTC

DTC and 1st trip DTC can be read by the following methods.

With CONSULT-II

With GST

CONSULT-II or GST (Generic Scan Tool) Examples: P0340, P0740, P0745, etc.
These DTCs are prescribed by ISO 15031-5.
(CONSULT-II also displays the malfunctioning component or system.)

No Tools

The number of blinks of the MI in the Diagnostic Test Mode II (Self-Diagnostic Results) indicates the DTC. Example: 0102, 0340 etc.
These DTCs are controlled by NISSAN.

- **1st trip DTC No. is the same as DTC No.**
- **Output of a DTC indicates a malfunction. However, GST or the Diagnostic Test Mode II do not indicate whether the malfunction is still occurring or has occurred in the past and has returned to normal. CONSULT-II can identify malfunction status as shown below. Therefore, using CONSULT-II (if available) is recommended.**

A sample of CONSULT-II display for DTC and 1st trip DTC is shown below. DTC or 1st trip DTC of a malfunction is displayed in SELF-DIAGNOSTIC RESULTS mode of CONSULT-II. Time data indicates how many times the vehicle was driven after the last detection of a DTC.
If the DTC is being detected currently, the time data will be “0”.
If a 1st trip DTC is stored in the ECM, the time data will be “[1t]”.

DTC display

SELF DIAG RESULTS	
DTC RESULTS	TIME
CKP SEN/CIRCUIT [P0335]	0

1st trip DTC display

SELF DIAG RESULTS	
DTC RESULTS	TIME
CKP SEN/CIRCUIT [P0335]	1t

PBIB0911E

FREEZE FRAME DATA AND 1ST TRIP FREEZE FRAME DATA

The ECM records the driving conditions such as fuel system status, calculated load value, engine coolant temperature, short term fuel trim, long term fuel trim, engine speed, vehicle speed, base fuel schedule and intake air temperature at the moment a malfunction is detected.
Data which are stored in the ECM memory, along with the 1st trip DTC, are called 1st trip freeze frame data. The data, stored together with the DTC data, are called freeze frame data and displayed on CONSULT-II or GST. The 1st trip freeze frame data can only be displayed on the CONSULT-II screen, not on the GST. For details, see EC-1058 .
Only one set of freeze frame data (either 1st trip freeze frame data or freeze frame data) can be stored in the ECM. 1st trip freeze frame data is stored in the ECM memory along with the 1st trip DTC. There is no priority for 1st trip freeze frame data and it is updated each time a different 1st trip DTC is detected. However, once freeze frame data (2nd trip detection/MI on) is stored in the ECM memory, 1st trip freeze frame data is no longer stored. Remember, only one set of freeze frame data can be stored in the ECM. The ECM has the following priorities to update the data.

Priority	Items	
1	Freeze frame data	Misfire — DTC: P0300 - P0304 Fuel Injection System Function — DTC: P0171, P0172
2		Except the above items (Includes CVT related items)
3	1st trip freeze frame data	

For example, the EGR malfunction (Priority: 2) was detected and the freeze frame data was stored in the 2nd trip. After that when the misfire (Priority: 1) is detected in another trip, the freeze frame data will be updated from the EGR malfunction to the misfire. The 1st trip freeze frame data is updated each time a different malfunction is detected. There is no priority for 1st trip freeze frame data. However, once freeze frame data is stored in the ECM memory, 1st trip freeze data is no longer stored (because only one freeze frame data or 1st trip freeze frame data can be stored in the ECM). If freeze frame data is stored in the ECM memory and freeze frame data with the same priority occurs later, the first (original) freeze frame data remains unchanged in the ECM memory.
Both 1st trip freeze frame data and freeze frame data (along with the DTCs) are cleared when the ECM memory is erased. Procedures for clearing the ECM memory are described in EC-1015, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .

SYSTEM READINESS TEST (SRT) CODE

System Readiness Test (SRT) code is specified in Mode 1 of ISO 15031-5.
As part of an enhanced emissions test for Inspection & Maintenance (I/M), certain states require the status of SRT be used to indicate whether the ECM has completed self-diagnosis of major emission systems and components. Completion must be verified in order for the emissions inspection to proceed.
If a vehicle is rejected for a State emissions inspection due to one or more SRT items indicating “INCMP”, use the information in this Service Manual to set the SRT to “CMPLT”.
In most cases the ECM will automatically complete its self-diagnosis cycle during normal usage, and the SRT status will indicate “CMPLT” for each application system. Once set as “CMPLT”, the SRT status remains “CMPLT” until the self-diagnosis memory is erased.

Occasionally, certain portions of the self-diagnostic test may not be completed as a result of the customer's normal driving pattern; the SRT will indicate “INCMP” for these items.

NOTE:
The SRT will also indicate “INCMP” if the self-diagnosis memory is erased for any reason or if the ECM memory power supply is interrupted for several hours.
If, during the state emissions inspection, the SRT indicates “CMPLT” for all test items, the inspector will continue with the emissions test. However, if the SRT indicates “INCMP” for one or more of the SRT items the vehicle is returned to the customer untested.

NOTE:
If MI is “ON” during the state emissions inspection, the vehicle is also returned to the customer untested even though the SRT indicates “CMPLT” for all test items. Therefore, it is important to check SRT (“CMPLT”) and DTC (No DTCs) before the inspection.

SRT Item

The table below shows required self-diagnostic items to set the SRT to “CMPLT”.

SRT item (CONSULT-II indication)	Performance Priority*	Required self-diagnostic items to set the SRT to “CMPLT”	Corresponding DTC No.
CATALYST	2	Three way catalyst function	P0420
HO2S	1	Heated oxygen sensor 1	P0132
		Heated oxygen sensor 1	P0133
		Heated oxygen sensor 1	P0134
		Heated oxygen sensor 1	P1143
		Heated oxygen sensor 1	P1144
		Heated oxygen sensor 2	P0138
		Heated oxygen sensor 2	P0139
		Heated oxygen sensor 2	P1146
		Heated oxygen sensor 2	P1147
HO2S HTR	1	Heated oxygen sensor 1 heater	P0031, P0032
		Heated oxygen sensor 2 heater	P0037, P0038

*: If completion of several SRTs is required, perform driving patterns (DTC confirmation procedure), one by one based on the priority for models with CONSULT-II.

SRT Set Timing

SRT is set as “CMPLT” after self-diagnosis has been performed one or more times. Completion of SRT is done regardless of whether the result is OK or NG. The set timing is different between OK and NG results and is shown in the table below.

Self-diagnosis result		Example							
		Diagnosis	Ignition cycle						
			← ON →	OFF	← ON →	OFF	← ON →	OFF	← ON →
All OK	Case 1	P0400	OK (1)		— (1)		OK (2)		— (2)
		P0402	OK (1)		— (1)		— (1)		OK (2)
		P1402	OK (1)		OK (2)		— (2)		— (2)
		SRT of EGR	“CMPLT”		“CMPLT”		“CMPLT”		“CMPLT”
	Case 2	P0400	OK (1)		— (1)		— (1)		— (1)
		P0402	— (0)		— (0)		OK (1)		— (1)
		P1402	OK (1)		OK (2)		— (2)		— (2)
		SRT of EGR	“INCMP”		“INCMP”		“CMPLT”		“CMPLT”

Self-diagnosis result		Example				
		Diagnosis	Ignition cycle ← ON → OFF ← ON → OFF ← ON → OFF ← ON →			
NG exists	Case 3	P0400	OK	OK	—	—
		P0402	—	—	—	—
		P1402	NG	—	NG	NG (Consecutive NG)
		(1st trip) DTC	1st trip DTC	—	1st trip DTC	DTC (= MI “ON”)
		SRT of EGR	“INCMP”	“INCMP”	“INCMP”	“CMPLT”

OK: Self-diagnosis is carried out and the result is OK.
NG: Self-diagnosis is carried out and the result is NG.
—: Self-diagnosis is not carried out.

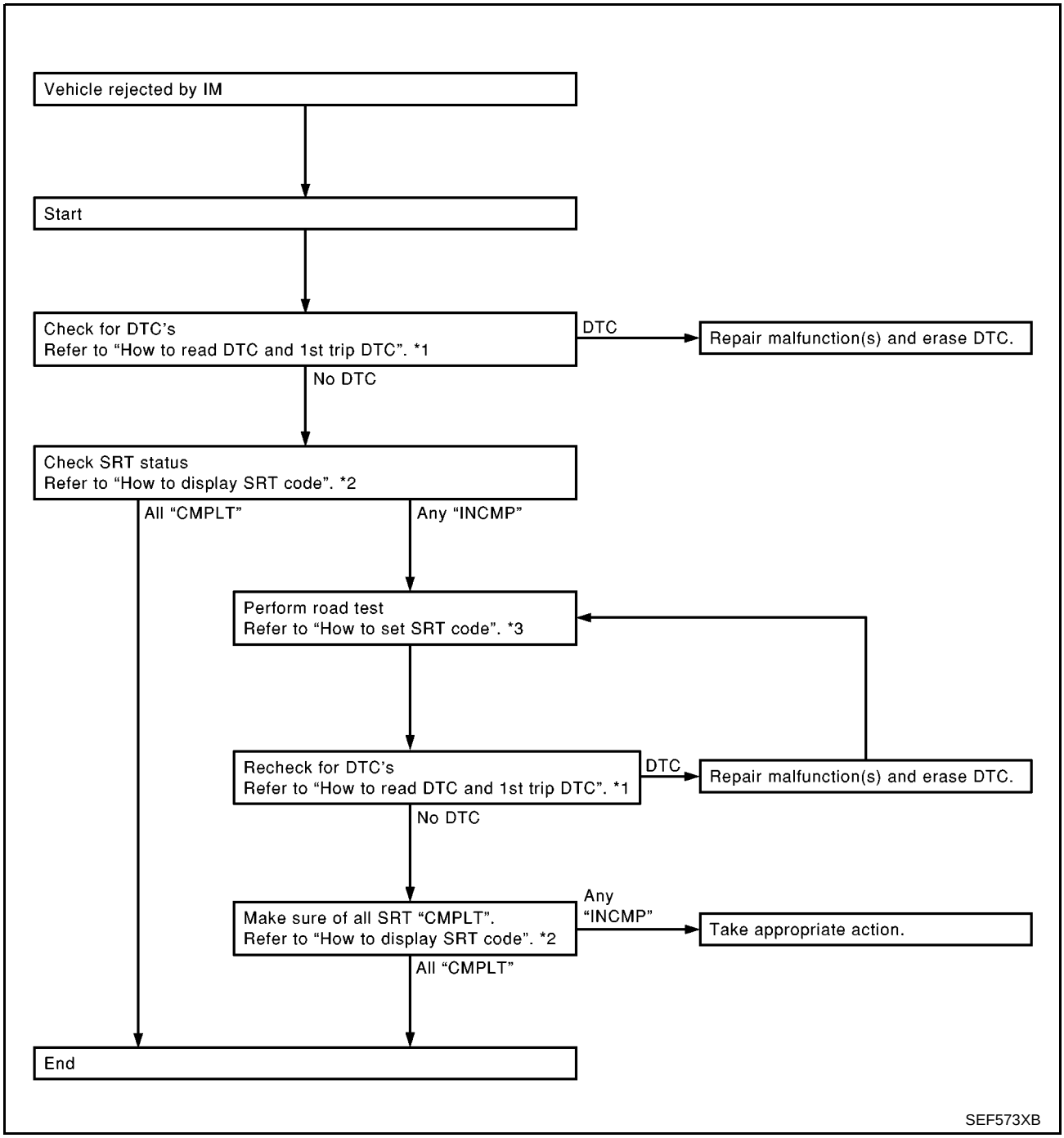
When all SRT related self-diagnoses showed OK results in a single cycle (Ignition OFF-ON-OFF), the SRT will indicate “CMPLT”. → Case 1 above
When all SRT related self-diagnoses showed OK results through several different cycles, the SRT will indicate “CMPLT” at the time the respective self-diagnoses have at least one OK result. → Case 2 above
If one or more SRT related self-diagnoses showed NG results in 2 consecutive cycles, the SRT will also indicate “CMPLT”. → Case 3 above
The table above shows that the minimum number of cycles for setting SRT as “INCMP” is one (1) for each self-diagnosis (Case 1 & 2) or two (2) for one of self-diagnoses (Case 3). However, in preparation for the state emissions inspection, it is unnecessary for each self-diagnosis to be executed twice (Case 3) for the following reasons:

- The SRT will indicate “CMPLT” at the time the respective self-diagnoses have one (1) OK result.
- The emissions inspection requires “CMPLT” of the SRT only with OK self-diagnosis results.
- When, during SRT driving pattern, 1st trip DTC (NG) is detected prior to “CMPLT” of SRT, the self-diagnosis memory must be erased from ECM after repair.
- If the 1st trip DTC is erased, all the SRT will indicate “INCMP”.

  NOTE:
  SRT can be set as “CMPLT” together with the DTC(s). Therefore, DTC check must always be carried out prior to the state emission inspection even though the SRT indicates “CMPLT”.

SRT Service Procedure

If a vehicle has failed the state emissions inspection due to one or more SRT items indicating “INCMP”, review the flowchart diagnostic sequence on the next page.



*1 EC-1007 *2 EC-1011 *3 EC-1009

How to Display SRT Code

WITH CONSULT-II

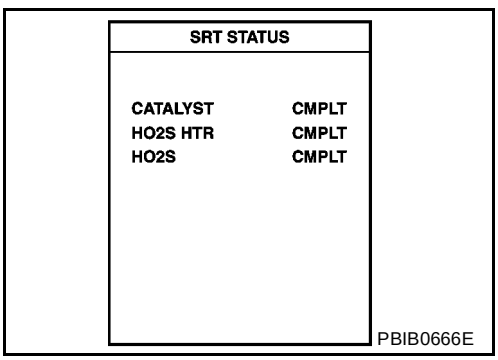
Selecting "SRT STATUS" in "DTC CONFIRMATION" mode with CONSULT-II.

For items whose SRT codes are set, a "CMPLT" is displayed on the CONSULT-II screen; for items whose SRT codes are not set, "INCMP" is displayed.

A sample of CONSULT-II display for SRT code is shown at right.

"INCMP" means the self-diagnosis is incomplete and SRT is not set.

"CMPLT" means the self-diagnosis is complete and SRT is set.



WITH GST

Selecting Mode 1 with GST (Generic Scan Tool)

How to Set SRT Code

To set all SRT codes, self-diagnosis for the items indicated above must be performed one or more times. Each diagnosis may require a long period of actual driving under various conditions.

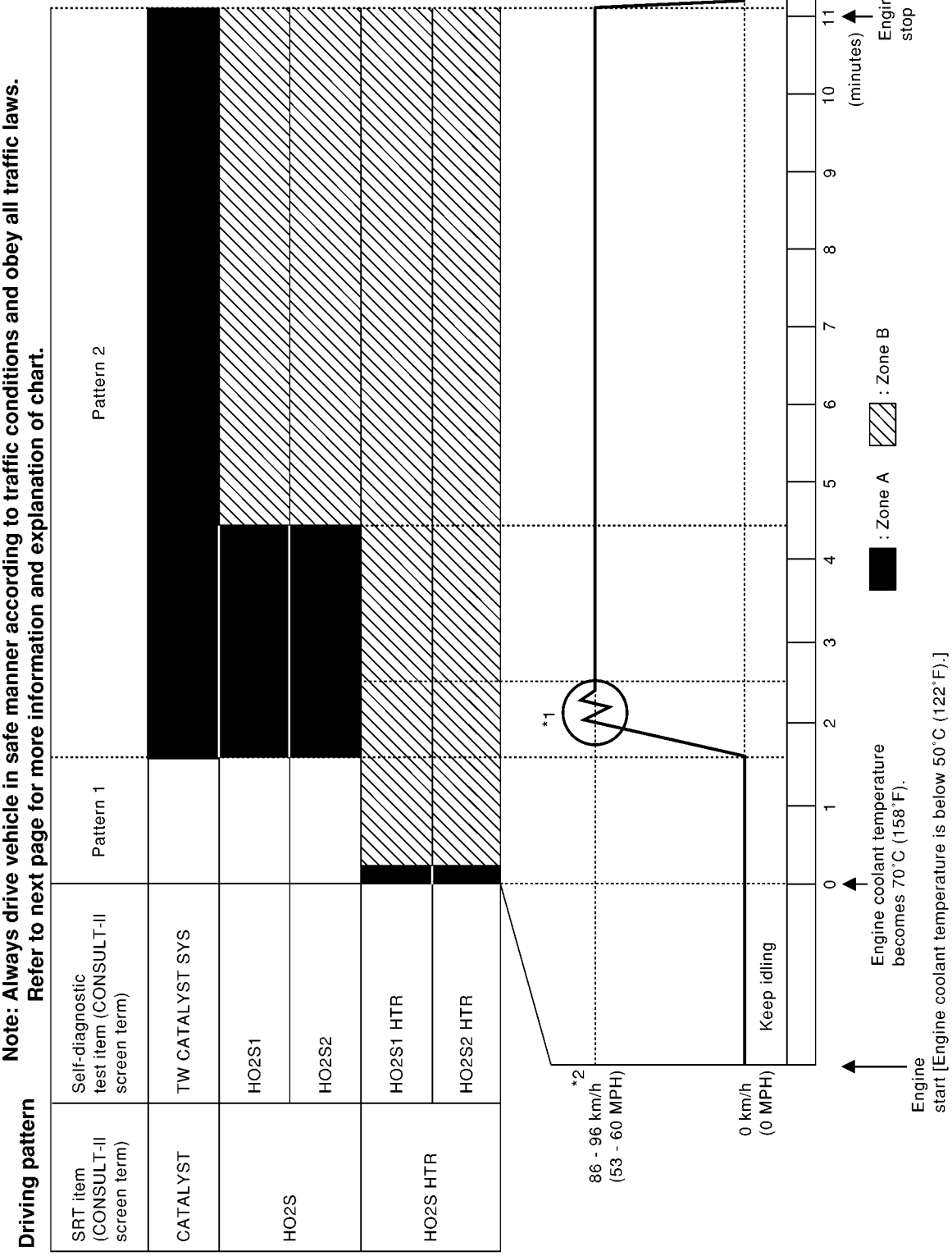
WITH CONSULT-II

Perform corresponding DTC Confirmation Procedure one by one based on “Performance Priority” in the table on EC-1009 .

WITHOUT CONSULT-II

The most efficient driving pattern in which SRT codes can be properly set is explained on the next page. The driving pattern should be performed one or more times to set all SRT codes.

Driving Pattern



MBIB0044E

- The time required for each diagnosis varies with road surface conditions, weather, altitude, individual driving habits, etc.
  Zone A refers to the range where the time, required for the diagnosis under normal conditions*, is the shortest.
  Zone B refers to the range where the diagnosis can still be performed if the diagnosis is not completed within zone A.

*: Normal conditions refer to the following:

- Sea level
- Flat road
- Ambient air temperature: 20 - 30°C (68 - 86°F)
- Diagnosis is performed as quickly as possible under normal conditions.
  Under different conditions [For example: ambient air temperature other than 20 - 30°C (68 - 86°F)], diagnosis may also be performed.

Pattern 1:

- **The engine is started at the engine coolant temperature of −10 to 35°C (14 to 95°F) (where the voltage between the ECM terminal 72 and ground is 3.0 - 4.3V).**
- **The engine must be operated at idle speed until the engine coolant temperature is greater than 70°C (158°F) (where the voltage between the ECM terminal 72 and ground is lower than 1.4V).**

Pattern 2:

- When steady-state driving is performed again even after it is interrupted, each diagnosis can be conducted. In this case, the time required for diagnosis may be extended.

*1: Depress the accelerator pedal until vehicle speed is 90 km/h (56 MPH), then release the accelerator pedal and keep it released for more than 10 seconds. Depress the accelerator pedal until vehicle speed is 90 km/h (56 MPH) again.
*2: Checking the vehicle speed with GST is advised.

TEST VALUE AND TEST LIMIT (GST ONLY — NOT APPLICABLE TO CONSULT-II)

The following is the information specified in Mode 6 of ISO 15031-5.
The test value is a parameter used to determine whether a system/circuit diagnostic test is “OK” or “NG” while being monitored by the ECM during self-diagnosis. The test limit is a reference value which is specified as the maximum or minimum value and is compared with the test value being monitored.
Items for which these data (test value and test limit) are displayed are the same as SRT code items.
These data (test value and test limit) are specified by Test ID (TID) and Component ID (CID) and can be displayed on the GST screen.

×: Applicable —: Not applicable

SRT item	Self-diagnostic test item	Test value (GST display)		Test limit	Application
		TID	CID		
CATALYST	Three way catalyst function	01H	01H	Max.	×
HO2S	Heated oxygen sensor 1	09H	04H	Max.	×
		0AH	84H	Min.	×
		0BH	04H	Max.	×
		0CH	04H	Max.	×
		0DH	04H	Max.	×
	Heated oxygen sensor 2	19H	86H	Min.	×
		1AH	86H	Min.	×
		1BH	06H	Max.	×
		1CH	06H	Max.	×
HO2S HTR	Heated oxygen sensor 1 heater	29H	08H	Max.	×
		2AH	88H	Min.	×
	Heated oxygen sensor 2 heater	2DH	0AH	Max.	×
		2EH	8AH	Min.	×

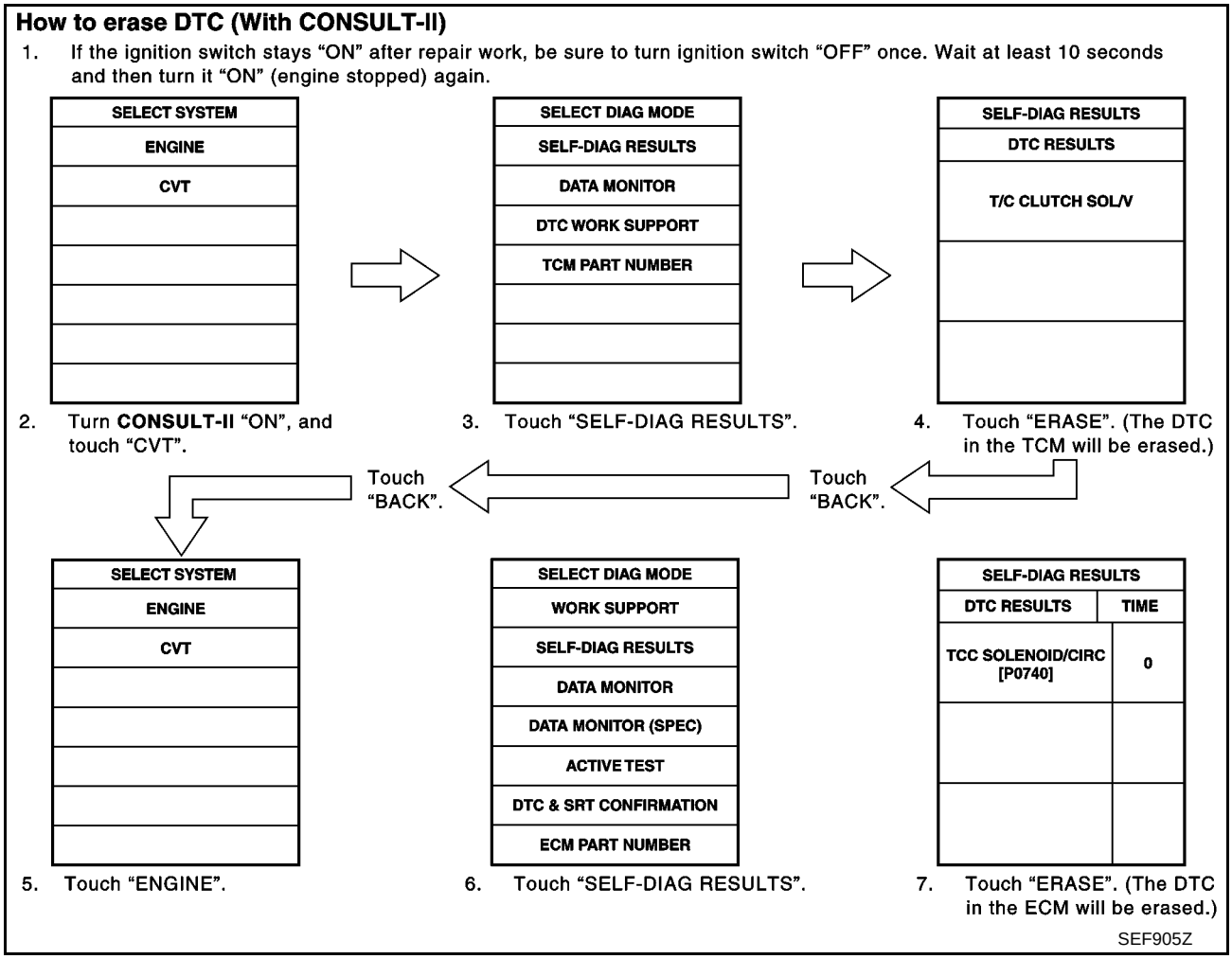
HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION

How to Erase DTC (With CONSULT-II)

The emission related diagnostic information in the ECM can be erased by selecting “ERASE” in the “SELF-DIAG RESULTS” mode with CONSULT-II.
If DTCs are displayed for both ECM and TCM (Transmission control module), they need to be erased individually from the ECM and TCM (Transmission control module).

NOTE:
If the DTC is not for CVT related items (see EC-959), skip steps 2 through 4.

1. If the ignition switch stays “ON” after repair work, be sure to turn ignition switch “OFF” once. Wait at least 10 seconds and then turn it “ON” (engine stopped) again.
2. Turn CONSULT-II “ON” and touch “CVT”.
3. Touch “SELF-DIAG RESULTS”.
4. Touch “ERASE”. [The DTC in the TCM (Transmission control module) will be erased.] Then touch “BACK” twice.
5. Touch “ENGINE”.
6. Touch “SELF-DIAG RESULTS”.
7. Touch “ERASE”. (The DTC in the ECM will be erased.)



How to Erase DTC (With GST)

The emission related diagnostic information in the ECM can be erased by selecting Mode 4 with GST.

NOTE:
If the DTC is not for CVT related items (see EC-959), skip step 2.

1. If the ignition switch stays “ON” after repair work, be sure to turn ignition switch “OFF” once. Wait at least 10 seconds and then turn it “ON” (engine stopped) again.

2. Perform “SELF-DIAGNOSTIC PROCEDURE (Without CONSULT-II)” in CVT section titled “TROUBLE DIAGNOSIS”, “Self-diagnosis”. (The engine warm-up step can be skipped when performing the diagnosis only to erase the DTC.)
3. Select Mode 4 with GST (Generic Scan Tool).

How to Erase DTC (No Tools)

1. If the ignition switch stays “ON” after repair work, be sure to turn ignition switch “OFF” once.
2. Wait at least 10 seconds and then turn it “ON” (engine stopped) again.
3. Change the diagnostic test mode from Mode II to Mode I by depressing the accelerator pedal. Refer to EC-1017, "HOW TO SWITCH DIAGNOSTIC TEST MODE" .

- **If the battery is disconnected, the emission-related diagnostic information will be lost after approx. 24 hours.**
- **The following data are cleared when the ECM memory is erased.**

– Diagnostic trouble codes
– 1st trip diagnostic trouble codes
– Freeze frame data
– 1st trip freeze frame data
– System readiness test (SRT) codes
– Test values
– Others

Actual work procedures are explained using a DTC as an example. Be careful so that not only the DTC, but all of the data listed above, are cleared from the ECM memory during work procedures.

NATS (Nissan Anti-theft System)

EBS00F1U

- **If the security indicator lights up with the ignition switch in the “ON” position or “NATS MALFUNCTION” is displayed on “SELF-DIAG RESULTS” screen, perform self-diagnostic results mode with CONSULT-II using NATS program card. Refer to BL-156, "NATS (NISSAN ANTI-THEFT SYSTEM)" .**
- **Confirm no self-diagnostic results of NATS is displayed before touching “ERASE” in “SELF-DIAG RESULTS” mode with CONSULT-II.**
- **When replacing ECM, initialization of NATS system and registration of all NATS ignition key IDs must be carried out with CONSULT-II using NATS program card.**
  Therefore, be sure to receive all keys from vehicle owner.
  Regarding the procedures of NATS initialization and NATS ignition key ID registration, refer to CONSULT-II operation manual, NATS.

SELF DIAG RESULTS	
DTC RESULTS	TIME
NATS MALFUNCTION [P1610]	0

SEF515Y

Malfunction Indicator (MI)

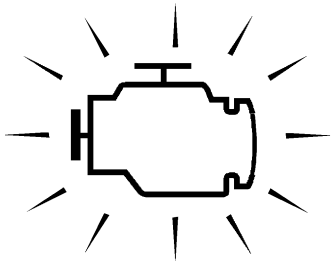
EBS00F1V

DESCRIPTION

The MI is located on the instrument panel.

1. The MI will light up when the ignition switch is turned ON without the engine running. This is a bulb check.
- If the MI does not light up, refer to DI-95, "WARNING LAMPS" or see EC-1406 .

2. When the engine is started, the MI should go off.
   If the MI remains on, the on board diagnostic system has detected an engine system malfunction.



SAT652J

ON BOARD DIAGNOSTIC SYSTEM FUNCTION

The on board diagnostic system has the following four functions.

Diagnostic Test Mode	KEY and ENG. Status	Function	Explanation of Function
Mode I	Ignition switch in “ON” position  Engine stopped 	BULB CHECK	This function checks the MI bulb for damage (blown, open circuit, etc.). If the MI does not come on, check MI circuit.
	Engine running 	MALFUNCTION WARNING	This is a usual driving condition. When a malfunction is detected twice in two consecutive driving cycles (two trip detection logic), the MI will light up to inform the driver that a malfunction has been detected. The following malfunctions will light up or blink the MI in the 1st trip. ● “Misfire (Possible three way catalyst damage)” ● Fail-safe mode
Mode II	Ignition switch in “ON” position  Engine stopped 	SELF-DIAGNOSTIC RESULTS	This function allows DTCs and 1st trip DTCs to be read.
	Engine running 	HEATED OXYGEN SENSOR 1 MONITOR	This function allows the fuel mixture condition (lean or rich), monitored by heated oxygen sensor 1, to be read.

MI Flashing without DTC

If the ECM is in Diagnostic Test Mode II, MI may flash when engine is running. In this case, check ECM diagnostic test mode. EC-1017, "HOW TO SWITCH DIAGNOSTIC TEST MODE" .
How to switch the diagnostic test (function) modes, and details of the above functions are described later, EC-1017 .
The following emission-related diagnostic information is cleared when the ECM memory is erased.

- Diagnostic trouble codes
- 1st trip diagnostic trouble codes
- Freeze frame data
- 1st trip freeze frame data
- System readiness test (SRT) codes
- Test values
- Others

HOW TO SWITCH DIAGNOSTIC TEST MODE

NOTE:

- **It is better to count the time accurately with a clock.**
- **It is impossible to switch the diagnostic mode when an accelerator pedal position sensor circuit has a malfunction.**
- **Always ECM returns to Diagnostic Test Mode I after ignition switch is turned “OFF”.**

How to Set Diagnostic Test Mode II (Self-diagnostic Results)

1. Confirm that accelerator pedal is fully released, turn ignition switch “ON” and wait 3 seconds.

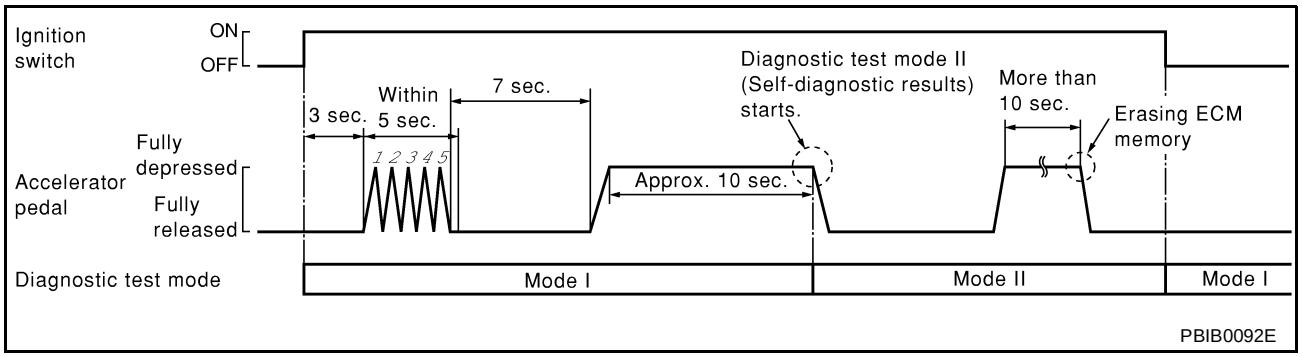
2. Repeat the following procedure quickly five times within 5 seconds.

a. Fully depress the accelerator pedal.

b. Fully release the accelerator pedal.

3. Wait 7 seconds, fully depress the accelerator pedal and keep it for approx. 10 seconds until the MI starts blinking.

4. Fully release the accelerator pedal.
ECM has entered to Diagnostic Test Mode II (Self-diagnostic results).



How to Set Diagnostic Test Mode II (Heated Oxygen Sensor 1 Monitor)

1. Set the ECM in Diagnostic Test Mode II (Self-diagnostic results). Refer to EC-1017, "How to Set Diagnostic Test Mode II (Self-diagnostic Results)" .

2. Start Engine.
ECM has entered to Diagnostic Test Mode II (Heated oxygen sensor 1 monitor).

How to Erase Diagnostic Test Mode II (Self-diagnostic Results)

1. Set ECM in Diagnostic Test Mode II (Self-diagnostic results). Refer to EC-1017, "How to Set Diagnostic Test Mode II (Self-diagnostic Results)" .

2. Fully depress the accelerator pedal and keep it for more than 10 seconds.
The emission-related diagnostic information has been erased from the backup memory in the ECM.

3. Fully release the accelerator pedal, and confirm the DTC 0000 is displayed.

DIAGNOSTIC TEST MODE I — BULB CHECK

In this mode, the MI on the instrument panel should stay ON. If it remains OFF, check the bulb. Refer to DI-95, "WARNING LAMPS" or see EC-1406 .

DIAGNOSTIC TEST MODE I — MALFUNCTION WARNING

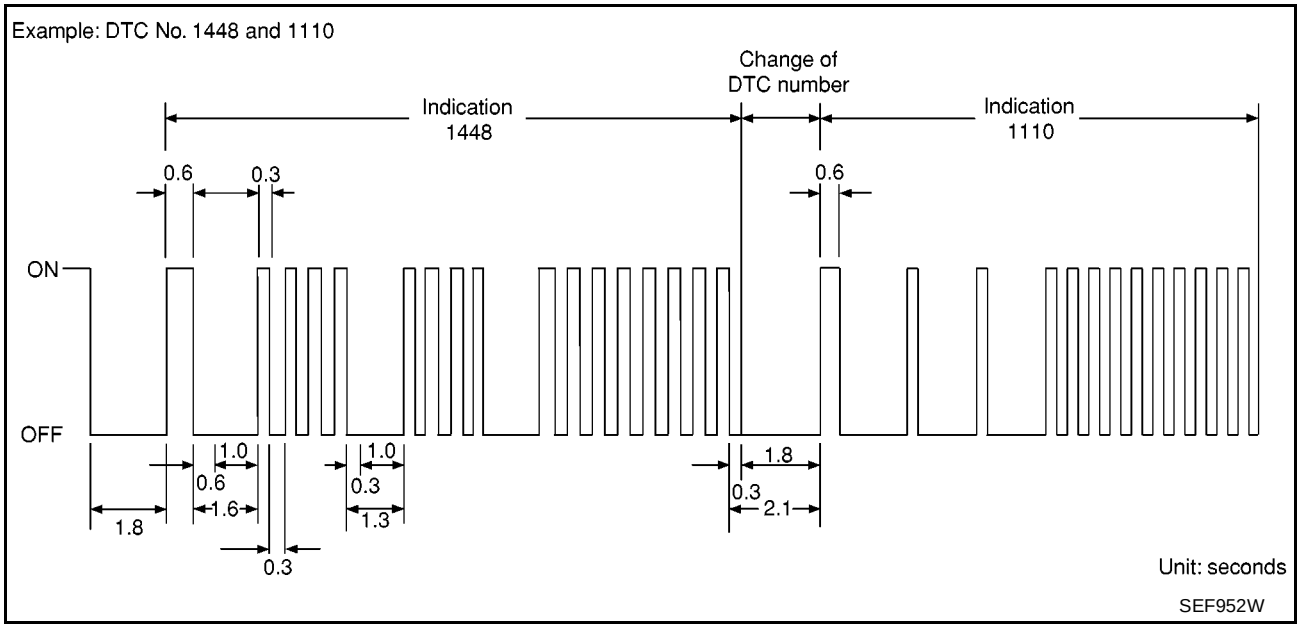
MI	Condition
ON	When the malfunction is detected.
OFF	No malfunction.

- These DTC numbers are clarified in Diagnostic Test Mode II (SELF-DIAGNOSTIC RESULTS)

DIAGNOSTIC TEST MODE II — SELF-DIAGNOSTIC RESULTS

In this mode, the DTC and 1st trip DTC are indicated by the number of blinks of the MI as shown below.
The DTC and 1st trip DTC are displayed at the same time. If the MI does not illuminate in diagnostic test mode I (Malfunction warning), all displayed items are 1st trip DTCs. If only one code is displayed when the MI illuminates in diagnostic test mode II (SELF-DIAGNOSTIC RESULTS), it is a DTC; if two or more codes are displayed, they may be either DTCs or 1st trip DTCs. DTC No. is same as that of 1st trip DTC. These unidentified

codes can be identified by using the CONSULT-II or GST. A DTC will be used as an example for how to read a code.



A particular trouble code can be identified by the number of four-digit numeral flashes. The “zero” is indicated by the number of ten flashes. The length of time the 1,000th-digit numeral flashes on and off is 1.2 seconds consisting of an ON (0.6-second) - OFF (0.6-second) cycle.
The 100th-digit numeral and lower digit numerals consist of a 0.3-second ON and 0.3-second OFF cycle.
A change from one digit numeral to another occurs at an interval of 1.0-second OFF. In other words, the later numeral appears on the display 1.3 seconds after the former numeral has disappeared.
A change from one trouble code to another occurs at an interval of 1.8-second OFF.
In this way, all the detected malfunctions are classified by their DTC numbers. The DTC “0000” refers to no malfunction. (See EC-959, "INDEX FOR DTC")

How to Erase Diagnostic Test Mode II (Self-diagnostic Results)

The DTC can be erased from the back up memory in the ECM by depressing accelerator pedal. Refer to EC-1017, "HOW TO SWITCH DIAGNOSTIC TEST MODE" .

- **If the battery is disconnected, the DTC will be lost from the backup memory after approx 24 hours.**
- **Be careful not to erase the stored memory before starting trouble diagnoses.**

DIAGNOSTIC TEST MODE II — HEATED OXYGEN SENSOR 1 MONITOR

In this mode, the MI displays the condition of the fuel mixture (lean or rich) which is monitored by the heated oxygen sensor 1.

MI	Fuel mixture condition in the exhaust gas	Air fuel ratio feedback control condition
ON	Lean	Closed loop system
OFF	Rich	
*Remains ON or OFF	Any condition	Open loop system

*: Maintains conditions just before switching to open loop.

To check the heated oxygen sensor 1 function, start engine in the Diagnostic Test Mode II and warm it up until engine coolant temperature indicator points to the middle of the gauge.
Next run engine at about 2,000 rpm for about 2 minutes under no-load conditions. Then make sure that the MI comes ON more than 5 times within 10 seconds with engine running at 2,000 rpm under no-load.

OBD System Operation Chart

EBS00F1W

RELATIONSHIP BETWEEN MI, 1ST TRIP DTC, DTC, AND DETECTABLE ITEMS

- When a malfunction is detected for the first time, the 1st trip DTC and the 1st trip freeze frame data are stored in the ECM memory.

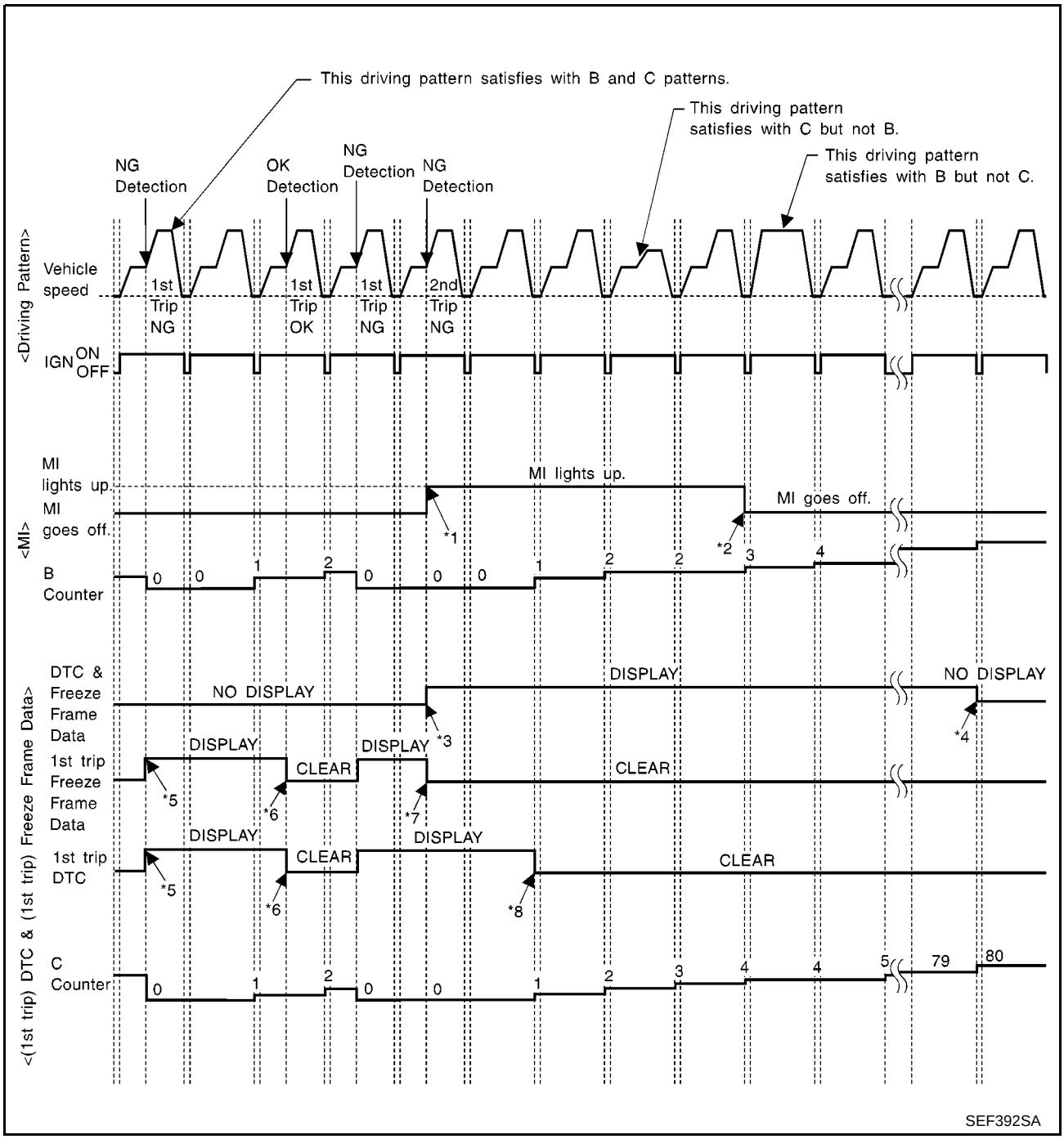
- When the same malfunction is detected in two consecutive trips, the DTC and the freeze frame data are stored in the ECM memory, and the MI will come on. For details, refer to EC-1004, "Two Trip Detection Logic" .
- The MI will go off after the vehicle is driven 3 times with no malfunction. The drive is counted only when the recorded driving pattern is met (as stored in the ECM). If another malfunction occurs while counting, the counter will reset.
- The DTC and the freeze frame data will be stored until the vehicle is driven 40 times (driving pattern A) without the same malfunction recurring (except for Misfire and Fuel Injection System). For Misfire and Fuel Injection System, the DTC and freeze frame data will be stored until the vehicle is driven 80 times (driving pattern C) without the same malfunction recurring. The “TIME” in “SELF-DIAGNOSTIC RESULTS” mode of CONSULT-II will count the number of times the vehicle is driven.
- The 1st trip DTC is not displayed when the self-diagnosis results in “OK” for the 2nd trip.

SUMMARY CHART

Items	Fuel Injection System	Misfire	Other
MI (goes off)	3 (pattern B)	3 (pattern B)	3 (pattern B)
DTC, Freeze Frame Data (no display)	80 (pattern C)	80 (pattern C)	40 (pattern A)
1st Trip DTC (clear)	1 (pattern C), *1	1 (pattern C), *1	1 (pattern B)
1st Trip Freeze Frame Data (clear)	*1 , *2	*1 , *2	1 (pattern B)

For details about patterns “B” and “C” under “Fuel Injection System” and “Misfire”, see EC-1022 .
For details about patterns “A” and “B” under “Other”, see EC-1024 .
*1: Clear timing is at the moment OK is detected.
*2: Clear timing is when the same malfunction is detected in the 2nd trip.

RELATIONSHIP BETWEEN MI, DTC, 1ST TRIP DTC AND DRIVING PATTERNS FOR "MISFIRE" <EXHAUST QUALITY DETERIORATION>, "FUEL INJECTION SYSTEM"



*1: When the same malfunction is detected in two consecutive trips, MI will light up.

*2: MI will go off after vehicle is driven 3 times (pattern B) without any malfunctions.

*3: When the same malfunction is detected in two consecutive trips, the DTC and the freeze frame data will be stored in ECM.

*4: The DTC and the freeze frame data will not be displayed any longer after vehicle is driven 80 times (pattern C) without the same malfunction. (The DTC and the freeze frame data still remain in ECM.)

*5: When a malfunction is detected for the first time, the 1st trip DTC and the 1st trip freeze frame data will be stored in ECM.

*6: The 1st trip DTC and the 1st trip freeze frame data will be cleared at the moment OK is detected.

*7: When the same malfunction is detected in the 2nd trip, the 1st trip freeze frame data will be cleared.

*8: 1st trip DTC will be cleared when vehicle is driven once (pattern C) without the same malfunction after DTC is stored in ECM.

EXPLANATION FOR DRIVING PATTERNS FOR "MISFIRE <EXHAUST QUALITY DETERIORATION>", "FUEL INJECTION SYSTEM"

<Driving Pattern B>

Driving pattern B means the vehicle operation as follows:
All components and systems should be monitored at least once by the OBD system.

- The B counter will be cleared when the malfunction is detected once regardless of the driving pattern.
- The B counter will be counted up when driving pattern B is satisfied without any malfunction.
- The MI will go off when the B counter reaches 3. (*2 in “OBD SYSTEM OPERATION CHART”)

<Driving Pattern C>

Driving pattern C means the vehicle operation as follows:

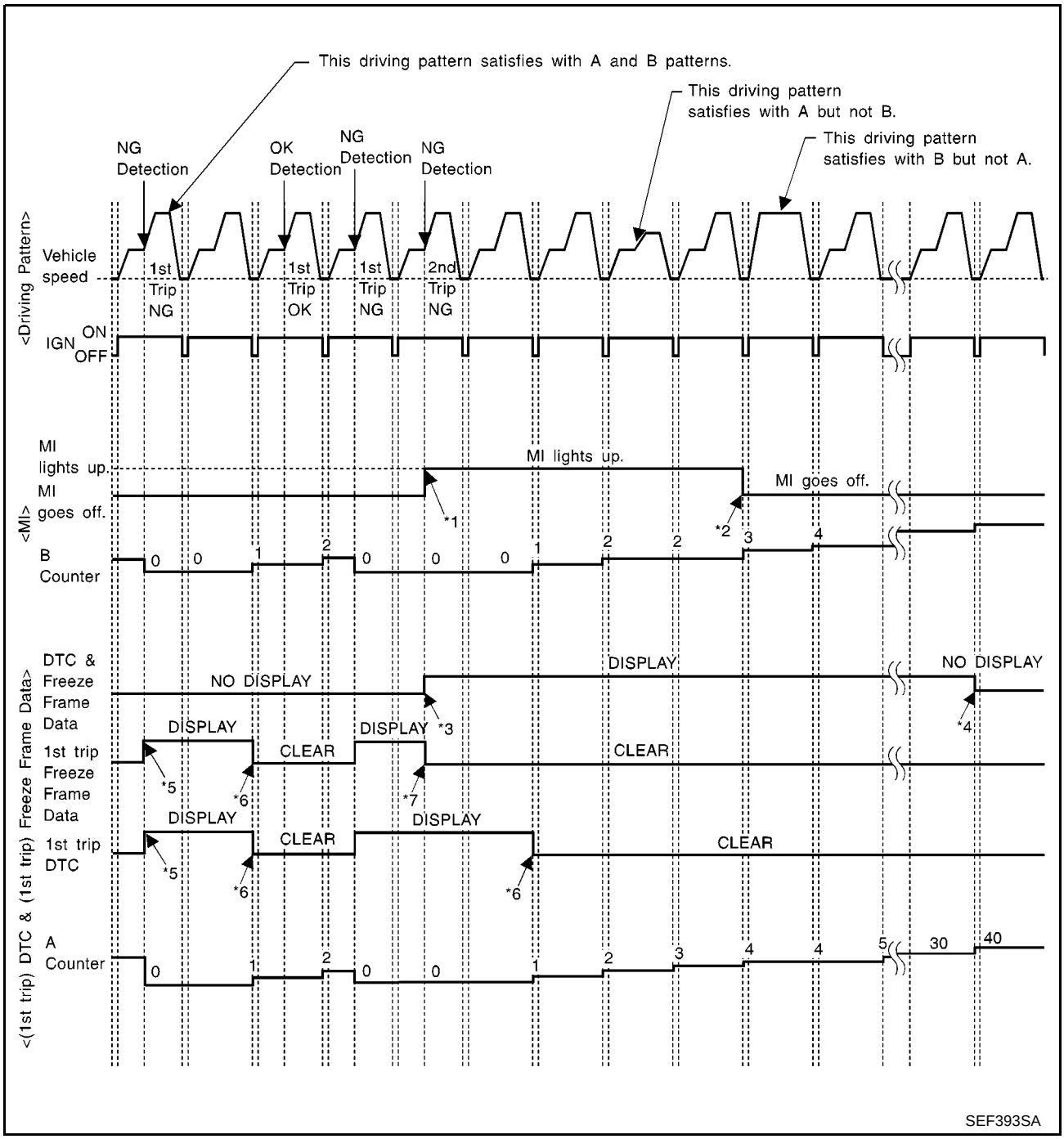
1. The following conditions should be satisfied at the same time:
   Engine speed: (Engine speed in the freeze frame data) ±375 rpm
   Calculated load value: (Calculated load value in the freeze frame data) x (1±0.1) [%]
   Engine coolant temperature (T) condition:

- When the freeze frame data shows lower than 70°C (158°F), “T” should be lower than 70°C (158°F).
- When the freeze frame data shows higher than or equal to 70°C (158°F), “T” should be higher than or equal to 70°C (158°F).

Example:
If the stored freeze frame data is as follows:
Engine speed: 850 rpm, Calculated load value: 30%, Engine coolant temperature: 80°C (176°F)
To be satisfied with driving pattern C, the vehicle should run under the following conditions:
Engine speed: 475 - 1,225 rpm, Calculated load value: 27 - 33%, Engine coolant temperature: more than 70°C (158°F)

- The C counter will be cleared when the malfunction is detected regardless of (1).
- The C counter will be counted up when (1) is satisfied without the same malfunction.
- The DTC will not be displayed after C counter reaches 80.
- The 1st trip DTC will be cleared when C counter is counted once without the same malfunction after DTC is stored in ECM.

RELATIONSHIP BETWEEN MI, DTC, 1ST TRIP DTC AND DRIVING PATTERNS EXCEPT FOR "MISFIRE <EXHAUST QUALITY DETERIORATION>", "FUEL INJECTION SYSTEM"



*1: When the same malfunction is detected in two consecutive trips, MI will light up.

*2: MI will go off after vehicle is driven 3 times (pattern B) without any malfunctions.

*3: When the same malfunction is detected in two consecutive trips, the DTC and the freeze frame data will be stored in ECM.

*4: The DTC and the freeze frame data will not be displayed any longer after vehicle is driven 40 times (pattern A) without the same malfunction. (The DTC and the freeze frame data still remain in ECM.)

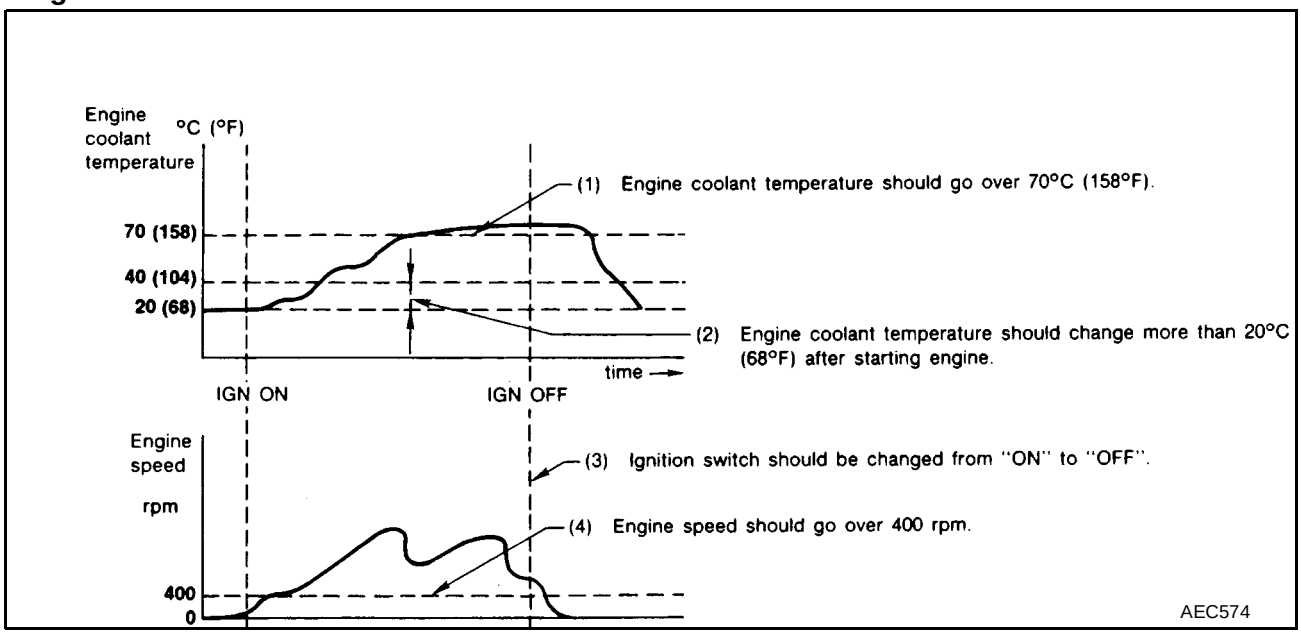
*5: When a malfunction is detected for the first time, the 1st trip DTC and the 1st trip freeze frame data will be stored in ECM.

*6: 1st trip DTC will be cleared after vehicle is driven once (pattern B) without the same malfunction.

*7: When the same malfunction is detected in the 2nd trip, the 1st trip freeze frame data will be cleared.

EXPLANATION FOR DRIVING PATTERNS EXCEPT FOR "MISFIRE <EXHAUST QUALITY DETERIORATION>", "FUEL INJECTION SYSTEM"

<Driving Pattern A>



- The A counter will be cleared when the malfunction is detected regardless of (1) - (4).
- The A counter will be counted up when (1) - (4) are satisfied without the same malfunction.
- The DTC will not be displayed after the A counter reaches 40.

<Driving Pattern B>

Driving pattern B means the vehicle operation as follows:
All components and systems should be monitored at least once by the OBD system.

- The B counter will be cleared when the malfunction is detected once regardless of the driving pattern.
- The B counter will be counted up when driving pattern B is satisfied without any malfunctions.
- The MI will go off when the B counter reaches 3 (*2 in “OBD SYSTEM OPERATION CHART”).

TROUBLE DIAGNOSIS

PFP:00004

Trouble Diagnosis Introduction

EBS00F1X

INTRODUCTION

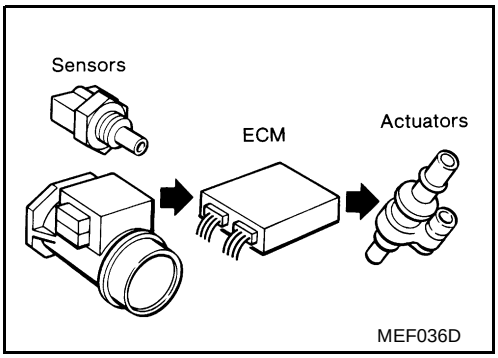
The engine has an ECM to control major systems such as fuel control, ignition control, idle air control system, etc. The ECM accepts input signals from sensors and instantly drives actuators. It is essential that both input and output signals are proper and stable. At the same time, it is important that there are no problems such as vacuum leaks, fouled spark plugs, or other problems with the engine.

It is much more difficult to diagnose a problem that occurs intermittently rather than continuously. Most intermittent problems are caused by poor electric connections or improper wiring. In this case, careful checking of suspected circuits may help prevent the replacement of good parts.

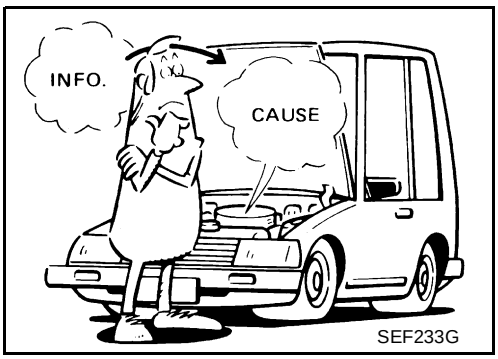
A visual check only may not find the cause of the problems. A road test with CONSULT-II (or GST) or a circuit tester connected should be performed. Follow the “Work Flow” on EC-1026 .

Before undertaking actual checks, take a few minutes to talk with a customer who approaches with a driveability complaint. The customer can supply good information about such problems, especially intermittent ones. Find out what symptoms are present and under what conditions they occur. A “Diagnostic Worksheet” like the example on EC-1029 should be used.

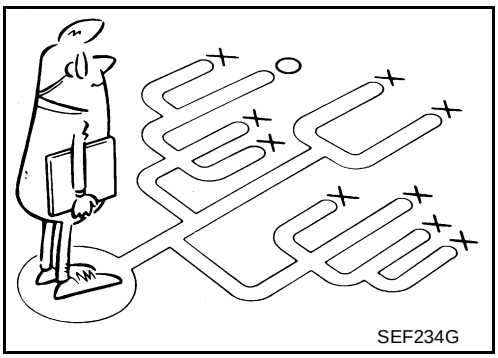
Start your diagnosis by looking for “conventional” problems first. This will help troubleshoot driveability problems on an electronically controlled engine vehicle.



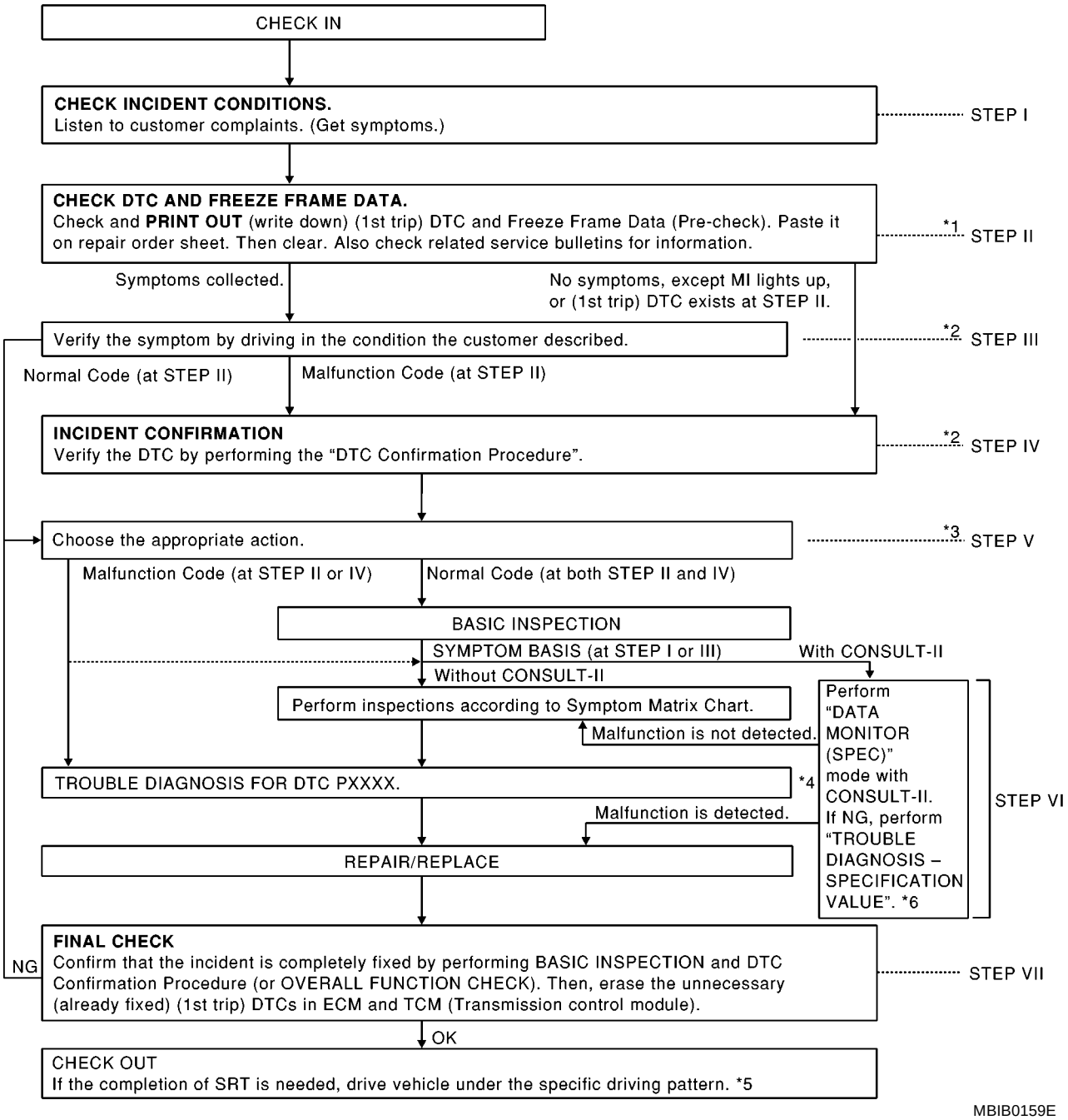
MEF036D



SEF233G


SEF234G

WORK FLOW
Flow Chart



MBIB0159E

*1 If time data of "SELF-DIAG RESULTS" is other than "0" or "[1t]", perform EC-1076, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

*2 If the incident cannot be verified, perform EC-1076, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

*3 If the on board diagnostic system cannot be performed, check main power supply and ground circuit. Refer to EC-1077, "POWER SUPPLY CIRCUIT FOR ECM" .

*4 If malfunctioning part cannot be detected, perform EC-1076, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

*5 EC-1013

*6 EC-1072

Description for Work Flow

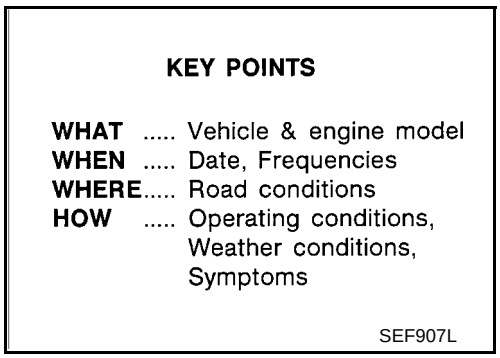
STEP	DESCRIPTION
STEP I	Get detailed information about the conditions and the environment when the incident/symptom occurred using the “DIAGNOSTIC WORK SHEET”, EC-1028 .
STEP II	Before confirming the concern, check and write down (print out using CONSULT-II or GST) the (1st trip) DTC and the (1st trip) freeze frame data, then erase the DTC and the data. (Refer to EC-1015 .) The (1st trip) DTC and the (1st trip) freeze frame data can be used when duplicating the incident at STEP III & IV. If the incident cannot be verified, perform EC-1076, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" . Study the relationship between the cause, specified by (1st trip) DTC, and the symptom described by the customer. (The “Symptom Matrix Chart” will be useful. See EC-1037 .) Also check related service bulletins for information.
STEP III	Try to confirm the symptom and under what conditions the incident occurs. The “DIAGNOSTIC WORK SHEET” and the freeze frame data are useful to verify the incident. Connect CONSULT-II to the vehicle in DATA MONITOR (AUTO TRIG) mode and check real time diagnosis results. If the incident cannot be verified, perform EC-1076, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" . If the malfunction code is detected, skip STEP IV and perform STEP V.
STEP IV	Try to detect the (1st trip) DTC by driving in (or performing) the “DTC Confirmation Procedure”. Check and read the (1st trip) DTC and (1st trip) freeze frame data by using CONSULT-II or GST. During the (1st trip) DTC verification, be sure to connect CONSULT-II to the vehicle in DATA MONITOR (AUTO TRIG) mode and check real time diagnosis results. If the incident cannot be verified, perform EC-1076, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" . In case the “DTC Confirmation Procedure” is not available, perform the “Overall Function Check” instead. The (1st trip) DTC cannot be displayed by this check, however, this simplified “check” is an effective alternative. The “NG” result of the “Overall Function Check” is the same as the (1st trip) DTC detection.
STEP V	Take the appropriate action based on the results of STEP I through IV. If the malfunction code is indicated, proceed to TROUBLE DIAGNOSIS FOR DTC PXXXX. If the normal code is indicated, proceed to the BASIC INSPECTION. (Refer to EC-1032 .) If COSULT-II is available, perform “DATA MONITOR (SPEC)” mode with CONSULT-II and proceed to the “TOROUBLE DIAGNOSIS – SPECIFICATION VALUE”. (Refer to EC-1072 .) (If malfunction is detected, proceed to “PERAIR/REPLACE”.) Then perform inspections according to the Symptom Matrix Chart. (Refer to EC-1037 .)
STEP VI	Identify where to begin diagnosis based on the relationship study between symptom and possible causes. Inspect the system for mechanical binding, loose connectors or wiring damage using (tracing) “Harness Layouts”. Gently shake the related connectors, components or wiring harness with CONSULT-II set in “DATA MONITOR (AUTO TRIG)” mode. Check the voltage of the related ECM terminals or monitor the output data from the related sensors with CONSULT-II. Refer to EC-1047 , EC-1067 . The “Diagnostic Procedure” in EC section contains a description based on open circuit inspection. A short circuit inspection is also required for the circuit check in the Diagnostic Procedure. For details, refer to “Circuit Inspection” in GI-24, "How to Perform Efficient Diagnosis for an Electrical Incident" . Repair or replace the malfunction parts. If malfunctioning part cannot be detected, perform EC-1076, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .
STEP VII	Once you have repaired the circuit or replaced a component, you need to run the engine in the same conditions and circumstances which resulted in the customer's initial complaint. Perform the “DTC Confirmation Procedure” and confirm the normal code [DTC No. P0000] is detected. If the incident is still detected in the final check, perform STEP VI by using a method different from the previous one. Before returning the vehicle to the customer, be sure to erase the unnecessary (already fixed) (1st trip) DTC in ECM and TCM (Transmission control module). (Refer to EC-1015, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" and CVT-21, "HOW TO ERASE DTC" .)

DIAGNOSTIC WORKSHEET

Description

There are many operating conditions that lead to the malfunction of engine components. A good grasp of such conditions can make troubleshooting faster and more accurate.
In general, each customer feels differently about a problem. It is important to fully understand the symptoms or conditions for a customer complaint.
Utilize a diagnostic worksheet like the one on the next page in order to organize all the information for troubleshooting.
Some conditions may cause the MIL to come on steady or blink and DTC to be detected. Examples:

- Vehicle ran out of fuel, which caused the engine to misfire.
- Fuel filler cap was left off or incorrectly screwed on, allowing fuel to evaporate into the atmosphere.



Worksheet Sample

Customer name MR/MS		Model & Year	VIN
Engine #		Trans.	Mileage
Incident Date		Manuf. Date	In Service Date
Fuel and fuel filler cap		☐ Vehicle ran out of fuel causing misfire ☐ Fuel filler cap was left off or incorrectly screwed on.	
Symptoms	☐ Startability	☐ Impossible to start ☐ No combustion ☐ Partial combustion ☐ Partial combustion affected by throttle position ☐ Partial combustion NOT affected by throttle position ☐ Possible but hard to start ☐ Others [ ]	
	☐ Idling	☐ No fast idle ☐ Unstable ☐ High idle ☐ Low idle ☐ Others [ ]	
	☐ Driveability	☐ Stumble ☐ Surge ☐ Knock ☐ Lack of power ☐ Intake backfire ☐ Exhaust backfire ☐ Others [ ]	
	☐ Engine stall	☐ At the time of start ☐ While idling ☐ While accelerating ☐ While decelerating ☐ Just after stopping ☐ While loading	
Incident occurrence		☐ Just after delivery ☐ Recently ☐ In the morning ☐ At night ☐ In the daytime	
Frequency		☐ All the time ☐ Under certain conditions ☐ Sometimes	
Weather conditions		☐ Not affected	
	Weather	☐ Fine ☐ Raining ☐ Snowing ☐ Others [ ]	
	Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold ☐ Humid ˚F	
Engine conditions		☐ Cold ☐ During warm-up ☐ After warm-up Engine speed 0 2,000 4,000 6,000 8,000 rpm	
Road conditions		☐ In town ☐ In suburbs ☐ Highway ☐ Off road (up/down)	
Driving conditions		☐ Not affected ☐ At starting ☐ While idling ☐ At racing ☐ While accelerating ☐ While cruising ☐ While decelerating ☐ While turning (RH/LH) Vehicle speed 0 10 20 30 40 50 60 MPH	
Malfunction indicator lamp		☐ Turned on ☐ Not turned on	

MTBL0017

DTC Inspection Priority Chart

EBS00F1Y

If some DTCs are displayed at the same time, perform inspections one by one based on the following priority chart.

NOTE:
If DTC U1000 and/or U1001 is displayed with other DTC, first perform the trouble diagnosis for DTC U1000 and U1001. Refer to EC-1083 .

Priority	Detected items (DTC)
1	● U1000 U1001 CAN communication line ● P0102 P0103 Mass air flow sensor ● P0112 P0113 P0127Intake air temperature sensor ● P0117 P0118 Engine coolant temperature sensor ● P0221 P0222 P0223 P1223 P1224 P1225 P1226 Throttle position sensor ● P0226 P0227 P0228 P1227 P1228 Accelerator pedal position sensor ● P0327 P0328 Knock sensor ● P0335 Crankshaft position sensor (POS) ● P0340 Camshaft position sensor (PHASE) ● P0500 Vehicle speed sensor ● P0605 ECM ● P1229 Sensor power supply ● P1610-P1615 NATS ● P1706 Park/Neutral position (PNP) switch
2	● P0031 P0032 Heated oxygen sensor 1 heater ● P0037 P0038 Heated oxygen sensor 2 heater ● P0132 P0133 P0134 P1143 P1144 Heated oxygen sensor 1 ● P0138 P0139 P1146 P1147 Heated oxygen sensor 2 ● P0444 P0445 EVAP canister purge volume control solenoid valve ● P0550 Power steering pressure sensor ● P0715 P0740 P0745 P1715 P1777 P1791 CVT related sensors and solenoid valves ● P1065 ECM power supply ● P1111 Intake valve timing control solenoid valve ● P1122 Electric throttle control function ● P1124 P1126 Throttle control motor relay ● P1128 Throttle control mother ● P1212 ESP/TCS/ABS communication line ● P1720 Vehicle speed sensor ● P1805 Brake switch
3	● P0011 Intake valve timing control ● P0171 P0172 Fuel injection system function ● P0300 - P0304 Misfire ● P0420 Three way catalyst function ● P1121 Electric throttle control actuator ● P1217 Engine over temperature (OVERHEAT) ● P1564 ICC steering switch ● P1568 ICC command value ● P1572 ICC brake switch ● P1574 ICC vehicle speed sensor ● P1778 CVT step motor

Fail-safe Chart

EBS00F1Z

When the DTC listed bellow is detected, the ECM enters fail-safe mode and the MI lights up.

DTC No.	Detected items	Engine operating condition in fail-safe mode
P0102 P0103	Mass air flow sensor circuit	Engine speed will not rise more than 2,400 rpm due to the fuel cut.

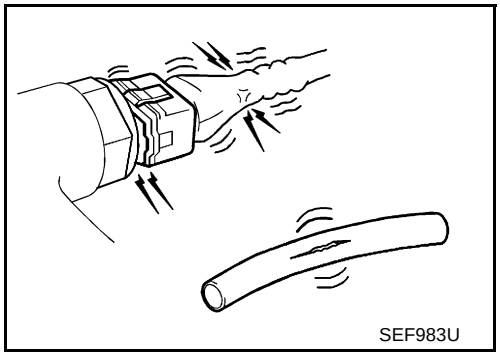
<table>
<tr><th>DTC No.</th><th>Detected items</th><th colspan="2">Engine operating condition in fail-safe mode</th></tr>
<tr><td rowspan="6">P0117
P0118</td><td rowspan="6">Engine coolant temperature sensor circuit</td><td colspan="2">Engine coolant temperature will be determined by ECM based on the time after turning ignition switch “ON” or “START”.
CONSULT-II displays the engine coolant temperature decided by ECM.</td></tr>
<tr><td>Condition</td><td>Engine coolant temperature decided (CONSULT-II display)</td></tr>
<tr><td>Just as ignition switch is turned ON or Start</td><td>40°C (104°F)</td></tr>
<tr><td>More than approx. 4 minutes after ignition ON or Start</td><td>80°C (176°F)</td></tr>
<tr><td>Except as shown above</td><td>40 - 80°C (104 - 176°F)
(Depends on the time)</td></tr>
<tr><td colspan="2">When the fail-safe system for engine coolant temperature sensor is activated, the cooling fan operates while engine is running.</td></tr>
<tr><td>P0221
P0222
P0223
P1223
P1224</td><td>Throttle position sensor</td><td colspan="2">The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees.
The ECM regulates the opening speed of the throttle valve to be slower than the normal condition.
So, the acceleration will be poor.</td></tr>
<tr><td>P0226
P0227
P0228
P1227
P1228</td><td>Accelerator pedal position sensor</td><td colspan="2">The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees.
The ECM regulates the opening speed of the throttle valve to be slower than the normal condition.
So, the acceleration will be poor.</td></tr>
<tr><td>P1121</td><td>Electric throttle control actuator
(ECM detect the throttle valve is stuck open.)</td><td colspan="2">While the vehicle is driving, it slows down gradually by fuel cut. After the vehicle stops, the engine stalls.
The engine can restart in “N” or “P” position, and engine speed will not exceed 1,000 rpm or more.</td></tr>
<tr><td>P1122</td><td>Electric throttle control function</td><td colspan="2">ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.</td></tr>
<tr><td>P1124
P1126</td><td>Throttle control motor relay</td><td colspan="2">ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.</td></tr>
<tr><td>P1128</td><td>Throttle control motor</td><td colspan="2">ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.</td></tr>
<tr><td>P1229</td><td>Sensor power supply</td><td colspan="2">ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.</td></tr>
</table>

Basic Inspection

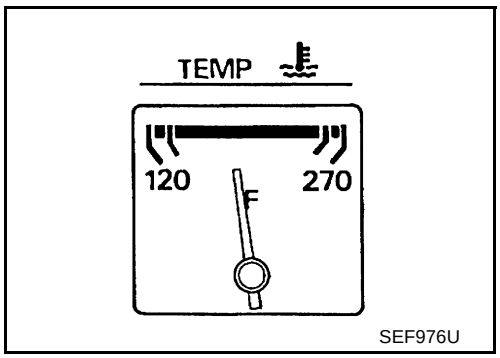
EBS00F20

1. INSPECTION START

1. Check service records for any recent repairs that may indicate a related problem, or a current need for scheduled maintenance.
2. Open engine hood and check the following:
- Harness connectors for improper connections
- Wiring harness for improper connections, pinches and cut
- Vacuum hoses for splits, kinks and improper connections
- Hoses and ducts for leaks
- Air cleaner clogging
- Gasket


SEF983U

3. Confirm that electrical or mechanical loads are not applied.
- Headlamp switch is OFF.
- Air conditioner switch is OFF.
- Rear window defogger switch is OFF.
- Steering wheel is in the straight-ahead position, etc.
4. Start engine and warm it up until engine coolant temperature indicator points the middle of gauge.
Ensure engine stays below 1,000 rpm.

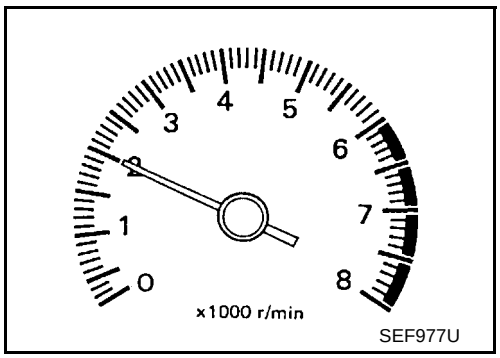


SEF976U

5. Run engine at about 2,000 rpm for about 2 minutes under no-load.
6. Make sure that no DTC is displayed with CONSULT-II or GST.

OK or NG

OK >> GO TO 3.
NG >> GO TO 2.



SEF977U

2. REPAIR OR REPLACE

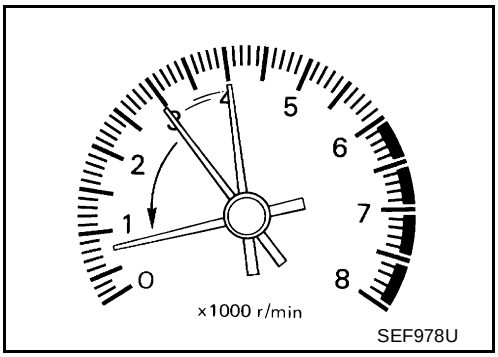
Repair or replace components as necessary according to corresponding “Diagnostic Procedure”.

>> GO TO 3

3. CHECK TARGET IDLE SPEED

With CONSULT-II

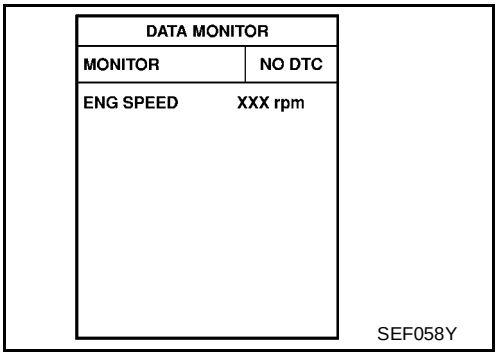
1. Run engine at about 2,000 rpm for about 2 minutes under no-load.
2. Rev engine (2,000 to 3,000 rpm) two or three times under no-load, then run engine at idle speed for about 1 minute.



SEF978U

3. Read idle speed in “DATA MONITOR” mode with CONSULT-II.

M/T: 600 ± 50 rpm
CVT: 650 ± 50 rpm (in “P” or “N” position)



SEF058Y

Without CONSULT-II

1. Run engine at about 2,000 rpm for about 2 minutes under no-load.
2. Rev engine (2,000 to 3,000 rpm) two or three times under no-load, then run engine at idle speed for about 1 minute.
3. Check idle speed.

M/T: 600 ± 50 rpm
CVT: 650 ± 50 rpm (in “P” or “N” position)

OK or NG

OK >> GO TO 10.
NG >> GO TO 4.

4. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

1. Stop engine.
2. Perform EC-998, "Accelerator Pedal Released Position Learning" .

>> GO TO 5.

5. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform EC-998, "Throttle Valve Closed Position Learning" .

>> GO TO 6.

6. PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-999, "Idle Air Volume Learning" .

Which is the result CMPLT or INCMP?

CMPLT or INCMP

CMPLT >> GO TO 7.
INCMP >> 1. Follow the construction of “Idle Air Volume Learning”.
2. GO TO 4.

7. CHECK TARGET IDLE SPEED AGAIN

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Read idle speed in “DATA MONITOR” mode with CONSULT-II.

M/T: 600 ± 50 rpm
CVT: 650 ± 50 rpm (in “P” or “N” position)

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Check idle speed.

M/T: 600 ± 50 rpm
CVT: 650 ± 50 rpm (in “P” or “N” position)

OK or NG

OK >> GO TO 10.
NG >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the Following.

- Check camshaft position sensor (PHASE) and circuit. Refer to EC-1212 .
- Check crankshaft position sensor (POS) and circuit. Refer to EC-1205 .

OK or NG

OK >> GO TO 9.
NG >> 1. Repair or replace.
2. GO TO 4.

9. CHECK ECM FUNCTION

1. Substitute another known-good ECM to check ECM function. (ECM may be the cause of a problem, but this is the rarely the case.)
2. Perform initialization of NATS system and registration of NATS ignition key IDs. Refer to EC-1016, "NATS (Nissan Anti-theft System)" .

>> GO TO 4.

10. CHECK IGNITION TIMING

1. Run engine at idle.
2. Check ignition timing with a timing light.

M/T: 14 ± 5° BTDC
CVT: 15 ± 5° BTDC (in “P” or “N” position)

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 11.

11. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

1. Stop engine.
2. Perform EC-998, "Accelerator Pedal Released Position Learning" .

>> GO TO 12.

12. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform EC-998, "Throttle Valve Closed Position Learning" .

>> GO TO 13.

13. PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-999, "Idle Air Volume Learning" .

Which is the result CMPLT or INCMP?

CMPLT or INCMP

CMPLT >> GO TO 14.
INCMP >> 1. Follow the construction of “Idle Air Volume Learning”.
2. GO TO 4.

14. CHECK TARGET IDLE SPEED AGAIN

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Read idle speed in “DATA MONITOR” mode with CONSULT-II.

M/T: 600 ± 50 rpm
CVT: 650 ± 50 rpm (in “P” or “N” position)

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Check idle speed.

M/T: 600 ± 50 rpm
CVT: 650 ± 50 rpm (in “P” or “N” position)

OK or NG

OK >> GO TO 15.
NG >> GO TO 17.

15. CHECK IGNITION TIMING AGAIN

1. Run engine at idle.
2. Check ignition timing with a timing light.

M/T: 14 ± 5° BTDC
CVT: 15 ± 5° BTDC (in "P" or "N" position)

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 16.

16. CHECK TIMING CHAIN INSTALLATION

Check timing chain installation. Refer to EM-143, "TIMING CHAIN" .

OK or NG

OK >> GO TO 17.
NG >> 1. Repair the timing chain installation.
2. GO TO 4.

17. DETECT MALFUNCTIONING PART

Check the following.

- Check camshaft position sensor (PHASE) and circuit. Refer to EC-1212 .
- Check crankshaft position sensor (POS) and circuit. Refer to EC-1205 .

OK or NG

OK >> GO TO 18.
NG >> 1. Repair or replace.
2. GO TO 4.

18. CHECK ECM FUNCTION

1. Substitute another known-good ECM to check ECM function. (ECM may be the cause of a problem, but this is the rarely the case.)
2. Perform initialization of NATS system and registration of NATS ignition key IDs. Refer to EC-1016, "NATS (Nissan Anti-theft System)" .

>> GO TO 4.

Symptom Matrix Chart
SYSTEM — BASIC ENGINE CONTROL SYSTEM

EBS00F21

		SYMPTOM													Reference page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Fuel	Fuel pump circuit	1	1	2	3	2		2	2			3		2	EC-1381
	Fuel pressure regulator system	3	3	4	4	4	4	4	4	4		4			EC-1001
	Injector circuit	1	1	2	3	2		2	2			2			EC-1375
	Evaporative emission system	3	3	4	4	4	4	4	4	4		4			EC-1408
Air	Positive crankcase ventilation system	3	3	4	4	4	4	4	4	4		4	1		EC-1411
	Incorrect idle speed adjustment	3	3				1	1	1	1		1			EC-1032
	Electric throttle control actuator	1	1	2	3	3	2	2	2	2		2		2	EC-1246, EC-1248, EC-1255, EC-1261
Ignition	Incorrect ignition timing adjustment	3	3	1	1	1		1	1			1			EC-1032
	Ignition circuit	1	1	2	2	2		2	2			2			EC-1365
Main power supply and ground circuit		2	2	3	3	3		3	3		2	3			EC-1077
Mass air flow sensor circuit		1	1	2	2	2		2	2			2			EC-1100
Engine coolant temperature sensor circuit		1	1	2	2	2	3	2	2	3	1	2			EC-1111
Throttle position sensor circuit			1	2		2	2	2	2	2		2			EC-1169, EC-1175, EC-1312, EC-1318, EC-1320, EC-1329
Accelerator pedal position sensor circuit				3	2	1	2			2					EC-1181, EC-1188, EC-1322
Heated oxygen sensor 1 circuit			1	2	3	2		2	2			2			EC-1119, EC-1125, EC-1135, EC-1266, EC-1272
Knock sensor circuit				2	2							3			EC-1201
Crankshaft position sensor (POS) circuit		2	2												EC-1205
Camshaft position sensor (PHASE) circuit		2	2												EC-1212
Vehicle speed signal circuit			2	3		3						3			EC-1228

	SYMPTOM													Reference page
	HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code	AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Power steering pressure sensor circuit		2				3	3	3	3					EC-1230
ECM	2	2	3	3	3	3	3	3	3	3	3			EC-1235, EC-1238
Intake valve timing control solenoid valve circuit	3	3	2		1	3	2	2	3		3			EC-1242
PNP switch circuit			3		3	3	3	3	3		3			EC-1353
Refrigerant pressure sensor circuit		2				3	3	3	3		4			EC-1387
Electrical load signal circuit						3	3	3	3					EC-1392
Air conditioner circuit	2	2	3	3	3	3	3	3	3		3		2	ATC-30

1 - 6: The numbers refer to the order of inspection.
(continued on next page)

SYSTEM — ENGINE MECHANICAL & OTHER

		SYMPTOM													Reference page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Fuel	Fuel tank	5	5												FL-13
	Fuel piping			5	5	5		5	5			5			MA-23, EM-128
	Vapor lock														—
	Valve deposit	5		5	5	5		5	5			5			—
	Poor fuel (Heavy weight gasoline, Low octane)														—

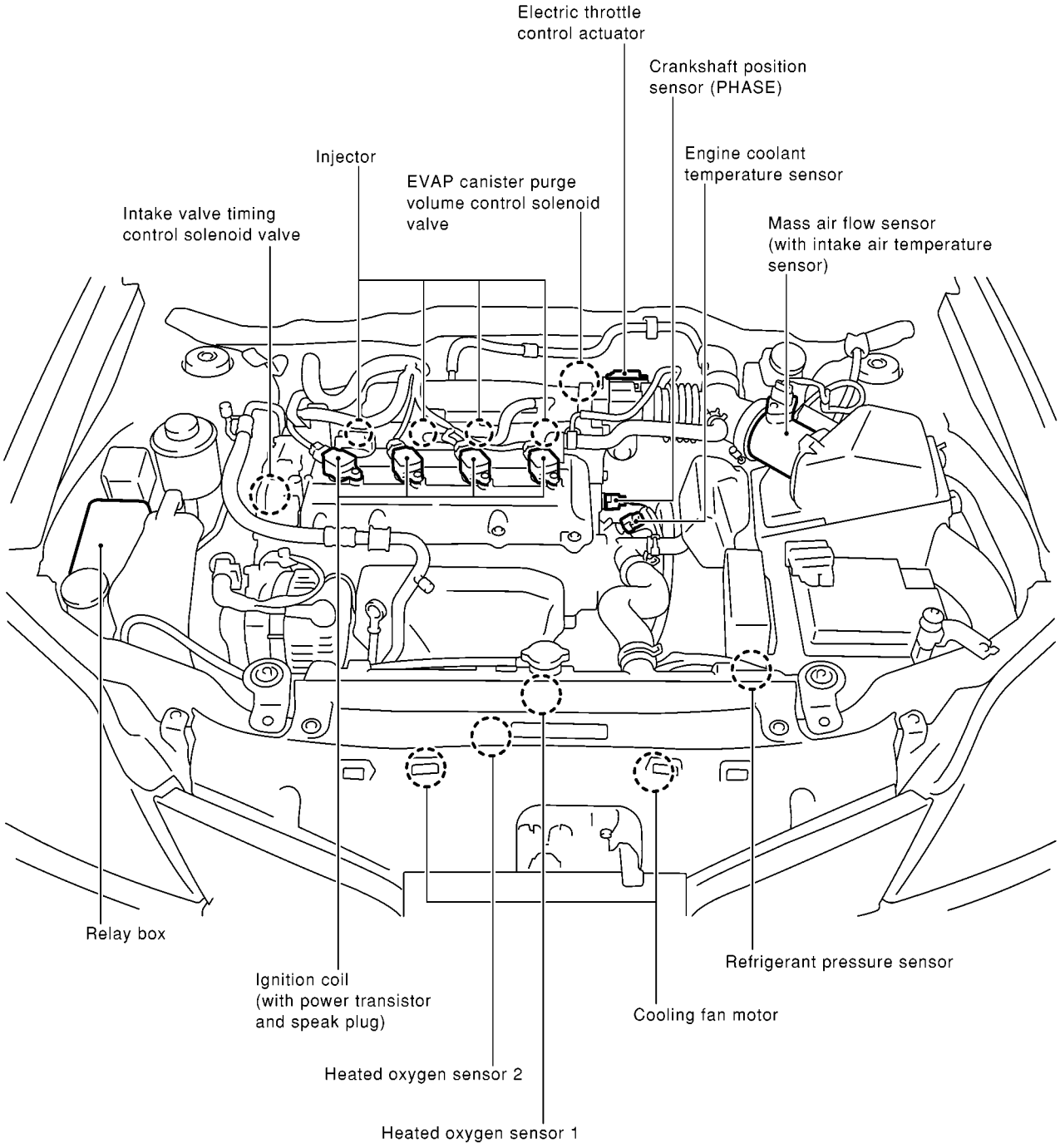
		SYMPTOM													Reference page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Air	Air duct		5	5		5		5	5			5			EM-114
	Air cleaner														EM-114
	Air leakage from air duct (Mass air flow sensor —electric throttle control actuator)	5			5		5			5					EM-114
	Electric throttle control actuator														EM-116
	Air leakage from intake manifold/ Collector/Gasket														EM-116
Cranking	Battery	1	1	1		1		1	1			1		1	SC-3
	Alternator circuit														SC-12
	Starter circuit	3													SC-22
	Signal plate/Flywheel/Drive plate	6													EM-165
	PNP switch	4													MT-126 or CVT-67
Engine	Cylinder head	5	5	5	5	5		5	5			5			EM-152
	Cylinder head gasket										4		3		
	Cylinder block	6	6	6	6	6		6	6			6	4		EM-165
	Piston														
	Piston ring														
	Connecting rod														
	Bearing														
	Crankshaft														
Valve mecha-nism	Timing chain	5	5	5	5	5		5	5			5			EM-143
	Camshaft														EM-133
	Intake valve timing control														EM-143
	Intake valve												3		EM-152
	Exhaust valve														
Exhaust	Exhaust manifold/Tube/Muffler/ Gasket	5	5	5	5	5		5	5			5			EM-121, EX-3
	Three way catalyst														

		SYMPTOM													Reference page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Lubrication	Oil pan/Oil strainer/Oil pump/Oil filter/Oil gallery	5	5	5	5	5		5	5			5	2		EM-123, LU-18 , LU-19 , LU-14
	Oil level (Low)/Filthy oil														LU-16
Cooling	Radiator/Hose/Radiator filler cap	5	5	5	5	5		5	5		2	5			CO-31
	Thermostat									5					CO-40
	Water pump														CO-38
	Water gallery														CO-27
	Cooling fan									5					CO-31
	Coolant level (low)/Contaminated coolant														CO-29
NATS (Nissan Anti-theft System)		1	1												EC-1016 or BL-156

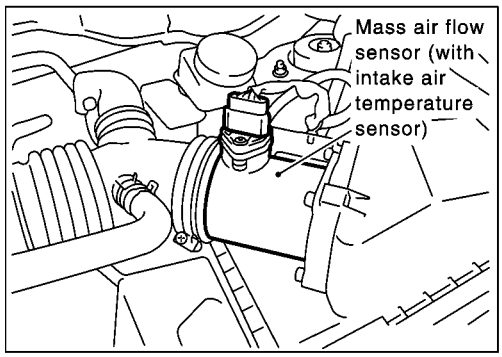
1 - 6: The numbers refer to the order of inspection.

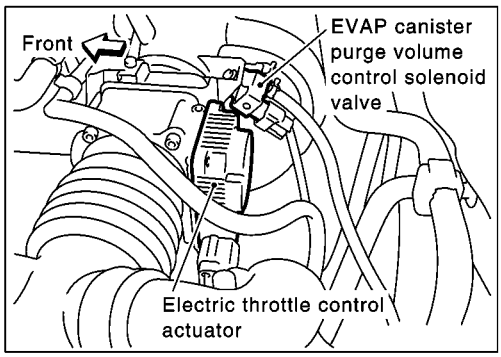
Engine Control Component Parts Location

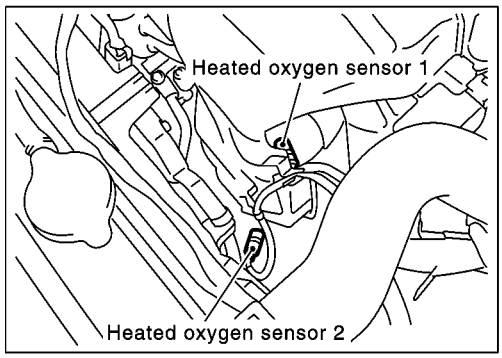
EBS00F22

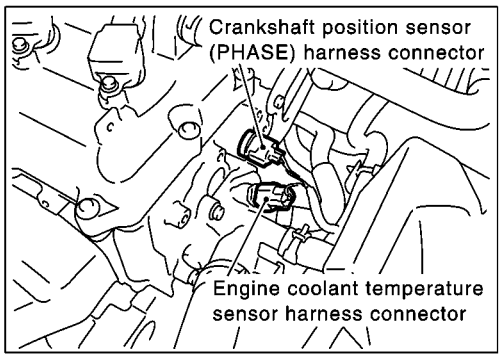


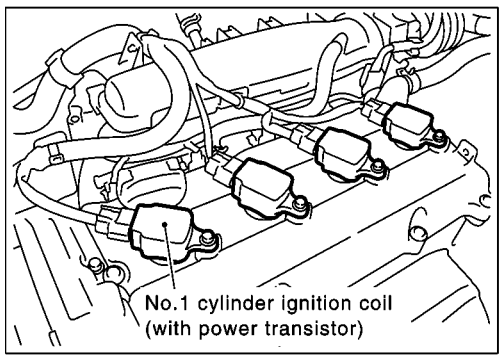
MBIB0070E

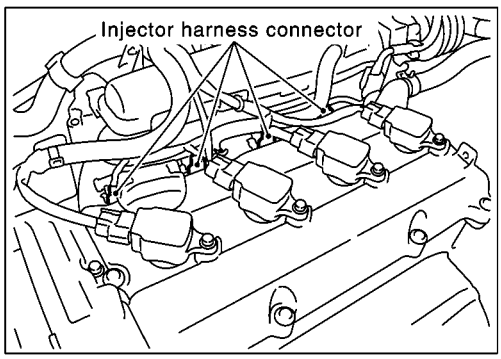

Mass air flow sensor (with intake air temperature sensor)

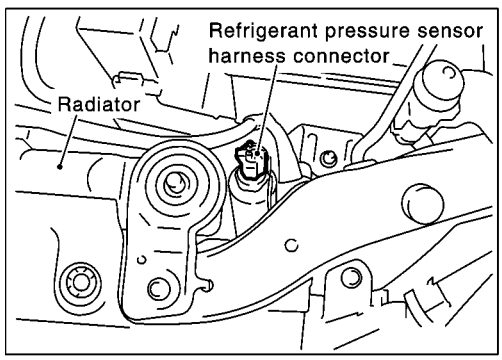

Front
EVAP canister purge volume control solenoid valve
Electric throttle control actuator

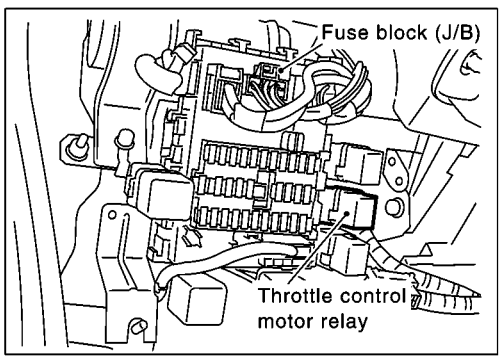

Heated oxygen sensor 1
Heated oxygen sensor 2


Crankshaft position sensor (PHASE) harness connector
Engine coolant temperature sensor harness connector

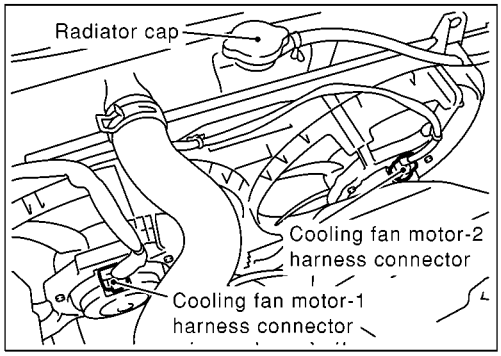

No.1 cylinder ignition coil (with power transistor)

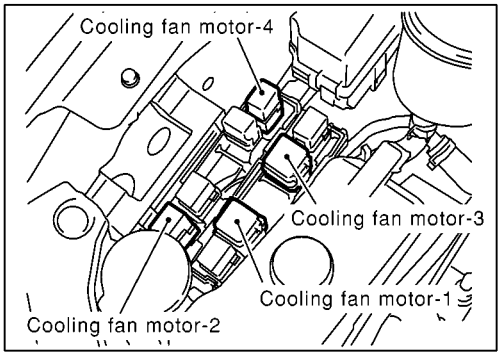

Injector harness connector

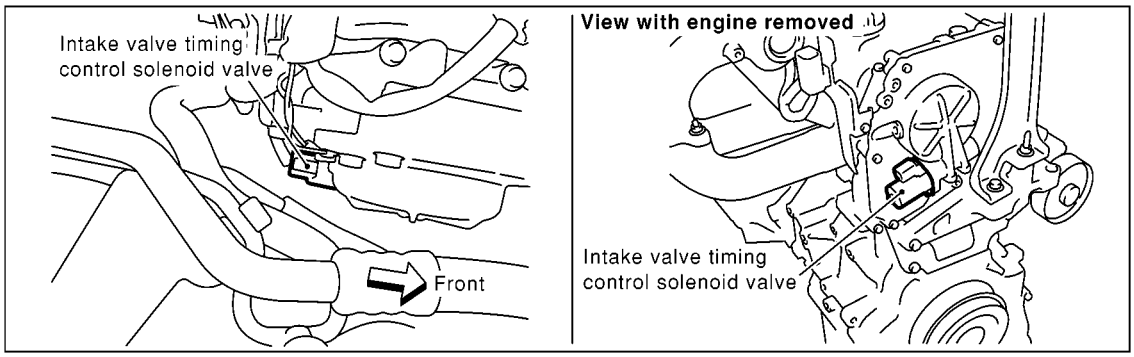

Refrigerant pressure sensor harness connector
Radiator

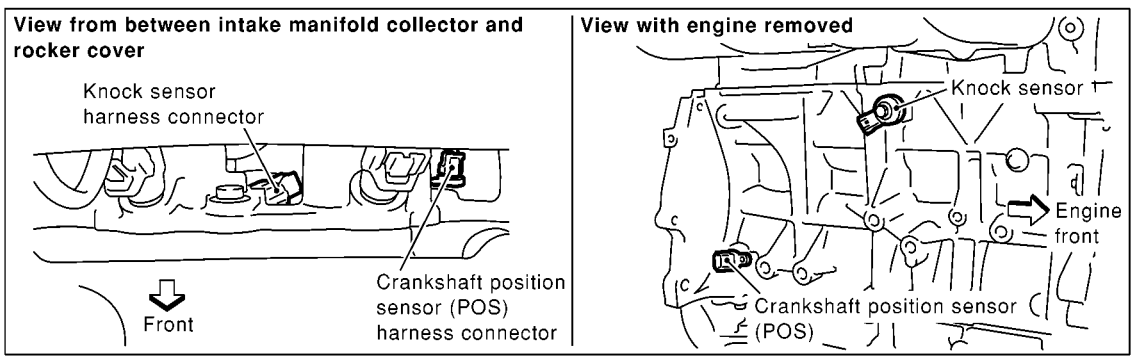

Fuse block (J/B)
Throttle control motor relay

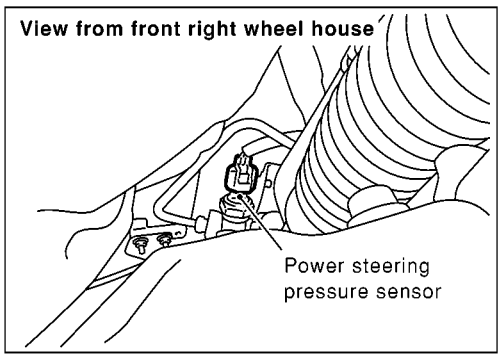
MBIB0147E

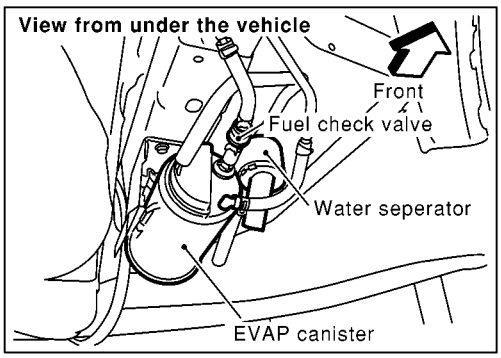

Radiator cap
Cooling fan motor-2
harness connector
Cooling fan motor-1
harness connector


Cooling fan motor-4
Cooling fan motor-3
Cooling fan motor-1
Cooling fan motor-2

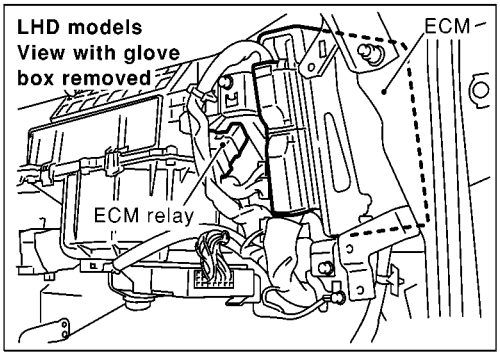

Intake valve timing
control solenoid valve
Front
View with engine removed
Intake valve timing
control solenoid valve

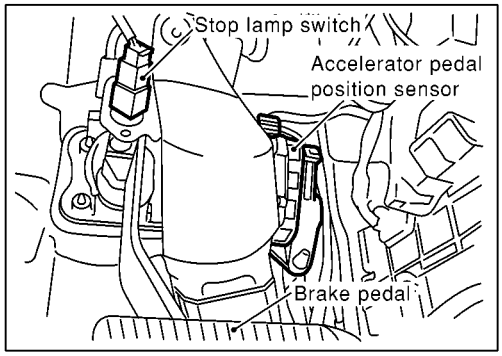

View from between intake manifold collector and rocker cover
Knock sensor
harness connector
Front
Crankshaft position
sensor (POS)
harness connector
View with engine removed
Knock sensor
Engine
front
Crankshaft position sensor
(POS)

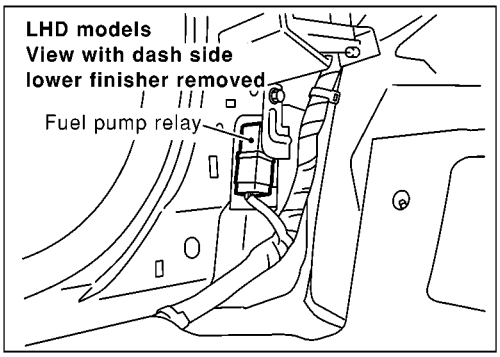

View from front right wheel house
Power steering
pressure sensor

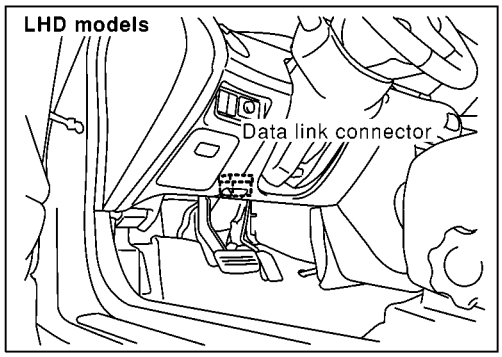

View from under the vehicle
Front
Fuel check valve
Water seperator
EVAP canister

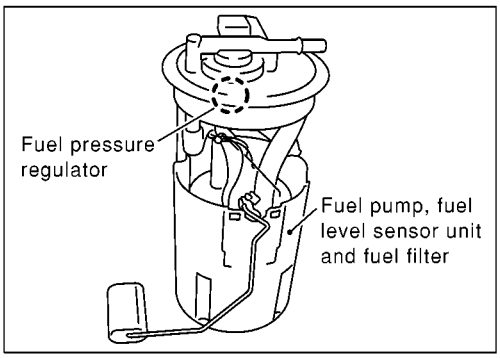
MBIB0148E

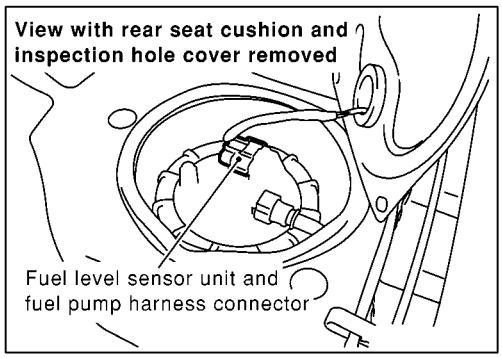

LHD models
View with glove box removed
ECM
ECM relay


Stop lamp switch
Accelerator pedal position sensor
Brake pedal


LHD models
View with dash side lower finisher removed
Fuel pump relay


LHD models
Data link connector

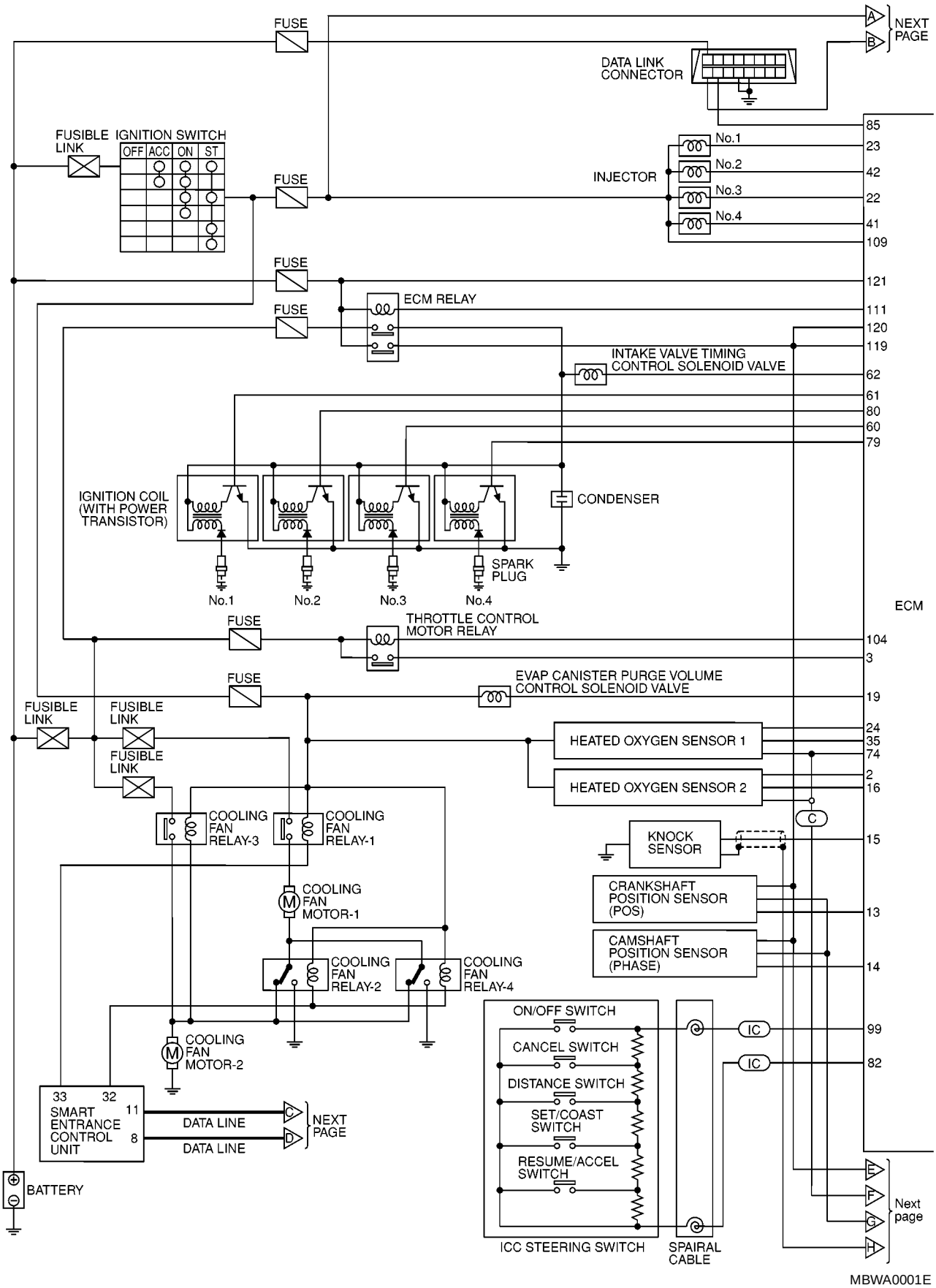

Fuel pressure regulator
Fuel pump, fuel level sensor unit and fuel filter


View with rear seat cushion and inspection hole cover removed
Fuel level sensor unit and fuel pump harness connector

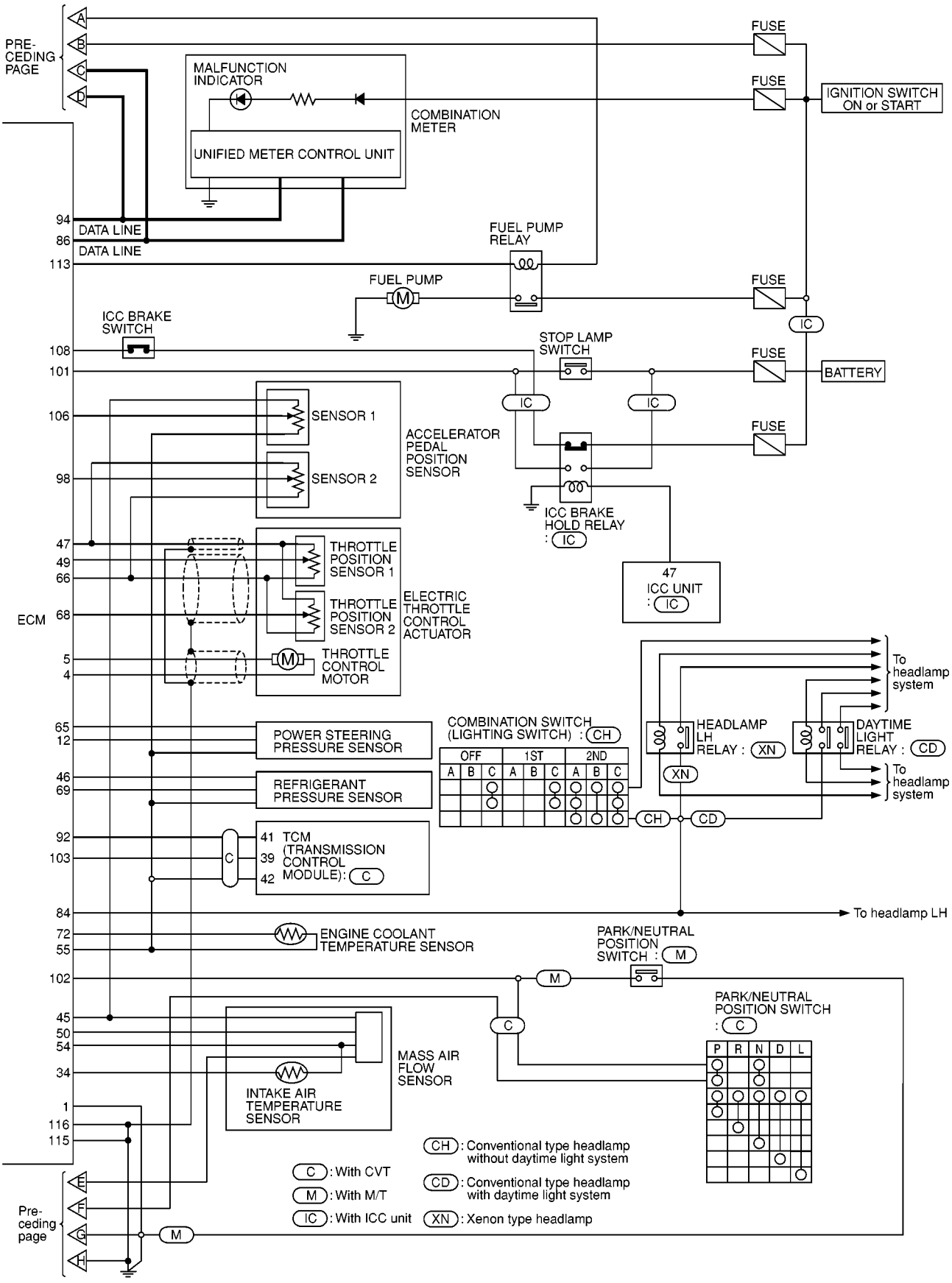
MBIB0149E

Circuit Diagram

EBS00F23



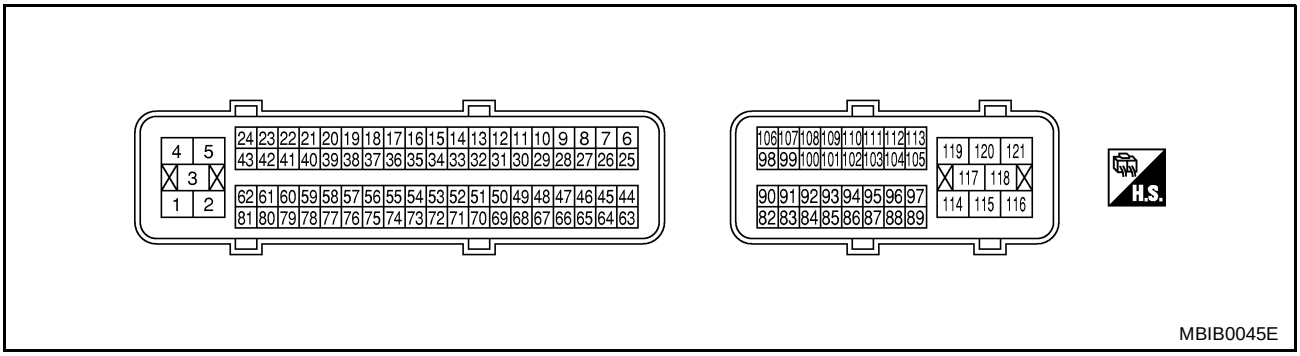
MBWA0001E


PRE-CEDING PAGE
A
B
C
D
MALFUNCTION INDICATOR
COMBINATION METER
UNIFIED METER CONTROL UNIT
FUSE
FUSE
IGNITION SWITCH ON or START
94
DATA LINE
86
DATA LINE
113
FUEL PUMP RELAY
FUEL PUMP
M
FUSE
IC
ICC BRAKE SWITCH
108
101
STOP LAMP SWITCH
FUSE
BATTERY
IC
IC
106
SENSOR 1
98
SENSOR 2
ACCELERATOR PEDAL POSITION SENSOR
FUSE
ICC BRAKE HOLD RELAY : IC
47
49
66
THROTTLE POSITION SENSOR 1
68
THROTTLE POSITION SENSOR 2
ELECTRIC THROTTLE CONTROL ACTUATOR
ECM
5
4
M
THROTTLE CONTROL MOTOR
47 ICC UNIT : IC
To headlamp system
65
12
POWER STEERING PRESSURE SENSOR
COMBINATION SWITCH (LIGHTING SWITCH) : CH
OFF
1ST
2ND
A B C A B C A B C
HEADLAMP LH RELAY : XN
DAYTIME LIGHT RELAY : CD
XN
To headlamp system
46
69
REFRIGERANT PRESSURE SENSOR
CH
CD
92
103
C
41 TCM (TRANSMISSION CONTROL MODULE):
39
42
C
84
To headlamp LH
72
55
ENGINE COOLANT TEMPERATURE SENSOR
PARK/NEUTRAL POSITION SWITCH : M
102
M
PARK/NEUTRAL POSITION SWITCH : C
45
50
54
34
C
MASS AIR FLOW SENSOR
P R N D L
INTAKE AIR TEMPERATURE SENSOR
1
116
115
CH : Conventional type headlamp without daytime light system
C : With CVT
M : With M/T
IC : With ICC unit
CD : Conventional type headlamp with daytime light system
XN : Xenon type headlamp
E
F
G
H
Pre-ceding page
M

MBWA0002E

ECM Harness Connector Terminal Layout

EBS00F24

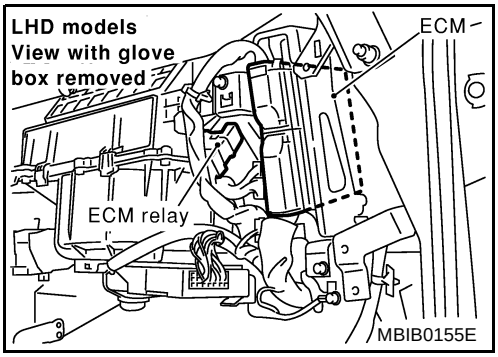


ECM Terminals and Reference Value

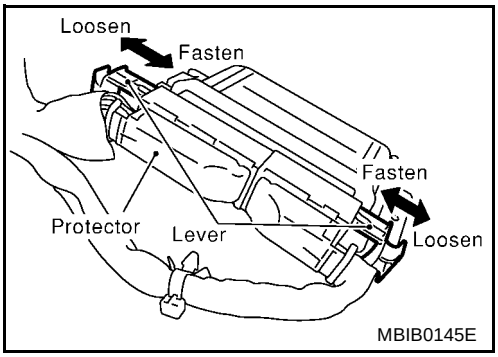
EBS00F25

PREPARATION

1. ECM is located behind the glove box. For this inspection, remove glove box.
2. Remove ECM harness protector.



3. When disconnecting ECM harness connector, loosen it with levers as far as they will go as shown at right.
4. Connect a break-out box (SST) and Y-cable adapter (SST) between the ECM and ECM harness connector.
   - Use extreme care not to touch 2 pins at one time.
   - Data is for comparison and may not be exact.



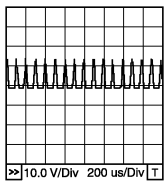
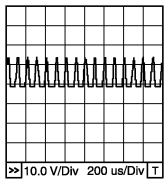
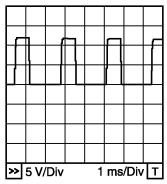
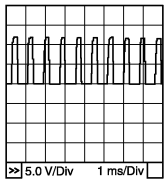
ECM INSPECTION TABLE

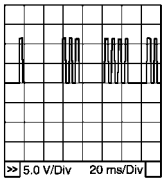
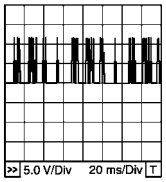
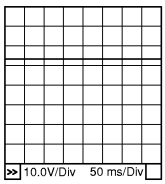
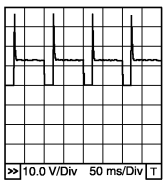
Specification data are reference values and are measured between each terminal and ground.

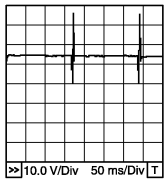
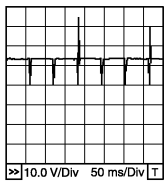
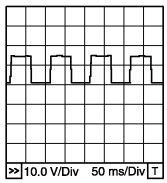
CAUTION:

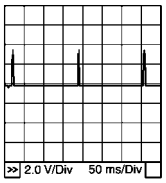
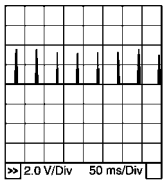
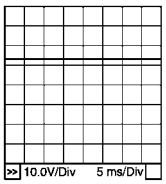
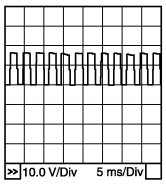
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
1	B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground

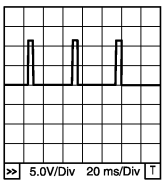
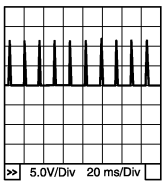
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
2	R/W	Heated oxygen sensor 2 heater	**[Engine is running]** ● Engine speed is below 3,800 rpm. ● After driving for 2 minutes at a speed of 70 km/h (43 MPH) or more	0 - 1.0V
			[Ignition switch "ON"] ● Engine stopped **[Engine is running]** ● Engine speed is above 3,800 rpm	BATTERY VOLTAGE (11 - 14V)
3	R	Throttle control motor relay power supply	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)
4	BR	Throttle control motor (Close)	**[Ignition switch "ON"]** ● Shift lever position is "D" (CVT model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal is releasing	0 - 14V★  PBIB0534E
5	Y	Throttle control motor (Open)	**[Ignition switch "ON"]** ● Shift lever position is "D" (CVT model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal is depressing	0 - 14V★  PBIB0533E
12	Y	Power steering pressure sensor	**[Engine is running]** ● Steering wheel is being turned	0.5 - 4.0V
			[Engine is running] ● Steering wheel is not being turned	0.4 - 0.8V
13	L	Crankshaft position sensor (POS)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 3.0V★  PBIB0527E
			[Engine is running] ● Engine speed is 2,000 rpm	Approximately 3.0V★  PBIB0528E

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
14	L	Camshaft position sensor (PHASE)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.0 - 4.0V★  PBIB0525E
			[Engine is running] ● Engine speed is 2,000 rpm.	1.0 - 4.0V★  PBIB0526E
15	W	Knock sensor	**[Engine is running]** ● Idle speed	Approximately 2.5V
16	W/Y	Heated oxygen sensor 2	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V
19	P	EVAP canister purge volume control solenoid valve	**[Engine is running]** ● Idle speed	BATTERY VOLTAGE (11 - 14V)★  PBIB0050E
			[Engine is running] ● Engine speed is about 2,000 rpm (More than 100 seconds after starting engine)	Approximately 10V★  PBIB0520E

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
22 23 41 42	G/B SB L R/W	Injector No. 3 Injector No. 1 Injector No. 4 Injector No. 2	**[Engine is running]** ● **Warm-up condition** ● Idle speed	BATTERY VOLTAGE (11 - 14V)★  PBIB0529E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	BATTERY VOLTAGE (11 - 14V)★  PBIB0530E
24	P/L	Heated oxygen sensor 1 heater	**[Engine is running]** ● **Warm-up condition** ● Engine speed is below 3,600 rpm.	Approximately 7.0V  PBIB0519E
			[Engine is running] ● Engine speed is above 3,600 rpm.	BATTERY VOLTAGE (11 - 14V)
34	G	Intake air temperature sensor	**[Engine is running]**	Approximately 0 - 4.8V Output voltage varies with intake air temperature.
35	PU	Heated oxygen sensor 1	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V (Periodically change)
45	R	Sensor's power supply	**[Ignition switch "ON"]**	Approximately 5V
46	R	Sensor's power supply (Refrigerant pressure sensor)	**[Ignition switch "ON"]**	Approximately 5V
47	G	Sensor's power supply	**[Ignition switch "ON"]**	Approximately 5V
49	W	Throttle position sensor 1	**[Ignition switch "ON"]** ● Shift lever position is "D" (CVT model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully released	More than 0.36V
			[Ignition switch "ON"] ● Shift lever position is "D" (CVT model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully depressed	Less than 4.75V

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
50	B	Mass air flow sensor	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.1 - 1.5V
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,500 rpm.	1.6 - 2.0V
54	W	Sensors' ground (Mass air flow sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
55	B	Sensors' ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
60 61 79 80	L/Y Y/R GY/L PU/G	Ignition signal No. 3 Ignition signal No. 1 Ignition signal No. 4 Ignition signal No. 2	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0 - 0.1V★  PBIB0521E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - 0.2V★  PBIB0522E
62	Y	Intake valve timing control solenoid valve	**[Engine is running]** ● **Warm-up condition** ● Idle speed	BATTERY VOLTAGE (11 - 14V)  MBIB0052E
			[Engine is running] ● **Warm-up condition** ● When revving engine up to 2,000 rpm quickly	Approximately 4V - BATTERY VOLTAGE (11 - 14V)★  PBIB0532E
65	R	Sensor's power supply (Power steering pressure sensor)	**[Ignition switch "ON"]**	Approximately 5V
66	B	Sensors' ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
68	R	Throttle position sensor 2	**[Ignition switch "ON"]** ● Shift lever position is "D" (CVT model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully released	Less than 4.75V
			[Ignition switch "ON"] ● Shift lever position is "D" (CVT model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully depressed	More than 0.36V
69	L	Refrigerant pressure sensor	**[Engine is running]** ● **Warm-up condition** ● Both A/C switch and blower switch are "ON" (Compressor operates.)	1.0 - 4.0V
72	L/OR	Engine coolant temperature sensor	**[Engine is running]**	Approximately 0 - 4.8V Output voltage varies with engine coolant temperature.
74	B	Sensors' ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
82*2	B	Sensor's ground (ICC steering switch)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
84	R/Y	Electrical load signal (Headlamp signal)	**[Ignition switch "ON"]** ● Lighting switch is "2ND" position	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"] ● Lighting switch is "OFF"	Approximately 0V
85	LG	DATA link connector	**[Ignition switch "ON"]** ● CONSULT-II or GST is disconnected.	BATTERY VOLTAGE (11 - 14V)
86	R	CAN communication line	**[Ignition switch "ON"]**	1.0 - 2.5V
92*1	GY	Accelerator pedal position sensor signal output	**[Ignition switch "ON"]** ● Shift lever position is "D" (CVT models) ● Shift lever position is "1st" (M/T models) ● Accelerator pedal fully released	Approximately 0.5V
			[Ignition switch "ON"] ● Shift lever position is "D" (CVT models) ● Shift lever position is "1st" (M/T models) ● Accelerator pedal fully depressed	Approximately 4.2V
94	L	CAN communication line	**[Ignition switch "ON"]**	2.5 - 4.0V
98	LG	Accelerator pedal position sensor 2	**[Ignition switch "ON"]** ● Shift lever position is "D" (CVT models) ● Shift lever position is "1st" (M/T models) ● Accelerator pedal fully released	0.175 - 0.335V
			[Ignition switch "ON"] ● Shift lever position is "D" (CVT models) ● Shift lever position is "1st" (M/T models) ● Accelerator pedal fully depressed	More than 1.95V

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
99*2	PU	ICC steering switch	**[Ignition switch "ON"]** ● ICC steering switch is "OFF".	Approximately 4.3V
			[Ignition switch "ON"] ● ON/OFF switch is "ON".	Approximately 0V
			[Ignition switch "ON"] ● CANCEL switch is "ON".	Approximately 1.3V
			[Ignition switch "ON"] ● DISTANCE switch is "ON".	Approximately 2.2V
			[Ignition switch "ON"] ● SET/COAST switch is "ON".	Approximately 3V
			[Ignition switch "ON"] ● RESUME/ACCEL switch is "ON".	Approximately 3.7V
101	R/G	Stop lamp switch	**[Ignition switch "ON"]** ● Brake pedal fully released	Approximately 0V
			[Ignition switch "ON"] ● Brake pedal fully depressed	BATTERY VOLTAGE (11 - 14V)
102	P (CVT) L (M/T)	PNP switch	**[Ignition switch "ON"]** ● Gear position is "P" or "N"	Approximately 0V
			[Ignition switch "ON"] ● Except the above gear position	**CVT models** BATTERY VOLTAGE (11 - 14V) **M/T models** Approximately 5V
103*1	L/OR	Tachometer signal output	**[Engine is running]** ● **Warm-up condition** ● Idle speed	10 - 11V★  MBIB0053E
			[Engine is running] ● Engine speed is 2,000 rpm	10 - 11V★  MBIB0054E
104	OR	Throttle control motor relay	**[Ignition switch "OFF"]**	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"]	0 - 1.0V

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
106	L	Accelerator pedal position sensor 1	**[Ignition switch "ON"]** ● Shift lever position is "D" (CVT models) ● Shift lever position is "1st" (M/T models) ● Accelerator pedal fully released	0.35 - 0.67V
			[Ignition switch "ON"] ● Shift lever position is "D" (CVT models) ● Shift lever position is "1st" (M/T models) ● Accelerator pedal fully depressed	More than 3.9V
108*2	R	ICC brake switch	**[Ignition switch "ON"]** ● Brake pedal is depressed	Approximately 0V
			[Ignition switch "ON"] ● Brake pedal is fully released	BATTERY VOLTAGE (11 - 14V)
109	B/R	Ignition switch	**[Ignition switch "OFF"]**	0V
			[Ignition switch "ON"]	BATTERY VOLTAGE (11 - 14V)
111	W/G	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch "OFF"]** ● For 5 seconds after turning ignition switch "OFF"	0 - 1.0V
			[Ignition switch "OFF"] ● 5 seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
113	B/P	Fuel pump relay	**[Ignition switch "ON"]** ● For 1 seconds after turning ignition switch "ON" **[Engine is running]**	0 - 1.0V
			[Ignition switch "ON"] ● More than 1 seconds after turning ignition switch "ON".	BATTERY VOLTAGE (11 - 14V)
115 116	B B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
119 120	W/R W/R	Power supply for ECM	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)
121	W/L	Power supply for ECM (Buck-up)	**[Ignition switch "OFF"]**	BATTERY VOLTAGE (11 - 14V)

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)
*1: CVT models
*2: Models with ICC system

CONSULT-II Function

EBS00F26

FUNCTION

Diagnostic test mode	Function
Work support	This mode enables a technician to adjust some devices faster and more accurately by following the indications on the CONSULT-II unit.
Self-diagnostic results	Self-diagnostic results such as 1st trip DTC, DTCs and 1st trip freeze frame data or freeze frame data can be read and erased quickly.*
Data monitor	Input/Output data in the ECM can be read.
Data monitor (SPEC)	Input/Output of the specification for Basic fuel schedule, AFM, A/F feedback control value and the other data monitor items can be read.

Diagnostic test mode	Function
Active test	Diagnostic Test Mode in which CONSULT-II drives some actuators apart from the ECMs and also shifts some parameters in a specified range.
Function test	This mode is used to inform customers when their vehicle condition requires periodic maintenance.
DTC & SRT confirmation	The status of system monitoring tests and the self-diagnosis status/result can be confirmed.
ECM part number	ECM part number can be read.

*: The following emission-related diagnostic information is cleared when the ECM memory is erased.

- Diagnostic trouble codes
- 1st trip diagnostic trouble codes
- Freeze frame data
- 1st trip freeze frame data
- System readiness test (SRT) codes
- Test values
- Others

ENGINE CONTROL COMPONENT PARTS/CONTROL SYSTEMS APPLICATION

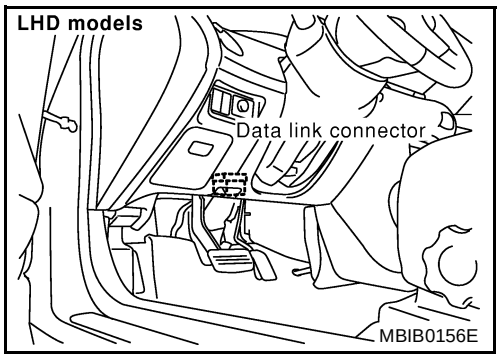
Item			DIAGNOSTIC TEST MODE						
			WORK SUP-PORT	SELF-DIAGNOSTIC RESULTS		DATA MONI-TOR	DATA MONI-TOR (SPEC)	ACTIVE TEST	DTC & SRT CONFIRMATION	
				DTC*1	FREEZE FRAME DATA*2				SRT STATUS	DTC WORK SUP-PORT
ENGINE CONTROL COMPONENT PARTS	INPUT	Crankshaft position sensor (POS)		×	×	×	×			
		Camshaft position sensor (PHASE)		×		×	×			
		Mass air flow sensor		×		×	×			
		Engine coolant temperature sensor		×	×	×	×	×		
		Heated oxygen sensor 1		×		×	×		×	×
		Heated oxygen sensor 2		×		×	×		×	×
		Vehicle speed signal		×	×	×	×			
		Accelerator pedal position sensor		×		×	×			
		Throttle position sensor		×		×	×			
		Intake air temperature sensor		×		×	×			
		Knock sensor		×						
		Refrigerant pressure sensor				×	×			
		Closed throttle position switch (accelerator pedal position sensor signal)				×	×			
		Air conditioner switch				×	×			
		Park/neutral position (PNP) switch		×		×	×			
		Stop lamp switch		×		×	×			
		Power steering pressure sensor		×		×	×			
		Battery voltage				×	×			
		Electrical load signal				×	×			
		ICC steering switch		×		×	×			
		ICC brake switch		×		×	×			

Item			DIAGNOSTIC TEST MODE							
			WORK SUP-PORT	SELF-DIAGNOSTIC RESULTS		DATA MONI-TOR	DATA MONI-TOR (SPEC)	ACTIVE TEST	DTC & SRT CONFIRMATION	
				DTC*1	FREEZE FRAME DATA*2				SRT STATUS	DTC WORK SUP-PORT
ENGINE CONTROL COMPONENT PARTS	OUTPUT	Injectors				×	×	×		
		Power transistor (Ignition timing)				×	×	×		
		Throttle control motor relay		×		×	×			
		Throttle control motor		×						
		EVAP canister purge volume control solenoid valve		×		×	×	×		×
		Air conditioner relay				×	×			
		Fuel pump relay	×			×	×	×		
		Cooling fan relay		×		×	×	×		
		Heated oxygen sensor 1 heater		×		×	×		×	
		Heated oxygen sensor 2 heater		×		×	×		×	
		Intake valve timing control solenoid valve		×		×	×	×		
		Calculated load value			×	×	×			

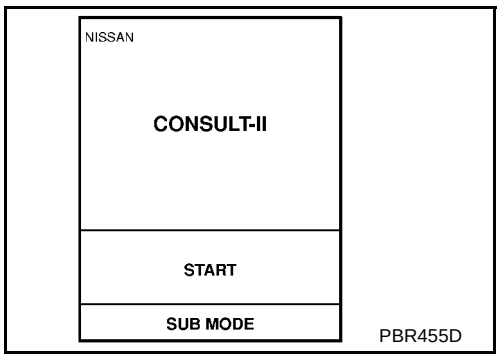
X: Applicable
*1: This item includes 1st trip DTCs.
*2: This mode includes 1st trip freeze frame data or freeze frame data. The items appear on CONSULT-II screen in freeze frame data mode only if a 1st trip DTC or DTC is detected. For details, refer to EC-1008 .

CONSULT-II INSPECTION PROCEDURE

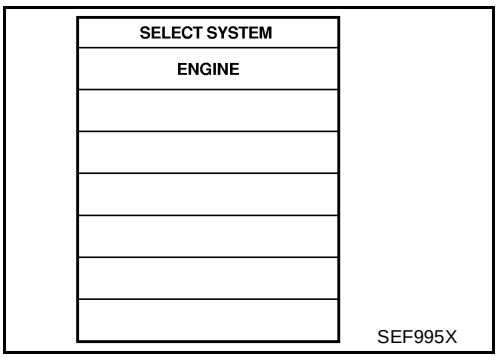
1. Turn ignition switch OFF.
2. Connect “CONSULT-II” to data link connector, which is located under drivers side dash panel.
3. Turn ignition switch ON.



4. Touch “START”.

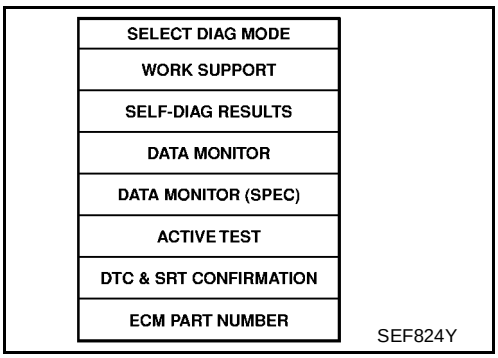


5. Touch “ENGINE”.



6. Perform each diagnostic test mode according to each service procedure.

For further information, see the CONSULT-II Operation Manual.



WORK SUPPORT MODE

Work Item

WORK ITEM	CONDITION	USAGE
FUEL PRESSURE RELEASE	● FUEL PUMP WILL STOP BY TOUCHING “START” DURING IDLING. CRANK A FEW TIMES AFTER ENGINE STALLS.	When releasing fuel pressure from fuel line
IDLE AIR VOL LEARN	● THE IDLE AIR VOLUME THAT KEEPS THE ENGINE WITHIN THE SPECIFIED RANGE IS MEMORIZED IN ECM.	When learning the idle air volume
SELF-LEARNING CONT	● THE COEFFICIENT OF SELF-LEARNING CONTROL MIXTURE RATIO RETURNS TO THE ORIGINAL COEFFICIENT.	When clearing the coefficient of self-learning control value
TARGET IDLE RPM ADJ*	● IDLE CONDITION	When setting target idle speed
TARGET IGN TIM ADJ*	● IDLE CONDITION	When adjusting target ignition timing After adjustment, confirm target ignition timing with a timing light.

*: This function is not necessary in the usual service procedure.

SELF-DIAG RESULTS MODE

Self Diagnostic Item

Regarding items of “DTC and 1st trip DTC”, refer to EC-959, "INDEX FOR DTC" .)

Freeze Frame Data and 1st Trip Freeze Frame Data

Freeze frame data item*	Description
DIAG TROUBLE CODE [PXXXX]	● The engine control component part/control system has a trouble code, it is displayed as “PXXXX”. (Refer to EC-959, "INDEX FOR DTC" .)
FUEL SYS-B1	● “Fuel injection system status” at the moment a malfunction is detected is displayed. ● One mode in the following is displayed. “MODE 2”: Open loop due to detected system malfunction “MODE 3”: Open loop due to driving conditions (power enrichment, deceleration enrichment) “MODE 4”: Closed loop - using oxygen sensor(s) as feedback for fuel control “MODE 5”: Open loop - has not yet satisfied condition to go to closed loop
CAL/LD VALUE [%]	● The calculated load value at the moment a malfunction is detected is displayed.
COOLANT TEMP [°C] or [°F]	● The engine coolant temperature at the moment a malfunction is detected is displayed.
L-FUEL TRIM-B1 [%]	● “Long-term fuel trim” at the moment a malfunction is detected is displayed. ● The long-term fuel trim indicates much more gradual feedback compensation to the base fuel schedule than short-term fuel trim.
S-FUEL TRIM-B1 [%]	● “Short-term fuel trim” at the moment a malfunction is detected is displayed. ● The short-term fuel trim indicates dynamic or instantaneous feedback compensation to the base fuel schedule.
ENGINE SPEED [rpm]	● The engine speed at the moment a malfunction is detected is displayed.
VHCL SPEED [km/h] or [mph]	● The vehicle speed at the moment a malfunction is detected is displayed.
B/FUEL SCHDL [msec]	● The base fuel schedule at the moment a malfunction is detected is displayed.
INT/A TEMP SE [°C] or [°F]	● The intake air temperature at the moment a malfunction is detected is displayed.

*: The items are the same as those of 1st trip freeze frame data.

DATA MONITOR MODE

Monitored Item

×: Applicable

Monitored item [Unit]	ECM INPUT SIG-NALS	MAIN SIG-NALS	CAN DIAG SUP-PORT MNTR	Description	Remarks
ENG SPEED [rpm]	×	×		● Indicates the engine speed computed from the signals of the crankshaft position sensor (POS) and camshaft position sensor (PHASE).	● Accuracy becomes poor if engine speed drops below the idle rpm. ● If the signal is interrupted while the engine is running, an abnormal value may be indicated.
MAS A/F SE-B1 [V]	×	×		● The signal voltage of the mass air flow sensor is displayed.	● When the engine is stopped, a certain value is indicated.
B/FUEL SCHDL [msec]		×		● “Base fuel schedule” indicates the fuel injection pulse width programmed into ECM, prior to any learned on board correction.	
A/F ALPHA-B1 [%]		×		● The mean value of the air-fuel ratio feedback correction factor per cycle is indicated.	● When the engine is stopped, a certain value is indicated. ● This data also includes the data for the air-fuel ratio learning control.

Monitored item [Unit]	ECM INPUT SIG-NALS	MAIN SIG-NALS	CAN DIAG SUP-PORT MNTR	Description	Remarks
COOLAN TEMP/S [°C] or [°F]	×	×		● The engine coolant temperature (determined by the signal voltage of the engine coolant temperature sensor) is displayed.	● When the engine coolant temperature sensor is open or short-circuited, ECM enters fail-safe mode. The engine coolant temperature determined by the ECM is displayed.
HO2S1 (B1) [V]	×	×		● The signal voltage of the heated oxygen sensor 1 is displayed.	
HO2S2 (B1) [V]	×			● The signal voltage of the heated oxygen sensor 2 is displayed.	
HO2S1 MNTR (B1) [RICH/LEAN]	×	×		● Display of heated oxygen sensor 1 signal during air-fuel ratio feedback control: RICH ... means the mixture became “rich”, and control is being affected toward a leaner mixture. LEAN ... means the mixture became “lean”, and control is being affected toward a rich mixture.	● After turning ON the ignition switch, “RICH” is displayed until air-fuel mixture ratio feedback control begins. ● When the air-fuel ratio feedback is clamped, the value just before the clamping is displayed continuously.
HO2S2 MNTR (B1) [RICH/LEAN]	×			● Display of heated oxygen sensor 2 signal: RICH ... means the amount of oxygen after three way catalyst is relatively small. LEAN ... means the amount of oxygen after three way catalyst is relatively large.	● When the engine is stopped, a certain value is indicated.
VHCL SPEED SE [km/h] or [mph]	×	×		● The vehicle speed computed from the vehicle speed signal is displayed.	
BATTERY VOLT [V]	×	×		● The power supply voltage of ECM is displayed.	
ACCEL SEN 1 [V]	×	×		● The accelerator pedal position sensor signal voltage is displayed.	
ACCEL SEN 2 [V]	×				
THRTL SEN 1 [V]	×	×		● The throttle position sensor signal voltage is displayed.	
THRTL SEN 2 [V]	×				
INT/A TEMP SE [°C] or [°F]	×	×		● The intake air temperature (determined by the signal voltage of the intake air temperature sensor) is indicated.	
START SIGNAL [ON/OFF]	×	×		● Indicates start signal status [ON/OFF] computed by the ECM according to the signals of engine speed and battery voltage.	● After starting the engine, [OFF] is displayed regardless of the starter signal.
CLSD THL POS [ON/OFF]	×	×		● Indicates idle position [ON/OFF] computed by the ECM according to the accelerator pedal position sensor signal.	
AIR COND SIG [ON/OFF]	×	×		● Indicates [ON/OFF] condition of the air conditioner switch as determined by the air conditioner signal.	
P/N POSI SW [ON/OFF]	×	×		● Indicates [ON/OFF] condition from the park/neutral position (PNP) switch signal.	

Monitored item [Unit]	ECM INPUT SIG-NALS	MAIN SIG-NALS	CAN DIAG SUP-PORT MNTR	Description	Remarks
PW/ST SIGNAL [ON/OFF]	×	×		● [ON/OFF] condition of the power steering oil pressure switch as determined by the power steering oil pressure signal is indicated.	
LOAD SIGNAL [ON/OFF]	×	×		● Indicates [ON/OFF] condition from the electrical load signal. ON ... Rear window defogger switch is ON and/or lighting switch is in 2nd position. OFF ... Both rear window defogger switch and lighting switch are OFF.	
IGNITION SW [ON/OFF]	×			● Indicates [ON/OFF] condition from ignition switch.	
HEATER FAN SW [ON/OFF]	×			● Indicates [ON/OFF] condition from the heater fan switch signal.	
BRAKE SW [ON/OFF]	×			● Indicates [ON/OFF] condition from the stop lamp switch signal.	
INJ PULSE-B1 [msec]		×		● Indicates the actual fuel injection pulse width compensated by ECM according to the input signals.	● When the engine is stopped, a certain computed value is indicated.
IGN TIMING [BTDC]		×		● Indicates the ignition timing computed by ECM according to the input signals.	● When the engine is stopped, a certain value is indicated.
CAL/LD VALUE [%]				● “Calculated load value” indicates the value of the current airflow divided by peak airflow.	
MASS AIRFLOW [g·m/s]				● Indicates the mass airflow computed by ECM according to the signal voltage of the mass air flow sensor.	
PURG VOL C/V [%]				● Indicates the EVAP canister purge volume control solenoid valve control value computed by the ECM according to the input signals. ● The opening becomes larger as the value increases.	
INT/V TIM (B1) [°CA]				● Indicates [°CA] of intake camshaft advanced angle.	
INT/V SOL (B1) [%]				● The control condition of the intake valve timing control solenoid valve (determined by ECM according to the input signals) is indicated. ON ... intake valve timing control is operating. OFF ... Intake valve timing control is not operating.	
AIR COND RLY [ON/OFF]		×		● The air conditioner relay control condition (determined by ECM according to the input signals) is indicated.	
FUEL PUMP RLY [ON/OFF]		×		● Indicates the fuel pump relay control condition determined by ECM according to the input signals.	

Monitored item [Unit]	ECM INPUT SIG-NALS	MAIN SIG-NALS	CAN DIAG SUP-PORT MNTR	Description	Remarks
THRTL RELAY [ON/OFF]		×		● Indicates the throttle control motor relay control condition determined by the ECM according to the input signals.	
COOLING FAN [HI/LOW/OFF]				● Indicates the condition of the cooling fan (determined by ECM according to the input signals). HI ... High speed operation LOW ... Low speed operation OFF ... Stop	
HO2S1 HTR (B1) [ON/OFF]				● Indicates [ON/OFF] condition of heated oxygen sensor 1 heater determined by ECM according to the input signals.	
HO2S2 HTR (B1) [ON/OFF]				● Indicates [ON/OFF] condition of heated oxygen sensor 2 heater determined by ECM according to the input signals.	
I/P PULLY SPD [rpm]	×			● Indicates the engine speed computed from the primary speed sensor signal.	
VEHICLE SPEED [km/h] or [mph]	×			● Indicates the vehicle speed computed from the secondary speed sensor signal.	
IDL A/V LEARN [YET/CMPLT/ INCMP]				● Display the condition of idle air volume learning YET ... Idle air volume learning has not been performed yet. CMPLT ... Idle air volume learning has already been performed successfully. INCMP ... Idle air volume learning has not been performed successfully.	
TRVL AFTER MIL [km] or [mile]				● Distance traveled while MI is activated.	
AC PRESS SEN [V]				● The signal voltage from the refrigerant pressure sensor is displayed.	
VHCL SPEED SE [km/h] or [mph]				● The vehicle speed computed from the vehicle speed signal sent from TCM is displayed.	
SET VHCL SPD [km/h] or [mph]				● The preset vehicle speed is displayed.	
MAIN SW [ON/OFF]				● Indicates [ON/OFF] condition from ON/ OFF switch signal.	
CANCEL SW [ON/OFF]				● Indicates [ON/OFF] condition from CAN-CEL switch signal.	
RESUME/ACC SW [ON/OFF]				● Indicates [ON/OFF] condition from ACCEL/RES switch signal.	
SET SW [ON/OFF]				● Indicates [ON/OFF] condition from COAST/SET switch signal.	
BRAKE SW1 [ON/OFF]				● Indicates [ON/OFF] condition from ICC brake switch signal.	
BRAKE SW2 [ON/OFF]				● Indicates [ON/OFF] condition of stop lamp switch signal.	
DIST SW [ON/OFF]				● Indicates [ON/OFF] condition from DIS-TANCE switch signal.	

Monitored item [Unit]	ECM INPUT SIG-NALS	MAIN SIG-NALS	CAN DIAG SUP-PORT MNTR	Description	Remarks
CRUISE LAMP [ON/OFF]				● Indicates [ON/OFF] condition of CRUISE lamp determined by the ECM according to the input signals.	
Voltage [V]				● Voltage, frequency, duty cycle or pulse width measured by the probe.	● Only "#" is displayed if item is unable to be measured. ● Figures with "#"s are temporary ones. They are the same figures as an actual piece of data which was just previously measured.
Frequency [msec], [Hz] or [%]					
DUTY-HI					
DUTY-LOW					
PLS WIDTH-HI					
PLS WIDTH-LOW					
CAN COMM [OK/NG]			×	● Indicates the communication condition of CAN communication line.	● These items are not displayed in "SELECTION FROM MENU" mode.
CAN CIRC 1 [OK/UNKWN]			×		
CAN CIRC 2 [OK/UNKWN]			×		
CAN CIRC 3 [OK/UNKWN]			×		
CAN CIRC 4 [OK/UNKWN]			×		
CAN CIRC 5 [OK/UNKWN]			×		
CAN CIRC 6 [OK/UNKWN]			×		
CAN CIRC 7 [OK/UNKWN]			×		

NOTE:
- Any monitored item that does not match the vehicle being diagnosed is deleted from the display automatically.

DATA MONITOR (SPEC) MODE

Monitored Item

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
ENG SPEED [rpm]	×		● Indicates the engine speed computed from the signal of the crankshaft position sensor (POS).	
MAS A/F SE-B1 [V]	×	×	● The signal voltage of the mass air flow sensor specification is displayed.	● When engine is running specification range is indicated.
B/FUEL SCHDL [msec]			● "Base fuel schedule" indicates the fuel injection pulse width programmed into ECM, prior to any learned on board correction.	● When engine is running specification range is indicated.
A/F ALPHA-B1 [%]		×	● The mean value of the air-fuel ratio feedback correction factor per cycle is indicated.	● When engine is running specification range is indicated. ● This data also includes the data for the air-fuel ratio learning control.

NOTE:
- Any monitored item that does not match the vehicle being diagnosed is deleted from the display automatically.

ACTIVE TEST MODE

Test Item

TEST ITEM	CONDITION	JUDGEMENT	CHECK ITEM (REMEDY)
FUEL INJECTION	● Engine: Return to the original trouble condition ● Change the amount of fuel injection using CONSULT-II.	If trouble symptom disappears, see CHECK ITEM.	● Harness and connectors ● Fuel injectors ● Heated oxygen sensor 1
IGNITION TIMING	● Engine: Return to the original trouble condition ● Timing light: Set ● Retard the ignition timing using CONSULT-II.	If trouble symptom disappears, see CHECK ITEM.	● Perform “Idle Air Volume Learning”.
POWER BALANCE	● Engine: After warming up, idle the engine. ● A/C switch “OFF” ● Shift lever “N” ● Cut off each injector signal one at a time using CONSULT-II.	Engine runs rough or dies.	● Harness and connectors ● Compression ● Fuel injectors ● Power transistor ● Spark plugs ● Ignition coils
COOLING FAN	● Ignition switch: ON ● Turn the cooling fan “ON” and “OFF” with CONSULT-II.	Cooling fan moves and stops.	● Harness and connectors ● Cooling fan relay ● Cooling fan motor
ENG COOLANT TEMP	● Engine: Return to the original trouble condition ● Change the engine coolant temperature using CONSULT-II.	If trouble symptom disappears, see CHECK ITEM.	● Harness and connectors ● Engine coolant temperature sensor ● Fuel injectors
FUEL PUMP RELAY	● Ignition switch: ON (Engine stopped) ● Turn the fuel pump relay “ON” and “OFF” using CONSULT-II and listen to operating sound.	Fuel pump relay makes the operating sound.	● Harness and connectors ● Fuel pump relay
PURG VOL CONT/V	● Engine: After warming up, run engine at 1,500 rpm. ● Change the EVAP canister purge volume control solenoid valve opening percent using CONSULT-II.	Engine speed changes according to the opening percent.	● Harness and connectors ● Solenoid valve
V/T ASSIGN ANGLE	● Engine: Return to the original trouble condition ● Change intake valve timing using CONSULT-II.	If trouble symptom disappears, see CHECK ITEM.	● Harness and connectors ● Intake valve timing control solenoid valve

DTC & SRT CONFIRMATION MODE

SRT STATUS Mode

For details, refer to EC-1008, "SYSTEM READINESS TEST (SRT) CODE" .

SRT Work Support Mode

This mode enables a technician to drive a vehicle to set the SRT while monitoring the SRT status.

DTC Work Support Mode

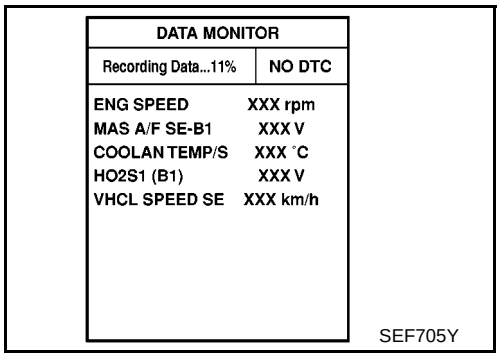
Test mode	Test item	Condition	Reference page
HO2S1	HO2S1 (B1) P0133	Refer to corresponding trouble diagnosis for DTC.	EC-1125
	HO2S1 (B1) P0134		EC-1135
	HO2S1 (B1) P1143		EC-1266
	HO2S1 (B1) P1144		EC-1272
H02S2	HO2S2 (B1) P0139		EC-1149
	HO2S2 (B1) P1146		EC-1278
	HO2S2 (B1) P1147		EC-1286

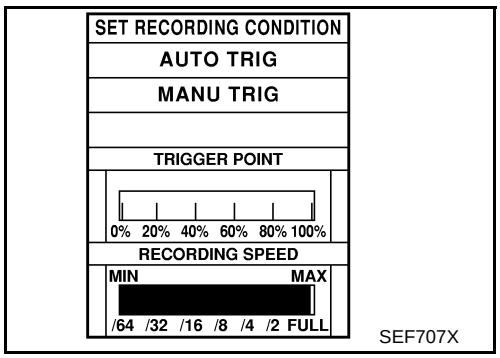
REAL TIME DIAGNOSIS IN DATA MONITOR MODE (RECORDING VEHICLE DATA)

Description

CONSULT-II has two kinds of triggers and they can be selected by touching “SETTING” in “DATA MONITOR” mode.

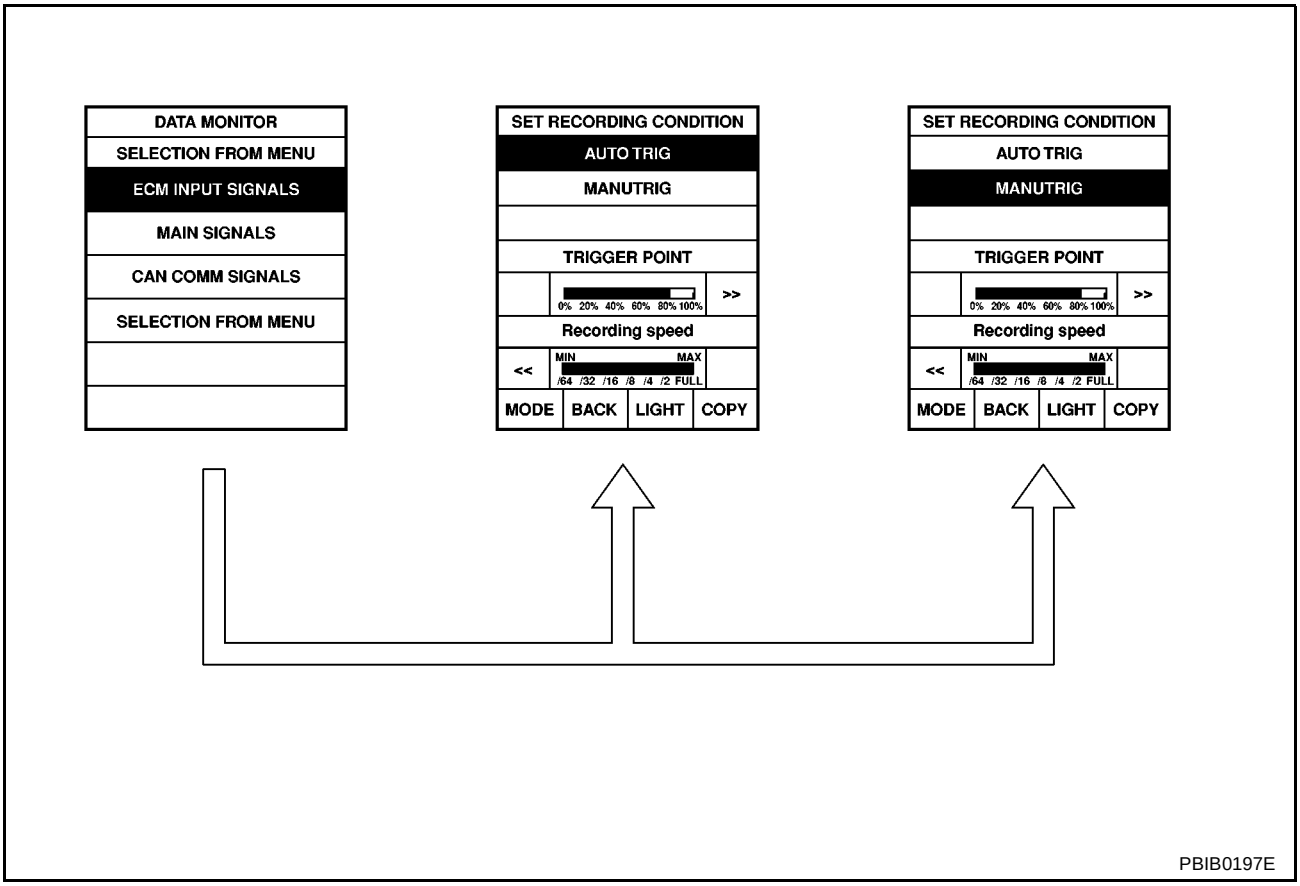
1. “AUTO TRIG” (Automatic trigger):
   - The malfunction will be identified on the CONSULT-II screen in real time.
     In other words, DTC/1st trip DTC and malfunction item will be displayed if the malfunction is detected by ECM.
     At the moment a malfunction is detected by ECM, “MONITOR” in “DATA MONITOR” screen is changed to “Recording Data ... xx%” as shown at right, and the data after the malfunction detection is recorded. Then when the percentage reached 100%, “REAL-TIME DIAG” screen is displayed. If “STOP” is touched on the screen during “Recording Data ... xx%”, “REAL-TIME DIAG” screen is also displayed.
     The recording time after the malfunction detection and the recording speed can be changed by “TRIGGER POINT” and “Recording Speed”. Refer to CONSULT-II OPERATION MANUAL.
2. “MANU TRIG” (Manual trigger):
   - DTC/1st trip DTC and malfunction item will not be displayed automatically on CONSULT-II screen even though a malfunction is detected by ECM.
     DATA MONITOR can be performed continuously even though a malfunction is detected.





Operation

1. “AUTO TRIG”
   - While trying to detect the DTC/1st trip DTC by performing the “DTC Confirmation Procedure”, be sure to select to “DATA MONITOR (AUTO TRIG)” mode. You can confirm the malfunction at the moment it is detected.
   - While narrowing down the possible causes, CONSULT-II should be set in “DATA MONITOR (AUTO TRIG)” mode, especially in case the incident is intermittent.
     When you are inspecting the circuit by gently shaking (or twisting) the suspicious connectors, components and harness in the “DTC Confirmation Procedure”, the moment a malfunction is found the DTC/1st trip DTC will be displayed. (Refer to “Incident Simulation Tests” in GI-24, "How to Perform Efficient Diagnosis for an Electrical Incident" .)
2. “MANU TRIG”
   - If the malfunction is displayed as soon as “DATA MONITOR” is selected, reset CONSULT-II to “MANU TRIG”. By selecting “MANU TRIG” you can monitor and store the data. The data can be utilized for further diagnosis, such as a comparison with the value for the normal operating condition.

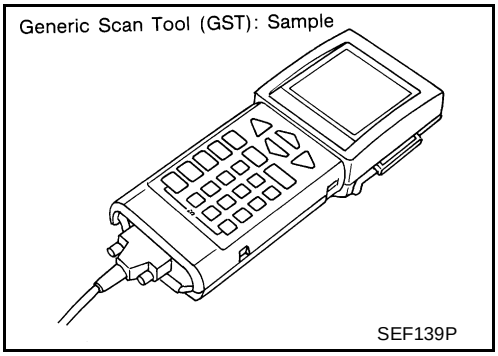


Generic Scan Tool (GST) Function

EBS00F27

DESCRIPTION

Generic Scan Tool (OBDII scan tool) complying with SAE J1978 has 8 different functions explained below.
ISO9141 is used as the protocol.
The name “GST” or “Generic Scan Tool” is used in this service manual.



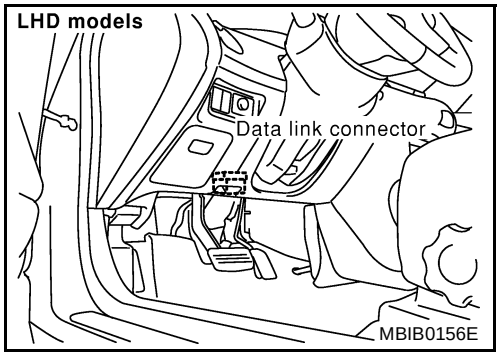
FUNCTION

Diagnostic test mode		Function
MODE 1	READINESS TESTS	This mode gains access to current emission-related data values, including analog inputs and outputs, digital inputs and outputs, and system status information.
MODE 2	(FREEZE DATA)	This mode gains access to emission-related data value which were stored by ECM during the freeze frame. For details, refer to EC-1008, "FREEZE FRAME DATA AND 1ST TRIP FREEZE FRAME DATA" .
MODE 3	DTCs	This mode gains access to emission-related power train trouble codes which were stored by ECM.

Diagnostic test mode		Function
MODE 4	CLEAR DIAG INFO	This mode can clear all emission-related diagnostic information. This includes: ● Clear number of diagnostic trouble codes (MODE 1) ● Clear diagnostic trouble codes (MODE 3) ● Clear trouble code for freeze frame data (MODE 1) ● Clear freeze frame data (MODE 2) ● Reset status of system monitoring test (MODE 1) ● Clear on board monitoring test results (MODE 6 and 7)
MODE 6	(ON BOARD TESTS)	This mode accesses the results of on board diagnostic monitoring tests of specific components/systems that are not continuously monitored.
MODE 7	(ON BOARD TESTS)	This mode enables the off board test drive to obtain test results for emission-related powertrain components/systems that are continuously monitored during normal driving conditions.
MODE 8	—	This mode is not applicable on this vehicle.
MODE 9	(CALIBRATION ID)	This mode enables the off-board test device to request specific vehicle information such as Vehicle Identification Number (VIN) and Calibration IDs.

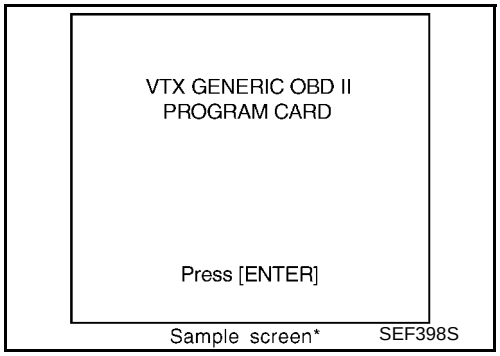
GST INSPECTION PROCEDURE

1. Turn ignition switch OFF.
2. Connect “GST” to data link connector, which is located under drivers side dash panel near the fuse box cover.
3. Turn ignition switch ON.



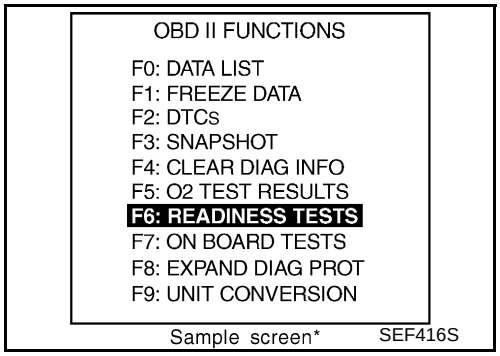
4. Enter the program according to instruction on the screen or in the operation manual.

(*: Regarding GST screens in this section, sample screens are shown.)



5. Perform each diagnostic mode according to each service procedure.

For further information, see the GST Operation Manual of the tool maker.



CONSULT-II Reference Value in Data Monitor Mode

EBS00F28

Remarks:
- Specification data are reference values.
- Specification data are output/input values which are detected or supplied by the ECM at the connector.
  * Specification data may not be directly related to their components signals/values/operations.
  i.e. Adjust ignition timing with a timing light before monitoring IGN TIMING, because the monitor may show the specification data in spite of the ignition timing not being adjusted to the specification data. This IGN TIMING monitors the data calculated by the ECM according to the signals input from the camshaft position sensor and other ignition timing related sensors.

MONITOR ITEM	CONDITION		SPECIFICATION
ENG SPEED	● Tachometer: Connect ● Run engine and compare tachometer indication with the CONSULT-II value.		Almost the same speed as the CONSULT-II value.
MAS A/F SE-B1	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: N ● No-load	Idle	Approx. 1.1 - 1.5V
		2,500 rpm	Approx. 1.6 - 2.0V
B/FUEL SCHDL	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	2.5 - 3.5 msec
		2,000 rpm	2.5 - 3.5 msec
A/F ALPHA-B1	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	54% - 155%
COOLAN TEMP/S	● Engine: After warming up		More than 70°C (158°F)
HO2S1 (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S2 (B1)	● Engine: After warming up	Revving engine from idle to 3,000 rpm quickly.	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S1 MNTR (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	LEAN ←→ RICH Changes more than 5 times during 10 seconds.
HO2S2 MNTR (B1)	● Engine: After warming up	Revving engine from idle to 3,000 rpm quickly.	LEAN ←→ RICH
VEH SPEED SE	● Turn drive wheels and compare speedometer indication with the CONSULT-II value.		Almost the same speed as the CONSULT-II value
BATTERY VOLT	● Ignition switch: ON (Engine stopped)		11 - 14V
ACCEL SEN1 ACCEL SEN2	● Ignition switch: ON (engine stopped)	Accelerator pedal: Fully released	0.35 - 0.67V
		Accelerator pedal: Fully depressed	More than 3.9V
THRTL SEN1 THRTL SEN2	● Ignition switch: ON (Engine stopped) ● Shift lever: D (CVTCVT model) 1st (M/T model)	Accelerator pedal: Fully released	More than 0.36V
		Accelerator pedal: Fully depressed	Less than 4.75V
START SIGNAL	● Ignition switch: ON → START → ON		OFF → ON → OFF
CLSD THL POS	● Ignition switch: ON	Accelerator pedal: Fully released	ON
		Accelerator pedal: Slightly depressed	OFF
AIR COND SIG	● Engine: After warming up, idle the engine	Air conditioner switch: OFF	OFF
		Air conditioner switch: ON (Compressor operates.)	ON
P/N POSI SW	● Ignition switch: ON	Shift lever: P or N (CVT model) Neutral (M/T model)	ON
		Shift lever: Except above	OFF

MONITOR ITEM	CONDITION		SPECIFICATION
PW/ST SIGNAL	● Engine: After warming up, idle the engine	Steering wheel is in neutral position. (Forward direction)	OFF
		Steering wheel is turned.	ON
LOAD SIGNAL	● Ignition switch: ON	Rear window defogger switch is ON and/or lighting switch is in 2nd.	ON
		Rear window defogger switch is OFF and lighting switch is OFF.	OFF
IGNITION SW	● Ignition switch: ON → OFF → ON		ON → OFF → ON
HEATER FAN SW	● Engine: After warming up, idle the engine	Heater fan is operating.	ON
		Heater fan is not operating	OFF
BRAKE SW	● Ignition switch: ON	Brake pedal: Fully released	OFF
		Brake pedal: Slightly depressed	ON
INJ PULSE-B1	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	2.0 - 3.0 msec
		2,000 rpm	1.9 - 2.9 msec
IGN TIMING	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	M/T 12° - 16° BTDC CVT 13° - 17° BTDC
		2,000 rpm	25° - 45° BTDC
CAL/LD VALUE	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	10% - 35%
		2,500 rpm	10% - 35%
MASS AIRFLOW	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	1.0 - 4.0 g·m/s
		2,500 rpm	4.0 - 10.0 g·m/s
PURG VOL C/V	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	0%
		2,000 rpm	20 - 30%
INT/V TIM (B1)	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	–5° - 5°CA
		When revving up to 2,000 rpm quickly	Approx. 0° - 20°CA
INT/V SOL (B1)	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	0% - 2%
		When revving up to 2,000 rpm quickly	Approx. 0% - 50%
AIR COND RLY	● Engine: After warming up, idle the engine	Air conditioner switch: OFF	OFF
		Air conditioner switch: ON (Compressor operates)	ON
FUEL PUMP RLY	● For 1 seconds after turning ignition switch ON ● Engine running or cranking		ON
	● Except above conditions		OFF
THRTL RELAY	● Ignition switch: ON		ON

MONITOR ITEM	CONDITION		SPECIFICATION
COOLING FAN	● Engine: After warming up, idle the engine ● Air conditioner switch: OFF	Engine coolant temperature is 94°C (201°F) or less	OFF
		Engine coolant temperature is between 95°C (203°F) and 99°C (210°F)	LOW
		Engine coolant temperature is 100°C (212°F) or more	HIGH
HO2S1 HTR (B1)	● Engine: After warming up ● Engine speed: Below 3,600 rpm		ON
	● Engine speed: Above 3,600 rpm		OFF
HO2S2 HTR (B1)	● Engine speed: Below 3,800 rpm [After driving for 2 minutes at a speed of 70 km/h (43 MPH) or more]		ON
	● Engine speed: Above 3,800 rpm		OFF
I/P PULLY SPD	● Vehicle speed: More than 20 km/h		Almost the same speed as the CONSULT-II value
VEHICLE SPEED	● Turn drive wheels and compare speedometer indication with the CONSULT-II value.		Almost the same speed as the CONSULT-II value
TRVL AFTER MIL	● Ignition switch: ON	Vehicle has traveled after MIL has turned ON.	0 - 65,535 km (0 - 40,723 mile)
O2SEN HTR DTY	● Engine coolant temperature when engine started: More than 80°C (176°F) ● Engine speed: below 3,600 rpm		Approx. 50 %
AC PRESS SEN	● Ignition switch: ON (Engine stopped)		Approx. 0V
	● Engine: Idle ● Air conditioner switch: OFF		1.0 - 4.0V
VEH SPEED SE	● Turn drive wheels and compare speedometer indication with the CONSULT-II value.		Almost the same speed as the CONSULT-II value
SET VHCL SPD	● Engine: Running	ICC: Operating	The preset vehicle speed is displayed.
MAIN SW	● Ignition switch: ON	ON/OFF switch: Depressed	ON
		ON/OFF switch: Released	OFF
CANCEL SW	● Ignition switch: ON	CANCEL switch: Depressed	ON
		CANCEL switch: Released	OFF
RESUME/ACC SW	● Ignition switch: ON	ACCEL/RES switch: Depressed	ON
		ACCEL/RES switch: Released	OFF
SET SW	● Ignition switch: ON	COAST/SET switch: Depressed	ON
		COAST/SET switch: Released	OFF
BRAKE SW1	● Ignition switch: ON	Brake pedal: Fully released	ON
		Brake pedal: Slightly depressed	OFF
BRAKE SW2	● Ignition switch: ON	Brake pedal: Fully released	OFF
		Brake pedal: Slightly depressed	ON
DIST SW	● Ignition switch: ON	DISTANCE switch: Depressed	ON
		DISTANCE switch: Released	OFF
CRUISE LAMP	● Ignition switch: ON	CRUISE lamp: Illuminated	ON
		CRUISE lamp: Not illuminated	OFF

MONITOR ITEM	CONDITION	SPECIFICATION
CAN COMM	● Ignition switch: ON	OK
CAN CIRC 1		OK
CAN CIRC 2		OK or ONKWN
CAN CIRC 3		OK
CAN CIRC 4		OK
CAN CIRC 5		OK or UNKWN
CAN CIRC 6		OK
CAN CIRC 7		UNKWN

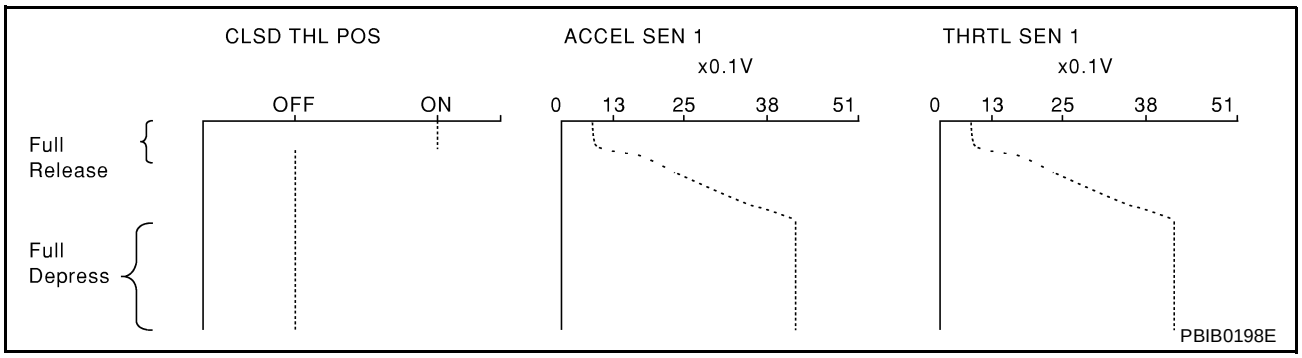
Major Sensor Reference Graph in Data Monitor Mode

EBS00F29

The following are the major sensor reference graphs in “DATA MONITOR” mode.

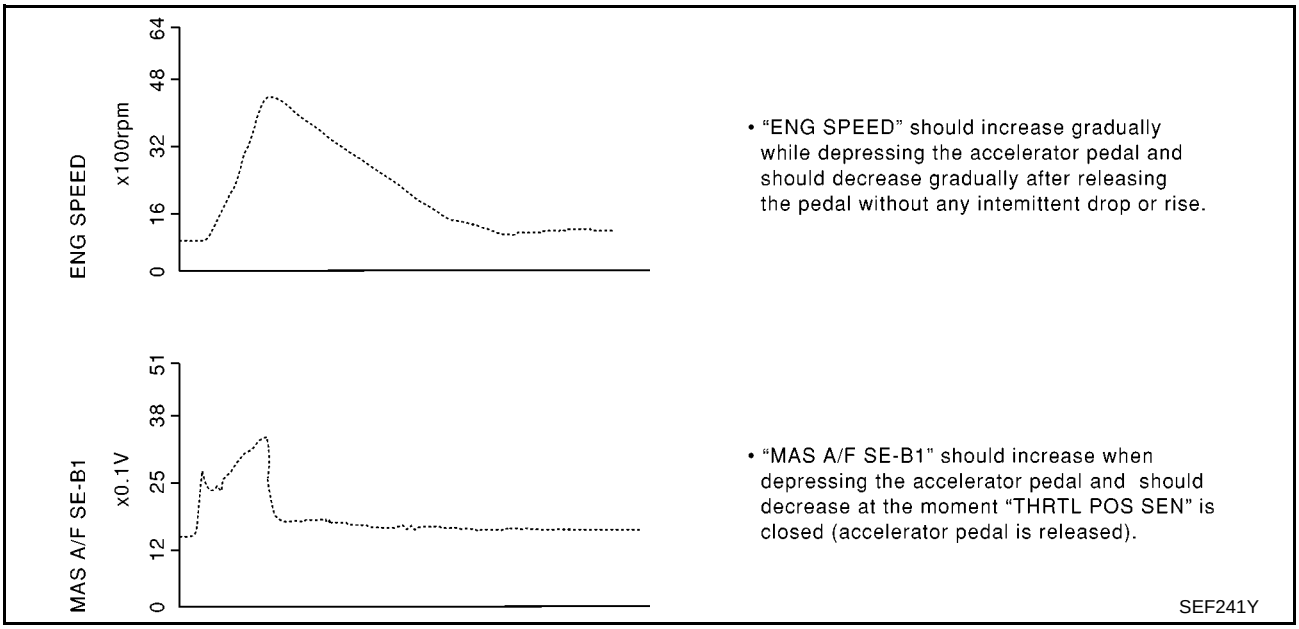
CLSD THL POS, ACCEL SEN 1, THRTL SEN 1

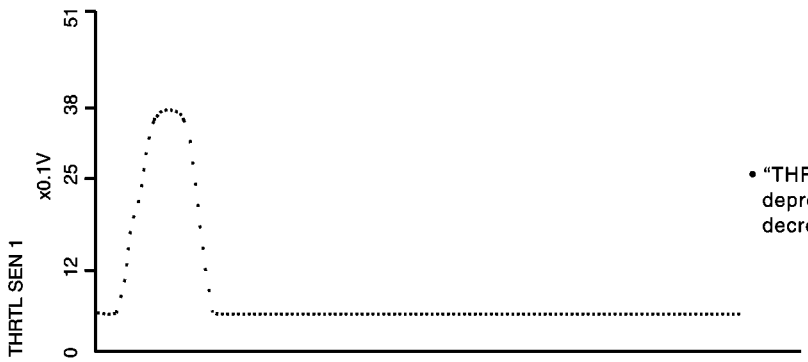
Below is the data for “CLSD THL POS”, “ACCEL SEN 1” and “THRTL SEN 1” when depressing the accelerator pedal with the ignition switch “ON” and with selector lever in “D” position (CVT models) or with shift lever in “1st” position (M/T models).
The signal of “ACCEL SEN 1” and “THRTL SEN 1” should rise gradually without any intermittent drop or rise after “CLSD THL POS” is changed from “ON” to “OFF”.



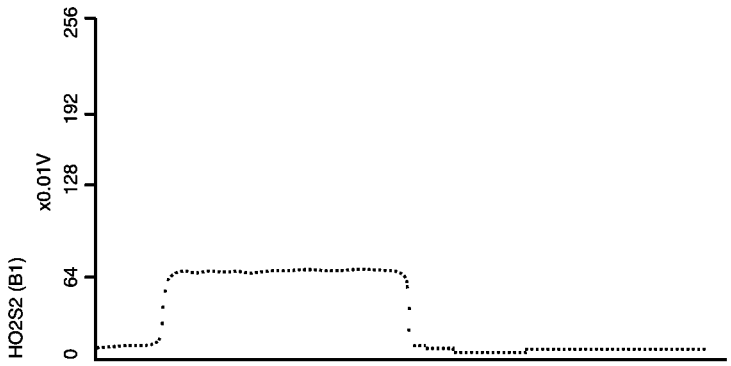
ENG SPEED, MAS A/F SE-B1, THRTL SEN 1, HO2S2 (B1), HO2S1 (B1), INJ PULSE-B1

Below is the data for “ENG SPEED”, “MAS A/F SE-B1”, “THRTL SEN 1”, “HO2S2 (B1)”, “HO2S1 (B1)” and “INJ PULSE-B1” when revving engine quickly up to 4,800 rpm under no load after warming up engine sufficiently.
Each value is for reference, the exact value may vary.

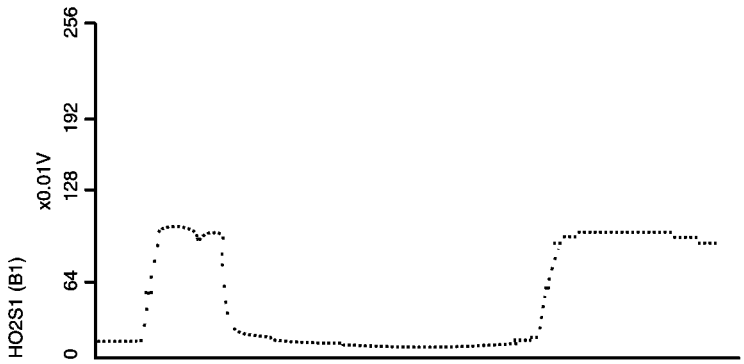




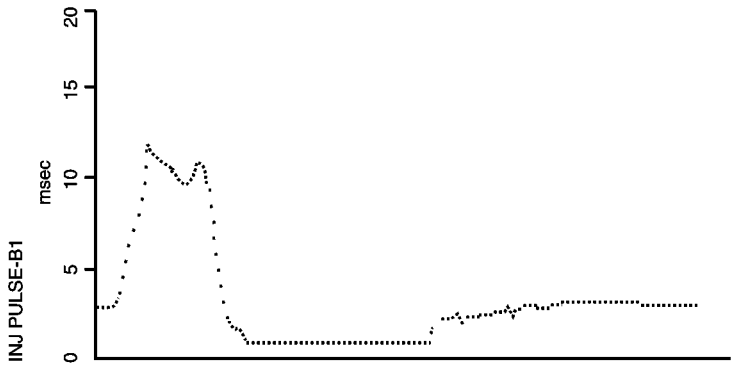
• "THRTL SEN 1" should increase while depressing the accelerator pedal and should decrease while releasing it.



• "HO2S2 (B1)" may increase immediately after depressing the accelerator pedal and may decrease after releasing the pedal.



• "HO2S1 (B1)" may increase immediately after depressing the accelerator pedal and may decrease after releasing the pedal.



• "INJ PULSE-B1" should increase when depressing the accelerator pedal and should decrease when the pedal is released.

PBIB0668E

TROUBLE DIAGNOSIS - SPECIFICATION VALUE

PFP:00031

Description

EBS00F2A

The specification (SP) value indicates the tolerance of the value that is displayed in “DATA MONITOR (SPEC)” mode of CONSULT-II during normal operation of the Engine Control System. When the value in “DATA MONITOR (SPEC)” mode is within the SP value, the Engine Control System is confirmed OK. When the value in “DATA MONITOR (SPEC)” mode is NOT within the SP value, the Engine Control System may have one or more malfunctions.
The SP value is used to detect malfunctions that may affect the Engine Control System, but will not light the MIL.
The SP value will be displayed for the following three items:

- B/FUEL SCHDL (The fuel injection pulse width programmed into ECM prior to any learned on board correction)
- A/F ALPHA-B1 (The mean value of air-fuel ratio feedback correction factor per cycle)
- MAS A/F SE-B1 (The signal voltage of the mass air flow sensor)

Testing Condition

EBS00F2B

- Vehicle driven distance: More than 5,000 km (3,017 miles)
- Barometric pressure: 98.3 - 104.3 kPa (0.983 - 1.043 bar, 1.003 - 1.064 kg/cm^2 , 14.25 - 15.12 psi)
- Atmospheric temperature: 20 - 30°C (68 - 86°F)
- Engine coolant temperature: 75 - 95°C (167 - 203°F)
- Transmission: Warmed-up*1
- Electrical load: Not applied*2
- Engine speed: Idle

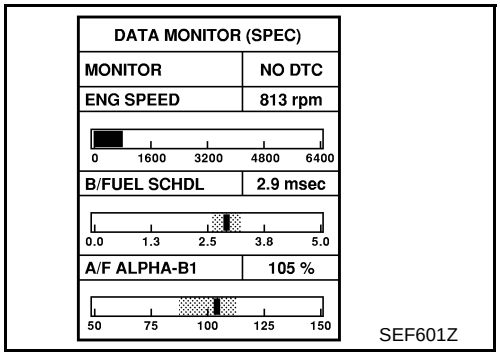
*1: For CVT models with CONSULT-II, after the engine is warmed up to normal operating temperature, drive vehicle until “FLUID TEMP SE” (CVT fluid temperature sensor signal) indicates more than 60°C (140°F).
For CVT models without CONSUT-II and M/T models, after the engine is warmed up to normal operating temperature, drive vehicle for 5 minutes.
*2: Rear window defogger switch, air conditioner switch, lighting switch are “OFF”. Steering wheel is straight ahead.

Inspection Procedure

EBS00F2C

NOTE:
Perform “DATA MONITOR (SPEC)” mode in maximum scale display.

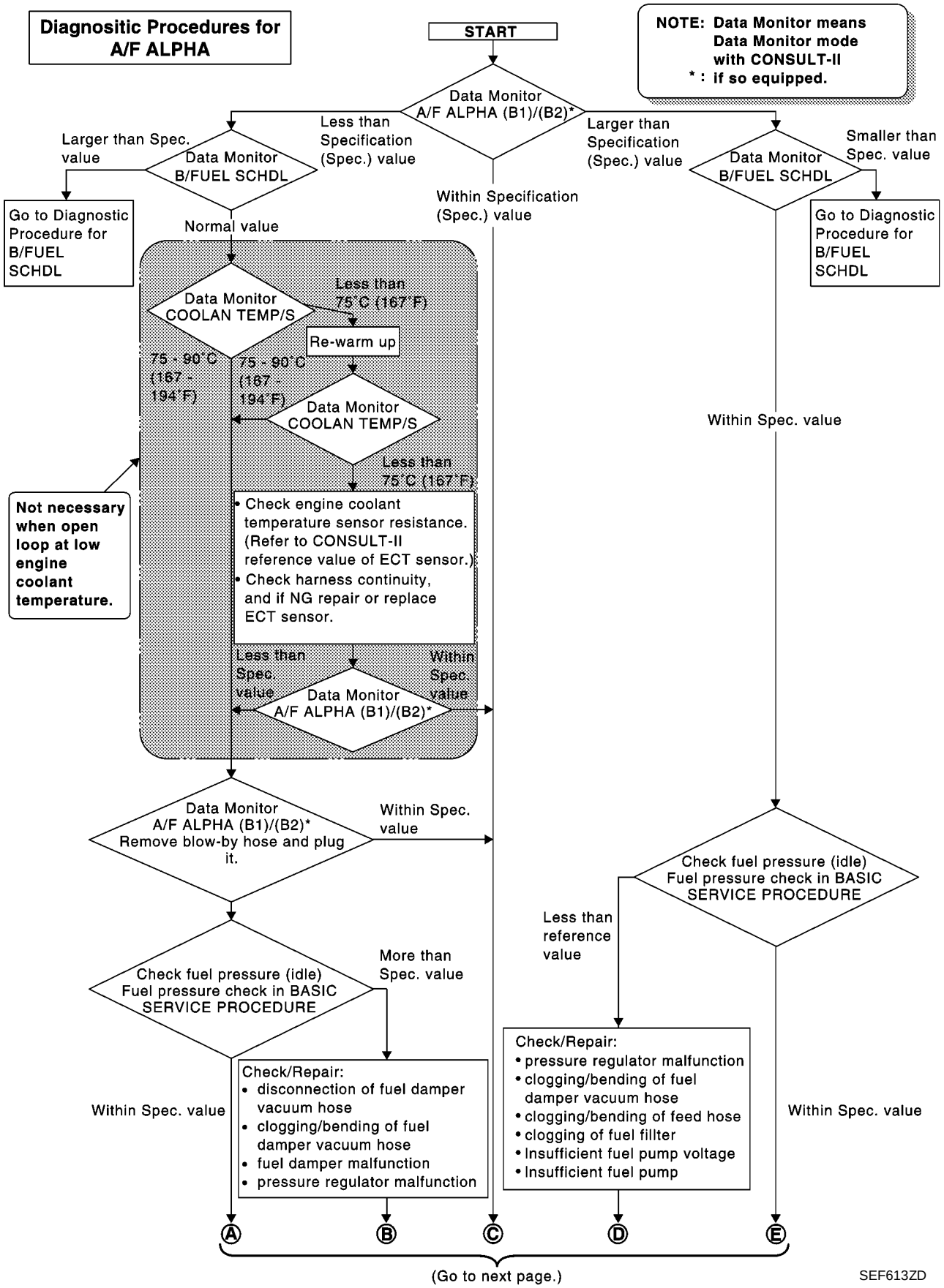
1. Perform EC-1032, "Basic Inspection" .
2. Confirm that the testing conditions indicated above are met.
3. Select “B/FUEL SCHDL”, “A/F ALPHA-B1” and “MAS A/F SE-B1” in “DATA MONITOR (SPEC)” mode with CONSULT-II.
4. Make sure that monitor items are within the SP value.
5. If NG, go to EC-1073, "Diagnostic Procedure" .

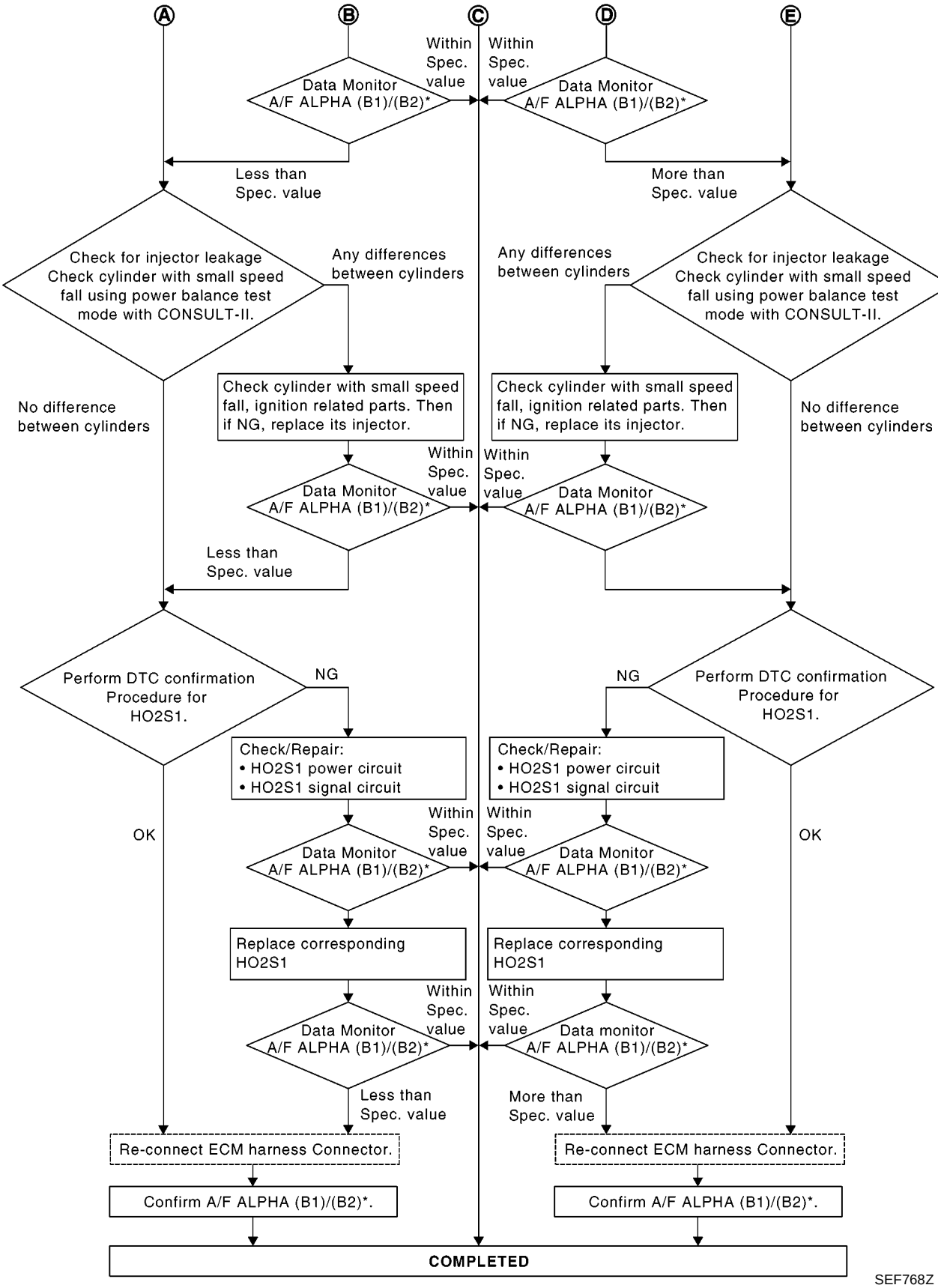


SEF601Z

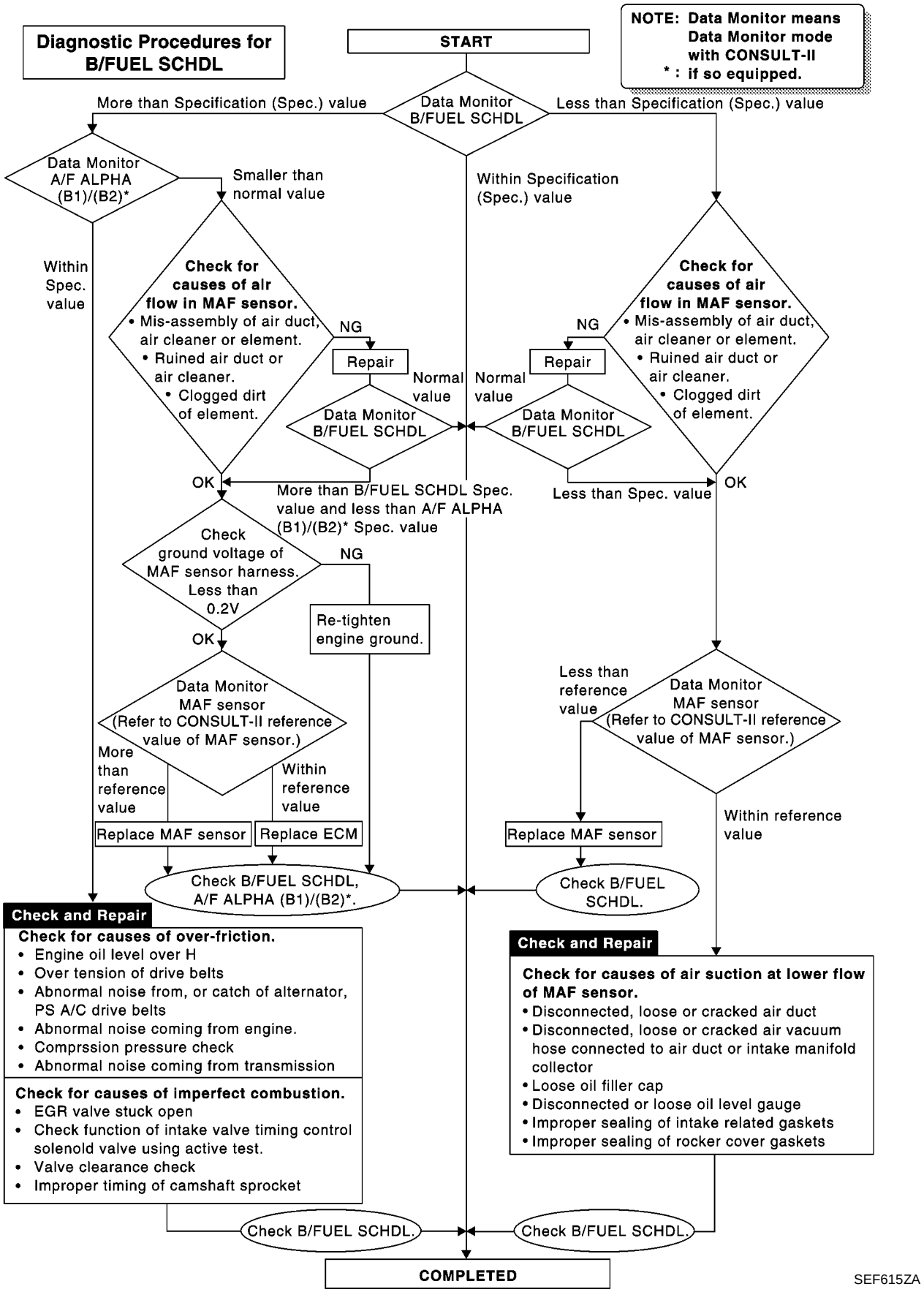
Diagnostic Procedure

EBS00F2D




Ⓐ
Ⓑ
Ⓒ
Ⓓ
Ⓔ
Within Spec. value
Within Spec. value
Data Monitor A/F ALPHA (B1)/(B2)*
Data Monitor A/F ALPHA (B1)/(B2)*
Less than Spec. value
More than Spec. value
Check for injector leakage Check cylinder with small speed fall using power balance test mode with CONSULT-II.
Any differences between cylinders
Any differences between cylinders
Check for injector leakage Check cylinder with small speed fall using power balance test mode with CONSULT-II.
No difference between cylinders
Check cylinder with small speed fall, ignition related parts. Then if NG, replace its injector.
Check cylinder with small speed fall, ignition related parts. Then if NG, replace its injector.
No difference between cylinders
Within Spec. value
Within Spec. value
Data Monitor A/F ALPHA (B1)/(B2)*
Data Monitor A/F ALPHA (B1)/(B2)*
Less than Spec. value
Perform DTC confirmation Procedure for HO2S1.
NG
NG
Perform DTC confirmation Procedure for HO2S1.
Check/Repair:
• HO2S1 power circuit
• HO2S1 signal circuit
Check/Repair:
• HO2S1 power circuit
• HO2S1 signal circuit
OK
Within Spec. value
Within Spec. value
OK
Data Monitor A/F ALPHA (B1)/(B2)*
Data Monitor A/F ALPHA (B1)/(B2)*
Replace corresponding HO2S1
Replace corresponding HO2S1
Within Spec. value
Within Spec. value
Data Monitor A/F ALPHA (B1)/(B2)*
Data monitor A/F ALPHA (B1)/(B2)*
Less than Spec. value
More than Spec. value
Re-connect ECM harness Connector.
Re-connect ECM harness Connector.
Confirm A/F ALPHA (B1)/(B2)*.
Confirm A/F ALPHA (B1)/(B2)*.
COMPLETED

SEF768Z


Diagnostic Procedures for B/FUEL SCHDL
START
NOTE: Data Monitor means Data Monitor mode with CONSULT-II
* : if so equipped.
Data Monitor B/FUEL SCHDL
More than Specification (Spec.) value
Less than Specification (Spec.) value
Within Specification (Spec.) value
Data Monitor A/F ALPHA (B1)/(B2)*
Smaller than normal value
Within Spec. value
Check for causes of air flow in MAF sensor.
• Mis-assembly of air duct, air cleaner or element.
• Ruined air duct or air cleaner.
• Clogged dirt of element.
NG
Repair
Normal value
Data Monitor B/FUEL SCHDL
Check for causes of air flow in MAF sensor.
• Mis-assembly of air duct, air cleaner or element.
• Ruined air duct or air cleaner.
• Clogged dirt of element.
NG
Repair
Normal value
Data Monitor B/FUEL SCHDL
OK
More than B/FUEL SCHDL Spec. value and less than A/F ALPHA (B1)/(B2)* Spec. value
Less than Spec. value
OK
Check ground voltage of MAF sensor harness. Less than 0.2V
NG
Re-tighten engine ground.
OK
Data Monitor MAF sensor (Refer to CONSULT-II reference value of MAF sensor.)
More than reference value
Within reference value
Replace MAF sensor
Replace ECM
Less than reference value
Data Monitor MAF sensor (Refer to CONSULT-II reference value of MAF sensor.)
Replace MAF sensor
Within reference value
Check B/FUEL SCHDL, A/F ALPHA (B1)/(B2)*.
Check B/FUEL SCHDL.
Check and Repair
Check for causes of over-friction.
• Engine oil level over H
• Over tension of drive belts
• Abnormal noise from, or catch of alternator, PS A/C drive belts
• Abnormal noise coming from engine.
• Comprssion pressure check
• Abnormal noise coming from transmission
Check for causes of imperfect combustion.
• EGR valve stuck open
• Check function of intake valve timing control solenold valve using active test.
• Valve clearance check
• Improper timing of camshaft sprocket
Check and Repair
Check for causes of air suction at lower flow of MAF sensor.
• Disconnected, loose or cracked air duct
• Disconnected, loose or cracked air vacuum hose connected to air duct or intake manifold collector
• Loose oil filler cap
• Disconnected or loose oil level gauge
• Improper sealing of intake related gaskets
• Improper sealing of rocker cover gaskets
Check B/FUEL SCHDL.
Check B/FUEL SCHDL.
COMPLETED
SEF615ZA

TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT

PFP:00006

Description

EBS00F2E

Intermittent incidents (I/I) may occur. In many cases, the problem resolves itself (the part or circuit function returns to normal without intervention). It is important to realize that the symptoms described in the customer's complaint often do not recur on (1st trip) DTC visits. Realize also that the most frequent cause of I/I occurrences is poor electrical connections. Because of this, the conditions under which the incident occurred may not be clear. Therefore, circuit checks made as part of the standard diagnostic procedure may not indicate the specific problem area.

Common I/I Report Situations

STEP in Work Flow	Situation
II	The CONSULT-II is used. The SELF-DIAG RESULTS screen shows time data other than “0” or “[1t]”.
III	The symptom described by the customer does not recur.
IV	(1st trip) DTC does not appear during the DTC Confirmation Procedure.
VI	The Diagnostic Procedure for PXXXX does not indicate the problem area.

Diagnostic Procedure

EBS00F2F

1. INSPECTION START

Erase (1st trip) DTCs. Refer to EC-1015, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .

>> GO TO 2.

2. CHECK GROUND TERMINALS

Check ground terminals for corroding or loose connection.
Refer to GI-24, "How to Perform Efficient Diagnosis for an Electrical Incident" , "Incident Simulation Tests", “Ground Inspection”.

OK or NG

OK >> GO TO 3.
NG >> Repair or replace.

3. SEARCH FOR ELECTRICAL INCIDENT

Perform GI-24, "How to Perform Efficient Diagnosis for an Electrical Incident" , "Incident Simulation Tests".

OK or NG

OK >> **INSPECTION END**
NG >> Repair or replace.

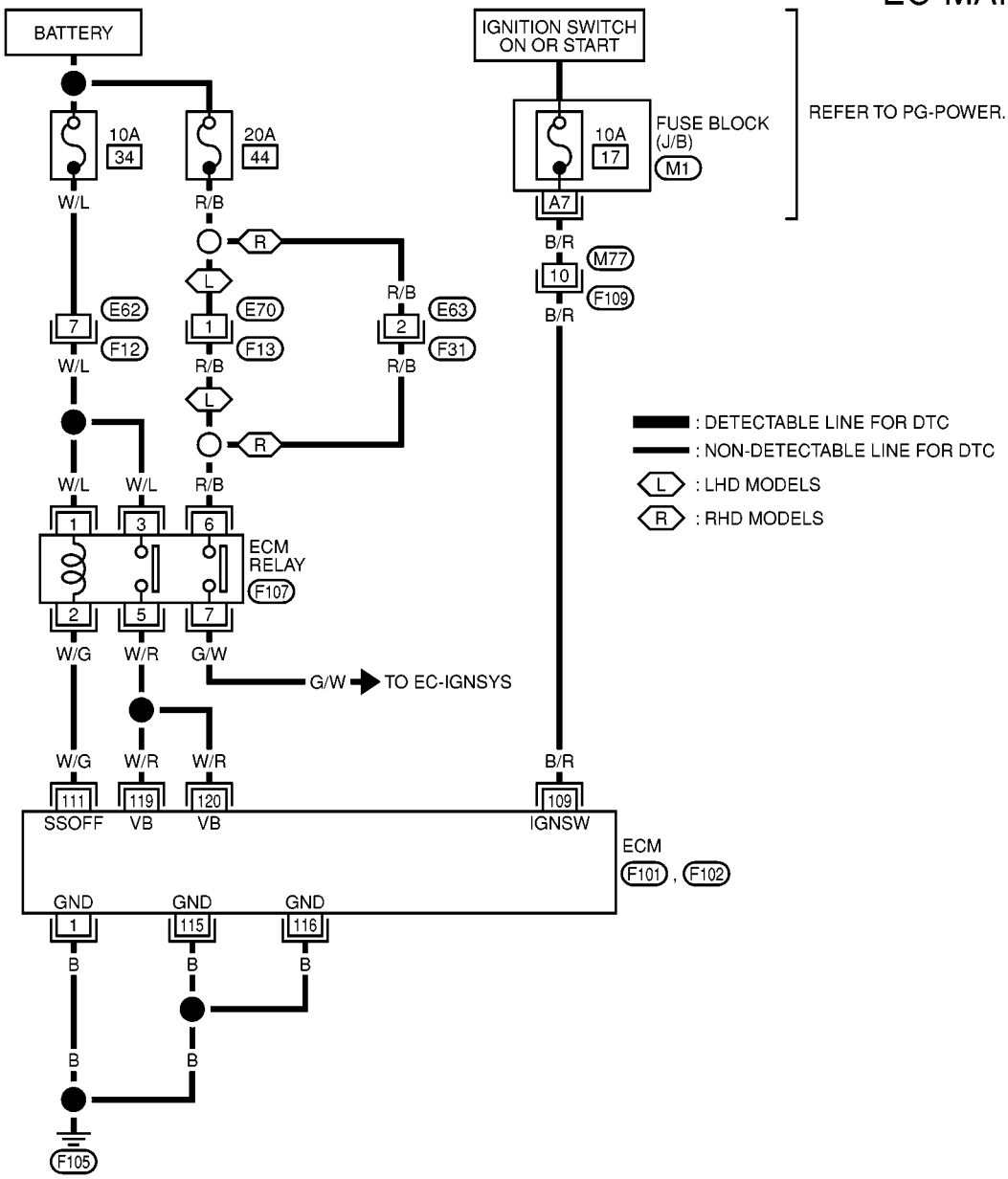
POWER SUPPLY CIRCUIT FOR ECM

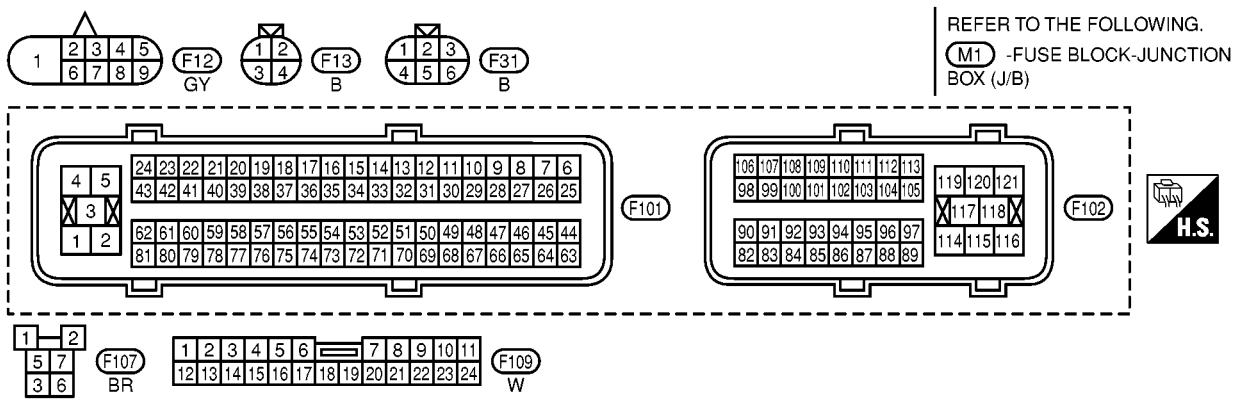
PFP:24110

Wiring Diagram

EBS00F2G

EC-MAIN-01





MBWA0003E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
1 115 116	B B B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
109	B/R	Ignition switch	**[Ignition switch "OFF"]**	0V
			[Ignition switch "ON"]	BATTERY VOLTAGE (11 - 14V)
111	W/G	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch "OFF"]** ● For 5 seconds after turning ignition switch "OFF"	0 - 1.0V
			[Ignition switch "OFF"] ● 5 seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
119 120	W/R W/R	Power supply for ECM	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

EBS00GKE

1. INSPECTION START

Start engine.

Is engine running?

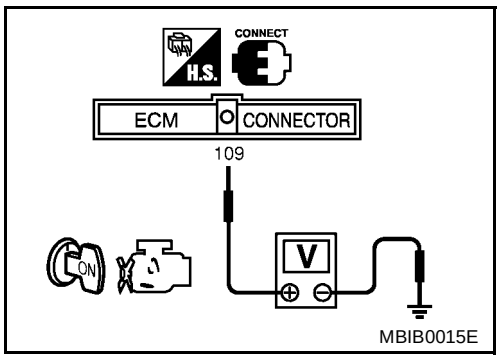
Yes or No

Yes >> GO TO 8.
No >> GO TO 2.

2. CHECK ECM POWER SUPPLY CIRCUIT-I

1. Turn ignition switch "OFF" and then "ON".
2. Check voltage between ECM terminal 109 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M77, F109
- Fuse block (J/B) connector M1
- 10A fuse
- Harness for open or short between ECM and fuse

>> Repair harness or connectors.

4. CHECK ECM GROUND CIRCUIT FOR OPEN AND SHORT-I

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminals 1, 115, 116 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

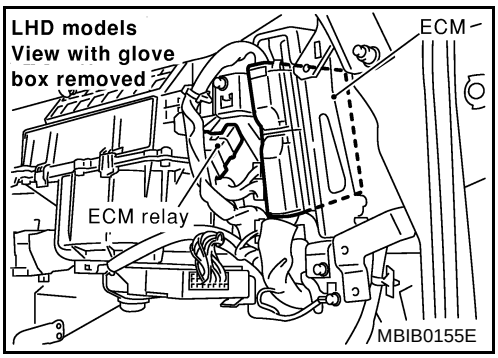
4. Also check harness for short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to power in harness or connectors.

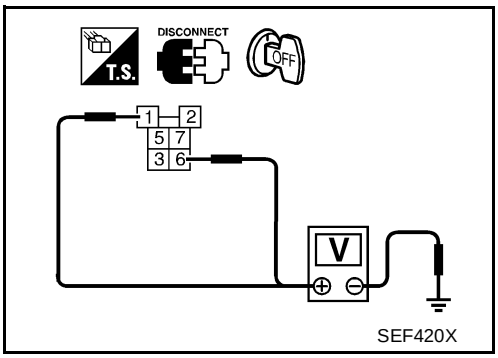
5. CHECK ECM POWER SUPPLY CIRCUIT-II

1. Disconnect ECM relay.



2. Check voltage between ECM relay terminals 1 and 6 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E62, F12
- Harness connectors E70, F13 (LHD models)
- Harness connectors E63, F31 (RHD models)
- 10A fuse
- 20A fuse
- Harness for open or short between ECM relay and battery

>> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 111 and ECM relay terminal 2.
   Refer to Wiring Diagram.

   Continuity should exist.

2. Also check harness for short to ground and short to power.

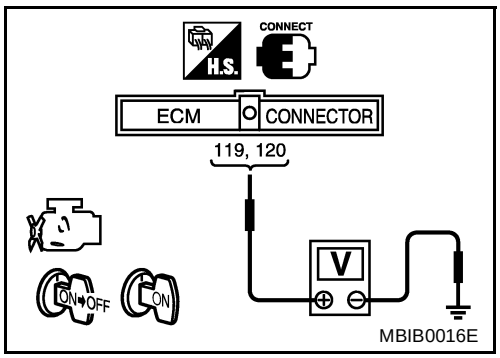
OK or NG

OK >> Go to EC-1365, "IGNITION SIGNAL" .
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK ECM POWER SUPPLY CIRCUIT-III

1. Stop engine and wait at least 10 seconds.
2. Turn ignition switch “ON” and then “OFF”.
3. Check voltage between ECM terminals 119, 120 and ground with CONSULT-II or tester.

   Voltage: After turning ignition switch “OFF”, battery voltage will exist for a few seconds, then drop approximately 0V.

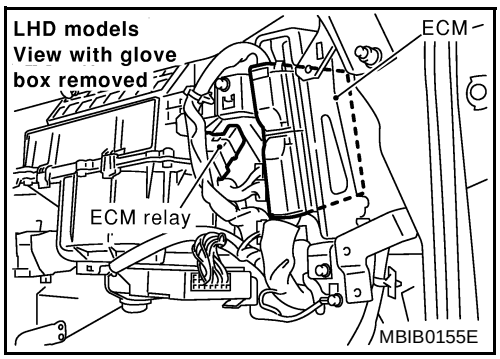


OK or NG

OK >> GO TO 13.
NG (Battery voltage does not exist.)>>GO TO 9.
NG (Battery voltage exists for more than a few seconds.)>>GO TO 11.

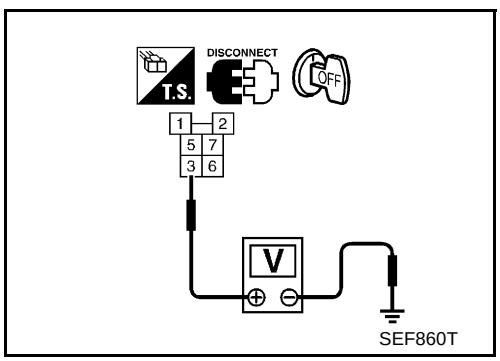
9. CHECK ECM POWER SUPPLY CIRCUIT-IV

1. Disconnect ECM relay.



2. Check voltage between ECM relay terminal 3 and ground with CONSULT-II or tester.

   Voltage: Battery voltage



OK or NG

OK >> GO TO 11.
NG >> GO TO 10.

10. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E62, F12
- Harness for open or short between ECM relay and 10A fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

11. CHECK ECM POWER SUPPLY CIRCUIT-V

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminals 119, 120 and ECM relay terminal 5. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 12.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

12. CHECK ECM RELAY

Refer to EC-1082, "Component Inspection" .

OK or NG

OK >> GO TO 13.
NG >> Replace ECM relay.

13. CHECK ECM GROUND CIRCUIT FOR OPEN AND SHORT-II

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminals 1, 115, 116 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to power.

OK or NG

OK >> GO TO 14.
NG >> Repair open circuit or short to power in harness or connectors.

14. CHECK INTERMITTENT INCIDENT

Refer to EC-1076, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

OK or NG

OK >> **INSPECTION END**

Component Inspection

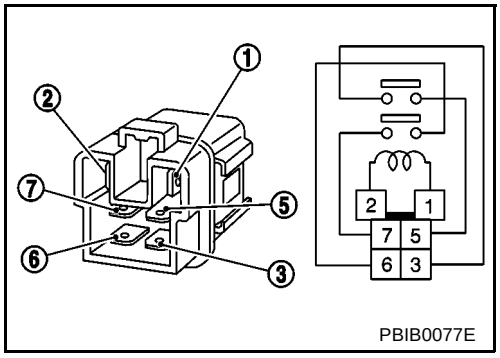
EBS00GKF

ECM RELAY

1. Apply 12V direct current between ECM relay terminals 1 and 2.
2. Check continuity between relay terminals 3 and 5, 6 and 7.

Condition	Continuity
12V direct current supply between terminals 1 and 2	Yes
OFF	No

3. If NG, replace ECM relay.



PBIB0077E

DTC U1000, U1001 CAN COMMUNICATION LINE

PFP:23710

Description

EBS00F2I

CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent error detection ability. Many electronic control units are equipped onto a vehicle, and each control unit shares information and links with other control units during operation (not independent). In CAN communication, control units are connected with 2 communication lines (CAN H line, CAN L line) allowing a high rate of information transmission with less wiring. Each control unit transmits/receives data but selectively reads required data only.

On Board Diagnosis Logic

EBS00F2J

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
U1000 1000	CAN communication line	● ECM cannot communicate to other control unit. ● ECM cannot communicate for more than the specified time.	● Harness or connectors (CAN communication line is open or shorted.)
U1001 1001			

DTC Confirmation Procedure

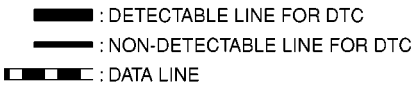
EBS00F2K

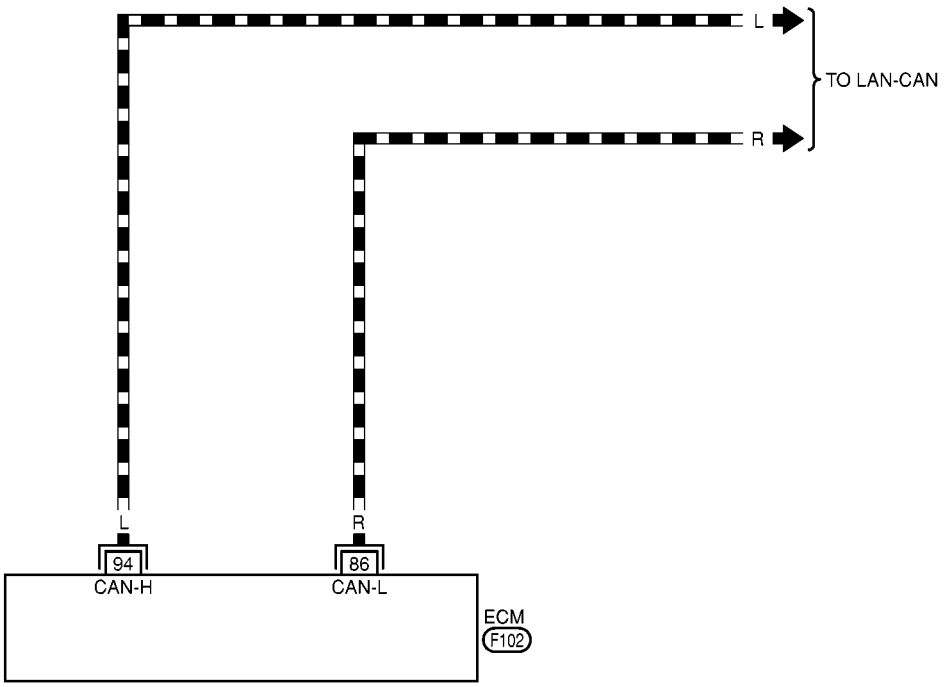
1. Turn ignition switch “ON” and wait at least 3 seconds.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. If 1st trip DTC is detected, go to EC-1085, "Diagnostic Procedure" .

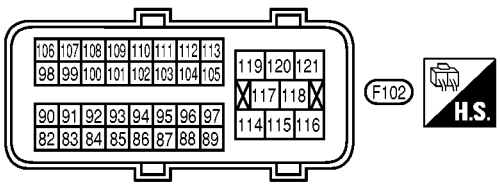
Wiring Diagram

EBS00F2L

EC-CAN-01







MBWA0038E

Diagnostic Procedure

EBS00F2M

1. INSPECTION START

1. Turn ignition switch “ON”.
2. Select “CAN DIAG SUPPORT MNTR” in “DATA MONITOR” mode with CONSULT-II.
3. Print out the CONSULT-II screen.

CVT Models with ESP and ICC

OK data

DATA MONITOR	
MONITOR	NO DTC
CAN COMM	OK
CAN CIRC 1	OK
CAN CIRC 2	OK
CAN CIRC 3	OK
CAN CIRC 4	OK
CAN CIRC 5	OK
CAN CIRC 6	OK
CAN CIRC 7	UNKWN

NG data

DATA MONITOR	
MONITOR	NO DTC
CAN COMM	OK
CAN CIRC 1	UNKWN
CAN CIRC 2	UNKWN
CAN CIRC 3	UNKWN
CAN CIRC 4	UNKWN
CAN CIRC 5	UNKWN
CAN CIRC 6	UNKWN
CAN CIRC 7	UNKWN

MBIB0174E

CVT Models with ESP without ICC

OK data

DATA MONITOR	
MONITOR	NO DTC
CAN COMM	OK
CAN CIRC 1	OK
CAN CIRC 2	OK
CAN CIRC 3	OK
CAN CIRC 4	OK
CAN CIRC 5	UNKWN
CAN CIRC 6	OK
CAN CIRC 7	UNKWN

NG data

DATA MONITOR	
MONITOR	NO DTC
CAN COMM	OK
CAN CIRC 1	UNKWN
CAN CIRC 2	UNKWN
CAN CIRC 3	UNKWN
CAN CIRC 4	UNKWN
CAN CIRC 5	UNKWN
CAN CIRC 6	UNKWN
CAN CIRC 7	UNKWN

MBIB0122E

CVT models without ESP and ICC

OK data

DATA MONITOR	
MONITOR	NO DTC
CAN COMM	OK
CAN CIRC 1	OK
CAN CIRC 2	OK
CAN CIRC 3	UNKWN
CAN CIRC 4	OK
CAN CIRC 5	UNKWN
CAN CIRC 6	OK
CAN CIRC 7	UNKWN

NG data

DATA MONITOR	
MONITOR	NO DTC
CAN COMM	OK
CAN CIRC 1	UNKWN
CAN CIRC 2	UNKWN
CAN CIRC 3	UNKWN
CAN CIRC 4	UNKWN
CAN CIRC 5	UNKWN
CAN CIRC 6	UNKWN
CAN CIRC 7	UNKWN

MBIB0180E

M/T Models with ESP

OK data

DATA MONITOR	
MONITOR	NO DTC
CAN COMM	OK
CAN CIRC 1	OK
CAN CIRC 2	UNKWN
CAN CIRC 3	OK
CAN CIRC 4	OK
CAN CIRC 5	UNKWN
CAN CIRC 6	OK
CAN CIRC 7	UNKWN

NG data

DATA MONITOR	
MONITOR	NO DTC
CAN COMM	OK
CAN CIRC 1	UNKWN
CAN CIRC 2	UNKWN
CAN CIRC 3	UNKWN
CAN CIRC 4	UNKWN
CAN CIRC 5	UNKWN
CAN CIRC 6	UNKWN
CAN CIRC 7	UNKWN

MBIB0123E

M/T models without ESP

OK data

DATA MONITOR	
MONITOR	NO DTC
CAN COMM	OK
CAN CIRC 1	OK
CAN CIRC 2	UNKWN
CAN CIRC 3	UNKWN
CAN CIRC 4	OK
CAN CIRC 5	UNKWN
CAN CIRC 6	OK
CAN CIRC 7	UNKWN

NG data

DATA MONITOR	
MONITOR	NO DTC
CAN COMM	OK
CAN CIRC 1	UNKWN
CAN CIRC 2	UNKWN
CAN CIRC 3	UNKWN
CAN CIRC 4	UNKWN
CAN CIRC 5	UNKWN
CAN CIRC 6	UNKWN
CAN CIRC 7	UNKWN

MBIB0179E

>> Go to LAN-8, "CAN COMMUNICATION" .

DTC P0011 IVT CONTROL

PFP:23796

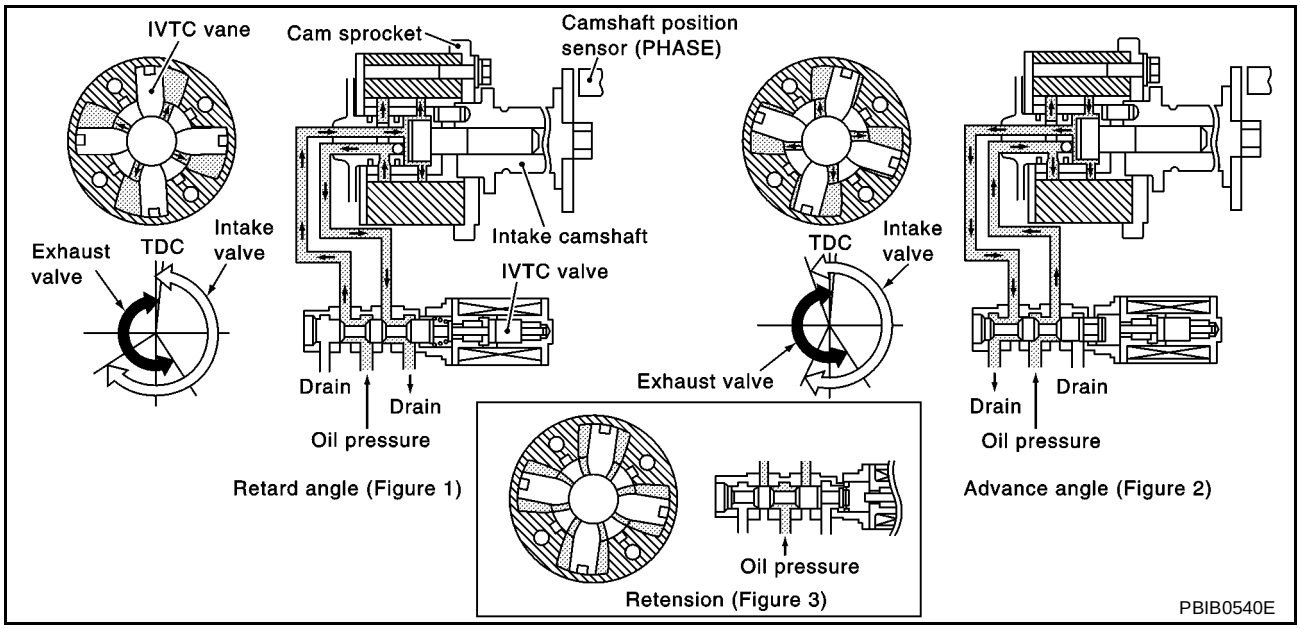
Description

EBS00F2N

SYSTEM DESCRIPTION

Sensor	Input signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed	Intake valve timing control	Intake valve timing control solenoid valve
Camshaft position sensor (PHASE)			
Engine coolant temperature sensor	Engine coolant temperature		
Vehicle speed signal*	Vehicle speed		

*: This signal is sent to the ECM through CAN communication line.



This mechanism hydraulically controls cam phases continuously with the fixed operating angle of the intake valve.

The ECM receives signals such as crankshaft position, camshaft position, engine speed, and engine coolant temperature. Then, the ECM sends ON/OFF pulse duty signals to the intake valve timing control solenoid valve depending on driving status. This makes it possible to control the shut/open timing of the intake valve to increase engine torque in low/mid speed range and output in high-speed range.

CONSULT-II Reference Value in Data Monitor Mode

EBS00F2O

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
INT/V TIM (B1)	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	–5° - 5°CA
		When revving up to 2,000 rpm quickly	Approx. 0° - 20°CA
INT/V SOL (B1)	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	0% - 2%
		When revving up to 2,000 rpm quickly	Approx. 0% - 50%

On Board Diagnosis Logic

EBS00F2P

DTC No.	Trouble diagnosis name	Detecting condition	Possible cause
P0011 0011	Intake valve timing control performance	There is a gap between angle of target and phase-control angle degree.	● Crankshaft position sensor (POS) ● Camshaft position sensor (PHASE) ● Accumulation of debris to the signal pick-up portion of the camshaft

FAIL-SAFE MODE

ECM enters in fail-safe mode when the malfunction is detected.

Detected items	Engine operating condition in fail-safe mode
Intake valve timing control	The signal is not energized to the solenoid valve and the valve control does not function

DTC Confirmation Procedure

EBS00F2Q

CAUTION:
Always drive at a safe speed.

NOTE:

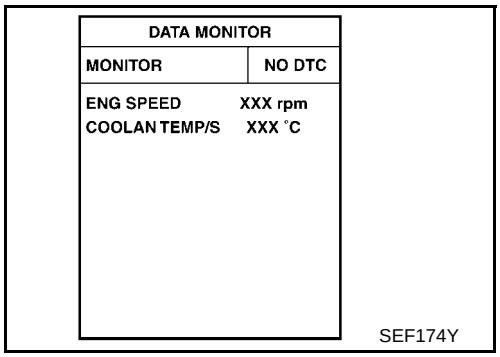
- **If DTC P0011 is displayed with DTC P1111, first perform trouble diagnosis for "DTC P1111". See EC-1242 .**
- If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is between 10V and 16V at idle.

WITH CONSULT-II

1. Turn ignition switch "ON".
2. Select "DATA MONITOR" mode with CONSULT-II.
3. Maintain the following conditions for at least 20 consecutive seconds.

ENG SPEED	2,000 - 3,175 rpm (A constant rotation is maintained.)
COOLANT TEMPS	80 - 90°C (176 - 194°F)
Selector lever	1st or 2nd position
Driving location uphill	Driving vehicle uphill (Increased engine load will help maintain the driving conditions required for this test.)



4. If 1st trip DTC is detected, go to EC-1088, "Diagnostic Procedure" .

WITH GST

Follow the procedure "WITH CONSULT-II" above.

Diagnostic Procedure

EBS00F2R

1. CHECK CRANKSHAFT POSITION SENSOR (POS)

Refer to EC-1210, "Component Inspection" .

OK or NG

OK >> GO TO 2.
NG >> Replace crankshaft position sensor (POS).

2. CHECK CAMSHAFT POSITION SENSOR (PHASE)

Refer to EC-1216, "Component Inspection" .

OK or NG

OK >> GO TO 3.
NG >> Replace camshaft position sensor (PHASE).

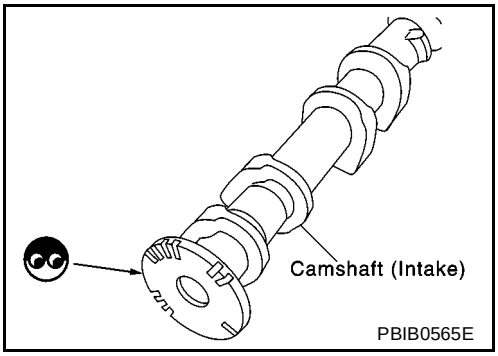
3. CHECK CAMSHAFT (INTAKE)

Check the following.

- Accumulation of debris to the signal plate of camshaft rear end
- Chipping signal plate of camshaft rear end

OK or NG

OK >> GO TO 4.
NG >> Remove debris and clean the signal plate of camshaft rear end or replace camshaft.



4. CHECK INTERMITTENT INCIDENT

Refer to EC-1076, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .
For wiring diagram refer to CKP sensor (POS) EC-1207 and CMP sensor (PHASE) EC-1213 .

>> **INSPECTION END**

DTC P0031, P0032 HO2S1 HEATER

PFP:22690

Description

EBS00GBD

SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM function	Actuator
Camshaft position sensor (PHASE) Crankshaft position sensor (POS)	Engine speed	Heated oxygen sensor 1 heater control	Heated oxygen sensor 1 heater
Engine coolant temperature sensor	Engine coolant temperature		

The ECM performs ON/OFF duty control of the heated oxygen sensor 1 heater corresponding to the engine speed and engine coolant temperature. The duty percent varies with engine coolant temperature when engine is started.

OPERATION

Engine speed rpm	Heated oxygen sensor 1 heater
Above 3,600	OFF
Below 3,600	ON

CONSULT-II Reference Value in Data Monitor Mode

EBS00GBE

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
HO2S1 HTR (B1)	● Engine: After warming up ● Engine speed: Below 3,600 rpm	ON
	● Engine speed: Above 3,600 rpm	OFF

On Board Diagnosis Logic

EBS00GBF

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0031 0031	Heated oxygen sensor 1 heater control circuit low	The current amperage in the heated oxygen sensor 1 heater circuit is out of the normal range. (An excessively low voltage signal is sent to ECM through the heated oxygen sensor 1 heater.)	● Harness or connectors (The heated oxygen sensor 1 heater circuit is open or shorted.) ● Heater oxygen sensor 1 heater
P0032 0032	Heated oxygen sensor 1 heater control circuit high	The current amperage in the heated oxygen sensor 1 heater circuit is out of the normal range. (An excessively high voltage signal is sent to ECM through the heated oxygen sensor 1 heater.)	● Harness or connectors (The heated oxygen sensor 1 heater circuit is shorted.) ● Heater oxygen sensor 1 heater

DTC Confirmation Procedure

EBS00GBG

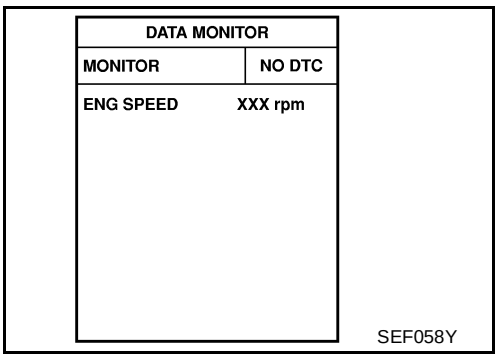
NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is between 10.5V and 16V at idle.

WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.

3. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
4. Start engine and run it for at least 6 seconds at idle speed.
5. If 1st trip DTC is detected, go to EC-1093, "Diagnostic Procedure" .



WITH GST

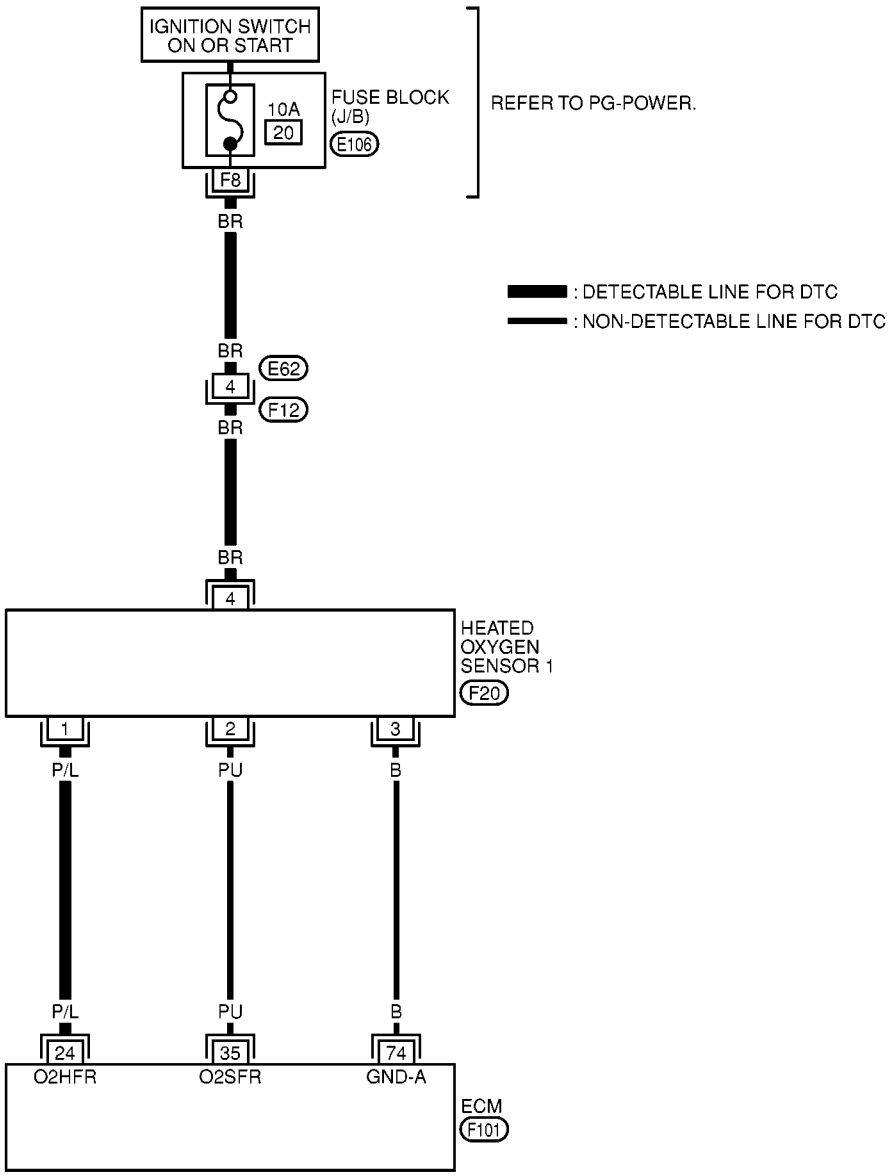
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Start engine and run it for at least 6 seconds at idle speed.
4. Turn ignition switch “OFF” and wait at least 10 seconds.
5. Start engine and run it for at least 6 seconds at idle speed.
6. Select “MODE 3” with GST.
7. If DTC is detected, go to EC-1093, "Diagnostic Procedure" .

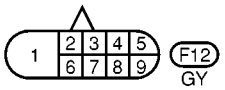
- **When using GST, “DTC Confirmation Procedure” should be performed twice as much as when using CONSULT-II because GST cannot display MODE 7 (1st trip DTC) concerning this diagnosis. Therefore, using CONSULT-II is recommended.**

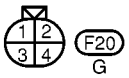
Wiring Diagram

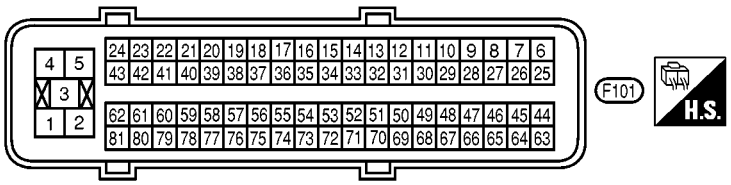
EBS00GBH

EC-HO2S1H-01







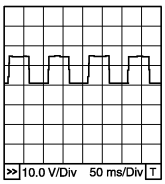


REFER TO THE FOLLOWING.
E106 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0009E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
24	P/L	Heated oxygen sensor 1 heater	**[Engine is running]** ● **Warm-up condition.** ● Engine speed is below 3,600 rpm.	Approximately 7.0V  PBIB0519E
			[Engine is running] ● Engine speed is above 3,600 rpm.	BATTERY VOLTAGE (11 - 14V)

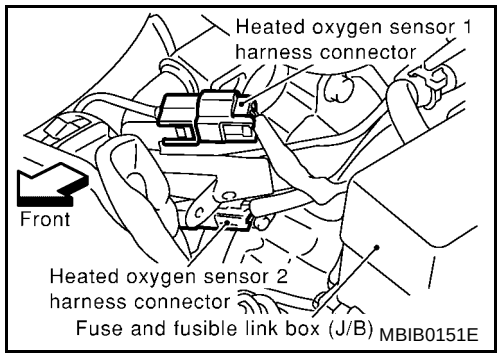
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnostic Procedure

EBS00GBI

1. CHECK HO2S1 POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 1 harness connector.
3. Turn ignition switch “ON”.



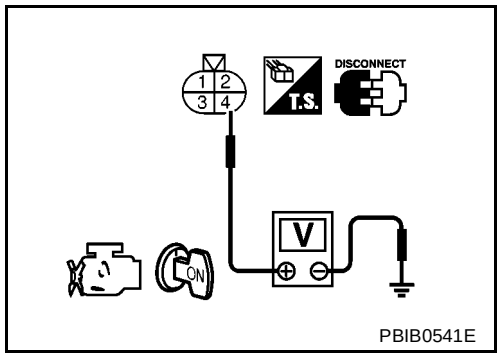
MBIB0151E

4. Check voltage between HO2S1 terminal 4 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 3.
NG >> GO TO 2.



PBIB0541E

2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E62, F12
- Fuse block (J/B) connector E106
- 10A fuse
- Harness for open or short between heated oxygen sensor 1 and fuse

>> Repair harness or connectors.

3. CHECK HO2S1 OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 24 and HO2S1 terminal 1.
   Refer to Wiring Diagram.

   Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK HEATED OXYGEN SENSOR 1 HEATER

Refer to EC-1094, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace heated oxygen sensor 1.

5. CHECK INTERMITTENT INCIDENT

Refer to EC-1076, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

EBS00GBJ

HEATED OXYGEN SENSOR 1 HEATER

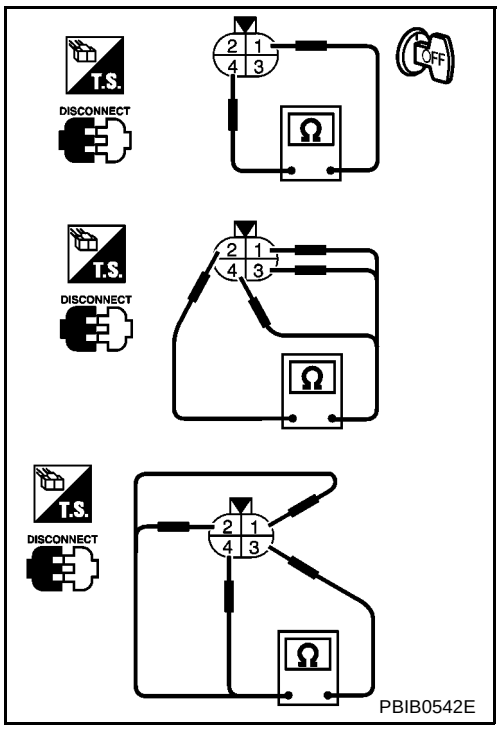
1. Check resistance between HO2S1 terminals as follows.

Terminal No.	Resistance
1 and 4	2.3 - 4.3 Ω at 25°C (77°F)
2 and 1, 3, 4	∞ Ω (Continuity should not exist)
3 and 1, 2, 4	

2. If NG, replace heated oxygen sensor 1.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**



Removal and Installation

EBS00GBK

HEATED OXYGEN SENSOR 1

Refer to EM-121, "EXHAUST MANIFOLD AND THREE WAY CATALYST" .

DTC P0037, P0038 HO2S2 HEATER

PFP:226A0

Description

EBS00GBL

SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM function	Actuator
Camshaft position sensor (PHASE)	Engine speed	Heated oxygen sensor 2 heater control	Heated oxygen sensor 2 heater
Crankshaft position sensor (POS)			

The ECM performs ON/OFF control of the heated oxygen sensor 2 heater corresponding to the engine speed.

OPERATION

Engine speed rpm	Heated oxygen sensor 2 heater
Above 3,800	OFF
Below 3,800	ON

CONSULT-II Reference Value in Data Monitor Mode

EBS00GBM

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
HO2S2 HTR (B1)	● Engine speed: Below 3,800 rpm [After driving for 2 minutes at a speed of 70 km/h (43 MPH) or more]	ON
	● Engine speed: Above 3,800 rpm	OFF

On Board Diagnosis Logic

EBS00GBN

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0037 0037	Heated oxygen sensor 2 heater control circuit low	The current amperage in the heated oxygen sensor 2 heater circuit is out of the normal range. (An excessively low voltage signal is sent to ECM through the heated oxygen sensor 2 heater.)	● Harness or connectors (The heated oxygen sensor 2 heater circuit is open or shorted.) ● Heater oxygen sensor 2 heater
P0038 0038	Heated oxygen sensor 2 heater control circuit high	The current amperage in the heated oxygen sensor 2 heater circuit is out of the normal range. (An excessively high voltage signal is sent to ECM through the heated oxygen sensor 2 heater.)	● Harness or connectors (The heated oxygen sensor 2 heater circuit is shorted.) ● Heater oxygen sensor 2 heater

DTC Confirmation Procedure

EBS00GBO

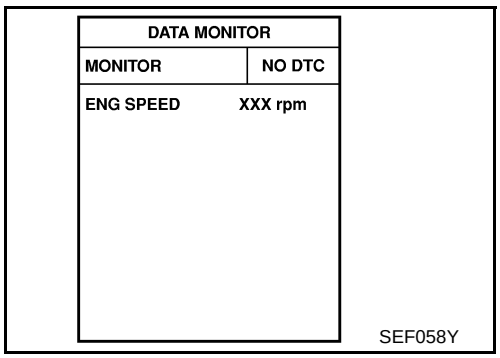
NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is between 10.5V and 16V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2. Start engine.
3. Drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.

4. Stop vehicle and let engine idle for at least 6 seconds.
5. If 1st trip DTC is detected, go to EC-1098, "Diagnostic Procedure" .



WITH GST

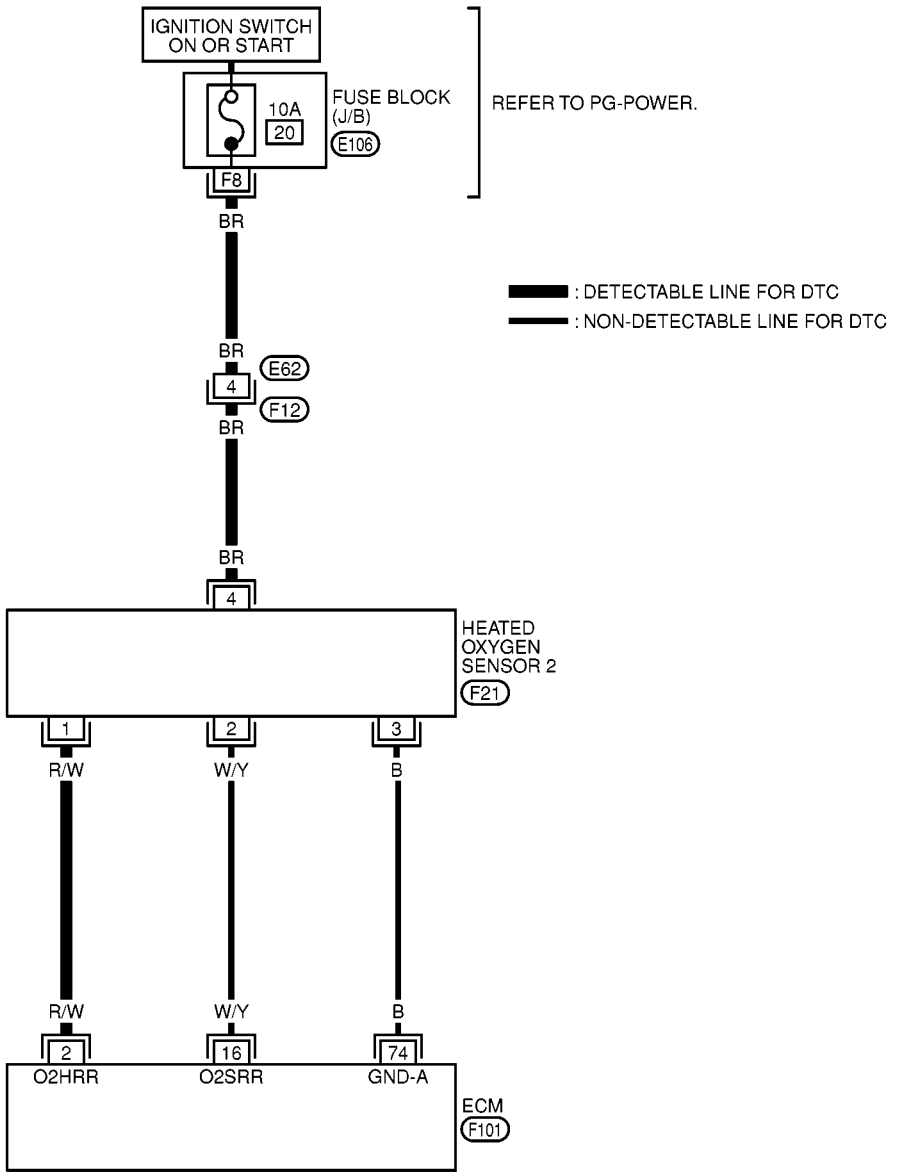
1. Start engine.
2. Drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
3. Stop vehicle and let engine idle for at least 6 seconds.
4. Turn ignition switch “OFF” and wait at least 10 seconds.
5. Start engine.
6. Drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
7. Stop vehicle and let engine idle for at least 6 seconds.
8. Select “MODE 3” with GST.
9. If DTC is detected, go to EC-1098, "Diagnostic Procedure" .

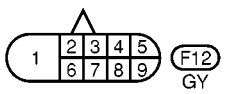
- **When using GST, “DTC Confirmation Procedure” should be performed twice as much as when using CONSULT-II because GST cannot display MODE 7 (1st trip DTC) concerning this diagnosis. Therefore, using CONSULT-II is recommended.**

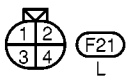
Wiring Diagram

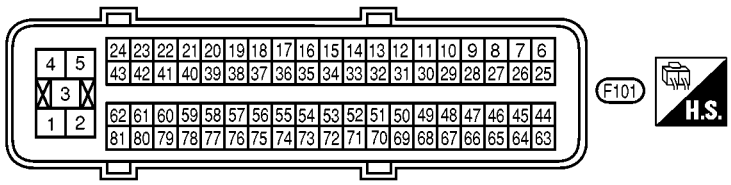
EBS00GBP

EC-HO2S2H-01









REFER TO THE FOLLOWING.
E106 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0011E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

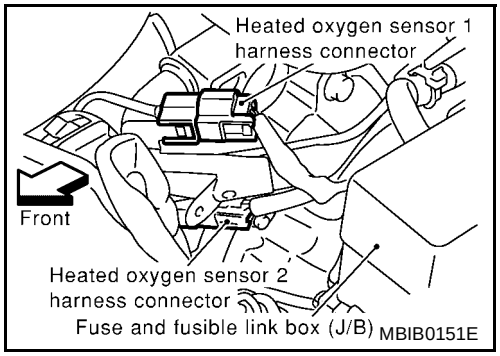
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
2	R/W	Heated oxygen sensor 2 heater	**[Engine is running]** ● Engine speed is below 3,800 rpm. ● After driving for 2 minutes at a speed of 70 km/h (43 MPH) or more.	0 - 1.0V
			[Ignition switch "ON"] ● Engine stopped **[Engine is running]** ● Engine speed is above 3,800 rpm.	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

EBS00GBQ

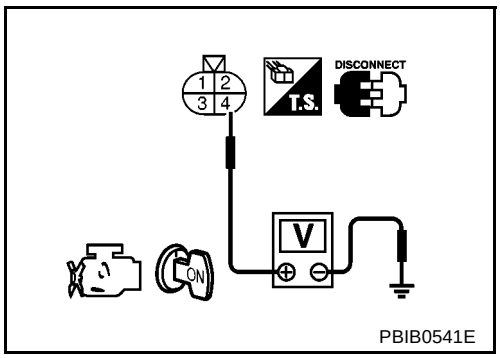
1. CHECK HO2S2 POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect heated oxygen sensor 2 harness connector.
3. Turn ignition switch "ON".



4. Check voltage between HO2S2 terminal 4 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E62, F12
- Fuse block (J/B) connector E106
- 10A fuse
- Harness for open or short between heated oxygen sensor 2 and fuse

>> Repair harness or connectors.

3. CHECK HO2S2 OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 2 and HO2S2 terminal 1. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK HEATED OXYGEN SENSOR 2 HEATER

Refer to EC-1099, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace heated oxygen sensor 2.

5. CHECK INTERMITTENT INCIDENT

Refer to EC-1076, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

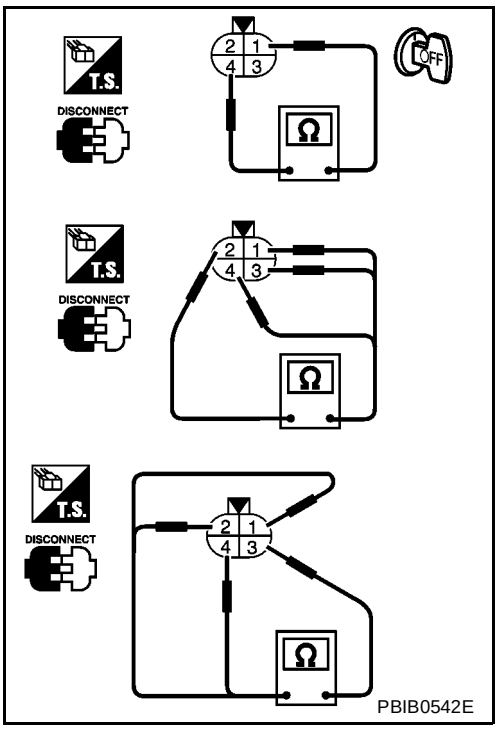
EBS00GBR

HEATED OXYGEN SENSOR 2 HEATER

1. Check resistance between HO2S2 terminals as follows.

Terminal No.	Resistance
1 and 4	2.3 - 4.3 Ω at 25°C (77°F)
2 and 1, 3, 4	∞ Ω (Continuity should not exist)
3 and 1, 2, 4	

2. If NG, replace heated oxygen sensor 2.



CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

EBS00GBS

HEATED OXYGEN SENSOR 2

Refer to EX-3, "EXHAUST SYSTEM" .

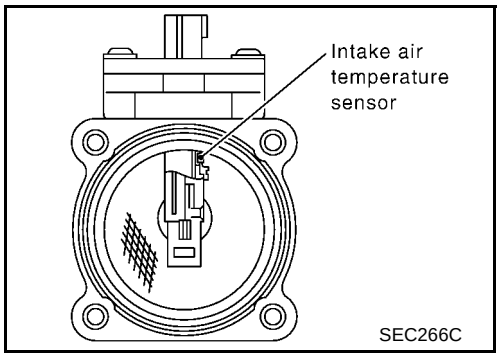
DTC P0102, P0103 MAF SENSOR

PFP:22680

Component Description

EBS00GBT

The mass air flow sensor is placed in the stream of intake air. It measures the intake flow rate by measuring a part of the entire intake flow. It consists of a hot film that is supplied with electric current from the ECM. The temperature of the hot film is controlled by the ECM a certain amount. The heat generated by the hot film is reduced as the intake air flows around it. The more air, the greater the heat loss.
Therefore, the ECM must supply more electric current to maintain the temperature of the hot film as air flow increases. The ECM detects the air flow by means of this current change.



CONSULT-II Reference Value in Data Monitor Mode

EBS00GBU

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
MAS A/F SE-B1	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: N ● No-load	Idle	Approx. 1.1 - 1.5V
		2,500 rpm	Approx. 1.6 - 2.0V
CAL/LD VALUE	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	10% - 35%
		2,500 rpm	10% - 35%
MASS AIRFLOW	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	1.0 - 4.0 g·m/s
		2,500 rpm	4.0 - 10.0 g·m/s

On Board Diagnosis Logic

EBS00GBV

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0102 0102	Mass air flow sensor circuit low input	An excessively low voltage from the sensor is sent to ECM when engine is running.	● Harness or connectors (The sensor circuit is open or shorted.) ● Intake air leaks ● Mass air flow sensor
P0103 0103	Mass air flow sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Mass air flow sensor

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MI lights up.

Detected items	Engine operating condition in fail-safe mode
Mass air flow sensor circuit	Engine speed will not rise more than 2,400 rpm due to the fuel cut.

DTC Confirmation Procedure

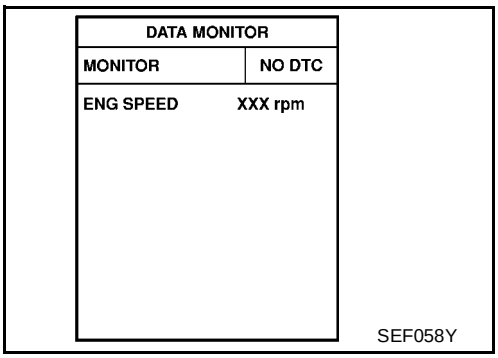
EBS00GBW

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

PROCEDURE FOR DTC P0102

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and wait 5 seconds at most.
4. If DTC is detected, go to EC-1103, "Diagnostic Procedure" .



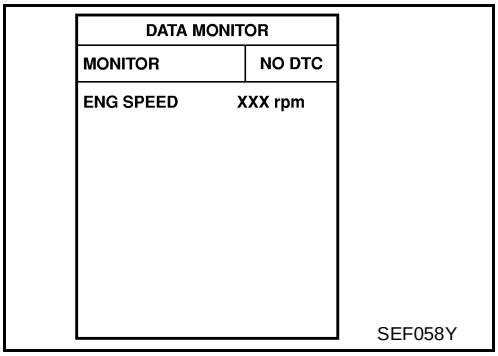
With GST

Follow the procedure “With CONSULT-II” above.

PROCEDURE FOR DTC P0103

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Wait at least 5 seconds.
4. If DTC is detected, go to EC-1103, "Diagnostic Procedure" .
   If DTC is not detected, go to next step.
5. Start engine and wait at least 5 seconds.
6. If DTC is detected, go to EC-1103, "Diagnostic Procedure" .



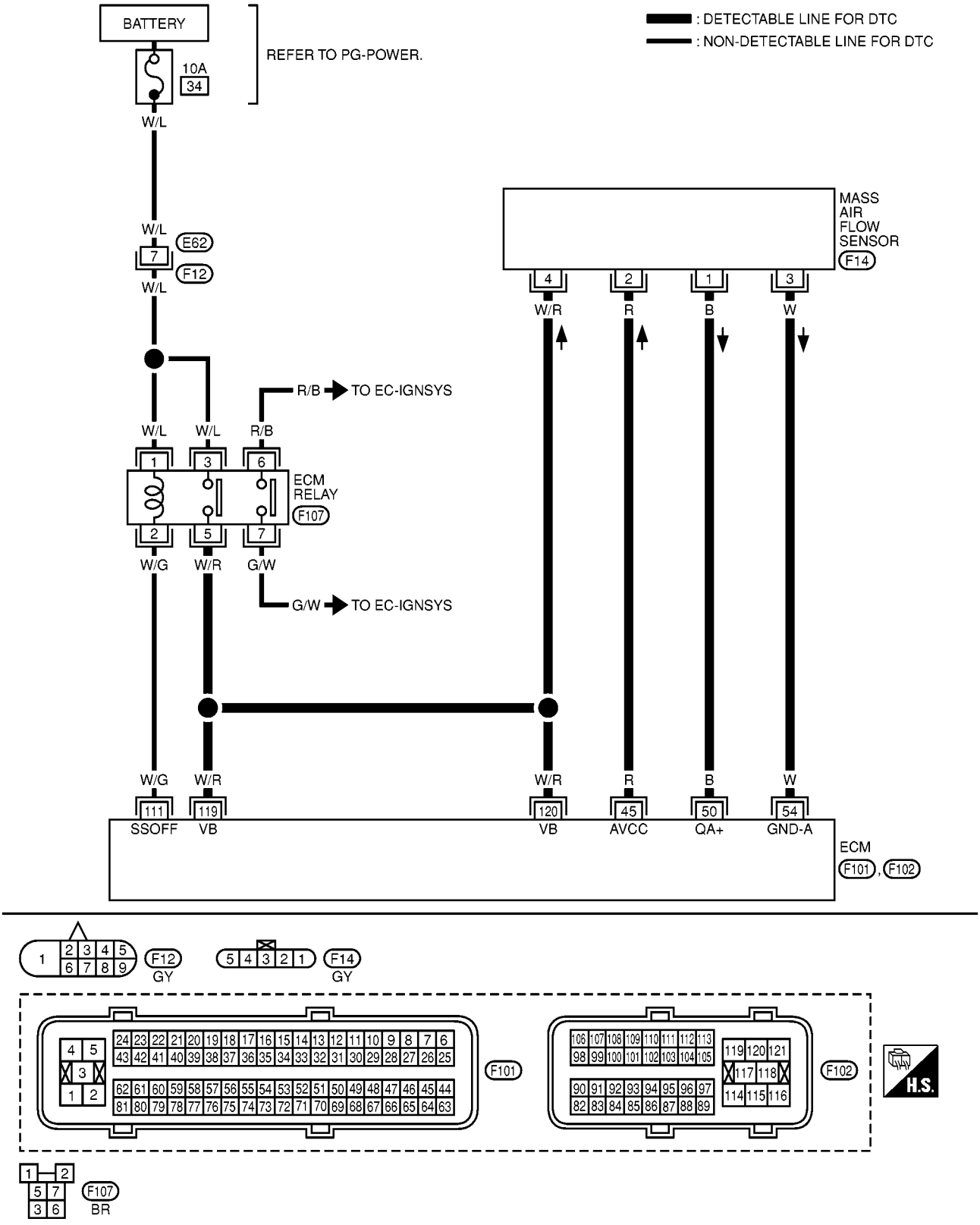
With GST

Follow the procedure “With CONSULT-II” above.

Wiring Diagram

EBS00GBX

EC-MAFS-01



MBWA0004E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
45	R	Sensor's power supply	**[Ignition switch "ON"]**	Approximately 5V
50	B	Mass air flow sensor	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.1 - 1.5V
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,500 rpm.	1.6 - 2.0V
54	W	Sensor's ground (Mass air flow sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V

Diagnostic Procedure

EBS00GBY

1. INSPECTION START

Which malfunction (P0102 or P0103) is duplicated?

P0102 or P0103

P0102 >> GO TO 2.
P0103 >> GO TO 3.

2. CHECK INTAKE SYSTEM

Check the following for connection.

- Air duct
- Vacuum hoses
- Intake air passage between air duct to intake manifold

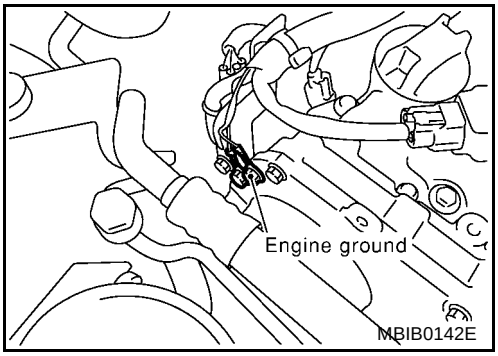
OK or NG

OK >> GO TO 3.
NG >> Reconnect the parts.

3. RETIGHTEN GROUND SCREWS

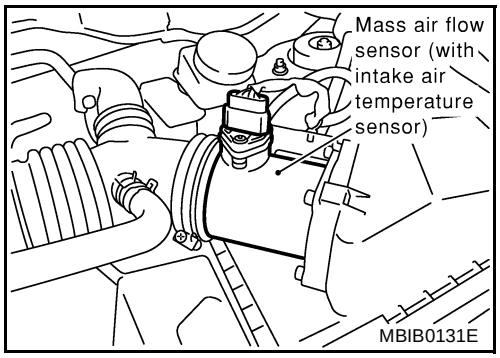
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 4.



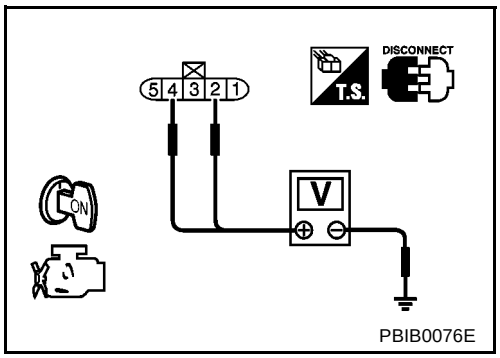
4. CHECK MAF SENSOR POWER SUPPLY CIRCUIT

1. Disconnect MAF sensor harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between MAF sensor terminals 2, 4 and ground with CONSULT-II or tester.

Terminal	Voltage
2	Approximately 5V
4	Battery voltage



OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between mass air flow sensor and ECM
- Harness for open or short between mass air flow sensor and ECM relay

>> Repair harness or connectors.

6. CHECK MAF SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between MAF sensor terminal 3 and ECM terminal 54. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK MAF SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between MAF sensor terminal 1 and ECM terminal 50. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK MASS AIR FLOW SENSOR

Refer to EC-1105, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> Replace mass air flow sensor.

9. CHECK INTERMITTENT INCIDENT

Refer to EC-1076, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

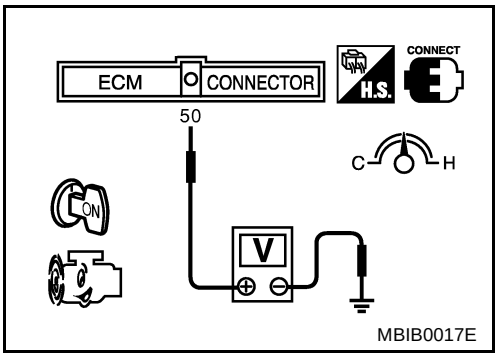
EBS00GBZ

MASS AIR FLOW SENSOR

1. Reconnect harness connectors disconnected.
2. Start engine and warm it up to normal operating temperature.
3. Check voltage between ECM terminal 50 (Mass air flow sensor signal) and ground.

Condition	Voltage V
Ignition switch “ON” (Engine stopped.)	Approx. 1.0
Idle (Engine is warmed-up to normal operating temperature.)	1.1 - 1.5
2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.6 - 2.0
Idle to about 4,000 rpm*	1.5 - 2.0 to Approx. 4.0

*: Check for liner voltage rise in response to engine being increased to about 4,000 rpm.



4. If the voltage is out of specification, proceed the following.

a. Turn ignition switch “OFF”.
b. Disconnect mass air flow sensor harness connector and reconnect it again.
c. Perform steps 2 and 3 again.

5. If NG, remove mass air flow sensor from air duct. Check hot film for damage or dust.
6. If NG, clean or replace mass air flow sensor.

Removal and Installation

EBS00GC0

MASS AIR FLOW SENSOR

Refer to EM-114, "AIR CLEANER AND AIR DUCT" .

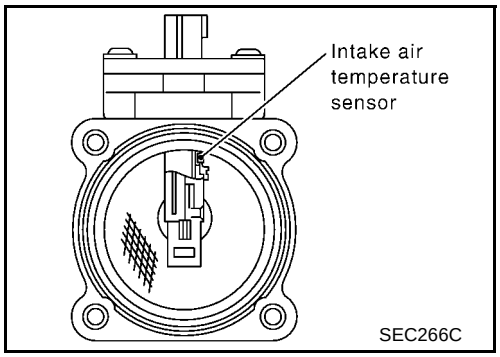
DTC P0112, P0113 IAT SENSOR

PFP:22630

Component Description

EBS00GC1

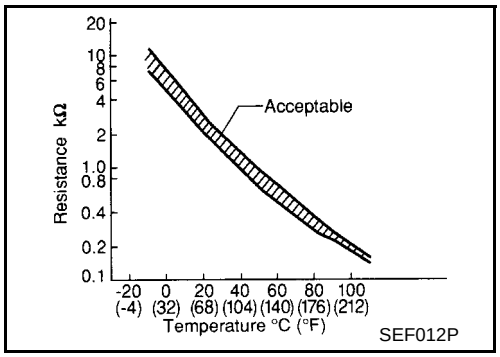
The intake air temperature sensor is built into mass air flow sensor. The sensor detects intake air temperature and transmits a signal to the ECM.
The temperature sensing unit uses a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the temperature rise.



<Reference data>

Intake air temperature °C (°F)	Voltage* V	Resistance kΩ
–10 (14)	4.43	7.9 - 9.3
25 (77)	3.32	1.9 - 2.1
80 (176)	1.23	0.31 - 0.37

*: These data are reference values and are measured between ECM terminal 34 (Intake air temperature sensor) and ground.



CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

On Board Diagnosis Logic

EBS00GC2

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0112 0112	Intake air temperature sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Intake air temperature sensor
P0113 0113	Intake air temperature sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	

DTC Confirmation Procedure

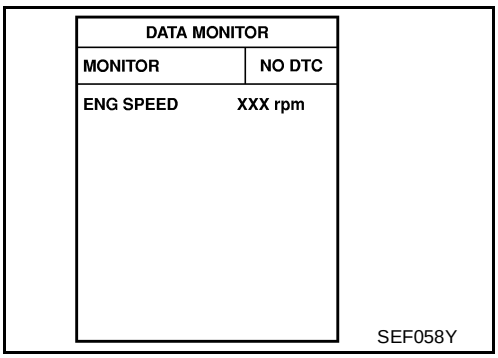
EBS00GC3

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON”.

2. Select “DATA MONITOR” mode with CONSULT-II.
3. Wait at least 5 seconds.
4. If 1st trip DTC is detected, go to EC-1103, "Diagnostic Procedure" .



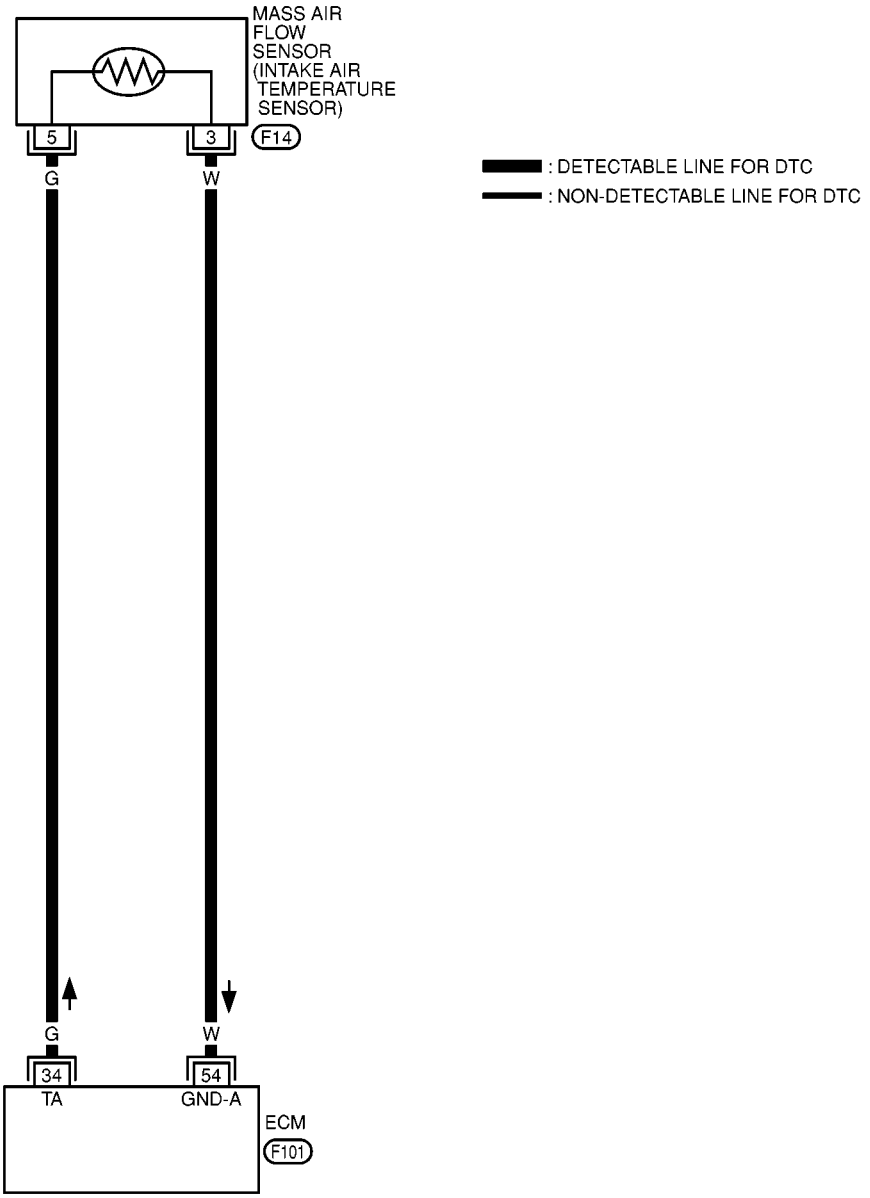
WITH GST

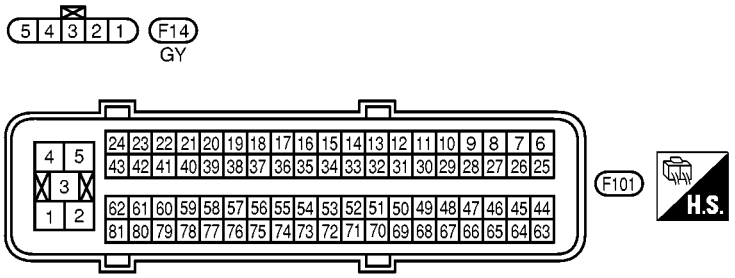
Follow the procedure “With CONSULT-II” above.

Wiring Diagram

EBS00GC4

EC-IATS-01





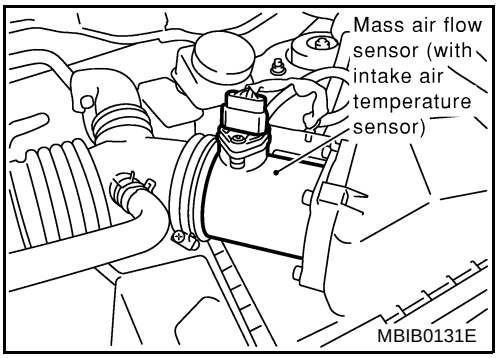
MBWA0005E

Diagnostic Procedure

EBS00GC5

1. CHECK INTAKE AIR TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect mass air flow sensor (intake air temperature sensor is built-into) harness connector.
3. Turn ignition switch “ON”.

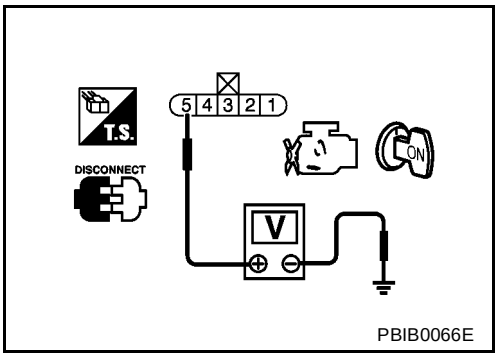


4. Check voltage between MAF sensor terminal 5 and ground.

Voltage: Approximately 5V

OK or NG

OK >> GO TO 2.
NG >> Repair harness or connectors.



2. CHECK INTAKE AIR TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between MAF sensor terminal 3 and ECM terminal 54. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 3.
NG >> Repair harness or connectors.

3. CHECK INTAKE AIR TEMPERATURE SENSOR

Refer to EC-1105, "Component Inspection" .

OK or NG

OK >> GO TO 4.
NG >> Replace mass air flow sensor (with intake air temperature sensor).

4. CHECK INTERMITTENT INCIDENT

Refer to EC-1076, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

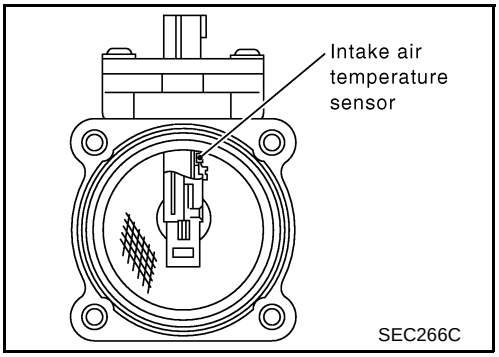
EBS00GC6

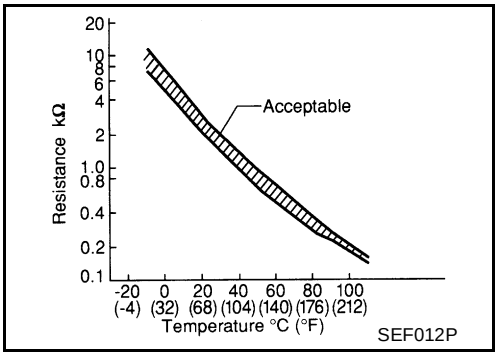
INTAKE AIR TEMPERATURE SENSOR

1. Check resistance between mass air flow sensor terminals 3 and 5 under the following conditions.

Intake air temperature °C (°F)	Resistance kΩ
25 (77)	1.9 - 2.1

2. If NG, replace mass air flow sensor (with intake air temperature sensor).





Removal and Installation

EBS00GC7

MASS AIR FLOW SENSOR

Refer to EM-114, "AIR CLEANER AND AIR DUCT" .

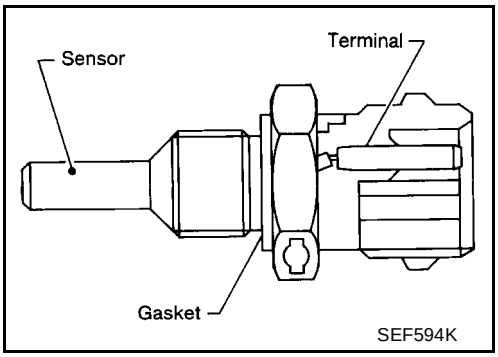
DTC P0117, P0118 ECT SENSOR

PFP:22630

Component Description

EBS00GC8

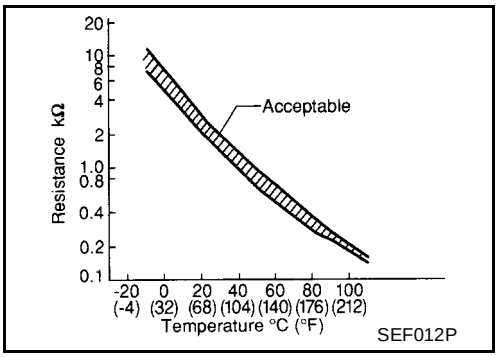
The engine coolant temperature sensor is used to detect the engine coolant temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine coolant temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.



<Reference data>

Engine coolant temperature °C (°F)	Voltage* V	Resistance kΩ
–10 (14)	4.4	7.0 - 11.4
20 (68)	3.5	2.1 - 2.9
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260

*: These data are reference values and are measured between ECM terminal 72 (Engine coolant temperature sensor) and ground.



CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

On Board Diagnosis Logic

EBS00GC9

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P0117 0117	Engine coolant temperature sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Engine coolant temperature sensor
P0118 0118	Engine coolant temperature sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	

FAIL-SAFE MODE

When this malfunction is detected, the ECM enters fail-safe mode and the MI lights up.

<table>
<tr><th>Detected items</th><th colspan="2">Engine operating condition in fail-safe mode</th></tr>
<tr><td rowspan="5">Engine coolant temperature sensor circuit</td><td colspan="2">Engine coolant temperature will be determined by ECM based on the time after turning ignition switch “ON” or “START”. CONSULT-II displays the engine coolant temperature decided by ECM.</td></tr>
<tr><td>Condition</td><td>Engine coolant temperature decided
(CONSULT-II display)</td></tr>
<tr><td>Just as ignition switch is turned ON or Start</td><td>40°C (104°F)</td></tr>
<tr><td>More than approx. 4 minutes after ignition ON or Start</td><td>80°C (176°F)</td></tr>
<tr><td>Except as shown above</td><td>40 - 80°C (104 - 176°F)
(Depends on the time)</td></tr>
<tr><td colspan="2">When the fail-safe system for engine coolant temperature sensor is activated, the cooling fan operates while engine is running.</td></tr>
</table>

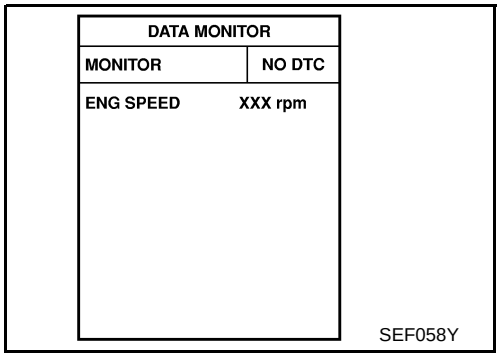
DTC Confirmation Procedure

EBS00GCA

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Wait at least 5 seconds.
4. If DTC is detected, go to EC-1114, "Diagnostic Procedure" .



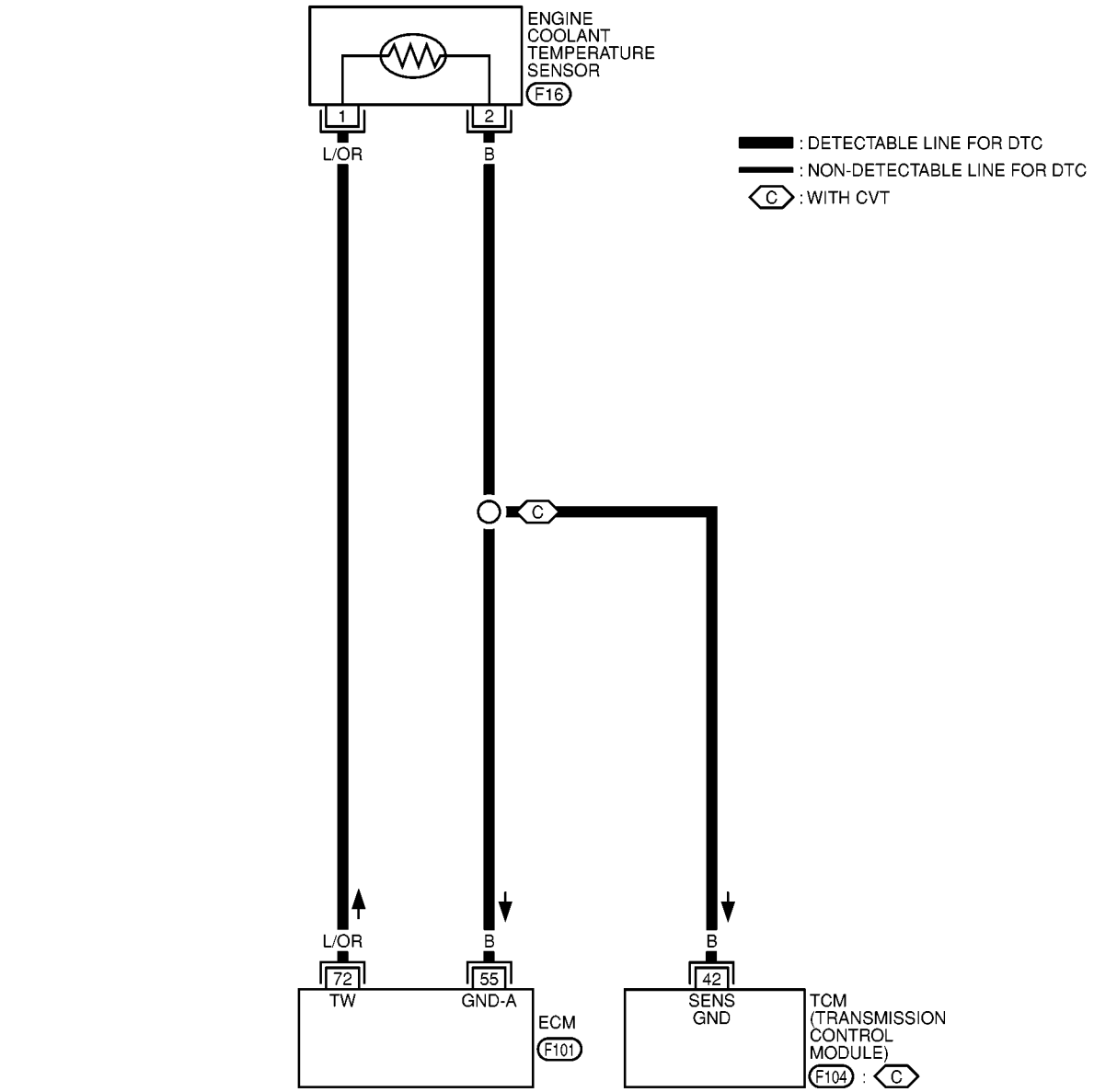
WITH GST

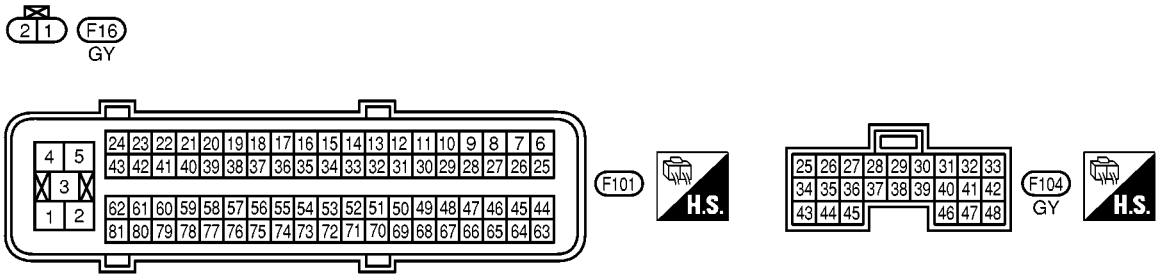
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

EBS00GCB

EC-ECTS-01





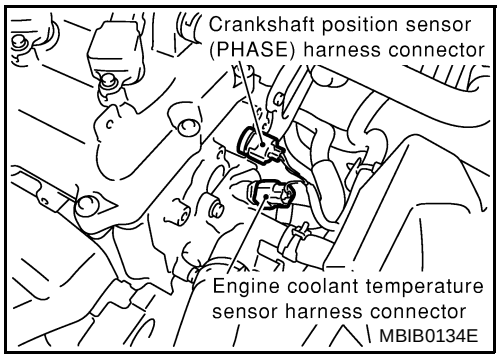
MBWA0006E

Diagnostic Procedure

EBS00GCC

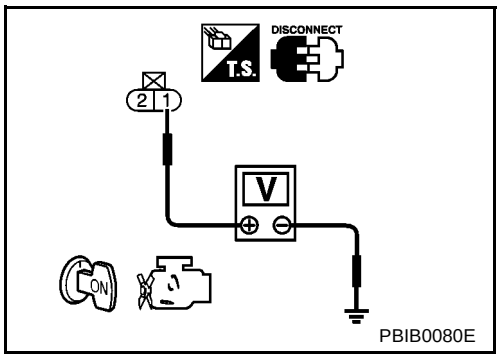
1. CHECK ECT SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect engine coolant temperature (ECT) sensor harness connector.
3. Turn ignition switch “ON”.



4. Check voltage between ECT sensor terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 2.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

2. CHECK ECT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between ECT sensor terminal 2 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between engine coolant temperature sensor and ECM
- Harness for open or short between engine coolant temperature sensor and TCM

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-1115, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace engine coolant temperature sensor.

5. CHECK INTERMITTENT INCIDENT

Refer to EC-1076, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

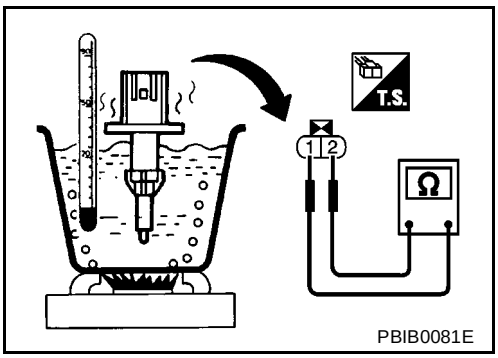
>> **INSPECTION END**

Component Inspection

EBS00GCD

ENGINE COOLANT TEMPERATURE SENSOR

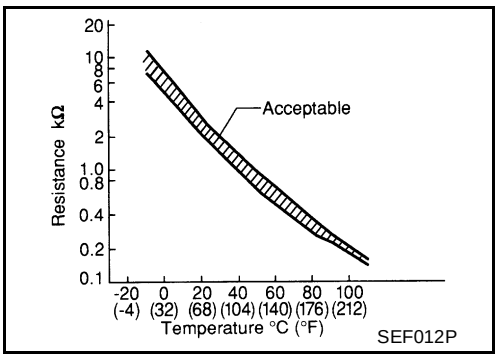
1. Check resistance between engine coolant temperature sensor terminals 1 and 2 as shown in the figure.



<Reference data>

Engine coolant temperature °C (°F)	Voltage* V	Resistance kΩ
–10 (14)	4.4	7.0 - 11.4
20 (68)	3.5	2.1 - 2.9
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260

*: These data are reference values and are measured between ECM terminal 72 (Engine coolant temperature sensor) and ground.



2. If NG, replace engine coolant temperature sensor.

Removal and Installation

EBS00GCE

ENGINE COOLANT TEMPERATURE SENSOR

Refer to CO-40, "THERMOSTAT AND WATER CONTROL VALVE" .

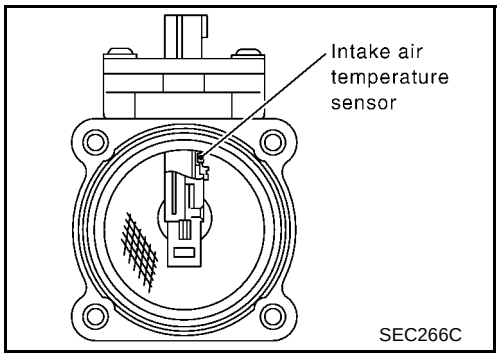
DTC P0127 IAT SENSOR

PFP:22630

Component Description

EBS00F3U

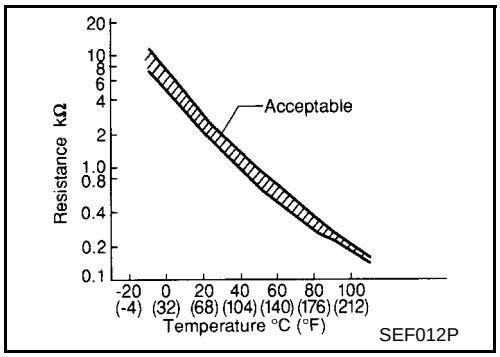
The intake air temperature sensor is built into mass air flow sensor. The sensor detects intake air temperature and transmits a signal to the ECM.
The temperature sensing unit uses a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the temperature rise.



<Reference data>

Intake air temperature °C (°F)	Voltage* V	Resistance kΩ
–10 (14)	4.43	7.9 - 9.3
25 (77)	3.32	1.9 - 2.1
80 (176)	1.23	0.31 - 0.37

*: These data are reference values and are measured between ECM terminal 84 (Intake air temperature sensor) and ground.



CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

On Board Diagnosis Logic

EBS00F3V

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0127 0127	Intake air temperature too high	Rationally incorrect voltage from the sensor is sent to ECM, compared with the voltage signal from engine coolant temperature sensor.	● Harness or connectors (The sensor circuit is open or shorted) ● Intake air temperature sensor

DTC Confirmation Procedure

EBS00F3W

CAUTION:
Always drive vehicle at a safe speed.

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

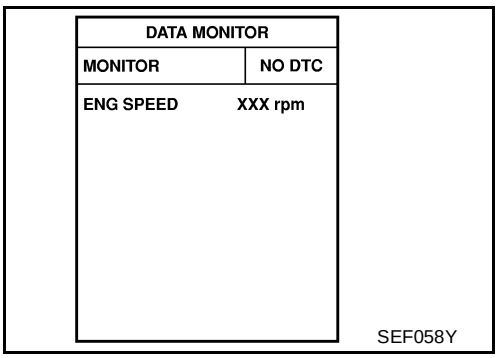
TESTING CONDITION:
This test may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

WITH CONSULT-II

1. Wait until engine coolant temperature is less than 90°C (194°F)

a. Turn ignition switch “ON”.

b. Select “DATA MONITOR” mode with CONSULT-II.
c. Check the engine coolant temperature.
d. If the engine coolant temperature is not less than 90°C (194°F), turn ignition switch "OFF" and cool down engine.
   - Perform the following steps before engine coolant temperature is above 90°C (194°F).
2. Turn ignition switch "ON".
3. Select "DATA MONITOR" mode with CONSULT-II.
4. Start engine.
5. Hold vehicle speed at more than 70 km/h (43 MPH) for 100 consecutive seconds.
6. If 1st trip DTC is detected, go to EC-1117, "Diagnostic Procedure" .



SEF058Y

WITH GST

Follow the procedure “With CONSULT-II” above.

Diagnostic Procedure

EBS00F3X

1. CHECK INTAKE AIR TEMPERATURE SENSOR

Refer to EC-1117, "Component Inspection" .

OK or NG

OK >> GO TO 2.
NG >> Replace mass air flow sensor (with intake air temperature sensor).

2. CHECK INTERMITTENT INCIDENT

Refer to EC-1076, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .
Refer to EC-1108, "Wiring Diagram" .

>> **INSPECTION END**

Component Inspection

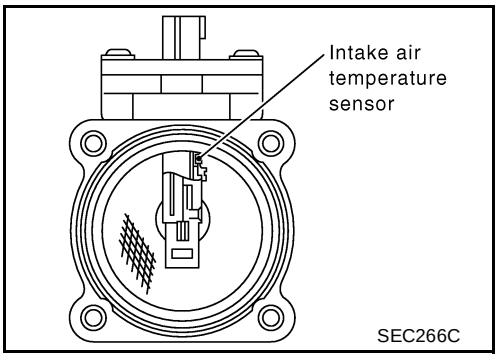
EBS00F3Y

INTAKE AIR TEMPERATURE SENSOR

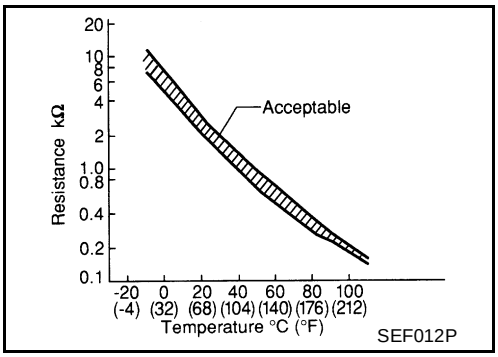
1. Check resistance between mass air flow sensor terminals 3 and 5 under the following conditions.

Intake air temperature °C (°F)	Resistance kΩ
25 (77)	1.9 - 2.1

2. If NG, replace mass air flow sensor (with intake air temperature sensor).



SEC266C



SEF012P

Removal and Installation

EBS00F3Z

MASS AIR FLOW SENSOR

Refer to EM-114, "AIR CLEANER AND AIR DUCT" .

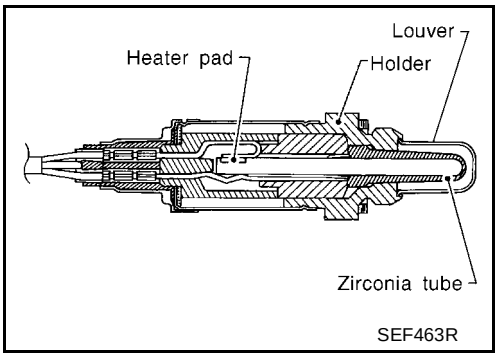
DTC P0132 HO2S1

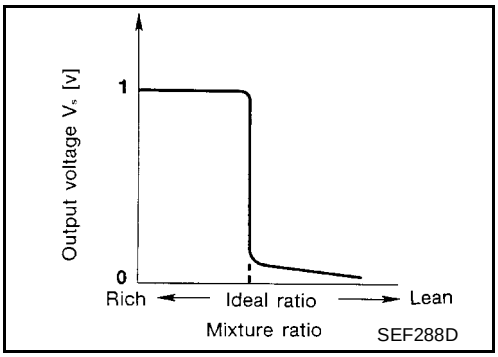
PFP:22690

Component Description

EBS00GCF

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.





CONSULT-II Reference Value in Data Monitor Mode

EBS00GCG

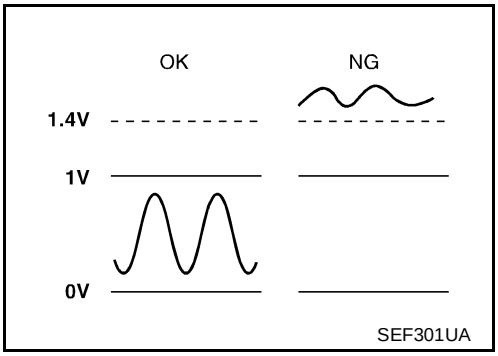
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S1 (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S1 MNTR (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	LEAN ←→ RICH Changes more than 5 times during 10 seconds.

On Board Diagnosis Logic

EBS00GCH

To judge the malfunction, the diagnosis checks that the heated oxygen sensor 1 output is not inordinately high.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0132 0132	Heated oxygen sensor 1 circuit high voltage	An excessively high voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Heated oxygen sensor 1

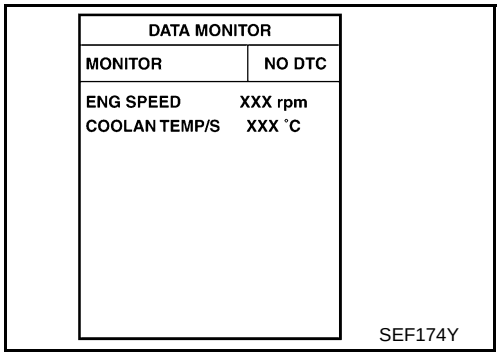
DTC Confirmation Procedure

EBS00GCI

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Turn ignition switch “ON”.
4. Select “DATA MONITOR” mode with CONSULT-II.
5. Restart engine and let it idle for 2 minutes.
6. If 1st trip DTC is detected, go to EC-1122, "Diagnostic Procedure" .



WITH GST

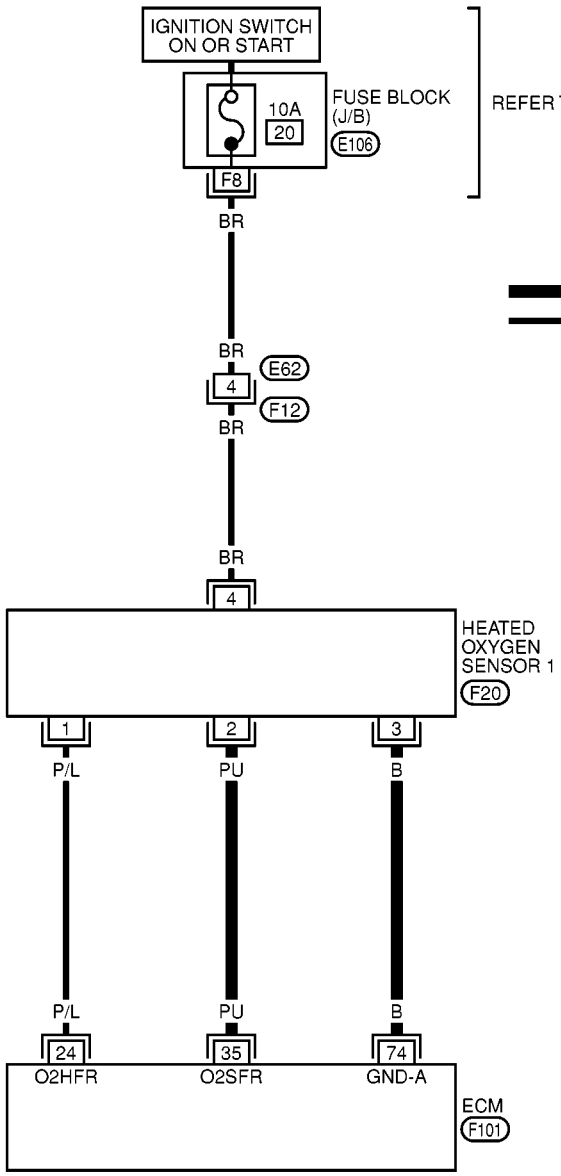
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Restart engine and let it idle for 2 minutes.
4. Turn ignition switch “OFF” and wait at least 10 seconds.
5. Restart engine and let it idle for 2 minutes.
6. Select “MODE 3” with GST.
7. If DTC is detected, go to EC-1122, "Diagnostic Procedure" .

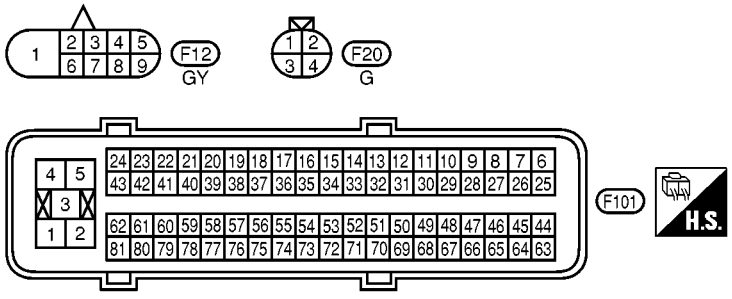
- **When using GST, “DTC Confirmation Procedure” should be performed twice as much as when using CONSULT-II because GST cannot display MODE 7 (1st trip DTC) concerning this diagnosis. Therefore, using CONSULT-II is recommended.**

Wiring Diagram

EBS00GCJ

EC-HO2S1-01





REFER TO THE FOLLOWING.
E106 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0008E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
35	PU	Heated oxygen sensor 1	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V (Periodically change)
74	B	Sensors' ground	**[Engine is running]** ● Idle speed	Approximately 0V

Diagnostic Procedure

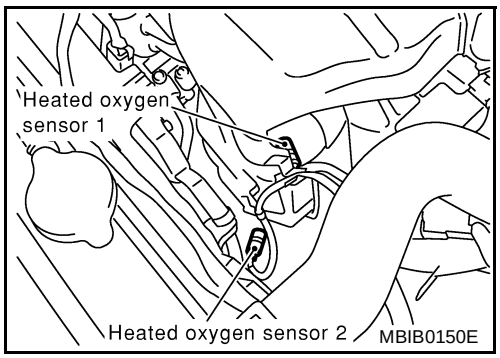
EBS00GCK

1. RETIGHTEN HEATED OXYGEN SENSOR 1

Loosen and retighten heated oxygen sensor 1.

Tightening torque: 40 - 50 N·m (4.1 - 5.1 kg-m, 30 - 37 ft-lb)

>> GO TO 2.



2. CHECK HO2S1 GROUND CIRCUIT FOR OPEN AND SHORT

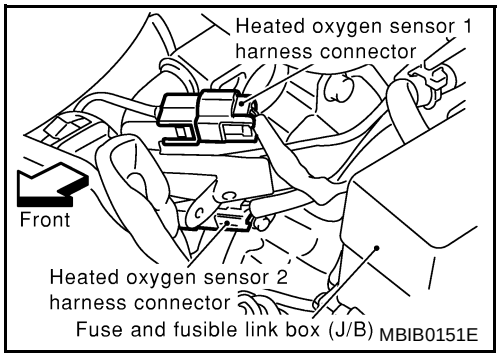
1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 1 harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminal 74 and HO2S1 terminal 3.
   Refer to Wiring Diagram.

   Continuity should exist.

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.



3. CHECK HO2S1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 35 and HO2S1 terminal 2. Refer to Wiring Diagram.

Continuity should exist.

2. Check harness continuity between ECM terminal 35 or HO2S1 terminal 2 and ground. Refer to Wiring Diagram.

Continuity should not exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK HO2S1 CONNECTOR FOR WATER

Check heated oxygen sensor 1 connectors for water.

Water should not exist.

OK or NG

OK >> GO TO 5.
NG >> Repair or replace harness or connectors.

5. CHECK HEATED OXYGEN SENSOR 1

Refer to EC-1123, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace heated oxygen sensor 1.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-1076, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

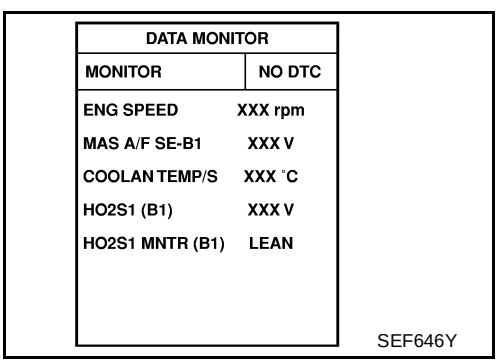
Component Inspection

EBS00GCL

HEATED OXYGEN SENSOR 1

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “MANU TRIG” and adjust “TRIGGER POINT” to 100% in “DATA MONITOR” mode with CONSULT-II.
3. Select “HO2S1 (B1)” and “HO2S1 MNTR (B1)”.
4. Hold engine speed at 2,000 rpm under no load during the following steps.
5. Touch “RECORD” on CONSULT-II screen.



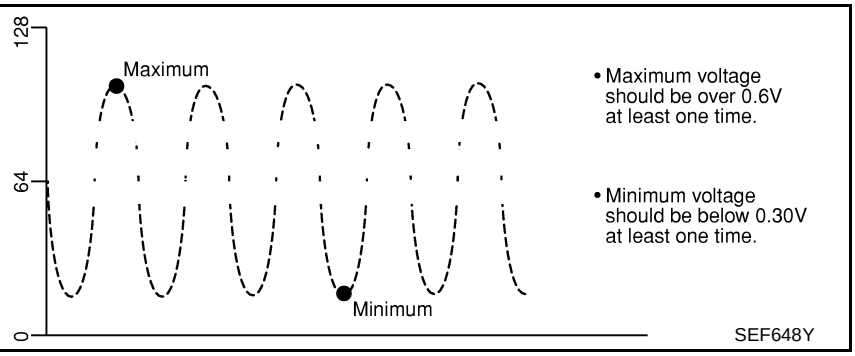
6. Check the following.
   - “HO2S1 MNTR (B1)” in “DATA MONITOR” mode changes from “RICH” to “LEAN” to “RICH” 5 times in 10 seconds.
     5 times (cycles) are counted as shown at right.
   - “HO2S1 (B1)” voltage goes above 0.6V at least once.
   - “HO2S1 (B1)” voltage goes below 0.3V at least once.
   - “HO2S1 (B1)” voltage never exceeds 1.0V.

cycle	1	2	3	4	5
HO2S1 MNTR (B1)	R-L-R-L-R-L-R-L-R-L-R				

R means HO2S1 MNTR (B1) indicates RICH
L means HO2S1 MNTR (B1) indicates LEAN

SEF217YA

Trigger	ENG SPEED	HO2S1 (B1)
	rpm	V
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX

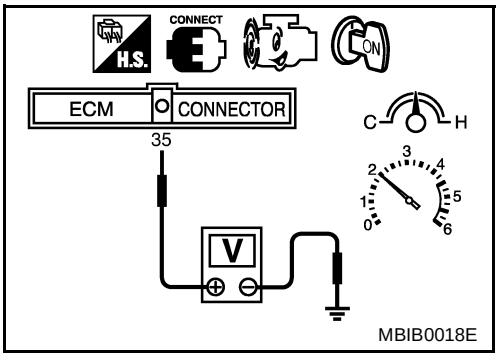


CAUTION:
- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 [HO2S1 (B1) signal] and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no load.
   - The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds.
   - The maximum voltage is over 0.6V at least one time.
   - The minimum voltage is below 0.3V at least one time.
   - The voltage never exceeds 1.0V.

   1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V
   2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V



CAUTION:
- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

EBS00GCM

HEATED OXYGEN SENSOR 1

Refer to EM-121, "EXHAUST MANIFOLD AND THREE WAY CATALYST" .

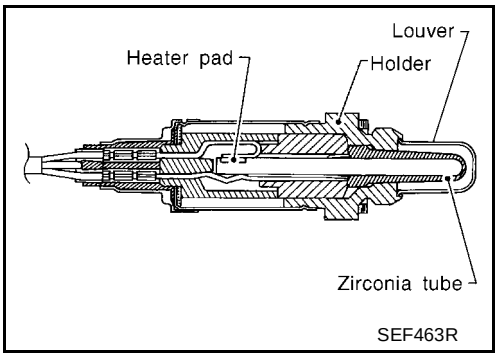
DTC P0133 HO2S1

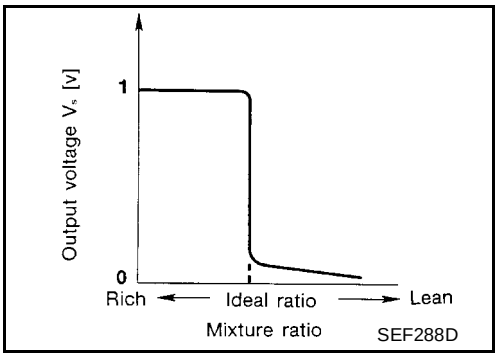
PFP:22690

Component Description

EBS00GCN

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.





CONSULT-II Reference Value in Data Monitor Mode

EBS00GCO

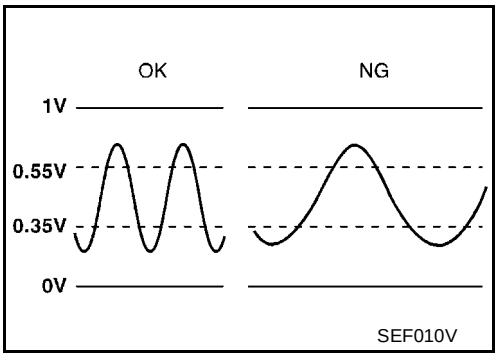
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S1 (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ⟷ Approx. 0.6 - 1.0V
HO2S1 MNTR (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	LEAN ⟷ RICH Changes more than 5 times during 10 seconds.

On Board Diagnosis Logic

EBS00GCP

To judge the malfunction of heated oxygen sensor 1, this diagnosis measures response time of heated oxygen sensor 1 signal. The time is compensated by engine operating (speed and load), fuel feedback control constant, and heated oxygen sensor 1 temperature index. Judgment is based on whether the compensated time (heated oxygen sensor 1 cycling time index) is inordinately long or not.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0133 0133	Heated oxygen sensor 1 circuit slow response	The response of the voltage signal from the sensor takes more than the specified time.	● Harness or connectors (The sensor circuit is open or shorted.) ● Heated oxygen sensor 1 ● Heated oxygen sensor 1 heater ● Fuel pressure ● Injectors ● Intake air leaks ● Exhaust gas leaks ● PCV valve ● Mass air flow sensor

DTC Confirmation Procedure

EBS00GCQ

CAUTION:
Always drive vehicle at a safe speed.

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

- **Always perform at a temperature above −10°C (14°F).**
- **Before performing the following procedure, confirm that battery voltage is more than 11V at idle.**

WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Stop engine and wait at least 10 seconds.
3. Turn ignition switch “ON” and select “HO2S1 (B1) P0133” of “HO2S1” in “DTC WORK SUPPORT” mode with CONSULT-II.
4. Touch “START”.
5. Start engine and let it idle for at least 3 minutes.

   NOTE:
   Never raise engine speed above 3,600 rpm after this step. If the engine speed limit is exceeded, return to step 5.

HO2S1 (B1) P0133	
OUT OF CONDITION	
MONITOR	
ENG SPEED	XXX rpm
B/FUEL SCHDL	XXX msec
COOLAN TEMP/S	XXX °C
VHCL SPEED SEN	XXX km/h

SEF338Z

6. When the following conditions are met, “TESTING” will be displayed on the CONSULT-II screen. Maintain the conditions continuously until “TESTING” changes to “COMPLETED”. (It will take approximately 20 to 50 seconds.)

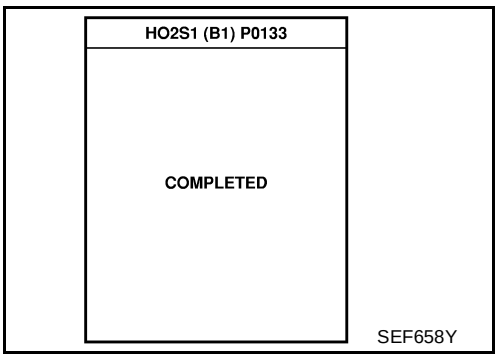
ENG SPEED	1,650 - 3,600 rpm
Vehicle speed	More than 80 km/h (50 MPH)
B/FUEL SCHDL	4.0 - 14.5 msec
Selector lever	Suitable position

HO2S1 (B1) P0133	
TESTING	
MONITOR	
ENG SPEED	XXX rpm
B/FUEL SCHDL	XXX msec
COOLAN TEMP/S	XXX °C
VHCL SPEED SEN	XXX km/h

SEF339Z

If “TESTING” is not displayed after 5 minutes, retry from step 2.

7. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”. If “NG” is displayed, refer to EC-1129, "Diagnostic Procedure" .



Overall Function Check

EBS00GCR

Use this procedure to check the overall function of the heated oxygen sensor 1 circuit. During this check, a 1st trip DTC might not be confirmed.

WITH GST

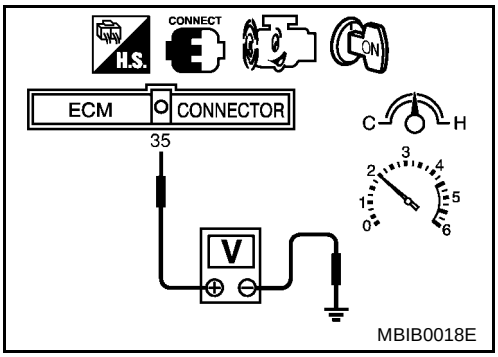
1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 (HO2S1 signal) and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no load.

- The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds.

1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V

2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V

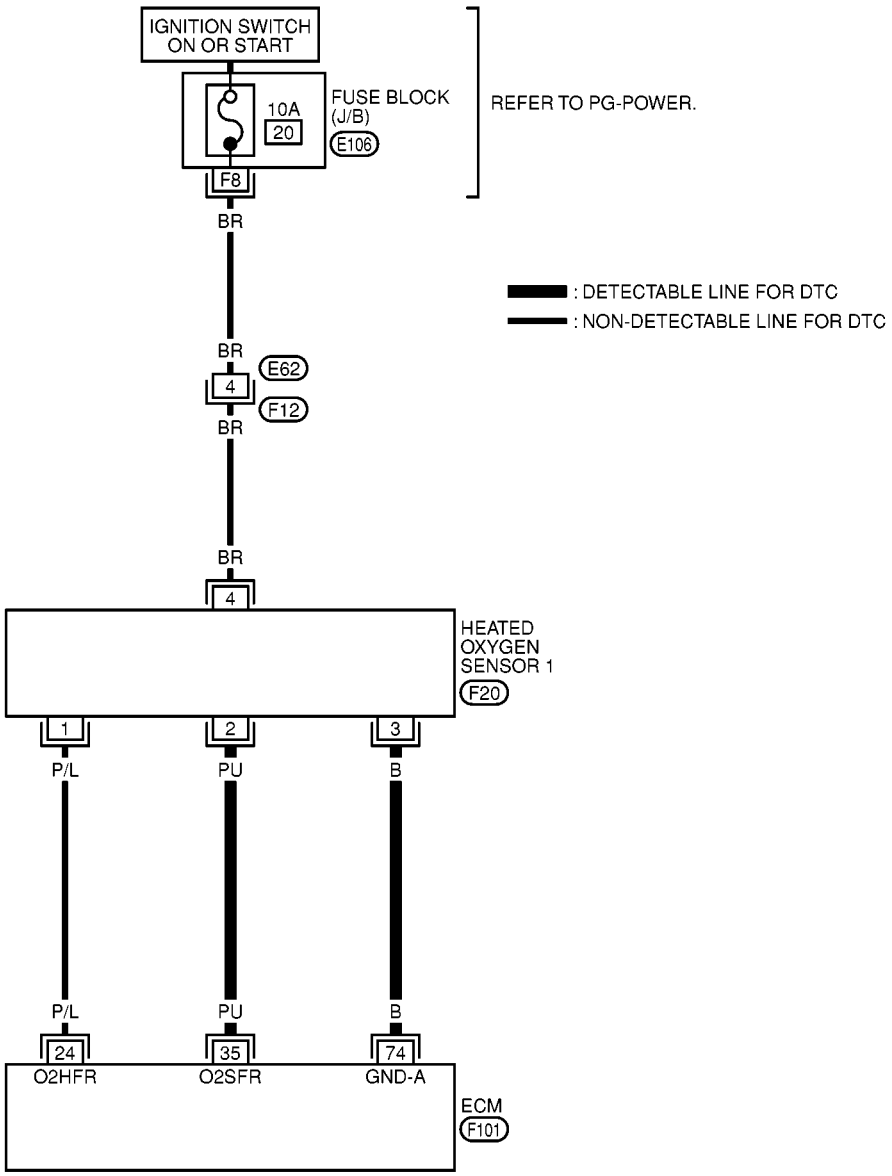
4. If NG, go to EC-1129, "Diagnostic Procedure" .

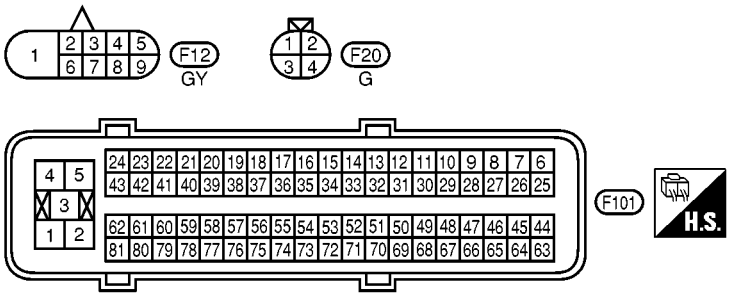


Wiring Diagram

EBS00GCS

EC-HO2S1-01





REFER TO THE FOLLOWING.
E106 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0008E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
35	PU	Heated oxygen sensor 1	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V (Periodically change)
74	B	Sensors' ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V

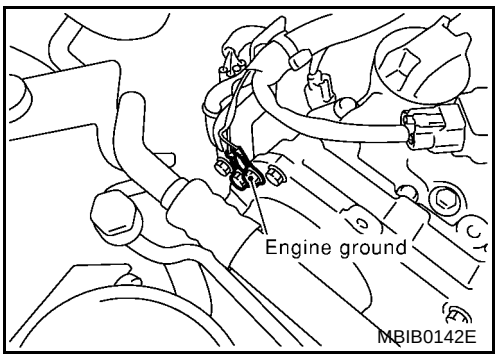
Diagnostic Procedure

EBS00GCT

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

>> GO TO 2.

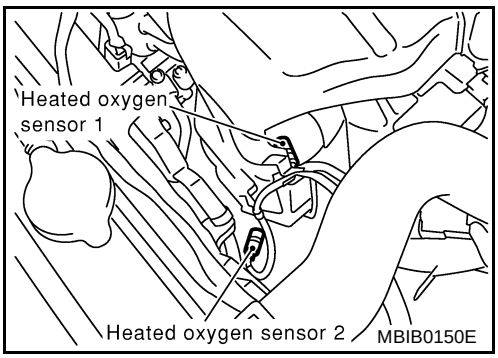


2. RETIGHTEN HEATED OXYGEN SENSOR 1

Loosen and retighten heated oxygen sensor 1.

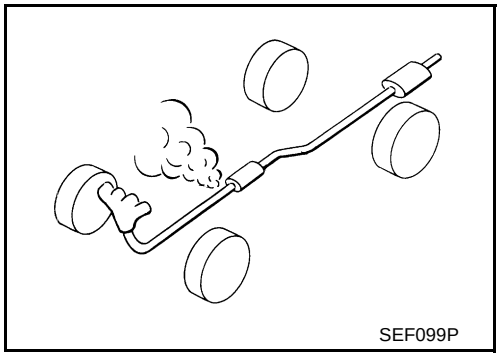
Tightening torque: 40 - 50 N·m (4.1 - 5.1 kg-m, 30 - 37 ft-lb)

>> GO TO 3.



3. CHECK FOR EXHAUST AIR LEAK

1. Start engine and run it at idle.
2. Listen for an exhaust air leak before three way catalyst (Manifold).


SEF099P

OK or NG

OK >> GO TO 4.
NG >> Repair or replace.

4. CHECK FOR INTAKE AIR LEAK

Listen for an intake air leak after the mass air flow sensor.

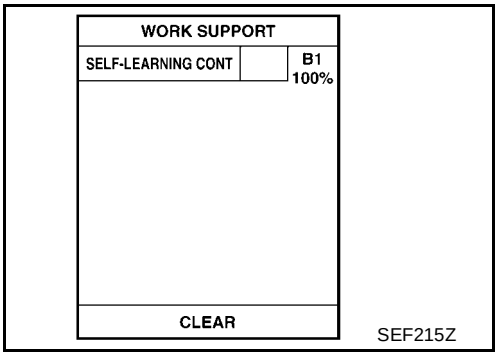
OK or NG

OK >> GO TO 5.
NG >> Repair or replace.

5. CLEAR THE SELF-LEARNING DATA

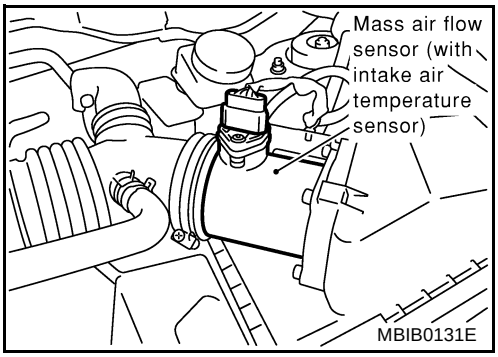
With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching “CLEAR”.
4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 or P0172 detected?
   Is it difficult to start engine?



Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF”.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure that DTC P0102 is displayed.
6. Erase the DTC memory. Refer to EC-1015, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
7. Make sure that DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 or P0172 detected?
   Is it difficult to start engine?



Yes or No

Yes >> Perform trouble diagnosis for DTC P0171 or DTC P0172 (Refer to EC-1157 or EC-1163).
No >> GO TO 6.

6. CHECK HO2S1 GROUND CIRCUIT FOR OPEN AND SHORT

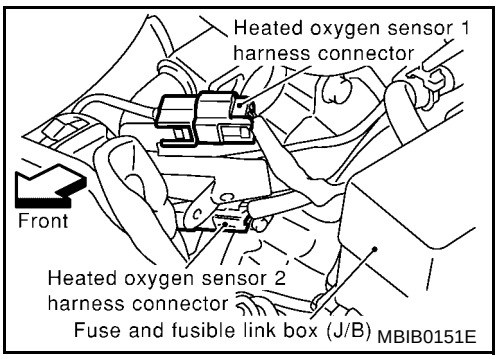
1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 1 harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminal 74 and HO2S1 terminal 3. Refer to Wiring Diagram.

   Continuity should exist.

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.



7. CHECK HO2S1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 35 and HO2S1 terminal 2.
   Refer to Wiring Diagram.

   Continuity should exist.

2. Check harness continuity between ECM terminal 35 or HO2S1 terminal 2 and ground.
   Refer to Wiring Diagram.

   Continuity should not exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 8.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK HEATED OXYGEN SENSOR 1 HEATER

Refer to EC-1094, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> Replace malfunctioning heated oxygen sensor 1.

9. CHECK MASS AIR FLOW SENSOR

Refer to EC-1105, "Component Inspection" .

OK or NG

OK >> GO TO 10.
NG >> Replace mass air flow sensor.

10. CHECK PCV VALVE

Refer to EC-1411, "Component Inspection" .

OK or NG

OK >> GO TO 11.
NG >> Replace PCV valve.

11. CHECK HEATED OXYGEN SENSOR 1

Refer to EC-1132, "Component Inspection" .

OK or NG

OK >> GO TO 12.
NG >> Replace heated oxygen sensor 1.

12. CHECK INTERMITTENT INCIDENT

Refer to EC-1076, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

EBS00GCU

HEATED OXYGEN SENSOR 1

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “MANU TRIG” and adjust “TRIGGER POINT” to 100% in “DATA MONITOR” mode with CONSULT-II.

3. Select “HO2S1 (B1)” and “HO2S1 MNTR (B1)”.
4. Hold engine speed at 2,000 rpm under no load during the following steps.
5. Touch “RECORD” on CONSULT-II screen.

DATA MONITOR	
MONITOR	NO DTC
ENG SPEED	XXX rpm
MAS A/F SE-B1	XXX V
COOLAN TEMP/S	XXX °C
HO2S1 (B1)	XXX V
HO2S1 MNTR (B1)	LEAN

SEF646Y

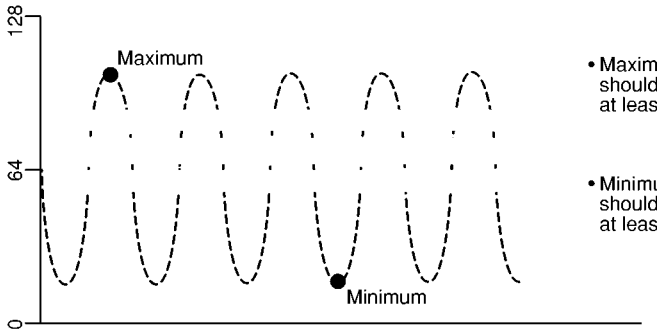
6. Check the following.
   - “HO2S1 MNTR (B1)” in “DATA MONITOR” mode changes from “RICH” to “LEAN” to “RICH” 5 times in 10 seconds.
     5 times (cycles) are counted as shown at right.
   - “HO2S1 (B1)” voltage goes above 0.6V at least once.
   - “HO2S1 (B1)” voltage goes below 0.3V at least once.
   - “HO2S1 (B1)” voltage never exceeds 1.0V.

cycle	1	2	3	4	5
HO2S1 MNTR (B1)	R-L	R-L	R-L	R-L	R-L

R means HO2S1 MNTR (B1) indicates RICH
L means HO2S1 MNTR (B1) indicates LEAN

SEF217YA

Trigger	ENG SPEED	HO2S1 (B1)
	rpm	V
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX



- Maximum voltage should be over 0.6V at least one time.
- Minimum voltage should be below 0.30V at least one time.

SEF648Y

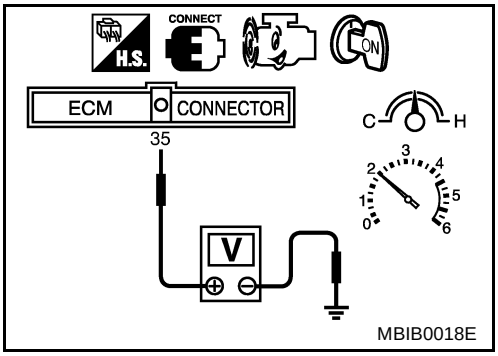
CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 (HO2S1 signal) and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no load.
   - The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds.
   - The maximum voltage is over 0.6V at least one time.
   - The minimum voltage is below 0.3V at least one time.
   - The voltage never exceeds 1.0V.

   1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V
   2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V



MBIB0018E

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**

- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

EBS00GCV

HEATED OXYGEN SENSOR 1

Refer to EM-121, "EXHAUST MANIFOLD AND THREE WAY CATALYST" .

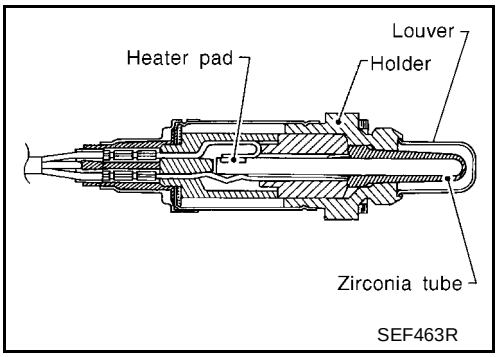
DTC P0134 HO2S1

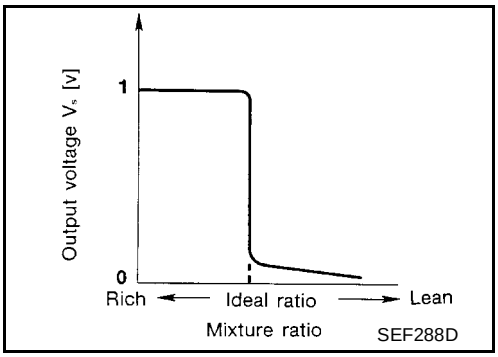
PFP:22690

Component Description

EBS00GCW

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.





CONSULT-II Reference Value in Data Monitor Mode

EBS00GCX

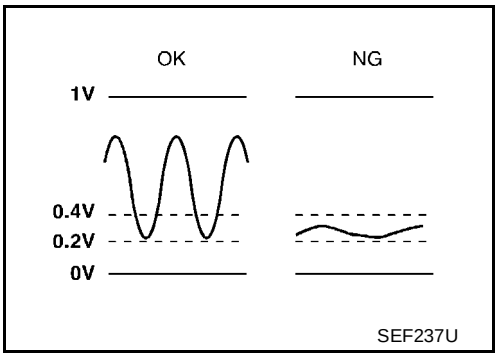
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S1 (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S1 MNTR (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	LEAN ←→ RICH Changes more than 5 times during 10 seconds.

On Board Diagnosis Logic

EBS00GCY

Under the condition in which the heated oxygen sensor 1 signal is not input, the ECM circuits will read a continuous approximately 0.3V. Therefore, for this diagnosis, the time that output voltage is within 200 to 400 mV range is monitored, and the diagnosis checks that this time is not inordinately long.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0134 0134	Heated oxygen sensor 1 circuit no activity detected	The voltage from the sensor is constantly approx. 0.3V.	● Harness or connectors (The sensor circuit is open or shorted.) ● Heated oxygen sensor 1

DTC Confirmation Procedure

EBS00GCZ

CAUTION:
Always drive vehicle at a safe speed.

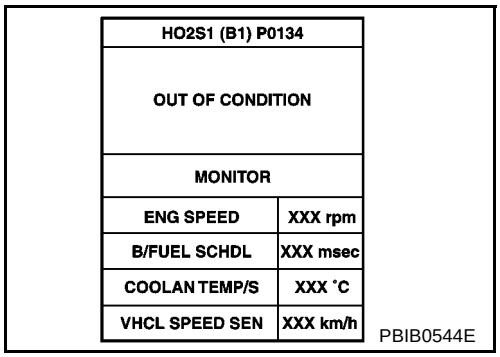
NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 11V at idle.

WITH CONSULT-II

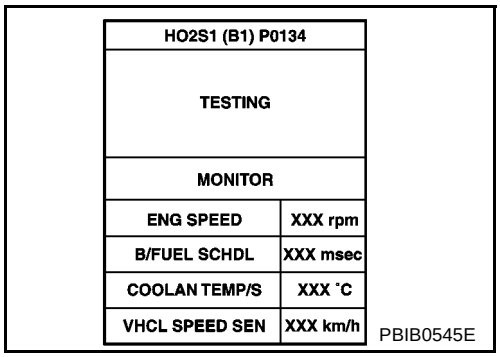
1. Start engine and warm it up to normal operating temperature.
2. Select “HO2S1 (B1) P0134” of “HO2S1” in “DTC WORK SUPPORT” mode with CONSULT-II.
3. Touch “START”.
4. Let it idle for at least 3 minutes.

   NOTE:
   Never raise engine speed above 3,600 rpm after this step. If the engine speed limit is exceeded, return to step 4.



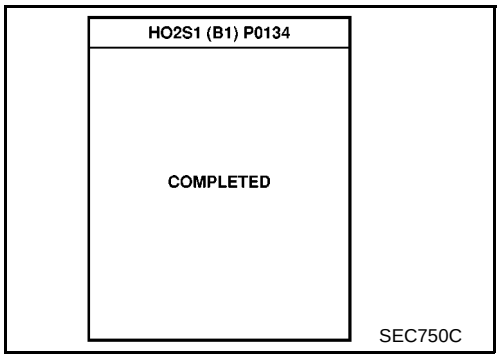
5. When the following conditions are met, “TESTING” will be displayed on the CONSULT-II screen. Maintain the conditions continuously until “TESTING” changes to “COMPLETED”. (It will take approximately 10 to 60 seconds.)

ENG SPEED	1,550 - 3,600 rpm
Vehicle speed	More than 64 km/h (40 MPH)
B/FUEL SCHDL	2.9 - 14.5 msec
Selector lever	Suitable position



   If “TESTING” is not displayed after 5 minutes, retry from step 2.

6. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”. If “NG” is displayed, refer to EC-1139, "Diagnostic Procedure" .



Overall Function Check

EBS00GD0

Use this procedure to check the overall function of the heated oxygen sensor 1 circuit. During this check, a 1st trip DTC might not be confirmed.

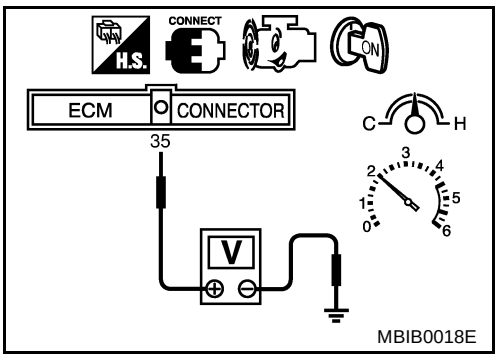
WITH GST

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 (HO2S1 signal) and engine ground.

3. Check the following with engine speed held at 2,000 rpm constant under no load.

- The voltage does not remain in the range of 0.2 - 0.4V.

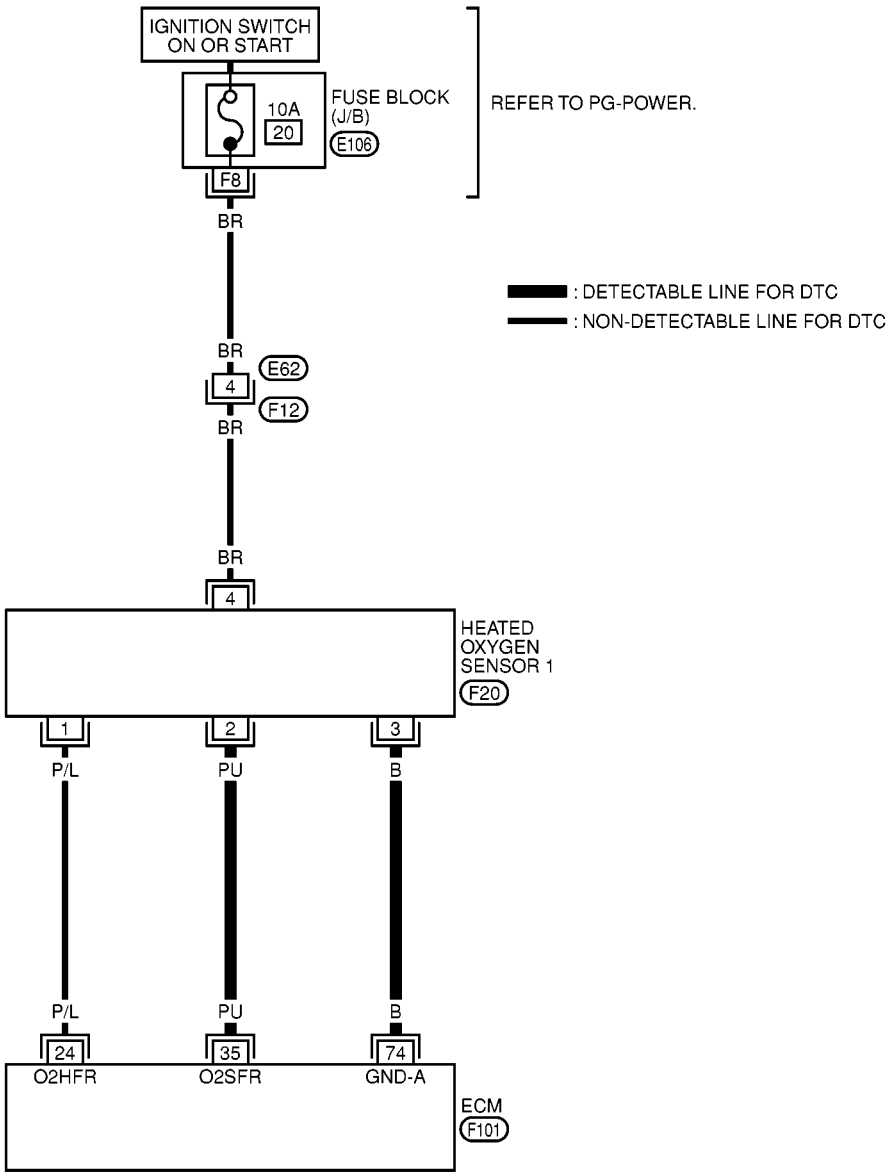
4. If NG, go to EC-1139, "Diagnostic Procedure" .

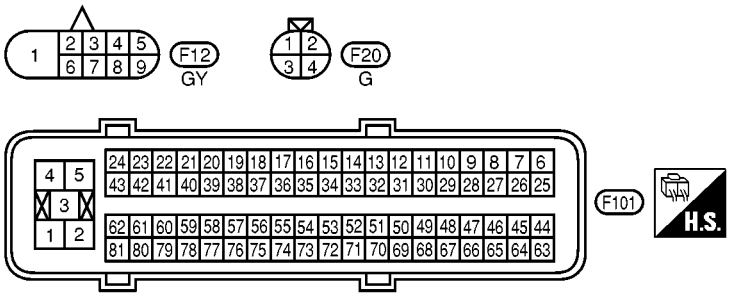


Wiring Diagram

EBS00GD1

EC-HO2S1-01





REFER TO THE FOLLOWING.
E106 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0008E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
35	PU	Heated oxygen sensor 1	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V (Periodically change)
74	B	Sensors' ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V

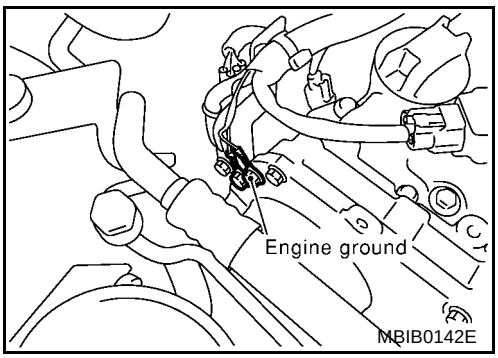
Diagnostic Procedure

EBS00GD2

1. INSPECTION START

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

>> GO TO 2.



2. CHECK HO2S1 GROUND CIRCUIT FOR OPEN AND SHORT

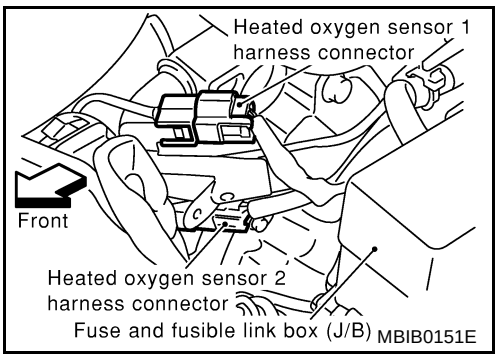
1. Disconnect heated oxygen sensor 1 harness connector.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 74 and HO2S1 terminal 3. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.



3. CHECK HO2S1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 35 and HO2S1 terminal 2.
   Refer to Wiring Diagram.

   Continuity should exist.

2. Check harness continuity between ECM terminal 35 or HO2S1 terminal 2 and ground.
   Refer to Wiring Diagram.

   Continuity should not exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK HEATED OXYGEN SENSOR 1

Refer to EC-1140, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace heated oxygen sensor 1.

5. CHECK INTERMITTENT INCIDENT

Refer to EC-1076, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

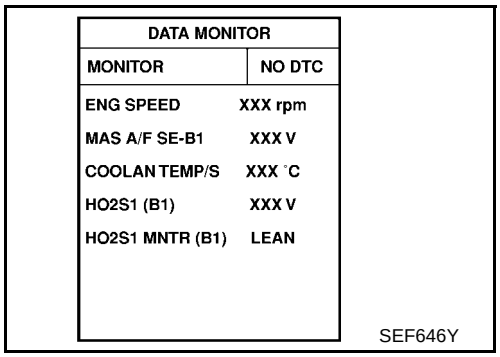
Component Inspection

EBS00GD3

HEATED OXYGEN SENSOR 1

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “MANU TRIG” and adjust “TRIGGER POINT” to 100% in “DATA MONITOR” mode with CONSULT-II.
3. Select “HO2S1 (B1)” and “HO2S1 MNTR (B1)”.
4. Hold engine speed at 2,000 rpm under no load during the following steps.
5. Touch “RECORD” on CONSULT-II screen.



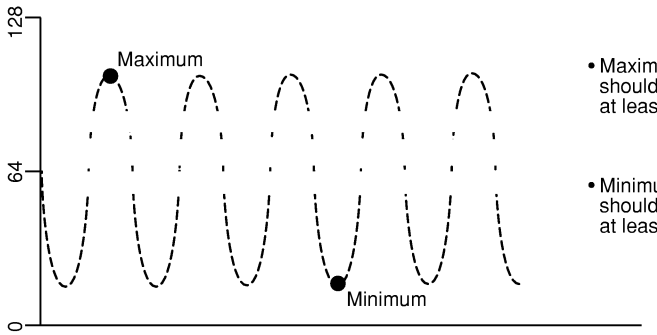
6. Check the following.
   - "HO2S1 MNTR (B1)" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" 5 times in 10 seconds.
     5 times (cycles) are counted as shown at right.
   - "HO2S1 (B1)" voltage goes above 0.6V at least once.
   - "HO2S1 (B1)" voltage goes below 0.3V at least once.
   - "HO2S1 (B1)" voltage never exceeds 1.0V.

cycle	1	2	3	4	5
HO2S1 MNTR (B1)	R-L-R-L-R-L-R-L-R-L-R				

R means HO2S1 MNTR (B1) indicates RICH
L means HO2S1 MNTR (B1) indicates LEAN

SEF217YA

Trigger	ENG SPEED	HO2S1 (B1)
	rpm	V
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX

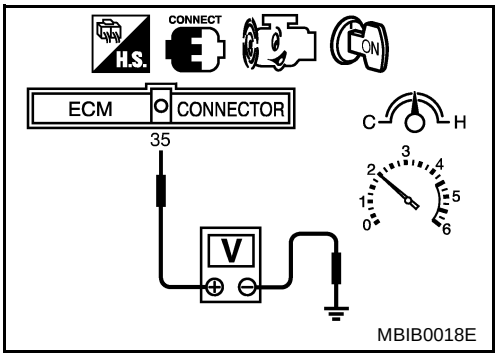


CAUTION:
- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

⊗ Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 (HO2S1 signal) and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no load.
   - The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds.
   - The maximum voltage is over 0.6V at least one time.
   - The minimum voltage is below 0.3V at least one time.
   - The voltage never exceeds 1.0V.

   1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V
   2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V



CAUTION:
- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

EBS00GD4

HEATED OXYGEN SENSOR 1

Refer to EM-121, "EXHAUST MANIFOLD AND THREE WAY CATALYST" .

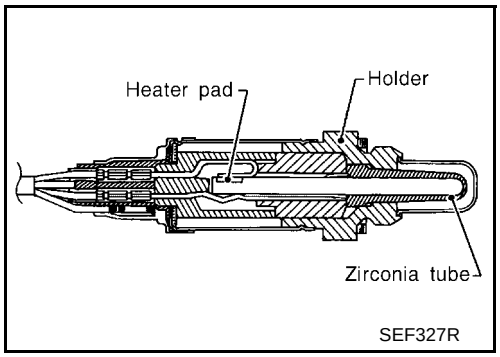
DTC P0138 HO2S2

PFP:226A0

Component Description

EBS00GD5

The heated oxygen sensor 2, after three way catalyst (manifold), monitors the oxygen level in the exhaust gas on each bank.
Even if switching characteristics of the heated oxygen sensor 1 are shifted, the air fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.
This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.
Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.



CONSULT-II Reference Value in Data Monitor Mode

EBS00GD6

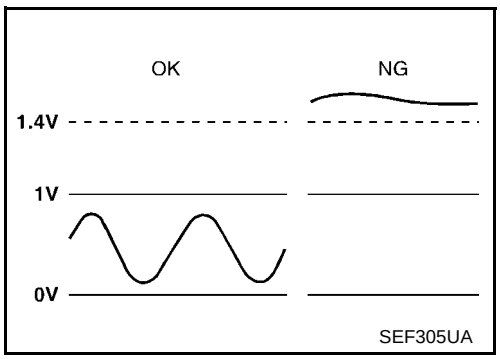
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S2 (B1)	● Engine: After warming up	Revving engine from idle to 3,000 rpm quickly.	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S2 MNTR (B1)	● Engine: After warming up	Revving engine from idle to 3,000 rpm quickly.	LEAN ←→ RICH

On Board Diagnosis Logic

EBS00GD7

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the heated oxygen sensor 1. The oxygen storage capacity before the three way catalyst causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the voltage is unusually high during the various driving condition such as fuel-cut.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0138 0138	Heated oxygen sensor 2 circuit high voltage	An excessively high voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Heated oxygen sensor 2

DTC Confirmation Procedure

EBS00GD8

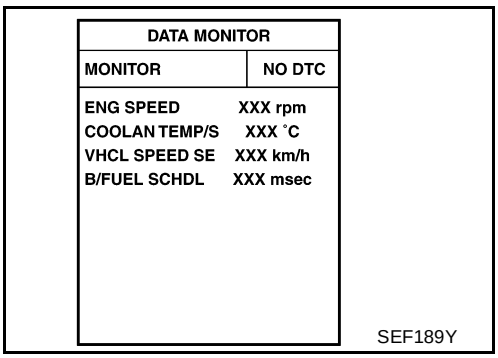
CAUTION:
Always drive vehicle at a safe speed.

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
3. Stop vehicle with engine running.

4. Let engine idle for 1 minute.
5. If 1st trip DTC is detected, go to EC-1145, "Diagnostic Procedure" .



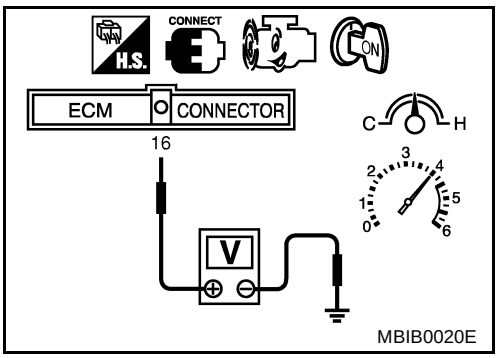
Overall Function Check

EBS00GD9

Use this procedure to check the overall function of the heated oxygen sensor 2 circuit. During this check, a 1st trip DTC might not be confirmed.

WITH GST

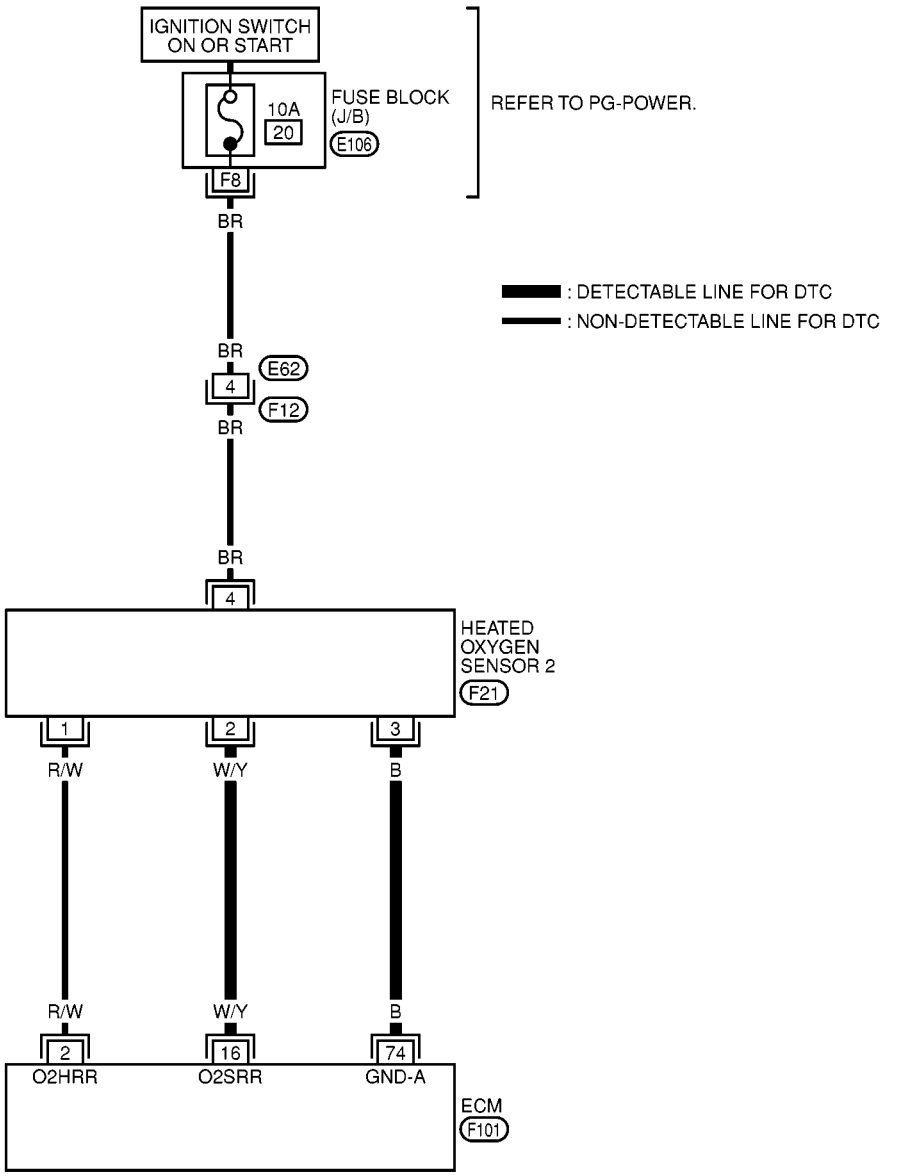
1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Set voltmeter probes between ECM terminal 16 (HO2S2 signal) and engine ground.
4. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be below 1.4V during this procedure.
5. If NG, go to EC-1145, "Diagnostic Procedure" .

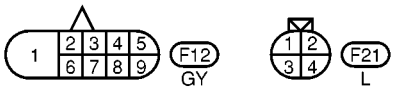


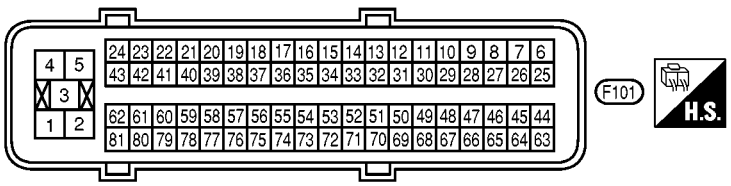
Wiring Diagram

EBS00GDA

EC-HO2S2-01







REFER TO THE FOLLOWING.
E106 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0010E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
16	W/Y	Heated oxygen sensor 2	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V
74	B	Sensors' ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V

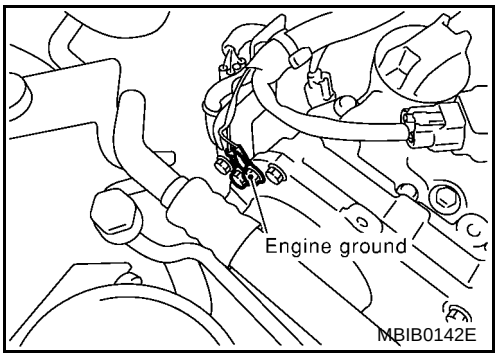
Diagnostic Procedure

EBS00GDB

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

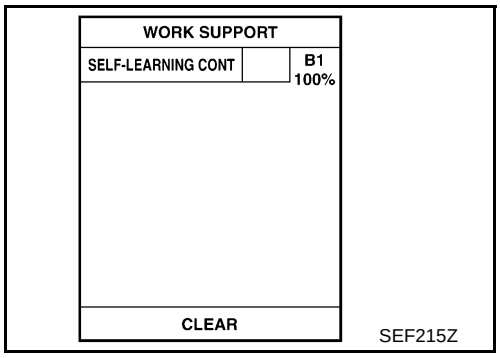
>> GO TO 2.



2. CLEAR THE SELF-LEARNING DATA

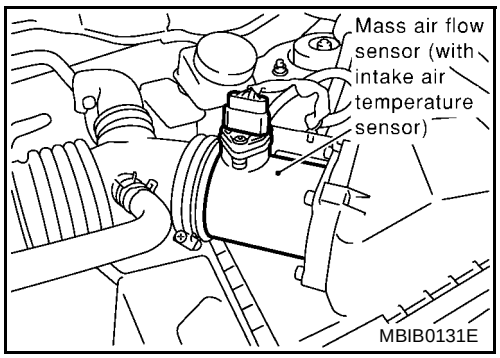
With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching “CLEAR”.
4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0172 detected?
   Is it difficult to start engine?



Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF”.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure that DTC P0102 is displayed.
6. Erase the DTC memory. Refer to EC-1015, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
7. Make sure that DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0172 detected?
   Is it difficult to start engine?



Yes or No

Yes >> Perform trouble diagnosis for DTC P0172. Refer to EC-1163 .
No >> GO TO 3.

3. CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

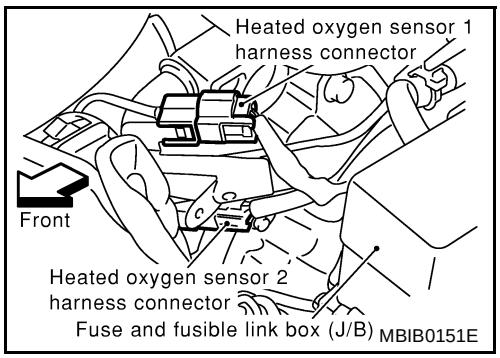
1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 2 harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminal 74 and HO2S2 terminal 3.
   Refer to Wiring Diagram.

   Continuity should exist.

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.



4. CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 16 and HO2S2 terminal 2.
   Refer to Wiring Diagram.

   Continuity should exist.

2. Check harness continuity between ECM terminal 16 or HO2S2 terminal 2 and ground.
   Refer to Wiring Diagram.

   Continuity should not exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK HEATED OXYGEN SENSOR 2

Refer to EC-1147, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace heated oxygen sensor 2.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-1076, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

EBS00GDC

HEATED OXYGEN SENSOR 2

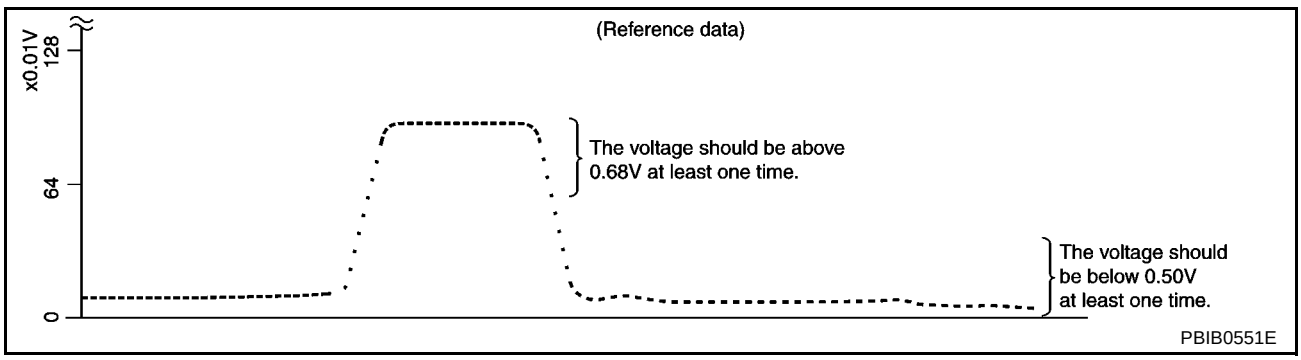
With CONSULT-II

1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)” as the monitor item with CONSULT-II.

ACTIVE TEST	
FUEL INJECTION	25 %
MONITOR	
ENG SPEED	XXX rpm
HO2S1 (B1)	XXX V
HO2S2 (B1)	XXX V
HO2S1 MNTR (B1)	RICH
HO2S2 MNTR (B1)	RICH

SEF662Y

4. Check “HO2S2 (B1)” at idle speed when adjusting “FUEL INJECTION” to ±25%.



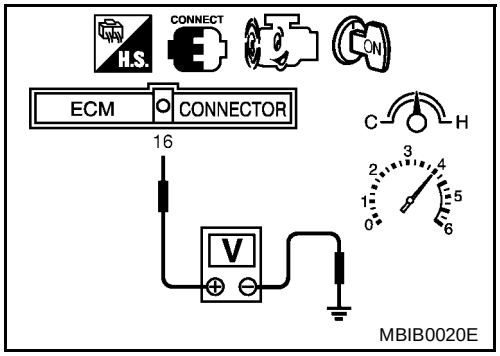
"HO2S2 (B1)" should be above 0.68V at least once when the "FUEL INJECTION" is +25%.
"HO2S2 (B1)" should be below 0.50V at least once when the "FUEL INJECTION" is −25%.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Set voltmeter probes between ECM terminal 16 [HO2S2 (B1) signal] and engine ground.
4. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be above 0.68V at least once during this procedure.
   If the voltage is above 0.68V at step 4, step 5 is not necessary.
5. Keep vehicle idling for 10 minutes, then check voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in "D" position (CVT), 3rd gear position (M/T).
   The voltage should be below 0.50V at least once during this procedure.
6. If NG, replace heated oxygen sensor 2.



CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

EBS00GDD

HEATED OXYGEN SENSOR 2

Refer to EX-3, "EXHAUST SYSTEM" .

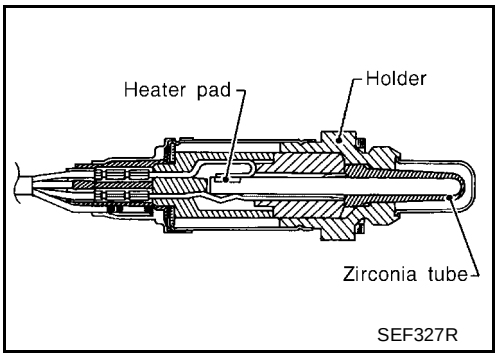
DTC P0139 HO2S2

PFP:226A0

Component Description

EBS00GDE

The heated oxygen sensor 2, after three way catalyst (manifold), monitors the oxygen level in the exhaust gas on each bank.
Even if switching characteristics of the heated oxygen sensor 1 are shifted, the air fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.
This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.
Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.



CONSULT-II Reference Value in Data Monitor Mode

EBS00GDF

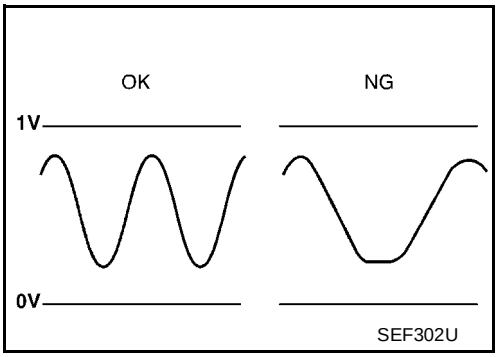
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S2 (B1)	● Engine: After warming up	Revving engine from idle to 3,000 rpm quickly.	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S2 MNTR (B1)	● Engine: After warming up	Revving engine from idle to 3,000 rpm quickly.	LEAN ←→ RICH

On Board Diagnosis Logic

EBS00GDG

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the heated oxygen sensor 1. The oxygen storage capacity before the three way catalyst causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the switching response of the sensor's voltage is faster than specified during the various driving condition such as fuel-cut.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0139 0139	Heated oxygen sensor 2 circuit slow response	It takes more time for the sensor to respond between rich and lean than the specified time.	● Harness or connectors (The sensor circuit is open or shorted.) ● Heated oxygen sensor 2 ● Fuel pressure ● Injectors ● Intake air leaks

DTC Confirmation Procedure

EBS00GDH

CAUTION:
Always drive vehicle at a safe speed.

NOTE:

- **“COMPLETED” will appear on CONSULT-II screen when all tests “COND1”, “COND2” and “COND3” are completed.**
- If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

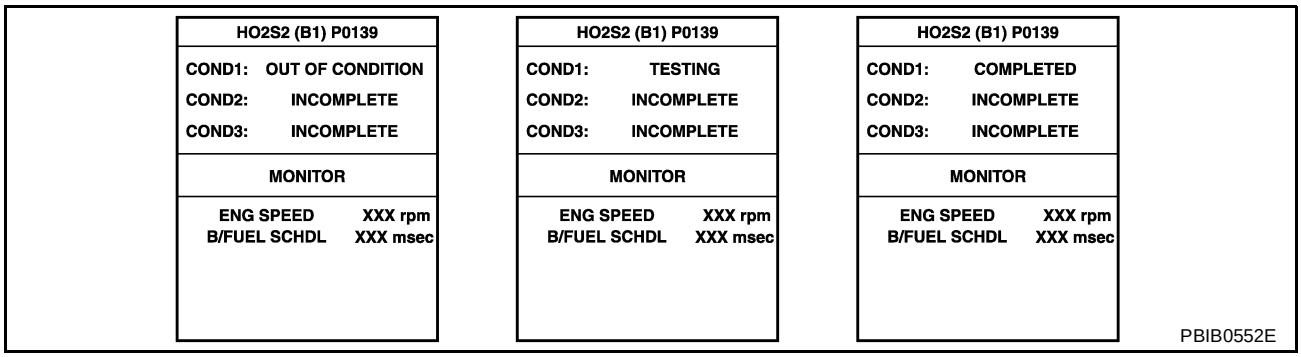
TESTING CONDITION:
Never stop engine during this procedure. If the engine is stopped, retry this procedure from step 2 in “Procedure for COND1”.

WITH CONSULT-II

Procedure for COND1

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Turn ignition switch “ON” and select “HO2S2 (B1) P0139” of “HO2S2” in “DTC WORK SUPPORT” mode with CONSULT-II.
4. Touch “START”.
5. Start engine and let it idle for at least 30 seconds.
6. Rev engine up to 2,000 rpm 2 or 3 times quickly under no load.
   If “COMPLETED” appears on CONSULT-II screen, go to step 2 in “Procedure for COND3”.
   If “COMPLETED” does not appear on CONSULT-II screen, go to the following step.
7. Drive vehicle at a speed of more than 70km/h (43 MPH) for 2 consecutive minutes.
8. When the following conditions are met, “TESTING” will be displayed at “COND1” on the CONSULT-II screen. Maintain the conditions continuously until “TESTING” changes to “COMPLETED”. (It will take approximately 60 seconds.)

ENG SPEED	More than 1,000 rpm
B/FUEL SCHDL	More than 1.0 msec
COOLANT TEMP/S	70 - 105 °C
Selector level	Suitable position



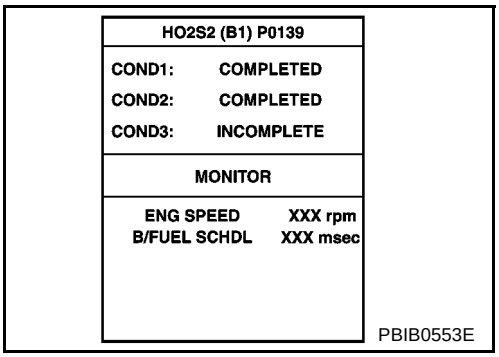
NOTE:

- **If “TESTING” is not displayed after 5 minutes, retry from step 2 in “Procedure for COND1”.**
- **If “COMPLETED” already appears at “COND2” on CONSULT-II screen before “Procedure for COND2” is conducted, it is unnecessary to conduct step 1 in “Procedure for COND2”.**

Procedure for COND2

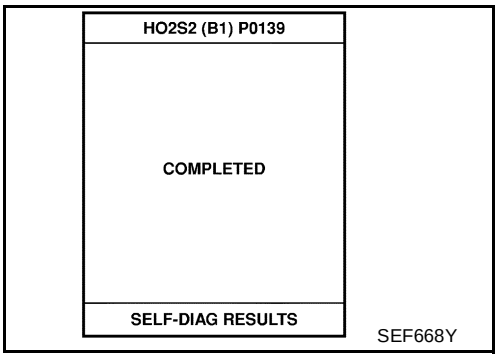
1. While driving, release accelerator pedal completely from the above condition [step 8] until “INCOMPLETE” at “COND2” on CONSULT-II screen has turned to “COMPLETED”. (It will take approximately 4 seconds.)

NOTE:
If “COMPLETED” already appears at “COND3” on CONSULT-II screen before “Procedure for COND3” is conducted, it is unnecessary to conduct step 1 in “Procedure for COND3”.



Procedure for COND3

1. Stop vehicle and let it idle until “INCOMPLETE” of “COND3” on CONSULT-II screen has turned to “COMPLETED”. (It will take a maximum of approximately 6 minutes.)
2. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”.
   If “NG” is displayed, refer to EC-1153, "Diagnostic Procedure" .



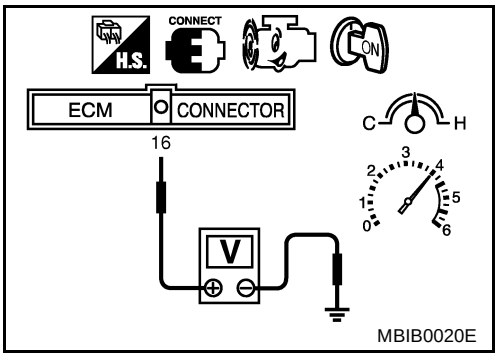
Overall Function Check

EBS00GDI

Use this procedure to check the overall function of the heated oxygen sensor 2 circuit. During this check, a 1st trip DTC might not be confirmed.

WITH GST

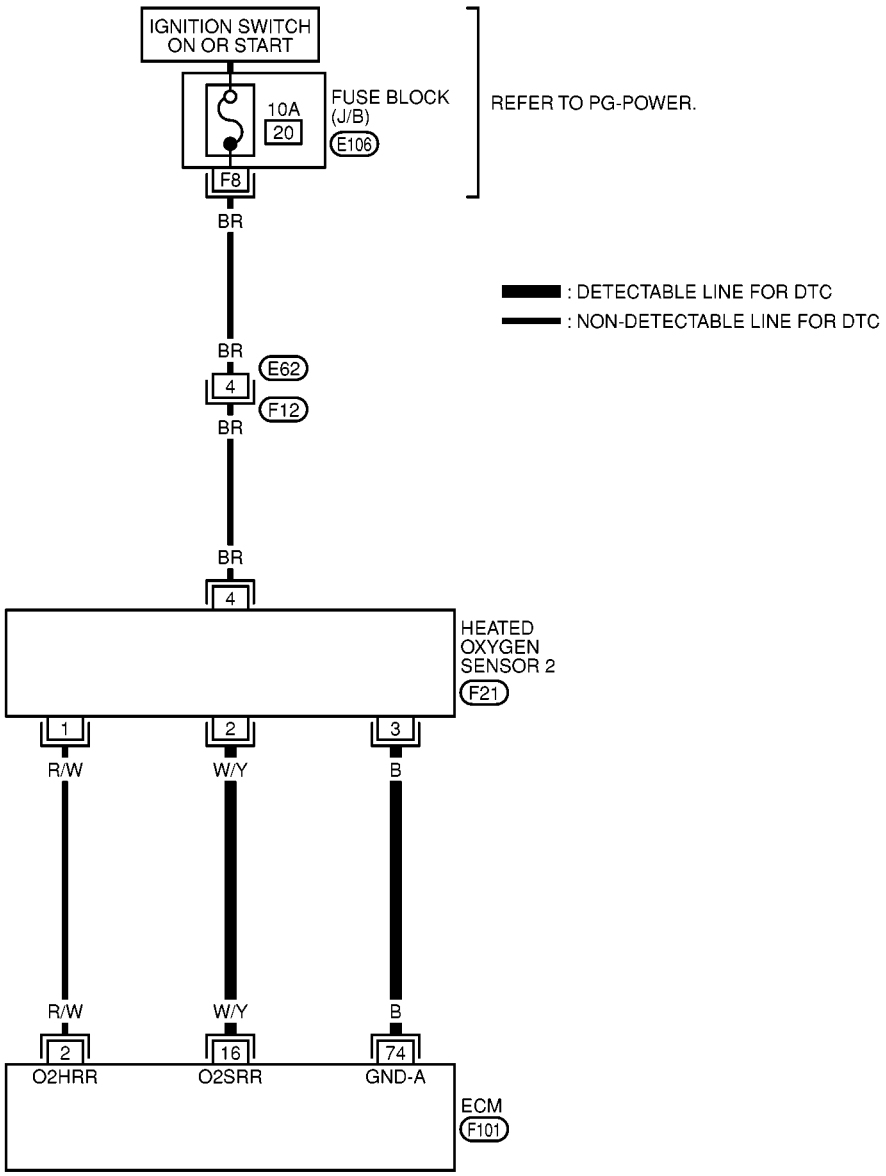
1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Set voltmeter probes between ECM terminal 16 (HO2S2 signal) and engine ground.
4. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should change at more than 0.06V for 1 second during this procedure.
   If the voltage can be confirmed in step 4, step 5 is not necessary.
5. Keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in “D” position (CVT), 3rd gear position (M/T).
   The voltage should change at more than 0.06V for 1 second during this procedure.
6. If NG, go to EC-1153, "Diagnostic Procedure" .

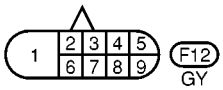


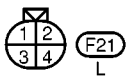
Wiring Diagram

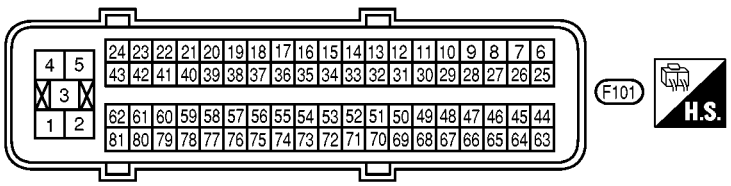
EBS00GDJ

EC-HO2S2-01









REFER TO THE FOLLOWING.
E106 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0010E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
16	W/Y	Heated oxygen sensor 2	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V
74	B	Sensors' ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V

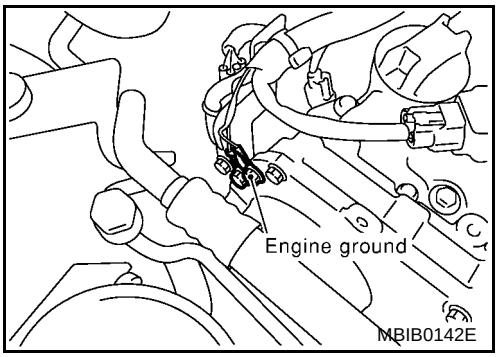
Diagnostic Procedure

EBS00GDK

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

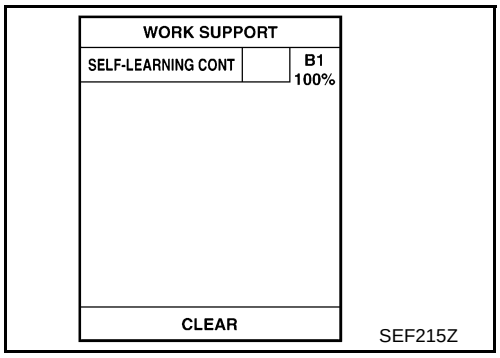
>> GO TO 2.



2. CLEAR THE SELF-LEARNING DATA

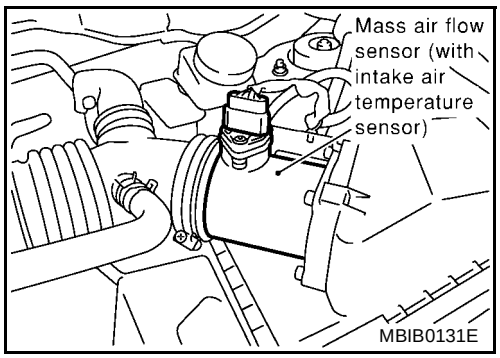
With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching “CLEAR”.
4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 or P0172 detected?
   Is it difficult to start engine?



Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF”.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure that DTC P0102 is displayed.
6. Erase the DTC memory. Refer to EC-1015, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
7. Make sure that DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 or P0172 detected?
   Is it difficult to start engine?



Yes or No

Yes >> Perform trouble diagnosis for DTC P0171 or P0172. Refer to EC-1157 or EC-1163 .
No >> GO TO 3.

3. CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

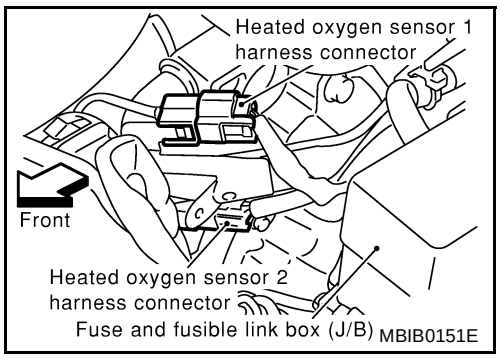
1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 2 harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminal 74 and HO2S2 terminal 3.
   Refer to Wiring Diagram.

   Continuity should exist.

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.



4. CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 16 and HO2S2 terminal 2. Refer to Wiring Diagram.

   Continuity should exist.

2. Check harness continuity between ECM terminal 16 or HO2S2 terminal 2 and ground. Refer to Wiring Diagram.

   Continuity should not exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK HEATED OXYGEN SENSOR 2

Refer to EC-1155, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace heated oxygen sensor 2.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-1076, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

EBS00GDL

HEATED OXYGEN SENSOR 2

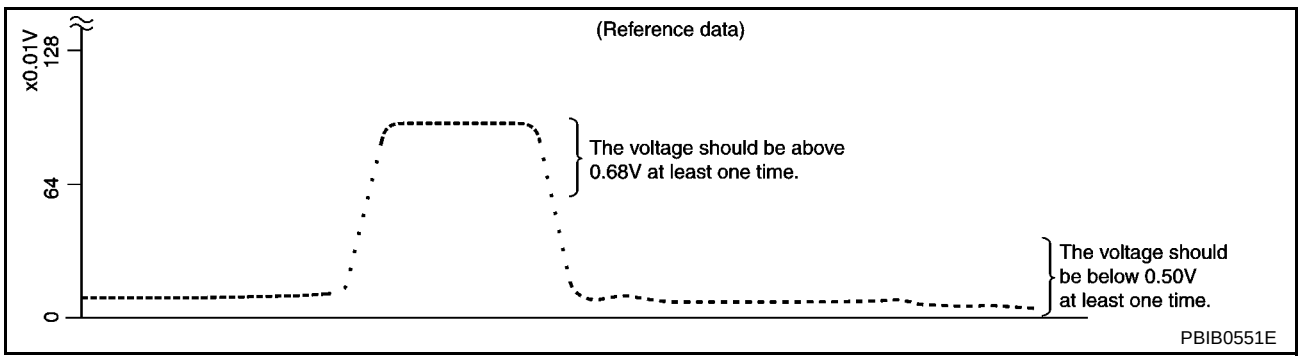
With CONSULT-II

1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)” as the monitor item with CONSULT-II.

ACTIVE TEST	
FUEL INJECTION	25 %
MONITOR	
ENG SPEED	XXX rpm
HO2S1 (B1)	XXX V
HO2S2 (B1)	XXX V
HO2S1 MNTR (B1)	RICH
HO2S2 MNTR (B1)	RICH

SEF662Y

4. Check “HO2S2 (B1)” at idle speed when adjusting “FUEL INJECTION” to ±25%.



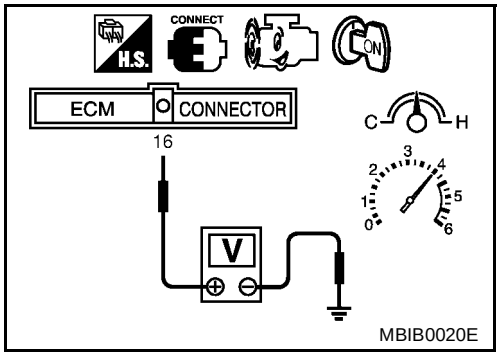
"HO2S2 (B1)" should be above 0.68V at least once when the "FUEL INJECTION" is +25%.
"HO2S2 (B1)" should be below 0.50V at least once when the "FUEL INJECTION" is −25%.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Set voltmeter probes between ECM terminal 16 (HO2S2 signal) and engine ground.
4. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be above 0.68V at least once during this procedure.
   If the voltage is above 0.68V at step 4, step 5 is not necessary.
5. Keep vehicle idling for 10 minutes, then check voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in "D" position (CVT), 3rd gear position (M/T).
   The voltage should be below 0.50V at least once during this procedure.
6. If NG, replace heated oxygen sensor 2.



CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

EBS00GDM

HEATED OXYGEN SENSOR 2

Refer to EX-3, "EXHAUST SYSTEM" .

DTC P0171 FUEL INJECTION SYSTEM FUNCTION

PFP:16600

On Board Diagnosis Logic

EBS00GDN

With the Air/Fuel Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought closely to the theoretical mixture ratio based on the mixture ratio feedback signal from the heated oxygen sensor 1. The ECM calculates the necessary compensation to correct the offset between the actual and the theoretical ratios.
In case the amount of the compensation value is extremely large (The actual mixture ratio is too lean.), the ECM judges the condition as the fuel injection system malfunction and light up the MI (2 trip detection logic).

Sensor	Input Signal to ECM	ECM function	Actuator
Heated oxygen sensors 1	Density of oxygen in exhaust gas (Mixture ratio feedback signal)	Fuel injection control	Fuel injectors

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0171 0171	Fuel injection system too lean	● Fuel injection system does not operate properly. ● The amount of mixture ratio compensation is too large. (The mixture ratio is too lean.)	● Intake air leaks ● Heated oxygen sensor 1 ● Injectors ● Exhaust gas leaks ● Incorrect fuel pressure ● Lack of fuel ● Mass air flow sensor ● Incorrect PCV hose connection

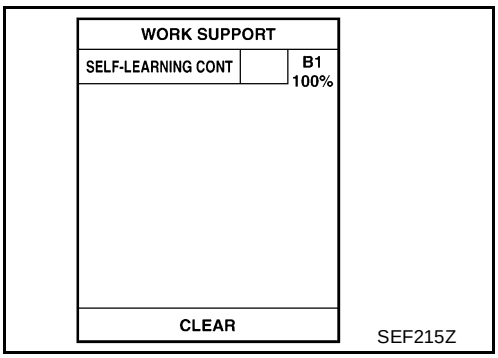
DTC Confirmation Procedure

EBS00GDO

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Turn ignition switch “ON” and select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
4. Clear the self-learning control coefficient by touching “CLEAR”.
5. Select “DATA MONITOR” mode with CONSULT-II.
6. Start engine again and let it idle for at least 10 minutes.
   The 1st trip DTC P0171 should be detected at this stage, if a malfunction exists. If so, go to EC-1160, "Diagnostic Procedure" .
7. If it is difficult to start engine at step 6, the fuel injection system has a malfunction, too.
8. Crank engine while depressing accelerator pedal. If engine starts, go to EC-1160, "Diagnostic Procedure" . If engine does not start, check exhaust and intake air leak visually.

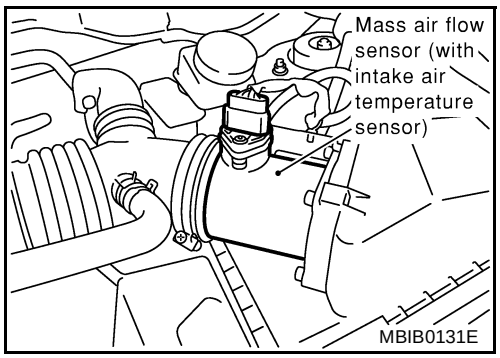


SEF215Z

WITH GST

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.

3. Disconnect mass air flow sensor harness connector. Then restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Select “MODE 3” with GST. Make sure DTC P0102 is detected.
6. Select “MODE 4” with GST and erase the DTC P0102.
7. Start engine again and let it idle for at least 10 minutes.
8. Select “MODE 7” with GST. The 1st trip DTC P0171 should be detected at this stage, if a malfunction exists. If so, go to EC-1160, "Diagnostic Procedure" .
9. If it is difficult to start engine at step 7, the fuel injection system has a malfunction.

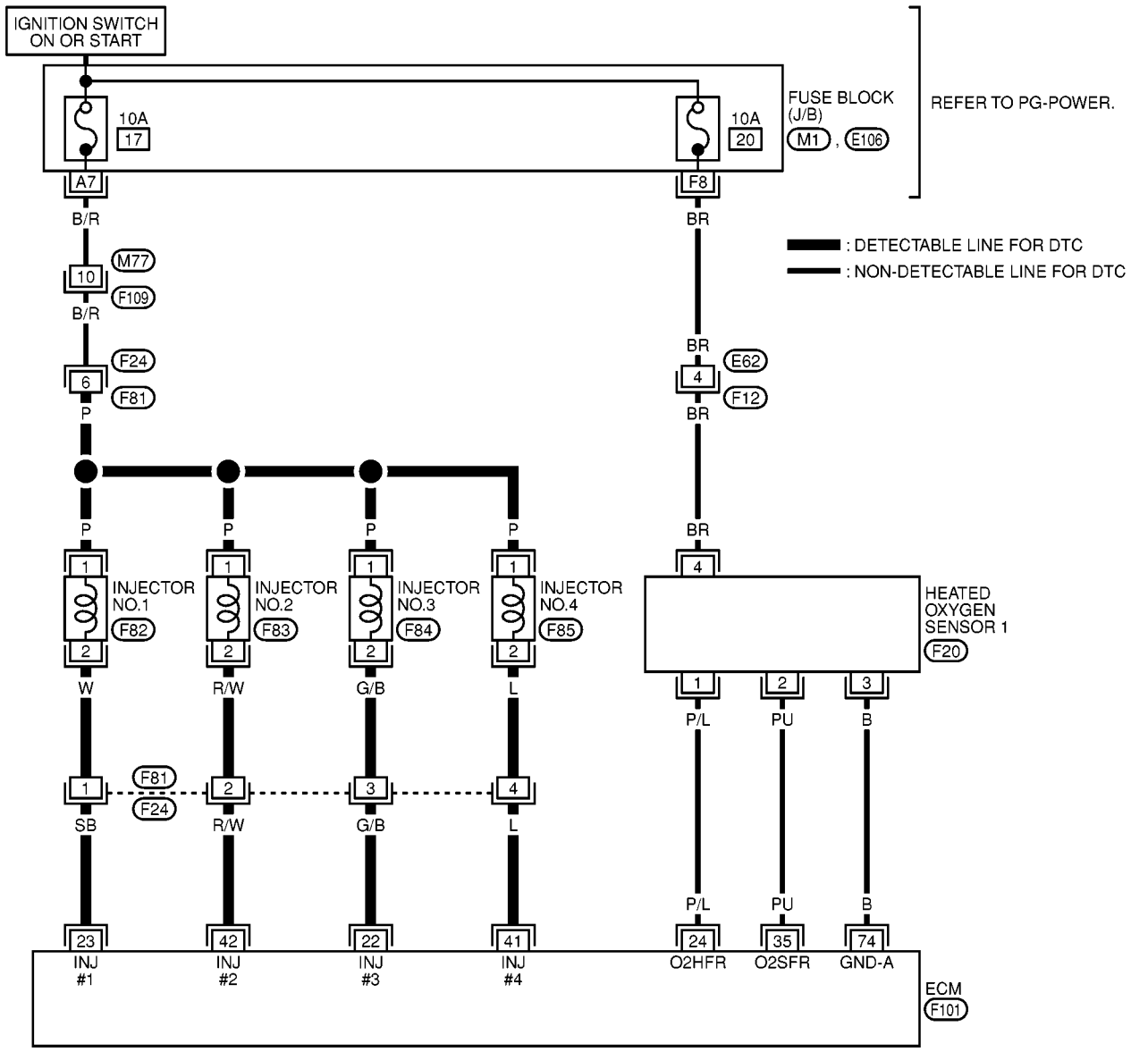


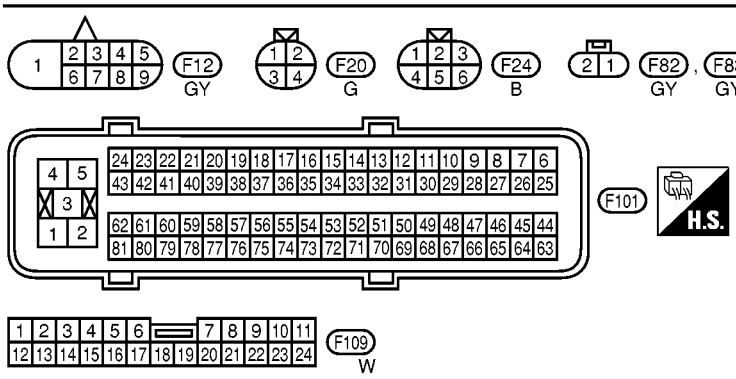
10. Crank engine while depressing accelerator pedal. If engine starts, go to EC-1160, "Diagnostic Procedure" .
    If engine does not start, check exhaust and intake air leak visually.

Wiring Diagram

EBS00GDP

EC-FUEL-01





REFER TO THE FOLLOWING.
M1, E106 -FUSE BLOCK-JUNCTION BOX (J/B)

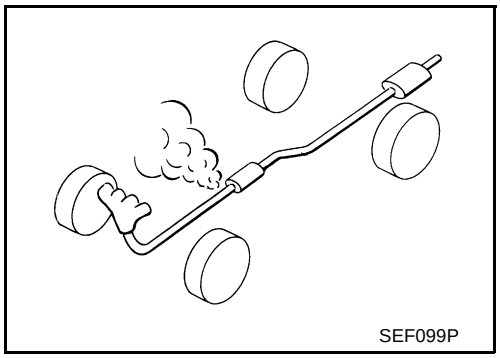
MBWA0012E

Diagnostic Procedure

EBS00GDQ

1. CHECK EXHAUST AIR LEAK

1. Start engine and run it at idle.
2. Listen for an exhaust air leak before three way catalyst.



OK or NG

OK >> GO TO 2.
NG >> Repair or replace.

2. CHECK FOR INTAKE AIR LEAK AND PCV HOSE

1. Listen for an intake air leak after the mass air flow sensor.
2. Check PCV hose connection.

OK or NG

OK >> GO TO 3.
NG >> Repair or replace.

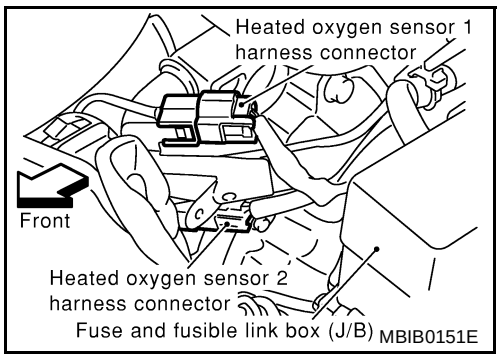
3. CHECK HEATED OXYGEN SENSOR 1 CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 1 (HO2S1) harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminal 35 and HO2S1 terminal 2.
   Refer to Wiring Diagram.

   Continuity should exist.

5. Check harness continuity between ECM terminal 35 or HO2S1 terminal 2 and ground.
   Refer to Wiring Diagram.

   Continuity should not exist.



6. Also check harness for short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK FUEL PRESSURE

1. Release fuel pressure to zero. Refer to EC-1001, "FUEL PRESSURE RELEASE" .
2. Install fuel pressure gauge and check fuel pressure. Refer to EC-1002, "FUEL PRESSURE CHECK" .

   At idling: Approximately 350 kPa (3.5 bar, 3.7 kg/cm^2 , 51 psi)

OK or NG

OK >> GO TO 5.
NG >> Follow the construction of “FUEL PRESSURE CHECK”.

5. CHECK MASS AIR FLOW SENSOR

With CONSULT-II

1. Install all removed parts.
2. Check “MASS AIR FLOW” in “DATA MONITOR” mode with CONSULT-II.

1.0 - 4.0 g·m/sec: at idling
4.0 - 10 g·m/sec: at 2,500 rpm

With GST

1. Install all removed parts.
2. Check mass air flow sensor signal in MODE 1 with GST.

1.0 - 4.0 g·m/sec: at idling
4.0 - 10 g·m/sec: at 2,500 rpm

OK or NG

OK >> GO TO 6.
NG >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds. Refer to EC-1100, "DTC P0102, P0103 MAF SENSOR" .

6. CHECK FUNCTION OF INJECTORS

With CONSULT-II

1. Start engine.
2. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT-II.
3. Make sure that each circuit produces a momentary engine speed drop.

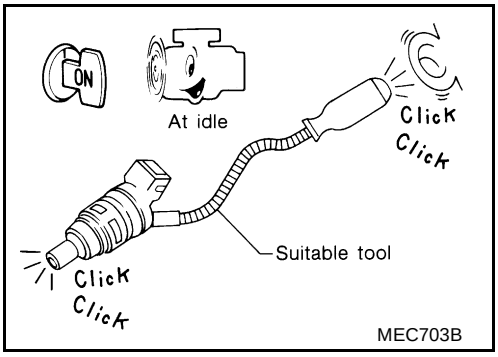
ACTIVE TEST	
POWER BALANCE	
MONITOR	
ENG SPEED	XXX rpm
MAS A/F SE-B1	XXX V

PBIB0133E

Without CONSULT-II

1. Start engine.
2. Listen to each injector operating sound.

Clicking noise should be heard.



MEC703B

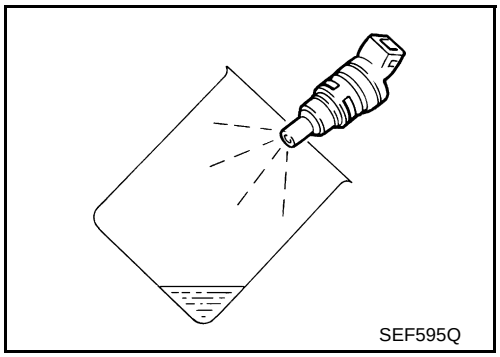
OK or NG

OK >> GO TO 7.
NG >> Perform trouble diagnosis for EC-1375, "INJECTOR CIRCUIT" .

7. CHECK INJECTOR

1. Confirm that the engine is cooled down and there are no fire hazards near the vehicle.
2. Turn ignition switch “OFF”.
3. Disconnect injector harness connectors.
4. Remove injector gallery assembly. Refer to EM-128, "FUEL INJECTOR AND FUEL TUBE" .
   Keep fuel hose and all injectors connected to injector gallery.
   The injector harness connectors should remain connected.
5. Disconnect all ignition coil harness connectors.
6. Prepare pans or saucers under each injector.
7. Crank engine for about 3 seconds. Make sure that fuel sprays out from injectors.

Fuel should be sprayed evenly for each injector.



OK or NG

OK >> GO TO 8.
NG >> Replace injectors from which fuel does not spray out. Always replace O-ring with new ones.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-1076, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

DTC P0172 FUEL INJECTION SYSTEM FUNCTION

PFP:16600

On Board Diagnosis Logic

EBS00GDR

With the Air/Fuel Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought closely to the theoretical mixture ratio based on the mixture ratio feedback signal from the heated oxygen sensors 1. The ECM calculates the necessary compensation to correct the offset between the actual and the theoretical ratios.
In case the amount of the compensation value is extremely large (The actual mixture ratio is too rich.), the ECM judges the condition as the fuel injection system malfunction and light up the MI (2 trip detection logic).

Sensor	Input Signal to ECM	ECM function	Actuator
Heated oxygen sensors 1	Density of oxygen in exhaust gas (Mixture ratio feedback signal)	Fuel injection control	Fuel injectors

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0172 0172	Fuel injection system too rich	● Fuel injection system does not operate properly. ● The amount of mixture ratio compensation is too large. (The mixture ratio is too rich.)	● Heated oxygen sensor 1 ● Injectors ● Exhaust gas leaks ● Incorrect fuel pressure ● Mass air flow sensor

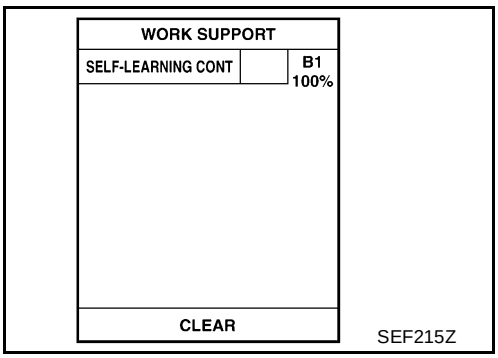
DTC Confirmation Procedure

EBS00GDS

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Turn ignition switch “ON” and select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
4. Clear the self-learning control coefficient by touching “CLEAR”.
5. Select “DATA MONITOR” mode with CONSULT-II.
6. Start engine again and let it idle for at least 10 minutes.
   The 1st trip DTC P0172 should be detected at this stage, if a malfunction exists. If so, go to EC-1166, "Diagnostic Procedure" .
7. If it is difficult to start engine at step 6, the fuel injection system has a malfunction, too.
8. Crank engine while depressing accelerator pedal.
   If engine starts, go to EC-1166, "Diagnostic Procedure" . If engine does not start, remove ignition plugs and check for fouling, etc.

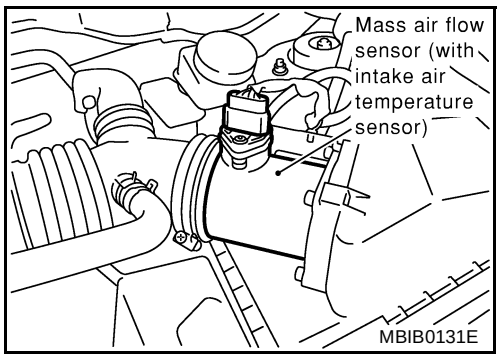


SEF215Z

WITH GST

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.

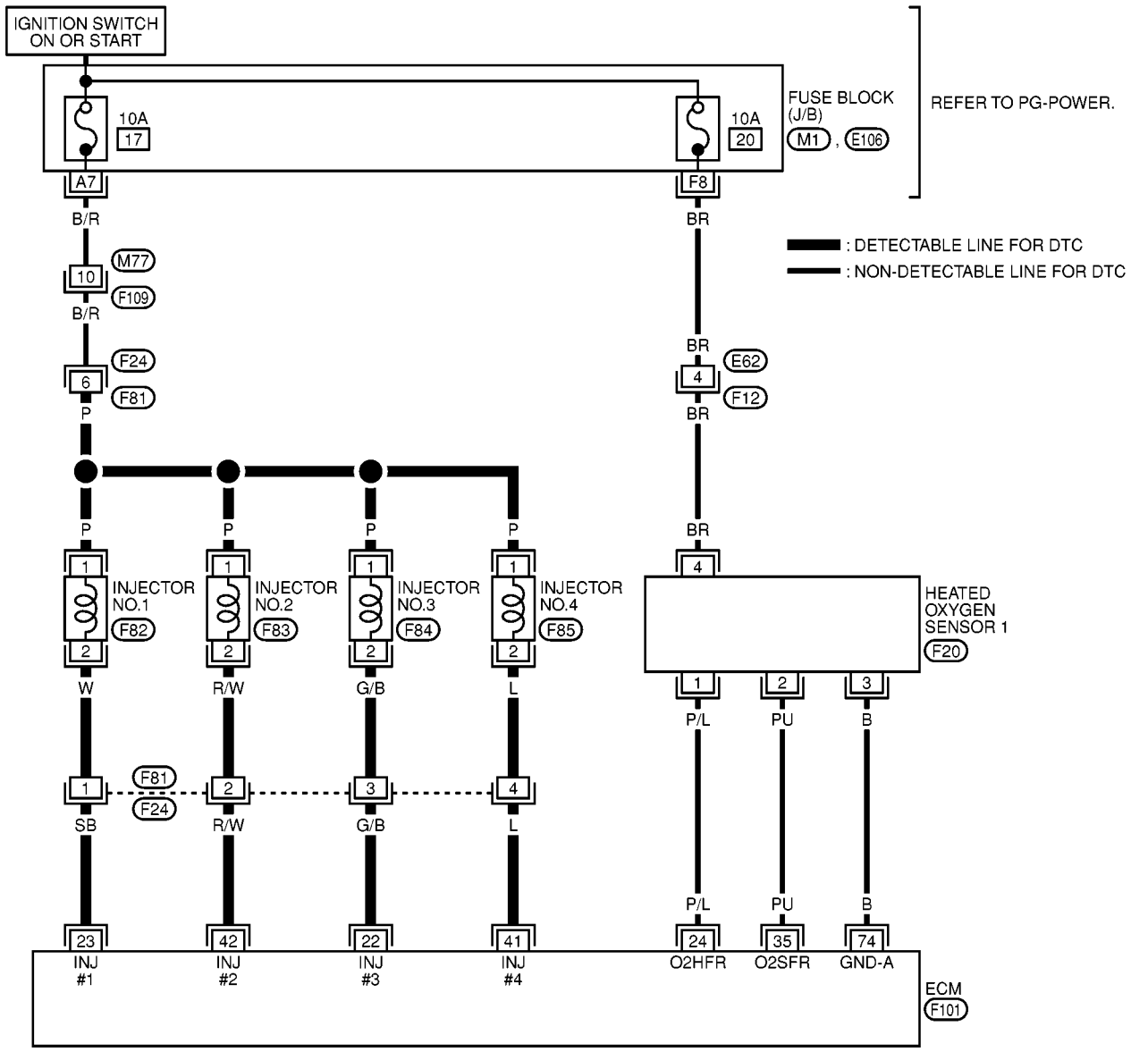
3. Disconnect mass air flow sensor harness connector. Then restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Select “MODE 3” with GST. Make sure DTC P0102 is detected.
6. Select “MODE 4” with GST and erase the DTC P0102.
7. Start engine again and let it idle for at least 10 minutes.
8. Select “MODE 7” with GST. The 1st trip DTC P0172 should be detected at this stage, if a malfunction exists. If so, go to EC-1166, "Diagnostic Procedure" .
9. If it is difficult to start engine at step 7, the fuel injection system has a malfunction.
10. Crank engine while depressing accelerator pedal.
    If engine starts, go to EC-1166, "Diagnostic Procedure" . If engine does not start, check exhaust and intake air leak visually.

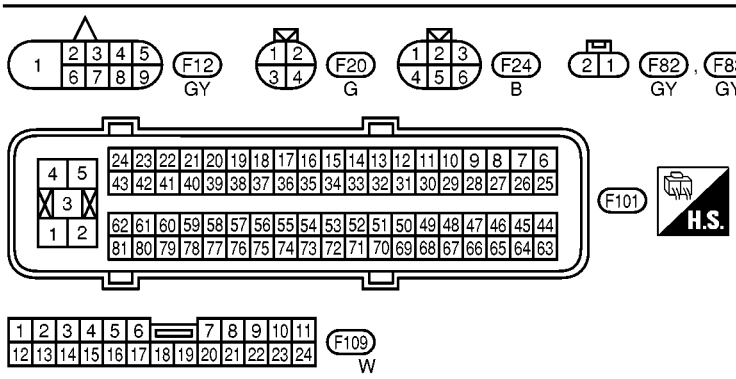


Wiring Diagram

EBS00GDT

EC-FUEL-01





REFER TO THE FOLLOWING.
M1, E106 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0012E

Diagnostic Procedure

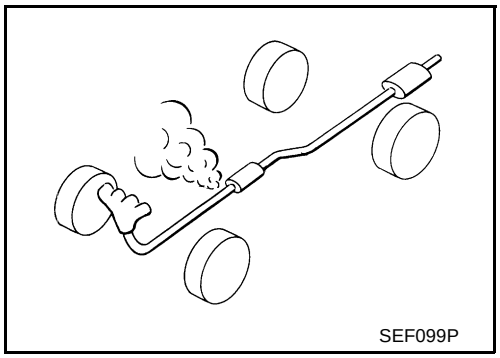
EBS00GDU

1. CHECK EXHAUST AIR LEAK

1. Start engine and run it at idle.
2. Listen for an exhaust air leak before three way catalyst.

OK or NG

OK >> GO TO 2.
NG >> Repair or replace.



2. CHECK FOR INTAKE AIR LEAK

Listen for an intake air leak after the mass air flow sensor.

OK or NG

OK >> GO TO 3.
NG >> Repair or replace.

3. CHECK HEATED OXYGEN SENSOR 1 CIRCUIT FOR OPEN AND SHORT

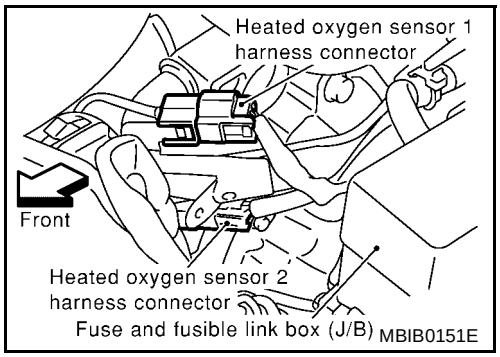
1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 1 (HO2S1) harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminal 35 and HO2S1 terminal 2.
   Refer to Wiring Diagram.

   Continuity should exist.

5. Check harness continuity between ECM terminal 35 or HO2S1 terminal 2 and ground.
   Refer to Wiring Diagram.

   Continuity should not exist.

6. Also check harness for short to power.



OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK FUEL PRESSURE

1. Release fuel pressure to zero. Refer to EC-1001, "FUEL PRESSURE RELEASE" .
2. Install fuel pressure gauge and check fuel pressure. Refer to EC-1002, "FUEL PRESSURE CHECK" .

   At idling: 350 kPa (3.5 bar, 3.7 kg/cm2, 51 psi)

OK or NG

OK >> GO TO 5.
NG >> Follow the construction of “FUEL PRESSURE CHECK”.

5. CHECK MASS AIR FLOW SENSOR

With CONSULT-II

1. Install all removed parts.
2. Check “MASS AIR FLOW” in “DATA MONITOR” mode with CONSULT-II.

1.0 - 4.0 g·m/sec: at idling
4.0 - 10 g·m/sec: at 2,500 rpm

With GST

1. Install all removed parts.
2. Check mass air flow sensor signal in MODE 1 with GST.

1.0 - 4.0 g·m/sec: at idling
4.0 - 10 g·m/sec: at 2,500 rpm

OK or NG

OK >> GO TO 6.
NG >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds. Refer to EC-1100, "DTC P0102, P0103 MAF SENSOR" .

6. CHECK FUNCTION OF INJECTORS

With CONSULT-II

1. Start engine.
2. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT-II.
3. Make sure that each circuit produces a momentary engine speed drop.

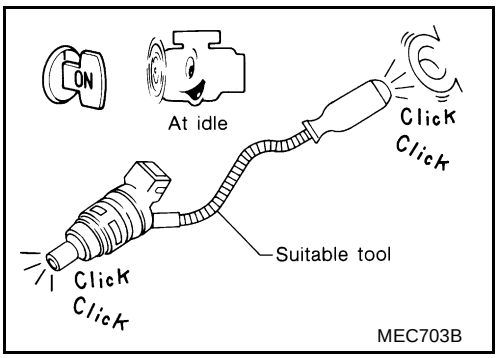
ACTIVE TEST	
POWER BALANCE	
MONITOR	
ENG SPEED	XXX rpm
MAS A/F SE-B1	XXX V

PBIB0133E

Without CONSULT-II

1. Start engine.
2. Listen to each injector operating sound.

Clicking noise should be heard.



MEC703B

OK or NG

OK >> GO TO 7.
NG >> Perform trouble diagnosis for EC-1375, "INJECTOR CIRCUIT" .

7. CHECK INJECTOR

1. Remove injector assembly. Refer to EM-128, "FUEL INJECTOR AND FUEL TUBE" .
   Keep fuel hose and all injectors connected to injector gallery.
2. Confirm that the engine is cooled down and there are no fire hazards near the vehicle.
3. Disconnect injector harness connectors.
   The injector harness connectors should remain connected.
4. Disconnect all ignition coil harness connectors.
5. Prepare pans or saucers under each injectors.
6. Crank engine for about 3 seconds.
   Make sure fuel does not drip from injector.

OK or NG

OK (Does not drip.)>>GO TO 8.
NG (Drips.)>>Replace the injectors from which fuel is dripping. Always replace O-ring with new one.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-1076, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

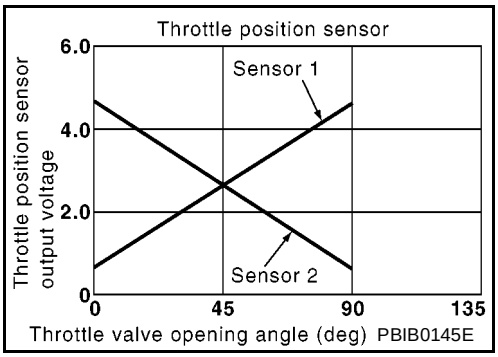
DTC P0221 TP SENSOR

PFP:16119

Component Description

EBS00GDV

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.
The throttle position sensor has the two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.



CONSULT-II Reference Value in Data Monitor Mode

EBS00GDW

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
THRTL SEN1 THRTL SEN2	● Ignition switch: ON (Engine stopped) ● Shift lever: D (CVT model) 1st (M/T model)	Accelerator pedal: Fully released	More than 0.36V
		Accelerator pedal: Fully depressed	Less than 4.75V

On Board Diagnosis Logic

EBS00GDX

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0221 0221	Throttle position sensor circuit range/performance problem	Rationally incorrect voltage is sent to ECM compared with the signals from TP sensor 1 and TP sensor 2.	● Harness or connector (The TP sensor 1 and 2 circuit is open or shorted.) ● Electric throttle control actuator (TP sensor 1 and 2)

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MI lights up.

Engine operation condition in fail-safe mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.

DTC Confirmation Procedure

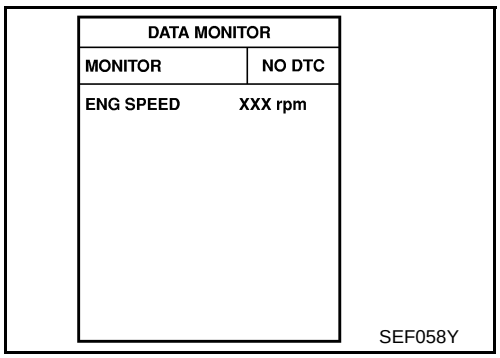
EBS00GDY

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.

2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-1172, "Diagnostic Procedure" .



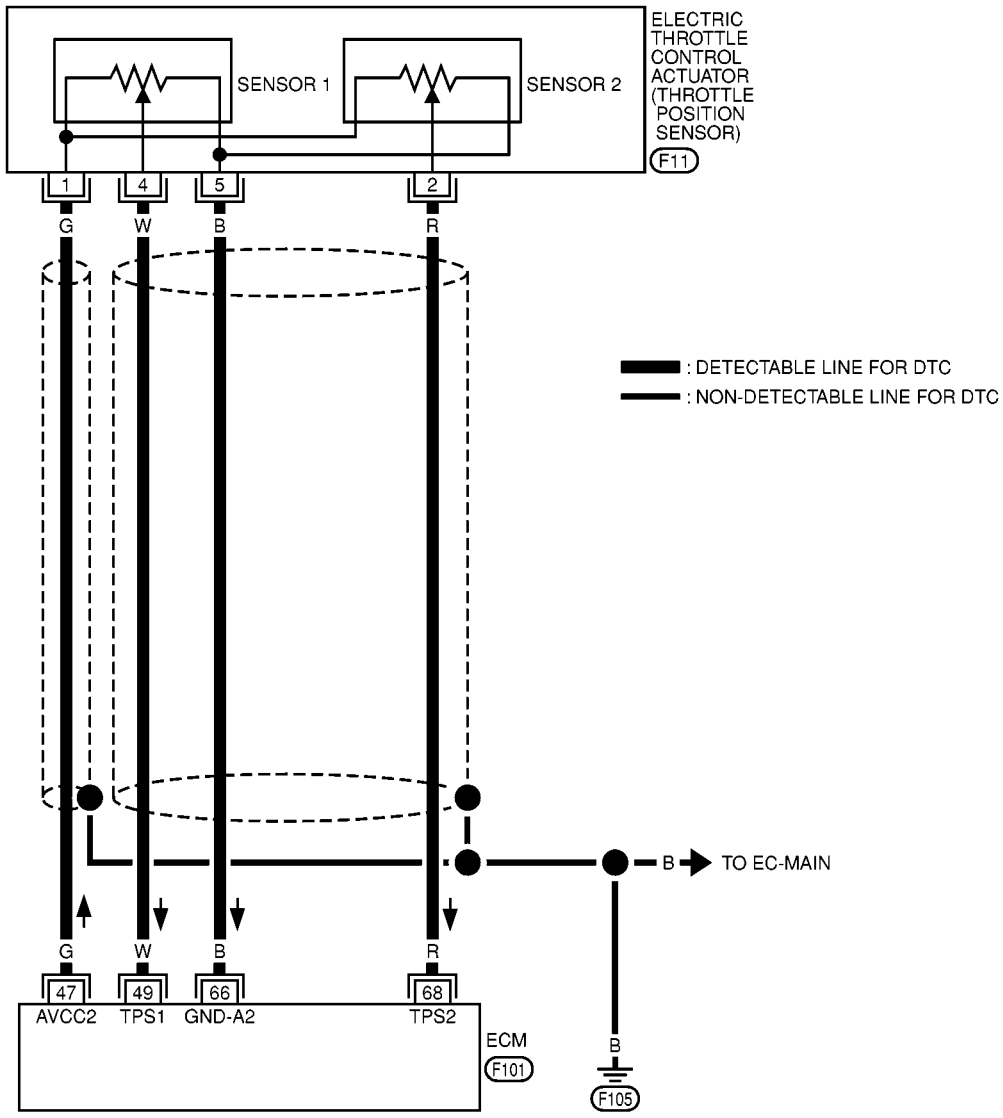
WITH GST

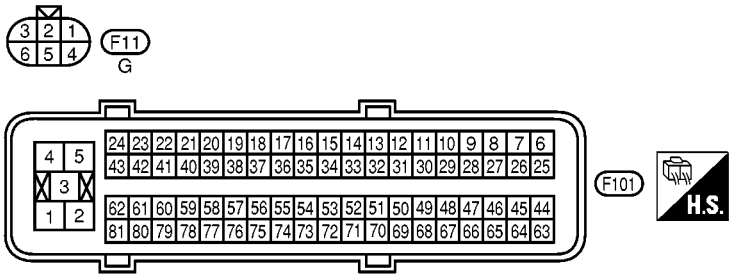
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

EBS00GDZ

EC-TPS3-01





MBWA0127E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
47	G	Throttle position sensor power supply	**[Ignition switch "ON"]**	Approximately 5V
49	W	Throttle position sensor 1	**[Ignition switch "ON"]** ● Shift lever position is "D" (CVT model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully released	More than 0.36V
			[Ignition switch "ON"] ● Shift lever position is "D" (CVT model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully depressed	Less than 4.75V
66	B	Sensors' ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
68	R	Throttle position sensor 2	**[Ignition switch "ON"]** ● Shift lever position is "D" (CVT model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully released	Less than 4.75V
			[Ignition switch "ON"] ● Shift lever position is "D" (CVT model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully depressed	More than 0.36V

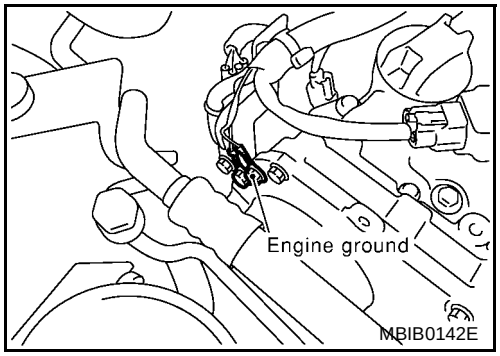
Diagnostic Procedure

EBS00GE0

1. RETIGHTEN GROUND SCREWS

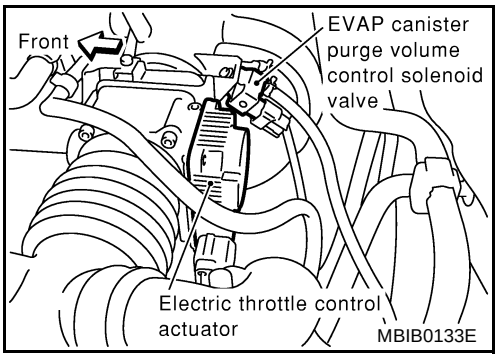
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



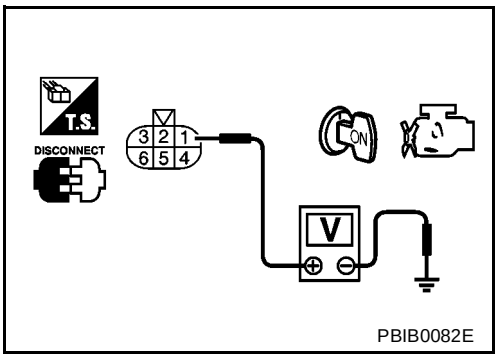
2. CHECK THROTTLE POSITION SENSOR POWER SUPPLY CIRCUIT

1. Disconnect electric throttle control actuator harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between electric throttle control actuator terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK THROTTLE POSITION SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 66 and electric throttle control actuator terminal 5. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK THROTTLE POSITION SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 49 and electric throttle control actuator terminal 4, ECM terminal 68 and electric throttle control actuator terminal 2. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK THROTTLE POSITION SENSOR

Refer to EC-1174, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-998, "Throttle Valve Closed Position Learning" .
3. Perform EC-999, "Idle Air Volume Learning" .

>> **INSPECTION END**

7. CHECK INTERMITTENT INCIDENT

Refer to EC-1076, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

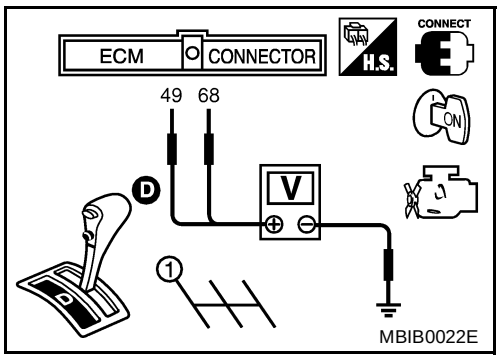
Component Inspection

EBS00GE1

THROTTLE POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Perform EC-998, "Throttle Valve Closed Position Learning" .
3. Turn ignition switch “ON”.
4. Set selector lever to “D” position (CVT models) or “1st” position (M/T models).
5. Check voltage between ECM terminals 49 (TP sensor 1 signal), 68 (TP sensor 2 signal) and engine ground under the following conditions.

Terminal	Accelerator pedal	Voltage
49 (Throttle position sensor 1)	Fully released	More than 0.36V
	Fully depressed	Less than 4.75V
68 (Throttle position sensor 2)	Fully released	Less than 4.75V
	Fully depressed	More than 0.36V



6. If NG, replace electric throttle control actuator and go to the next step.
7. Perform EC-998, "Throttle Valve Closed Position Learning" .
8. Perform EC-999, "Idle Air Volume Learning" .

Remove and Installation

EBS00GE2

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-116, "INTAKE MANIFOLD" .

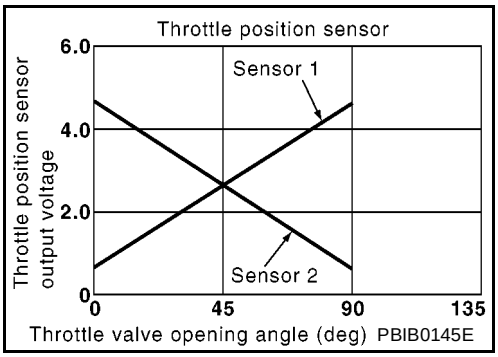
DTC P0222, P0223 TP SENSOR

PFP:16119

Component Description

EBS00GE3

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.
The throttle position sensor has the two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.



CONSULT-II Reference Value in Data Monitor Mode

EBS00GE4

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
THRTL SEN1	● Ignition switch: ON (Engine stopped) ● Shift lever: D (CVT model) 1st (M/T model)	Accelerator pedal: Fully released	More than 0.36V
		Accelerator pedal: Fully depressed	Less than 4.75V

On Board Diagnosis Logic

EBS00GE5

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0222 0222	Throttle position sensor 1 circuit low input	An excessively low voltage from the TP sensor 1 is sent to ECM.	● Harness or connectors (The TP sensor 1 circuit is open or shorted.) ● Electric throttle control actuator (TP sensor 1)
P0223 0223	Throttle position sensor 1 circuit high input	An excessively high voltage from the TP sensor 1 is sent to ECM.	

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters in fail-safe mode and the MI lights up.

Engine operation condition in fail-safe mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.

DTC Confirmation Procedure

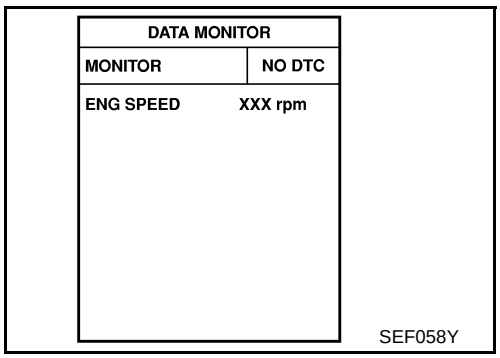
EBS00GE6

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.

2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-1178, "Diagnostic Procedure" .



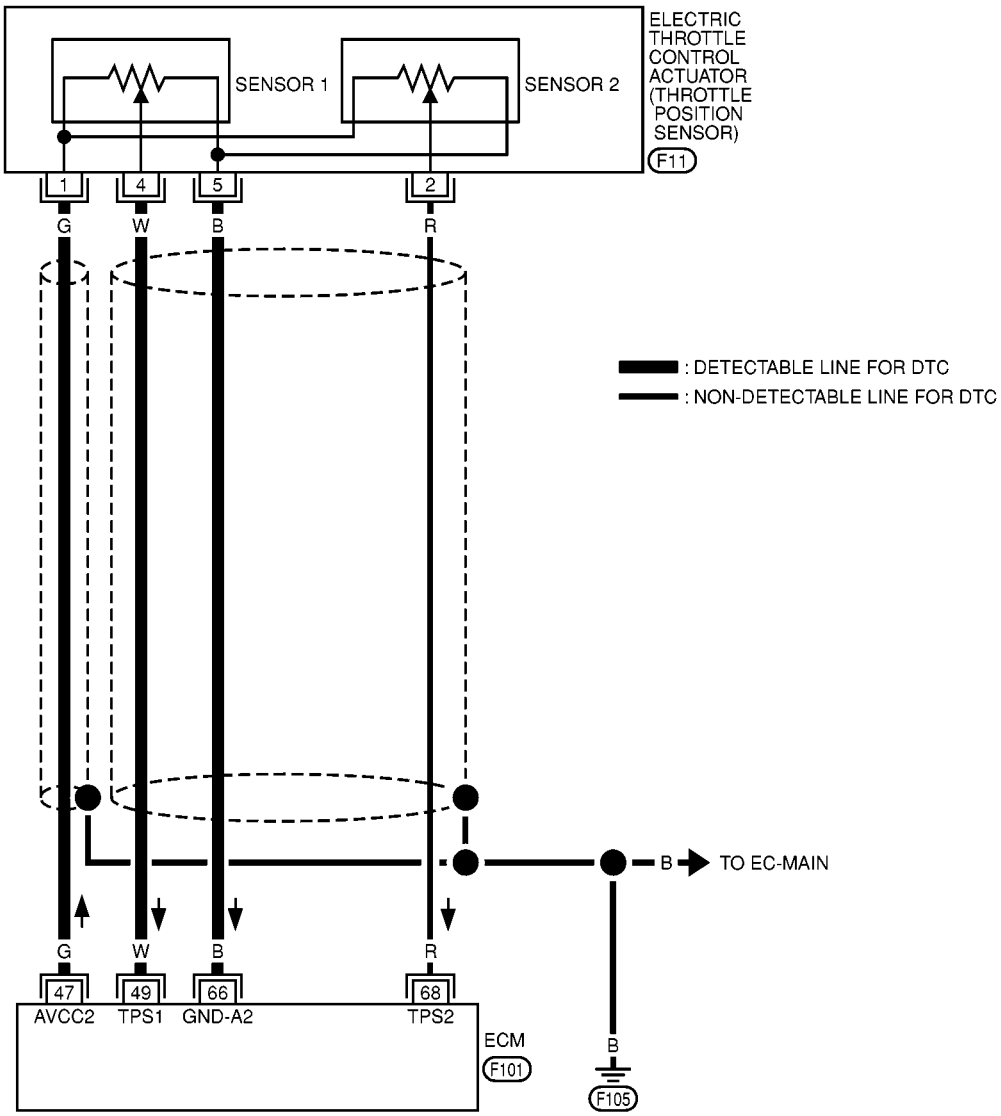
WITH GST

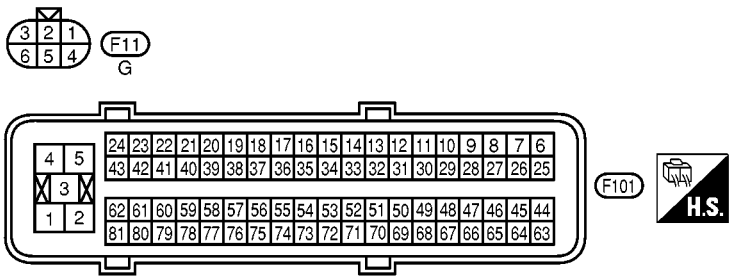
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

EBS00GE7

EC-TPS1-01





MBWA0125E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
47	G	Throttle position sensor power supply	**[Ignition switch “ON”]**	Approximately 5V
49	W	Throttle position sensor 1	**[Ignition switch “ON”]** ● Shift lever position is “D” (CVT model) ● Shift lever position is “1st” (M/T model) ● Accelerator pedal fully released	More than 0.36V
			[Ignition switch “ON”] ● Shift lever position is “D” (CVT model) ● Shift lever position is “1st” (M/T model) ● Accelerator pedal fully depressed	Less than 4.75V
66	B	Sensors′ ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
68	R	Throttle position sensor 2	**[Ignition switch “ON”]** ● Shift lever position is “D” (CVT model) ● Shift lever position is “1st” (M/T model) ● Accelerator pedal fully released	Less than 4.75V
			[Ignition switch “ON”] ● Shift lever position is “D” (CVT model) ● Shift lever position is “1st” (M/T model) ● Accelerator pedal fully depressed	More than 0.36V

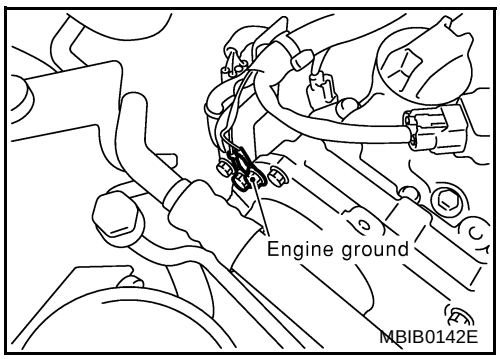
Diagnostic Procedure

EBS00GE8

1. RETIGHTEN GROUND SCREWS

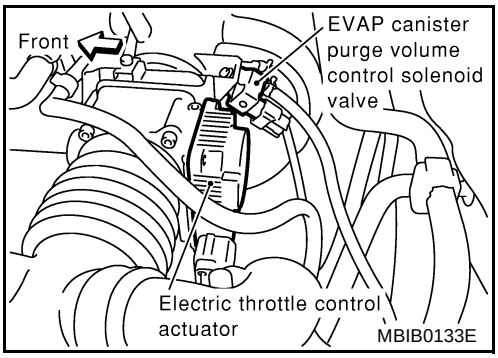
1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

>> GO TO 2.



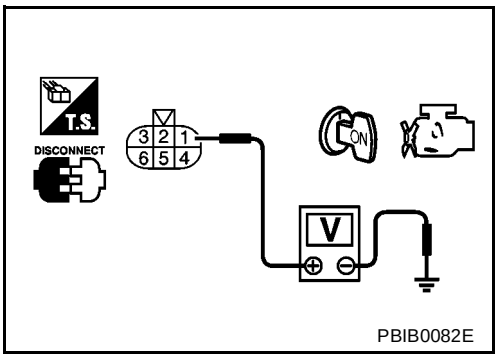
2. CHECK THROTTLE POSITION SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect electric throttle control actuator harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between electric throttle control actuator terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK THROTTLE POSITION SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 66 and electric throttle control actuator terminal 5. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK THROTTLE POSITION SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 49 and electric throttle control actuator terminal 4. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK THROTTLE POSITION SENSOR

Refer to EC-1180, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-998, "Throttle Valve Closed Position Learning" .
3. Perform EC-999, "Idle Air Volume Learning" .

>> **INSPECTION END**

7. CHECK INTERMITTENT INCIDENT

Refer to EC-1076, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

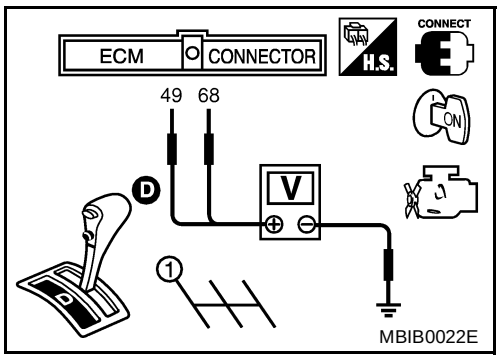
Component Inspection

EBS00GE9

THROTTLE POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Perform EC-998, "Throttle Valve Closed Position Learning" .
3. Turn ignition switch “ON”.
4. Set selector lever to “D” position (CVT models) or “1st” position (M/T models).
5. Check voltage between ECM terminals 49 (TP sensor 1 signal), 68 (TP sensor 2 signal) and engine ground under the following conditions.

Terminal	Accelerator pedal	Voltage
49 (Throttle position sensor 1)	Fully released	More than 0.36V
	Fully depressed	Less than 4.75V
68 (Throttle position sensor 2)	Fully released	Less than 4.75V
	Fully depressed	More than 0.36V



6. If NG, replace electric throttle control actuator and go to the next step.
7. Perform EC-998, "Throttle Valve Closed Position Learning" .
8. Perform EC-999, "Idle Air Volume Learning" .

Remove and Installation

EBS00GEA

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-116, "INTAKE MANIFOLD" .

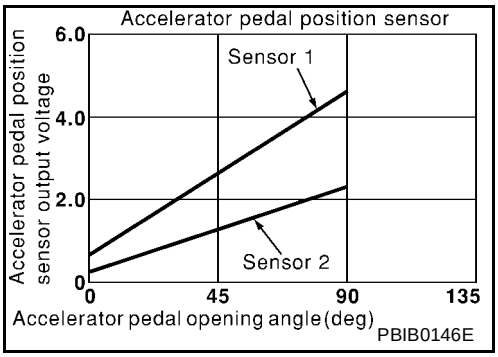
DTC P0226 APP SENSOR

PFP:18002

Component Description

EBS00GEB

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.
Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometers which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the accelerator pedal and feed the voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.
Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for the engine operation such as fuel cut.



CONSULT-II Reference Value in Data Monitor Mode

EBS00GEC

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
ACCEL SEN1 ACCEL SEN2	● Ignition switch: ON (engine stopped)	Accelerator pedal: Fully released	0.35 - 0.67V
		Accelerator pedal: Fully depressed	More than 3.9V
CLSD THL POS	● Ignition switch: ON	Accelerator pedal: Fully released	ON
		Accelerator pedal: Slightly depressed	OFF

On Board Diagnosis Logic

EBS00GED

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0226 0226	Accelerator pedal position sensor circuit range/performance problem	Rationally incorrect voltage is sent to ECM compared with the signals from APP sensor 1 and APP sensor 2.	● Harness or connector (The APP sensor 1 and 2 circuit is open or shorted.) ● Accelerator pedal position sensor 1 and 2

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters in fail-safe mode and the MI lights up.

Engine operating condition in fail-safe mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.

DTC Confirmation Procedure

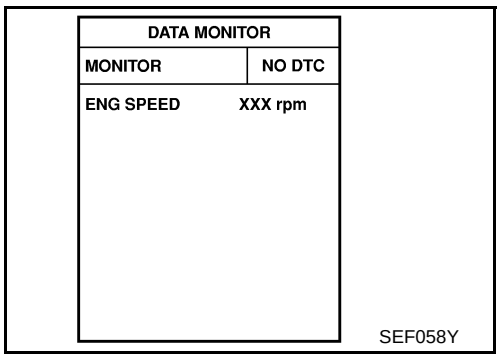
EBS00GEE

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.

2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-1184, "Diagnostic Procedure" .

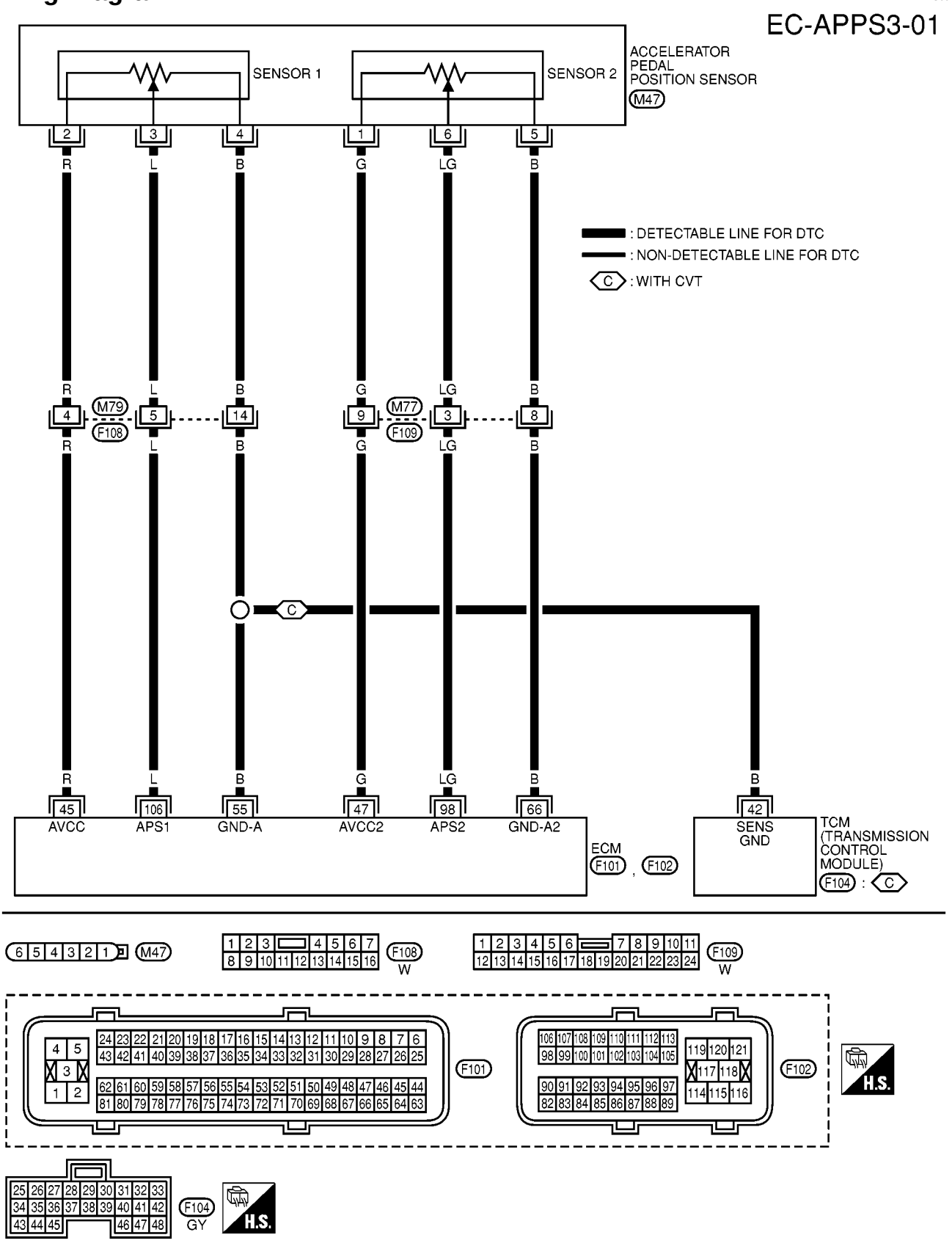


WITH GST

Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

EBS00GEF



MBWA0131E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
45	R	Sensors′ power supply	**[Ignition switch “ON”]**	Approximately 5V
47	G	Sensors′ power supply	**[Ignition switch “ON”]**	Approximately 5V
55	B	Sensor′s ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
66	B	Sensor′s ground	**[Ignition switch “ON”]** ● **Warm-up condition** ● Idle speed	Approximately 0V
98	LG	Accelerator pedal position sensor 2	**[Ignition switch “ON”]** ● Shift lever position is “D” (CVT models) ● Shift lever position is “Ist” (M/T models) ● Accelerator pedal fully released	0.175 - 0.335V
			[Ignition switch “ON”] ● Shift lever position is “D” (CVT models) ● Shift lever position is “Ist” (M/T models) ● Accelerator pedal fully depressed	More than 1.95V
106	L	Accelerator pedal position sensor 1	**[Ignition switch “ON”]** ● Shift lever position is “D” (CVT models) ● Shift lever position is “Ist” (M/T models) ● Accelerator pedal fully released	0.35 - 0.67V
			[Ignition switch “ON”] ● Shift lever position is “D” (CVT models) ● Shift lever position is “Ist” (M/T models) ● Accelerator pedal fully depressed	More than 3.9V

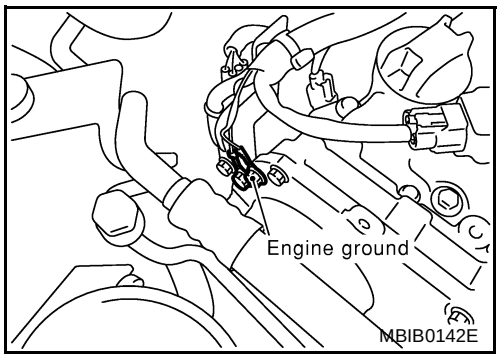
Diagnostic Procedure

EBS00GEG

1. RETIGHTEN GROUND SCREWS

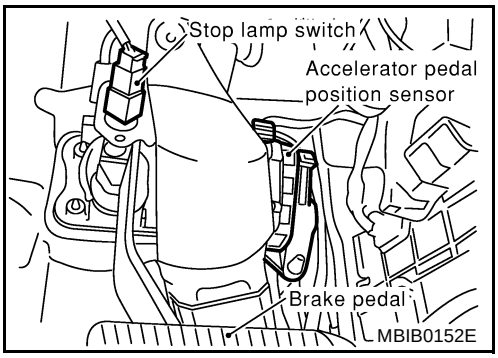
1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

>> GO TO 2.



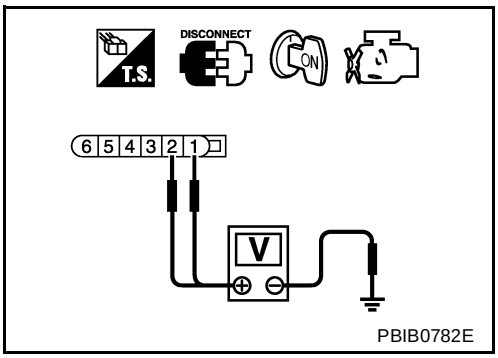
2. CHECK APP SENSOR POWER SUPPLY CIRCUIT

1. Disconnect accelerator pedal position (APP) sensor harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between APP sensor terminals 1, 2 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M77, F109
- Harness connectors M79, F108
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK APP SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 55 and APP sensor terminal 4, ECM terminal 66 and APP sensor terminal 5.
   Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M77, F109
- Harness connectors M79, F108
- Harness for open or short between ECM and accelerator pedal position sensor
- Harness for open or short between TCM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK APP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 106 and APP sensor terminal 3, ECM terminal 98 and APP sensor terminal 6.
   Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M77, F109
- Harness connectors M79, F108
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK APP SENSOR

Refer to EC-1187, "Component Inspection" .

OK or NG

OK >> GO TO 10.
NG >> GO TO 9.

9. REPLACE APP SENSOR

1. Replace the accelerator pedal position sensor.
2. Perform EC-998, "Accelerator Pedal Released Position Learning" .
3. Perform EC-998, "Throttle Valve Closed Position Learning" .
4. Perform EC-999, "Idle Air Volume Learning" .

>> **INSPECTION END**

10. CHECK INTERMITTENT INCIDENT

Refer to EC-1076, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

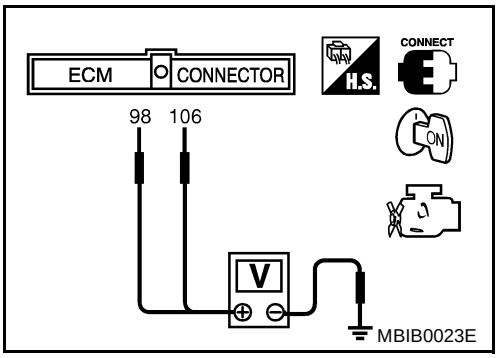
Component Inspection

EBS00GEH

ACCELERATOR PEDAL POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Turn ignition switch “ON”.
3. Check voltage between ECM terminals 106 (APP sensor 1 signal), 98 (APP sensor 2 signal) and engine ground under the following conditions.

Terminal	Accelerator pedal	Voltage
106 (Accelerator pedal position sensor 1)	Fully released	0.35 - 0.67V
	Fully depressed	More than 3.9V
98 (Accelerator pedal position sensor 2)	Fully released	0.175 - 0.335V
	Fully depressed	More than 1.95V



4. If NG, replace accelerator pedal assembly and go to the next step.
5. Perform EC-998, "Accelerator Pedal Released Position Learning" .
6. Perform EC-998, "Throttle Valve Closed Position Learning" .
7. Perform EC-999, "Idle Air Volume Learning" .

Remove and Installation

EBS00GEI

ACCELERATOR PEDAL

Refer to ACC-2, "ACCELERATOR CONTROL SYSTEM" .

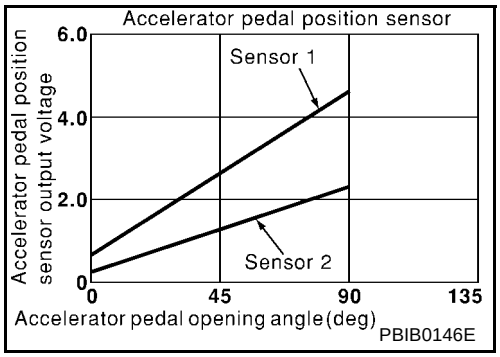
DTC P0227, P0228 APP SENSOR

PFP:18002

Component Description

EBS00GEJ

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.
Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometers which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the accelerator pedal and feed the voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.



Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for the engine operation such as fuel cut.

CONSULT-II Reference Value in Data Monitor Mode

EBS00GEK

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
ACCEL SEN1	● Ignition switch: ON (engine stopped)	Accelerator pedal: Fully released	0.35 - 0.67V
		Accelerator pedal: Fully depressed	More than 3.9V
CLSD THL POS	● Ignition switch: ON	Accelerator pedal: Fully released	ON
		Accelerator pedal: Slightly depressed	OFF

On Board Diagnosis Logic

EBS00GEL

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0227 0227	Accelerator pedal position sensor 1 circuit low input	An excessively low voltage from the APP sensor 1 is sent to ECM.	● Harness or connectors (The APP sensor 1 circuit is open or shorted.) ● Accelerator pedal position sensor (Accelerator pedal position sensor 1)
P0228 0228	Accelerator pedal position sensor 1 circuit high input	An excessively high voltage from the APP sensor 1 is sent to ECM.	

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters in fail-safe mode and the MI lights up.

Engine operating condition in fail-safe mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.

DTC Confirmation Procedure

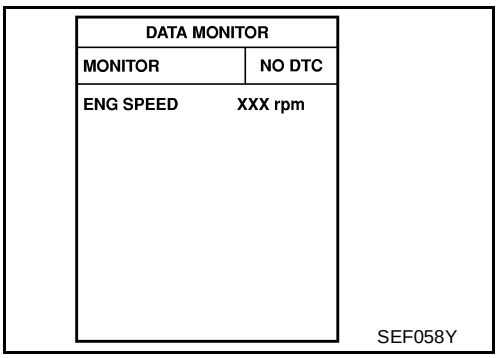
EBS00GEM

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.

2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-1191, "Diagnostic Procedure" .



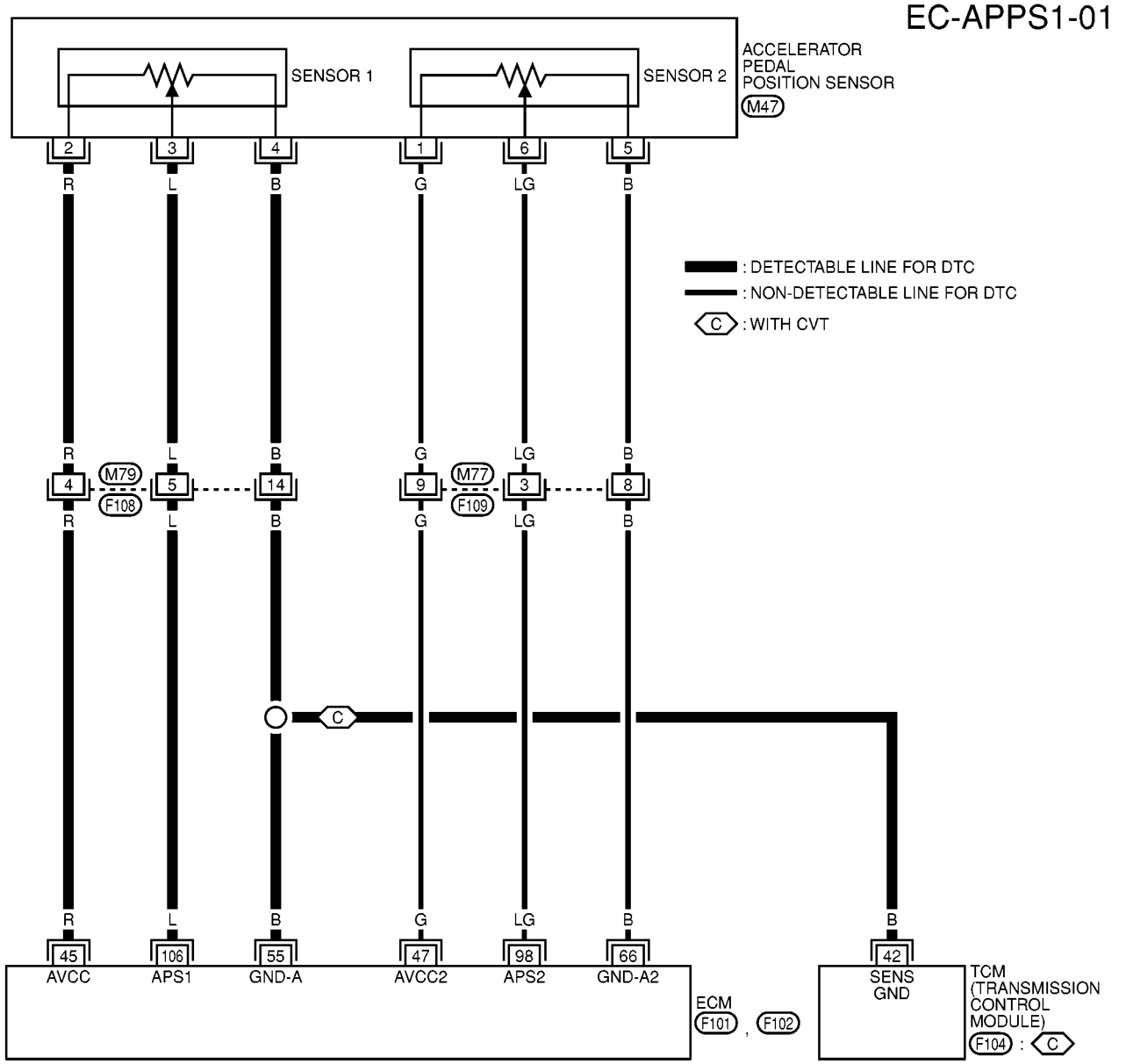
WITH GST

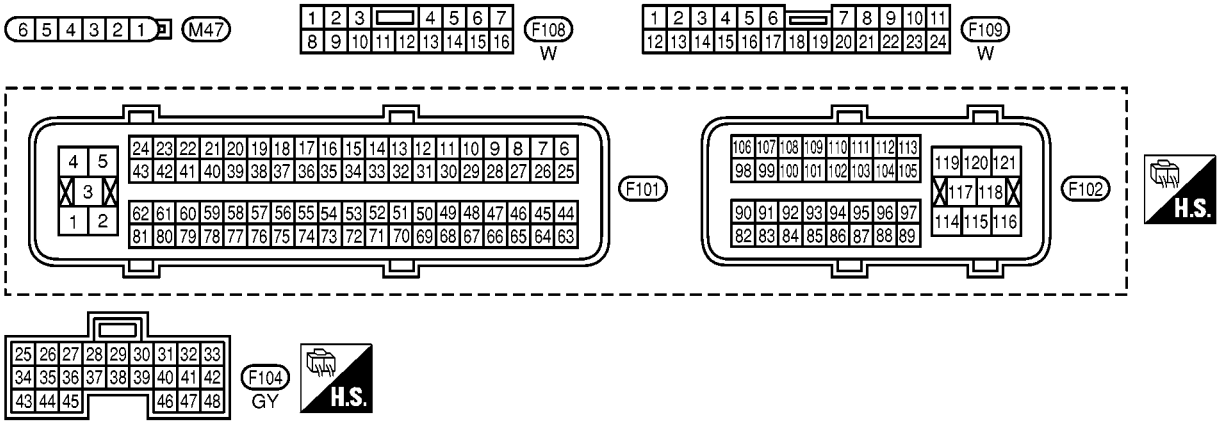
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

EBS00GEN

EC-APPS1-01





MBWA0129E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
45	R	Sensors′ power supply	**[Ignition switch “ON”]**	Approximately 5V
47	G	Sensors′ power supply	**[Ignition switch “ON”]**	Approximately 5V
55	B	Sensor′s ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
66	B	Sensor′s ground	**[Ignition switch “ON”]** ● **Warm-up condition** ● Idle speed	Approximately 0V
98	LG	Accelerator pedal position sensor 2	**[Ignition switch “ON”]** ● Shift lever position is “D” (CVT models) ● Shift lever position is “Ist” (M/T models) ● Accelerator pedal fully released	0.175 - 0.335V
			[Ignition switch “ON”] ● Shift lever position is “D” (CVT models) ● Shift lever position is “Ist” (M/T models) ● Accelerator pedal fully depressed	More than 1.95V
106	L	Accelerator pedal position sensor 1	**[Ignition switch “ON”]** ● Shift lever position is “D” (CVT models) ● Shift lever position is “Ist” (M/T models) ● Accelerator pedal fully released	0.35 - 0.67V
			[Ignition switch “ON”] ● Shift lever position is “D” (CVT models) ● Shift lever position is “Ist” (M/T models) ● Accelerator pedal fully depressed	More than 3.9V

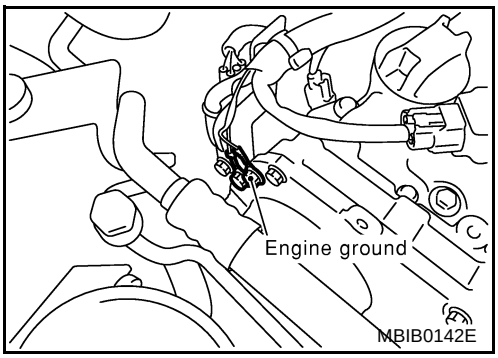
Diagnostic Procedure

EBS00GEO

1. RETIGHTEN GROUND SCREWS

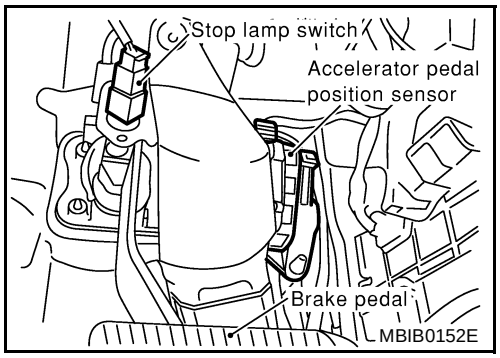
1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

>> GO TO 2.



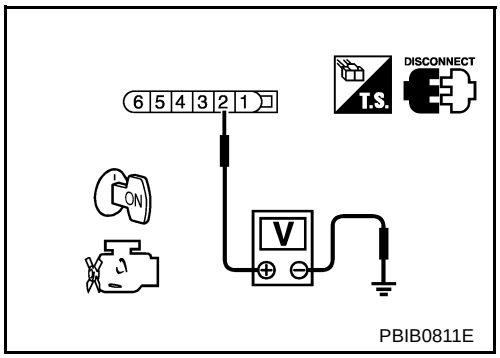
2. CHECK APP SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect accelerator pedal position (APP) sensor harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between APP sensor terminal 2 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M79, F108
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK APP SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 55 and APP sensor terminal 4. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M79, F108
- Harness for open or short between ECM and accelerator pedal position sensor
- Harness for open or short between TCM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK APP SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 106 and APP sensor terminal 3. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M79, F108
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK APP SENSOR

Refer to EC-1193, "Component Inspection" .

OK or NG

OK >> GO TO 10.
NG >> GO TO 9.

9. REPLACE APP SENSOR

1. Replace the accelerator pedal position sensor.
2. Perform EC-998, "Accelerator Pedal Released Position Learning" .
3. Perform EC-998, "Throttle Valve Closed Position Learning" .
4. Perform EC-999, "Idle Air Volume Learning" .

>> **INSPECTION END**

10. CHECK INTERMITTENT INCIDENT

Refer to EC-1076, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

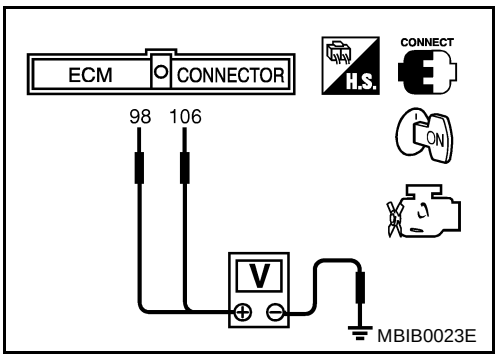
Component Inspection

EBS00GEP

ACCELERATOR PEDAL POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Turn ignition switch “ON”.
3. Check voltage between ECM terminals 106 (APP sensor 1 signal), 98 (APP sensor 2 signal) and engine ground under the following conditions.

Terminal	Accelerator pedal	Voltage
106 (Accelerator pedal position sensor 1)	Fully released	0.35 - 0.67V
	Fully depressed	More than 3.9V
98 (Accelerator pedal position sensor 2)	Fully released	0.175 - 0.335V
	Fully depressed	More than 1.95V



4. If NG, replace accelerator pedal assembly and go to the next step.
5. Perform EC-998, "Accelerator Pedal Released Position Learning" .
6. Perform EC-998, "Throttle Valve Closed Position Learning" .
7. Perform EC-999, "Idle Air Volume Learning" .

Remove and Installation

EBS00GEQ

ACCELERATOR PEDAL

Refer to ACC-2, "ACCELERATOR CONTROL SYSTEM" .

DTC P0300 - P0304 MULTIPLE CYLINDER MISFIRE, NO. 1 - 4 CYLINDER MISFIRE

PFP:00000

On Board Diagnosis Logic

EBS00GER

When a misfire occurs, engine speed will fluctuate. If the engine speed fluctuates enough to cause the crankshaft position (CKP) sensor (POS) signal to vary, ECM can determine that a misfire is occurring.

Sensor	Input Signal to ECM	ECM function
Crankshaft position sensor (POS)	Engine speed	On board diagnosis of misfire

The misfire detection logic consists of the following two conditions.

1. One Trip Detection Logic (Three Way Catalyst Damage)
   On the first trip that a misfire condition occurs that can damage the three way catalyst (TWC) due to overheating, the MI will blink.
   When a misfire condition occurs, the ECM monitors the CKP sensor (POS) signal every 200 engine revolutions for a change.
   When the misfire condition decreases to a level that will not damage the TWC, the MI will turn off.
   If another misfire condition occurs that can damage the TWC on a second trip, the MI will blink.
   When the misfire condition decreases to a level that will not damage the TWC, the MI will remain on.
   If another misfire condition occurs that can damage the TWC, the MI will begin to blink again.
2. Two Trip Detection Logic (Exhaust quality deterioration)
   For misfire conditions that will not damage the TWC (but will affect vehicle emissions), the MI will only light when the misfire is detected on a second trip. During this condition, the ECM monitors the CKP sensor signal every 1,000 engine revolutions.
   A misfire malfunction can be detected on any one cylinder or on multiple cylinders.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0300 0300	Multiple cylinder misfire detected	Multiple cylinder misfire.	● Improper spark plug ● Insufficient compression ● Incorrect fuel pressure ● The injector circuit is open or shorted ● Fuel injectors ● Intake air leak ● The ignition signal circuit is open or shorted ● Lack of fuel ● Drive plate or flywheel ● Heated oxygen sensor 1 ● Incorrect PCV hose connection
P0301 0301	No.1 cylinder misfire detected	No. 1 cylinder misfires.	
P0302 0302	No. 2 cylinder misfire detected	No. 2 cylinder misfires.	
P0303 0303	No. 3 cylinder misfire detected	No. 3 cylinder misfires.	
P0304 0304	No. 4 cylinder misfire detected	No. 4 cylinder misfires.	

DTC Confirmation Procedure

EBS00GES

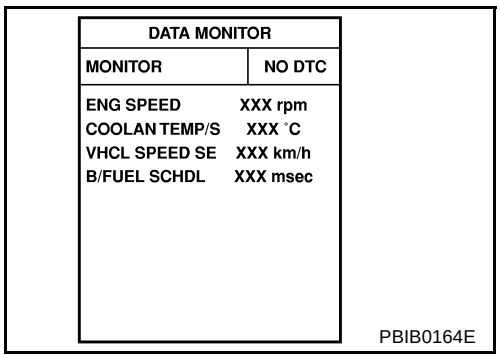
CAUTION:
Always drive vehicle at a safe speed.

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON”, and select “DATA MONITOR” mode with CONSULT-II.
2. Start engine and warm it up to normal operating temperature.
3. Turn ignition switch “OFF” and wait at least 10 seconds.

4. Start engine again and drive at 1,500 to 3,000 rpm for at least 3 minutes.
   Hold the accelerator pedal as steady as possible.
   NOTE:
   Refer to the freeze frame data for the test driving conditions.
5. If 1st trip DTC is detected, go to EC-1196, "Diagnostic Procedure" .



WITH GST

Follow the procedure “WITH CONSULT-II” above.

Diagnostic Procedure

EBS00GET

1. CHECK FOR INTAKE AIR LEAK AND PCV HOSE

1. Start engine and run it at idle speed.
2. Listen for the sound of the intake air leak.
3. Check PCV hose connection.

OK or NG

OK >> GO TO 2.
NG >> Repair or replace.

2. CHECK FOR EXHAUST SYSTEM CLOGGING

Stop engine and visually check exhaust tube, three way catalyst and muffler for dents.

OK or NG

OK >> GO TO 3.
NG >> Repair or replace.

3. PERFORM POWER BALANCE TEST

With CONSULT-II

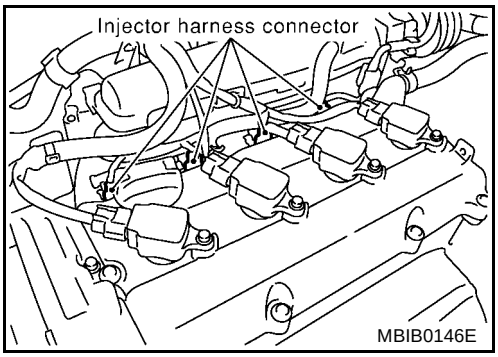
1. Perform “POWER BALANCE” in “ACTIVE TEST” mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

ACTIVE TEST	
POWER BALANCE	
MONITOR	
ENG SPEED	XXX rpm
MAS A/F SE-B1	XXX V

PBIB0133E

Without CONSULT-II

When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?



MBIB0146E

Yes or No

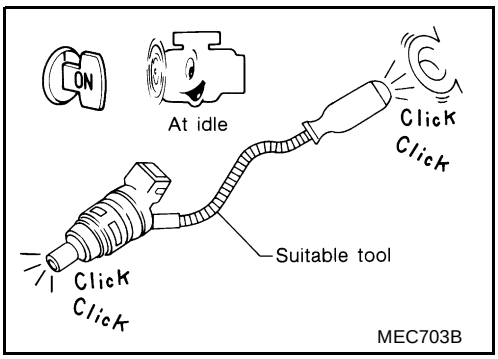
Yes >> GO TO 4.
No >> GO TO 7.

4. CHECK INJECTOR

Does each injector make an operating sound at idle?

Yes or No

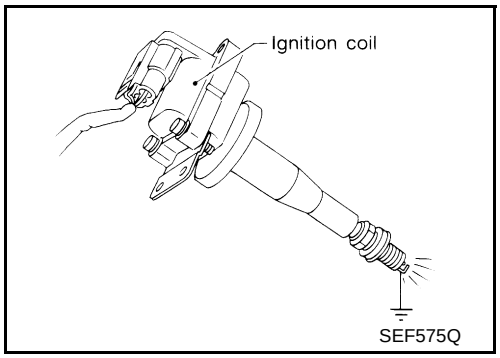
Yes >> GO TO 5.
No >> Check injector(s) and circuit(s). Refer to EC-1375, "INJECTOR CIRCUIT" .



MEC703B

5. CHECK IGNITION SPARK

1. Disconnect ignition coil assembly from rocker cover.
2. Connect a known good spark plug to the ignition coil assembly.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

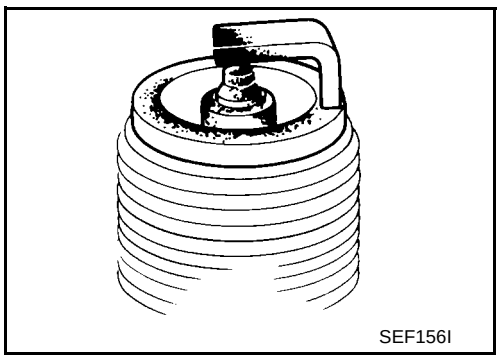


OK or NG

OK >> GO TO 6.
NG >> Check ignition coil, power transistor and their circuits. Refer to EC-1365, "IGNITION SIGNAL" .

6. CHECK SPARK PLUGS

Remove the spark plugs and check for fouling, etc.



OK or NG

OK >> GO TO 7.
NG >> Repair or replace spark plug(s) with standard type one(s). For spark plug type, refer to MA-26, "Checking and Changing Spark Plugs" .

7. CHECK COMPRESSION PRESSURE

Check compression pressure. Refer to EM-152, "CHECKING COMPRESSION PRESSURE" .

Standard:	**1,190 kPa (11.9 bar, 12.1 kg/cm^2 , 172 psi)/250 rpm**
Minimum:	**990 kPa (9.9 bar, 10.1 kg/cm^2 , 144 psi)/250 rpm**
Difference between each cylinder:	**98 kPa (0.98 bar, 1.0 kg/cm^2 , 14 psi)/250 rpm**

OK or NG

OK >> GO TO 8.
NG >> Check pistons, piston rings, valves, valve seats and cylinder head gaskets.

8. CHECK FUEL PRESSURE

1. Install all removed parts.
2. Release fuel pressure to zero. Refer to EC-1001, "FUEL PRESSURE RELEASE" .
3. Install fuel pressure gauge and check fuel pressure. Refer to EC-1002, "FUEL PRESSURE CHECK" .

At idle: Approx. 350 kPa (3.5 bar, 3.7 kg/cm^2 , 51 psi)

OK or NG

OK >> GO TO 9.
NG >> Follow the construction of “FUEL PRESSURE CHECK”.

9. CHECK IGNITION TIMING

Check the following items. Refer to EC-1032, "Basic Inspection" .

Items		Specifications
Target idle speed	CVT	650 ± 50 rpm (in “P” or “N” position)
	M/T	600 ± 50 rpm
Ignition timing	CVT	15 ± 5° BTDC (in “P” or “N” position)
	M/T	14 ± 5° BTDC

OK or NG

OK >> GO TO 10.
NG >> Follow the “Basic Inspection”.

10. CHECK HEATED OXYGEN SENSOR 1

Refer to EC-1123, "Component Inspection" .

OK or NG

OK >> GO TO 12.
NG >> GO TO 11.

11. CHECK MASS AIR FLOW SENSOR

With CONSULT-II

Check mass air flow sensor signal in “DATA MONITOR” mode with CONSULT-II.

1.0 - 4.0 g·m/sec: at idling
4.0 - 10.0 g·m/sec: at 2,500 rpm

With GST

Check mass air flow sensor signal in MODE 1 with GST.

1.0 - 4.0 g·m/sec: at idling
4.0 - 10.0 g·m/sec: at 2,500 rpm

OK or NG

OK >> GO TO 12.
NG >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds. Refer to EC-1100, "DTC P0102, P0103 MAF SENSOR" .

12. CHECK SYMPTOM MATRIX CHART

Check items on the rough idle symptom in EC-1037, "Symptom Matrix Chart" .

OK or NG

OK >> GO TO 13.
NG >> Repair or replace.

13. ERASE THE 1ST TRIP DTC

Some tests may cause a 1st trip DTC to be set.
Erase the 1st trip DTC from the ECM memory after performing the tests. Refer to EC-1015, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .

>> GO TO 14.

14. CHECK INTERMITTENT INCIDENT

Refer to EC-1076, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

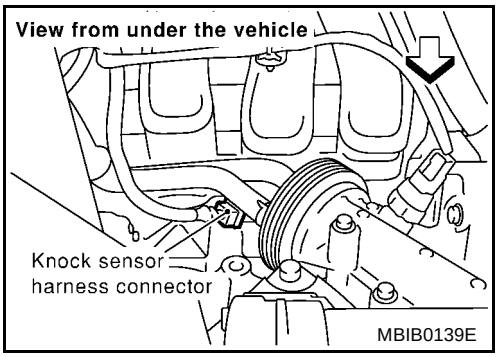
DTC P0327, P0328 KS

PFP:22060

Component Description

EBS00GEU

The knock sensor is attached to the cylinder block. It senses engine knocking using a piezoelectric element. A knocking vibration from the cylinder block is sensed as vibrational pressure. This pressure is converted into a voltage signal and sent to the ECM.



On Board Diagnosis Logic

EBS00GEV

The MI will not light for knock sensor malfunction.

DTC No.	Trouble Diagnosis Name	DTC Detected Condition	Possible Cause
P0327 0327	Knock sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Knock sensor
P0328 0328	Knock sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	

DTC Confirmation Procedure

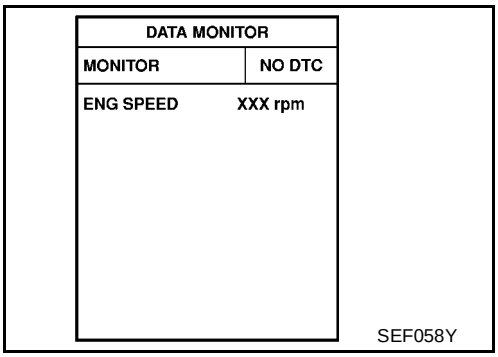
EBS00GEW

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2. Start engine and run it for at least 5 seconds at idle speed.
3. If 1st trip DTC is detected, go to EC-1203, "Diagnostic Procedure" .



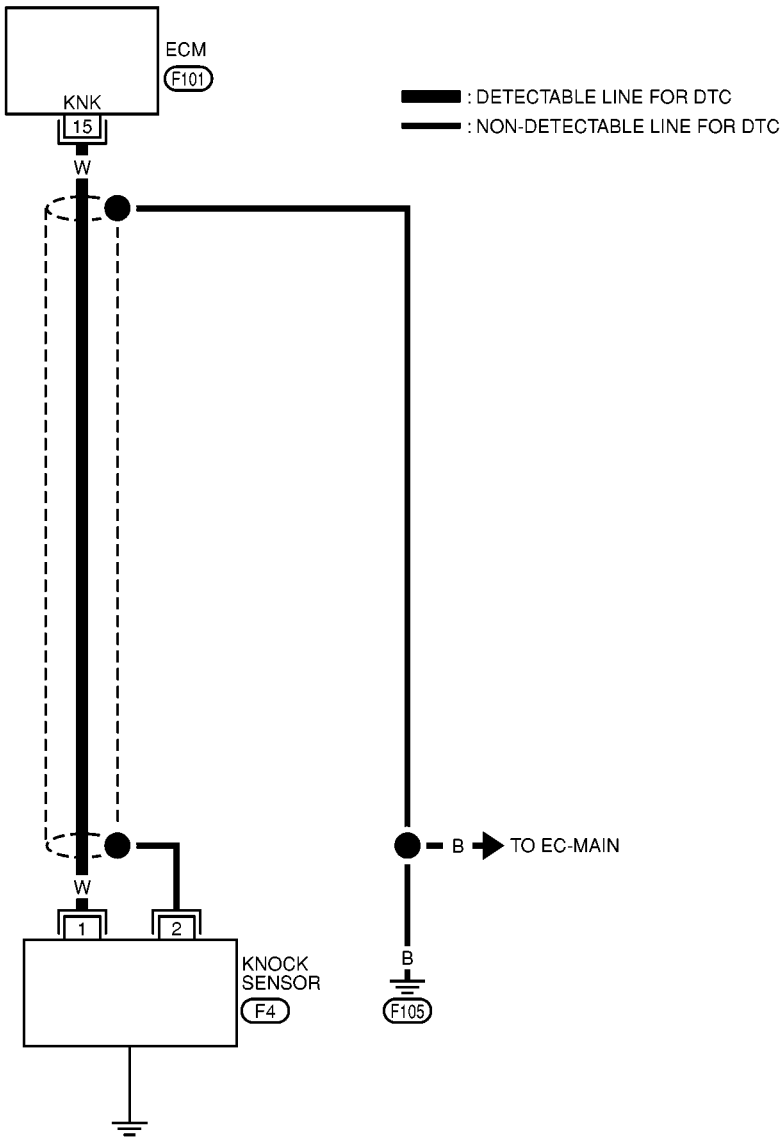
WITH GST

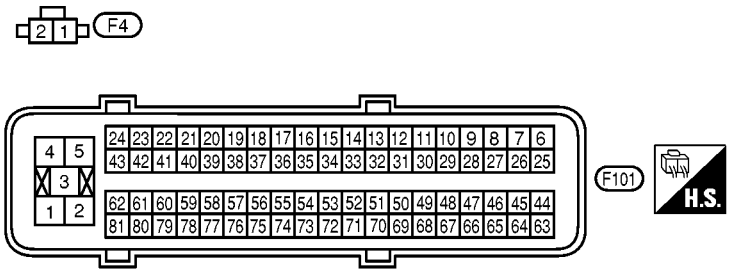
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

EBS00GEX

EC-KS-01





MBWA0013E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
15	W	Knock sensor	**[Engine is running]** ● Idle speed	Approximately 2.5V

Diagnostic Procedure

EBS00GEY

1. CHECK KNOCK SENSOR INPUT SIGNAL CIRCUIT-I

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check resistance between ECM terminal 15 and engine ground. Refer to Wiring Diagram.

   NOTE:
   It is necessary to use an ohmmeter which can measure more than 10 MΩ.

   Resistance: Approximately 530 - 590kΩ [at 20°C (68°F)]

4. Also check harness for short to ground and short to power.

OK or NG

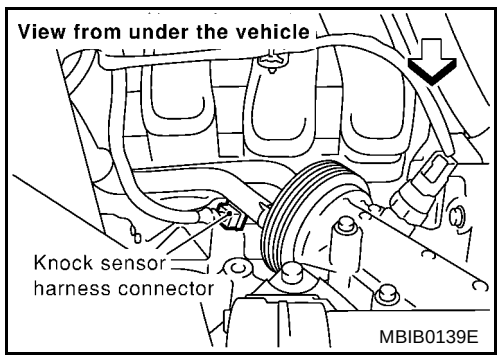
OK >> GO TO 4.
NG >> GO TO 2.

2. CHECK KNOCK SENSOR INPUT SIGNAL CIRCUIT-II

1. Disconnect knock sensor harness connector.
2. Check harness continuity between ECM terminal 15 and knock sensor terminal 1.
   Refer to Wiring Diagram.

   Continuity should exist.

3. Also check harness for short to ground and short to power.



OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK KNOCK SENSOR

Refer to EC-1204, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace knock sensor.

4. CHECK KNOCK SENSOR SHIELD CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between knock sensor terminal 2 and engine ground.

   Continuity should exist

2. Also check harness for short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to power in harness or connectors.

5. CHECK INTERMITTENT INCIDENT

Refer to EC-1076, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

EBS00GEZ

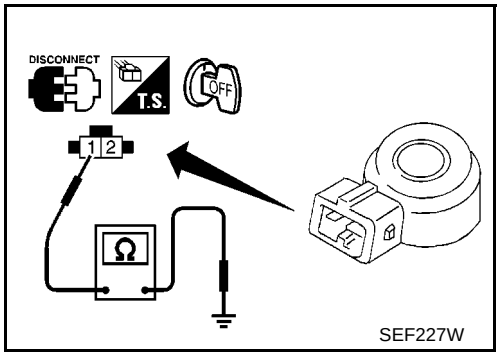
KNOCK SENSOR

Check resistance between knock sensor terminal 1 and ground.

NOTE:
It is necessary to use an ohmmeter which can measure more than 10 MΩ.

Resistance: Approximately 530 - 590kΩ [at 20°C (68°F)]

CAUTION:
Do not use any knock sensors that have been dropped or physically damaged. Use only new ones.



Removal and Installation

EBS00GF0

KNOCK SENSOR

Refer to EM-165, "CYLINDER BLOCK" .

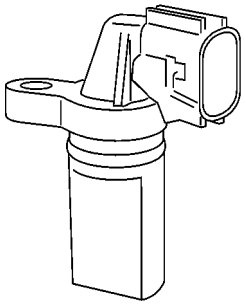
DTC P0335 CKP SENSOR (POS)

PFP:23731

Component Description

EBS00GF1

The crankshaft position sensor (POS) is located on the cylinder block rear housing facing the gear teeth (cogs) of the signal plate at the end of the crankshaft. It detects the fluctuation of the engine revolution.
The sensor consists of a permanent magnet and Hall IC.
When the engine is running, the high and low parts of the teeth cause the gap with the sensor change.
The changing gap causes the magnetic field near the sensor to change.
Due to the changing magnetic field, the voltage from the sensor changes.
The ECM receives the voltage signal and detects the fluctuation of the engine revolution.


PBIB0562E

CONSULT-II Reference Value in Data Monitor Mode

EBS00GF2

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
ENG SPEED·	● Tachometer: Connect ● Run engine and compare tachometer indication with the CONSULT-II value.	Almost the same speed as the CONSULT-II value.

On Board Diagnosis Logic

EBS00GF3

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0335 0335	Crankshaft position sensor (POS) circuit	● The crankshaft position sensor (POS) signal is not detected by the ECM during the first few seconds of engine cranking. ● The proper pulse signal from the crankshaft position sensor (POS) is not sent to ECM while the engine is running. ● The crankshaft position sensor (POS) signal is not in the normal pattern during engine running.	● Harness or connectors (The sensor circuit is open or shorted.) ● Crankshaft position sensor (POS) ● Signal plate

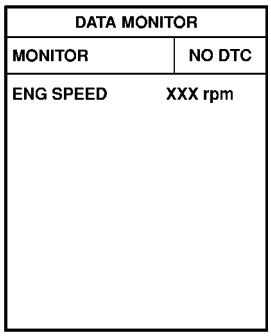
DTC Confirmation Procedure

EBS00GF4

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10.5V with ignition switch ON”.

WITH CONSULT-II

1. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2. Crank engine for at least 2 seconds and run it for at least 5 seconds at idle speed.
3. If 1st trip DTC is detected, go to EC-1208, "Diagnostic Procedure" .



SEF058Y

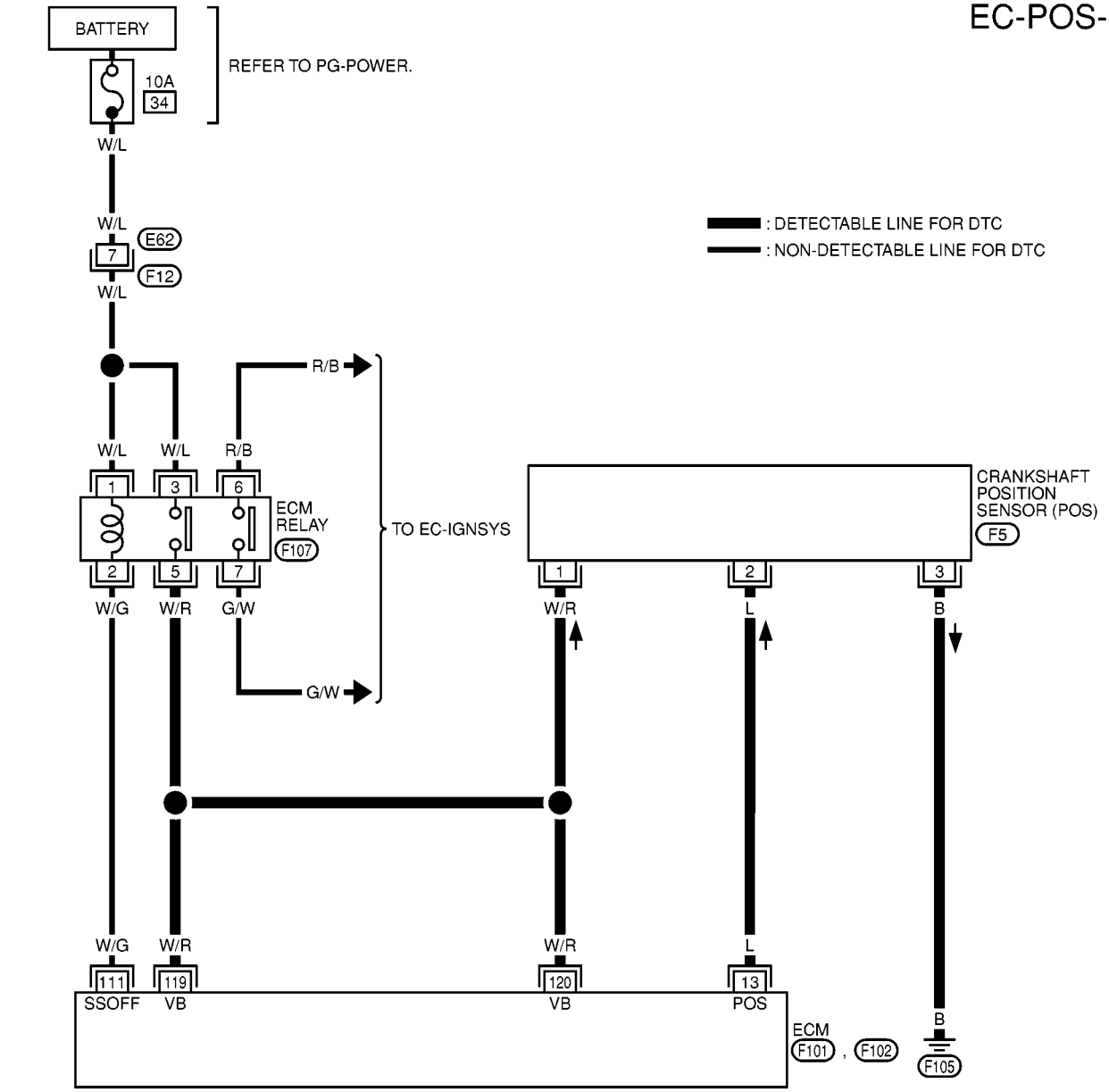
WITH GST

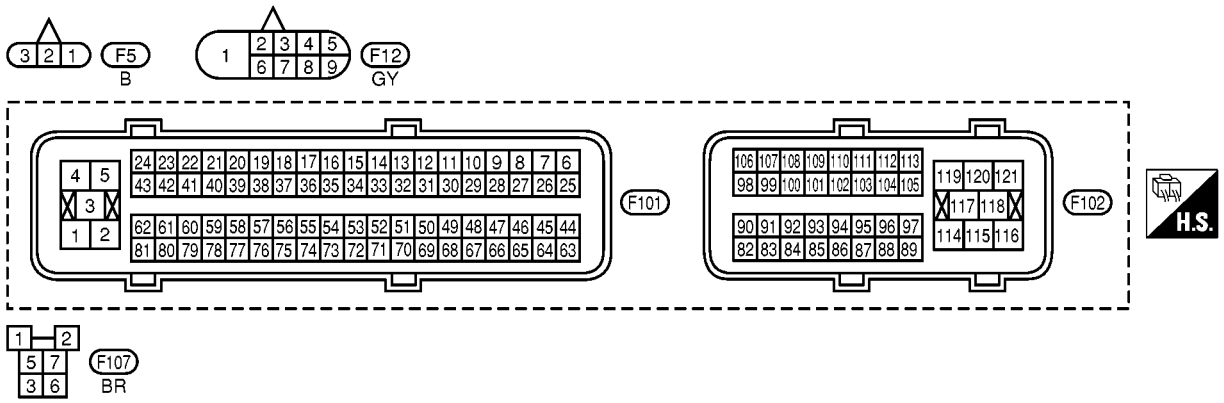
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

EBS00GF5

EC-POS-01



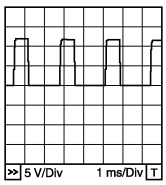
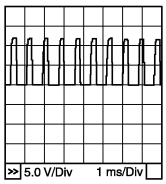


MBWA0014E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
13	L	Crankshaft position sensor (POS)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 3V★  PBIB0527E
			[Engine is running] ● Engine speed is 2,000 rpm	Approximately 3V★  PBIB0528E

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

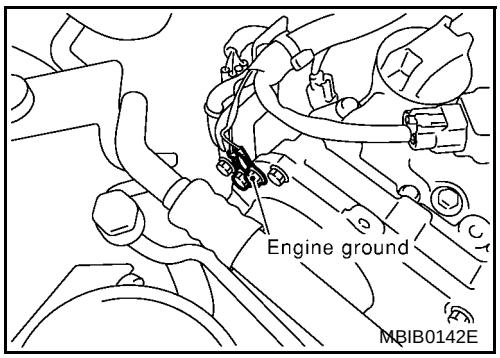
Diagnostic Procedure

EBS00GF6

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

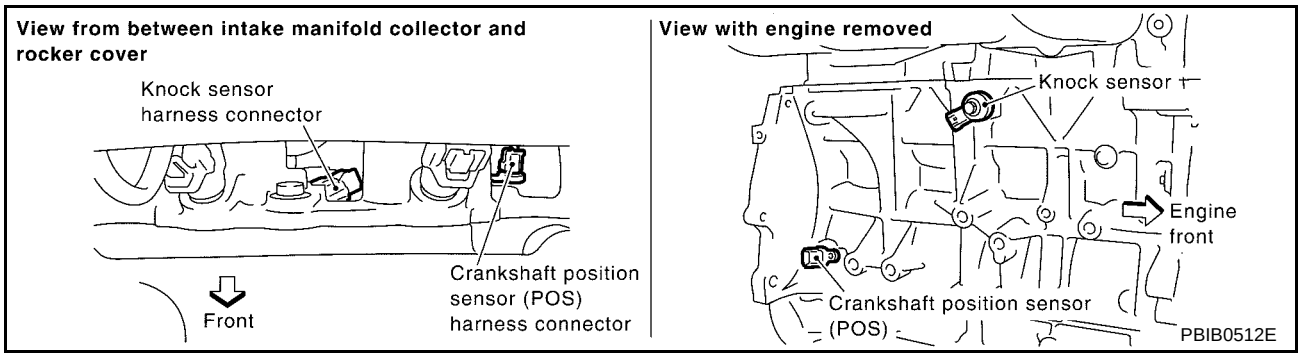
>> GO TO 2.



MBIB0142E

2. CHECK CRANKSHAFT POSITION (CKP) SENSOR (POS) POWER SUPPLY CIRCUIT

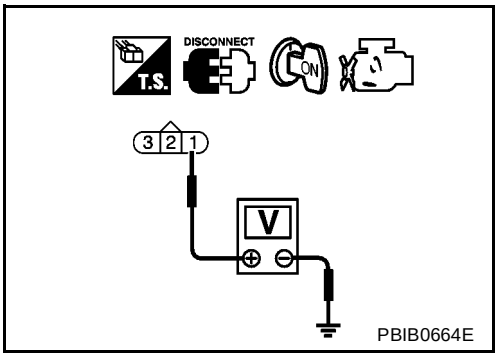
1. Disconnect crankshaft position (CKP) sensor (POS) harness connector.



2. Turn ignition switch “ON”.

3. Check voltage between CKP sensor (POS) terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage



4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between crankshaft position sensor (POS) and ECM
- Harness for open or short between crankshaft position sensor (POS) and ECM relay

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK CKP SENSOR (POS) GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between CKP sensor (POS) terminal 3 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for and short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK CKP SENSOR (POS) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 13 and CKP sensor (POS) terminal 2. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK CRANKSHAFT POSITION SENSOR (POS)

Refer to EC-1210, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace crankshaft position sensor (POS).

7. CHECK GEAR TOOTH

Visually check for chipping signal plate gear tooth.

OK or NG

OK >> GO TO 8.
NG >> Replace the signal plate.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-1076, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

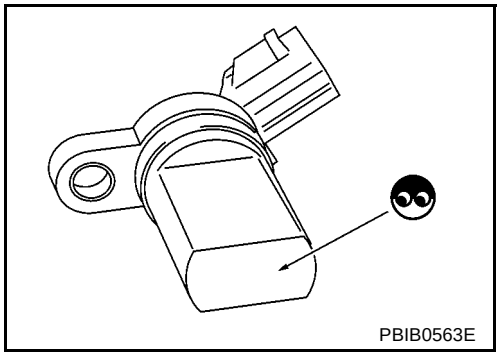
>> **INSPECTION END**

Component Inspection

EBS00GF7

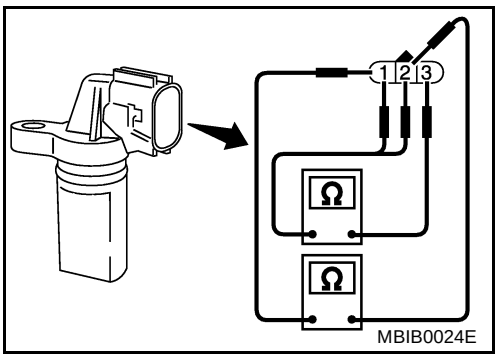
CRANKSHAFT POSITION SENSOR (POS)

1. Loosen the fixing bolt of the sensor.
2. Disconnect crankshaft position sensor (POS) harness connector.
3. Remove the sensor.
4. Visually check the sensor for chipping.


PBIB0563E

5. Check resistance as shown in the figure.

Terminal No. (Polarity)	Resistance Ω [at 25°C (77°F)]
3 (+) - 1 (-)	Except 0 or ∞
3 (+) - 2 (-)	
2 (+) - 1 (-)	



EBS00GF8

6. If NG, replace crankshaft position sensor (POS).

Removal and Installation

CRANKSHAFT POSITION SENSOR (POS)

Refer to EM-165, "CYLINDER BLOCK" .

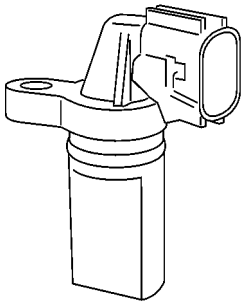
DTC P0340 CMP SENSOR (PHASE)

PFP:23731

Component Description

EBS00GF9

The camshaft position sensor (PHASE) senses the retraction with intake valve camshaft to identify a particular cylinder. The camshaft position sensor (PHASE) senses the piston position.
When the crankshaft position sensor (POS) system becomes inoperative, the camshaft position sensor (PHASE) provides various controls of engine parts instead, utilizing timing of cylinder identification signals.
The sensor consists of a permanent magnet and Hall IC.
When engine is running, the high and low parts of the teeth cause the gap with the sensor to change.
The changing gap causes the magnetic field near the sensor to change.
Due to the changing magnetic field, the voltage from the sensor changes.


PBIB0562E

On Board Diagnosis Logic

EBS00GFA

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0340 0340	Camshaft position sensor (PHASE) circuit	● The cylinder No. signal is not sent to ECM for the first few seconds during engine cranking. ● The cylinder No. signal is not set to ECM during engine running. ● The cylinder No. signal is not in the normal pattern during engine running.	● Harness or connectors (The sensor circuit is open or shorted.) ● Camshaft position sensor (PHASE) ● Camshaft (Intake) ● Starter motor (Refer to SC-22 .) ● Starting system circuit (Refer to SC-22 .) ● Dead (Weak) battery

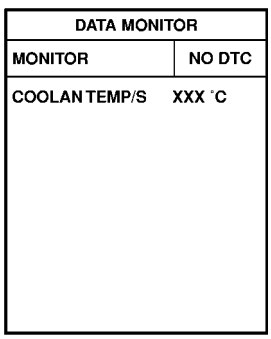
DTC Confirmation Procedure

EBS00GFB

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10.5V with ignition switch “ON”.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Crank engine for at least 2 seconds and run it for at least 5 seconds at idle speed.
4. If 1st trip DTC is detected, go to EC-1214, "Diagnostic Procedure" .
   If 1st trip DTC is not detected, go to next step.
5. Maintain engine speed at more than 800 rpm for at least 5 seconds.
6. If 1st trip DTC is detected, go to EC-1214, "Diagnostic Procedure" .



SEF013Y

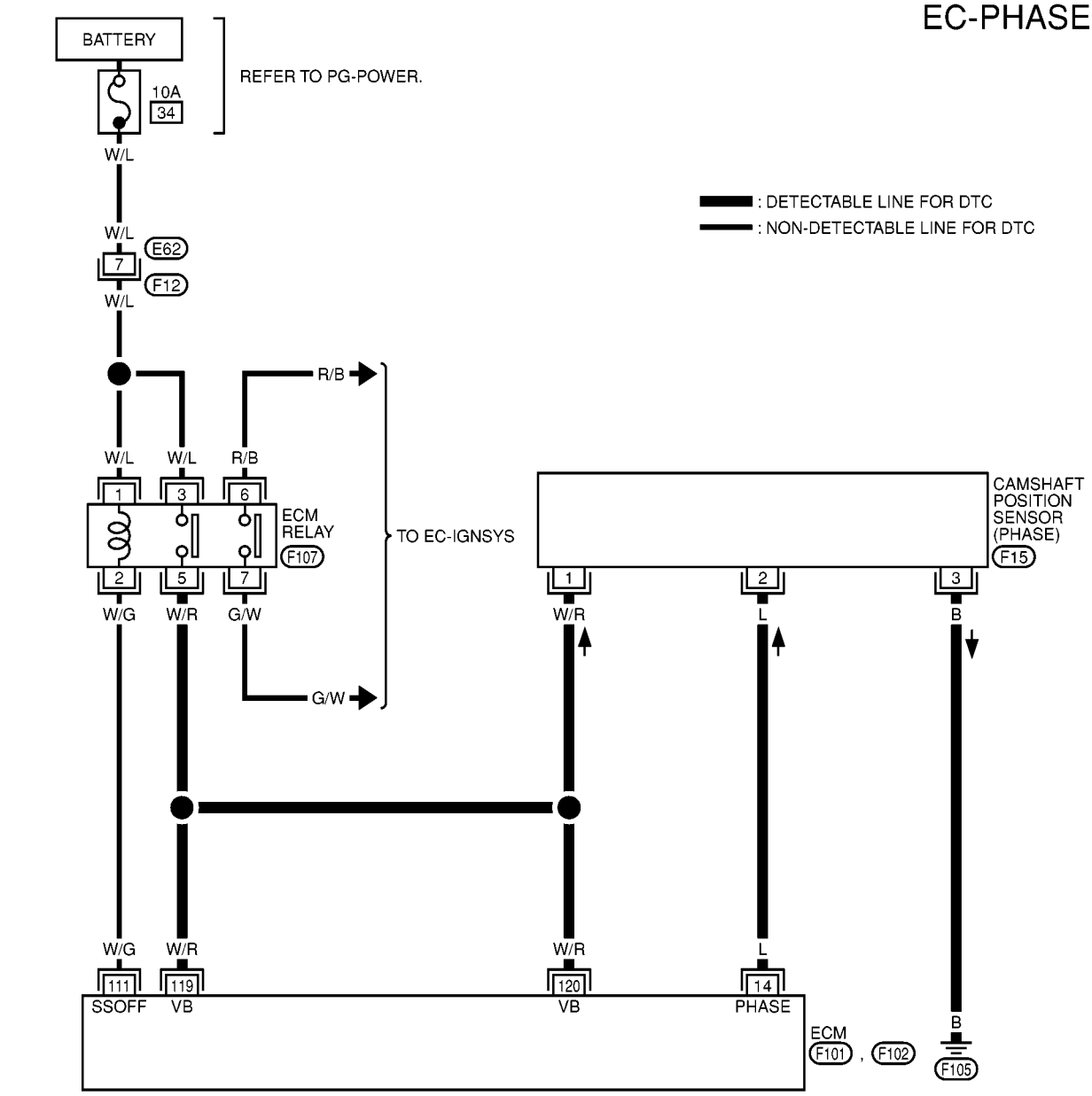
WITH GST

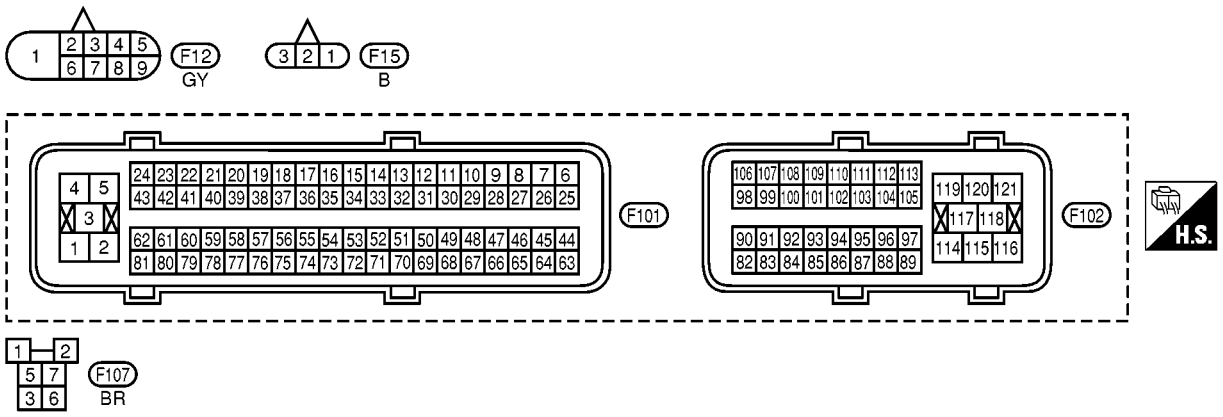
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

EBS00GFC

EC-PHASE-01



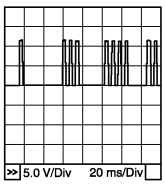
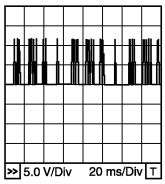


MBWA0015E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
14	L	Camshaft position sensor (PHASE)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.0 - 4.0V★  PBIB0525E
			[Engine is running] ● Engine speed is 2,000 rpm.	1.0 - 4.0V★  PBIB0526E

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnostic Procedure

EBS00GFD

1. CHECK STARTING SYSTEM

Turn ignition switch to “START” position.

Does the engine turn over?

Does the starter motor operate?

Yes or No

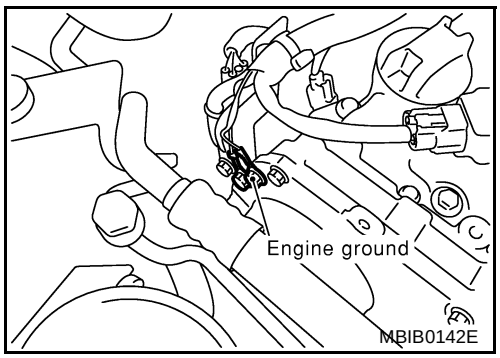
Yes >> GO TO 2.

No >> Check starting system. (Refer to SC-22, "STARTING SYSTEM" .)

2. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

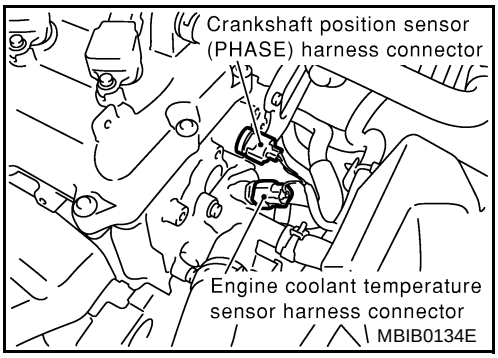
>> GO TO 3.



MBIB0142E

3. CHECK CAMSHAFT POSITION (CMP) SENSOR (PHASE) POWER SUPPLY CIRCUIT

1. Disconnect camshaft position (CMP) sensor (PHASE) harness connector.
2. Turn ignition switch “ON”.



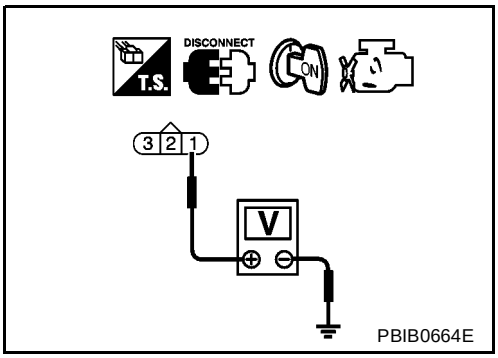
3. Check voltage between CMP sensor (PHASE) terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.



4. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between camshaft position sensor (PHASE) and ECM
- Harness for open or short between camshaft position sensor (PHASE) and ECM relay

>> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK CMP SENSOR (PHASE) GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between CMP sensor (PHASE) terminal 3 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK CMP SENSOR (PHASE) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 14 and CMP sensor (PHASE) terminal 2. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground or short to power.

OK or NG

OK >> GO TO 7.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK CAMSHAFT POSITION SENSOR (PHASE)

Refer to EC-1216, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> Replace camshaft position sensor (PHASE).

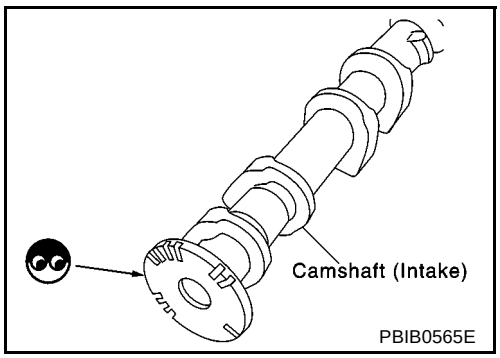
8. CHECK CAMSHAFT (INTAKE)

Check the following.

- Accumulation of debris to the signal plate of camshaft rear end
- Chipping signal plate of camshaft rear end

OK or NG

OK >> GO TO 9.
NG >> Remove debris and clean the signal plate of camshaft rear end or replace camshaft.



9. CHECK INTERMITTENT INCIDENT

Refer to EC-1076, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

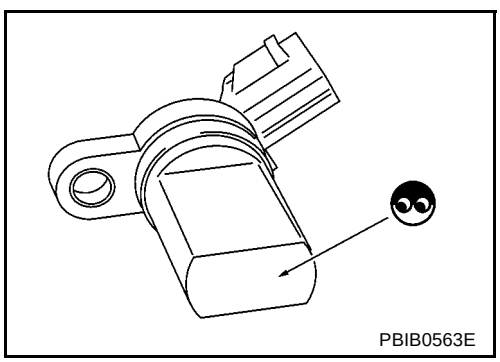
>> **INSPECTION END**

Component Inspection

EBS00GFE

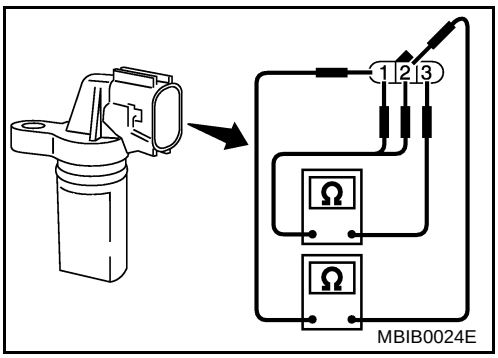
CAMSHAFT POSITION SENSOR (PHASE)

1. Loosen the fixing bolt of the sensor.
2. Disconnect camshaft position sensor (PHASE) harness connector.
3. Remove the sensor.
4. Visually check the sensor for chipping.



5. Check resistance as shown in the figure.

Terminal No. (Polarity)	Resistance Ω [at 25°C (77°F)]
3 (+) - 1 (-)	Except 0 or ∞
3 (+) - 2 (-)	
2 (+) - 1 (-)	



EBS00GFF

Removal and Installation

CAMSHAFT POSITION SENSOR (PHASE)

Refer to EM-133, "CAMSHAFT" .

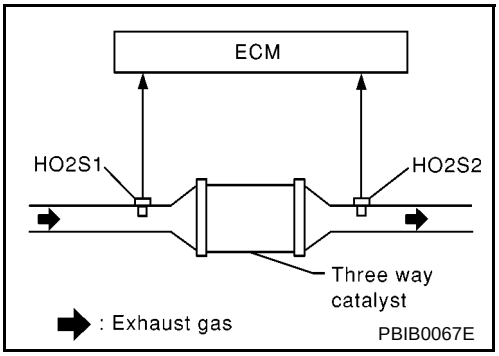
DTC P0420 THREE WAY CATALYST FUNCTION

PFP:20905

On Board Diagnosis Logic

EBS00GFG

The ECM monitors the switching frequency ratio of heated oxygen sensors 1 and 2.
A three way catalyst (Manifold) with high oxygen storage capacity will indicate a low switching frequency of heated oxygen sensor 2. As oxygen storage capacity decreases, the heated oxygen sensor 2 switching frequency will increase.
When the frequency ratio of heated oxygen sensors 1 and 2 approaches a specified limit value, the three way catalyst (Manifold) malfunction is diagnosed.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0420 0420	Catalyst system efficiency below threshold	● Three way catalyst (Manifold) does not operate properly. ● Three way catalyst (Manifold) does not have enough oxygen storage capacity.	● Three way catalyst (Manifold) ● Exhaust tube ● Intake air leaks ● Fuel injectors ● Fuel injector leaks ● Spark plug ● Improper ignition timing

DTC Confirmation Procedure

EBS00GFH

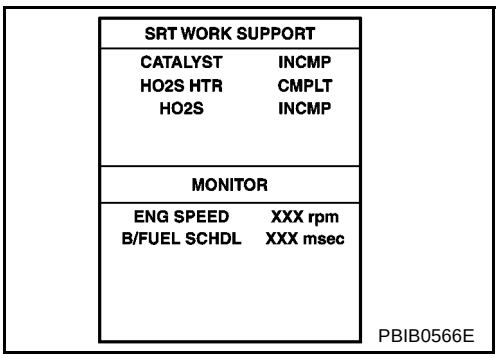
NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

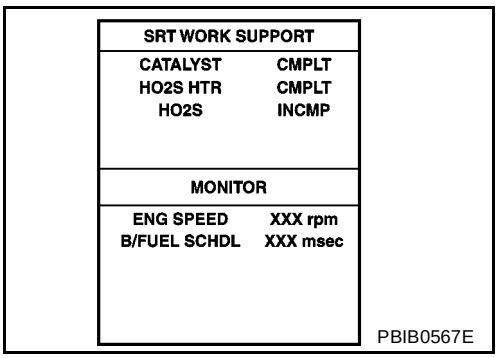
TESTING CONDITION:

- **Open engine hood before conducting the following procedure.**
- **Do not hold engine speed for more than the specified minutes below.**

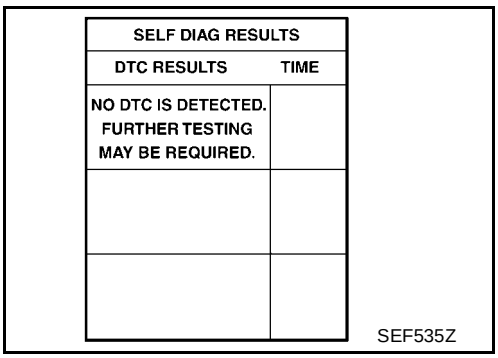
1. Turn ignition switch “ON”.
2. Select “DTC & SRT CONFIRMATION” then “SRT WORK SUPPORT” mode with CONSULT-II.
3. Start engine.
4. Rev engine up to 2,000 to 3,000 rpm and hold it for 3 consecutive minutes then release the accelerator pedal completely.
   If “INCMP” of “CATALYST” changed to “COMPLT”, go to step 7
5. Wait 5 seconds at idle.



6. Rev engine up to 2,000 to 3,000 rpm and maintain it until “INCMP” of “CATALYST” changes to “CMPLT” (It will take approximately 5 minutes).
If not “CMPLT”, stop engine and cool it down to less than 70°C (158°F) and then retest from step 1.



7. Select “SELF-DIAG RESULTS” mode with CONSULT-II.
8. Confirm that the 1st trip DTC is not detected.
If the 1st trip DTC is detected, go to EC-1220, "Diagnostic Procedure" .



Overall Function Check

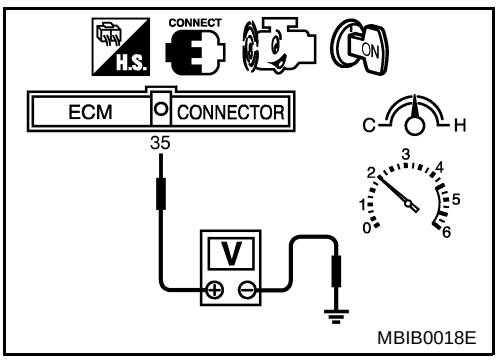
EBS00GFI

Use this procedure to check the overall function of the three way catalyst (Manifold). During this check, a 1st trip DTC might not be confirmed.

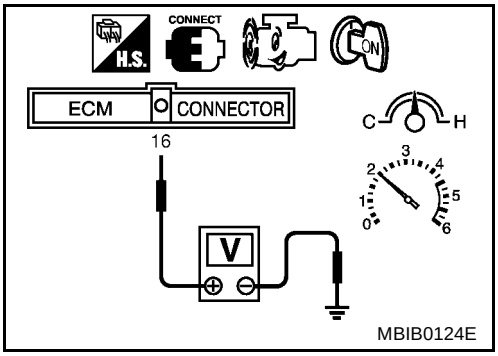
CAUTION:
Always drive vehicle at a safe speed.

WITH GST

1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Set voltmeters probes between ECM terminal 35 (HO2S1 signal) and engine ground, and ECM terminal 16 (HO2S2 signal) and engine ground.
4. Keep engine speed at 2,000 rpm constant under no load.



5. Make sure that the voltage switching frequency (high & low) between ECM terminal 16 and engine ground is very less than that of ECM terminal 35 and engine ground.
Switching frequency ratio = A/B
A: Heated oxygen sensor 2 voltage switching frequency
B: Heated oxygen sensor 1 voltage switching frequency
This ratio should be less than 0.75.
If the ratio is greater than above, it means three way catalyst does not operate properly. Go to EC-1220, "Diagnostic Procedure" .



NOTE:
If the voltage at terminal 92 does not switch periodically more than 5 times within 10 seconds at step 5, perform trouble diagnosis for “DTC P0133” first. (See EC-1129 .)

Diagnostic Procedure

EBS00GFJ

1. CHECK EXHAUST SYSTEM

Visually check exhaust tubes and muffler for dent.

OK or NG

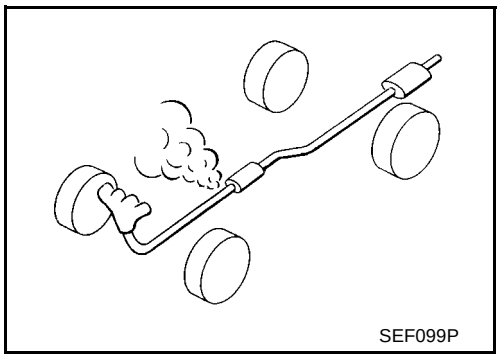
OK >> GO TO 2.
NG >> Repair or replace.

2. CHECK EXHAUST AIR LEAK

1. Start engine and run it at idle.
2. Listen for an exhaust air leak before the three way catalyst (Manifold).

OK or NG

OK >> GO TO 3.
NG >> Repair or replace.


SEF099P

3. CHECK INTAKE AIR LEAK

Listen for an intake air leak after the mass air flow sensor.

OK or NG

OK >> GO TO 4.
NG >> Repair or replace.

4. CHECK IGNITION TIMING

Check the following items. Refer to EC-1032, "Basic Inspection" .

Items		Specifications
Ignition timing	CVT	15° ± 5° BTDC (in “P” or “N” position)
	M/T	14° ± 5° BTDC
Target idle speed	CVT	650 ± 50 rpm (in “P” or “N” position)
	M/T	600 ± 50 rpm

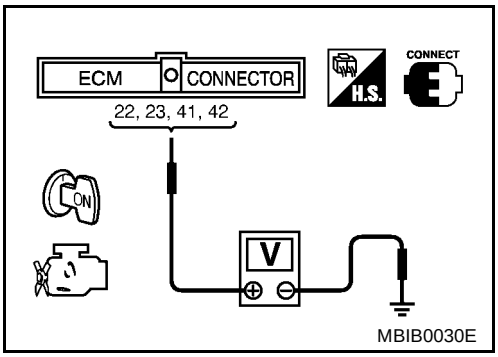
OK or NG

OK >> GO TO 5.
NG >> Follow the “Basic Inspection”.

5. CHECK INJECTORS

1. Refer to Wiring Diagram for Injectors, EC-1376 .
2. Stop engine and then turn ignition switch “ON”.
3. Check voltage between ECM terminals 22, 23, 41, 42 and ground with CONSULT-II or tester.

Battery voltage should exist.

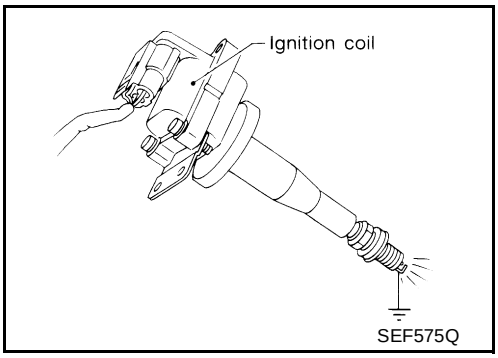


OK or NG

OK >> GO TO 6.
NG >> Perform EC-1377, "Diagnostic Procedure" .

6. CHECK IGNITION SPARK

1. Turn ignition switch “OFF”.
2. Disconnect ignition coil assembly from rocker cover.
3. Connect a known good spark plug to the ignition coil assembly.
4. Place end of spark plug against a suitable ground and crank engine.
5. Check for spark.



OK or NG

OK >> GO TO 7.
NG >> Check ignition coil with power transistor and their circuit. Refer to EC-1365, "IGNITION SIGNAL" .

7. CHECK INJECTOR

1. Turn ignition switch “OFF”.
2. Remove injector assembly.
   Refer to EM-128, "FUEL INJECTOR AND FUEL TUBE" .
   Keep fuel hose and all injectors connected to injector gallery.
3. Disconnect all ignition coil harness connectors.
4. Turn ignition switch “ON”.
   Make sure fuel does not drip from injector.

OK or NG

OK (Does not drip.)>>GO TO 8.
NG (Drips.)>>Replace the injector(s) from which fuel is dripping.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-1076, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

Trouble is fixed.>>**INSPECTION END**
Trouble is not fixed.>>Replace three way catalyst (Manifold).

DTC P0444, P0445 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

PFP:14920

Description

EBS00GVT

SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*1	EVAP canister purge flow control	EVAP canister purge volume control solenoid valve
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Battery	Battery voltage*1		
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Closed throttle position		
Heated oxygen sensors 1	Density of oxygen in exhaust gas (Mixture ratio feedback signal)		
Vehicle speed signal*2	Vehicle speed		

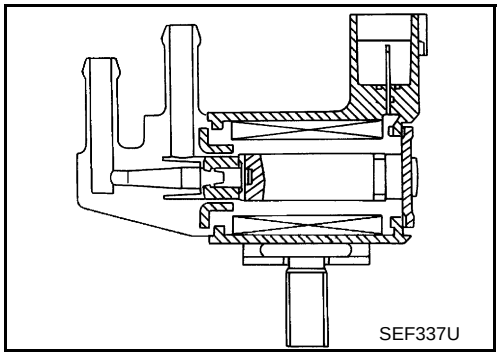
*1: ECM determines the start signal status by the signals of engine speed and battery voltage.

*2: This signal is sent to the ECM through CAN communication line.

This system controls flow rate of fuel vapor from the EVAP canister. The opening of the vapor by-pass passage in the EVAP canister purge volume control solenoid valve changes to control the flow rate. The EVAP canister purge volume control solenoid valve repeats ON/OFF operation according to the signal sent from the ECM. The opening of the valve varies for optimum engine control. The optimum value stored in the ECM is determined by considering various engine conditions. When the engine is operating, the flow rate of fuel vapor from the EVAP canister is regulated as the air flow changes.

COMPONENT DESCRIPTION

The EVAP canister purge volume control solenoid valve uses a ON/OFF duty to control the flow rate of fuel vapor from the EVAP canister. The EVAP canister purge volume control solenoid valve is moved by ON/OFF pulses from the ECM. The longer the ON pulse, the greater the amount of fuel vapor that will flow through the valve.



CONSULT-II Reference Value in Data Monitor Mode

EBS00GVU

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
PURG VOL C/V	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	0%
		2,000 rpm	20 - 30%

On Board Diagnosis Logic

EBS00GVZ

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0444 0444	EVAP canister purge volume control solenoid valve circuit open	An excessively low voltage signal is sent to ECM through the valve	● Harness or connectors (The solenoid valve circuit is open or shorted.) ● EVAP canister purge volume control solenoid valve
P0445 0445	EVAP canister purge volume control solenoid valve circuit shorted	An excessively high voltage signal is sent to ECM through the valve	● Harness or connectors (The solenoid valve circuit is shorted.) ● EVAP canister purge volume control solenoid valve

DTC Confirmation Procedure

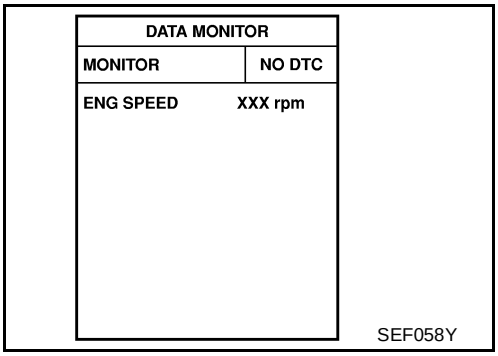
EBS00GW0

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:
Before performing the following procedure, confirm battery voltage is more than 11V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for at least 13 seconds.
4. If 1st trip DTC is detected, go to EC-1225, "Diagnostic Procedure" .



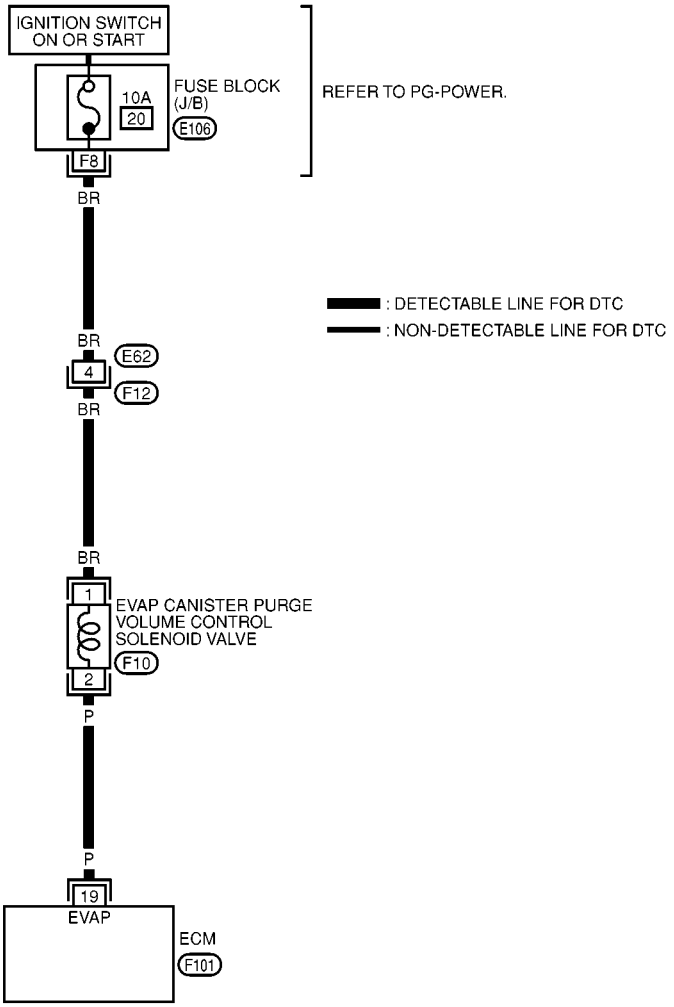
WITH GST

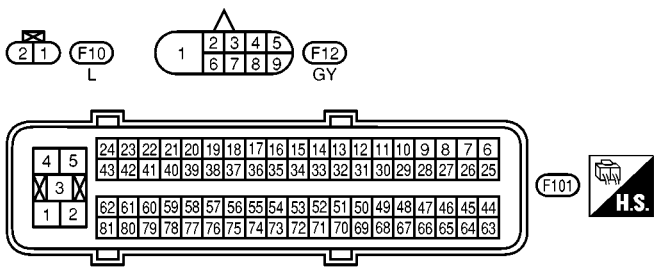
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

EBS00GVV

EC-PGC/V-01





REFER TO THE FOLLOWING.

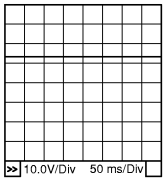
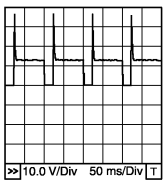
E106 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0016E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
19	P	EVAP canister purge volume control solenoid valve	**[Engine is running]** ● Idle speed	BATTERY VOLTAGE (11 - 14V)★  PBIB0050E
			[Engine is running] ● Engine speed is about 2,000 rpm (More than 100 seconds after starting engine)	Approximately 10V★  PBIB0520E

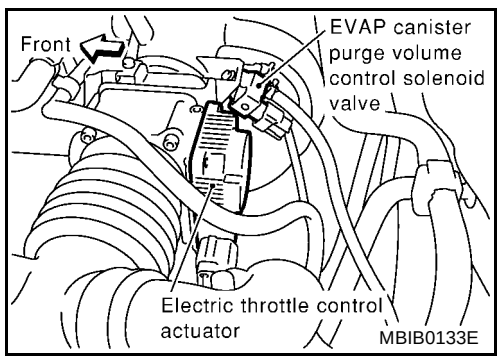
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnostic Procedure

EBS00GVW

1. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect EVAP canister purge volume control solenoid valve harness connector.
3. Turn ignition switch “ON”.

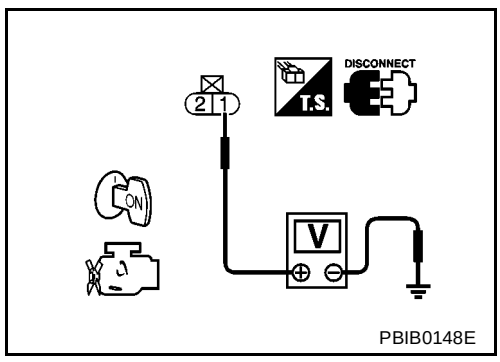


4. Check voltage between EVAP canister purge volume control solenoid valve terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 3.
NG >> GO TO 2.



2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E62, F12
- Harness for open or short between EVAP canister purge volume control solenoid valve and ECM

>> Repair harness or connectors.

3. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 19 and EVAP canister purge volume control solenoid valve terminal 2. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK (With CONSULT-II)>>GO TO 4.
OK (Without CONSULT-II)>>GO TO 5.
NG >> Repair open circuit or short to ground and short to power in harness or connectors.

4. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

With CONSULT-II

1. Reconnect all harness connectors disconnected.
2. Start engine.
3. Perform “PURG VOL CONT/V” in “ACTIVE TEST” mode with CONSULT-II. Check that engine speed varies according to the valve opening.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

ACTIVE TEST	
PURG VOL CONT/V	XXX %
MONITOR	
ENG SPEED	XXX rpm
A/F ALPHA-B1	XXX %
HO2S1 MNTR (B1)	LEAN

PBIB0569E

5. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-1227, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace EVAP canister purge volume control solenoid valve.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-1076, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

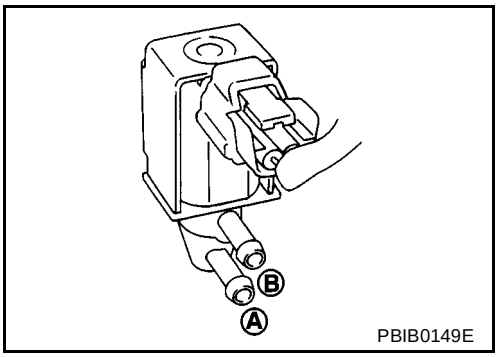
EBS00GVX

EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT-II

Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

Condition (PURG VOL CONT/V value)	Air passage continuity between A and B
100.0%	Yes
0.0%	No

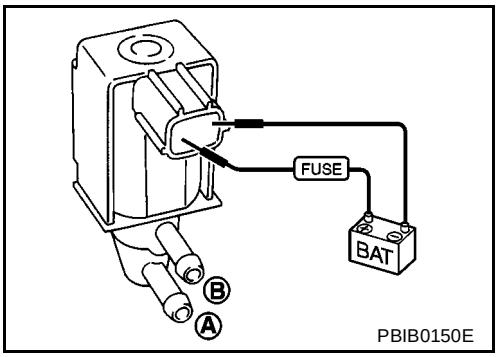


PBIB0149E

Without CONSULT-II

Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

Condition	Air passage continuity between A and B
12V direct current supply between terminals 1 and 2	Yes
No supply	No



PBIB0150E

Removal and Installation

EBS00GVY

EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EM-116, "INTAKE MANIFOLD" .

DTC P0500 VSS

PFP:32702

Description

EBS00GFK

NOTE:
If DTC P0500 is displayed with DTC U1000 or U1001, first perform the trouble diagnosis for DTC U1000, U1001. Refer to EC-1083, "DTC U1000, U1001 CAN COMMUNICATION LINE" .
The vehicle speed signal is sent to the combination meter from the ESP/TCS/ABS control unit or ABS actuator and electric unit (control unit) through CAN communication line. The combination meter then sends a signal to the ECM through CAN communication line.

On Board Diagnosis Logic

EBS00GFL

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0500 0500	Vehicle speed sensor	The almost 0 km/h (0 MPH) signal from vehicle speed sensor is sent to ECM even when vehicle is being driven.	● Harness or connectors (The CAN communication line is open or shorted.) ● ESP/TCS/ABS control unit ● ABS actuator and electric unit (control unit) ● Wheel sensor ● Combination meter

DTC Confirmation Procedure

EBS00GFM

CAUTION:
Always drive vehicle at a safe speed.

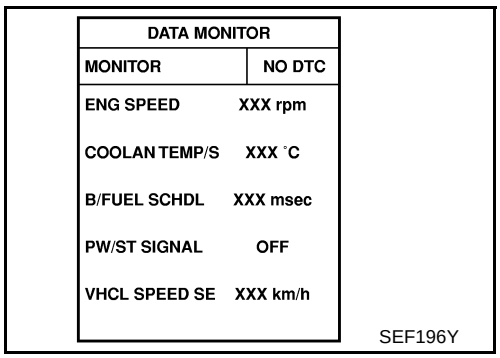
NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:
Steps 1 and 2 may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

WITH CONSULT-II

1. Start engine.
2. Read “VHCL SPEED SE” in “DATA MONITOR” mode with CONSULT-II. The vehicle speed on CONSULT-II should exceed 10 km/h (6 MPH) when rotating wheels with suitable gear position.
   If NG, go to EC-1229, "Diagnostic Procedure" .
   If OK, go to following step.
3. Select “DATA MONITOR” mode with CONSULT-II.
4. Warm engine up to normal operating temperature.
5. Maintain the following conditions for at least 60 consecutive seconds.

ENG SPEED	2,000 - 6,000 rpm
COOLAN TEMP/S	More than 70°C (158°F)
B/FUEL SCHDL	4.9 - 31.8 msec
Selector lever	Suitable position
PW/ST SIGNAL	OFF



6. If 1st trip DTC is detected, go to EC-1229, "Diagnostic Procedure" .

Overall Function Check

EBS00GFN

Use this procedure to check the overall function of the vehicle speed signal circuit. During this check, a 1st trip DTC might not be confirmed.

WITH GST

1. Lift up drive wheels.

2. Start engine.
3. Read vehicle speed signal in “MODE 1” with GST.
   The vehicle speed signal on GST should be able to exceed 10 km/h (6 MPH) when rotating wheels with suitable gear position.
4. If NG, go to EC-1229, "Diagnostic Procedure" .

Diagnostic Procedure

EBS00GFO

1. CHECK DTC

Refer to BRC-17, "TROUBLE DIAGNOSIS" (Models without ESP) or BRC-60, "TROUBLE DIAGNOSIS" (Models with ESP).

OK or NG

OK >> GO TO 2.
NG >> Repair or replace.

2. CHECK COMBINATION METER

Check combination meter function.
Refer to DI-5, "COMBINATION METERS (LHD MODELS)" or DI-34, "COMBINATION METERS (RHD MODELS)" .

>> **INSPECTION END**

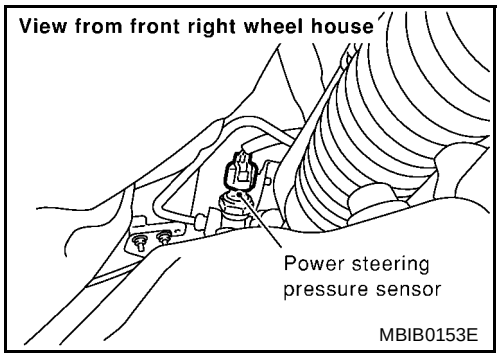
DTC P0550 PSP SENSOR

PFP:49763

Component Description

EBS00GFP

Power steering pressure (PSP) sensor is installed to the power steering high-pressure tube and detects a power steering load. This sensor is a potentiometer which transforms the power steering load into output voltage, and emits the voltage signal to the ECM. The ECM controls the electric throttle control actuator and adjusts the throttle valve opening angle to increase the engine speed and adjusts the idle speed for the increased load.



CONSULT-II Reference Value in Data Monitor Mode

EBS00GFQ

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
PW/ST SIGNAL	● Engine: After warming up, idle the engine	Steering wheel is in neutral position. (Forward direction)	OFF
		Steering wheel is turned.	ON

On Board Diagnosis Logic

EBS00GFR

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0550 0550	Power steering pressure sensor circuit	An excessively low or high voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Power steering pressure sensor

DTC Confirmation Procedure

EBS00GFS

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for at least 5 seconds.
4. If 1st trip DTC is detected, go to EC-1232, "Diagnostic Procedure" .

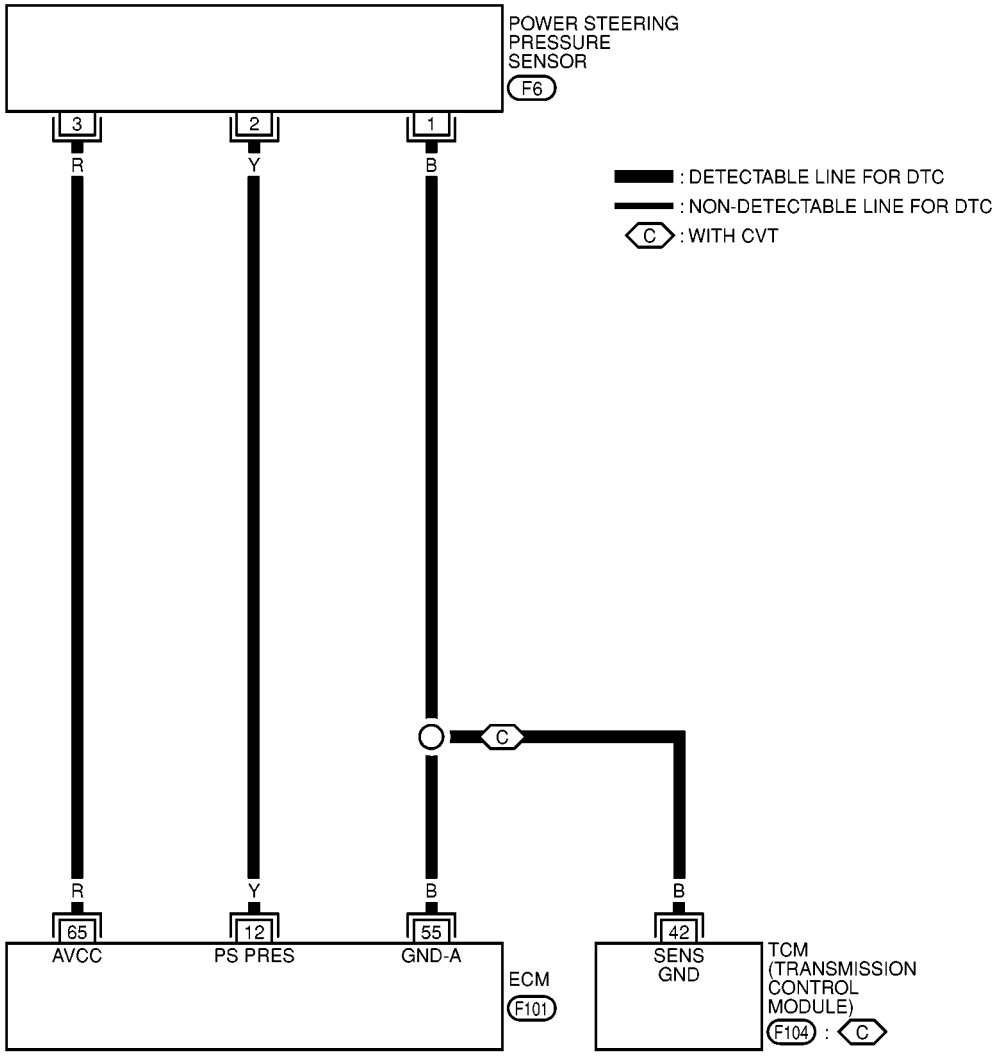
WITH GST

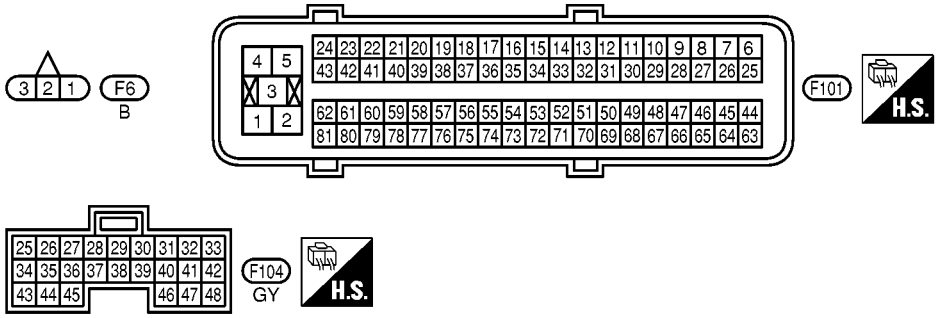
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

EBS00GFT

EC-PS/SEN-01





MBWA0032E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
12	Y	Power steering pressure sensor	**[Engine is running]** ● Steering wheel is being turned.	Approximately 3.6V
			[Engine is running] ● Steering wheel is not being turned.	Approximately 0.6V
55	B	Sensors' ground	**[Engine is running]** ● Warm-up condition ● Idle speed	Approximately 0V
65	R	Sensor's power supply (Power steering pressure sensor)	**[Ignition switch "ON"]**	Approximately 5V

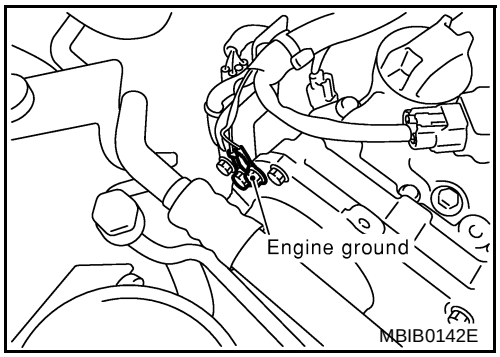
Diagnostic Procedure

EBS00GFU

1. RETIGHTEN GROUND SCREWS

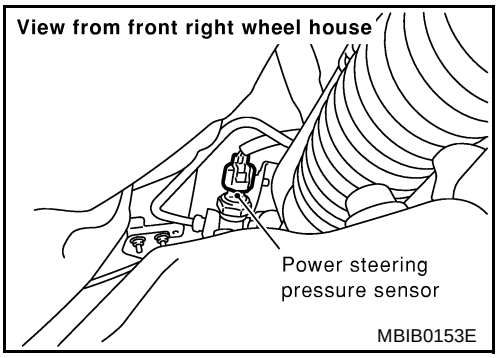
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



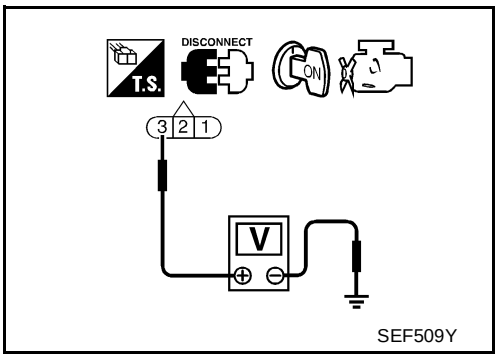
2. CHECK PSP SENSOR POWER SUPPLY CIRCUIT

1. Disconnect PSP sensor harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between PSP sensor terminal 3 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 3.
NG >> Repair harness or connectors.

3. CHECK PSP SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 55 and PSP sensor terminal 1. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between power steering pressure sensor and ECM
- Harness for open or short between power steering pressure sensor and TCM

>> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK PSP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 12 and PSP sensor terminal 2.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK PSP SENSOR

Refer to EC-1234, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace PSP sensor.

7. CHECK INTERMITTENT INCIDENT

Refer to EC-1076, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

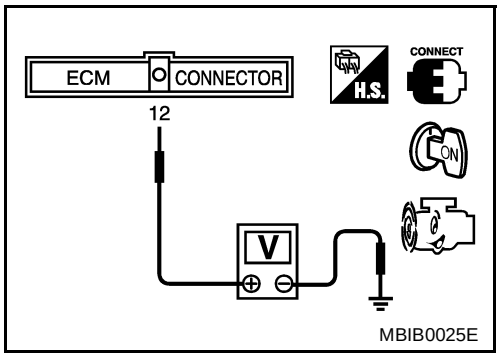
Component Inspection

EBS00GFV

POWER STEERING PRESSURE SENSOR

1. Reconnect all harness connectors disconnected.
2. Start engine and let it idle.
3. Check voltage between ECM terminal 12 and ground under the following conditions.

Condition	Voltage
Steering wheel is being turned fully.	Approximately 3.6V
Steering wheel is not being turned.	Approximately 0.6V



MBIB0025E

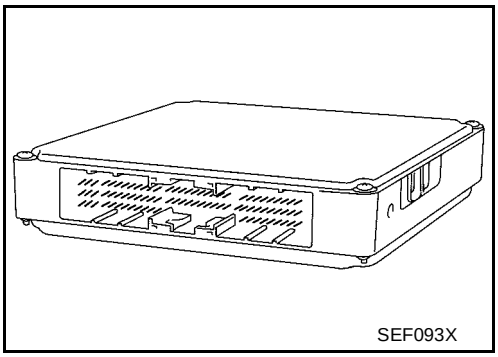
DTC P0605 ECM

PFP:23710

Component Description

EBS00GFW

The ECM consists of a microcomputer and connectors for signal input and output and for power supply. The ECM controls the engine.


SEF093X

On Board Diagnosis Logic

EBS00GFX

DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause
P0605 0605	Engine control module	A)	ECM calculation function is malfunctioning.	● ECM
		B)	ECM EEP-ROM system is malfunctioning.	
		C)	ECM self shut-off function is malfunctioning.	

FAIL-SAFE MODE

ECM enters fail-safe mode when malfunction A is detected.

Detected items	Engine operation condition in fail-safe mode
Malfunction A	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

DTC Confirmation Procedure

EBS00GFY

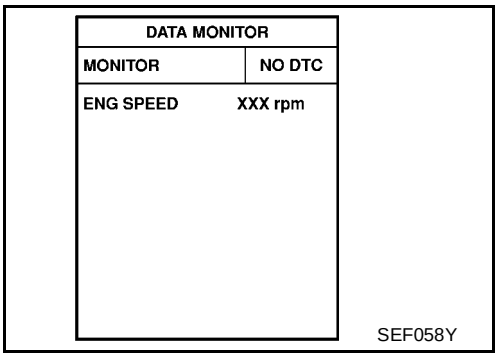
Perform “PROCEDURE FOR MALFUNCTION A” first. If the DTC cannot be confirmed, perform “PROCEDURE FOR MALFUNCTION B”. If there is no problem on “PROCEDURE FOR MALFUNCTION B”, perform “PROCEDURE FOR MALFUNCTION C”.

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

PROCEDURE FOR MALFUNCTION A

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. If DTC is detected, go to EC-1237, "Diagnostic Procedure" .



SEF058Y

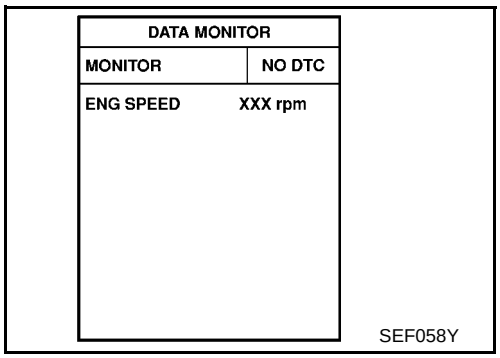
With GST

Follow the procedure “With CONSULT-II” above.

PROCEDURE FOR MALFUNCTION B

With CONSULT-II

1. Turn ignition switch “ON” and wait at least 1 second.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Turn ignition switch “OFF”, wait at least 10 seconds, and then turn “ON”.
4. If 1st trip DTC is detected, go to EC-1237, "Diagnostic Procedure" .



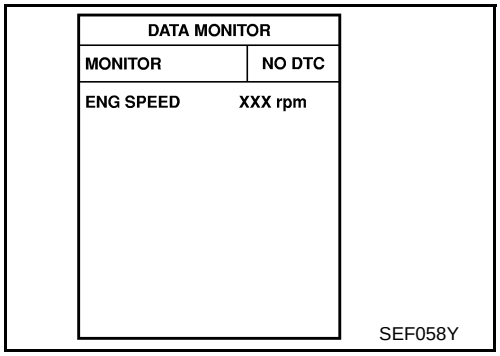
With GST

Follow the procedure “With CONSULT-II” above.

PROCEDURE FOR MALFUNCTION C

With CONSULT-II

1. Turn ignition switch “ON” and wait at least 1 second.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Turn ignition switch “OFF”, wait at least 10 seconds, and then turn “ON”.
4. Repeat step 3 procedure, 32 times.
5. If 1st trip DTC is detected, go to EC-1237, "Diagnostic Procedure" .



With GST

Follow the procedure “With CONSULT-II” above.

Diagnostic Procedure

EBS00GFZ

1. INSPECTION START

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “SELF DIAG RESULTS” mode with CONSULT-II.
3. Touch “ERASE”.
4. **Perform “DTC Confirmation Procedure”.**
   See EC-1235 .
5. Is the 1st trip DTC P0605 displayed again?

With GST

1. Turn ignition switch “ON”.
2. Select MODE 4 with GST.
3. Touch “ERASE”.
4. **Perform “DTC Confirmation Procedure”.**
   See EC-1235 .
5. Is the 1st trip DTC P0605 displayed again?

Yes or No

Yes >> GO TO 2.
No >> **INSPECTION END**

2. REPLACE ECM

1. Replace ECM.
2. Perform initialization of NATS system and registration of all NATS ignition key IDs. Refer to EC-1016, "NATS (Nissan Anti-theft System)" .
3. Perform EC-998, "Accelerator Pedal Released Position Learning" .
4. Perform EC-998, "Throttle Valve Closed Position Learning" .
5. Perform EC-999, "Idle Air Volume Learning" .

>> **INSPECTION END**

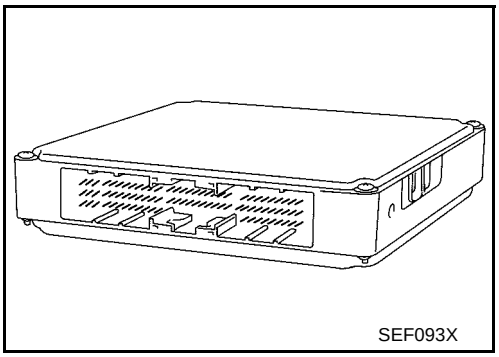
DTC P1065 ECM POWER SUPPLY

PFP:23710

Component Description

EBS00GG0

Battery voltage is supplied to the ECM even when the ignition switch is turned OFF for the ECM memory function of the DTC memory, the air fuel ratio feedback compensation value memory, the idle air volume learning value memory, etc.


SEF093X

On Board Diagnosis Logic

EBS00GG1

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1065 1065	ECM power supply circuit	ECM back up RAM system does not function properly.	● Harness or connectors [ECM power supply (back-up) circuit is open or shorted.] ● ECM

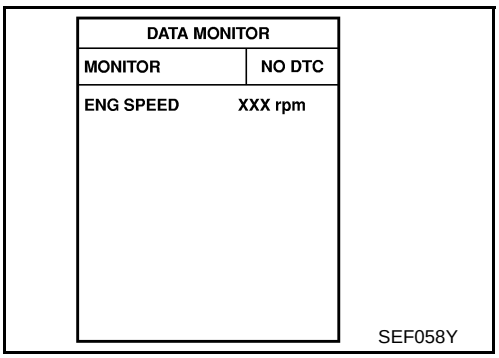
DTC Confirmation Procedure

EBS00GG2

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON” and wait at least 1 second.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. Turn ignition switch “OFF”, wait at least 10 seconds, and then turn “ON”.
5. Repeat steps 3 and 4 four times.
6. If 1st trip DTC is detected, go to EC-1240, "Diagnostic Procedure" .



SEF058Y

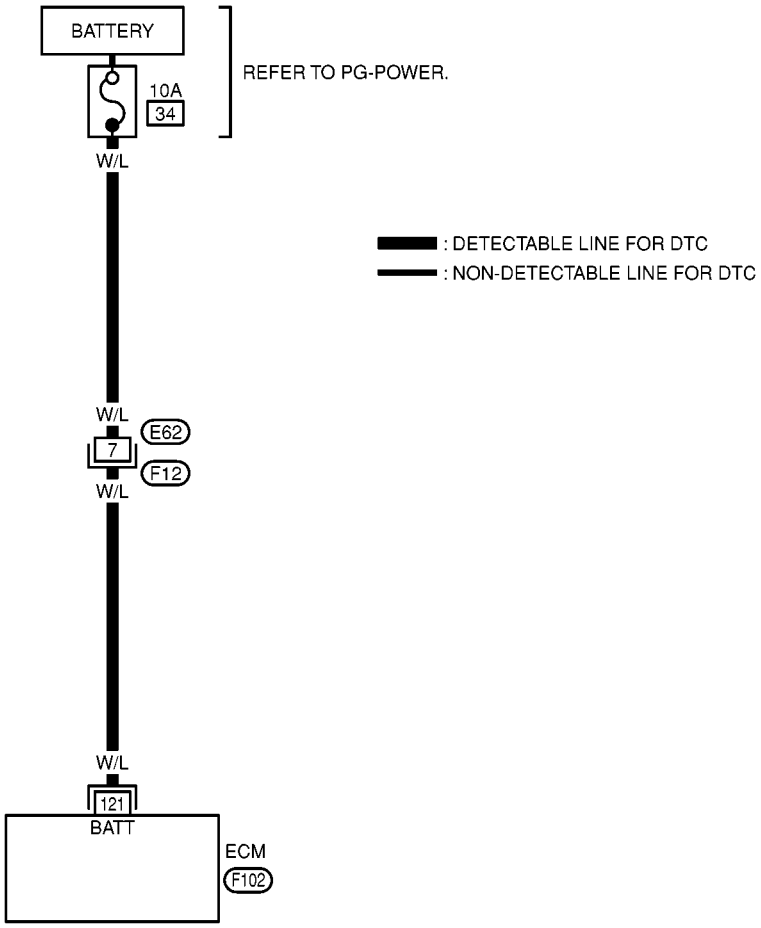
WITH GST

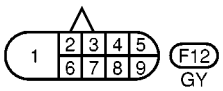
Follow the procedure “WITH CONSULT-II” above.

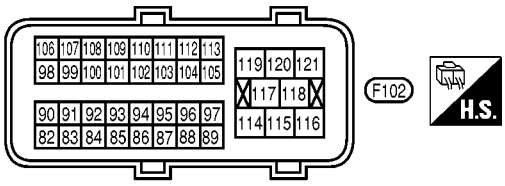
Wiring Diagram

EBS00GG3

EC-ECM/PW-01







MBWA0040E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
121	W/L	Power supply for ECM (Buck-up)	**[Ignition switch "OFF"]**	BATTERY VOLTAGE (11 - 14V)

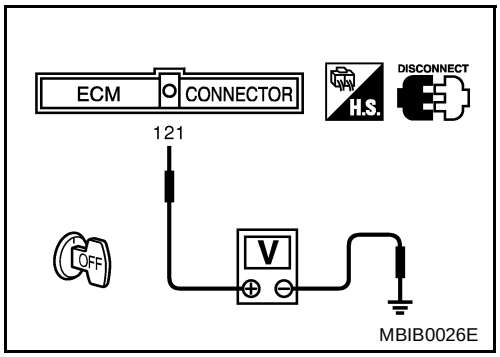
Diagnostic Procedure

EBS00GG4

1. CHECK ECM POWER SUPPLY

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check voltage between ECM terminal 121 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E62, F12
- 10A fuse
- Harness for open or short between ECM and battery

>> Repair or replace harness or connectors.

3. CHECK INTERMITTENT INCIDENT

Refer to EC-1076, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

OK or NG

OK >> GO TO 4.
NG >> Repair or replace harness or connectors.

4. PERFORM DTC CONFIRMATION PROCEDURE

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “SELF DIAG RESULTS” mode with CONSULT-II.
3. Touch “ERASE”.
4. **Perform “DTC Confirmation Procedure”.**
   See EC-1238 .
5. Is the 1st trip DTC P1065 displayed again?

With GST

1. Turn ignition switch “ON”.
2. Select MODE 4 with GST.
3. Touch “ERASE”.
4. **Perform “DTC Confirmation Procedure”.**
   See EC-1238 .
5. Is the 1st trip DTC P1065 displayed again?

Yes or No

Yes >> GO TO 5.
No >> **INSPECTION END**

5. REPLACE ECM

1. Replace ECM.
2. Perform initialization of NATS system and registration of all NATS ignition key IDs. Refer to EC-1016, "NATS (Nissan Anti-theft System)" .
3. Perform EC-998, "Accelerator Pedal Released Position Learning" .
4. Perform EC-998, "Throttle Valve Closed Position Learning" .
5. Perform EC-999, "Idle Air Volume Learning" .

>> **INSPECTION END**

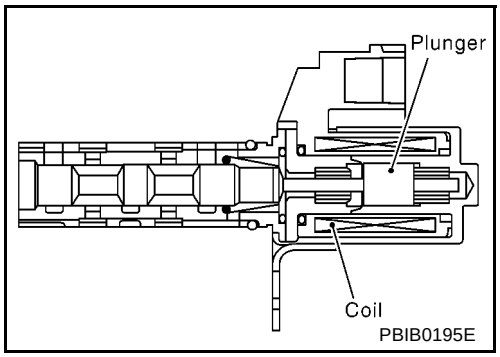
DTC P1111 IVT CONTROL SOLENOID VALVE

PFP:23796

Component Description

EBS00GG5

Intake valve timing control solenoid valve is activated by ON/OFF pulse duty (ratio) signals from the ECM.
The intake valve timing control solenoid valve changes the oil amount and direction of flow through intake valve timing control unit or stops oil flow.
The longer pulse width advances valve angle.
The shorter pulse width retards valve angle.
When ON and OFF pulse widths become equal, the solenoid valve stops oil pressure flow to fix the intake valve angle at the control position.



CONSULT-II Reference Value in Data Monitor Mode

EBS00GG6

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
INT/V SOL (B1)	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	0% - 2%
		When revving engine up to 2,000 rpm quickly	Approx. 0% - 50%

On Board Diagnosis Logic

EBS00GG7

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1111 1111	Intake valve timing control solenoid valve circuit	An improper voltage is sent to the ECM through intake valve timing control solenoid valve.	● Harness or connectors (Solenoid valve circuit is open or shorted.) ● Intake valve timing control solenoid valve

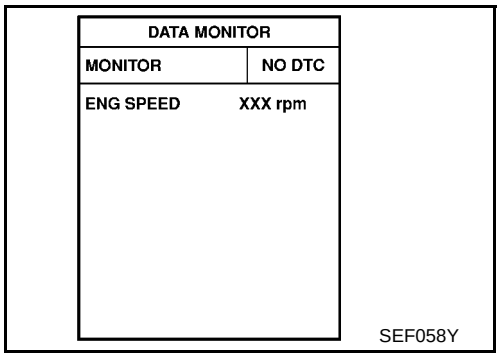
DTC Confirmation Procedure

EBS00GG8

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 5 seconds.
4. If 1st trip DTC is detected, go to EC-1244, "Diagnostic Procedure" .



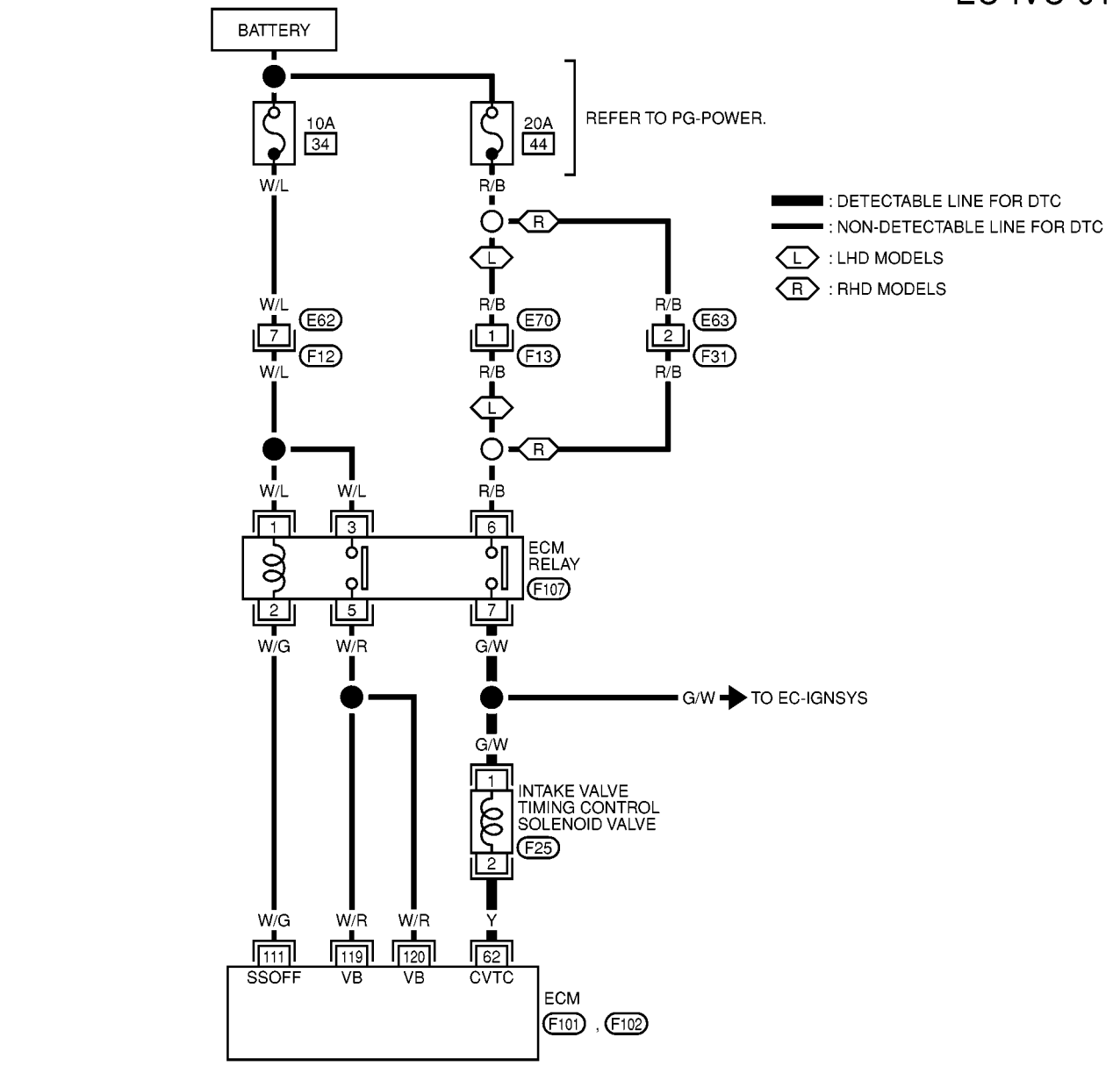
WITH GST

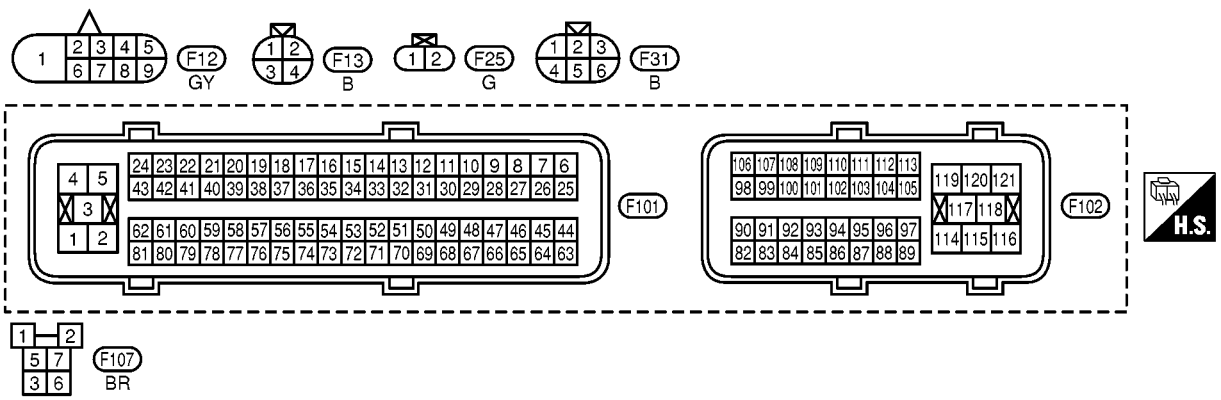
Following the procedure “WITH CONSULT-II” above.

Wiring Diagram

EBS00GG9

EC-IVC-01



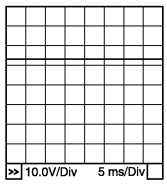
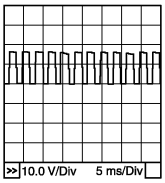


MBWA0017E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
62	Y	Intake valve timing control solenoid valve	**[Engine is running]** ● **Warm-up condition** ● Idle speed	BATTERY VOLTAGE (11 - 14V)  MBIB0052E
			[Engine is running] ● **Warm-up condition** ● When revving engine up to 2,000 rpm quickly	Approximately 4V - BATTERY VOLTAGE (11 - 14V)★  PBIB0532E

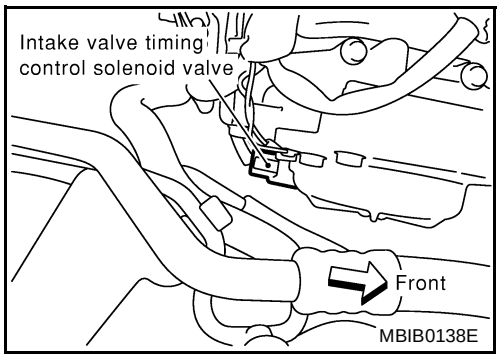
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnostic Procedure

EBS00GGA

1. CHECK POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect intake valve timing control solenoid valve harness connector.
3. Turn ignition switch “ON”.



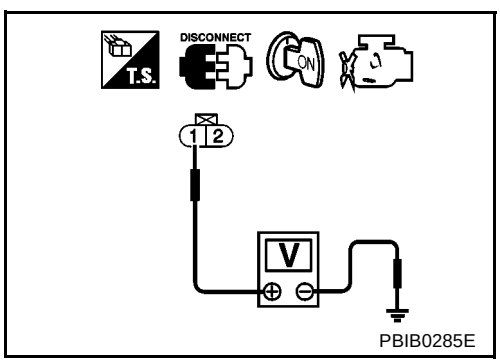
MBIB0138E

4. Check voltage between intake valve timing control solenoid valve terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 3.
NG >> GO TO 2.



PBIB0285E

2. DETECT MALFUNCTION PART

Check harness for open or short between intake valve timing control solenoid valve and ECM relay.

>> Repair or replace harness or connectors.

3. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 62 and intake valve timing control solenoid valve terminal 2. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE

Refer to EC-1245, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace intake valve timing control solenoid valve.

5. CHECK INTERMITTENT INCIDENT

Refer to EC-1076, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

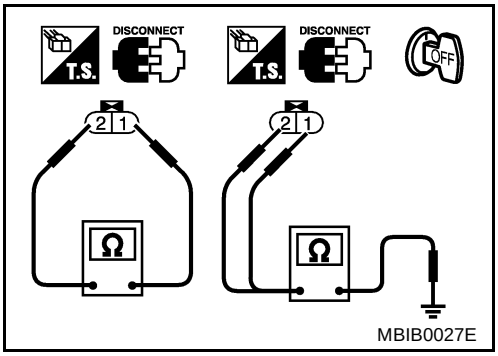
Component Inspection

EBS00GGB

INTAKE VALVE TIMING CONTROL SOLENOID VALVE

1. Disconnect intake valve timing control solenoid valve harness connector.
2. Check resistance between intake valve timing control solenoid valve terminals 1 and 2 under the following conditions.

Terminals	Resistance
1 and 2	Approximately 8Ω at 20°C (68°F)
1 or 2 and ground	∞Ω (Continuity should not exist)



Removal and Installation

EBS00GGC

INTAKE VALVE TIMING CONTROL SOLENOID VALVE

Refer to EM-143, "TIMING CHAIN" .

DTC P1121 ELECTRIC THROTTLE CONTROL ACTUATOR

PFP:16119

Component Description

EBS00GGD

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc.
The throttle control motor is operated by the ECM and it opens and closes the throttle valve.
The throttle position sensor detects the throttle valve position, and the opening and closing speed of the throttle valve and feeds the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

On Board Diagnosis Logic

EBS00GGE

DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause
P1121 1121	Electric throttle control actuator	A)	Electric throttle control actuator does not function properly due to the return spring malfunction.	● Electric throttle control actuator
		B)	Throttle valve opening angle in fail-safe mode is not in specified range.	
		C)	ECM detect the throttle valve is stuck open. **This self-diagnosis has the one trip detection logic.**	

FAIL-SAFE MODE

When the malfunction A or B is detected in the two consecutive trips, the ECM enters in fail-safe mode and MI lights up.
When the malfunction C is detected even in the 1st trip, the ECM enters in fail-safe mode and the MI lights up.

Detected items	Engine operating condition in fail-safe mode
Malfunction A	The ECM controls the electric throttle actuator by regulating the throttle opening around the idle position. The engine speed will not rise more than 2,000 rpm.
Malfunction B	ECM controls the electric throttle control actuator by regulating the throttle opening to 20 degrees or less.
Malfunction C	While the vehicle is driving, it slows down gradually by fuel cut. After the vehicle stops, the engine stalls. The engine can restart in “N” or “P” position, and engine speed will not exceed 1,000 rpm or more.

DTC Confirmation Procedure

EBS00GNX

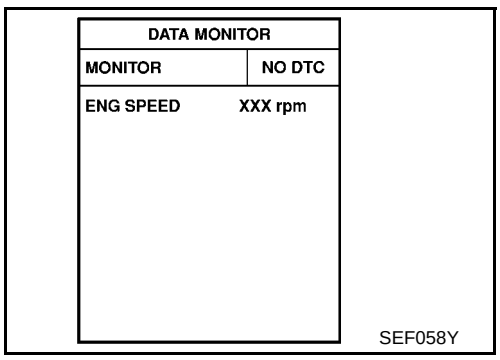
NOTE:

- **Perform “PROCEDURE FOR MALFUNCTION A AND B” first. If the 1st trip DTC cannot be confirmed, perform “PROCEDURE FOR MALFUNCTION C”.**
- If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

PROCEDURE FOR MALFUNCTION A AND B

With CONSULT-II

1. Turn ignition witch “ON” and wait at least 1 second.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Shift selector lever to “D” position (CVT), “1st” position (M/T) and wait at least 2 seconds.
4. Turn ignition switch “OFF”, wait at least 10 seconds, and then turn “ON”.
5. If 1st trip DTC is detected, go to EC-1247, "Diagnostic Procedure" .



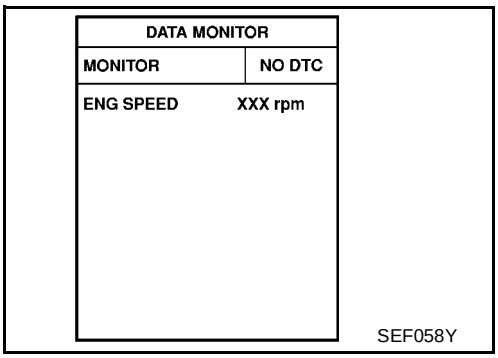
With GST

Follow the procedure “With CONSULT-II” above.

PROCEDURE FOR MALFUNCTION C

With CONSULT-II

1. Turn ignition switch “ON” and wait at least 1 second.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Shift selector lever to “D” position (CVT), “1st” position (M/T) and wait at least 2 seconds.
4. Shift selector lever to “N” or “P” position.
5. Start engine and let it idle for 3 seconds.
6. If DTC is detected, go to EC-1247, "Diagnostic Procedure" .



With GST

Follow the procedure “With CONSULT-II” above.

Diagnostic Procedure

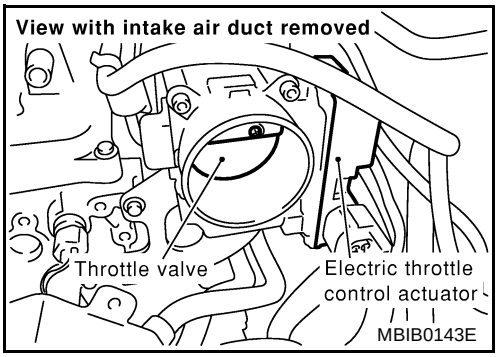
EBS00GNY

1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Remove the intake air duct.
2. Check if a foreign matter is caught between the throttle valve and the housing.

OK or NG

OK >> GO TO 2.
NG >> Remove the foreign matter and clean the electric throttle control actuator inside.



2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-998, "Throttle Valve Closed Position Learning" .
3. Perform EC-999, "Idle Air Volume Learning" .

>> **INSPECTION END**

Removal and Installation

EBS00HBW

Refer to EM-116, "INTAKE MANIFOLD" .

DTC P1122 ELECTRIC THROTTLE CONTROL FUNCTION

PFP:16119

Description

EBS00GGH

NOTE:
If DTC P1122 is displayed with DTC P1121 or 1126, first perform the trouble diagnosis for DTC P1121 or P1126. Refer to EC-1246 or EC-1255 .

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc.
The throttle control motor is operated by the ECM and it opens and closes the throttle valve.
The current opening angle of the throttle valve is detected by the throttle position sensor and it provides feedback to the ECM to control the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

On Board Diagnosis Logic

EBS00GGI

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1122 1122	Electric throttle control performance problem	Electric throttle control function does not operate properly.	● Harness or connectors (Throttle control motor circuit is open or shorted.) ● Harness or connectors (Throttle control motor relay circuit is open or shorted.) ● Electric throttle control actuator ● Throttle control motor relay

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MI lights up.

Engine operating condition in fail-safe mode
ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

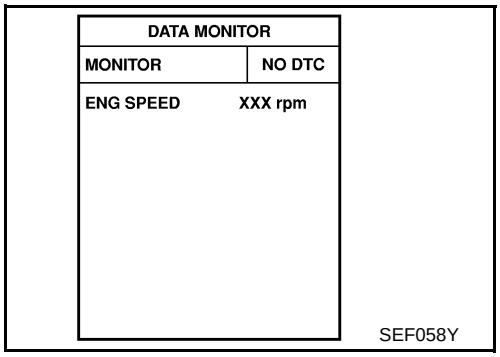
DTC Confirmation Procedure

EBS00GGJ

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON” and wait at least 2 seconds.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 5 seconds.
4. If DTC is detected, go to EC-1250, "Diagnostic Procedure" .



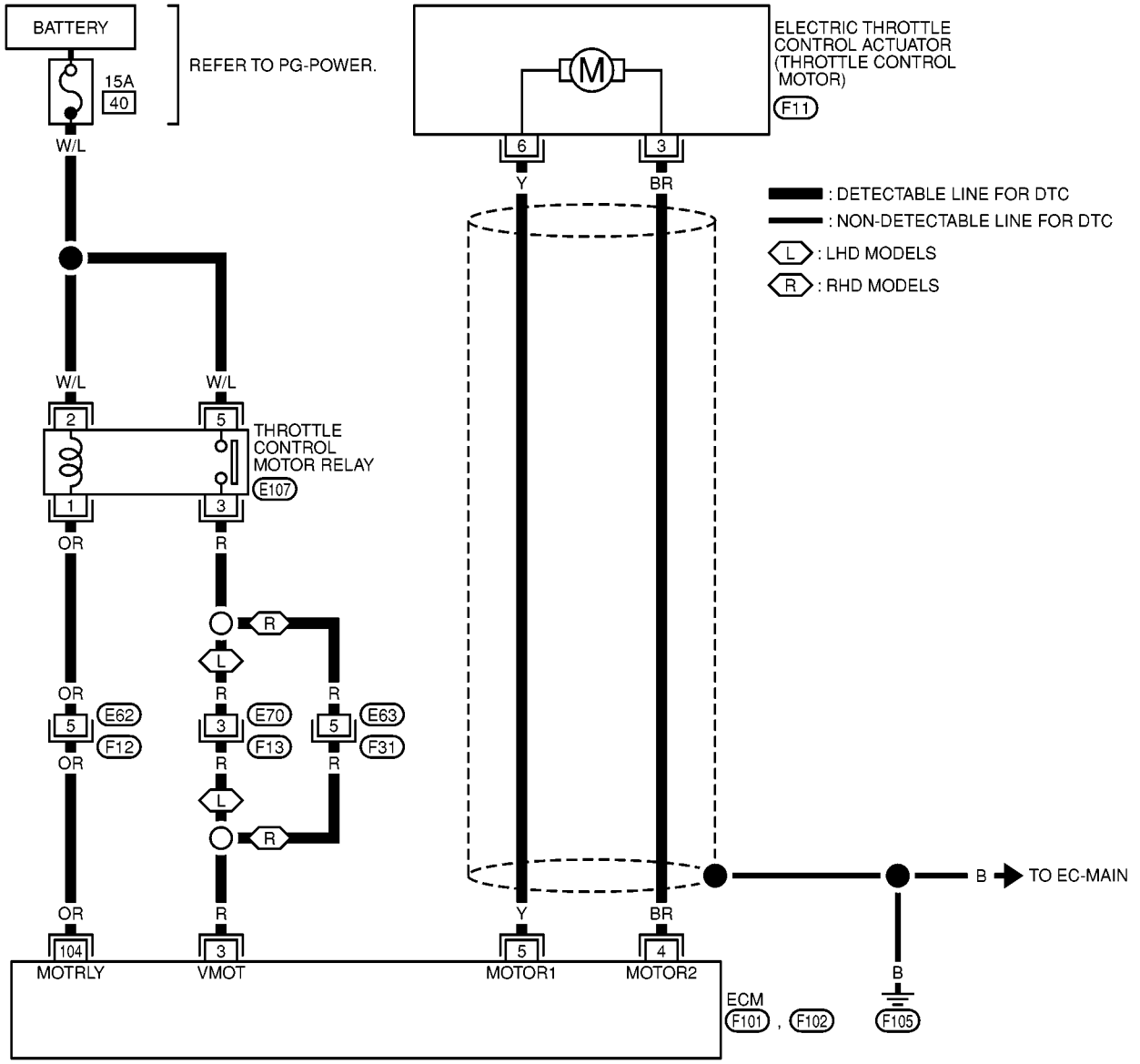
WITH GST

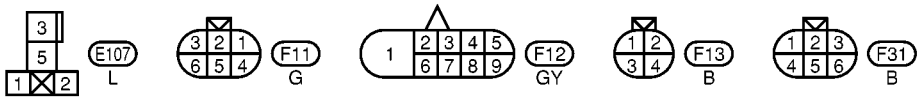
Follow the procedure “WITH CONSULT-II” above.

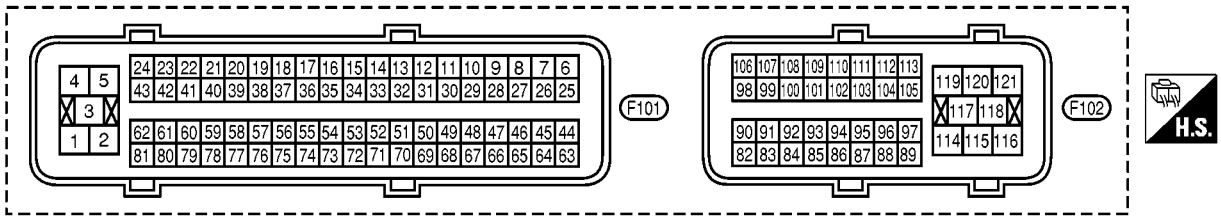
Wiring Diagram

EBS00GGK

EC-ETC1-01





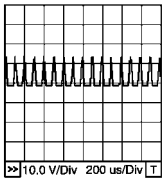
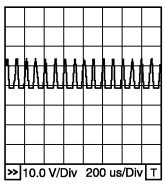


MBWA0132E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
3	R	Throttle control motor relay power supply	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)
4	BR	Throttle control motor (Close)	**[Ignition switch "ON"]** ● Shift lever position is "D" (CVT model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal is releasing	0 - 14V★  PBIB0534E
5	Y	Throttle control motor (Open)	**[Ignition switch "ON"]** ● Shift lever position is "D" (CVT model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal is depressing	0 - 14V★  PBIB0533E
104	OR	Throttle control motor relay	**[Ignition switch "OFF"]**	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"]	0 - 1.0V

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

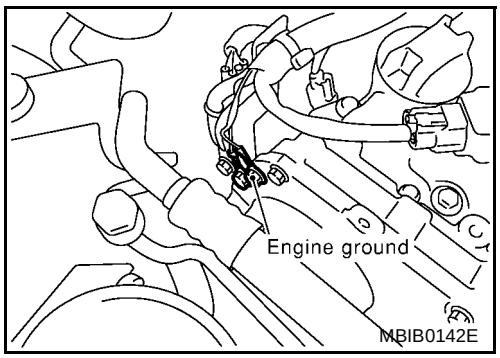
Diagnostic Procedure

EBS00GGL

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.

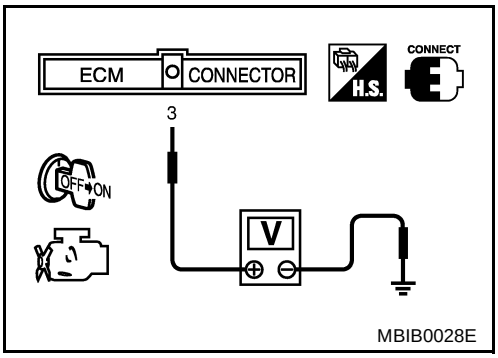


MBIB0142E

2. CHECK THROTTLE CONTROL MOTOR RELAY SIGNAL CIRCUIT

Check voltage between ECM terminal 3 and ground under the following conditions with CONSULT-II or tester.

Ignition switch	Voltage
OFF	Approximately 0V
ON	Battery voltage (11 - 14V)

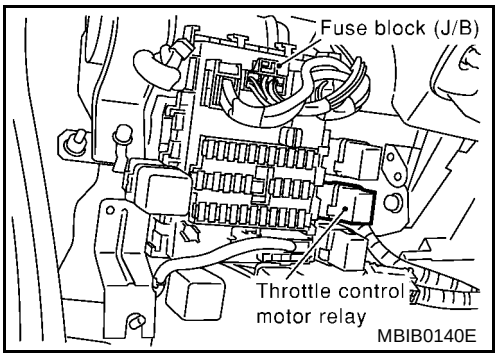


OK or NG

OK >> GO TO 10.
NG >> GO TO 3.

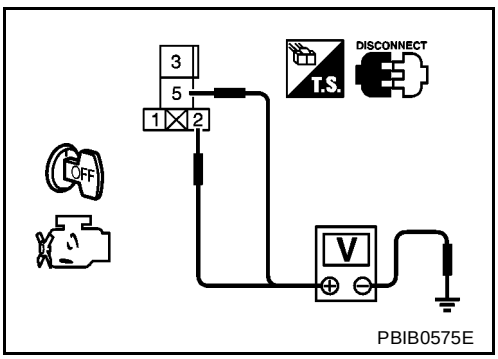
3. CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect throttle control motor relay.



3. Check voltage between throttle control motor relay terminals 2, 5 and ground.

Voltage: Battery voltage



OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

- 15A fuse
- Harness for open or short between throttle control motor relay and fuse

>> Repair or replace harness or connectors.

5. CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 3 and throttle control motor relay terminal 3. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E70, F13 (LHD models)
- Harness connectors E63, F31 (RHD models)
- Harness for open or short between ECM and throttle control motor relay

>> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK THROTTLE CONTROL MOTOR RELAY OUTPUT SIGNAL CIRCUIT

1. Check continuity between ECM terminal 104 and throttle control motor relay terminal 1. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 9.
NG >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E62, F12
- Harness for open or short between ECM and throttle control motor relay

>> Repair or replace harness or connectors.

9. CHECK THROTTLE CONTROL MOTOR RELAY

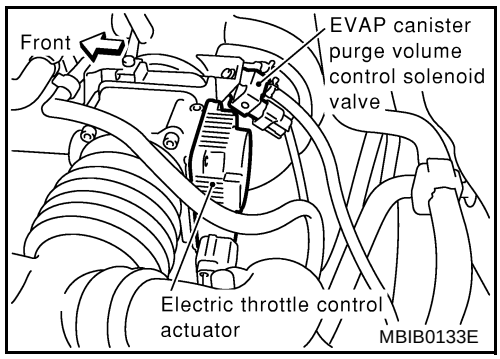
Refer to EC-1254, "Component Inspection" .

OK or NG

OK >> GO TO 13.
NG >> Replace throttle control motor relay.

10. CHECK THROTTLE CONTROL MOTOR OUTPUT SIGNAL CIRCUIT FOR OPEN OR SHORT

1. Turn ignition switch “OFF”.
2. Disconnect electric throttle control actuator harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between the following terminals. Refer to Wiring Diagram.



Electric throttle control actuator terminal	ECM terminal	Continuity
3	4	Should exist
	5	Should not exist
6	4	Should not exist
	5	Should exist

5. Also check harness for short to ground and short to power.

OK or NG

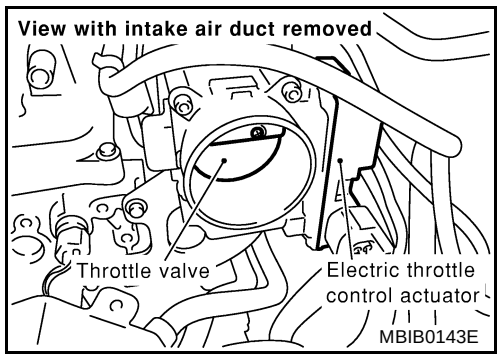
OK >> GO TO 11.
NG >> Repair or replace.

11. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Remove the intake air duct.
2. Check if foreign matter is caught between the throttle valve and the housing.

OK or NG

OK >> GO TO 12.
NG >> Remove the foreign matter and clean the electric throttle control actuator inside.



12. CHECK THROTTLE CONTROL MOTOR

Refer to EC-1254, "Component Inspection" .

OK or NG

OK >> GO TO 13.
NG >> GO TO 14.

13. CHECK INTERMITTENT INCIDENT

Refer to EC-1076, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

OK or NG

OK >> GO TO 14.
NG >> Repair or replace harness or connectors.

14. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-998, "Throttle Valve Closed Position Learning" .
3. Perform EC-999, "Idle Air Volume Learning" .

>> **INSPECTION END**

Component Inspection

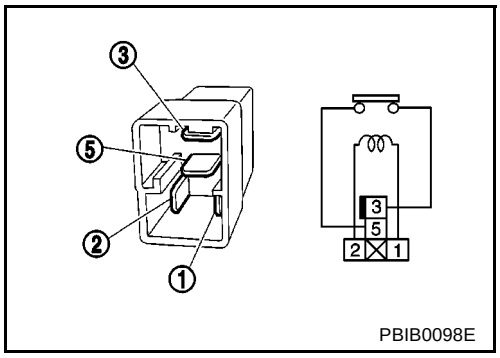
EBS00GGM

THROTTLE CONTROL MOTOR RELAY

1. Apply 12V direct current between relay terminals 1 and 2.
2. Check continuity between relay terminals 3 and 5.

Conditions	Continuity
12V direct current supply between terminals 1 and 2	Yes
No current supply	No

3. If NG, replace throttle control motor relay.



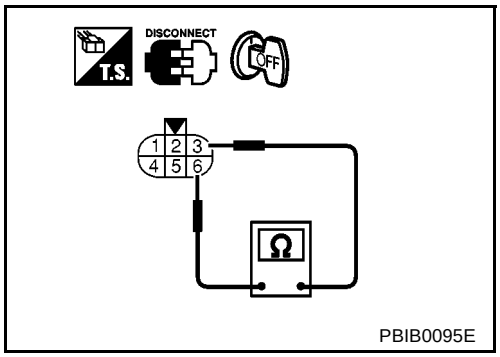
PBIB0098E

THROTTLE CONTROL MOTOR

1. Disconnect electric throttle control actuator harness connector.
2. Check resistance between terminals 3 and 6.

Resistance: Approximately 1 - 15 Ω [at 25 °C (77°F)]

3. If NG, replace electric throttle control actuator and go to next step.
4. Perform EC-998, "Throttle Valve Closed Position Learning" .
5. Perform EC-999, "Idle Air Volume Learning" .



PBIB0095E

Remove and Installation

EBS00GGN

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-116, "INTAKE MANIFOLD" .

DTC P1124, P1126 THROTTLE CONTROL MOTOR RELAY

PFP:16119

Component Description

EBS00GGO

Power supply for the Throttle Control motor is provided to the ECM via throttle control motor relay. The throttle control motor relay is ON/OFF controlled by the ECM. When the ignition switch is turned ON, the ECM sends an ON signal to throttle control motor relay and battery voltage is provided to the ECM. When the ignition switch is turned OFF, the ECM sends an OFF signal to throttle control motor relay and battery voltage is not provided to the ECM.

CONSULT-II Reference Value in Data Monitor Mode

EBS00GGP

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
THRTL RELAY	● Ignition switch: ON	ON

On Board Diagnosis Logic

EBS00GGQ

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1124 1124	Throttle control motor relay circuit short	ECM detect the throttle control motor relay is stuck ON.	● Harness or connectors (Throttle control motor relay circuit is shorted.) ● Throttle control motor relay
P1126 1126	Throttle control motor relay circuit open	ECM detects a voltage of power source for throttle control motor is excessively low. **This self-diagnosis has the one trip detection logic.**	● Harness or connectors (Throttle control motor relay circuit is open.) ● Throttle control motor relay

FAIL-SAFE MODE

When the DTC P1124 is detected in the two consecutive trips, the ECM enters fail-safe mode and MI lights up.
When the DTC P1126 is detected even in the 1st trip, the ECM enters fail-safe mode and the MI lights up.

Engine operating condition in fail-safe mode
ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

DTC Confirmation Procedure

EBS00GGR

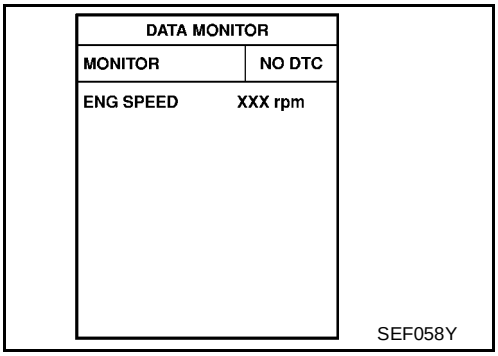
NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

PROCEDURE FOR DTC P1124

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

With CONSULT-II

1. Turn ignition switch “ON” and wait at least 1 second.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. If 1st trip DTC is detected, go to EC-1258, "Diagnostic Procedure" .



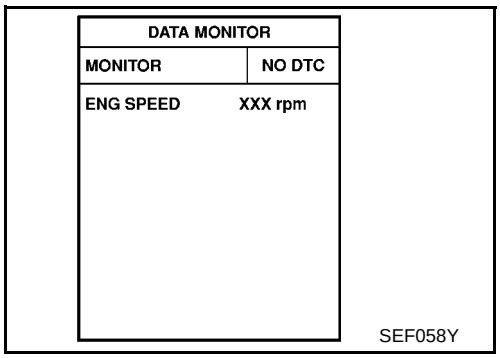
With GST

Follow the procedure “With CONSULT-II” above.

PROCEDURE FOR DTC P1126

With CONSULT-II

1. Turn ignition switch “ON” and wait at least 2 seconds.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 5 seconds.
4. If DTC is detected, go to EC-1258, "Diagnostic Procedure" .



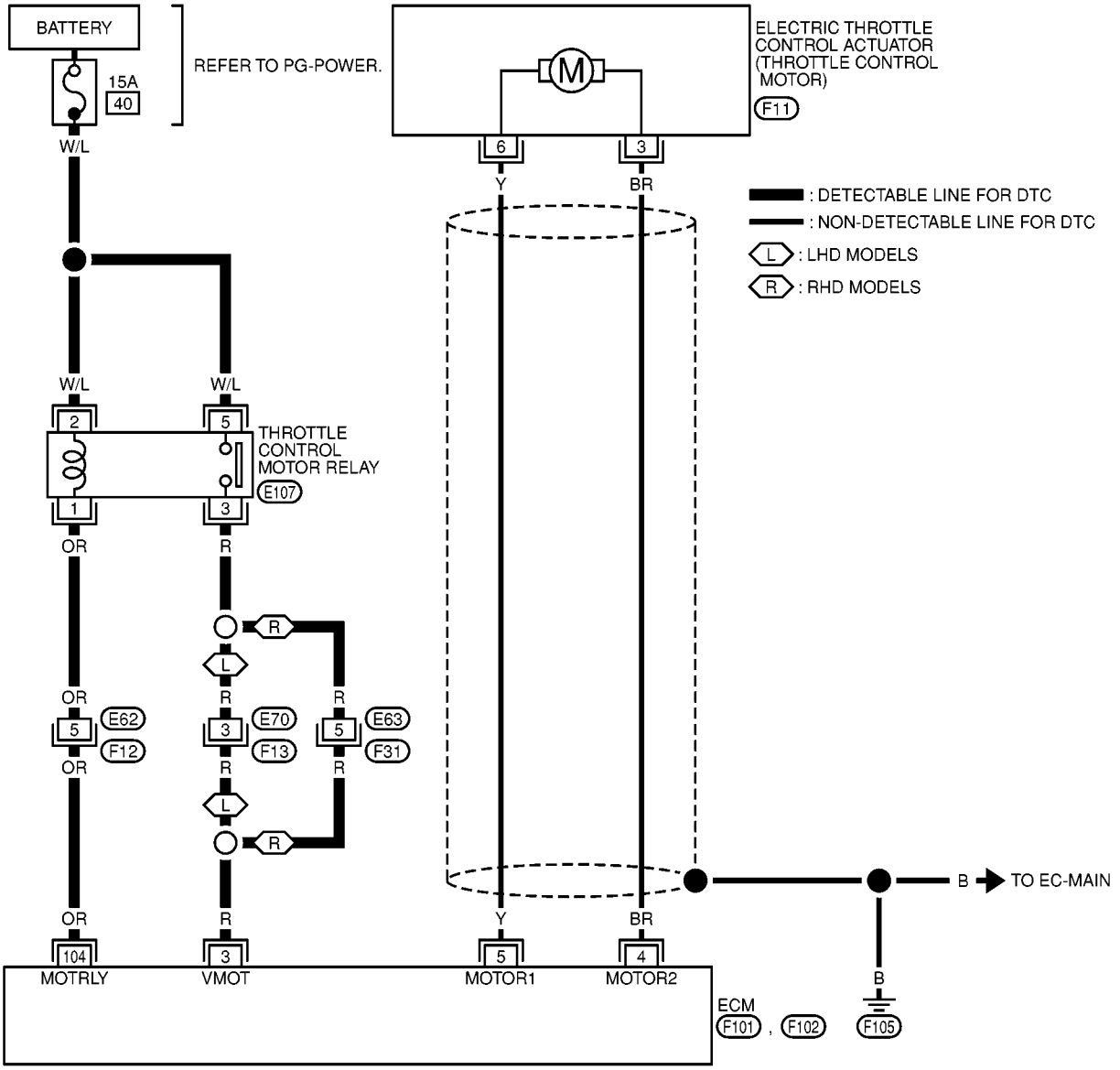
With GST

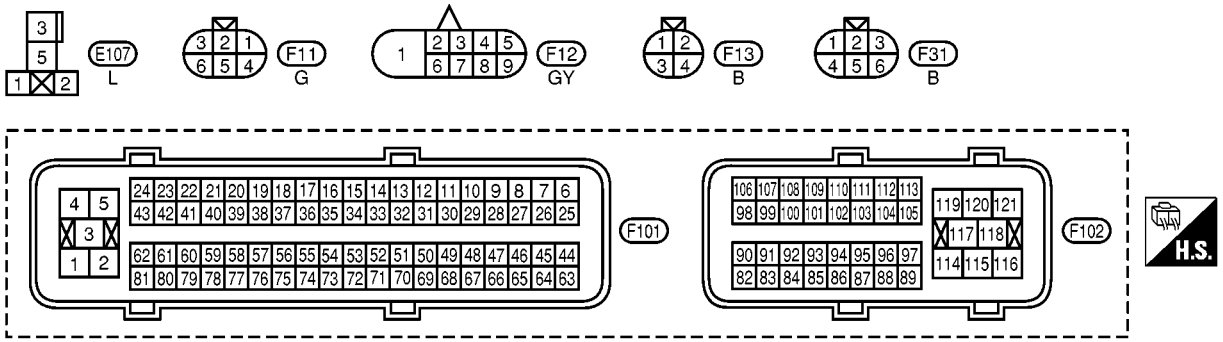
Follow the procedure “With CONSULT-II” above.

Wiring Diagram

EBS00GGS

EC-ETC2-01





MBWA0133E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

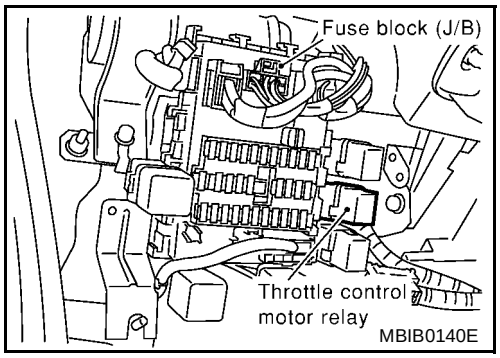
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
3	R	Throttle control motor relay power supply	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)
104	OR	Throttle control motor relay	**[Ignition switch "OFF"]**	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"]	0 - 1.0V

Diagnostic Procedure

EBS00GGT

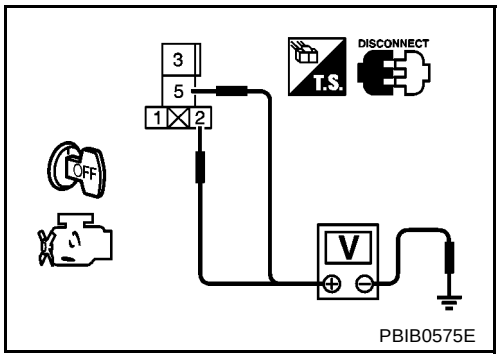
1. CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect throttle control motor relay.



3. Check voltage between throttle control motor relay terminals 2, 5 and ground.

Voltage: Battery voltage



OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

- 15A fuse
- Harness for open or short between throttle control motor relay and fuse

>> Repair or replace harness or connectors.

3. CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 3 and throttle control motor relay terminal 3. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E70, F13 (LHD models)
- Harness connectors E63, F31 (RHD models)
- Harness for open or short between ECM and throttle control motor relay

>> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK THROTTLE CONTROL MOTOR RELAY OUTPUT SIGNAL CIRCUIT

1. Check continuity between ECM terminal 104 and throttle control motor relay terminal 1. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E62, F12
- Harness for open or short between ECM and throttle control motor relay

>> Repair or replace harness or connectors.

7. CHECK THROTTLE CONTROL MOTOR RELAY

Refer to EC-1259, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> Replace throttle control motor relay.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-1076, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

EBS00GGU

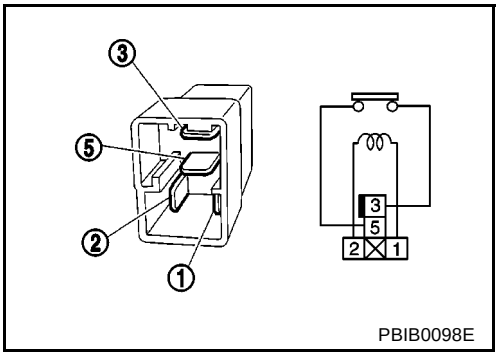
THROTTLE CONTROL MOTOR RELAY

1. Apply 12V direct current between relay terminals 1 and 2.

2. Check continuity between relay terminals 3 and 5.

Conditions	Continuity
12V direct current supply between terminals 1 and 2	Yes
No current supply	No

3. If NG, replace throttle control motor relay.



PBIB0098E

DTC P1128 THROTTLE CONTROL MOTOR

PFP:16119

Component Description

EBS00GGV

The throttle control motor is operated by the ECM and it opens and closes the throttle valve.
The current opening angle of the throttle valve is detected by the throttle position sensor and it provides feedback to the ECM to control the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

On Board Diagnosis Logic

EBS00GGW

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1128 1128	Throttle control motor circuit short	ECM detects short both circuits between ECM and throttle control motor.	● Harness or connectors (Throttle control motor circuit is shorted.) ● Electric throttle control actuator (Throttle control motor)

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MI lights up.

Engine operating condition in fail-safe mode
ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

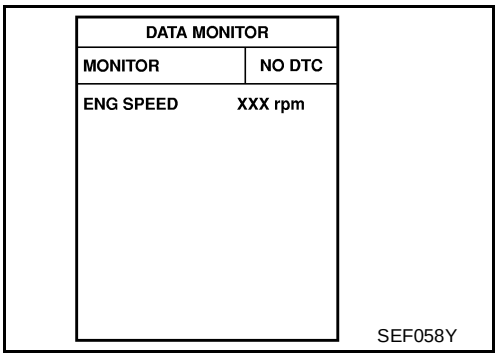
DTC Confirmation Procedure

EBS00GGX

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON” and wait at least 2 seconds.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 5 seconds.
4. If DTC is detected, go to EC-1263, "Diagnostic Procedure" .



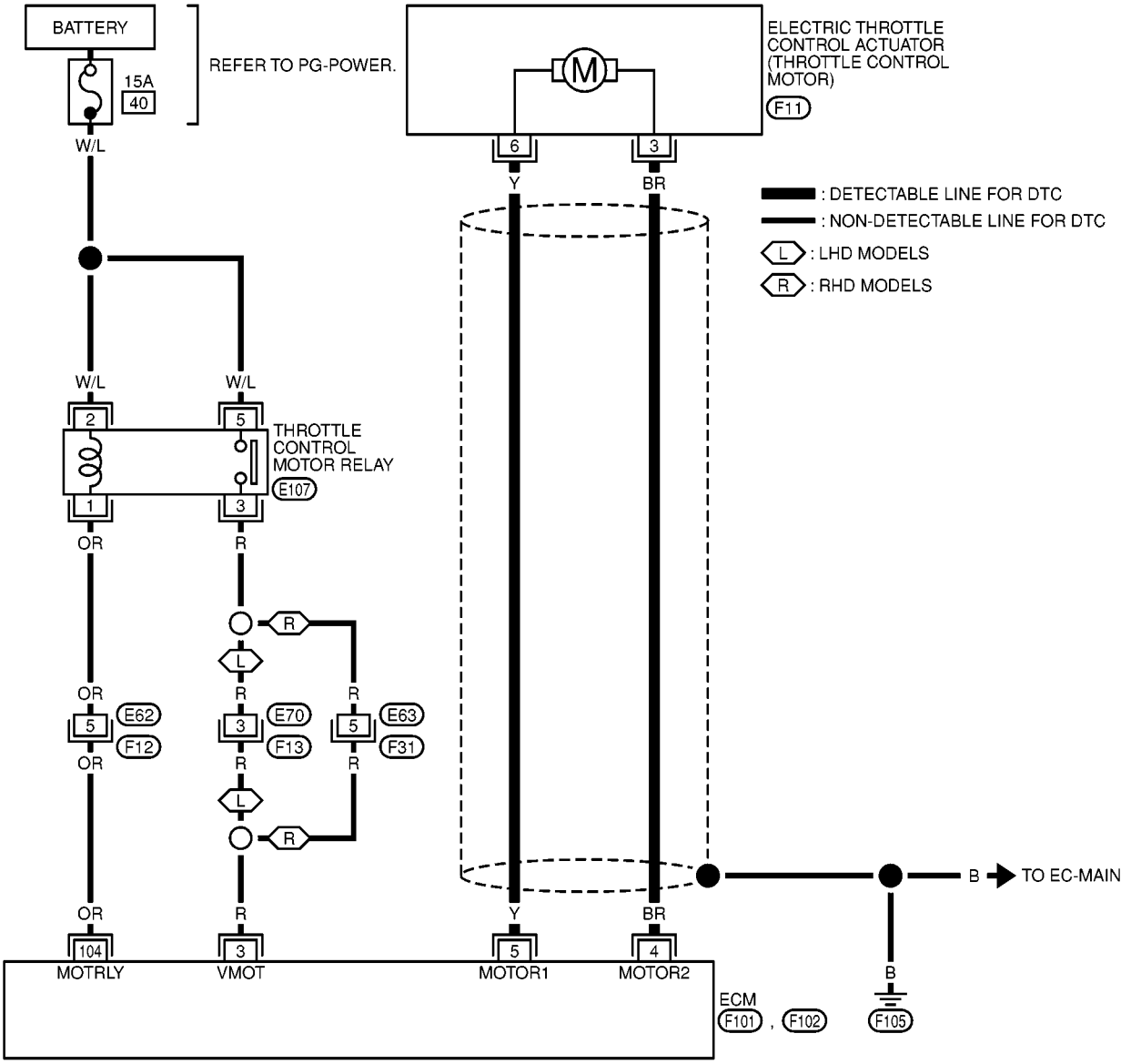
WITH GST

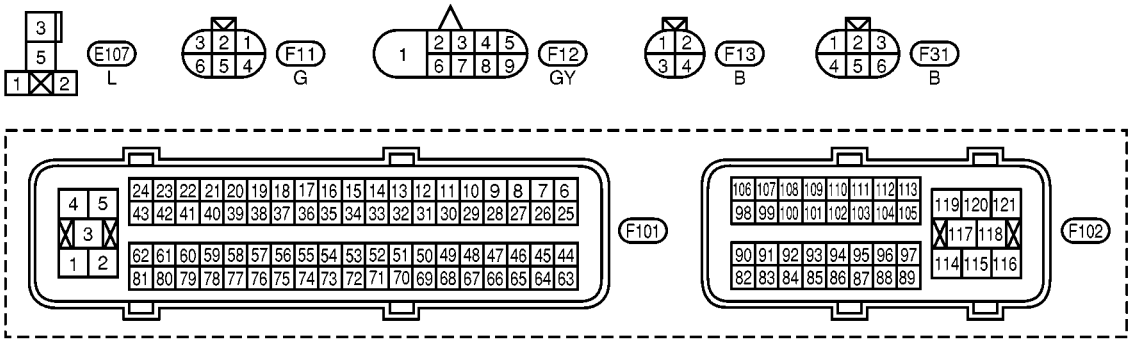
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

EBS00GGY

EC-ETC3-01



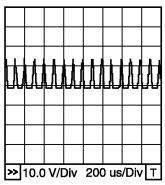
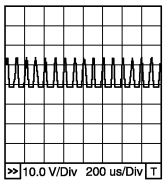


MBWA0134E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
4	BR	Throttle control motor (Close)	**[Ignition switch "ON"]** ● Shift lever position is "D" (CVT model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal is releasing	0 - 14V★  PBIB0534E
5	Y	Throttle control motor (Open)	**[Ignition switch "ON"]** ● Shift lever position is "D" (CVT model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal is depressing	0 - 14V★  PBIB0533E

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

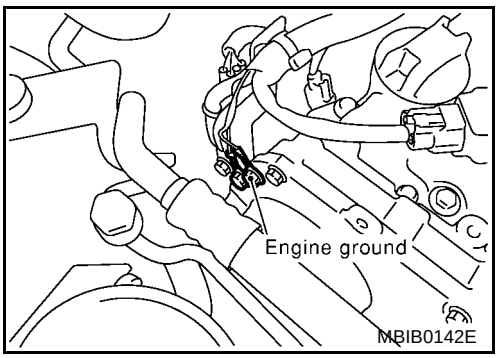
Diagnostic Procedure

EBS00GGZ

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

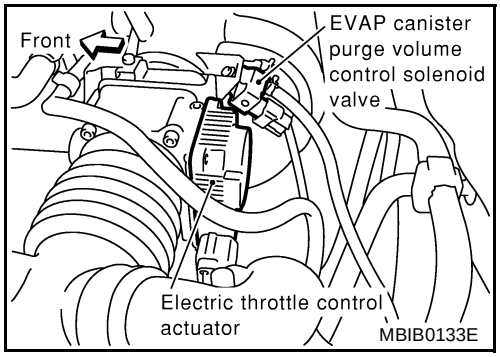
>> GO TO 2.



MBIB0142E

2. CHECK THROTTLE CONTROL MOTOR OUTPUT SIGNAL CIRCUIT FOR OPEN OR SHORT

1. Turn ignition switch “OFF”.
2. Disconnect electric throttle control actuator harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between the following terminals. Refer to Wiring Diagram.



Electric throttle control actuator terminal	ECM terminal	Continuity
3	4	Should exist
	5	Should not exist
6	4	Should not exist
	5	Should exist

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 3.
NG >> Repair or replace.

3. CHECK THROTTLE CONTROL MOTOR

Refer to EC-1264, "Component Inspection" .

OK or NG

OK >> GO TO 4.
NG >> GO TO 5.

4. CHECK INTERMITTENT INCIDENT

Refer to EC-1076, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

OK or NG

OK >> GO TO 5.
NG >> Repair or replace harness or connectors.

5. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-998, "Throttle Valve Closed Position Learning" .
3. Perform EC-999, "Idle Air Volume Learning" .

>> **INSPECTION END**

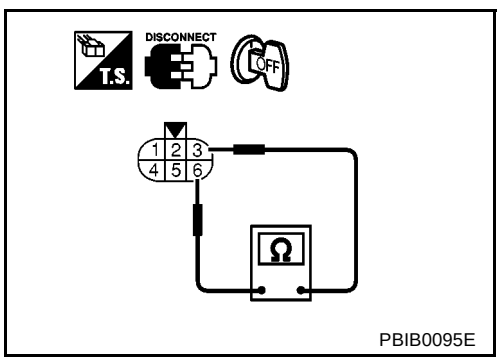
Component Inspection

EBS00GH0

THROTTLE CONTROL MOTOR

1. Disconnect electric throttle control actuator harness connector.
2. Check resistance between terminals 3 and 6.

Resistance: Approximately 1 - 15 Ω [at 25 °C (77°F)]



3. If NG, replace electric throttle control actuator and go to next step.
4. Perform EC-998, "Throttle Valve Closed Position Learning" .
5. Perform EC-999, "Idle Air Volume Learning" .

Remove and Installation

EBS00GH1

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-116, "INTAKE MANIFOLD" .

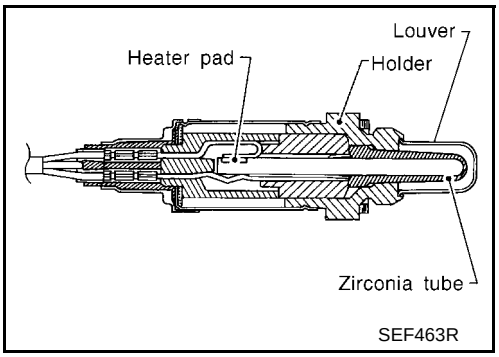
DTC P1143 HO2S1

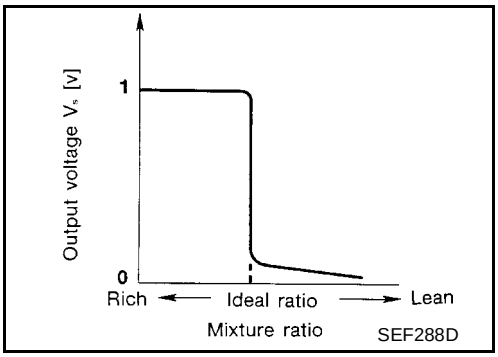
PFP:22690

Component Description

EBS00GH2

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.





CONSULT-II Reference Value in Data Monitor Mode

EBS00GH3

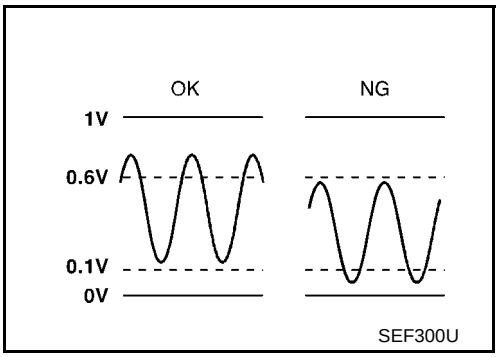
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S1 (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S1 MNTR (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	LEAN ←→ RICH Changes more than 5 times during 10 seconds.

On Board Diagnosis Logic

EBS00GH4

To judge the malfunction, the output from the heated oxygen sensor 1 is monitored to determine whether the “rich” output is sufficiently high and whether the “lean” output is sufficiently low. When both the outputs are shifting to the lean side, the malfunction will be detected.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1143 1143	Heated oxygen sensor 1 lean shift monitoring	The maximum and minimum voltage from the sensor are not reached to the specified voltages.	● Heated oxygen sensor 1 ● Heated oxygen sensor 1 heater ● Fuel pressure ● Injectors ● Intake air leaks

DTC Confirmation Procedure

EBS00GH5

CAUTION:
Always drive vehicle at a safe speed.

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

- **Always perform at a temperature above −10°C (14°F).**
- **Before performing following procedure, confirm that battery voltage is more than 11V at idle.**

WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Stop engine and wait at least 10 seconds.
3. Turn ignition switch “ON” and select “HO2S1 (B1) P1143” of “HO2S1” in “DTC WORK SUPPORT” mode with CONSULT-II.
4. Touch “START”.
5. Start engine and let it idle for at least 3 minutes.

   NOTE:
   Never raise engine speed above 3,600 rpm after this step. If the engine speed limit is exceeded, return to step 5.

HO2S1 (B1) P1143	
OUT OF CONDITION	
MONITOR	
ENG SPEED	XXX rpm
B/FUEL SCHDL	XXX msec
COOLAN TEMP/S	XXX °C
VHCL SPEED SEN	XXX km/h

PBIB0546E

6. When the following conditions are met, “TESTING” will be displayed on the CONSULT-II screen. Maintain the conditions continuously until “TESTING” changes to “COMPLETED”. (It will take approximately 50 seconds or more.)

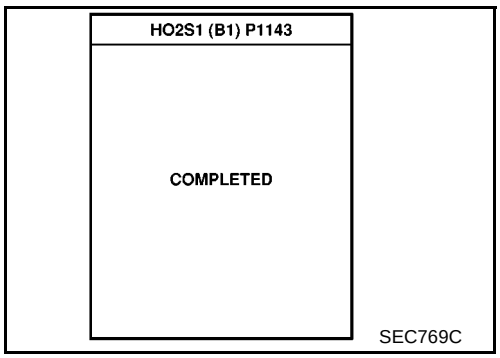
ENG SPEED	1,400 - 3,200 rpm
Vehicle speed	Less than 100 km/h (62 MPH)
B/FUEL SCHDL	2.9 - 14.5 msec
Selector lever	Suitable position

If “TESTING” is not displayed after 5 minutes, retry from step 2.

HO2S1 (B1) P1143	
TESTING	
MONITOR	
ENG SPEED	XXX rpm
B/FUEL SCHDL	XXX msec
COOLAN TEMP/S	XXX °C
VHCL SPEED SEN	XXX km/h

PBIB0547E

7. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”. If “NG” is displayed, refer to EC-1268, "Diagnostic Procedure" .



Overall Function Check

EBS00GH6

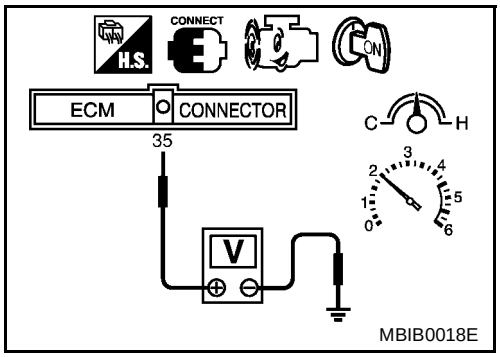
Use this procedure to check the overall function of the heated oxygen sensor 1 circuit. During this check, a 1st trip DTC might not be confirmed.

WITH GST

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 (HO2S1 signal) and engine ground.
3. Check one of the following with engine speed held at 2,000 rpm constant under no load.

- The maximum voltage is over 0.6V at least one time.
- The minimum voltage is over 0.1V at least one time.

4. If NG, go to EC-1268, "Diagnostic Procedure" .



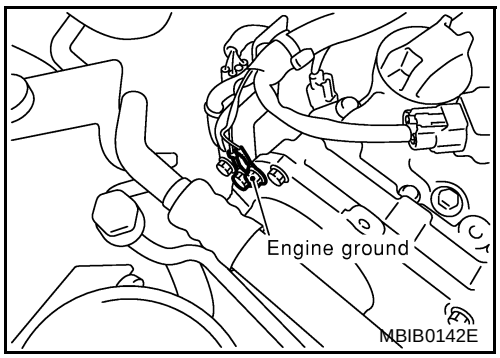
Diagnostic Procedure

EBS00GH7

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

>> GO TO 2.

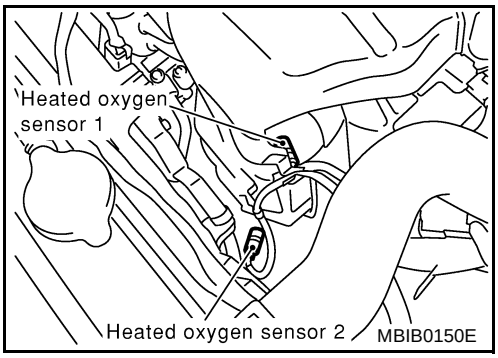


2. RETIGHTEN HEATED OXYGEN SENSOR 1

Loosen and retighten heated oxygen sensor 1.

Tightening torque: 40 - 50 N·m (4.1 - 5.1 kg-m, 30 - 37 ft-lb)

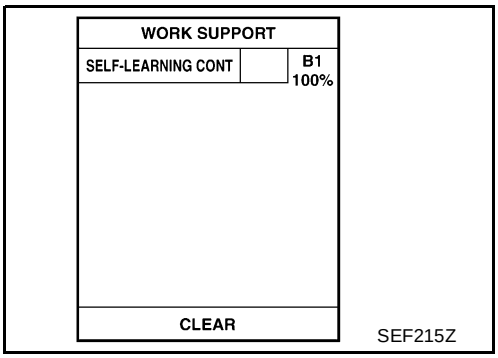
>> GO TO 3.



3. CLEAR THE SELF-LEARNING DATA

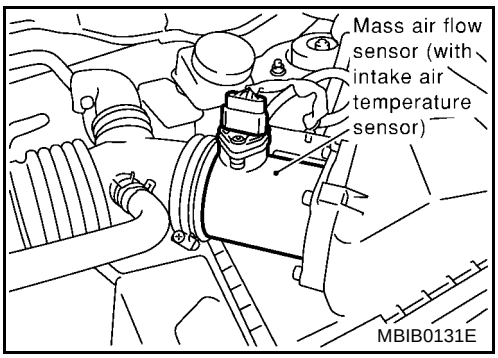
With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching “CLEAR”.
4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 detected?
   Is it difficult to start engine?



Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF”.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure that DTC P0102 is displayed.
6. Erase the DTC memory. Refer to EC-1015, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
7. Make sure that DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 detected?
   Is it difficult to start engine?



Yes or No

Yes >> Perform trouble diagnosis for DTC P0171. Refer to EC-1157 .
No >> GO TO 4.

4. CHECK HEATED OXYGEN SENSOR 1 HEATER

Refer to EC-1094, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace heated oxygen sensor 1.

5. CHECK HEATED OXYGEN SENSOR 1

Refer to EC-1270, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace heated oxygen sensor 1.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-1076, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .
For circuit, refer to EC-1121, "Wiring Diagram" .

>> **INSPECTION END**

Component Inspection

EBS00GH8

HEATED OXYGEN SENSOR 1

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “MANU TRIG” and adjust “TRIGGER POINT” to 100% in “DATA MONITOR” mode with CONSULT-II.
3. Select “HO2S1 (B1)” and “HO2S1 MNTR (B1)”.
4. Hold engine speed at 2,000 rpm under no load during the following steps.
5. Touch “RECORD” on CONSULT-II screen.

DATA MONITOR	
MONITOR	NO DTC
ENG SPEED	XXX rpm
MAS A/F SE-B1	XXX V
COOLAN TEMP/S	XXX °C
HO2S1 (B1)	XXX V
HO2S1 MNTR (B1)	LEAN

SEF646Y

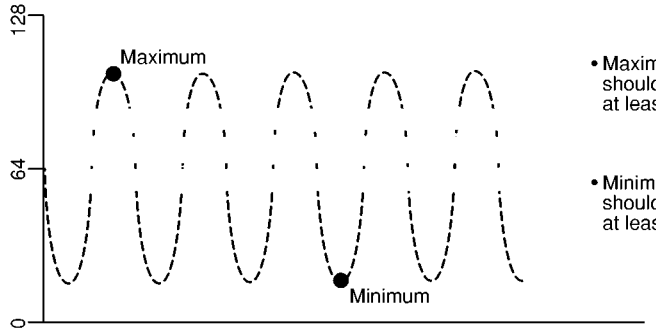
6. Check the following.
   - “HO2S1 MNTR (B1)” in “DATA MONITOR” mode changes from “RICH” to “LEAN” to “RICH” 5 times in 10 seconds.
     5 times (cycles) are counted as shown at right.
   - “HO2S1 (B1)” voltage goes above 0.6V at least once.
   - “HO2S1 (B1)” voltage goes below 0.3V at least once.
   - “HO2S1 (B1)” voltage never exceeds 1.0V.

cycle	1	2	3	4	5
HO2S1 MNTR (B1)	R-L	R-L	R-L	R-L	R-L

R means HO2S1 MNTR (B1) indicates RICH
L means HO2S1 MNTR (B1) indicates LEAN

SEF217YA

Trigger	ENG SPEED	HO2S1 (B1)
	rpm	V
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX



SEF648Y

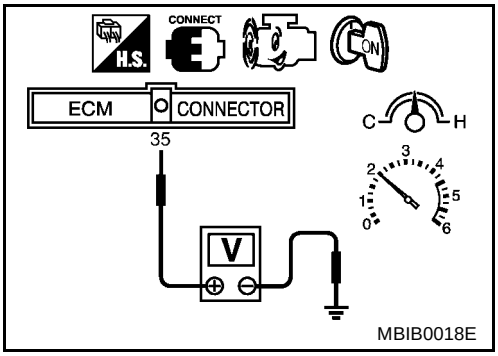
CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 (HO2S1 signal) and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no load.
   - The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds.
   - The maximum voltage is over 0.6V at least one time.
   - The minimum voltage is below 0.3V at at least one time.
   - The voltage never exceeds 1.0V.

   1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V
   2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V



CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

EBS00GH9

HEATED OXYGEN SENSOR 1

Refer to EM-121, "EXHAUST MANIFOLD AND THREE WAY CATALYST" .

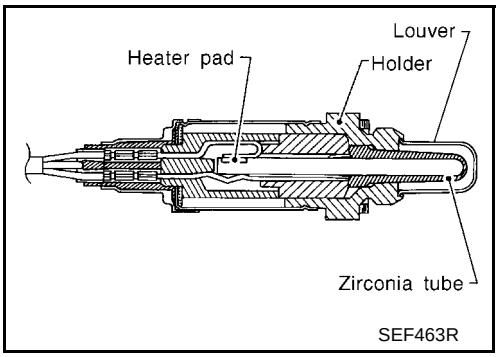
DTC P1144 HO2S1

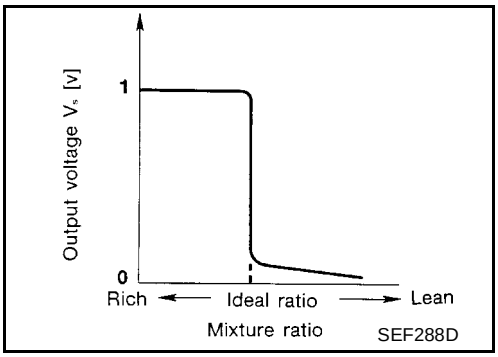
PFP:22690

Component Description

EBS00GHA

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.





CONSULT-II Reference Value in Data Monitor Mode

EBS00GHB

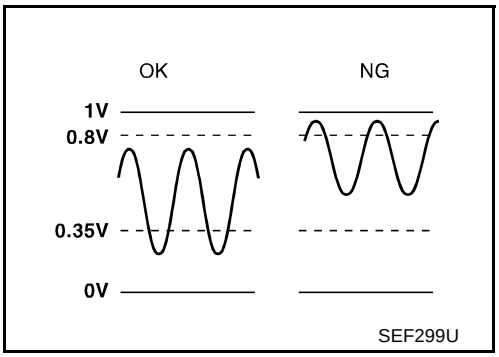
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S1 (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S1 MNTR (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	LEAN ←→ RICH Changes more than 5 times during 10 seconds.

On Board Diagnosis Logic

EBS00GHC

To judge the malfunction, the output from the heated oxygen sensor 1 is monitored to determine whether the “rich” output is sufficiently high. The “lean” output is sufficiently low. When both the outputs are shifting to the rich side, the malfunction will be detected.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1144 1144	Heated oxygen sensor 1 rich shift monitoring	The maximum and minimum voltages from the sensor are beyond the specified voltages.	● Heated oxygen sensor 1 ● Heated oxygen sensor 1 heater ● Fuel pressure ● Injectors

DTC Confirmation Procedure

EBS00GHD

CAUTION:
Always drive vehicle at a safe speed.

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

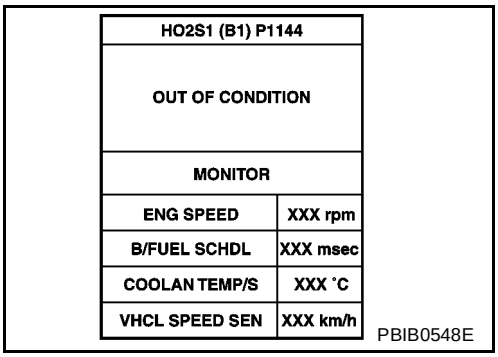
TESTING CONDITION:

- **Always perform at a temperature above −10°C (14°F).**
- **Before performing the following procedure, confirm that battery voltage is more than 11V at idle.**

WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Stop engine and wait at least 5 seconds.
3. Turn ignition switch “ON” and select “HO2S1 (B1) P1144” of “HO2S1” in “DTC WORK SUPPORT” mode with CONSULT-II.
4. Touch “START”.
5. Start engine and let it idle for at least 3 minutes.

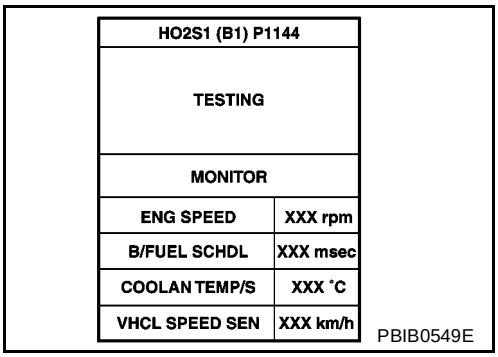
   NOTE:
   Never raise engine speed above 3,600 rpm after this step. If the engine speed limit is exceeded, return to step 5.



PBIB0548E

6. When the following conditions are met, “TESTING” will be displayed on the CONSULT-II screen. Maintain the conditions continuously until “TESTING” changes to “COMPLETED”. (It will take approximately 50 seconds or more.)

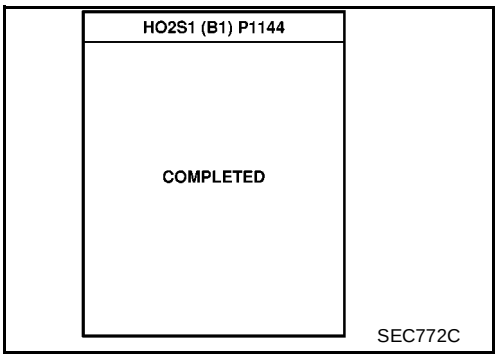
ENG SPEED	1,400 - 3,200 rpm
Vehicle speed	Less than 100 km/h (62 MPH)
B/FUEL SCHDL	2.9 - 14.5 msec
Selector lever	Suitable position



PBIB0549E

   If “TESTING” is not displayed after 5 minutes, retry from step 2.

7. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”. If “NG” is displayed, refer to EC-1274, "Diagnostic Procedure" .



SEC772C

Overall Function Check

EBS00GHE

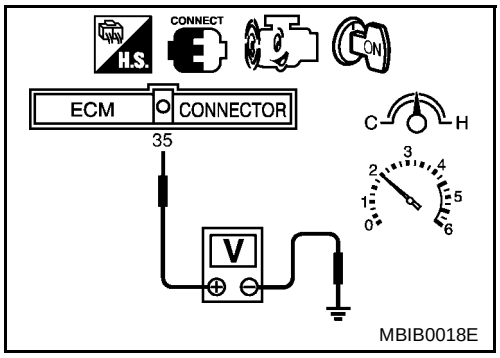
Use this procedure to check the overall function of the heated oxygen sensor 1 circuit. During this check, a 1st trip DTC might not be confirmed.

WITH GST

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 (HO2S1 signal) and engine ground.
3. Check one of the following with engine speed held at 2,000 rpm constant under no load.

- The maximum voltage is below 0.8V at at least one time.
- The minimum voltage is below 0.35V at least one time.

4. If NG, go to EC-1274, "Diagnostic Procedure" .



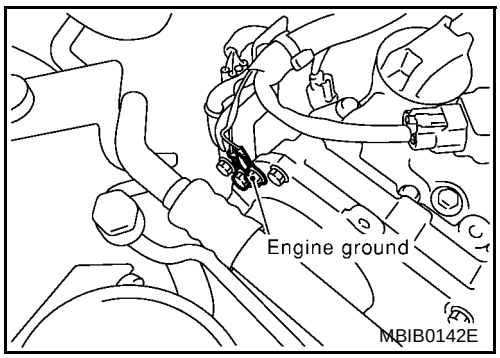
Diagnostic Procedure

EBS00GHF

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

>> GO TO 2.

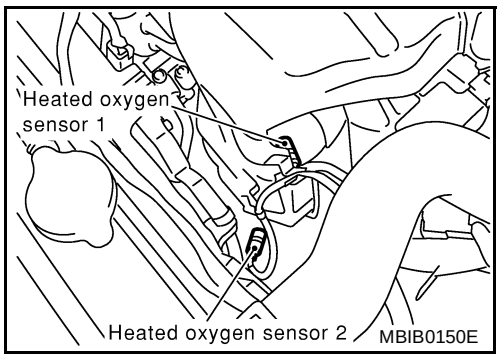


2. RETIGHTEN HEATED OXYGEN SENSOR 1

Loosen and retighten heated oxygen sensor 1.

Tightening torque: 40 - 50 N·m (4.1 - 5.1 kg-m, 30 - 37 ft-lb)

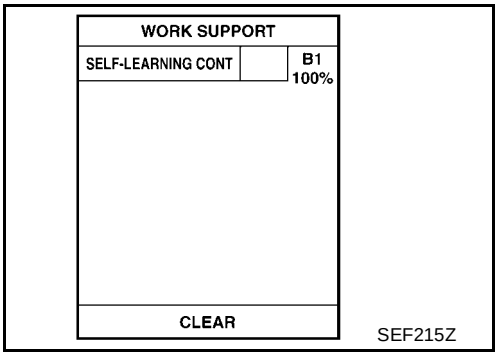
>> GO TO 3.



3. CLEAR THE SELF-LEARNING DATA

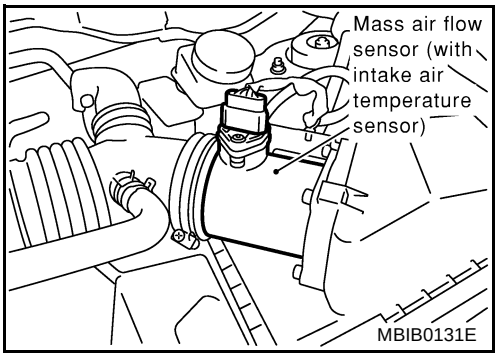
With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching “CLEAR”.
4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0172 detected?
   Is it difficult to start engine?



Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF”.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure that DTC P0102 is displayed.
6. Erase the DTC memory. Refer to EC-1015, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
7. Make sure that DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0172 detected?
   Is it difficult to start engine?



Yes or No

Yes >> Perform trouble diagnosis for DTC P0172. Refer to EC-1163 .
No >> GO TO 4.

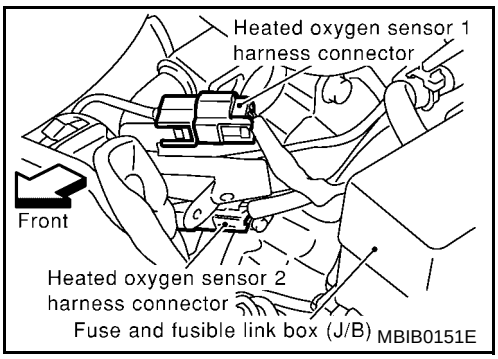
4. CHECK HO2S1 CONNECTOR FOR WATER

1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 1 harness connector.
3. Check connectors for water.

Water should not exist.

OK or NG

OK >> GO TO 5.
NG >> Repair or replace harness or connectors.



5. CHECK HEATED OXYGEN SENSOR 1 HEATER

Refer to EC-1094, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace heated oxygen sensor 1.

6. CHECK HEATED OXYGEN SENSOR 1

Refer to EC-1276, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace heated oxygen sensor 1.

7. CHECK INTERMITTENT INCIDENT

Refer to EC-1076, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .
For circuit, refer to EC-1121, "Wiring Diagram" .

>> **INSPECTION END**

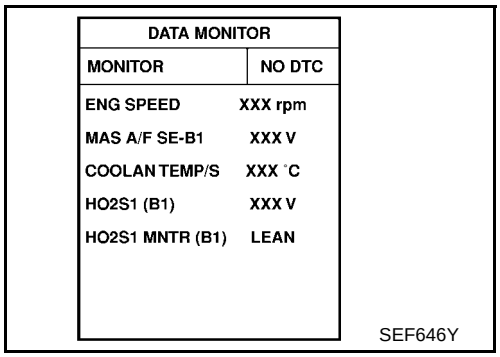
Component Inspection

EBS00GHG

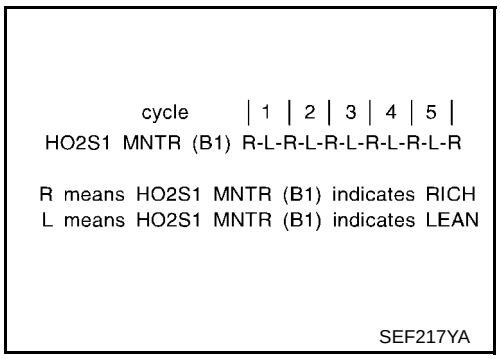
HEATED OXYGEN SENSOR 1

With CONSULT-II

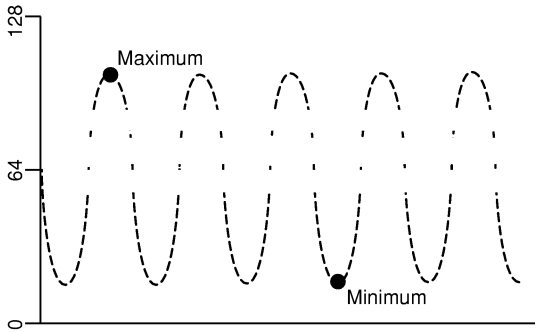
1. Start engine and warm it up to normal operating temperature.
2. Select “MANU TRIG” and adjust “TRIGGER POINT” to 100% in “DATA MONITOR” mode with CONSULT-II.
3. Select “HO2S1 (B1)” and “HO2S1 MNTR (B1)”.
4. Hold engine speed at 2,000 rpm under no load during the following steps.
5. Touch “RECORD” on CONSULT-II screen.



6. Check the following.
   - “HO2S1 MNTR (B1)” in “DATA MONITOR” mode changes from “RICH” to “LEAN” to “RICH” 5 times in 10 seconds.
     5 times (cycles) are counted as shown at right.
   - “HO2S1 (B1)” voltage goes above 0.6V at least once.
   - “HO2S1 (B1)” voltage goes below 0.3V at least once.
   - “HO2S1 (B1)” voltage never exceeds 1.0V.



Trigger	ENG SPEED	HO2S1 (B1)
	rpm	V
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX



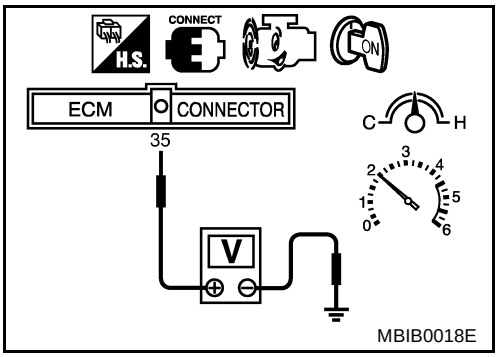
CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 (HO2S1 signal) and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no load.
   - The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds.
   - The maximum voltage is over 0.6V at least one time.
   - The minimum voltage is below 0.3V at least one time.
   - The voltage never exceeds 1.0V.

   1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V
   2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V



CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

EBS00GHH

HEATED OXYGEN SENSOR 1

Refer to EM-121, "EXHAUST MANIFOLD AND THREE WAY CATALYST" .

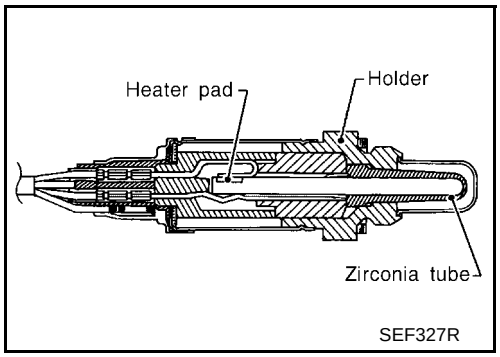
DTC P1146 HO2S2

PFP:226A0

Component Description

EBS00GHI

The heated oxygen sensor 2, after three way catalyst (manifold), monitors the oxygen level in the exhaust gas on each bank.
Even if switching characteristics of the heated oxygen sensor 1 are shifted, the air fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.
This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.
Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.



CONSULT-II Reference Value in Data Monitor Mode

EBS00GHJ

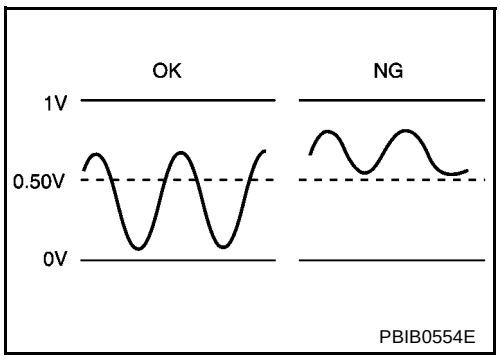
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S2 (B1)	● Engine: After warming up	Revving engine from idle to 3,000 rpm quickly.	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S2 MNTR (B1)	● Engine: After warming up	Revving engine from idle to 3,000 rpm quickly.	LEAN ←→ RICH

On Board Diagnosis Logic

EBS00GHK

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the heated oxygen sensor 1. The oxygen storage capacity before the three way catalyst causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the minimum voltage of sensor is sufficiently low during the various driving condition such as fuel-cut.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1146 1146	Heated oxygen sensor 2 minimum voltage monitoring	The minimum voltage from the sensor is not reached to the specified voltage.	● Harness or connectors (The sensor circuit is open or shorted.) ● Heated oxygen sensor 2 ● Fuel pressure ● Injectors

DTC Confirmation Procedure

EBS00GHL

CAUTION:
Always drive vehicle at a safe speed.

NOTE:

- **“COMPLETED” will appear on CONSULT-II screen when all tests “COND1”, “COND2” and “COND3” are completed.**
- If “DTC confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

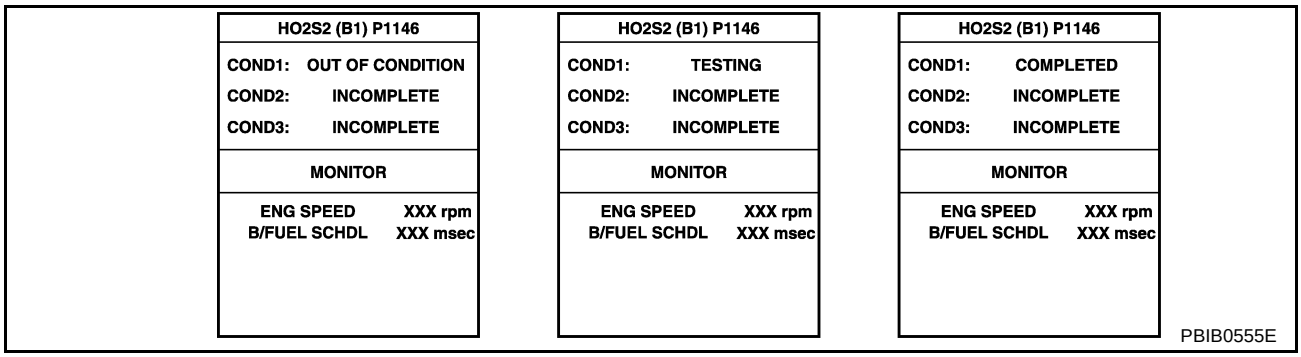
TESTING CONDITION:
Never stop engine during this procedure. If the engine is stopped, retry procedure from step 2 in “Procedure for COND1”

WITH CONSULT-II

Procedure for COND1

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Turn ignition switch “ON” and select “HO2S2 (B1) P1146” of “HO2S2” in “DTC WORK SUPPORT” mode with CONSULT-II.
4. Touch START”.
5. Start engine and let it idle for at least 30 seconds.
6. Rev engine up to 2,000 rpm 2 or 3 times quickly under no load.
   If “COMPLETED” appears on CONSULT-II screen, go to step 2 in Procedure for COND3”.
   If “COMPLETED” does not appear on CONSULT-II screen, go to the following step.
7. Drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
8. When the following conditions are met, “TESTING” will be displayed at “COND1” on the CONSULT-II screen. Maintain the conditions continuously until “TESTING” changes to “COMPLETED”. (It will take approximately 60 seconds.)

ENG SPEED	More than 1,000 rpm
B/FUEL SCHDL	More than 1.0 msec
COOLANT TEMP/S	70 - 105°C
Selector lever	Suitable position



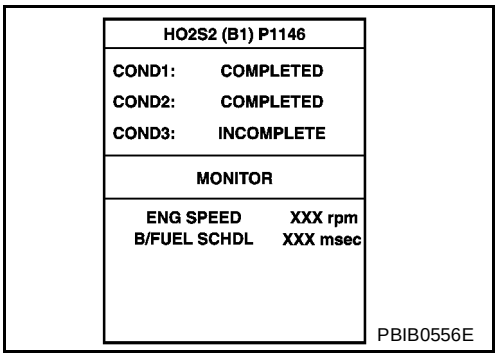
NOTE:

- **If “TESTING” is not displayed after 5 minutes, retry from step 2 in “Procedure for COND1”.**
- **If “COMPLETED” already appears at “COND2” on CONSULT-II screen before “Procedure for COND2” is conducted, it is unnecessary to conduct step 1 in “Procedure for COND2”.**

Procedure for COND2

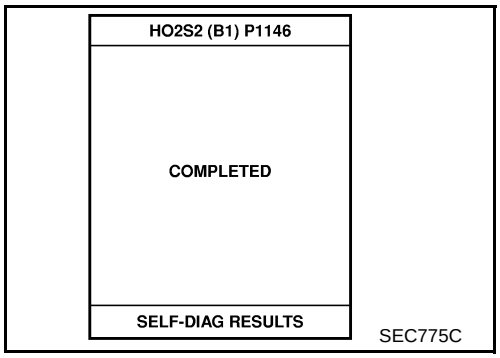
1. While driving, release accelerator pedal completed from the above condition [step 8] until “INCOMPLETE” at “COND2” on CONSULT-II screen has turned to “COMPLETED” (It will take approximately 4 seconds.)

   NOTE:
   If “COMPLETE” already appears at “COND3” on CONSULT-II screen before “Procedure for COND3” is conducted, it is unnecessary to conduct step 1 in “Procedure for COND3”.



Procedure for COND3

1. Stop vehicle and let it idle until “INCOMPLETE” of “COND3” on CONSULT-II screen has turned to “COMPLETED”. (It will take a maximum of approximately 6 minutes.)
2. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”.
   If “NG” is displayed, refer to EC-1282, "Diagnostic Procedure" .



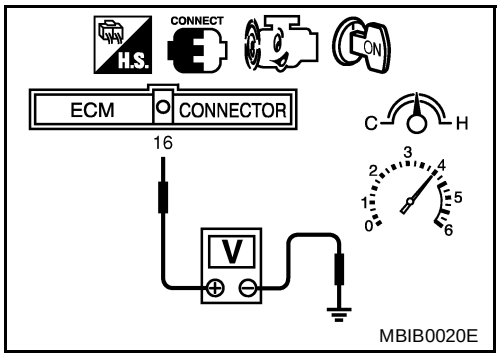
Overall Function Check

EBS00GHM

Use this procedure to check the overall function of the heated oxygen sensor 2 circuit. During this check, a 1st trip DTC might not be confirmed.

WITH GST

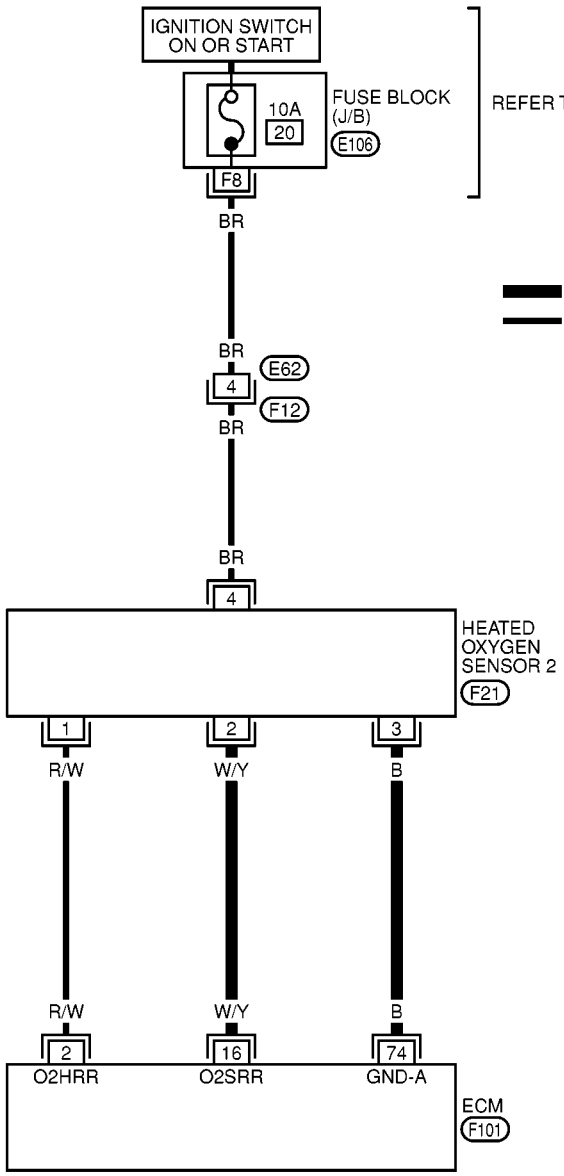
1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Set voltmeter probes between ECM terminal 16 (HO2S2 signal) and engine ground.
4. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be below 0.50V at least once during this procedure.
   If the voltage can be confirmed in step 4, step 5 is not necessary.
5. Keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in “D” position (CVT), 3rd gear position (M/T).
   The voltage should be below 0.50V at least once during this procedure.
6. If NG, go to EC-1282, "Diagnostic Procedure" .

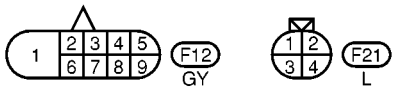


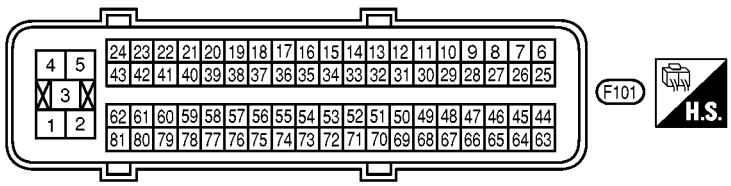
Wiring Diagram

EBS00GHN

EC-HO2S2-01







REFER TO THE FOLLOWING.
E106 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0010E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
16	W/Y	Heated oxygen sensor 2	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V
74	B	Sensors' ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V

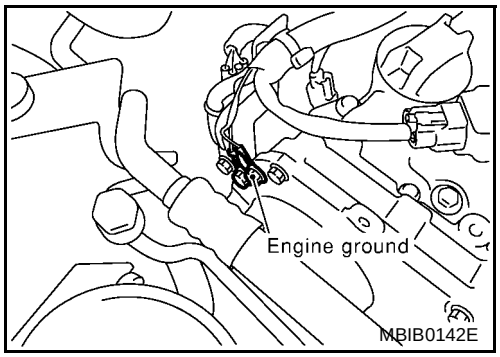
Diagnostic Procedure

EBS00GHO

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

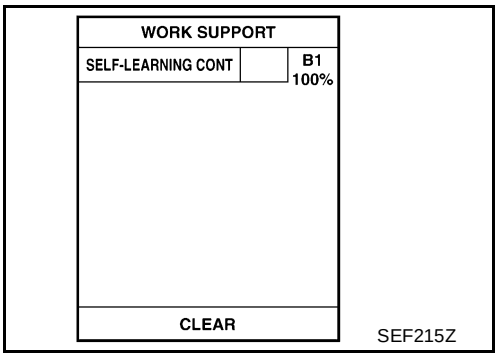
>> GO TO 2.



2. CLEAR THE SELF-LEARNING DATA

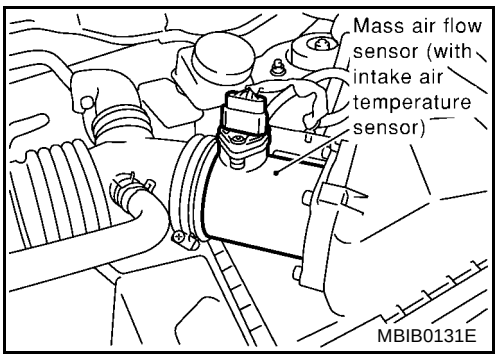
With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching “CLEAR”.
4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0172 detected?
   Is it difficult to start engine?



Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF”.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure that DTC P0102 is displayed.
6. Erase the DTC memory. Refer to EC-1015, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
7. Make sure that DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0172 detected?
   Is it difficult to start engine?



Yes or No

Yes >> Perform trouble diagnosis for DTC P0172. Refer to EC-1163 .
No >> GO TO 3.

3. CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

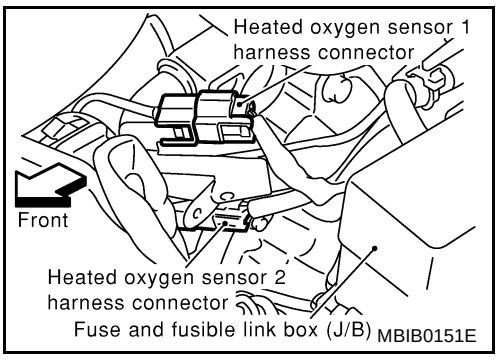
1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 2 harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminal 74 and HO2S2 terminal 3.
   Refer to Wiring Diagram.

   Continuity should exist.

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.



4. CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 16 and HO2S2 terminal 2.
   Refer to Wiring Diagram.

   Continuity should exist.

2. Check harness continuity between ECM terminal 16 or HO2S2 terminal 2 and ground.
   Refer to Wiring Diagram.

   Continuity should not exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK HEATED OXYGEN SENSOR 2

Refer to EC-1284, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace heated oxygen sensor 2.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-1076, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

EBS00GHP

HEATED OXYGEN SENSOR 2

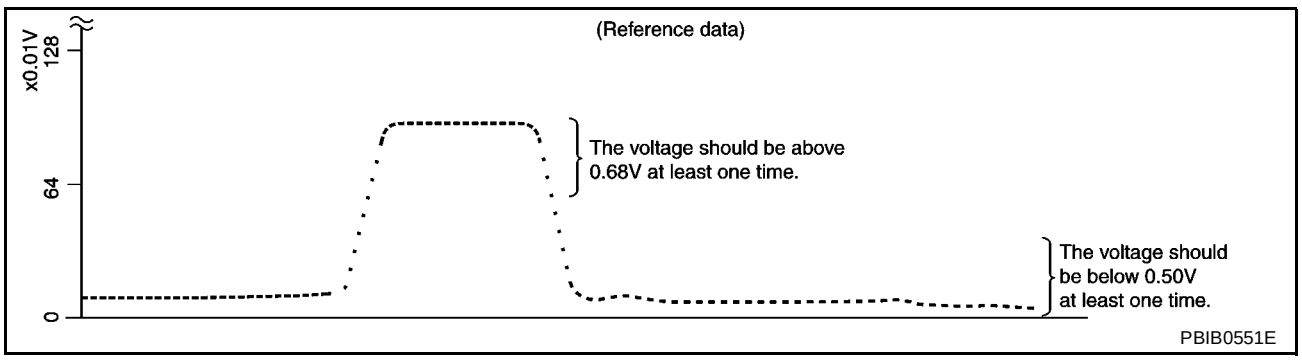
With CONSULT-II

1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)” as the monitor item with CONSULT-II.

ACTIVE TEST	
FUEL INJECTION	25 %
MONITOR	
ENG SPEED	XXX rpm
HO2S1 (B1)	XXX V
HO2S2 (B1)	XXX V
HO2S1 MNTR (B1)	RICH
HO2S2 MNTR (B1)	RICH

SEF662Y

4. Check “HO2S2 (B1)” at idle speed when adjusting “FUEL INJECTION” to ±25%.



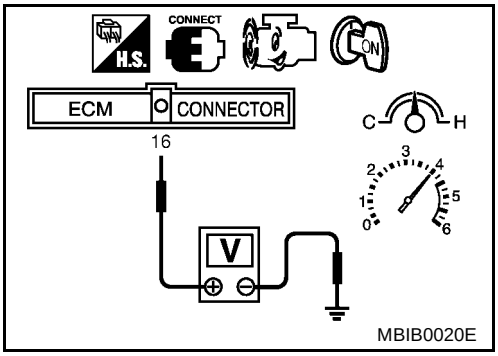
"HO2S2 (B1)" should be above 0.68V at least once when the "FUEL INJECTION" is +25%.
"HO2S2 (B1)" should be below 0.50V at least once when the "FUEL INJECTION" is −25%.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Set voltmeter probes between ECM terminal 16 (HO2S2 signal) and engine ground.
4. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be above 0.68V at least once during this procedure.
   If the voltage is above 0.68V at step 4, step 5 is not necessary.
5. Keep vehicle at idling for 10 minutes, then check voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in "D" position (CVT), 3rd gear position (M/T).
   The voltage should be below 0.50V at least once during this procedure.
6. If NG, replace heated oxygen sensor 2.



CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

EBS00GHQ

HEATED OXYGEN SENSOR 2

Refer to EX-3, "EXHAUST SYSTEM" .

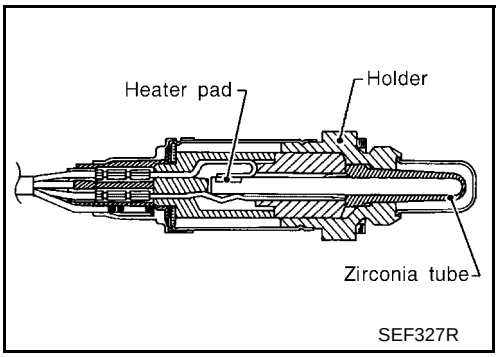
DTC P1147 HO2S2

PFP:226A0

Component Description

EBS00GHR

The heated oxygen sensor 2, after three way catalyst (manifold), monitors the oxygen level in the exhaust gas on each bank.
Even if switching characteristics of the heated oxygen sensor 1 are shifted, the air fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.
This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.
Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.



CONSULT-II Reference Value in Data Monitor Mode

EBS00GHS

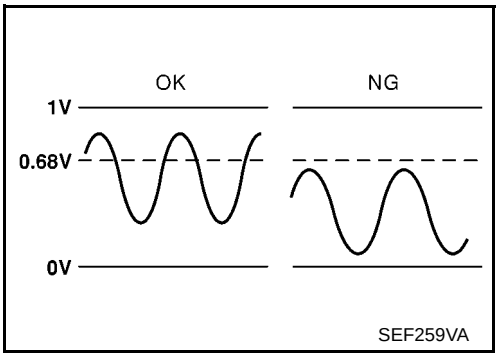
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S2 (B1)	● Engine: After warming up	Revving engine from idle to 3,000 rpm quickly.	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S2 MNTR (B1)	● Engine: After warming up	Revving engine from idle to 3,000 rpm quickly.	LEAN ←→ RICH

On Board Diagnosis Logic

EBS00GHT

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the heated oxygen sensor 1. The oxygen storage capacity before the three way catalyst causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the maximum voltage of the sensor is sufficiently high during the various driving condition such as fuel-cut.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1147 1147	Heated oxygen sensor 2 maximum voltage monitoring	The maximum voltage from the sensor is not reached to the specified voltage.	● Harness or connectors (The sensor circuit open or shorted.) ● Heated oxygen sensor 2 ● Fuel pressure ● Injectors ● Intake air leaks

DTC Confirmation Procedure

EBS00GHU

CAUTION:
Always drive vehicle at a safe speed.

NOTE:

- **“COMPLETED” will appear on CONSULT-II screen when all tests “COND1”, “COND2” and “COND3” are completed.**
- If “DTC confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

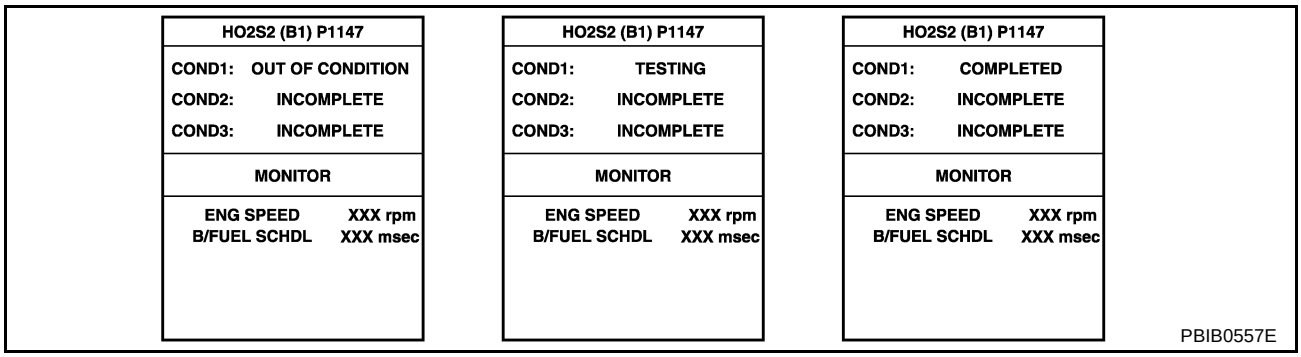
TESTING CONDITION:
Never stop engine during this procedure. If the engine is stopped, retry procedure from step 2 in “Procedure for COND1”

WITH CONSULT-II

Procedure for COND1

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Turn ignition switch “ON” and select “HO2S2 (B1) P1147” of “HO2S2” in “DTC WORK SUPPORT” mode with CONSULT-II.
4. Touch “START”.
5. Start engine and let it idle for at least 30 seconds.
6. Rev engine up to 2,000 rpm 2 or 3 times quickly under no load.
   If “COMPLETED” appears on CONSULT-II screen, go to step 2 in “Procedure for COND3”.
   If “COMPLETED” does not appear on CONSULT-II screen, go to the following step.
7. Drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
8. When the following conditions are met, “TESTING” will be displayed at COND1” on the CONSULT-II screen. Maintain the conditions continuously until “TESTING” changes to “COMPLETED”. (It will take approximately 60 seconds.)

ENG SPEED	More than 1,000 rpm
B/FUEL SCHDL	More than 1.0 msec
COOLANT TEMP/S	70 - 105°C
Selector lever	Suitable position



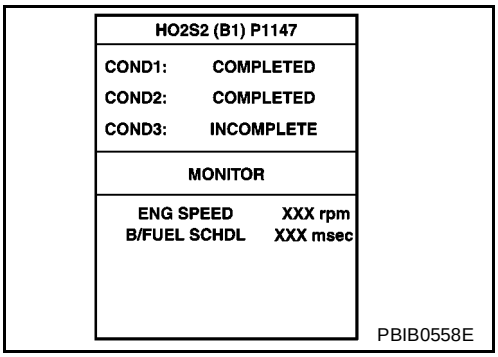
NOTE:

- **If “TESTING” is not displayed after 5 minutes, retry from step 2 in “Procedure for COND1”.**
- **If “COMPLETED” already appears at “COND2” on CONSULT-II screen before “Procedure for COND2” is conducted, it is unnecessary to conduct step 1 in “Procedure for COND2”.**

Procedure for COND2

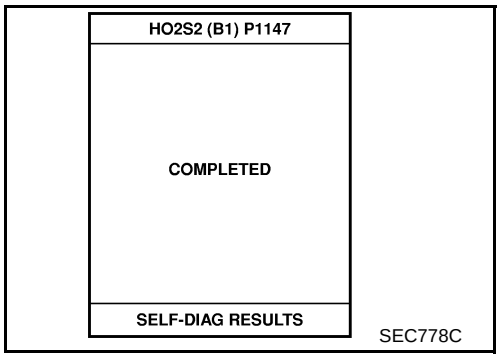
1. While driving, release accelerator pedal completed from the above condition [step 8] until “INCOMPLETE” at “COND2” on CONSULT-II screen has turned to “COMPLETED” (It will take approximately 4 seconds.)

   NOTE:
   If “COMPLETE” already appears at “COND3” on CONSULT-II screen before “Procedure for COND3” is conducted, it is unnecessary to conduct step 1 in “Procedure for COND3”.



Procedure for COND3

1. Stop vehicle and let it idle until “INCOMPLETE” of “COND3” on CONSULT-II screen has turned to “COMPLETED”. (It will take a maximum of approximately 6 minutes.)
2. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”.
   If “NG” is displayed, refer to EC-1290, "Diagnostic Procedure" .



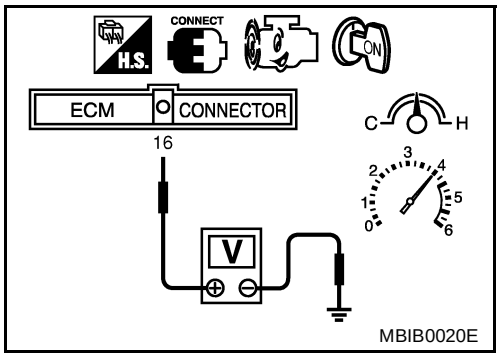
Overall Function Check

EBS00GHV

Use this procedure to check the overall function of the heated oxygen sensor 2 circuit. During this check, a 1st trip DTC might not be confirmed.

WITH GST

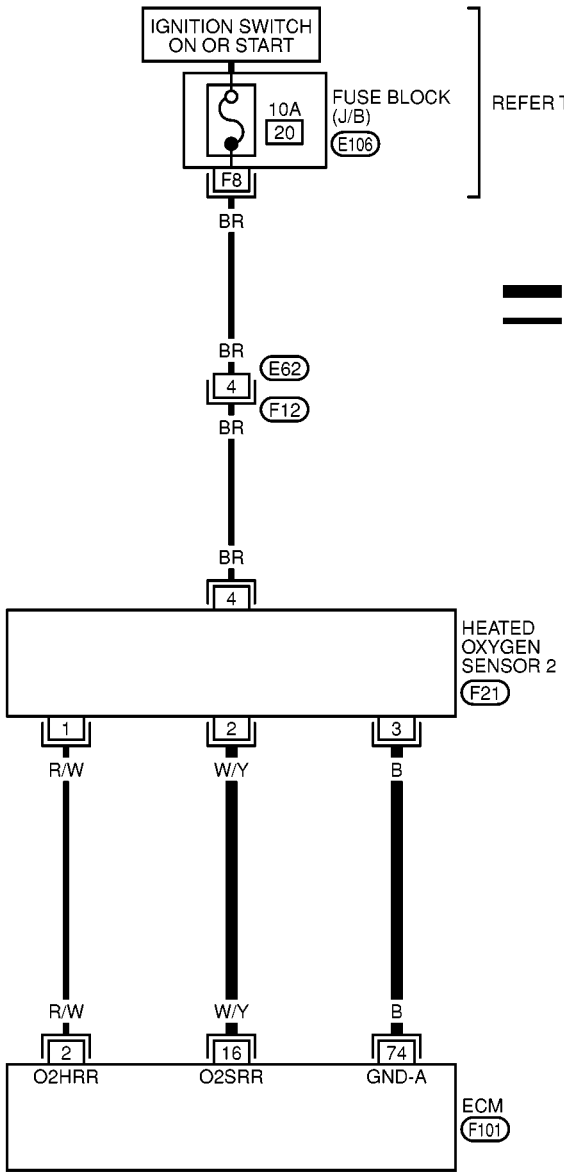
1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Set voltmeter probes between ECM terminal 16 (HO2S2 signal) and engine ground.
4. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be above 0.68V at least once during this procedure.
   If the voltage can be confirmed in step 4, step 5 is not necessary.
5. Keep vehicle idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in “D” position (CVT), 3rd gear position (M/T).
   The voltage should be above 0.68V at least once during this procedure.
6. If NG, go to EC-1290, "Diagnostic Procedure" .

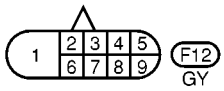


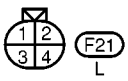
Wiring Diagram

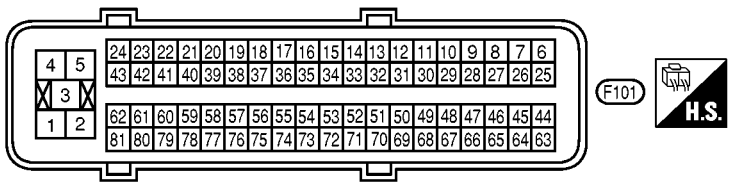
EBS00GHW

EC-HO2S2-01









REFER TO THE FOLLOWING.
E106 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0010E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
16	W/Y	Heated oxygen sensor 2	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V
74	B	Sensors' ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V

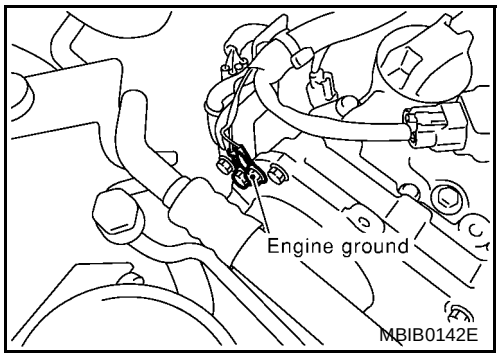
Diagnostic Procedure

EBS00GHX

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

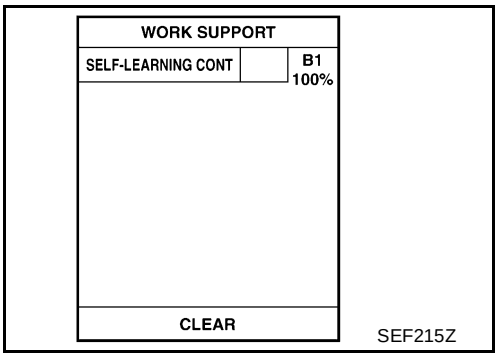
>> GO TO 2.



2. CLEAR THE SELF-LEARNING DATA

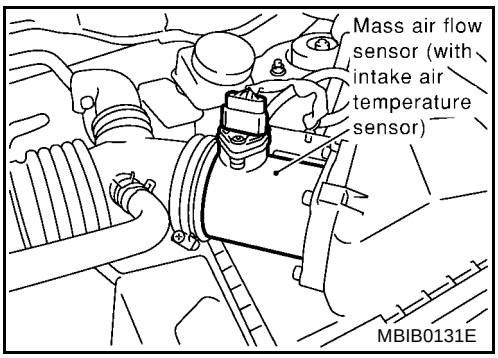
With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-II.
3. Clear the self-learning control coefficient by touching “CLEAR”.
4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 detected?
   Is it difficult to start engine?



Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF”.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure that DTC P0102 is displayed.
6. Erase the DTC memory. Refer to EC-1015, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
7. Make sure that DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 detected?
   Is it difficult to start engine?



Yes or No

Yes >> Perform trouble diagnosis for DTC P0171. Refer to EC-1157 .
No >> GO TO 3.

3. CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

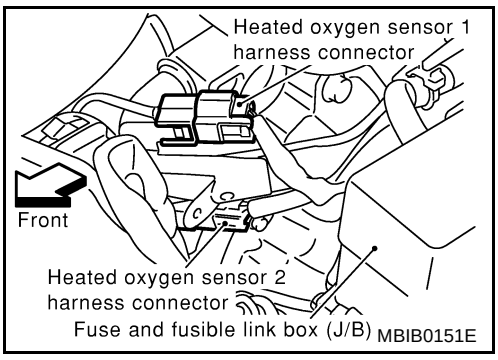
1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 2 harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminal 74 and HO2S2 terminal 3.
   Refer to Wiring Diagram.

   Continuity should exist.

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.



4. CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 16 and HO2S2 terminal 2.
   Refer to Wiring Diagram.

   Continuity should exist.

2. Check harness continuity between ECM terminal 16 or HO2S2 terminal 2 and ground.
   Refer to Wiring Diagram.

   Continuity should not exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK HEATED OXYGEN SENSOR 2

Refer to EC-1292, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace heated oxygen sensor 2.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-1076, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

EBS00GHY

HEATED OXYGEN SENSOR 2

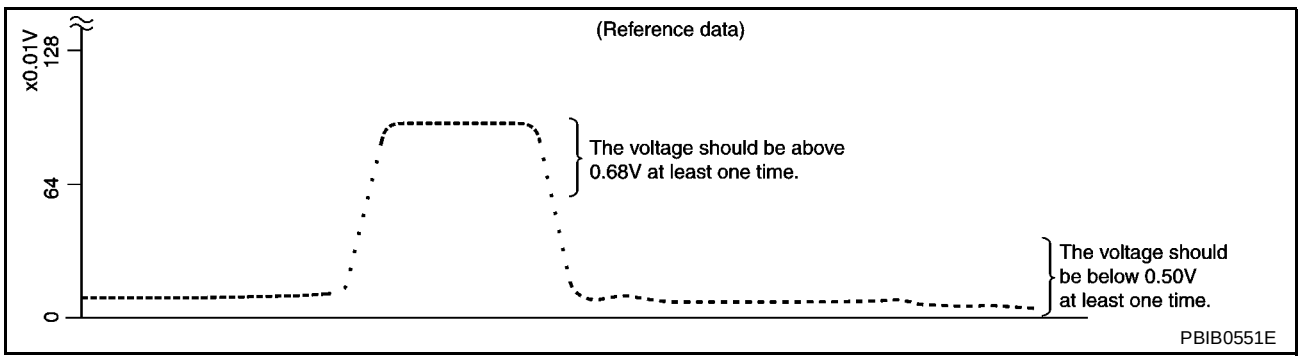
With CONSULT-II

1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)” as the monitor item with CONSULT-II.

ACTIVE TEST	
FUEL INJECTION	25 %
MONITOR	
ENG SPEED	XXX rpm
HO2S1 (B1)	XXX V
HO2S2 (B1)	XXX V
HO2S1 MNTR (B1)	RICH
HO2S2 MNTR (B1)	RICH

SEF662Y

4. Check “HO2S2 (B1)” at idle speed when adjusting “FUEL INJECTION” to ±25%.



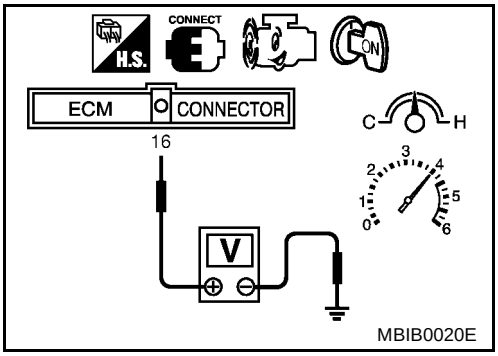
"HO2S2 (B1)" should be above 0.68V at least once when the "FUEL INJECTION" is +25%.
"HO2S2 (B1)" should be below 0.50V at least once when the "FUEL INJECTION" is −25%.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Set voltmeter probes between ECM terminal 16 (HO2S2 signal) and engine ground.
4. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be above 0.68V at least once during this procedure.
   If the voltage is above 0.68V at step 4, step 5 is not necessary.
5. Keep vehicle idling for 10 minutes, then check voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in "D" position (CVT), 3rd gear position (M/T).
   The voltage should be below 0.50V at least once during this procedure.
6. If NG, replace heated oxygen sensor 2.



CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

EBS00GHZ

HEATED OXYGEN SENSOR 2

Refer to EX-3, "EXHAUST SYSTEM" .

DTC P1212 ESP/TCS/ABS COMMUNICATION LINE

PFP:47850

Description

EBS00GWG

NOTE:
If DTC P1212 is displayed with DTC U1000 or U1001, first perform the trouble diagnosis for DTC U1000, U1001. Refer to EC-1083, "DTC U1000, U1001 CAN COMMUNICATION LINE" .
This CAN communication line is used to control the smooth engine operation during ESP/TCS/ABS operation. Pulse signals are exchanged between ECM and ESP/ABS/TCS control unit.
Be sure to erase the malfunction information such as DTC not only in ESP/TCS/ABS control unit but also ECM after the ESP/TCS/ABS related repair.

On Board Diagnosis Logic

EBS00GWH

Freeze frame data is not stored in the ECM for this self-diagnosis. The MI will not light up for this self-diagnosis.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1212 1212	ESP/TCS/ABS communication line	ECM can not receive the information from ESP/TCS/ABS control unit continuously.	● Harness or connectors (The CAN communication line between ECM and ESP/TCS/ABS control unit is open or shorted.) ● ESP/TCS/ABS control unit ● Dead (Weak) battery

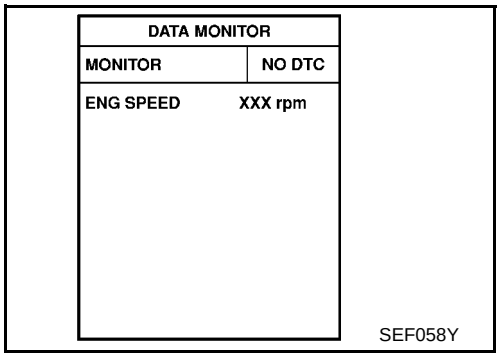
DTC Confirmation Procedure

EBS00GWI

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10.5V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for at least 10 seconds.
4. If a 1st trip DTC is detected, go to EC-1294, "Diagnostic Procedure" .



WITH GST

Follow the procedure “WITH CONSULT-II” above.

Diagnostic Procedure

EBS00GWJ

1. CHECK ESP/TCS/ABS CONTROL UNIT FUNCTION

Refer to BRC-60, "TROUBLE DIAGNOSIS" .

>> **INSPECTION END**

DTC P1217 ENGINE OVER TEMPERATURE

PFP:00000

System Description

EBS00GI0

NOTE:
If DTC P1217 is displayed with DTC U1000, U1001, first perform the trouble diagnosis for DTC U1000, U1001. Refer to EC-1083, "DTC U1000, U1001 CAN COMMUNICATION LINE" .

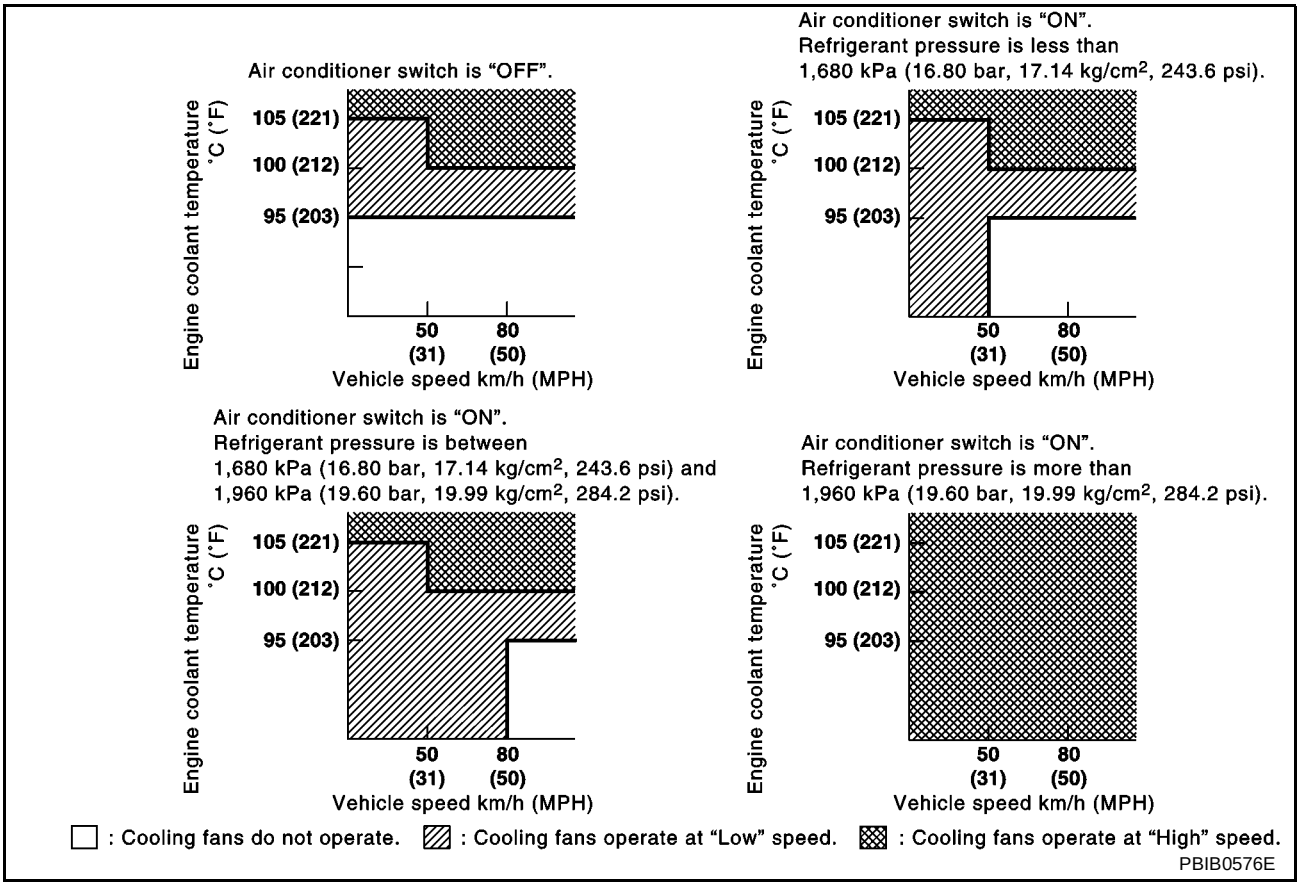
COOLING FAN CONTROL

Sensor	Input Signal to ECM	ECM function	Actuator
Vehicle speed signal	Vehicle speed*1	Cooling fan control	Cooling fan relay(s)
Engine coolant temperature sensor	Engine coolant temperature		
Air conditioner switch	Air conditioner “ON” signal*1		
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*2		
Battery	Battery voltage*2		
Refrigerant pressure sensor	Refrigerant pressure		

*1: These signals are sent to ECM through CAN communication line.
*2: ECM determines the start signal status by the signals of engine speed and battery voltage.

The ECM controls the cooling fan corresponding to the vehicle speed, engine coolant temperature, refrigerant pressure, and air conditioner ON signal. The control system has 3-step control [HIGH/LOW/OFF].
The ECM sends a cooling fan control signal to the smart entrance control unit through CAN communication line, and the smart entrance control unit controls cooling fan relays.

OPERATION



CONSULT-II Reference Value in Data Monitor Mode

EBS00GI1

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
AIR COND SIG	● Engine: After warming up, idle the engine	Air conditioner switch: OFF	OFF
		Air conditioner switch: ON (Compressor operates.)	ON
COOLING FAN	● Engine: After warming up, idle the engine ● Air conditioner switch: OFF	Engine coolant temperature is 99°C (210°F) or less	OFF
		Engine coolant temperature is 100°C (212°F) or more	ON

On Board Diagnosis Logic

EBS00GI2

If the cooling fan or another component in the cooling system malfunctions, engine coolant temperature will rise. When the engine coolant temperature reaches an abnormally high temperature condition, a malfunction is indicated.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1217 1217	Engine over temperature (Overheat)	● Cooling fan does not operate properly (Overheat). ● Cooling fan system does not operate properly (Overheat). ● Engine coolant was not added to the system using the proper filling method.	● Harness or connectors (The cooling fan circuit is open or shorted.) ● Cooling fan ● Radiator hose ● Radiator ● Radiator cap ● Water pump ● Thermostat For more information, refer to EC-1310, "Main 12 Causes of Overheating" .

CAUTION:

When a malfunction is indicated, be sure to replace the coolant. Refer to MA-20, "Changing Engine Coolant" . Also, replace the engine oil. Refer to MA-24, "Changing Engine Oil" .

1. **Fill radiator with coolant up to specified level with a filling speed of 2 liters per minute. Be sure to use coolant with the proper mixture ratio. Refer to MA-18, "Engine Coolant Mixture Ratio" .**
2. **After refilling coolant, run engine to ensure that no water-flow noise is emitted.**

Overall Function Check

EBS00GI3

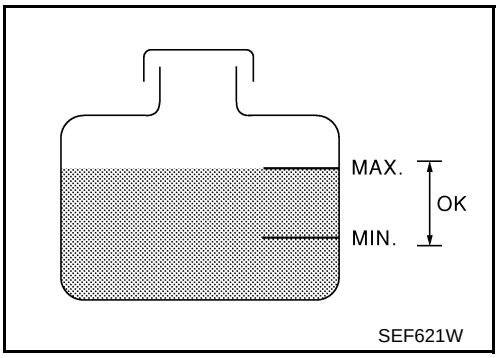
Use this procedure to check the overall function of the cooling fan. During this check, a DTC might not be confirmed.

WARNING:

Never remove the radiator cap when the engine is hot. Serious burns could be caused by high pressure fluid escaping from the radiator.
Wrap a thick cloth around cap. Carefully remove the cap by turning it a quarter turn to allow built-up pressure to escape. Then turn the cap all the way off.

WITH CONSULT-II

1. Check the coolant level in the reservoir tank and radiator.
   Allow engine to cool before checking coolant level.
   If the coolant level in the reservoir tank and/or radiator is below the proper range, skip the following steps and go to EC-1300, "Diagnostic Procedure" .
2. Confirm whether customer filled the coolant or not. If customer filled the coolant, skip the following steps and go to EC-1300, "Diagnostic Procedure" .
3. Turn ignition switch “ON”.



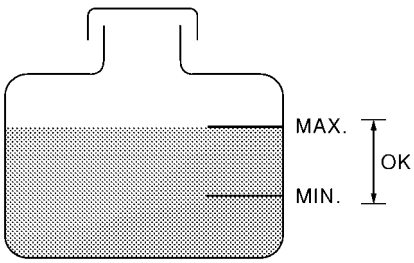
4. Perform “COOLING FAN” in “ACTIVE TEST” mode with CONSULT-II.
5. If the results are NG, go to EC-1300, "Diagnostic Procedure" .

ACTIVE TEST	
COOLING FAN	ON
MONITOR	
COOLAN TEMP/S	XXX °C

MBIB0037E

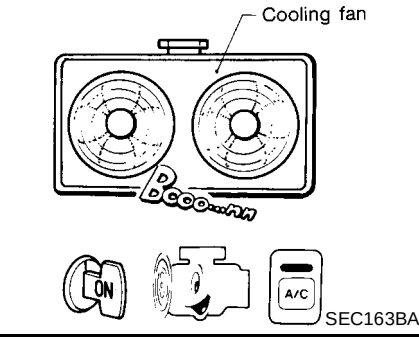
WITH GST

1. Check the coolant level in the reservoir tank and radiator.
   Allow engine to cool before checking coolant level.
   If the coolant level in the reservoir tank and/or radiator is below the proper range, skip the following steps and go to EC-1300, "Diagnostic Procedure" .
2. Confirm whether customer filled the coolant or not. If customer filled the coolant, skip the following steps and go to EC-1300, "Diagnostic Procedure" .
3. Start engine.
   Be careful not to overheat engine.
4. Set temperature control lever to full cold position.
5. Turn air conditioner switch “ON”.
6. Turn blower fan switch “ON”.



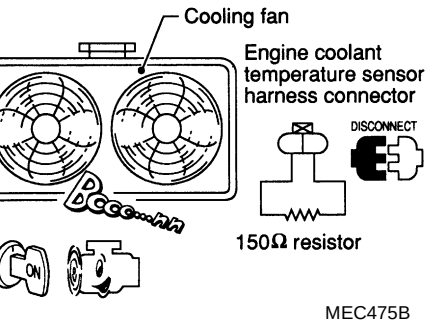
SEF621W

7. Run engine at idle for a few minutes with air conditioner operating.
   Be careful not to overheat engine.
8. Make sure that cooling fans operates at low speed.
   If NG, go to EC-1300, "Diagnostic Procedure" .
   If OK, go to the following step.
9. Turn ignition switch “OFF”.
10. Turn air conditioner switch and blower fan switch “OFF”.
11. Disconnect engine coolant temperature sensor harness connector.
12. Connect 150Ω resistor to engine coolant temperature sensor harness connector.



SEC163BA

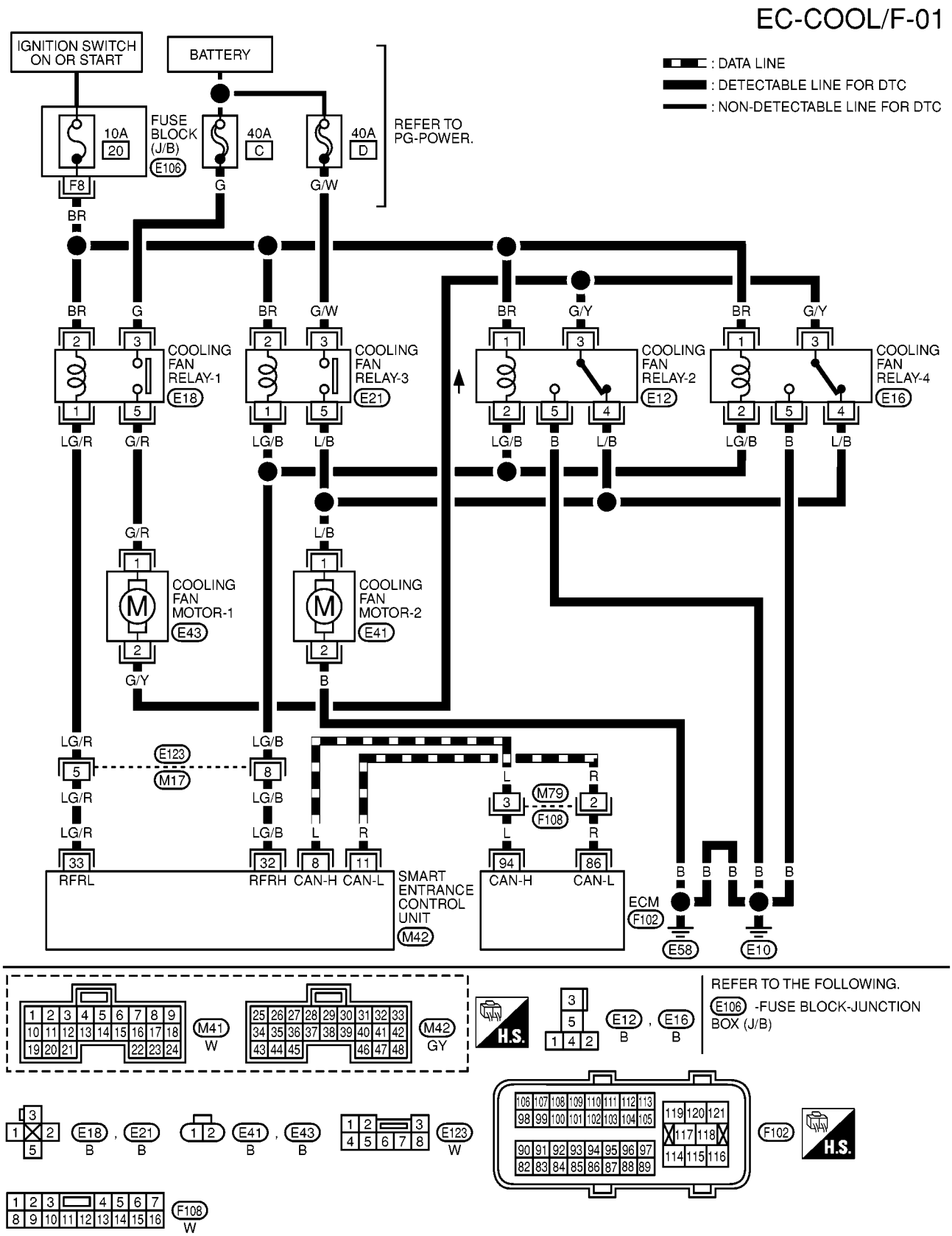
13. Restart engine and make sure that cooling fan operates at higher speed than low speed.
    Be careful not to overheat engine.
14. If NG, go to EC-1300, "Diagnostic Procedure" .



MEC475B

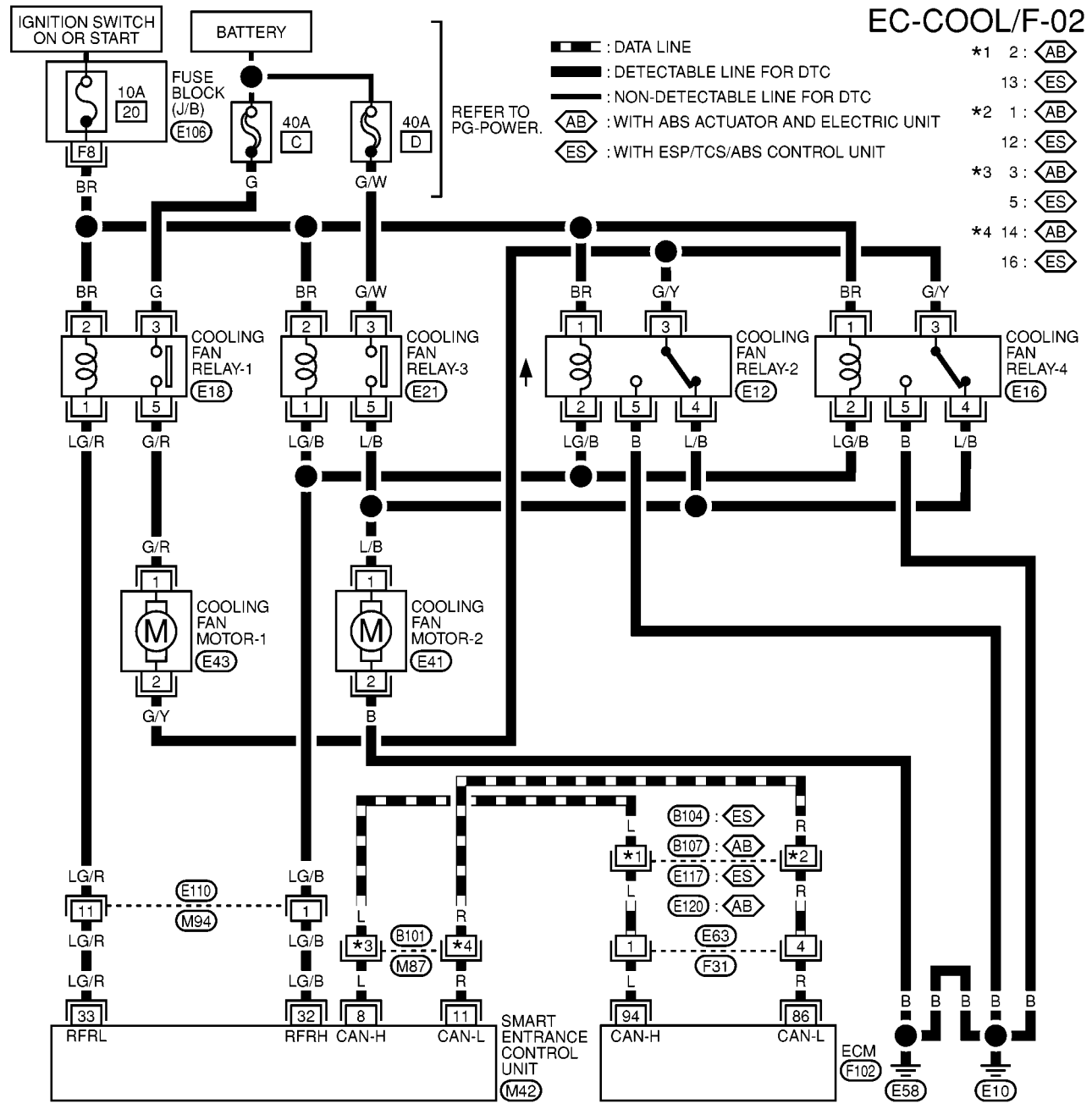
Wiring Diagram
LHD MODELS

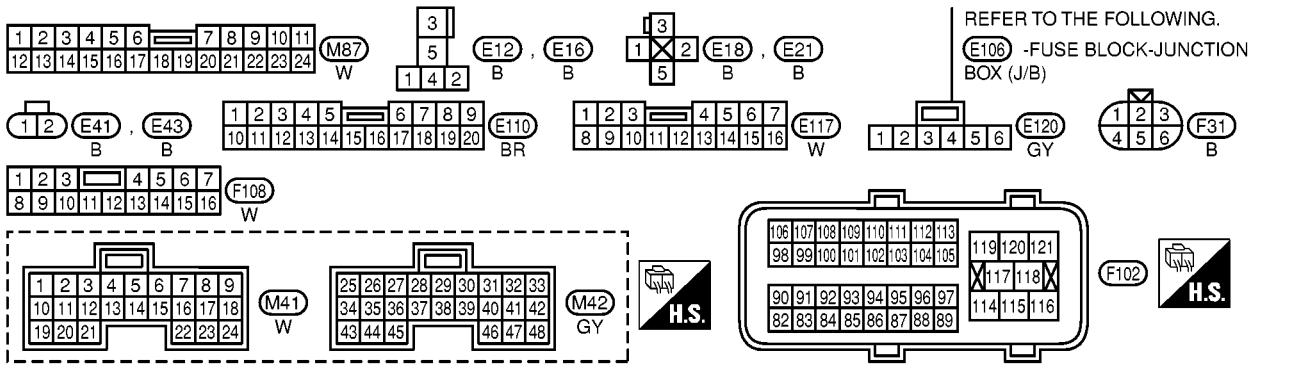
EBS00GI4



MBWA0018E

RHD MODELS





MBWA0146E

Diagnostic Procedure

EBS00GRN

1. INSPECTION START

Do you have CONSULT-II?

Yes or No

Yes >> GO TO 2.
No >> GO TO 5.

2. CHECK COOLING FAN LOW SPEED OPERATION

With CONSULT-II

1. Turn ignition switch “ON”.
2. Perform “COOLING FAN” in “ACTIVE TEST” mode with CONSULT-II and touch “LOW” on the CONSULT-II screen.
3. Make sure that cooling fans-1 and -2 operate at low speed.

OK or NG

OK >> GO TO 3.
NG >> Check cooling fan low speed control circuit. (Go to EC-1304, "PROCEDURE A" .)

ACTIVE TEST	
COOLING FAN	LOW
MONITOR	
COOLAN TEMP/S	XXX °C

SEF784Z

3. CHECK COOLING FAN HIGH SPEED OPERATION-I

With CONSULT-II

1. Touch “HIGH”on the CONSULT-II screen.
2. Make sure that cooling fan-1 operates at higher speed than low speed.

OK or NG

OK >> GO TO 4.
NG >> Check cooling fan high speed control circuit-1. (Go to EC-1306, "PROCEDURE B" .)

ACTIVE TEST	
COOLING FAN	HIGH
MONITOR	
COOLAN TEMP/S	XXX °C

SEF785Z

4. CHECK COOLING FAN HIGH SPEED OPERATION-II

With CONSULT-II

Make sure that cooling fan-2 operates at higher speed than low speed.

OK or NG

OK >> GO TO 8.
NG >> Check cooling fan high speed control circuit-2. (Go to EC-1308, "PROCEDURE C" .)

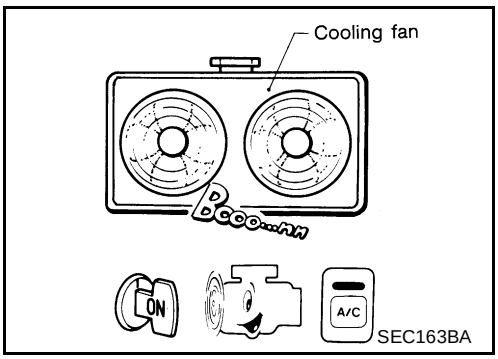
5. CHECK COOLING FAN LOW SPEED OPERATION

Without CONSULT-II

1. Start engine and let it idle.
2. Turn air conditioner switch “ON”.
3. Turn blower fan switch “ON”.
4. Make sure that cooling fans-1 and -2 operate at low speed.

OK or NG

OK >> GO TO 6.
NG >> Check cooling fan low speed control circuit. (Go to EC-1304, "PROCEDURE A" .)



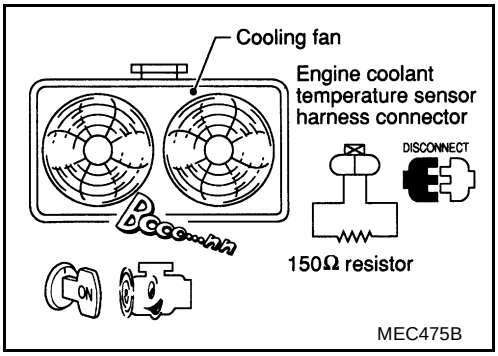
6. CHECK COOLING FAN HIGH SPEED OPERATION-I

Without CONSULT-II

1. Turn ignition switch “OFF”.
2. Turn air conditioner switch and blower fan switch “OFF”.
3. Disconnect engine coolant temperature sensor harness connector.
4. Connect 150Ω resistor to engine coolant temperature sensor harness connector.
5. Restart engine and make sure that cooling fan-1 operates at higher speed than low speed.

OK or NG

OK >> GO TO 7.
NG >> Check cooling fan high speed control circuit-1. (Go to EC-1306, "PROCEDURE B" .)



7. CHECK COOLING FAN HIGH SPEED OPERATION-II

Without CONSULT-II

Make sure that cooling fan-2 operates higher speed than lower speed.

OK or NG

OK >> GO TO 8.
NG >> Check cooling fan high speed control circuit-2. (Go to EC-1308, "PROCEDURE C" .)

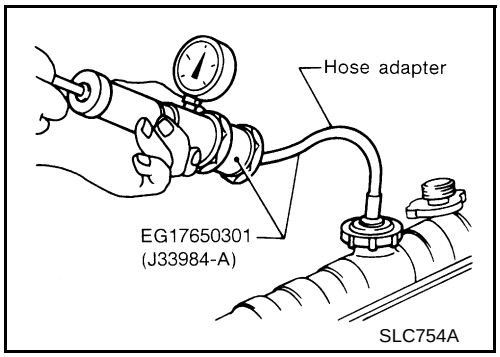
8. CHECK COOLING SYSTEM FOR LEAK

Apply pressure to the cooling system with a tester, and check if the pressure drops.

Testing pressure: 157 kPa (1.57 bar, 1.6 kg/cm^2 , 23psi)

CAUTION:
Higher than the specified pressure may cause radiator damage.

Pressure should not drop.



OK or NG

OK >> GO TO 9.
NG >> GO TO 8.

9. DETECT MALFUNCTIONING PART

Check the following for leak.

- Hose
- Radiator
- Water pump (Refer toCO-38, "WATER PUMP" .)

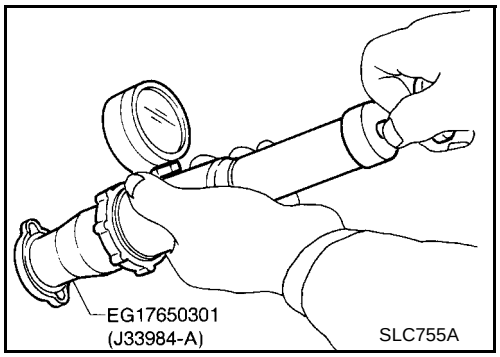
>> Repair or replace.

10. CHECK RADIATOR CAP

Apply pressure to cap with a tester and check radiator cap relief pressure.

Radiator cap relief pressure:

78 - 98 kPa (0.59 - 0.98 bar, 0.6 - 1.0 kg/cm^2 , 9 - 14 psi)



OK or NG

OK >> GO TO 11.
NG >> Replace radiator cap.

11. CHECK THERMOSTAT

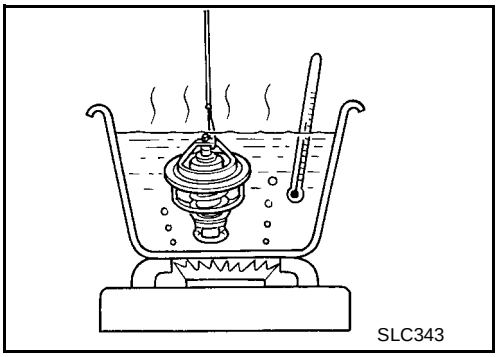
1. Remove thermostat.
2. Check valve seating condition at normal room temperatures.
   It should seat tightly.
3. Check valve opening temperature and valve lift.

   Valve opening temperature:

   80.5 - 83.5 °C (177 - 182 °F)

   Valve lift:

   More than 8 mm/95 °C (0.31 in/203 °F)



4. Check if valve is closed at 5°C (9°F) below valve opening temperature. For details, refer to CO-40, "THERMOSTAT AND WATER CONTROL VALVE" .

OK or NG

OK >> GO TO 12.
NG >> Replace thermostat.

12. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-1115, "Component Inspection" .

OK or NG

OK >> GO TO 13.
NG >> Replace engine coolant temperature sensor.

13. CHECK MAIN 12 CAUSES

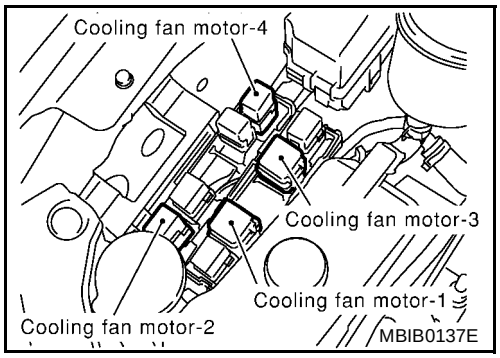
If the cause cannot be isolated, go to EC-1310, "Main 12 Causes of Overheating" .

>> **INSPECTION END**

PROCEDURE A

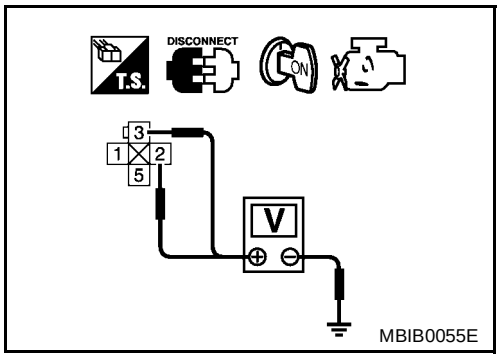
1. CHECK COOLING FAN POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect cooling fan relay-1.
3. Turn ignition switch “ON”.



4. Check voltage between cooling fan relay-1 terminals 2, 3 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

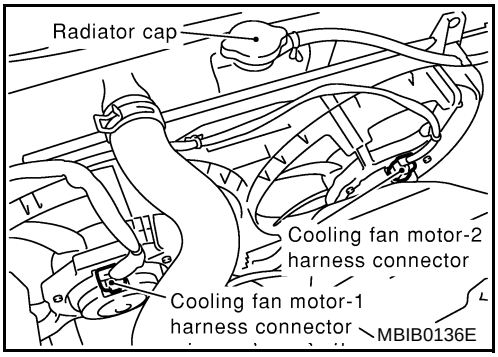
- Fuse block (J/B) connector E106
- 10A fuse
- 40A fusible link
- Harness for open or short between cooling fan relay-1 and fuse
- Harness for open or short between cooling fan relay-1 and battery

>> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK COOLING FAN MOTORS CONTROL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect cooling fan motor-1 harness connector and cooling fan motor-2 harness connector.
3. Disconnect cooling fan relay-2 and cooling fan relay-4.
4. Check harness continuity between the following.

- Cooling fan relay-1 terminal 5 and cooling fan motor-1 terminal 1
- Cooling fan motor-1 terminal 2 and cooling fan relay-2 terminal 3
- Cooling fan motor-1 terminal 2 and cooling fan relay-4 terminal 3
- Cooling fan relay-2 terminal 4 and cooling fan motor-2 terminal 1
- Cooling fan relay-4 terminal 4 and cooling fan motor-2 terminal 1
- Cooling fan motor-2 terminal 2 and ground
  Refer to Wiring Diagram.



Continuity should exist.

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK COOLING FAN MOTOR OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

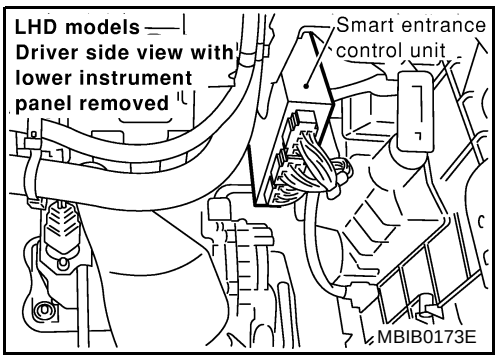
1. Disconnect smart entrance control unit harness connector.
2. Check harness continuity between cooling fan relay-1 terminal 1 and smart entrance control unit terminal 33. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.



5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E123, M17 (LHD models)
- Harness connectors E110, M94 (RHD models)
- Harness for open or short between cooling fan relay-1 and smart entrance control unit

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK COOLING FAN RELAY-1, -2 AND 4

Refer to EC-1311, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace cooling fan relay.

7. CHECK COOLING FAN MOTORS-1 AND -2

Refer to EC-1311, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> Replace cooling fan motors.

8. CHECK SMART ENTRANCE CONTROL UNIT

Refer to BCS-39, "Trouble Diagnoses" .

OK or NG

OK >> GO TO 9.
NG >> Replace smart entrance control unit.

9. CHECK INTERMITTENT INCIDENT

Perform EC-1076, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

PROCEDURE B

1. CHECK COOLING FAN RELAY GROUND CIRCUIT FOR OPEN AND SHORT

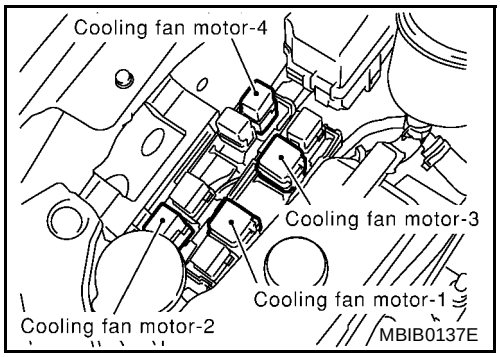
1. Turn ignition switch “OFF”.
2. Disconnect cooling fan relay-2 and cooling fan relay-4.
3. Check harness continuity between cooling fan relay-2 terminal 5 and ground, cooling fan relay-4 terminal 5 and ground. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 2.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.



2. CHECK COOLING FAN MOTOR OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

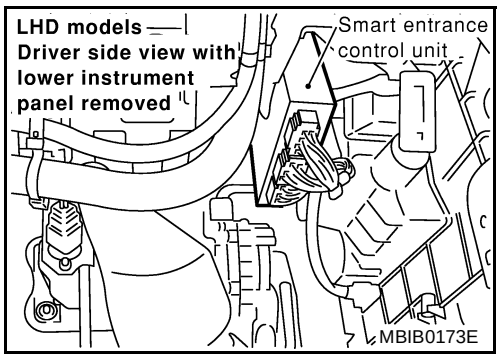
1. Disconnect smart entrance control unit harness connector.
2. Check harness continuity between cooling fan relay-2 terminal 2 and smart entrance control unit terminal 32, cooling fan relay-4 terminal 2 and smart entrance control unit terminal 32. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> GO TO 3.



3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E123, M17 (LHD models)
- Harness connectors E110, M94 (RHD models)
- Harness for open or short between cooling fan relay-2 and smart entrance control unit
- Harness for open or short between cooling fan relay-4 and smart entrance control unit

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK COOLING FAN RELAYS-2 AND -4

Refer to EC-1311, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace cooling fan relays.

5. CHECK SMART ENTRANCE CONTROL UNIT

Refer to BCS-39, "Trouble Diagnoses" .

OK or NG

OK >> GO TO 6.
NG >> Replace smart entrance control unit.

6. CHECK INTERMITTENT INCIDENT

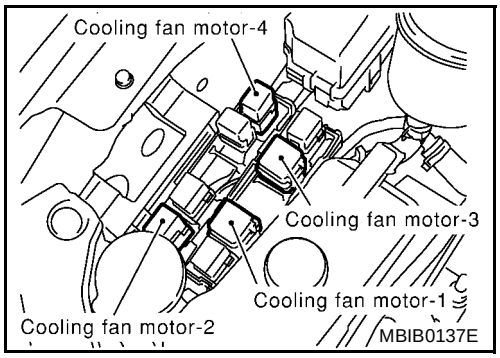
Perform EC-1076, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

PROCEDURE C

1. CHECK COOLING FAN MOTOR-2 POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect cooling fan relay-3.
3. Turn ignition switch “ON”.

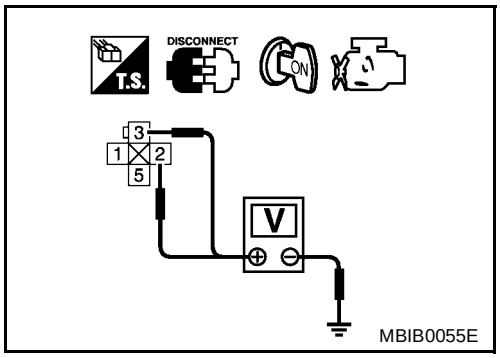


4. Check voltage between cooling fan relay-3 terminals 2, 3 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 3.
NG >> GO TO 2.



2. DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector E106
- 10A fuse
- 40A fusible link
- Harness for open or short between cooling fan relay-3 and fuse
- Harness for open or short between cooling fan relay-3 and battery

>> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK COOLING FAN MOTOR CONTROL CIRCUIT FOR OPEN AND SHORT

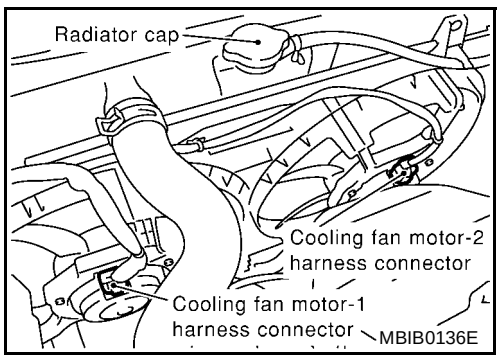
1. Turn ignition switch “OFF”.
2. Disconnect cooling fan motor-2 harness connector.
3. Check harness continuity between cooling fan relay-3 terminal 5 and cooling fan motor-2 terminal 1.
   Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to power in harness or connectors.



4. CHECK COOLING FAN MOTOR CONTROL CIRCUIT FOR SHORT TO GROUND

Check harness continuity between cooling fan relay-3 terminal 5 or cooling fan motor-2 terminal 1 and ground. Refer to Wiring Diagram.

Continuity should not exist.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Cooling fan relays-2 and -4 (Refer to EC-1311, "Component Inspection")
- Harness for short to ground between cooling fan relay-2 and cooling fan motor-2
- Harness for short to ground between cooling fan relay-3 and cooling fan motor-2
- Harness for short to ground between cooling fan relay-4 and cooling fan motor-2

>> Repair or replace.

6. CHECK COOLING FAN OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

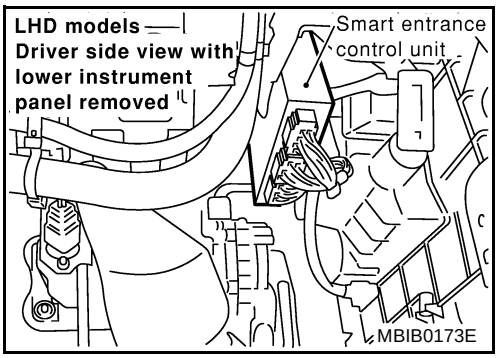
1. Disconnect smart entrance control unit harness connector.
2. Check harness continuity between cooling fan relay-3 terminal 1 and smart entrance control unit terminal 32. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> GO TO 7.



7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E123, M17 (LHD models)
- Harness connectors E110, M94 (RHD models)
- Harness for open or short between cooling fan relay-3 and smart entrance control unit

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK COOLING FAN RELAY-3

Refer to EC-1311, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> Replace cooling fan relay.

9. CHECK SMART ENTRANCE CONTROL UNIT

Refer to BCS-39, "Trouble Diagnoses" .

OK or NG

OK >> GO TO 10.
NG >> Replace smart entrance control unit.

10. CHECK INTERMITTENT INCIDENT

Perform EC-1076, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Main 12 Causes of Overheating

EBS00GI6

Engine	Step	Inspection item	Equipment	Standard	Reference page
OFF	1	● Blocked radiator ● Blocked condenser ● Blocked radiator grille ● Blocked bumper	● Visual	No blocking	—
	2	● Coolant mixture	● Coolant tester	50 - 50% coolant mixture	See MA-18, "Engine Coolant Mixture Ratio" .
	3	● Coolant level	● Visual	Coolant up to MAX level in reservoir tank and radiator filler neck	See CO-29, "LEVEL CHECK" .
	4	● Radiator cap	● Pressure tester	59 - 98 kPa (0.59 - 0.98 bar, 0.6 - 1.0 kg/cm^2 , 9 - 14 psi) (Limit)	See CO-32, "CHECKING RADIATOR CAP" .
ON*2	5	● Coolant leaks	● Visual	No leaks	See CO-29, "LEAK CHECK" .
ON*2	6	● Thermostat	● Touch the upper and lower radiator hoses	Both hoses should be hot	See CO-40, "THERMOSTAT AND WATER CONTROL VALVE" , and CO-31, "RADIATOR" .
ON*1	7	● Cooling fan	● CONSULT-II	Operating	See trouble diagnosis for DTC P1217 (EC-1295).
OFF	8	● Combustion gas leak	● Color checker chemical tester 4 Gas analyzer	Negative	—
ON*3	9	● Coolant temperature gauge	● Visual	Gauge less than 3/4 when driving	—
		● Coolant overflow to reservoir tank	● Visual	No overflow during driving and idling	See MA-20, "Changing Engine Coolant" .
OFF*4	10	● Coolant return from reservoir tank to radiator	● Visual	Should be initial level in reservoir tank	See CO-29, "LEVEL CHECK" .
OFF	11	● Cylinder head	● Straight gauge feeler gauge	0.1 mm (0.004 in) Maximum distortion (warping)	See EM-152, "CYLINDER HEAD" .
	12	● Cylinder block and pistons	● Visual	No scuffing on cylinder walls or piston	See EM-165, "CYLINDER BLOCK" .

*1: Turn the ignition switch ON.
*2: Engine running at 3,000 rpm for 10 minutes.
*3: Drive at 90 km/h (55 MPH) for 30 minutes and then let idle for 10 minutes.
*4: After 60 minutes of cool down time.
For more information, refer to CO-25, "OVERHEATING CAUSE ANALYSIS" .

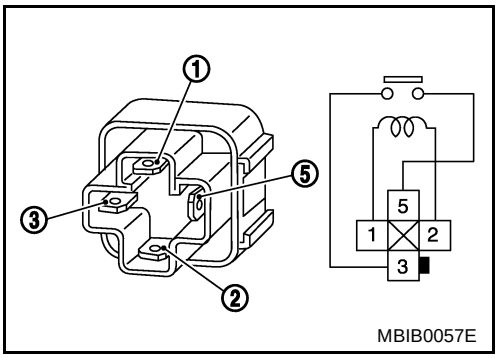
Component Inspection

EBS00GI7

COOLING FAN RELAY-1 AND -3

Check continuity between terminals 3 and 5 under the following conditions.

Conditions	Continuity
12V direct current supply between terminals 1 and 2	Yes
No current supply	No

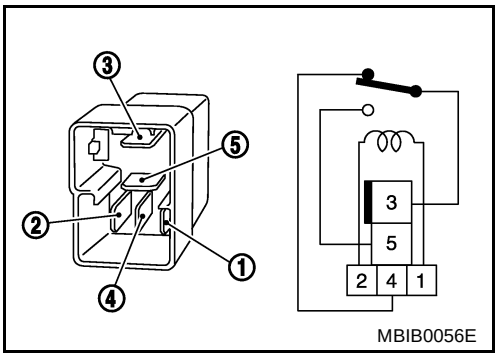


MBIB0057E

COOLING FAN RELAY-2 AND -4

Check continuity between terminals 3 and 4, 3 and 5 under the following conditions.

Conditions	Terminals	Continuity
12V direct current supply between terminals 1 and 2	3 and 4	No
	3 and 5	Yes
No current supply	3 and 4	Yes
	3 and 5	No

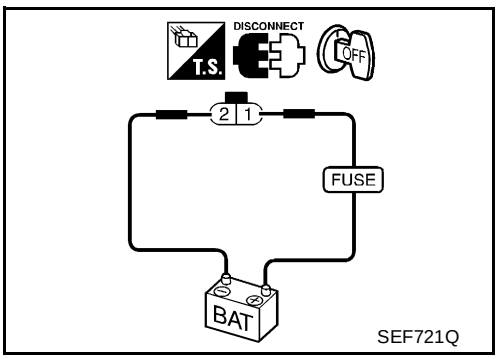


MBIB0056E

COOLING FAN MOTOR-1 AND -2

1. Disconnect cooling fan motor harness connectors.
2. Supply cooling fan motor terminals with battery voltage and check operation.

	Terminals	
	(+)	(-)
Cooling fan motor	1	2



SEF721Q

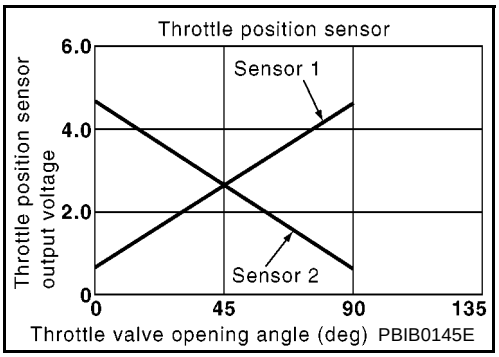
DTC P1223, P1224 TP SENSOR

PFP:16119

Component Description

EBS00GI8

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.
The throttle position sensor has the two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.



CONSULT-II Reference Value in Data Monitor Mode

EBS00GI9

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
THRTL SEN2	● Ignition switch: ON (Engine stopped) ● Shift lever: D (CVT model) 1st (M/T model)	Accelerator pedal: Fully released	More than 0.36V
		Accelerator pedal: Fully depressed	Less than 4.75V

On Board Diagnosis Logic

EBS00GIA

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1223 1223	Throttle position sensor 2 circuit low input	An excessively low voltage from the TP sensor 2 is sent to ECM.	● Harness or connectors (The TP sensor 2 circuit is open or shorted.) ● Electric throttle control actuator (TP sensor 2)
P1224 1224	Throttle position sensor 2 circuit high input	An excessively high voltage from the TP sensor 2 is sent to ECM.	

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters in fail-safe mode and the MI lights up.

Engine operation condition in fail-safe mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.

DTC Confirmation Procedure

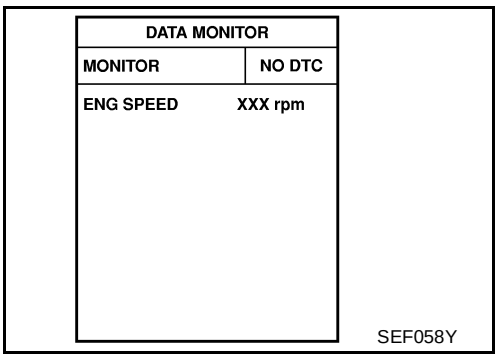
EBS00GIB

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.

2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-1315, "Diagnostic Procedure" .



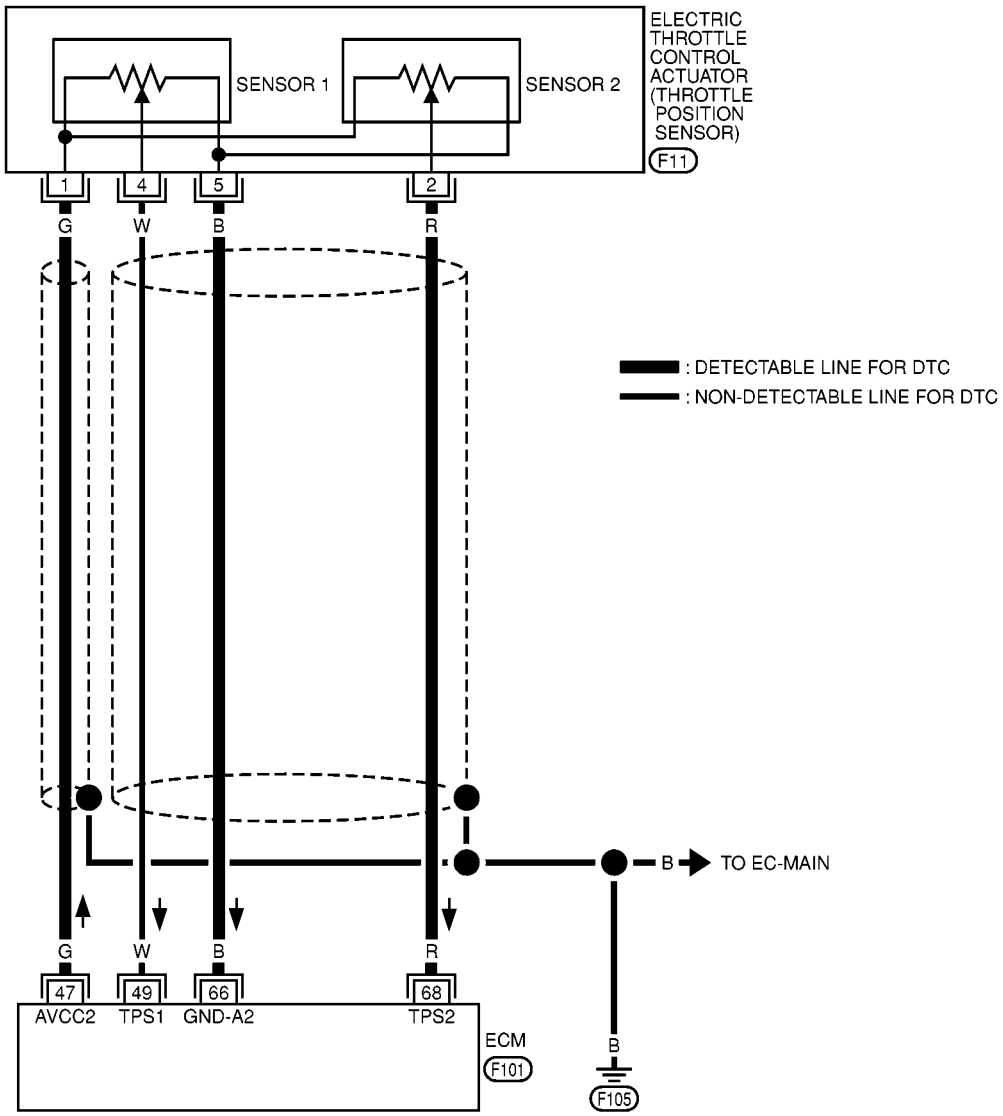
WITH GST

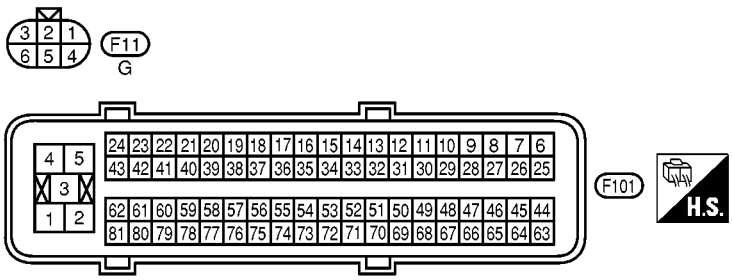
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

EBS00GIC

EC-TPS2-01





MBWA0126E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
47	G	Throttle position sensor power supply	**[Ignition switch "ON"]**	Approximately 5V
49	W	Throttle position sensor 1	**[Ignition switch "ON"]** ● Shift lever position is "D" (CVT model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully released	More than 0.36V
			[Ignition switch "ON"] ● Shift lever position is "D" (CVT model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully depressed	Less than 4.75V
66	B	Sensors' ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
68	R	Throttle position sensor 2	**[Ignition switch "ON"]** ● Shift lever position is "D" (CVT model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully released	Less than 4.75V
			[Ignition switch "ON"] ● Shift lever position is "D" (CVT model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully depressed	More than 0.36V

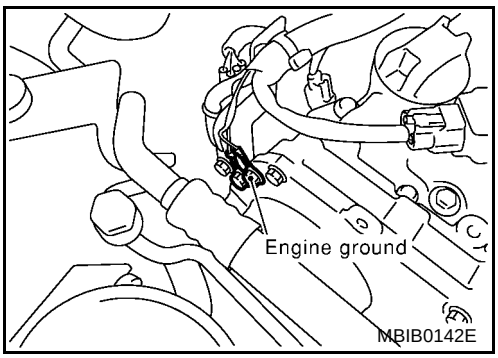
Diagnostic Procedure

EBS00GID

1. RETIGHTEN GROUND SCREWS

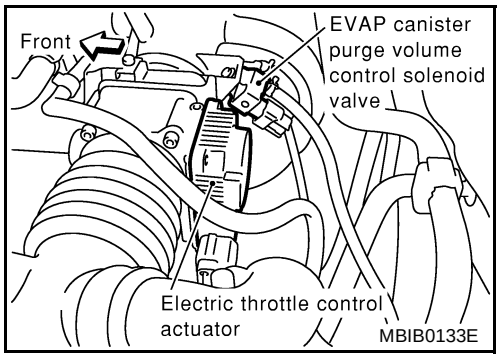
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



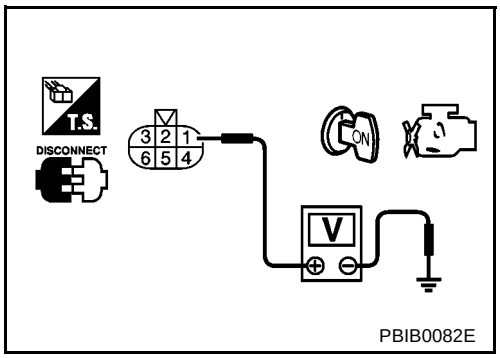
2. CHECK THROTTLE POSITION SENSOR 2 POWER SUPPLY CIRCUIT

1. Disconnect electric throttle control actuator harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between electric throttle control actuator terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK THROTTLE POSITION SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 66 and electric throttle control actuator terminal 5. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK THROTTLE POSITION SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 68 and electric throttle control actuator terminal 2. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK THROTTLE POSITION SENSOR

Refer to EC-1317, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-998, "Throttle Valve Closed Position Learning" .
3. Perform EC-999, "Idle Air Volume Learning" .

>> **INSPECTION END**

7. CHECK INTERMITTENT INCIDENT

Refer to EC-1076, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

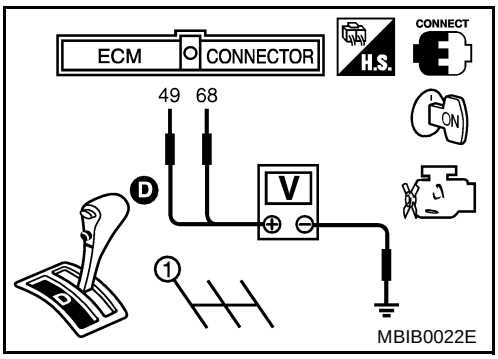
Component Inspection

EBS00GIE

THROTTLE POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Perform EC-998, "Throttle Valve Closed Position Learning" .
3. Turn ignition switch “ON”.
4. Set selector lever to “D” position (CVT models) or “1st” position (M/T models).
5. Check voltage between ECM terminals 49 (TP sensor 1 signal), 68 (TP sensor 2 signal) and engine ground under the following conditions.

Terminal	Accelerator pedal	Voltage
49 (Throttle position sensor 1)	Fully released	More than 0.36V
	Fully depressed	Less than 4.75V
68 (Throttle position sensor 2)	Fully released	Less than 4.75V
	Fully depressed	More than 0.36V



6. If NG, replace electric throttle control actuator and go to the next step.
7. Perform EC-998, "Throttle Valve Closed Position Learning" .
8. Perform EC-999, "Idle Air Volume Learning" .

Remove and Installation

EBS00GIF

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-116, "INTAKE MANIFOLD" .

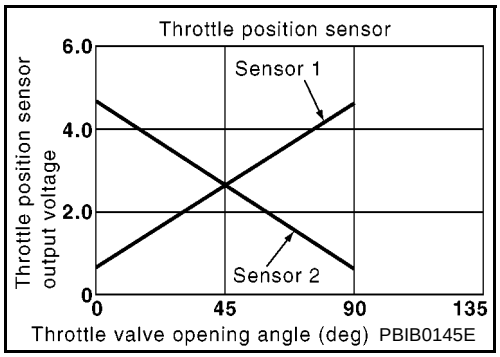
DTC P1225 TP SENSOR

PFP:16119

Component Description

EBS00GIG

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.
The throttle position sensor has the two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.



On Board Diagnosis Logic

EBS00GIH

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1225 1225	Closed throttle position learning performance problem	Closed throttle position learning value is excessively low.	● Electric throttle control actuator (TP sensor 1 and 2)

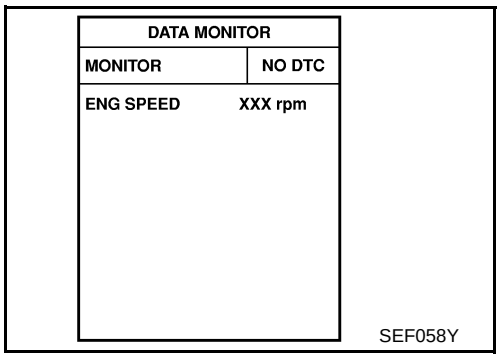
DTC Confirmation Procedure

EBS00GII

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Turn ignition switch “OFF”, wait at least 10 seconds.
4. Turn ignition switch “ON”.
5. If 1st trip DTC is detected, go to EC-1319, "Diagnostic Procedure" .



WITH GST

Follow the procedure “With CONSULT-II” above.

Diagnostic Procedure

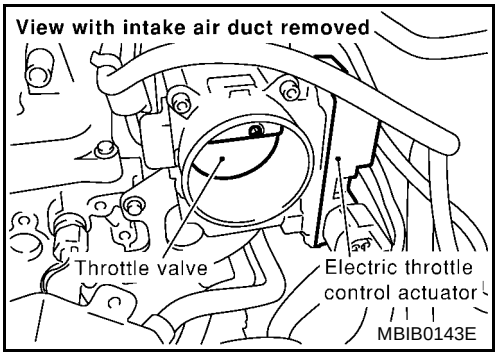
EBS00GIJ

1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Turn ignition switch “OFF”.
2. Remove the intake air duct.
3. Check if foreign matter is caught between the throttle valve and the housing.

OK or NG

OK >> GO TO 2.
NG >> Remove the foreign matter and clean the electric throttle control actuator inside.



2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-998, "Throttle Valve Closed Position Learning" .
3. Perform EC-999, "Idle Air Volume Learning" .

>> **INSPECTION END**

Remove and Installation

EBS00GIK

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-116, "INTAKE MANIFOLD" .

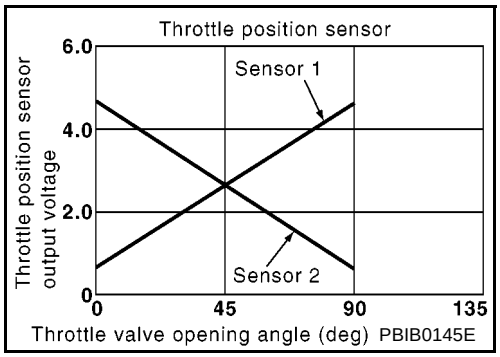
DTC P1226 TP SENSOR

PFP:16119

Component Description

EBS00GIL

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.
The throttle position sensor has the two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.



On Board Diagnosis Logic

EBS00GIM

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1226 1226	Closed throttle position learning performance problem	Closed throttle position learning is not performed successfully, repeatedly.	● Electric throttle control actuator (TP sensor 1 and 2)

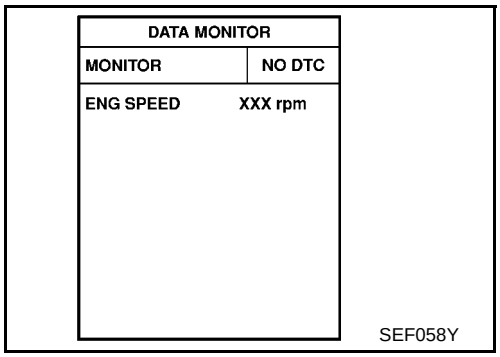
DTC Confirmation Procedure

EBS00GIN

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Turn ignition switch “OFF”, wait at least 10 seconds.
4. Turn ignition switch “ON”.
5. Repeat steps 3 and 4, 32 times.
6. If 1st trip DTC is detected, go to EC-1321, "Diagnostic Procedure" .



WITH GST

Follow the procedure “With CONSULT-II” above.

Diagnostic Procedure

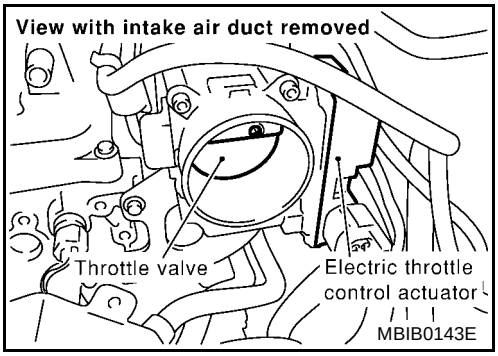
EBS00GIO

1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Turn ignition switch “OFF”.
2. Remove the intake air duct.
3. Check if foreign matter is caught between the throttle valve and the housing.

OK or NG

OK >> GO TO 2.
NG >> Remove the foreign matter and clean the electric throttle control actuator inside.



2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-998, "Throttle Valve Closed Position Learning" .
3. Perform EC-999, "Idle Air Volume Learning" .

>> **INSPECTION END**

Remove and Installation

EBS00GIP

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-116, "INTAKE MANIFOLD" .

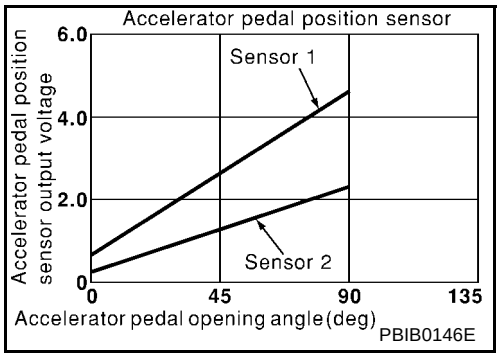
DTC P1227, P1228 APP SENSOR

PFP:18002

Component Description

EBS00GIQ

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.
Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometers which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the accelerator pedal and feed the voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.



Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for the engine operation such as fuel cut.

CONSULT-II Reference Value in Data Monitor Mode

EBS00GIR

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
ACCEL SEN2	● Ignition switch: ON (engine stopped)	Accelerator pedal: Fully released	0.35 - 0.67V
		Accelerator pedal: Fully depressed	More than 3.9V
CLSD THL POS	● Ignition switch: ON	Accelerator pedal: Fully released	ON
		Accelerator pedal: Slightly depressed	OFF

On Board Diagnosis Logic

EBS00GIS

These half-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1227 1227	Accelerator pedal position sensor 2 circuit low input	An excessively low voltage from the APP sensor 2 is sent to ECM.	● Harness or connectors (The APP sensor 2 circuit is open or shorted.) ● Accelerator pedal position sensor (Accelerator pedal position sensor 2)
P1228 1228	Accelerator pedal position sensor 2 circuit high input	An excessively high voltage from the APP sensor 2 is sent to ECM.	

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters in fail-safe mode and the MI lights up.

Engine operating condition in fail-safe mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of throttle valve to be shower than the normal condition. So, the acceleration will be poor.

DTC Confirmation Procedure

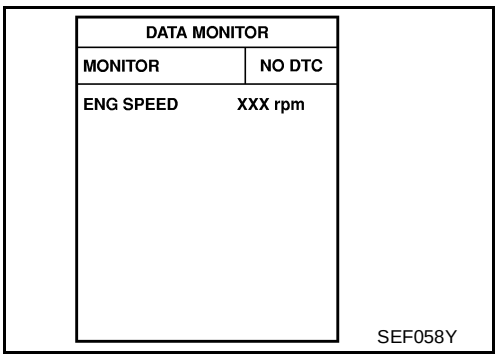
EBS00GIT

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.

2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-1325, "Diagnostic Procedure" .

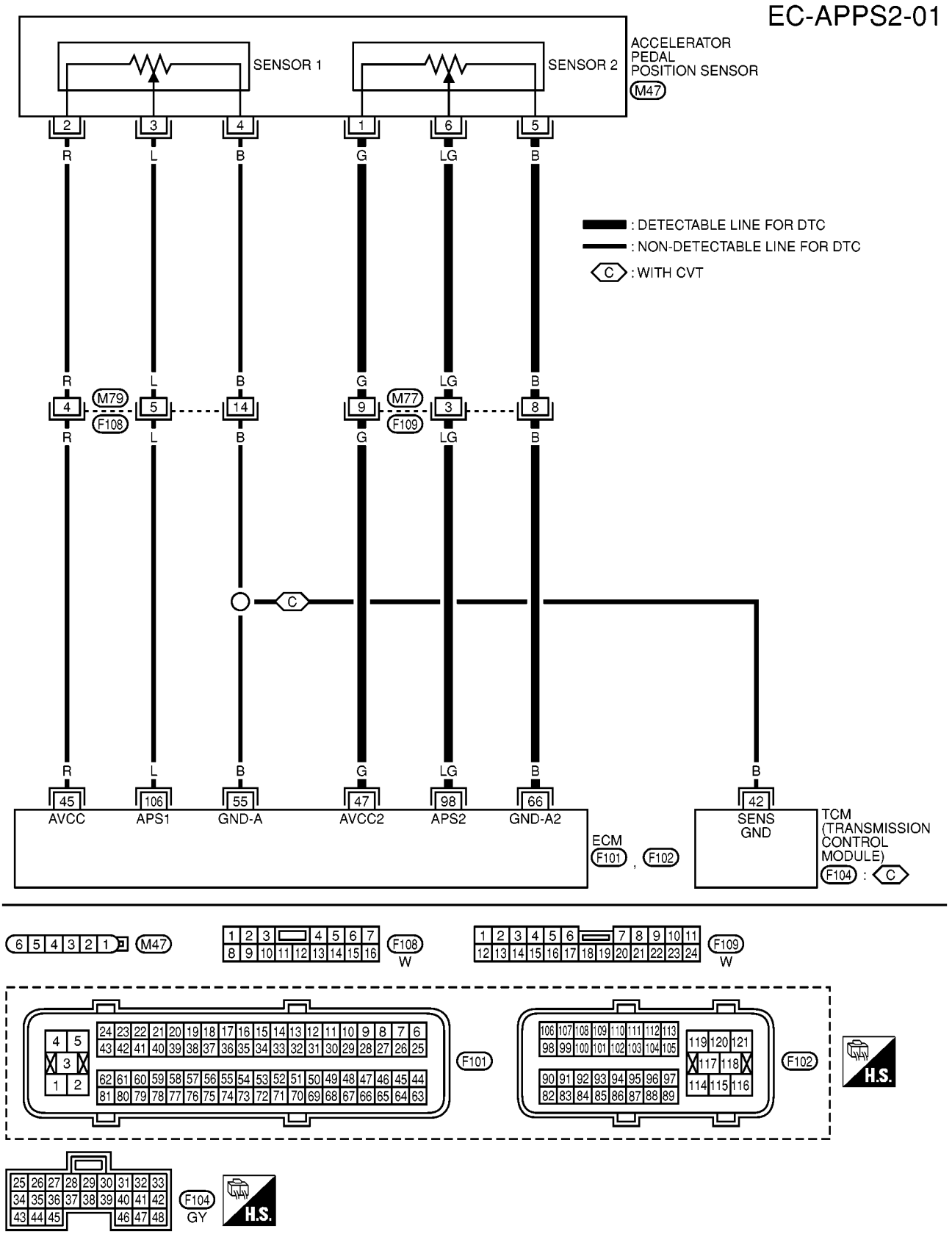


WITH GST

Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

EBS00GIU



MBWA0130E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
45	R	Sensors′ power supply	**[Ignition switch “ON”]**	Approximately 5V
47	G	Sensors′ power supply	**[Ignition switch “ON”]**	Approximately 5V
55	B	Sensor′s ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
66	B	Sensor′s ground	**[Ignition switch “ON”]** ● **Warm-up condition** ● Idle speed	Approximately 0V
98	LG	Accelerator pedal position sensor 2	**[Ignition switch “ON”]** ● Shift lever position is “D” (CVT models) ● Shift lever position is “1st” (M/T models) ● Accelerator pedal fully released	0.175 - 0.335V
			[Ignition switch “ON”] ● Shift lever position is “D” (CVT models) ● Shift lever position is “1st” (M/T models) ● Accelerator pedal fully depressed	More than 1.95V
106	L	Accelerator pedal position sensor 1	**[Ignition switch “ON”]** ● Shift lever position is “D” (CVT models) ● Shift lever position is “1st” (M/T models) ● Accelerator pedal fully released	0.35 - 0.67V
			[Ignition switch “ON”] ● Shift lever position is “D” (CVT models) ● Shift lever position is “1st” (M/T models) ● Accelerator pedal fully depressed	More than 3.9V

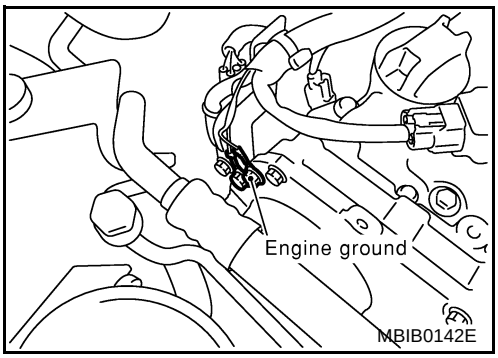
Diagnostic Procedure

EBS00GIV

1. RETIGHTEN GROUND SCREWS

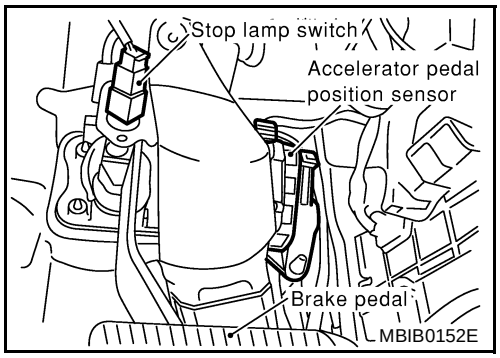
1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

>> GO TO 2.



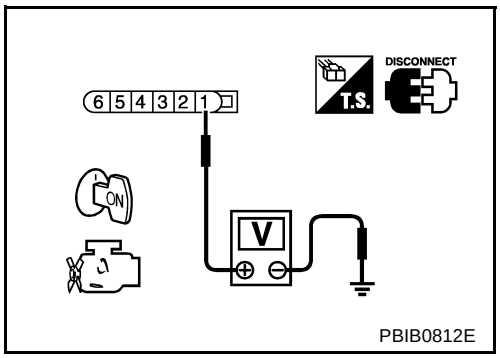
2. CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT

1. Disconnect accelerator pedal position (APP) sensor harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between APP sensor terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M77, F109
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK APP SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 66 and APP sensor terminal 5. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M77, F109
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK APP SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 98 and APP sensor terminal 6. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M77, F109
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK APP SENSOR

Refer to EC-1327, "Component Inspection" .

OK or NG

OK >> GO TO 10.
NG >> GO TO 9.

9. REPLACE APP SENSOR

1. Replace the accelerator pedal position sensor.
2. Perform EC-998, "Accelerator Pedal Released Position Learning" .
3. Perform EC-998, "Throttle Valve Closed Position Learning" .
4. Perform EC-999, "Idle Air Volume Learning" .

>> **INSPECTION END**

10. CHECK INTERMITTENT INCIDENT

Refer to EC-1076, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

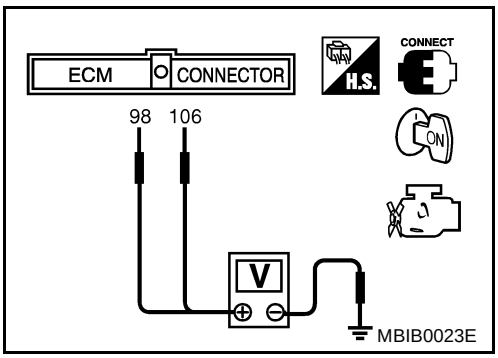
Component Inspection

EBS00GIW

ACCELERATOR PEDAL POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Turn ignition switch “ON”.
3. Check voltage between ECM terminals 106 (APP sensor 1 signal), 98 (APP sensor 2 signal) and engine ground under the following conditions.

Terminal	Accelerator pedal	Voltage
106 (Accelerator pedal position sensor 1)	Fully released	0.35 - 0.67V
	Fully depressed	More than 3.9V
98 (Accelerator pedal position sensor 2)	Fully released	0.175 - 0.335V
	Fully depressed	More than 1.95V



4. If NG, replace accelerator pedal assembly and go to the next step.
5. Perform EC-998, "Accelerator Pedal Released Position Learning" .
6. Perform EC-998, "Throttle Valve Closed Position Learning" .
7. Perform EC-999, "Idle Air Volume Learning" .

Remove and Installation

EBS00GIX

ACCELERATOR PEDAL

Refer to ACC-2, "ACCELERATOR CONTROL SYSTEM" .

DTC P1229 SENSOR POWER SUPPLY

PFP:16119

On Board Diagnosis Logic

EBS00GIY

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1229 1229	Sensor power supply circuit short	ECM detects a voltage of power source for sensor is excessively low or high.	● Harness or connectors (The TP sensor 1 and 2 circuit is shorted.) (APP sensor 2 circuit is shorted.) ● Electric throttle control actuator (TP sensor 1 and 2) ● Accelerator pedal position sensor (APP sensor 2) ● ECM pin terminal

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters in fail-safe mode and the MI lights up.

Engine operation condition in fail-safe mode
ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

DTC Confirmation Procedure

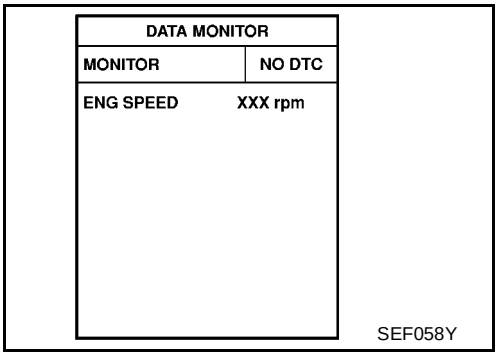
EBS00GIZ

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-1331, "Diagnostic Procedure" .



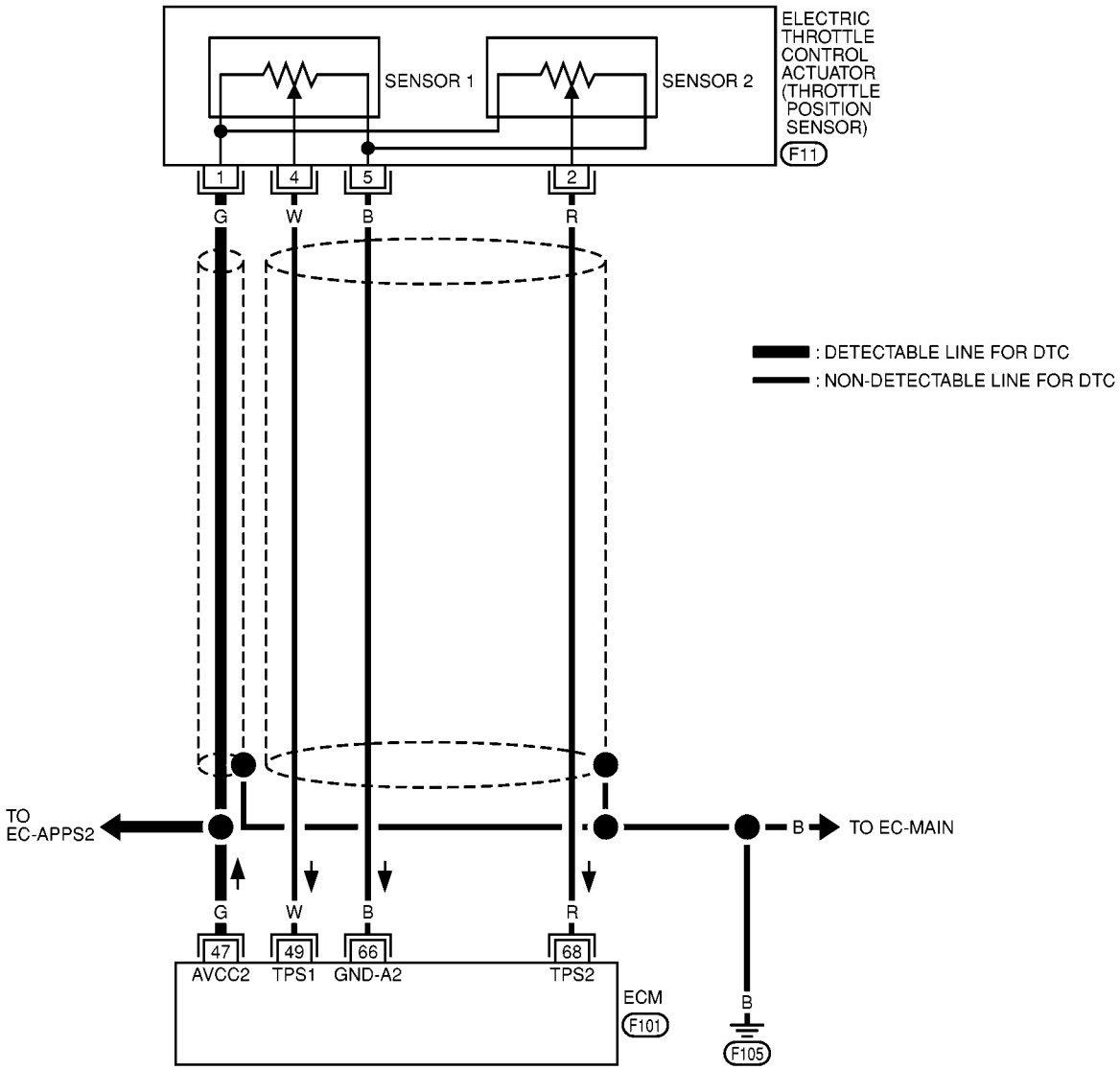
WITH GST

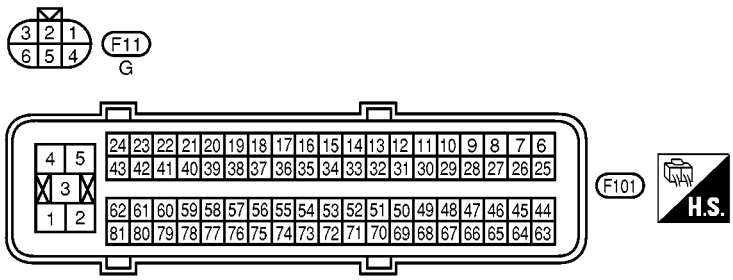
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

EBS00GJ0

EC-SEN/PW-01





MBWA0128E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
47	G	Sensor's power supply	**[Ignition switch "ON"]**	Approximately 5V

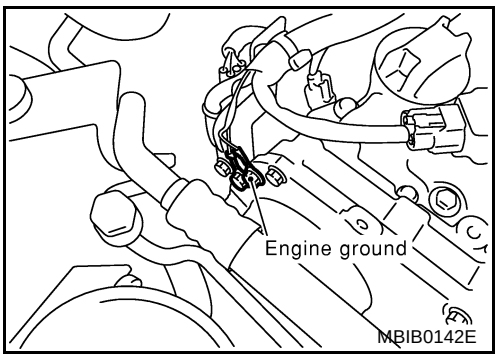
Diagnostic Procedure

EBS00GJ1

1. RETIGHTEN GROUND SCREWS

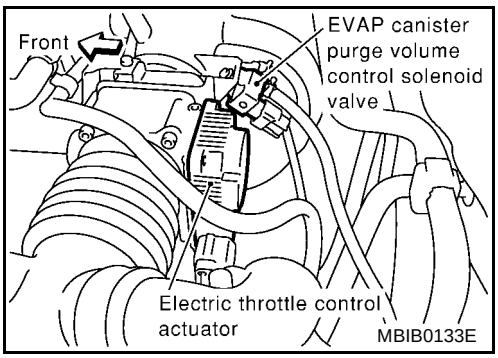
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



2. CHECK THROTTLE POSITION SENSOR POWER SUPPLY CIRCUIT

1. Disconnect electric throttle control actuator harness connector.
2. Turn ignition switch "ON".

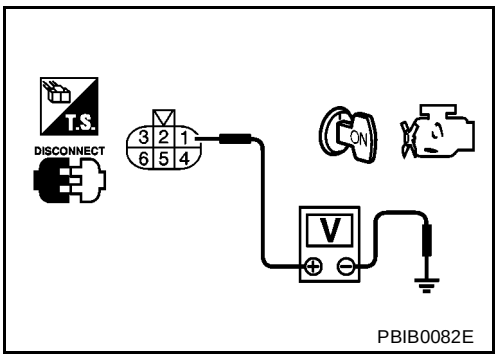


3. Check voltage between electric throttle control actuator terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 5V

OK or NG

OK >> GO TO 6.
NG >> GO TO 3.



3. CHECK SENSOR POWER SUPPLY CIRCUITS FOR SHORT

Check the following.

- Harness for short to power and short to ground between following terminals.

ECM terminal	Sensor terminals	Reference Wiring Diagram
47	Electric throttle control actuator terminal 1	EC-1330
	Accelerator pedal position sensor terminal 1	EC-1324

- ECM pin terminal.

OK or NG

OK >> GO TO 4.
NG >> Repair short to ground or short to power in harness or connectors.

4. CHECK ACCELERATOR PEDAL POSITON SENSOR

Refer to EC-1327, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> GO TO 5.

5. REPLACE ACCELERATOR PEDAL POSITION SENSOR

1. Replace accelerator pedal position sensor.
2. Perform EC-998, "Accelerator Pedal Released Position Learning" .
3. Perform EC-998, "Throttle Valve Closed Position Learning" .
4. Perform EC-999, "Idle Air Volume Learning" .

>> **INSPECTION END**

6. CHECK THROTTLE POSITION SENSOR

Refer to EC-1174, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

7. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace electric throttle control actuator.
2. Perform EC-998, "Throttle Valve Closed Position Learning" .
3. Perform EC-999, "Idle Air Volume Learning" .

>> **INSPECTION END**

8. CHECK INTERMITTENT INCIDENT

Refer to EC-1076, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

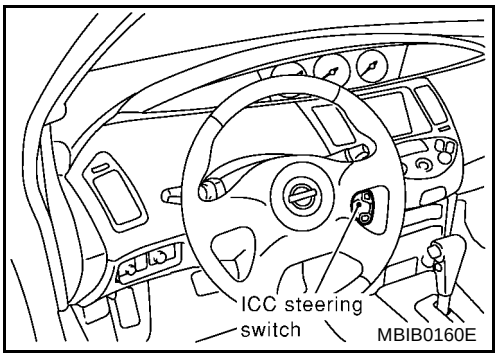
DTC P1564 ICC STEERING SWITCH

PFP:25551

Component Description

EBS00GTV

ICC steering switch has variant values of electrical resistance for each button. ECM reads voltage variation of switch, and determines which button is operated.
Refer to ACS-5, "DESCRIPTION" for the ICC function.



CONSULT-II Reference Value in Data Monitor Mode

EBS00GTW

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
MAIN SW	● Ignition switch: ON	● ON/OFF switch pressed	ON
		● ON/OFF switch released	OFF
CANCEL	● Ignition switch: ON	● CANCEL switch pressed	ON
		● CANCEL switch released	OFF
RESUME/ACC SW	● Ignition switch: ON	● ACCEL RES switch pressed	ON
		● ACCEL RES switch released	OFF
SET SW	● Ignition switch: ON	● COAST/SET switch pressed	ON
		● COAST/SET switch released	OFF
DIST SW	● Ignition switch: ON	● DISTANCE switch pressed	ON
		● DISTANCE switch released	OFF

On Board Diagnosis Logic

EBS00GTX

NOTE:
If DTC P1564 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-1235 .

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P1564 1564	ICC steering switch	● An excessively high voltage signal from the ICC steering switch is sent to ECM. ● ECM detects that input signal from the ICC steering switch is out of the specified range. ● ECM detects that the ICC steering switch is stuck ON.	● Harness or connectors (The switch circuit is open or shorted.) ● ICC steering switch ● ECM

DTC Confirmation Procedure

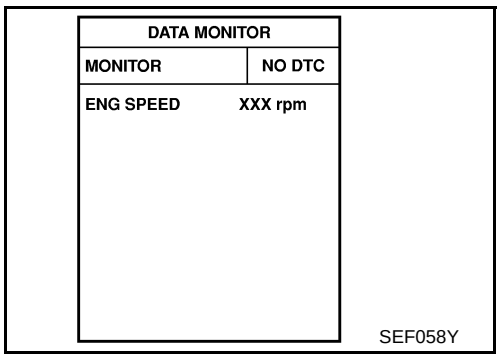
EBS00GTY

NOTE:
If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch "ON".

2. Select "DATA MONITOR" mode with CONSULT-II.
3. Wait at least 10 seconds.
4. Press "CRUISE" switch for at least 10 seconds, then release it and wait at least 10 seconds.
5. Press "ACCEL/RES" switch for at least 10 seconds, then release it and wait at least 10 seconds.
6. Press "COAST/SET" switch for at least 10 seconds, then release it and wait at least 10 seconds.
7. Press “DISTANCE” switch for at least 10 seconds, then release it and wait at least 10 seconds.
8. Press "CANCEL" switch for at least 10 seconds, then release it and wait at least 10 seconds.
9. If 1st trip DTC is detected, go to EC-1337, "Diagnostic Procedure" .



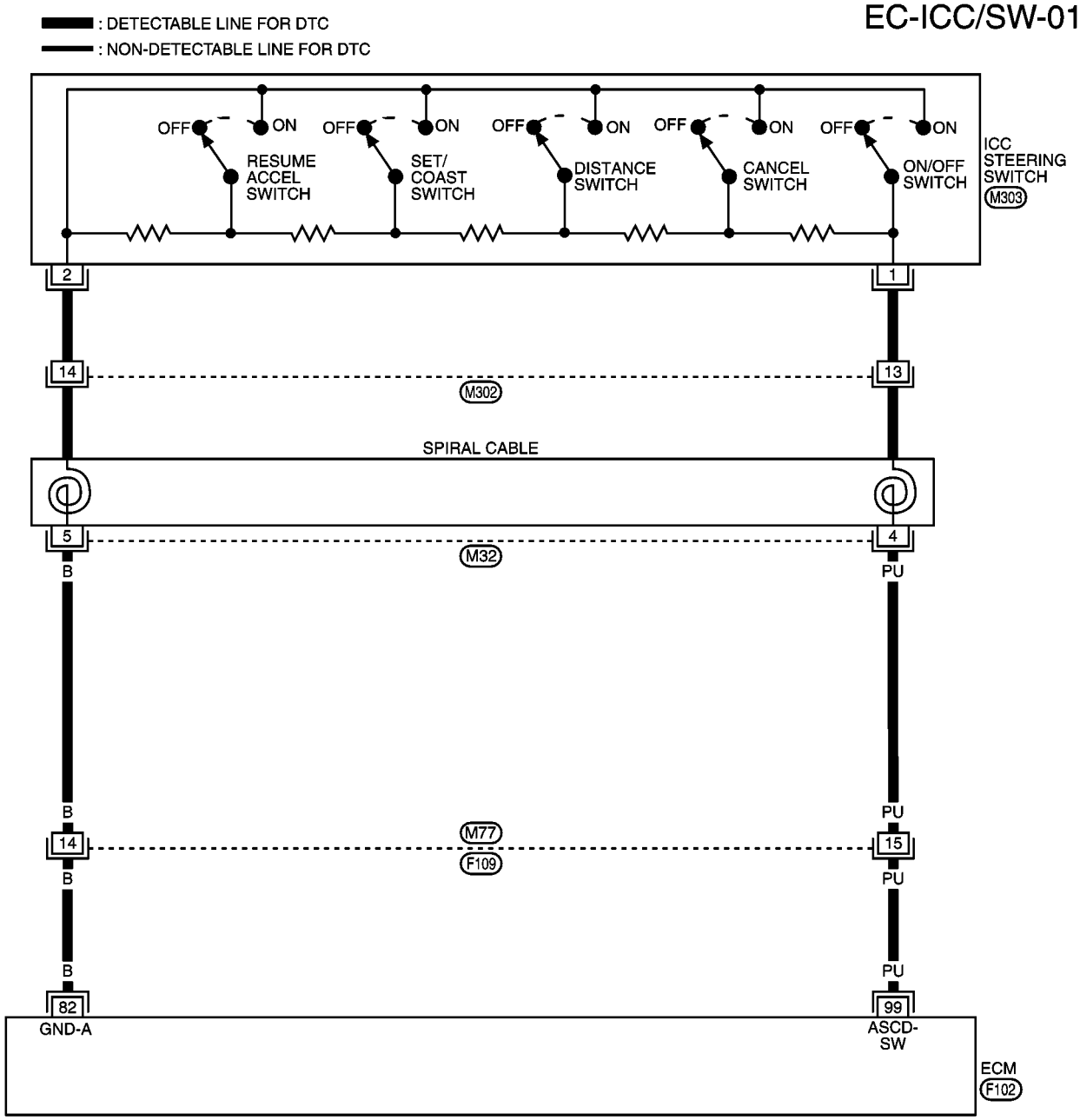
WITH GST

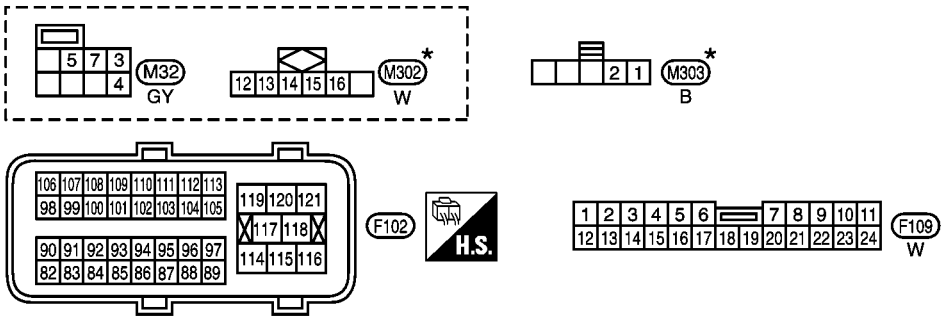
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

EBS00GTZ

EC-ICC/SW-01





* : THIS CONNECTOR IS NOT SHOWN IN "HARNESS LAYOUT", PG SECTION.

MBWA0153E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
82	B	Sensor's ground (ICC steering switch)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
99	PU	ICC steering switch	**[Ignition switch "ON"]** ● ICC steering switch is "OFF".	Approximately 4.3V
			[Ignition switch "ON"] ● ON/OFF switch is "ON".	Approximately 0V
			[Ignition switch "ON"] ● CANCEL switch is "ON".	Approximately 1.3V
			[Ignition switch "ON"] ● DISTANCE switch is "ON".	Approximately 2.2V
			[Ignition switch "ON"] ● SET/COAST switch is "ON".	Approximately 3V
			[Ignition switch "ON"] ● RESUME/ACCEL switch is "ON".	Approximately 3.7V

Diagnostic Procedure

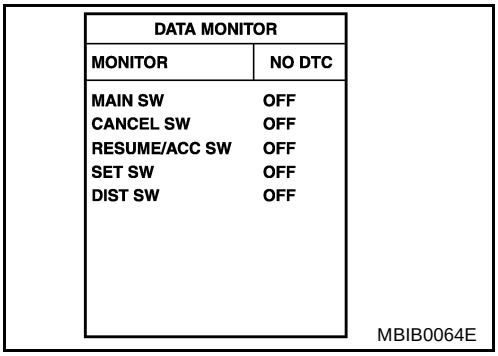
EBS00GU0

1. CHECK ICC STEERING SWITCH CIRCUIT

With CONSULT-II

1. Turn ignition switch "ON".
2. Select "MAIN SW", "RESUME/ACC SW", "SET SW", “DIST SW” and "CANCEL SW" in "DATA MONITOR" mode with CONSULT-II.
3. Check each item indication under the following conditions.

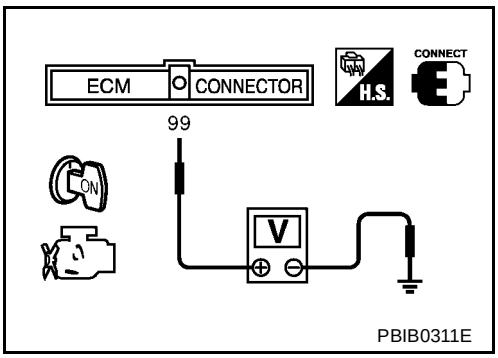
Switch	Monitor item	Condition	Indication
ON/OFF	MAIN SW	Pressed	ON
		Released	OFF
COAST/SET	SET SW	Pressed	ON
		Released	OFF
ACCEL/RES	RESUME/ACC SW	Pressed	ON
		Released	OFF
DISTANCE	DIST SW	Pressed	ON
		Released	OFF
CANCEL	CANCEL SW	Pressed	ON
		Released	OFF



Without CONSULT-II

1. Turn ignition switch "ON".
2. Check voltage between ECM terminal 99 and ground with pressing each button.

Switch	Condition	Voltage [V]
ON/OFF	Pressed	Approx. 0
	Released	Approx. 4.3
COAST/SET	Pressed	Approx. 3.0
	Released	Approx. 4.3
ACCEL RES	Pressed	Approx. 3.7
	Released	Approx. 4.3
DISTANCE	Pressed	Approx. 2.2
	Released	Approx. 4.3
CANCEL	Pressed	Approx. 1.3
	Released	Approx. 4.3



OK or NG

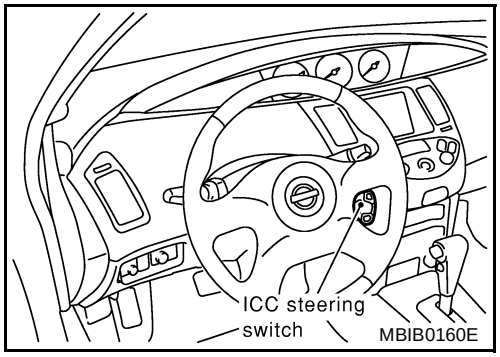
OK >> GO TO 7.
NG >> GO TO 2.

2. CHECK ICC STEERING SWITCH GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Disconnect ICC steering switch harness connector and ECM harness connector.
3. Check harness continuity between ICC steering switch terminal 2 and ECM terminal 82.
   Refer to Wiring Diagram.

   Continuity should exist.

4. Also check harness for short to ground and short to power.



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M77, F109
- Spiral cable
- Harness for open and short between ECM and ICC steering switch

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK ICC STEERING SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 99 and ICC steering switch terminal 1.
   Refer to Wiring Diagram.

   Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M77, F109
- Spiral cable
- Harness for open and short between ECM and ICC steering switch

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK ICC STEERING SWITCH

Refer to EC-1339, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace ICC steering switch.

7. CHECK INTERMITTENT INCIDENT

Refer to EC-1076, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

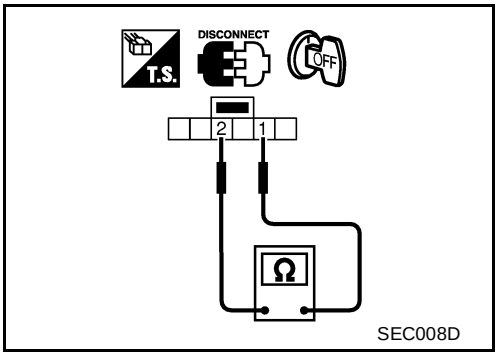
>> **INSPECTION END**

Component Inspection

EBS00GU1

ICC STEERING SWITCH

1. Disconnect ICC steering switch.
2. Check continuity between ICC steering switch terminals 1 and 2 with pushing each switch.



Switch	Condition	Resistance [Ω]
ON/OFF SW	Pressed	Approx. 0
	Released	Approx. 5,500
COAST/SET SW	Pressed	Approx. 1,400
	Released	Approx. 5,500
ACCEL RES SW	Pressed	Approx. 2,600
	Released	Approx. 5,500
DISTANCE SW	Pressed	Approx. 740
	Released	Approx. 5,500
CANCEL SW	Pressed	Approx. 310
	Released	Approx. 5,500

If NG, replace ICC steering switch.

DTC P1568 ICC FUNCTION

PFP:18995

On Board Diagnosis Logic

EBS00GTS

This self-diagnosis has the one trip detection logic

NOTE:

- **If DTC P1568 is displayed with DTC U1000, U1001, first perform the trouble diagnosis for DTC U1000, U1001. Refer to EC-1083, "DTC U1000, U1001 CAN COMMUNICATION LINE" .**
- **If DTC P1568 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-1235, "DTC P0605 ECM"**

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P1568 1568	ICC function	ECM detects a difference between signals from ICC unit is out of specified range.	● Harness or connectors (The CAN communication line is open or shorted.) ● ICC unit ● ECM

DTC Confirmation Procedure

EBS00GTT

CAUTION:

Always drive vehicle at a safe speed.

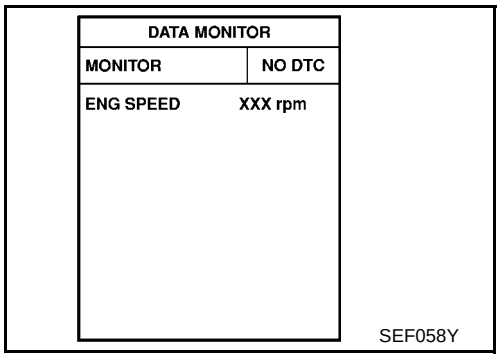
NOTE:

If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

Step 4 may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Press “ON/OFF” switch on ICC steering switch.
4. Drive the vehicle at more than 40 km/h (25 MPH).
5. Press “COAST/SET” switch.
6. If DTC is detected, go to EC-1340, "Diagnostic Procedure" .



WITH GST

Follow the procedure “WITH CONSULT-II” above.

Diagnostic Procedure

EBS00GTU

1. REPLACE ICC UNIT

1. Replace ICC unit.
2. Perform ACS-13, "ACTION TEST" .
3. Check DTC of ICC unit. Refer to ACS-44, "TROUBLE DIAGNOSIS FOR SELF-DIAGNOSTIC ITEMS" .

>> **INSPECTION END**

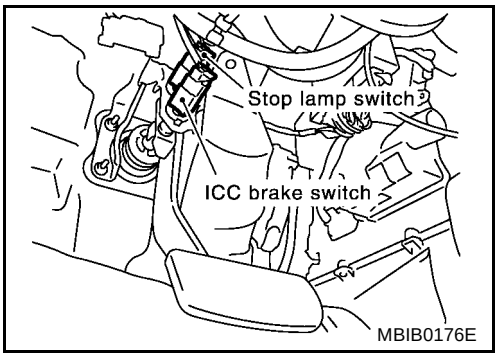
DTC P1572 ICC BRAKE SWITCH

PFP:25320

Component Description

EBS00GU2

When the brake pedal is depressed, ICC brake switch is turned OFF and stop lamp switch is turned ON. ECM detects the state of the brake pedal by this input of two kinds (ON/OFF signal).
Refer to ACS-5, "DESCRIPTION" for the ICC function.



CONSULT-II Reference Value in Data Monitor Mode

EBS00GU3

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
BRAKE SW1 (ICC brake switch)	● Ignition switch: ON	● Brake pedal fully released	ON
		● Brake pedal depressed	OFF
BRAKE SW2 (stop lamp switch)	● Ignition switch: ON	● Brake pedal fully released	OFF
		● Brake pedal depressed	ON

On Board Diagnosis Logic

EBS00GU4

NOTE:
If DTC P1572 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-1235 .

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P1572 1572	ICC brake switch	ON signals from the stop lamp switch and the ICC brake switch are sent to ECM at the same time.	● Harness or connectors (The stop lamp switch circuit is open or shorted.) ● Harness or connectors (The ICC brake switch circuit is open or shorted.) ● Stop lamp switch ● ICC brake switch ● ICC brake hold relay ● Incorrect stop lamp switch installation ● Incorrect ICC brake switch installation ● ECM

DTC Confirmation Procedure

EBS00GU5

CAUTION:
Always drive vehicle at a safe speed.

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:
Steps 3 and 4 may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

WITH CONSULT-II

1. Start engine.
2. Select “DATA MONITOR” mode with CONSULT-II.

3. Drive the vehicle for at least 5 consecutive seconds under the following condition.

VHCL SPEED SE	More than 30 km/h (19 MPH)
Selector lever	Suitable position

If 1st trip DTC is detected, go to EC-1344, "Diagnostic Procedure" .
If 1st trip DTC is not detected, go to the following step.

4. Drive the vehicle for at least 5 consecutive seconds under the following condition.

VHCL SPEED SE	More than 30 km/h (19 MPH)
Selector lever	Suitable position
Driving location	Depress the brake pedal for more than five seconds so as not to come off from the above-mentioned condition.

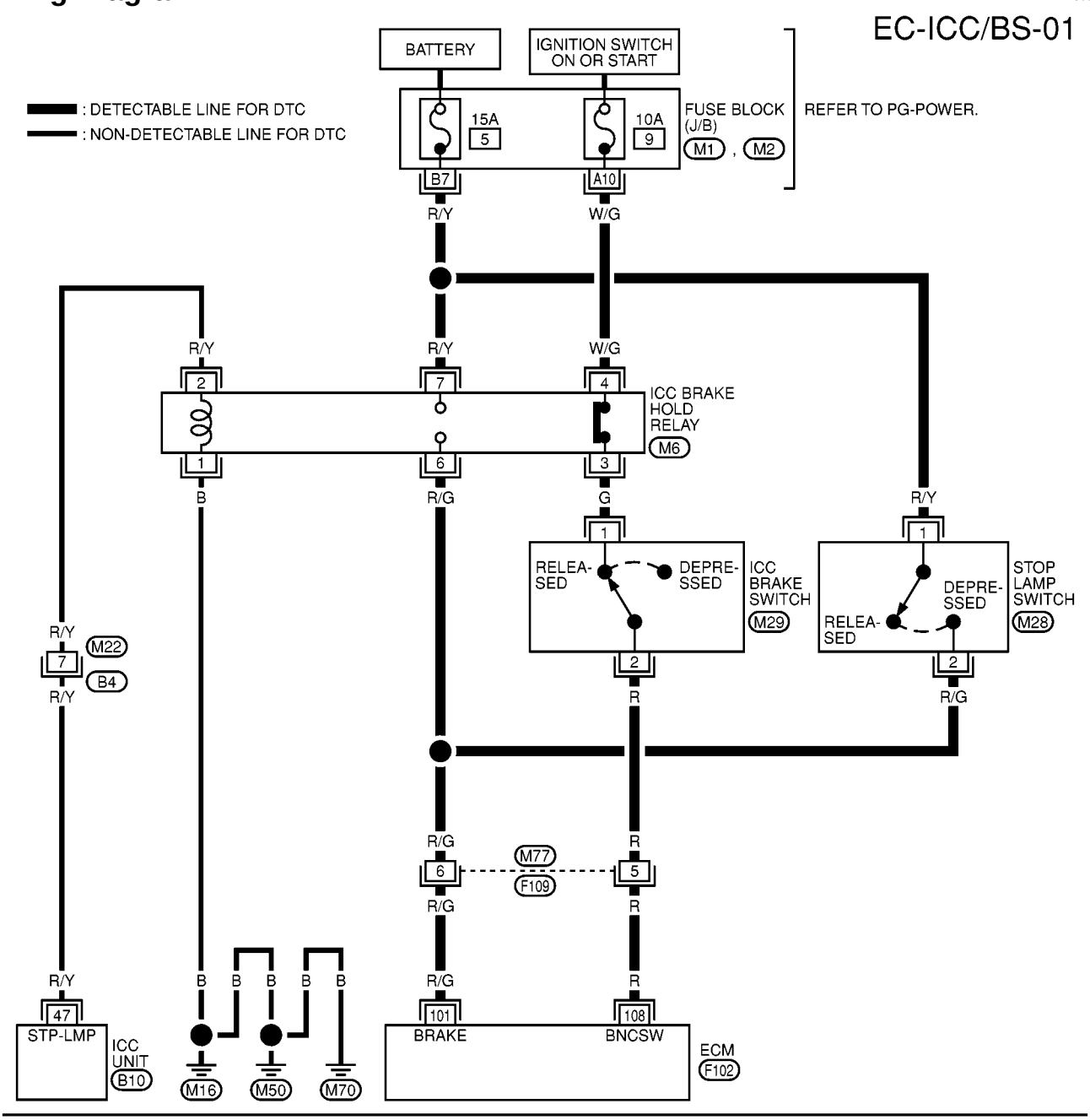
5. If 1st trip DTC is detected, go to EC-1344, "Diagnostic Procedure" .

WITH GST

Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

EBS00GU6



MBWA0154E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
101	R/G	Stop lamp switch	**[Engine is running]** ● Brake pedal fully released	Approximately 0V
			[Engine is running] ● Brake pedal depressed	BATTERY VOLTAGE (11 - 14V)
108	R	ICC brake switch	**[Ignition switch “ON”]** ● Brake pedal is depressed	Approximately 0V
			[Ignition switch “ON”] ● Brake pedal is fully released	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

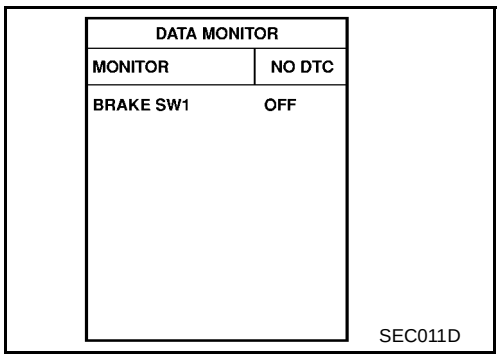
EBS00GU7

1. CHECK OVERALL FUNCTION-I

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “BRAKE SW1” in “DATA MONITOR” mode with CONSULT-II.
3. Check “BRAKE SW1” indication under the following conditions.

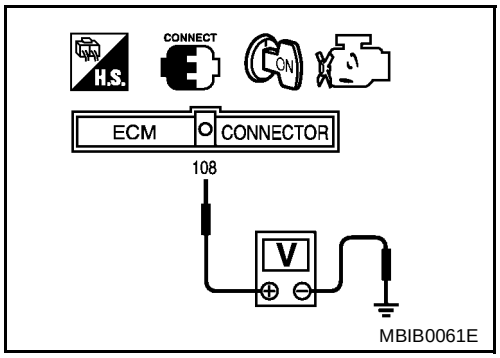
CONDITION	INDICATION
When brake pedal is depress	OFF
When brake pedal is fully released	ON



Without CONSULT-II

1. Turn ignition switch “ON”.
2. Check voltage between ECM terminal 108 and ground under the following conditions.

CONDITION	VOLTAGE
When brake pedal is depress	Approximately 0V
When brake pedal is fully released	Battery voltage



OK or NG

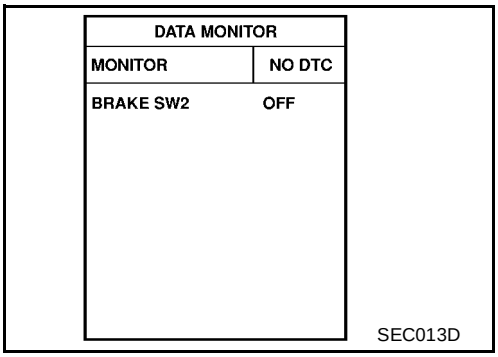
OK >> GO TO 2.
NG >> GO TO 3.

2. CHECK OVERALL FUNCTION-II

With CONSULT-II

Check “BRAKE SW2” indication in “DATA MONITOR” mode.

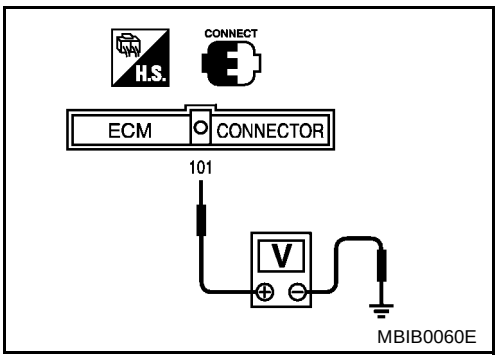
CONDITION	INDICATION
When brake pedal is released	OFF
When brake pedal is depressed	ON



Without CONSULT-II

Check voltage between ECM terminal 101 and ground under the following conditions.

CONDITION	VOLTAGE
When brake pedal is released	Approximately 0V
When brake pedal is depressed	Battery voltage

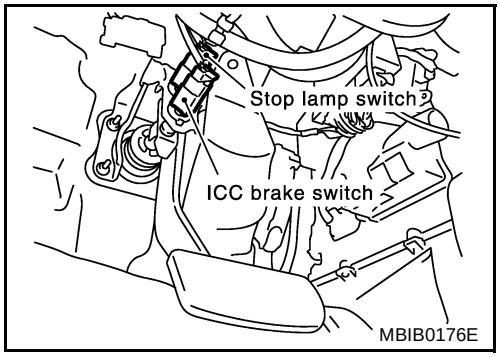


OK or NG

OK >> GO TO 18.
NG >> GO TO 11.

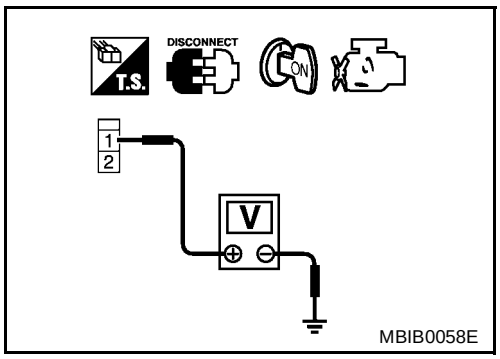
3. CHECK ICC BRAKE SWITCH POWER SUPPLY CIRCUIT-I

1. Turn ignition switch “OFF”.
2. Disconnect ICC brake switch harness connector.
3. Turn ignition switch “ON”.



4. Check voltage between ICC brake switch terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage

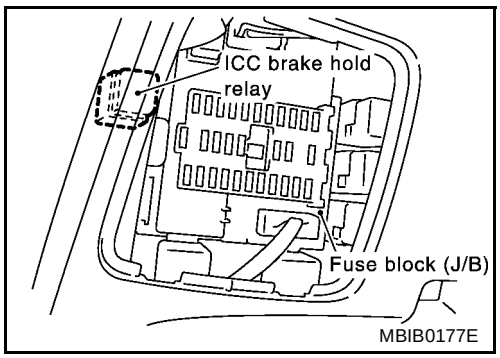


OK or NG

OK >> GO TO 8.
NG >> GO TO 4.

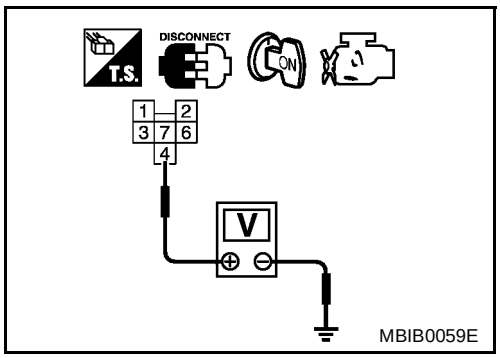
4. CHECK ICC BRAKE SWITCH POWER SUPPLY CIRCUIT-II

1. Turn ignition switch “OFF”.
2. Disconnect ICC brake hold relay.
3. Turn ignition switch “ON”.



4. Check voltage between ICC brake hold relay terminal 4 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector M1
- 10A fuse
- Harness for open or short between ICC brake hold relay and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK ICC BRAKE SWITCH POWER SUPPLY CIRCUIT-III

1. Turn ignition switch “OFF”.
2. Check harness continuity between ICC brake hold relay terminal 3 and ICC brake switch terminal 1. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK ICC BRAKE HOLD RELAY

Refer to EC-1349, "Component Inspection" .

OK or NG

OK >> GO TO 18.
NG >> Replace ICC brake hold relay.

8. CHECK ICC BRAKE SWITCH INPUT SIGNAL CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ICC brake switch terminal 2 and ECM terminal 108. Refer Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 10.
NG >> GO TO 9.

9. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M77, F109
- Harness for open or short between ICC brake switch and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

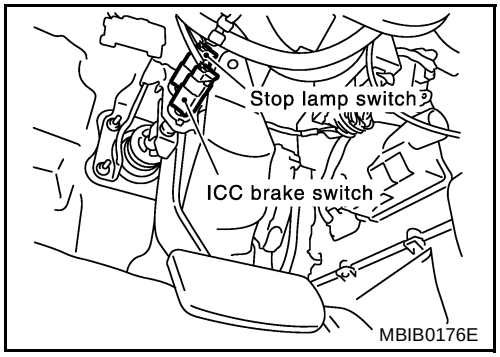
10. CHECK ICC BRAKE SWITCH

Refer to EC-1349, "Component Inspection" .

OK >> GO TO 18.
NG >> Replace ICC brake switch.

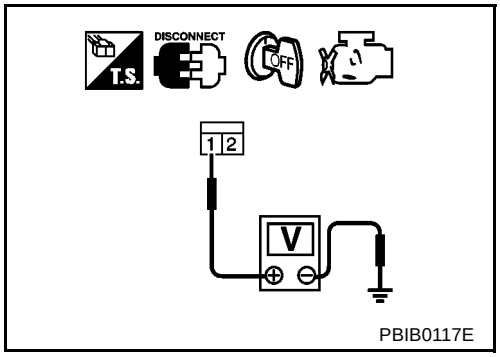
11. CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect stop lamp switch harness connector.



3. Check voltage between stop lamp switch terminal 1 and ground with CONSULT -II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 13.
NG >> GO TO 12.

12. DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector M2
- 15A fuse
- Harness for open or short between stop lamp switch and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

13. CHECK STOP LAMP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 101 and stop lamp switch terminal 2. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 15.
NG >> GO TO 14.

14. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M77, F109
- Harness for open or short between ECM and stop lamp switch

>> Repair open circuit or short to ground or short to power in harness or connectors.

15. CHECK ICC BRAKE HOLD RELAY CIRCUIT FOR OPEN AND SHORT

1. Disconnect ICC brake hold relay.
2. Check harness continuity between stop lamp switch terminal 1 and ICC brake hold relay terminal 7, stop lamp switch terminal 2 and ICC brake hold relay terminal 6.
   Refer to Wiring Diagram.

   Continuity should exist.
3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 16.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

16. CHECK STOP LAMP SWITCH

Refer to EC-1349, "Component Inspection"

OK or NG

OK >> GO TO 17.
NG >> Replace stop lamp switch.

17. CHECK ICC BRAKE HOLD RELAY

Refer to EC-1349, "Component Inspection" .

OK or NG

OK >> GO TO 18.
NG >> Replace ICC brake hold relay.

18. CHECK INTERMITTENT INCIDENT

Refer to EC-1076, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

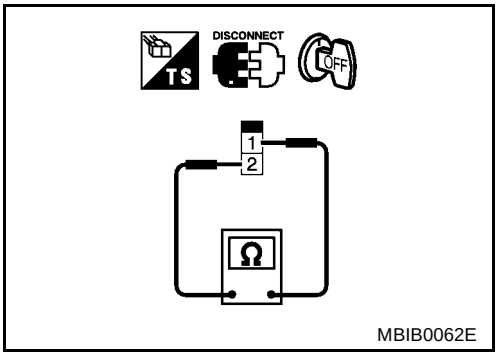
EBS00GU8

ICC BRAKE SWITCH

1. Turn ignition switch “OFF”.
2. Disconnect ICC brake switch harness connector.
3. Check continuity between ICC brake switch terminals 1 and 2 under the following conditions.

Condition	Continuity
When brake pedal is fully released.	Should exist.
When brake pedal is depressed.	Should not exist.

If NG, adjust ICC brake switch installation, refer to BR-6, "BRAKE PEDAL" , and perform step 3 again.



MBIB0062E

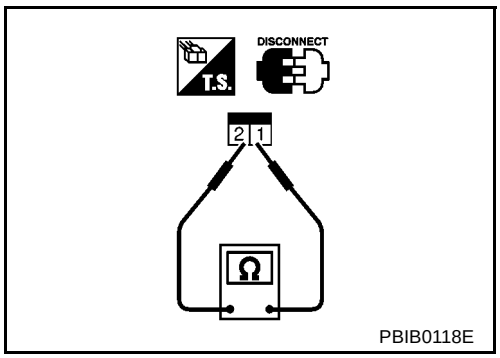
STOP LAMP SWITCH

1. Turn ignition switch “OFF”.
2. Disconnect stop lamp switch harness connector.

3. Check continuity between stop lamp switch terminals 1 and 2 under the following conditions.

Condition	Continuity
When brake pedal is fully released.	Should not exist.
When brake pedal is depressed.	Should exist.

If NG, adjust stop lamp switch installation, refer to BR-6, "BRAKE PEDAL" , and perform step 3 again.

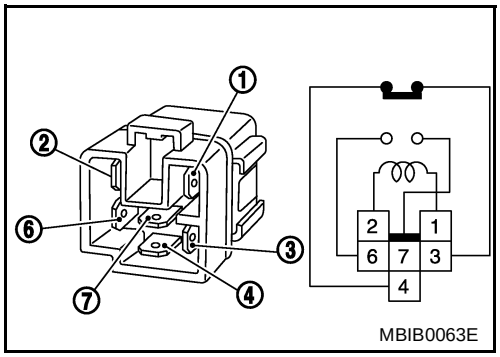


ICC BRAKE HOLD RELAY

1. Apply 12V direct current between ICC brake hold relay terminals 1 and 2.
2. Check continuity between relay terminals 3 and 4, 6 and 7 under the following conditions.

Condition	Between terminals	Continuity
12V direct current supply between terminals 1 and 2	3 and 4	Should not exist
	6 and 7	Should exist
No current supply	3 and 4	Should exist
	6 and 7	Should not exist

3. If NG, replace ICC brake hold relay.



DTC P1574 ICC VEHICLE SPEED SENSOR

PFP:31036

Component Description

EBS00GTN

The ECM receives two vehicle speed signals via CAN communication line. One is sent from combination meter, and the other is from TCM (Transmission control module). The ECM uses these signals for ICC control. Refer to ACS-5, "DESCRIPTION" for ICC functions.

On Board Diagnosis Logic

EBS00GTO

NOTE:

- **If DTC P1574 is displayed with DTC U1000, U1001, first perform the trouble diagnosis for DTC U1000, U1001. Refer to EC-1083, "DTC U1000, U1001 CAN COMMUNICATION LINE" .**
- **If DTC P1574 is displayed with DTC P0500, first perform the trouble diagnosis for DTC P0500. Refer to EC-1228, "DTC P0500 VSS" .**

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P1574 1574	ICC vehicle speed sensor	ECM detects a difference between two vehicle speed signals is out of the specified range.	● Harness or connectors (The CAN communication line is open or shorted.) ● TCM ● Secondary speed sensor ● ESP/TCS/ABS control unit ● Wheel sensor ● Combination meter ● ECM

DTC Confirmation Procedure

EBS00GTP

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

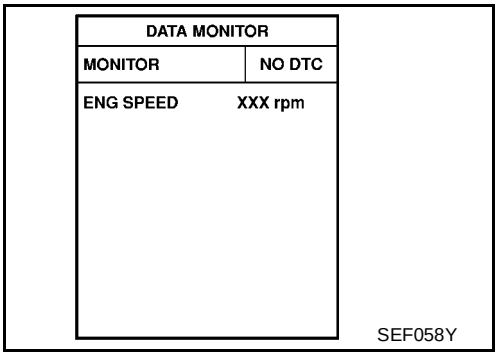
If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

Step 3 may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

WITH CONSULT-II

1. Start engine.
2. Select "DATA MONITOR" mode with CONSULT-II.
3. Drive the vehicle at more than 40 km/h (25MPH).
4. If 1st trip DTC is detected, go to EC-1352, "Diagnostic Procedure" .



WITH GST

Follow the procedure “WITH CONSULT-II” above.

Diagnostic Procedure

EBS00GTQ

1. CHECK DTC WITH TCM

Check DTC with TCM. Refer to CVT-20, "ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION" .

OK or NG

OK >> GO TO 2.
NG >> Perform trouble shooting relevant to DTC indicated.

2. CHECK VEHICLE SPEED SENSOR CIRCUIT

Refer to BRC-17, "TROUBLE DIAGNOSIS" (Models without ESP) or BRC-60, "TROUBLE DIAGNOSIS" (Models with ESP).

OK or NG

OK >> GO TO 3.
NG >> Repair or replace.

3. CHECK COMBINATION METER

Check combination meter function.
Refer to DI-5, "COMBINATION METERS (LHD MODELS)" or DI-34, "COMBINATION METERS (RHD MODELS)" .

>> **INSPECTION END**

DTC P1706 PNP SWITCH

PFP:32006

Component Description

EBS00GJ2

When the shift lever position is “P” (CVT models only) or “N”, park/neutral position (PNP) switch is “ON”.
ECM detects the position because the continuity of the line (the “ON” signal) exists.

CONSULT-II Reference Value in Data Monitor Mode

EBS00GJ3

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
P/N POSI SW	● Ignition switch: ON	Shift lever: P or N (CVT model) Neutral (M/T model)	ON
		Shift lever: Except above	OFF

On Board Diagnosis Logic

EBS00GJ4

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1706 1706	Park/neutral position switch	The signal of the park/neutral position (PNP) switch is not changed in the process of engine starting and driving.	● Harness or connectors (PNP switch circuit is open or shorted.) ● Park/neutral position (PNP) switch

DTC Confirmation Procedure

EBS00GJ5

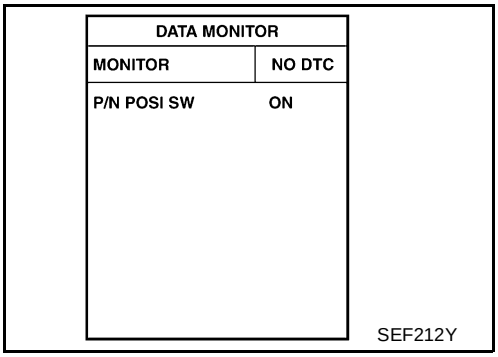
CAUTION:
Always drive vehicle at a safe speed.

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “P/N POSI SW” in “DATA MONITOR” mode with CONSULT-II. Then check the “P/N POSI SW” signal under the following conditions.

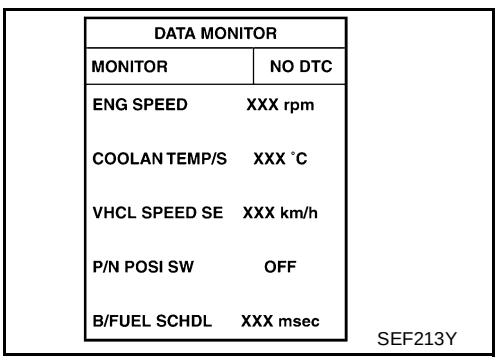
Position (Selector lever)	Known-good signal
“N” and “P” position	ON
Except the above position	OFF



If NG, go to EC-1356, "Diagnostic Procedure" .
If OK, go to following step.

3. Select “DATA MONITOR” mode with CONSULT-II.
4. Start engine and warm it up to normal operating temperature.
5. Maintain the following conditions for at least 60 consecutive seconds.

ENG SPEED	1,500 - 3,000 rpm
COOLAN TEMP/S	More than 70°C (158°F)
B/FUEL SCHDL	3.0 - 31.8 msec
VHCL SPEED SE	More than 64 km/h (40 MPH)
Selector lever	Suitable position



6. If 1st trip DTC is detected, go to EC-1356, "Diagnostic Procedure" .

Overall Function Check

EBS00GJ6

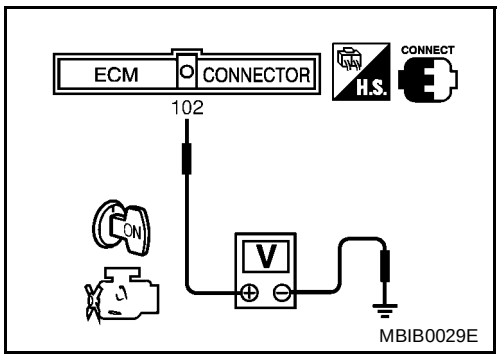
Use this procedure to check the overall function of the park/neutral position (PNP) switch circuit. During this check, a 1st trip DTC might not be confirmed.

WITH GST

1. Turn ignition switch “ON”.
2. Check voltage between ECM terminal 102 (PNP switch signal) and body ground under the following conditions.

Condition (Gear position)	Voltage V (Known good data)
“P” (CVT models only) and “N” position	Approx. 0
Except the above position	CVT models: Battery voltage M/T models: Approximately 5V

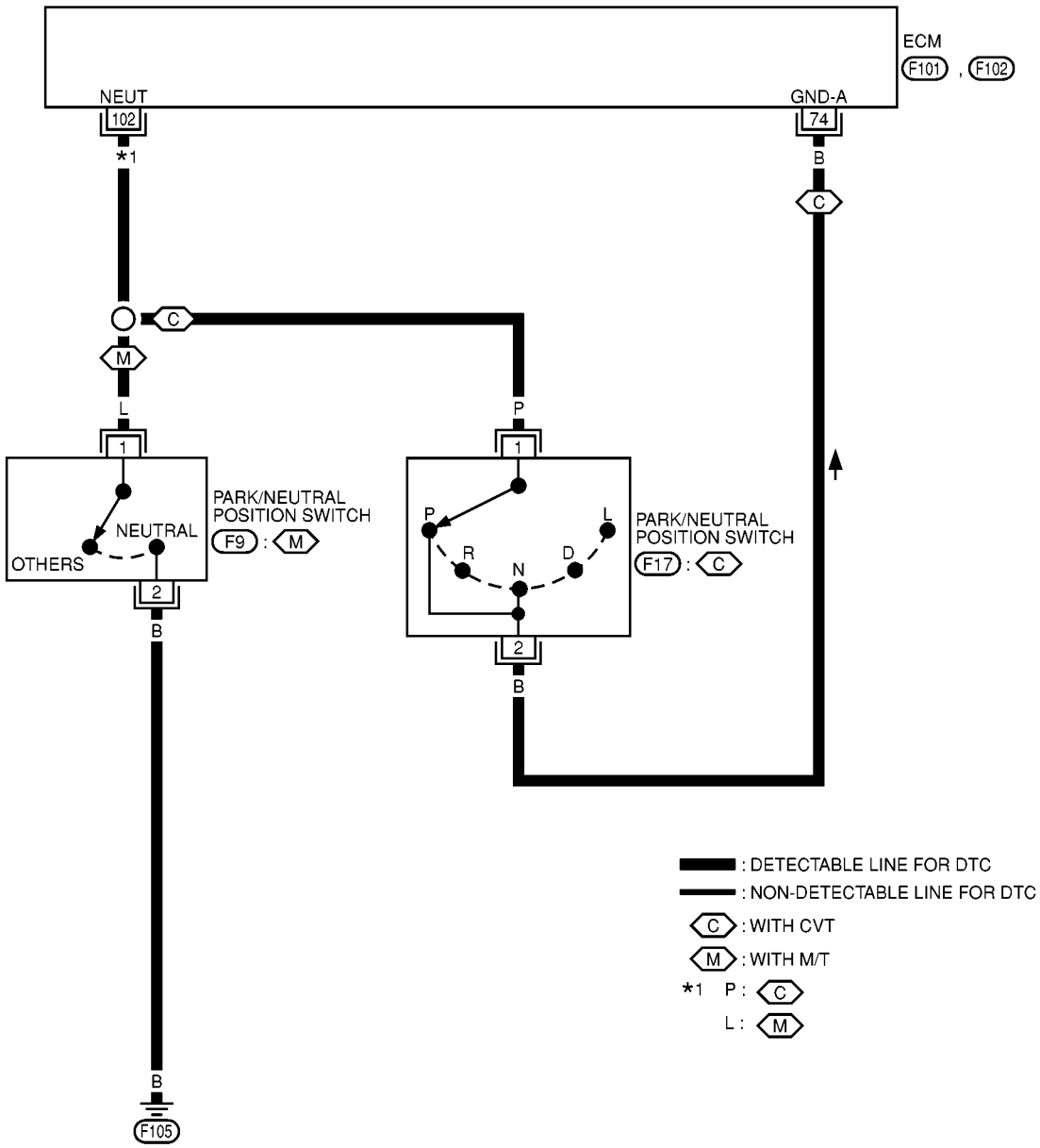
3. If NG, go to EC-1356, "Diagnostic Procedure" .

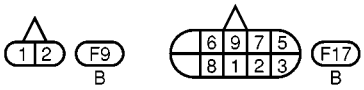


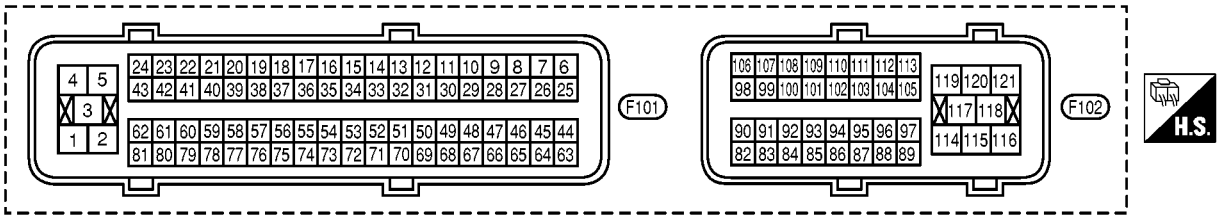
Wiring Diagram

EBS00GJ7

EC-PNP/SW-01







MBWA0019E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
74 (CVT models)	B	Sensors' ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
102	P (CVT) L (M/T)	PNP switch	**[Ignition switch "ON"]** ● Shift lever position is "P" (CVT models) or "N", "Neutral" (M/T models).	Approximately 0V
			[Ignition switch "ON"] ● Except the above gear position	**CVT models** BATTERY VOLTAGE (11 - 14V) **M/T models** Approximately 5V

Diagnostic Procedure

EBS00GJ8

1. CHECK GROUND CIRCUIT

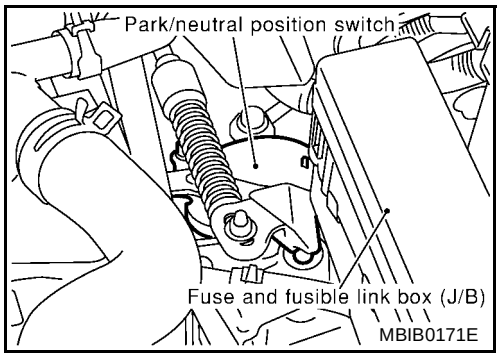
1. Turn ignition switch "OFF".
2. Disconnect PNP switch harness connector.
3. Check harness continuity between PNP switch terminal 2 and ground.
   Refer to Wiring Diagram.

   Continuity should exist.

4. Also check harness for short to power.

OK or NG

OK >> GO TO 3.
NG >> GO TO 2.



2. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open and short between PNP switch and ECM (CVT models)
- Harness for open and short between PNP switch and ground (M/T models)

>> Repair open circuit or short to power in harness or connectors.

3. CHECK INPUT SIGNAL CIRCUIT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 102 and PNP switch terminal 1.
   Refer to Wiring Diagram.

   Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to power in harness or connectors.

4. CHECK PNP SWITCH

Refer to CVT-71, "Component Inspection" (CVT models) or MT-126, "PARK/NEUTRAL POSITION SWITCH" (M/T models).

OK or NG

OK >> GO TO 5.
NG >> Replace PNP switch.

5. CHECK INTERMITTENT INCIDENT

Refer to EC-1076, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

DTC P1720 VSS

PFP:31036

Description

EBS00GVN

NOTE:
If DTC P1720 is displayed with DTC U1000, U1001, first perform the trouble diagnosis for DTC U1000, U1001. Refer to EC-1083, "DTC U1000, U1001 CAN COMMUNICATION LINE" .
ECM receives two vehicle speed signals via CAN communication line. One is sent from ESP/TCS/ABS control unit (models with ESP), ABS actuator and electric unit (models without ESP) via combination meter, and the other is from TCM (Transmission control module). ECM uses these signals for engine control.

CONSULT-II Reference Value in Data Monitor Mode

EBS00GVO

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
VEH SPEED SE	● Turn drive wheels and compare speedometer indication with the CONSULT-II value.	Almost the same speed as the CONSULT-II value

On Board Diagnosis Logic

EBS00GVP

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1720 1720	Vehicle speed sensor (TCM output)	A difference between two vehicle speed signals is out of the specified range.	● Harness or connectors (Revolution sensor circuit is open or shorted) ● Harness or connectors (Wheel sensor circuit is open or shorted.) ● TCM ● Secondary speed sensor ● ESP/TCS/ABS control unit ● ABS actuator and electric unit ● Wheel sensor ● Combination meter

DTC Confirmation Procedure

EBS00GVR

CAUTION:
Always drive vehicle at a safe speed.

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch "ON".
2. Select "DATA MONITOR" mode with CONSULT-II.
3. Start engine.
4. Drive vehicle at a speed of 20 km/h (12 MPH) or more for at least 5 seconds without brake pedal depressing.
5. If 1st trip DTC is detected, go to EC-1358, "Diagnostic Procedure" .

WITH GST

Follow the procedure “WITH CONSULT-II” above.

Diagnostic Procedure

EBS00GVS

1. CHECK DTC WITH TCM

Check DTC with TCM. Refer to CVT-20, "ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION" .

OK or NG

OK >> GO TO 2.
NG >> Perform trouble shooting relevant to DTC indicated.

2. CHECK DTC WITH ABS

Check DTC with ABS actuator and electric unit (Models without ESP) or ESP/TCS/ABS control unit (Models with ESP). Refer to BRC-17, "TROUBLE DIAGNOSIS" or BRC-60, "TROUBLE DIAGNOSIS" .

OK or NG

OK >> GO TO 3.
NG >> Perform trouble shooting relevant to DTC indicated.

3. CHECK COMBINATION METER

Check combination meter function.
Refer to DI-5, "COMBINATION METERS (LHD MODELS)" or DI-34, "COMBINATION METERS (RHD MODELS)" .

>> **INSPECTION END**

DTC P1805 BRAKE SWITCH

PFP:25320

Description

EBS00GJ9

Brake switch signal is applied to the ECM through the stop lamp switch when the brake pedal is depressed. This signal is used mainly to decrease the engine speed when the vehicle is driving.

CONSULT-II Reference Value in Data Monitor Mode

EBS00GJA

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
BRAKE SW	● Ignition switch: ON	Brake pedal: Fully released	OFF
		Brake pedal: Slightly depressed	ON

On Board Diagnosis Logic

EBS00GJB

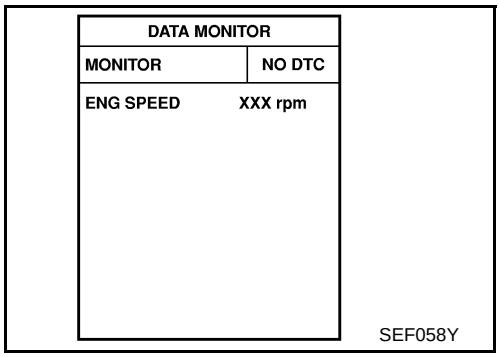
DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1805 1805	Brake switch	A brake switch signal is not sent to ECM for an extremely long time while the vehicle is driving.	● Harness or connectors (Stop lamp switch circuit is open or shorted.) ● Stop lamp switch

DTC Confirmation Procedure

EBS00GJC

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Fully depress the brake pedal for at least 5 seconds.
3. Erase the DTC with CONSULT-II.
4. Select “DATA MONITOR” mode with CONSULT-II.
5. If 1st trip DTC is detected, go to EC-1362, "Diagnostic Procedure" .



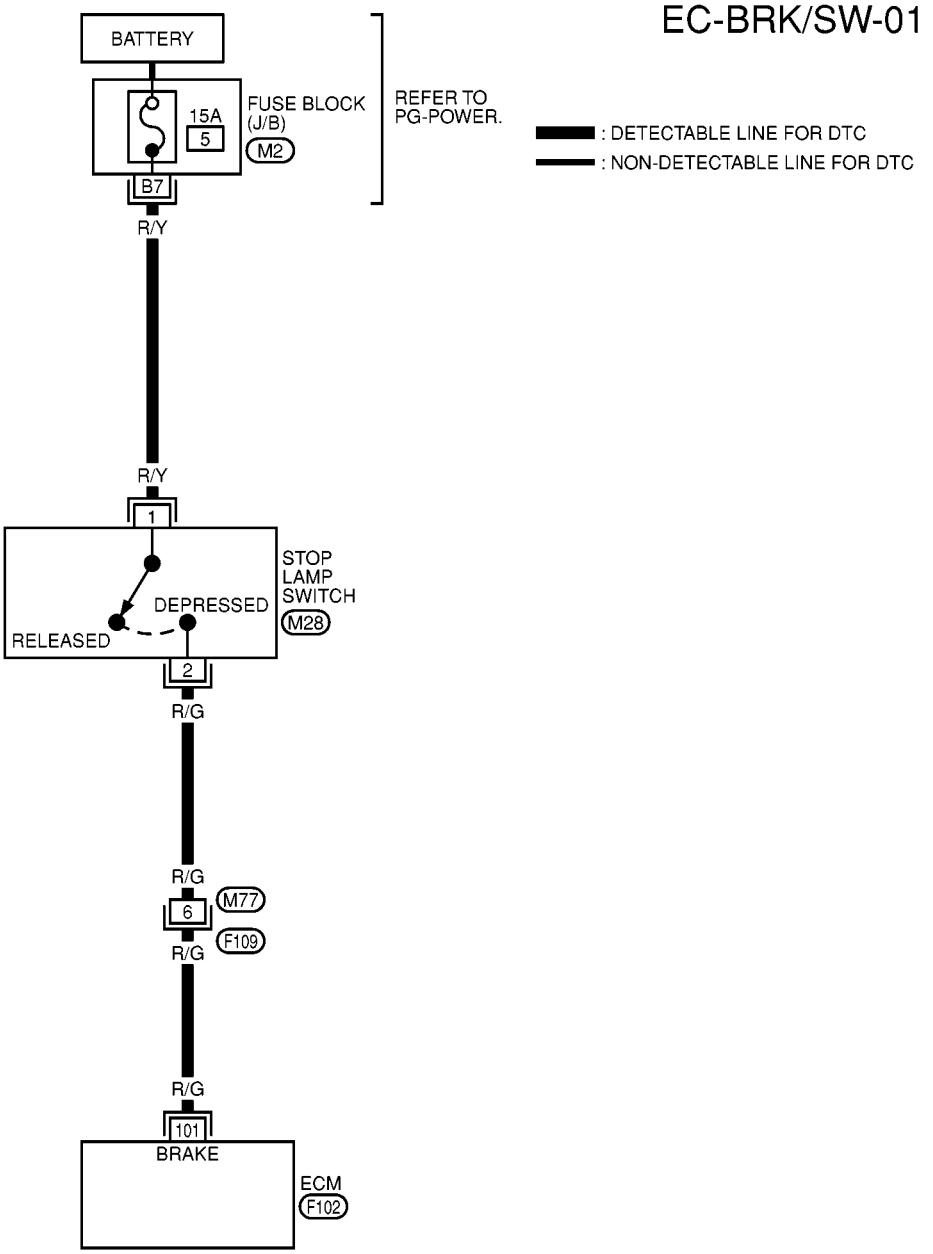
WITH GST

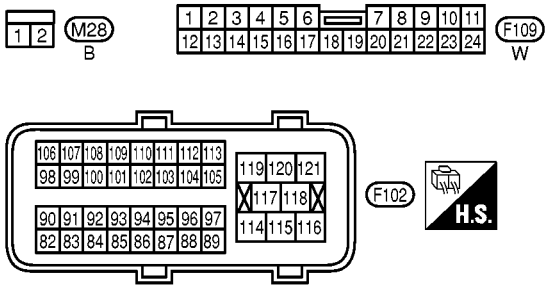
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

EBS00GJD

EC-BRK/SW-01





REFER TO THE FOLLOWING.
M2 -FUSE BLOCK-
JUNCTION BOX (J/B)

MBWA0034E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
101	R/G	Stop lamp switch	**[Engine is running]** ● Brake pedal fully released	Approximately 0V
			[Engine is running] ● Brake pedal depressed	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

EBS00GJE

1. CHECK STOP LAMP SWITCH CIRCUIT

1. Turn ignition switch “OFF”.
2. Check the stop lamp when depressing and releasing the brake pedal.

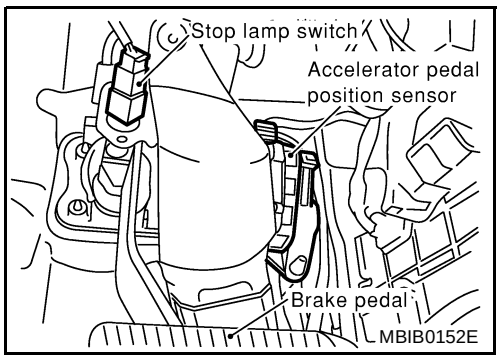
Brake pedal	Stop lamp
Fully released	Not illuminated
Depressed	Illuminated

OK or NG

OK >> GO TO 4.
NG >> GO TO 2.

2. CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT

1. Disconnect stop lamp switch harness connector.

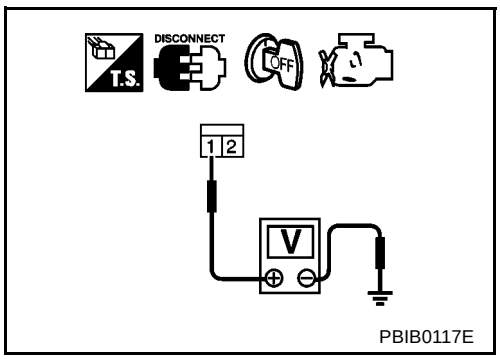


2. Check voltage between stop lamp switch terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 4.
NG >> GO TO 3.



3. DETECT MALFUNCTIONING PART

Check the following.

- 15A fuse
- Fuse block (J/B) connector M2
- Harness for open and short between stop lamp switch and battery

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK STOP LAMP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 101 and stop lamp switch terminal 2. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M77, F109
- Harness for open or short between ECM and stop lamp switch

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK STOP LAMP SWITCH

Refer to EC-1363, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace stop lamp switch.

7. CHECK INTERMITTENT INCIDENT

Refer to EC-1076, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

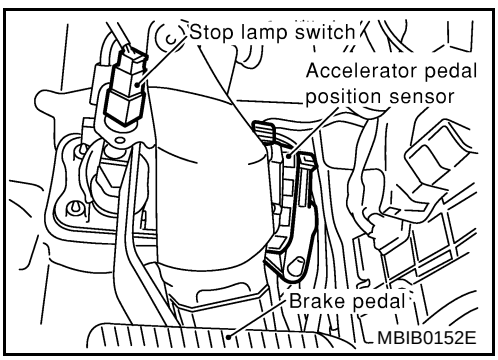
>> **INSPECTION END**

Component Inspection

EBS00GJF

STOP LAMP SWITCH

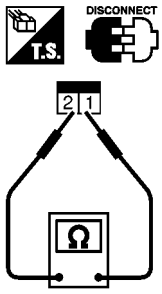
1. Disconnect stop lamp switch harness connector.



2. Check continuity between stop lamp switch terminals 1 and 2 under the following conditions.

Conditions	Continuity
Brake pedal fully released	Should not exist.
Brake pedal depressed	Should exist.

If NG, adjust brake pedal installation, refer to BR-6, "BRAKE PEDAL" , and perform step 2 again.



PBIB0118E

IGNITION SIGNAL

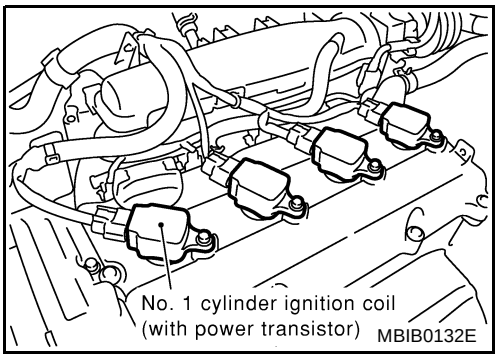
PFP:22448

Component Description

EBS00GJG

IGNITION COIL & POWER TRANSISTOR

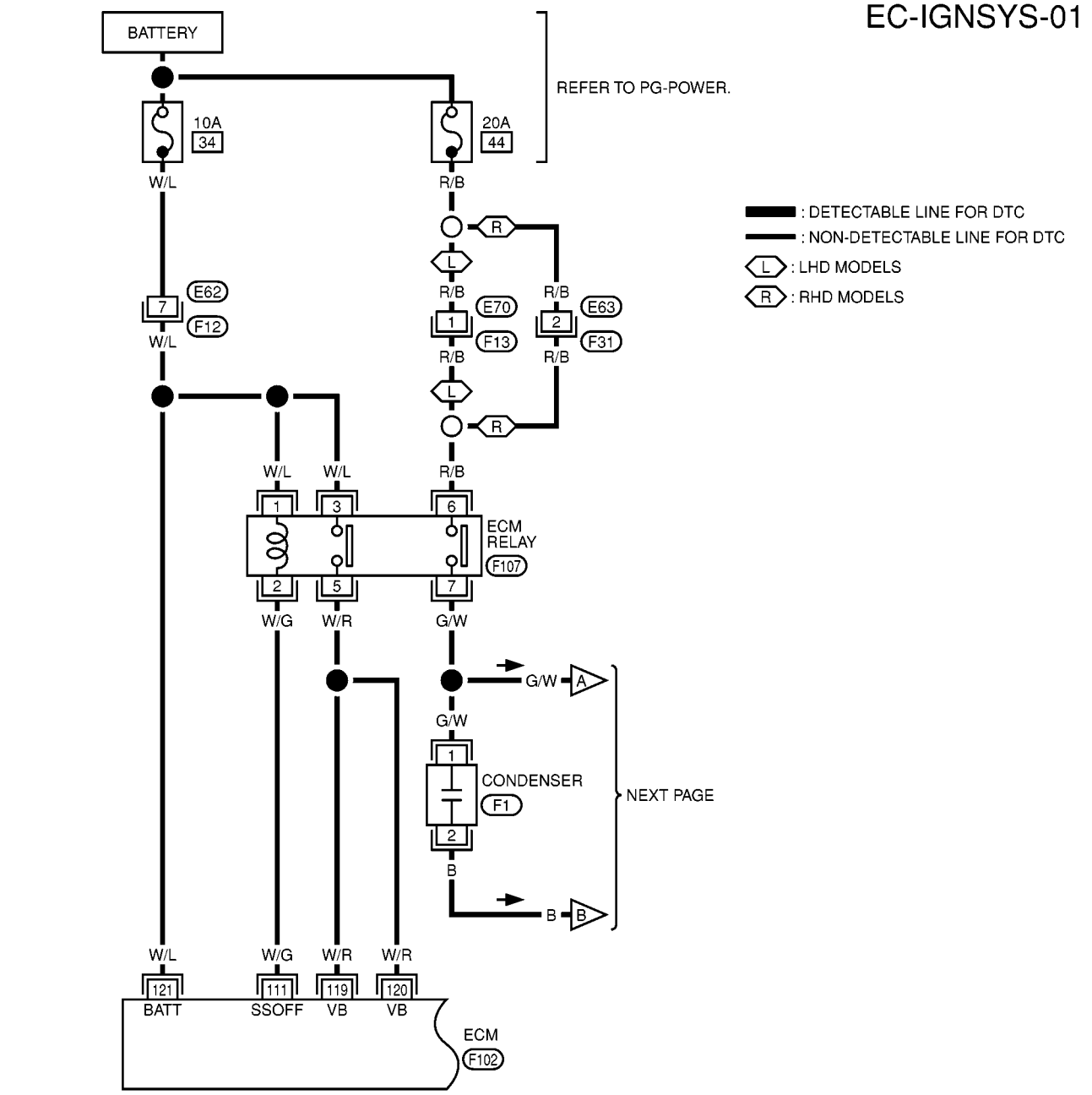
The ignition signal from the ECM is sent to and amplified by the power transistor. The power transistor turns on and off the ignition coil primary circuit. This on-off operation induces the proper high voltage in the coil secondary circuit.

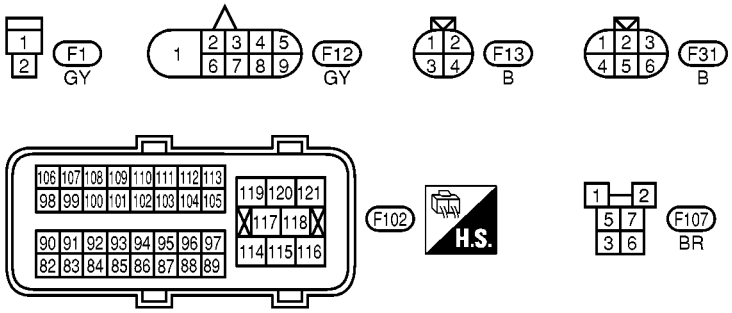


Wiring Diagram

EBS00GJH

EC-IGNSYS-01





MBWA0029E

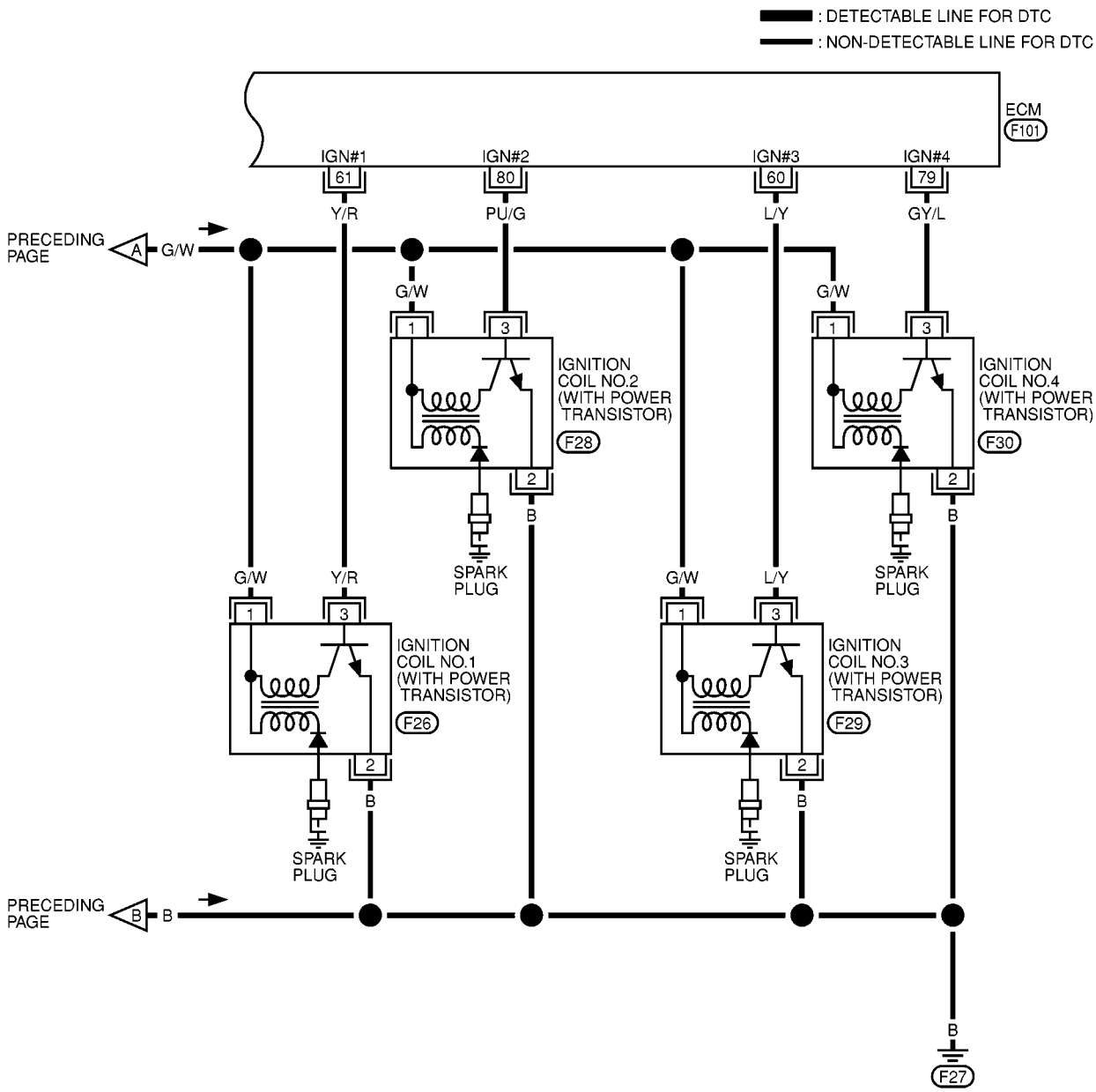
Specification data are reference values and are measured between each terminal and ground.

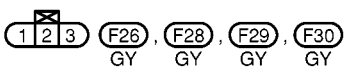
CAUTION:

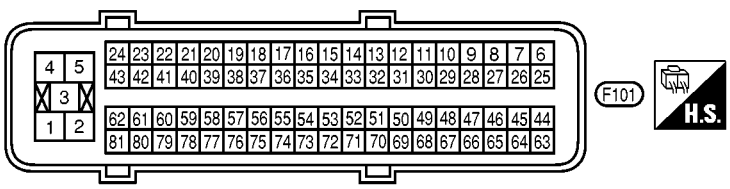
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
111	W/G	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch "OFF"]** ● For a few seconds after turning ignition switch "OFF"	0 - 1.0V
			[Ignition switch "OFF"] ● More than a few seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
119 120	W/R W/R	Power supply for ECM	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)
121	W/L	Power supply for ECM (Buck-up)	**[Ignition switch "OFF"]**	BATTERY VOLTAGE (11 - 14V)

EC-IGNSYS-02



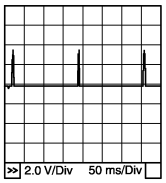
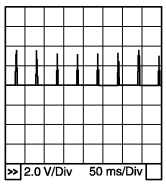




MBWA0030E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
60 61 79 80	L/Y Y/R GY/L PU/G	Ignition signal No. 3 Ignition signal No. 1 Ignition signal No. 4 Ignition signal No. 2	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0 - 0.1V★  PBIB0521E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - 0.2V★  PBIB0522E

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnostic Procedure

EBS00GJI

1. CHECK ENGINE START

Turn ignition switch “OFF”, and restart engine.
Is engine running?

Yes or No

Yes (With CONSULT-II)>>GO TO 2.
Yes (Without CONSULT-II)>>GO TO 3.
No >> GO TO 4.

2. CHECK OVERALL FUNCTION

With CONSULT-II

1. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT-II.
2. Make sure that each circuit produces a momentary engine speed drop.

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 12.

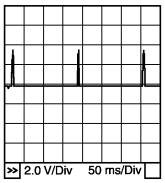
ACTIVE TEST	
POWER BALANCE	
MONITOR	
ENG SPEED	XXX rpm
MAS A/F SE-B1	XXX V

PBIB0133E

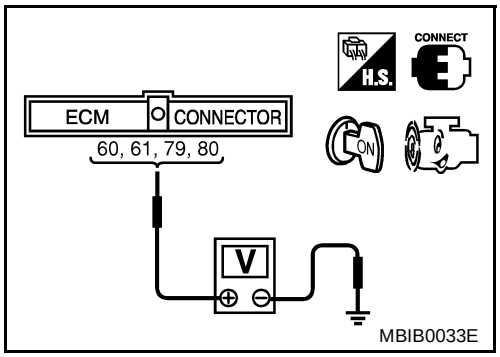
3. CHECK OVERALL FUNCTION

Without CONSULT-II

1. Let engine idle.
2. Read the voltage signal between ECM terminals 60, 61, 79, 80 and ground with an oscilloscope.
3. Verify that the oscilloscope screen shows the signal wave as shown below.



PBIB0521E



MBIB0033E

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 12.

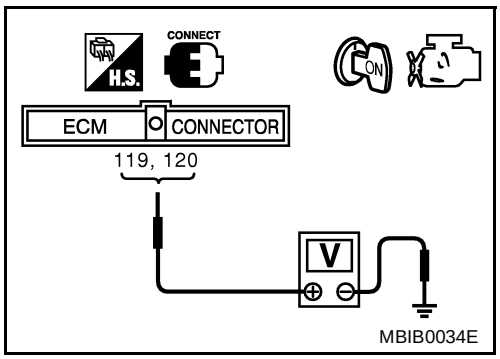
4. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-I

1. Turn ignition switch “ON”.
2. Check voltage between ECM terminals 119, 120 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 5.
NG >> Go to EC-1077, "POWER SUPPLY CIRCUIT FOR ECM" .



MBIB0034E

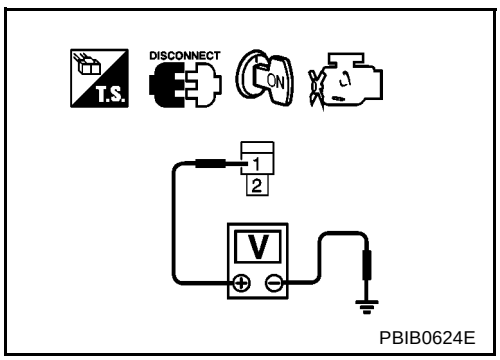
5. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-II

1. Turn ignition switch “OFF”.
2. Disconnect condenser harness connector.
3. Turn ignition switch “ON”.
4. Check voltage between condenser terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 10.
NG >> GO TO 6.



PBIB0624E

6. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-III

1. Turn ignition switch “OFF”.
2. Disconnect ECM relay.
3. Check harness continuity between ECM relay terminal 7 and condenser terminal 1.
   Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

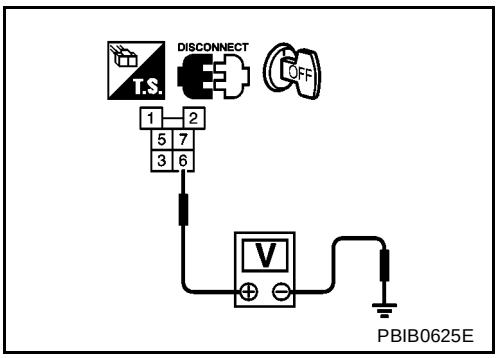
OK or NG

OK >> GO TO 7.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-IV

Check voltage between ECM relay terminal 6 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 9.
NG >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E70, F13 (LHD models)
- Harness connectors E63, F31 (RHD models)
- 20A fuse
- Harness for open or short between ECM relay and battery

>> Repair or replace harness or connectors.

9. CHECK ECM RELAY

Refer to EC-1373, "Component Inspection" .

OK or NG

OK >> GO TO 17.
NG >> Replace ECM relay.

10. CHECK CONDENSER GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect condenser harness connector.
3. Check harness continuity between condenser terminal 2 and ground.
   Refer to Wiring diagram.

Continuity should exist.

4. Also check harness for short to power.

OK or NG

OK >> GO TO 11.
NG >> Repair open circuit or short to power in harness or connector.

11. CHECK CONDENSER

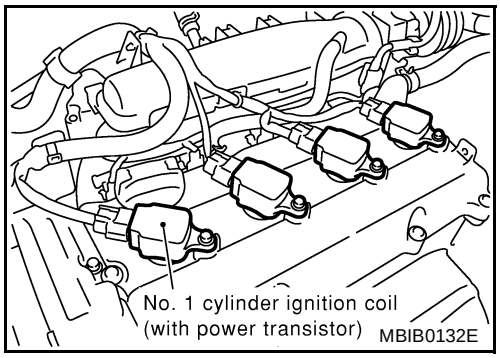
Refer to EC-1373, "Component Inspection" .

OK or NG

OK >> GO TO 12.
NG >> Replace condenser.

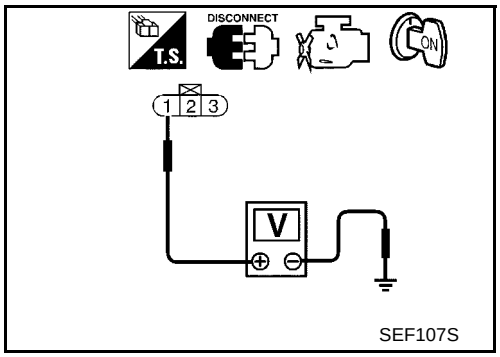
12. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-V

1. Turn ignition switch “OFF”.
2. Reconnect all harness connectors disconnected.
3. Disconnect ignition coil harness connector.
4. Turn ignition switch “ON”.



5. Check voltage between ignition coil terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 14.
NG >> GO TO 13.

13. DETECT MALFUNCTIONING PART

Check harness for open or short between ignition coil and ECM relay.

>> Repair or replace harness or connectors.

14. CHECK IGNITION COIL GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between ignition coil terminal 2 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 15.
NG >> Repair open circuit or short to power in harness or connectors.

15. CHECK IGNITION COIL OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminals 60, 61, 79, 80 and ignition coil terminal 3. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 16.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

16. CHECK IGNITION COIL WITH POWER TRANSISTOR

Refer to EC-1373, "Component Inspection" .

OK or NG

OK >> GO TO 17.
NG >> Replace ignition coil with power transistor.

17. CHECK INTERMITTENT INCIDENT

Refer to EC-1076, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

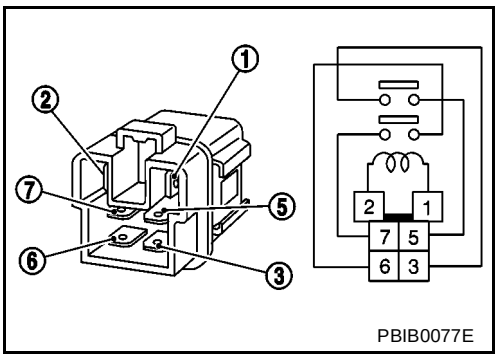
EBS00GJJ

ECM RELAY

1. Apply 12V direct current between ECM relay terminals 1 and 2.
2. Check continuity between relay terminals 3 and 5, 6 and 7.

Condition	Continuity
12V direct current supply between terminals 1 and 2	Yes
OFF	No

3. If NG, replace ECM relay.

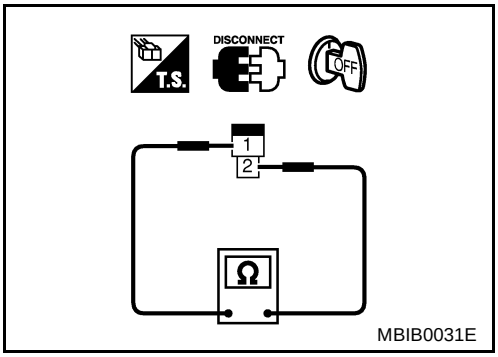


PBIB0077E

CONDENSER

1. Turn ignition switch “OFF”.
2. Disconnect condenser harness connector.
3. Check resistance between condenser terminals 1 and 2.

Resistance: Above 1 MΩ at 25°C (77°F)



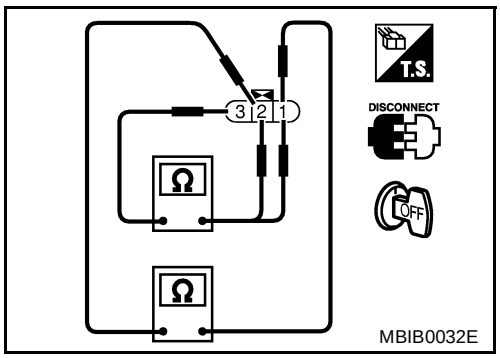
MBIB0031E

IGNITION COIL WITH POWER TRANSISTOR

1. Turn ignition switch “OFF”.
2. Disconnect ignition coil harness connector.

3. Check resistance between ignition coil terminals as follows.

Terminal No.	Resistance Ω [at 25°C (77°F)]
2 and 3	Except 0 or ∞
1 and 2	Except 0
1 and 3	



Removal and Installation

EBS00GJK

IGNITION COIL WITH POWER TRANSISTOR

Refer to EM-126, "IGNITION COIL" .

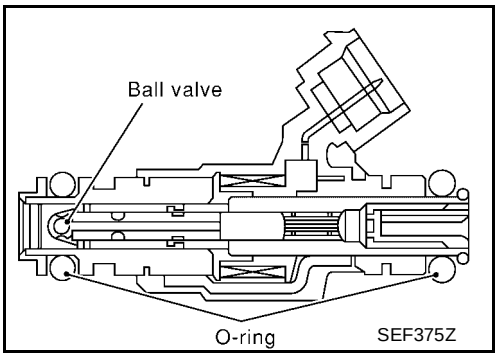
INJECTOR CIRCUIT

PFP:16600

Component Description

EBS00GJR

The fuel injector is a small, precise solenoid valve. When the ECM supplies a ground to the injector circuit, the coil in the injector is energized. The energized coil pulls the needle valve back and allows fuel to flow through the injector into the intake manifold. The amount of fuel injected depends upon the injection pulse duration. Pulse duration is the length of time the injector remains open. The ECM controls the injection pulse duration based on engine fuel needs.



CONSULT-II Reference Value in Data Monitor Mode

EBS00GJS

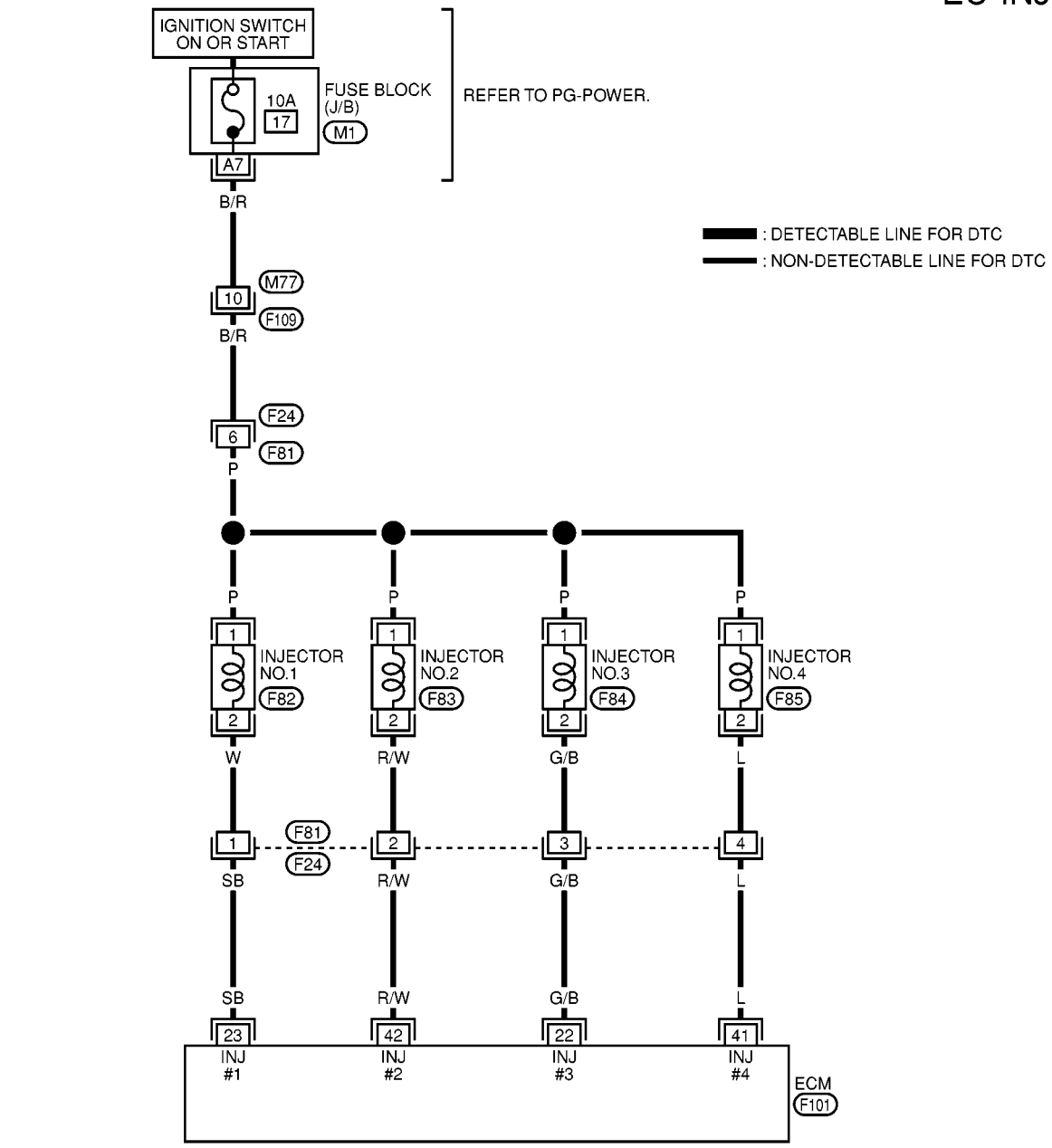
Specification data are reference values.

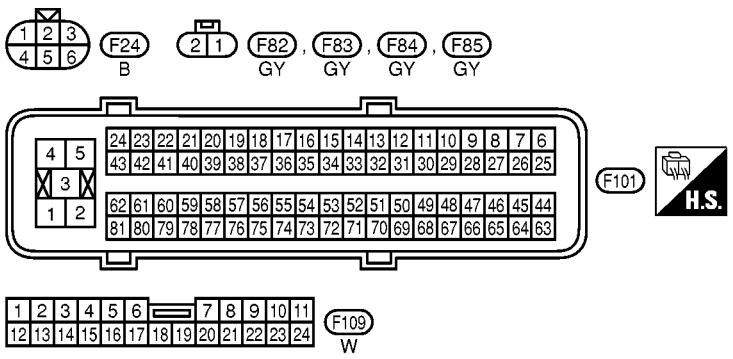
MONITOR ITEM	CONDITION		SPECIFICATION
B/FUEL SCHDL	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	2.5 - 3.5 msec
		2,000 rpm	2.5 - 3.5 msec
INJ PULSE-B1	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	2.0 - 3.0 msec
		2,000 rpm	1.9 - 2.9 msec

Wiring Diagram

EBS00GJT

EC-INJECT-01



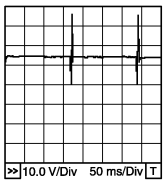
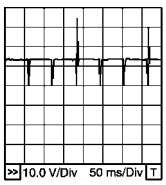


REFER TO THE FOLLOWING.
M1 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0028E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
22 23 41 42	G/B SB L R/W	Injector No. 3 Injector No. 1 Injector No. 4 Injector No. 2	**[Engine is running]** ● **Warm-up condition** ● Idle speed	BATTERY VOLTAGE (11 - 14V)★  PBIB0529E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	BATTERY VOLTAGE (11 - 14V)★  PBIB0530E

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnostic Procedure

EBS00GJU

1. INSPECTION START

Turn ignition switch to “START”.
Is any cylinder ignited?

Yes or No

Yes >> GO TO 2.
No >> GO TO 3.

2. CHECK OVERALL FUNCTION

With CONSULT-II

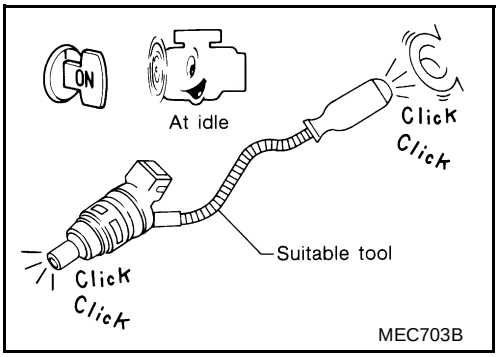
1. Start engine.
2. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT-II.
3. Make sure that each circuit produces a momentary engine speed drop.

ACTIVE TEST	
POWER BALANCE	
MONITOR	
ENG SPEED	XXX rpm
MAS A/F SE-B1	XXX V

PBIB0133E

Without CONSULT-II

1. Start engine.
2. Listen to each injector operating sound.
   Clicking noise should be heard.



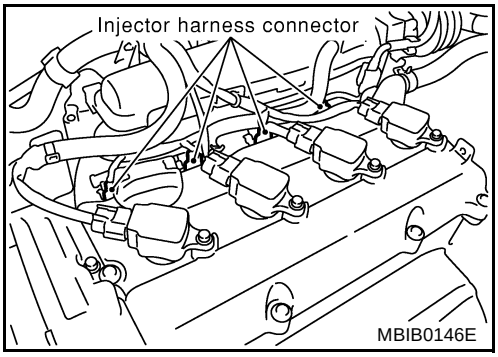
MEC703B

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 3.

3. CHECK INJECTOR POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect injector harness connector.
3. Turn ignition switch “ON”.

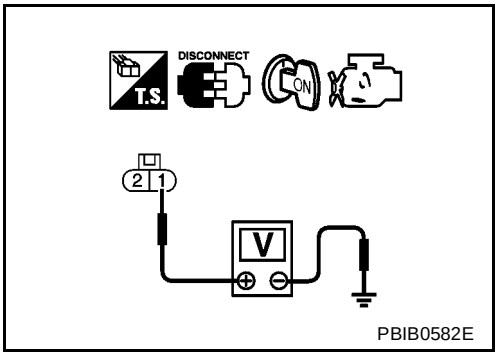


4. Check voltage between injector terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.



4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M77, F109
- Harness connectors F24, F81
- Fuse block (J/B) connector M1
- 10A fuse
- Harness for open or short between injector and fuse

>> Repair harness or connectors.

5. CHECK INJECTOR OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between injector terminal 2 and ECM terminals 22, 23, 41, 42. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFONCTIONING PART

Check the following.

- Harness connectors F81, F24
- Harness for open or short between injector and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK INJECTOR

Refer to EC-1380, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> Replace injector.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-1076, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

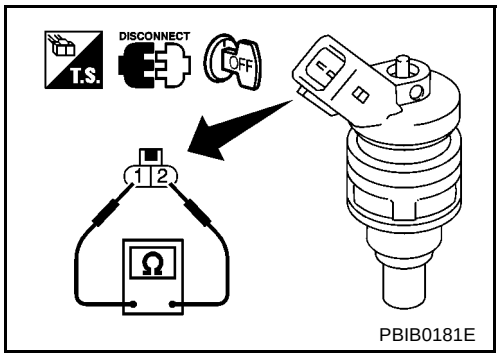
Component Inspection

EBS00GJV

INJECTOR

1. Disconnect injector harness connector.
2. Check resistance between terminals as shown in the figure.

Resistance: 12.1 - 12.9Ω [at 20°C (68°F)]



Removal and Installation

EBS00GJW

INJECTOR

Refer to EM-128, "FUEL INJECTOR AND FUEL TUBE" .

FUEL PUMP CIRCUIT

PFP:17042

Description

EBS00GK0

SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM Function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*	Fuel pump control	Fuel pump relay
Battery	Battery voltage*		

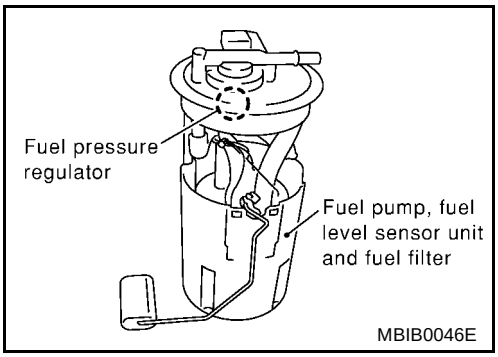
*: ECM determines the start signal status by the signals of engine speed and battery voltage.

The ECM activates the fuel pump for several seconds after the ignition switch is turned on to improve engine startability. If the ECM receives a engine speed signal from the crankshaft position sensor (POS) and camshaft position sensor (PHASE), it knows that the engine is rotating, and causes the pump to operate. If the engine speed signal is not received when the ignition switch is ON, the engine stalls. The ECM stops pump operation and prevents battery discharging, thereby improving safety. The ECM does not directly drive the fuel pump. It controls the ON/OFF fuel pump relay, which in turn controls the fuel pump.

Condition	Fuel pump operation
Ignition switch is turned to ON.	Operates for 1 second.
Engine running and cranking	Operates.
When engine is stopped	Stops in 1.5 seconds.
Except as shown above	Stops.

COMPONENT DESCRIPTION

A turbine type design fuel pump is used in the fuel tank.



CONSULT-II Reference Value in Data Monitor Mode

EBS00GK1

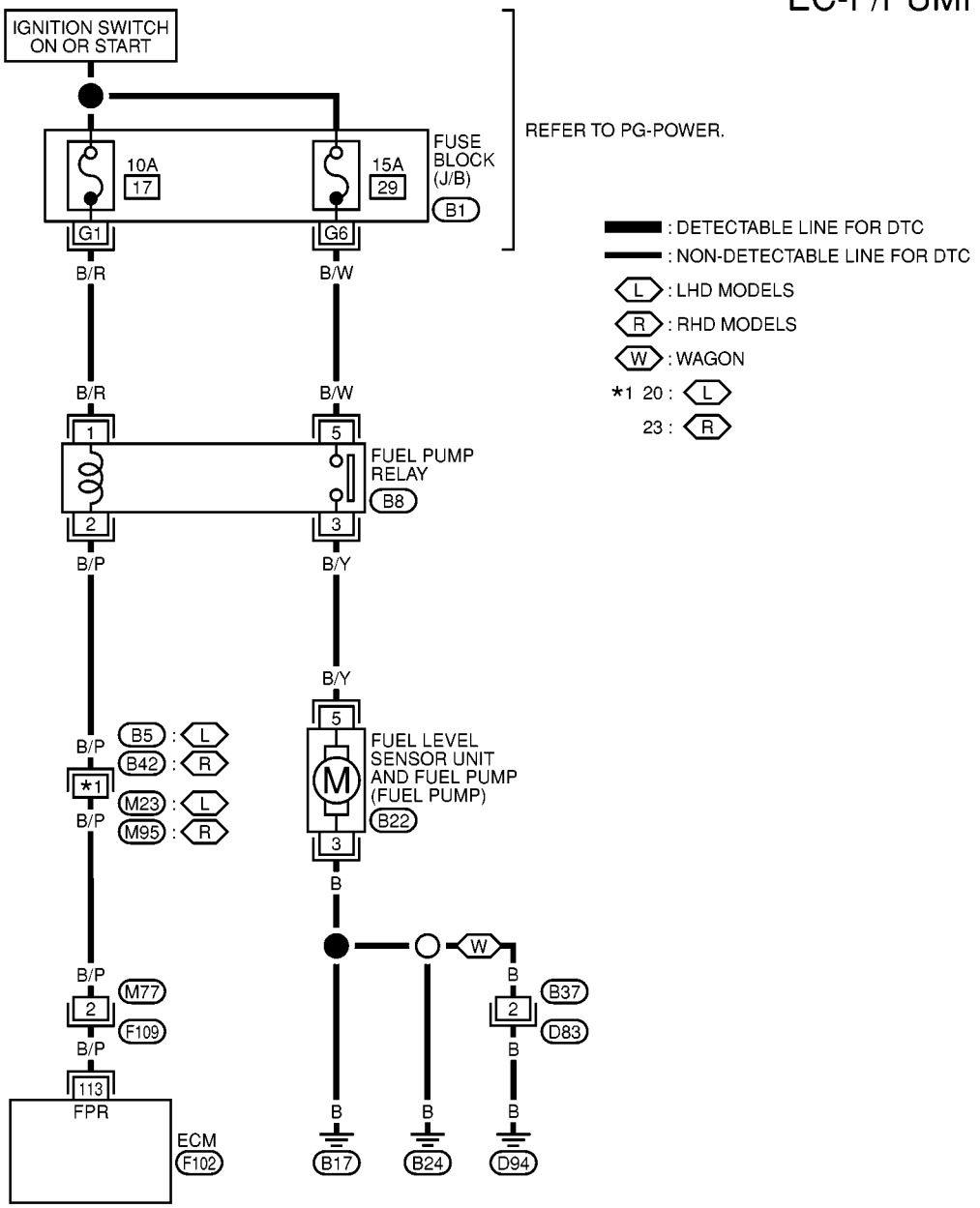
Specification data are reference values.

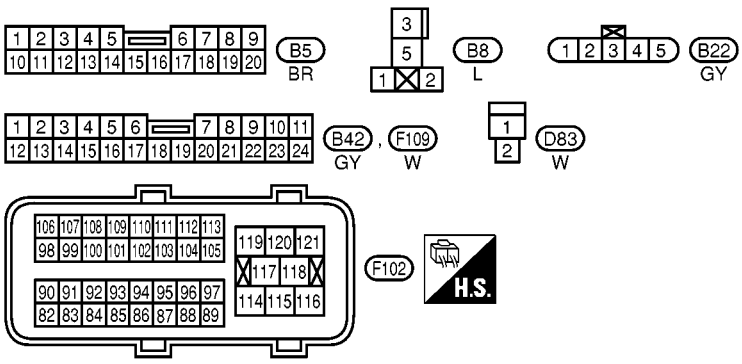
MONITOR ITEM	CONDITION	SPECIFICATION
FUEL PUMP RLY	● For 1 seconds after turning ignition switch ON ● Engine running or cranking	ON
	● Except above conditions	OFF

Wiring Diagram

EBS00GK2

EC-F/PUMP-01





REFER TO THE FOLLOWING.
B1 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0031E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

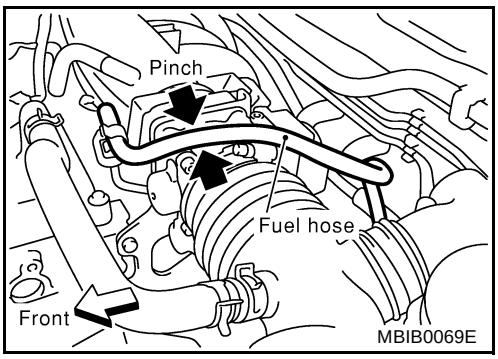
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
113	B/P	Fuel pump relay	**[Ignition switch "ON"]** ● For 1 seconds after turning ignition switch "ON" **[Engine is running]**	0 - 1.0V
			[Ignition switch "ON"] ● More than 1 seconds after turning ignition switch "ON".	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

EBS00GK3

1. CHECK OVERALL FUNCTION

1. Turn ignition switch "ON".
2. Pinch fuel feed hose with two fingers.
   Fuel pressure pulsation should be felt on the fuel hose for 1 second after ignition switch is turned "ON".

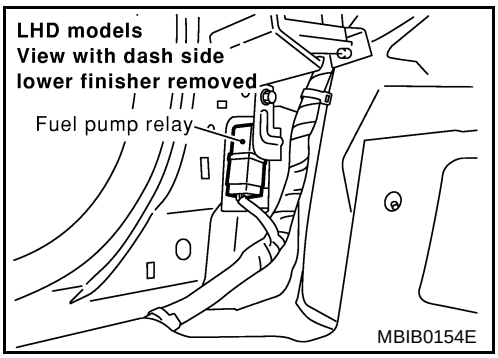


OK or NG

OK >> **INSPECTION END**
NG >> GO TO 2.

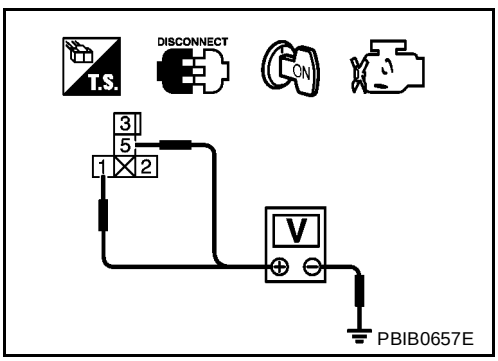
2. CHECK FUEL PUMP RELAY POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect fuel pump relay.
3. Turn ignition switch "ON".



4. Check voltage between fuel pump relay terminals 1, 5 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector B1
- 10A fuse
- 15A fuse
- Harness for open or short between fuel pump relay and fuse

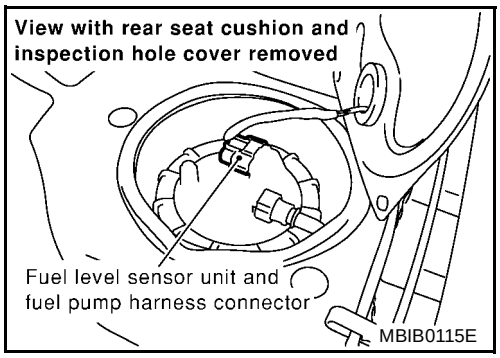
>> Repair harness or connectors.

4. CHECK FUEL PUMP POWER SUPPLY AND GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect fuel level sensor unit and fuel pump harness connector.
3. Check harness continuity between fuel pump relay terminal 3 and fuel level sensor unit and fuel pump terminal 5, fuel level sensor unit and fuel pump terminal 3 and body ground.
   Refer to Wiring Diagram.

   Continuity should exist.

4. Also check harness for short to ground and short to power.



OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors B37, D83 (Wagon)
- Harness for open or short between fuel level sensor unit and fuel pump and fuel pump relay
- Harness for open or short between fuel level sensor unit and fuel pump and body ground

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK FUEL PUMP RELAY OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 113 and fuel pump relay terminal 2.
   Refer to Wiring Diagram.

   Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M77, F109
- Harness connectors B5, M23 (LHD models)
- Harness connectors B42, M95 (RHD models)
- Harness for open or short between ECM and fuel pump relay

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK FUEL PUMP RELAY

Refer to EC-1385, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> Replace fuel pump relay.

9. CHECK FUEL PUMP

Refer to EC-1385, "Component Inspection" .

OK or NG

OK >> GO TO 10.
NG >> Replace fuel pump.

10. CHECK INTERMITTENT INCIDENT

Refer to EC-1076, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

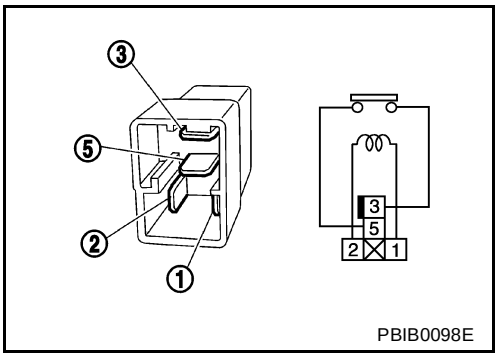
Component Inspection

EBS00GK4

FUEL PUMP RELAY

Check continuity between terminals 3 and 5 under the following conditions.

Conditions	Continuity
12V direct current supply between terminals 1 and 2	Yes
No current supply	No

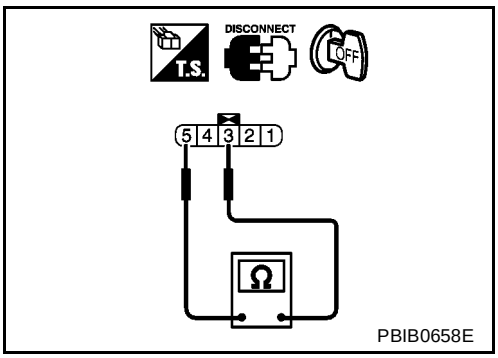


PBIB0098E

FUEL PUMP

1. Disconnect fuel level sensor unit and fuel pump harness connector.
2. Check resistance between fuel level sensor unit and fuel pump terminals 3 and 5.

Resistance: Approximately 1.0Ω [at 25°C (77°F)]



PBIB0658E

Removal and Installation

EBS00GK5

FUEL PUMP

Refer to FL-6, "FUEL LEVEL SENSOR UNIT, FUEL FILTER AND FUEL PUMP ASSEMBLY (EXCEPT YD22DDTi)" .

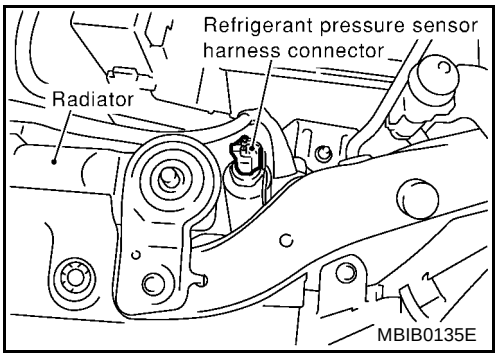
REFRIGERANT PRESSURE SENSOR

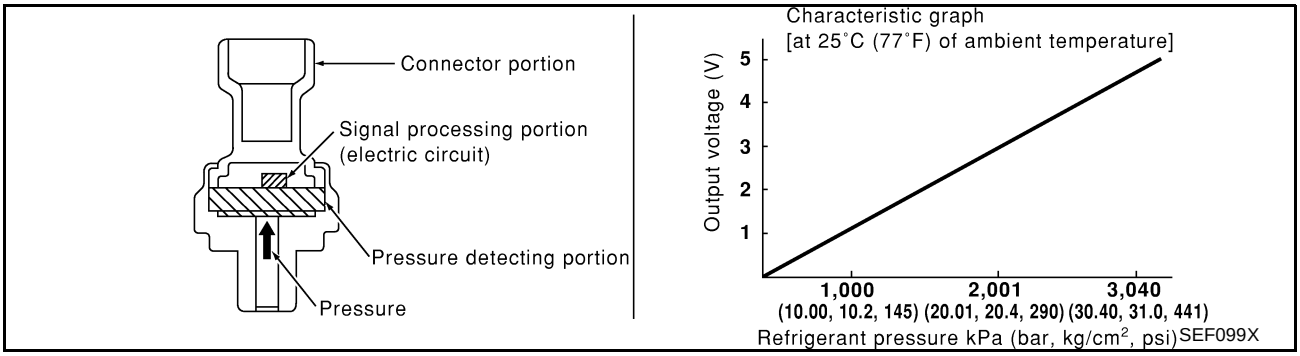
PFP:92136

Component Description

EBS00GK6

The refrigerant pressure sensor is installed at the liquid tank of the air conditioner system. The sensor uses an electrostatic volume pressure transducer to convert refrigerant pressure to voltage. The voltage signal is sent to ECM, and ECM controls cooling fan system.

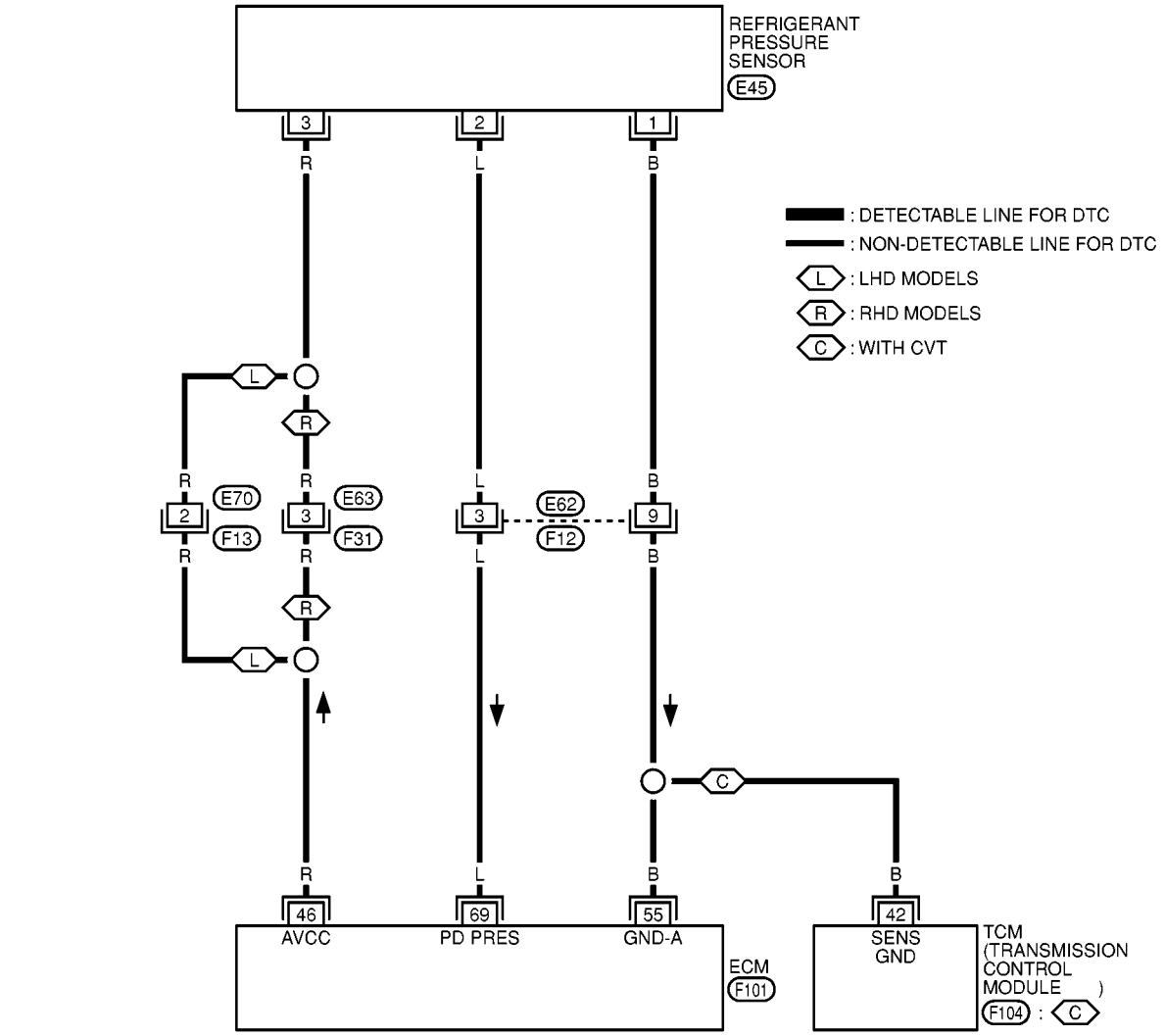


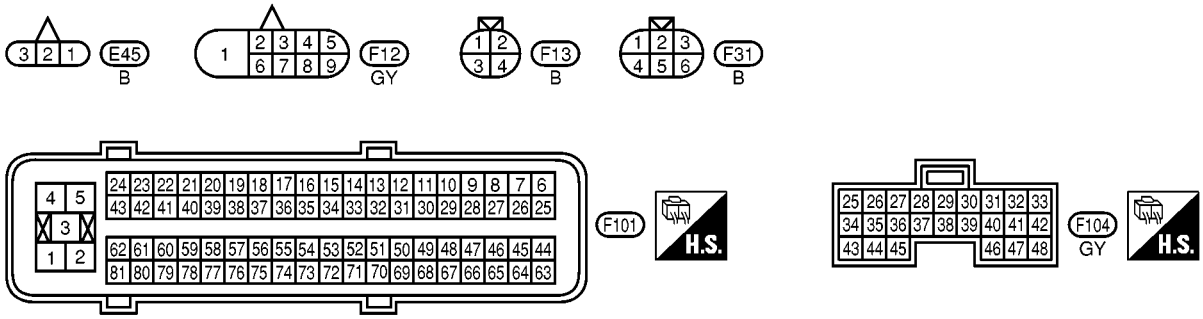


Wiring Diagram

EBS00GK7

EC-RP/SEN-01





MBWA0033E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
55	B	Sensor's ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
46	R	Sensor's power supply (Refrigerant pressure sensor)	**[Ignition switch "ON"]**	Approximately 5V
69	L	Refrigerant pressure sensor	**[Engine is running]** ● **Warm-up condition** ● Both A/C switch and blower switch are "ON". (Compressor operates.)	1.0 - 4.0V

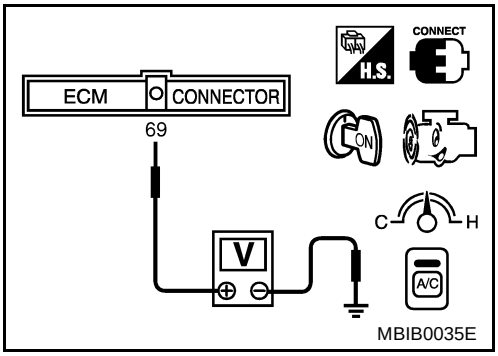
Diagnostic Procedure

EBS00GK8

1. CHECK REFRIGERANT PRESSURE SENSOR OVERALL FUNCTION

1. Start engine and warm it up to normal operating temperature.
2. Turn A/C switch and blower switch "ON".
3. Check voltage between ECM terminal 69 and ground with CONSULT-II or tester.

Voltage: 1.0 - 4.0V

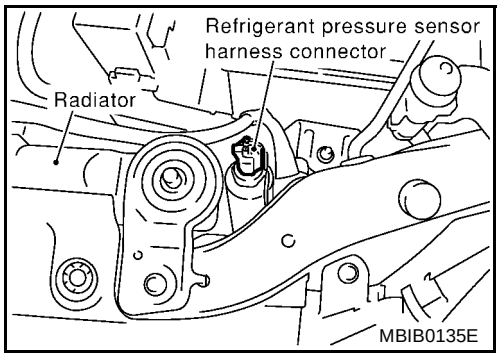


OK or NG

OK >> **INSPECTION END**
NG >> GO TO 2.

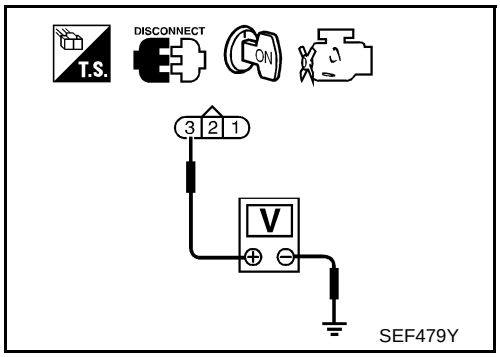
2. CHECK REFRIGERANT PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Turn A/C switch and blower switch “OFF”.
2. Stop engine.
3. Disconnect refrigerant pressure sensor harness connector.
4. Turn ignition switch “ON”.



5. Check voltage between refrigerant pressure sensor terminal 3 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E70, F13 (LHD models)
- Harness connectors E63, F31 (RHD models)
- Harness for open or short between ECM and refrigerant pressure sensor

>> Repair harness or connectors.

4. CHECK REFRIGERANT PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 55 and refrigerant pressure sensor terminal 1. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E62, F12
- Harness for open or short between ECM and refrigerant pressure sensor
- Harness for open or short between TCM and refrigerant pressure sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK REFRIGERANT PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 69 and refrigerant pressure sensor terminal 2. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E62, F12
- Harness for open or short between ECM and refrigerant pressure sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-1076, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

OK or NG

OK >> Replace refrigerant pressure sensor.
NG >> Repair or replace.

Removal and Installation

EBS00GK9

REFRIGERANT PRESSURE SENSOR

Refer to ATC-127, "REFRIGERANT LINES" .

ELECTRICAL LOAD SIGNAL

PFP:25350

Description

EBS00GKA

The electrical load signals except headlamp switch signal are transferred through the CAN communication line.

CONSULT-II Reference Value in Data Monitor Mode

EBS00GVI

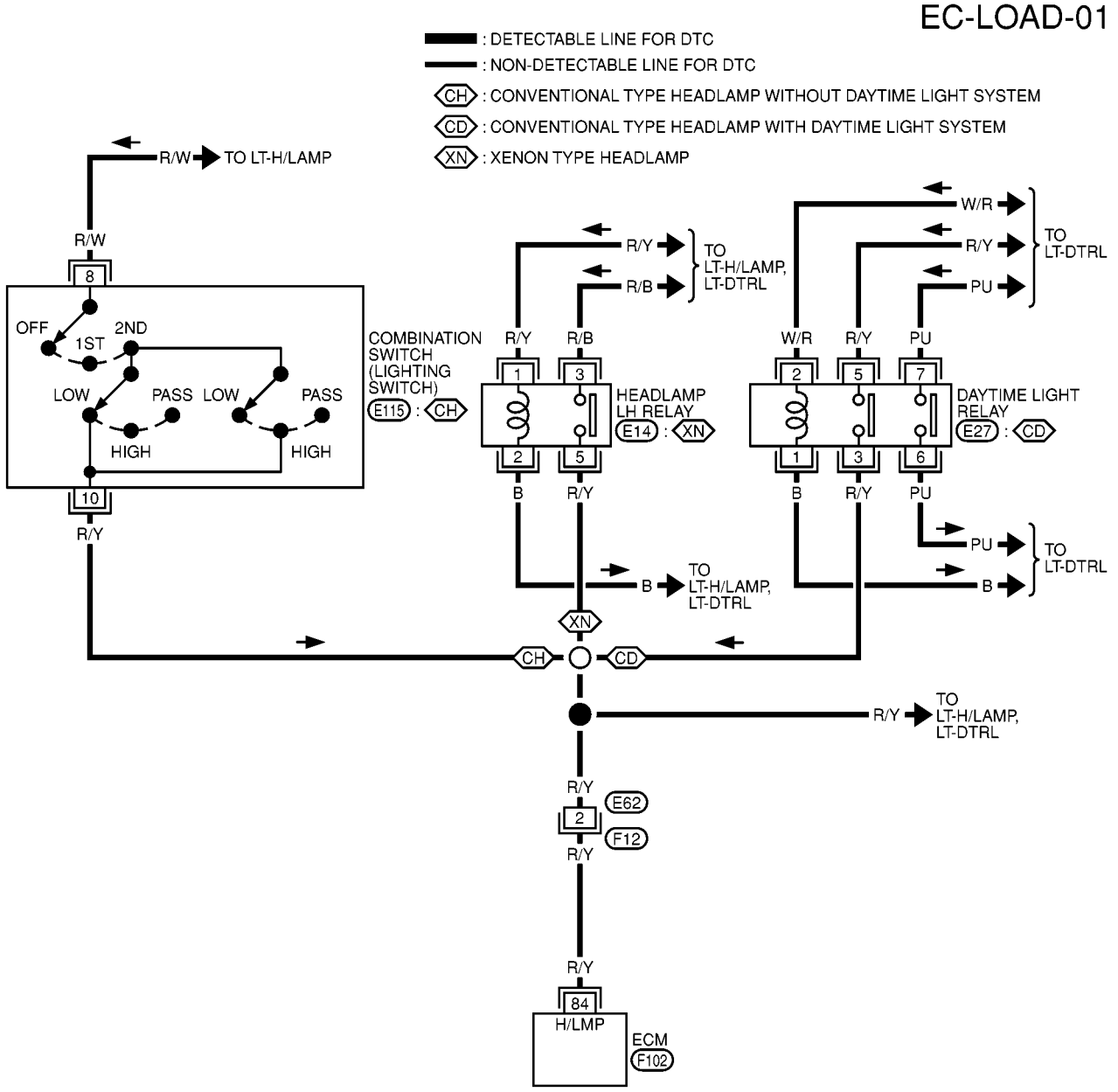
Specification data are reference values.

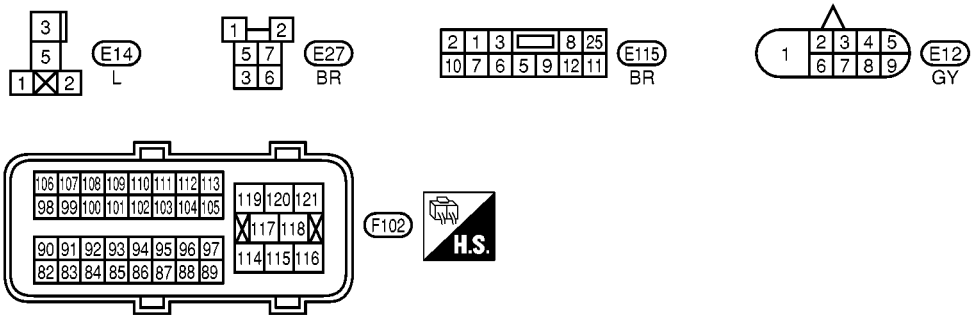
MONITOR ITEM	CONDITION		SPECIFICATION
LOAD SIGNAL	● Ignition switch: ON	Rear window defogger switch is ON and/or lighting switch is 2nd.	ON
		Rear window defogger switch is OFF and lighting switch is OFF.	OFF

Wiring Diagram

EBS00GVJ

EC-LOAD-01





MBWA0147E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
84	R/Y	Electrical load signal (Headlamp signal)	**[Ignition switch "ON"]** ● Lighting switch is "2ND" position	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"] ● Lighting switch is "OFF"	Approximately 0V

Diagnostic Procedure

EBS00GKB

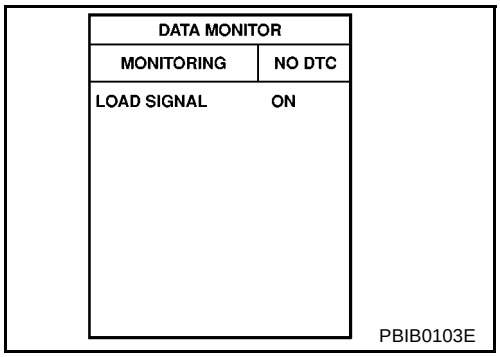
1. CHECK LOAD SIGNAL CIRCUIT OVERALL FUNCTION-I

With CONSULT-II

With GST

1. Turn ignition switch "ON".
2. Connect CONSULT-II or GST and select "DATA MONITOR" mode.
3. Select "LOAD SIGNAL" and check indication under the following conditions.

Condition	Indication
Rear window defogger switch "ON"	ON
Rear window defogger switch "OFF"	OFF



OK or NG

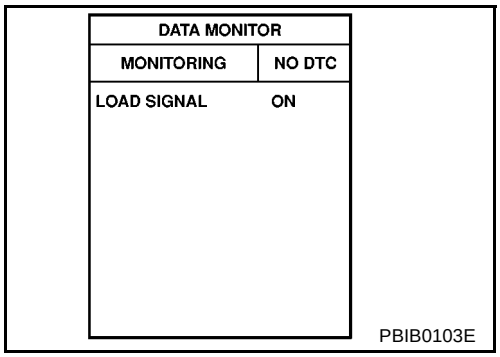
OK (With CONSULT-II)>>GO TO 2.
OK (Without CONSULT-II)>>GO TO 3.
NG >> GO TO 4.

2. CHECK LOAD SIGNAL CIRCUIT OVERALL FUNCTION-II

With CONSULT-II

Check "LOAD SIGNAL" indication under the following conditions.

Condition	Indication
Lighting switch "ON" at 2nd position	ON
Lighting switch "OFF"	OFF



OK or NG

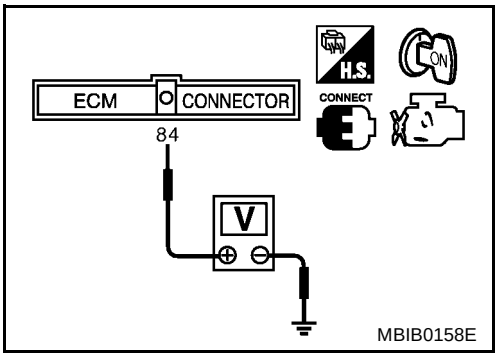
OK >> **INSPECTION END**
NG >> GO TO 5.

3. CHECK LOAD SIGNAL CIRCUIT OVERALL FUNCTION-II

Without CONSULT-II

Check voltage between ECM terminal 84 and ground under the following conditions.

Condition	Voltage
Lighting switch "ON" at 2nd position	Battery voltage
Lighting switch "OFF"	Approximately 0V



OK or NG

OK >> **INSPECTION END**
NG >> GO TO 5.

4. CHECK REAR WINDOW DEFOGGER SYSTEM

Refer to GW-40, "REAR WINDOW DEFOGGER" .

>> **INSPECTION END**

5. CHECK HEADLAMP FUNCTION

1. Turn lighting switch “ON” at 2nd position.
2. Check that headlamps are illuminated.

OK or NG

OK >> GO TO 6.
NG >> Refer to LT-5, "HEADLAMP -CONVENTIONAL TYPE-" , LT-10, "HEADLAMP - XENON TYPE -" , LT-18, "HEADLAMP (WITH DAYTIME) - CONVENTIONAL TYPE -" or LT-25, "HEADLAMP (WITH DAYTIME) - XENON TYPE -" .

6. CHECK HEADLAMP INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

CONVENTIONAL TYPE HEADLAMP WITHOUT DAYTIME LIGHT SYSTEM

1. Turn ignition switch “OFF”.
2. Disconnect ECM hraness connector.
3. Disconnect lighting switch harness connector .
4. Check harness continuity between ECM terminal 84 and lighting switch terminal 10.
   Refer to Wiring Diagram.

   Continuity should exist.

5. Also check harness for short to ground and short to power.

CONVENTIONAL TYPE HEADLAMP WITH DAYTIME LIGHT SYSTEM

1. Turn ignition switch “OFF”.
2. Disconnect ECM hraness connector.
3. Disconnect daytime light relay.
4. Check harness continuity between ECM terminal 84 and daytime light relay terminal 3.
   Refer to Wiring Diagram.

   Continuity should exist.

5. Also check harness for short to ground and short to power.

XENON TYPE HEADLAMP

1. Turn ignition switch “OFF”.
2. Disconnect ECM hraness connector.
3. Disconnect headlamp LH relay.
4. Check harness continuity between ECM terminal 84 and headlamp LH relay terminal 5.
   Refer to Wiring Diagram.

   Continuity should exist.

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E62, F12
- harness for open and short between ECM and lighting switch
- harness for open and short between ECM and daytime light relay
- harness for open and short between ECM and headlamp LH relay

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-1076, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

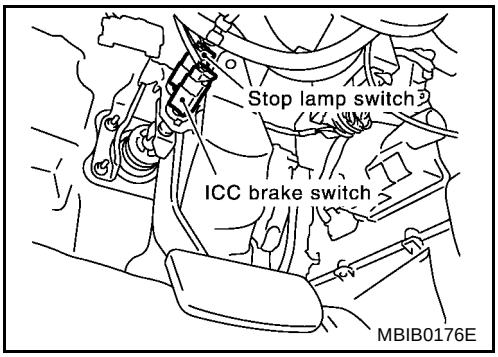
ICC BRAKE SWITCH

PFP:25320

Component Description

EBS00GU9

When depress on the brake pedal, ICC brake switch is turned OFF and stop lamp switch is turned ON. ECM detects the state of the brake pedal by this input of two kinds (ON/OFF signal)
Refer to ACS-5, "DESCRIPTION" for the ICC function.



CONSULT-II Reference Value in Data Monitor Mode

EBS00GUA

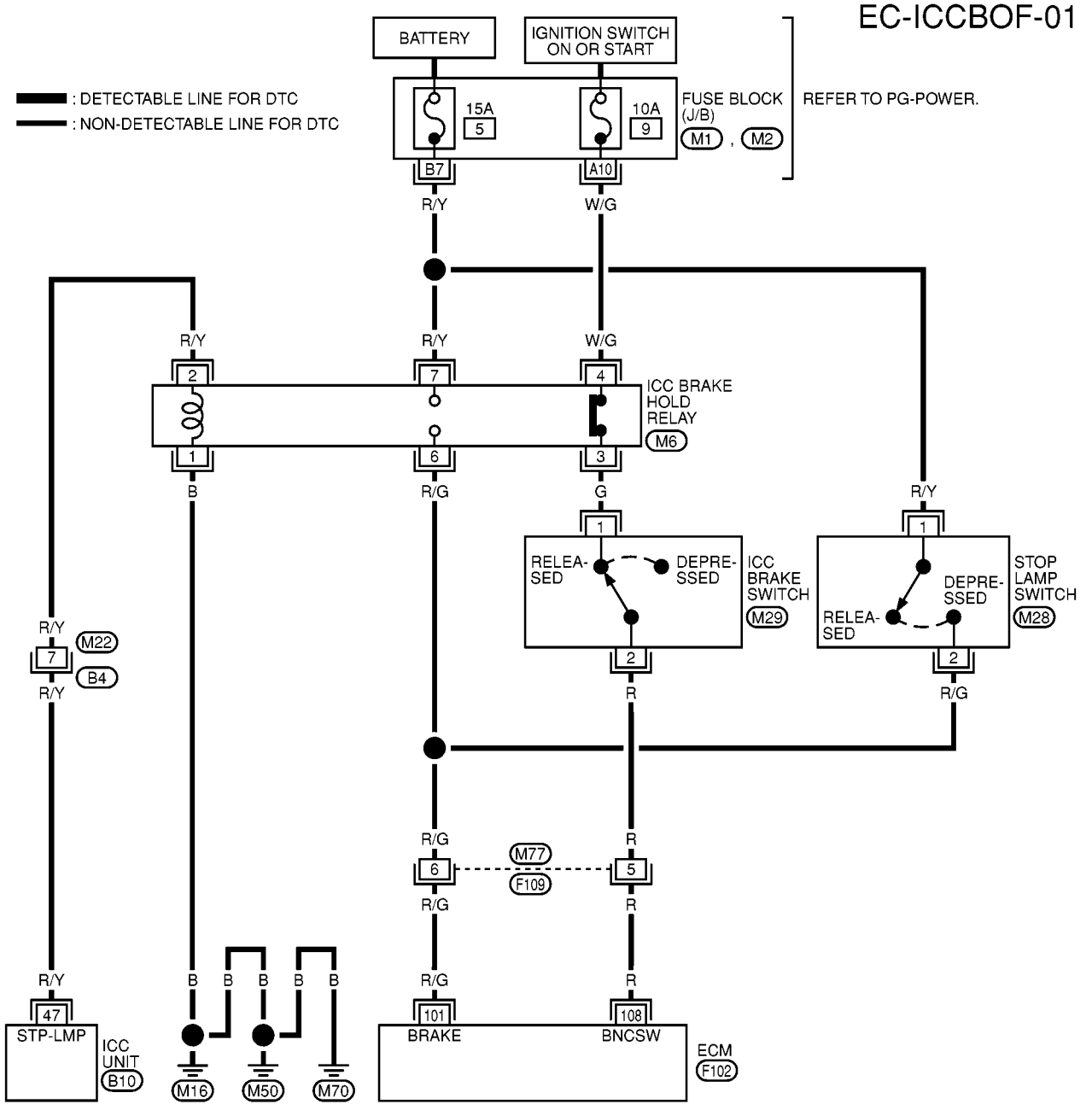
Specification data are reference values.

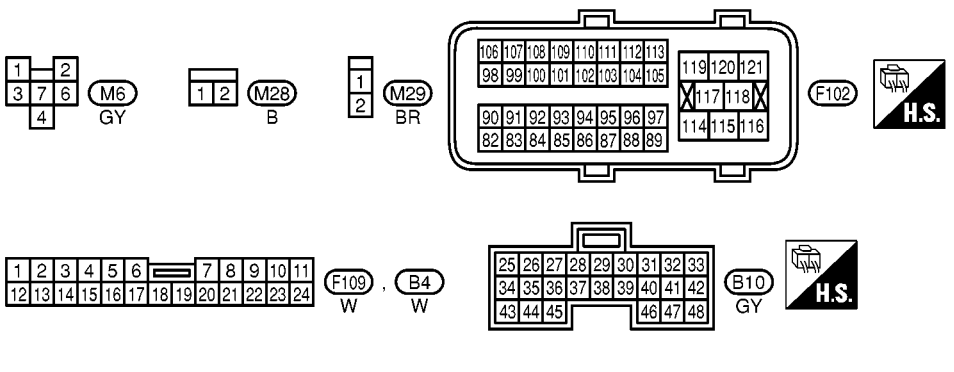
MONITOR ITEM	CONDITION		SPECIFICATION
BRAKE SW1 (ICC brake switch)	● Ignition switch: ON	● Brake pedal fully released	ON
		● Brake pedal depressed	OFF
BRAKE SW2 (stop lamp switch)	● Ignition switch: ON	● Brake pedal fully released	OFF
		● Brake pedal depressed	ON

Wiring Diagram

EBS00GUB

EC-ICCBOF-01





REFER TO THE FOLLOWING.
M1 , M2 -FUSE BLOCK
-JUNCTION BOX (J/B)

MBWA0155E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
101	R/G	Stop lamp switch	**[Engine is running]** ● Brake pedal fully released	Approximately 0V
			[Engine is running] ● Brake pedal depressed	BATTERY VOLTAGE (11 - 14V)
108	R	ICC brake switch	**[Ignition switch "ON"]** ● Brake pedal is depressed	Approximately 0V
			[Ignition switch "ON"] ● Brake pedal is fully released	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

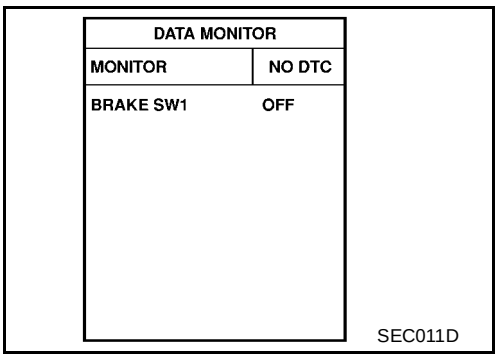
EBS00GUC

1. CHECK OVERALL FUNCTION-I

With CONSULT-II

1. Turn ignition switch "ON".
2. Select "BRAKE SW1" in "DATA MONITOR" mode with CONSULT-II.
3. Check "BRAKE SW1" indication under the following conditions.

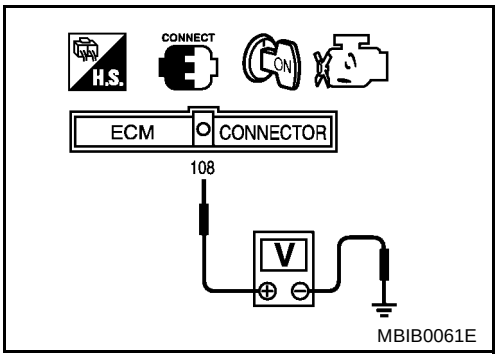
CONDITION	INDICATION
When brake pedal is depress	OFF
When brake pedal is fully released	ON



Without CONSULT-II

1. Turn ignition switch "ON".
2. Check voltage between ECM terminal 108 and ground under the following conditions.

CONDITION	VOLTAGE
When brake pedal is depress	Approximately 0V
When brake pedal is fully released	Battery voltage



OK or NG

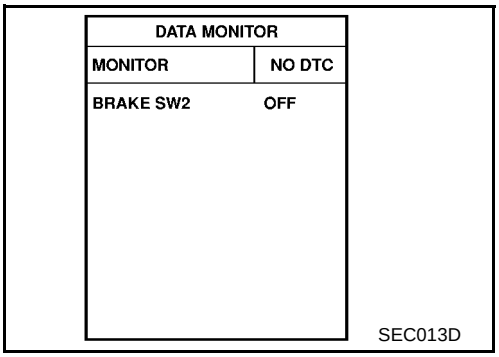
OK >> GO TO 2.
NG >> GO TO 3.

2. CHECK OVERALL FUNCTION-II

With CONSULT-II

Check “BRAKE SW2” indication in “DATA MONITOR” mode.

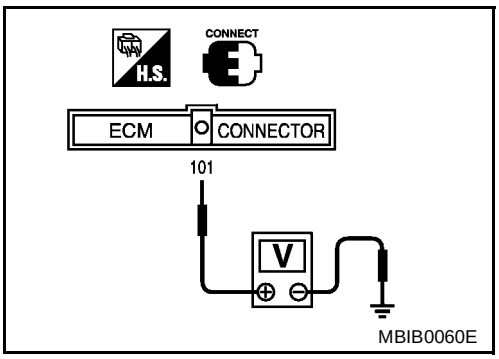
CONDITION	INDICATION
When brake pedal is released	OFF
When brake pedal is depressed	ON



Without CONSULT-II

Check voltage between ECM terminal 101 and ground under the following conditions.

CONDITION	VOLTAGE
When brake pedal is released	Approximately 0V
When brake pedal is depressed	Battery voltage

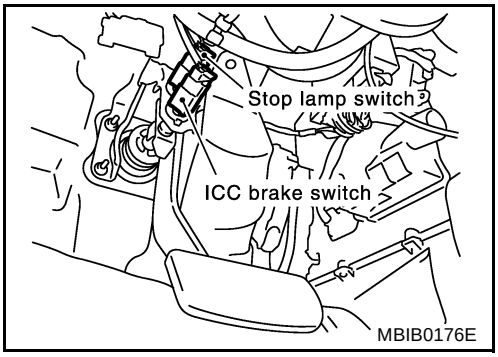


OK or NG

OK >> **INSPECTION END.**
NG >> GO TO 11.

3. CHECK ICC BRAKE SWITCH POWER SUPPLY CIRCUIT-I

1. Turn ignition switch “OFF”.
2. Disconnect ICC brake switch harness connector.
3. Turn ignition switch “ON”.

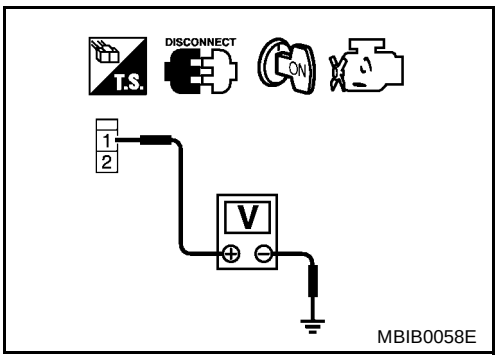


4. Check voltage between ICC brake switch terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage

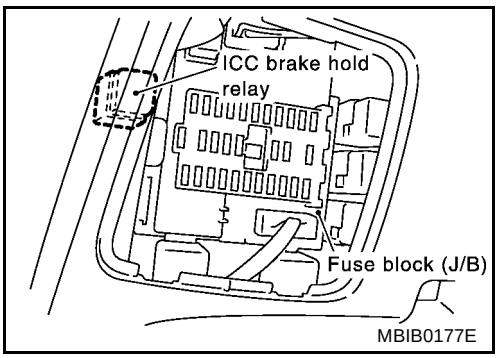
OK or NG

OK >> GO TO 8.
NG >> GO TO 4.



4. CHECK ICC BRAKE SWITCH POWER SUPPLY CIRCUIT-II

1. Turn ignition switch “OFF”.
2. Disconnect ICC brake hold relay.
3. Turn ignition switch “ON”.

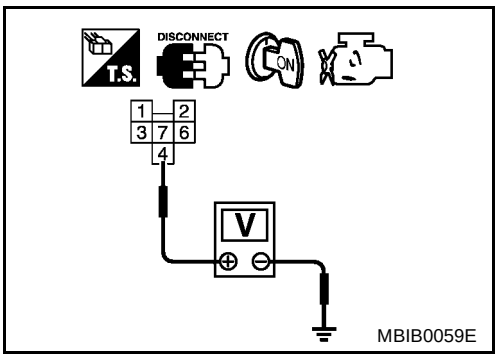


4. Check voltage between ICC brake hold relay terminal 4 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.



5. DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector M1
- 10A fuse
- Harness for open or short between ICC brake hold relay and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK ICC BRAKE SWITCH POWER SUPPLY CIRCUIT-III

1. Turn ignition switch “OFF”.
2. Check harness continuity between ICC brake hold relay terminal 3 and ICC brake switch terminal 1. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK ICC BRAKE HOLD RELAY

Refer to EC-1404, "Component Inspection" .

OK or NG

OK >> GO TO 18.
NG >> Replace ICC brake hold relay.

8. CHECK ICC BRAKE SWITCH INPUT SIGNAL CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ICC brake switch terminal 2 and ECM terminal 108. Refer Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 10.
NG >> GO TO 9.

9. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M77, F109
- Harness for open or short between ICC brake switch and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

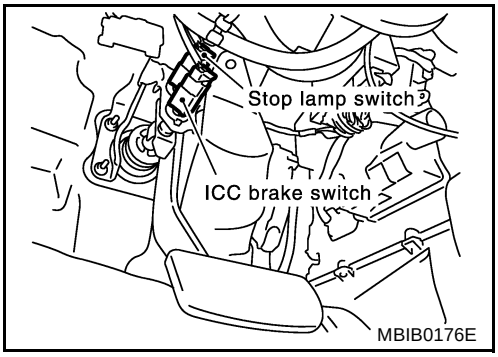
10. CHECK ICC BRAKE SWITCH

Refer to EC-1404, "Component Inspection" .

OK >> GO TO 18.
NG >> Replace ICC brake switch.

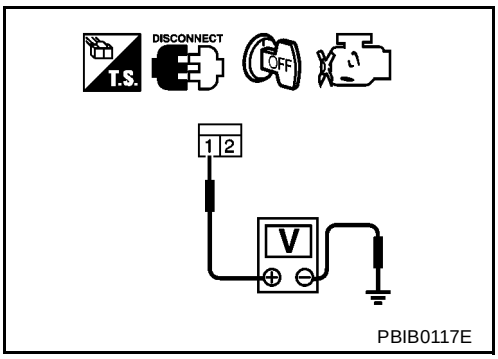
11. CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect stop lamp switch harness connector.



3. Check voltage between stop lamp switch terminal 1 and ground with CONSULT -II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 13.
NG >> GO TO 12.

12. DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector M2
- 15A fuse
- Harness for open or short between stop lamp switch and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

13. CHECK STOP LAMP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 101 and stop lamp switch terminal 2. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 15.
NG >> GO TO 14.

14. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M77, F109
- Harness for open or short between ECM and stop lamp switch

>> Repair open circuit or short to ground or short to power in harness or connectors.

15. CHECK ICC BRAKE HOLD RELAY CIRCUIT FOR OPEN AND SHORT

1. Disconnect ICC brake hold relay.
2. Check harness continuity between stop lamp switch terminal 1 and ICC brake hold relay terminal 7, stop lamp switch terminal 2 and ICC brake hold relay terminal 6.
   Refer to Wiring Diagram.

   Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 16.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

16. CHECK STOP LAMP SWITCH

Refer to EC-1404, "Component Inspection"

OK or NG

OK >> GO TO 17.
NG >> Replace stop lamp switch.

17. CHECK ICC BRAKE HOLD RELAY

Refer to EC-1404, "Component Inspection" .

OK or NG

OK >> GO TO 18.
NG >> Replace ICC brake hold relay.

18. CHECK INTERMITTENT INCIDENT

Refer to EC-1076, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

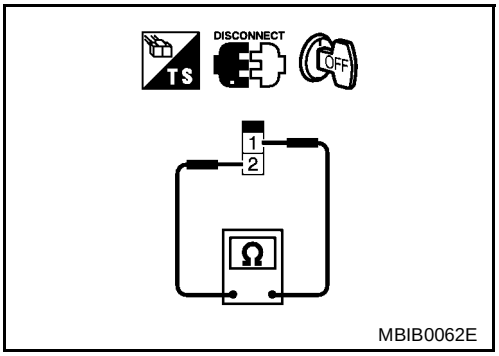
EBS00GXB

ICC BRAKE SWITCH

1. Turn ignition switch “OFF”.
2. Disconnect ICC brake switch harness connector.
3. Check continuity between ICC brake switch terminals 1 and 2 under the following conditions.

Condition	Continuity
When brake pedal is fully released.	Should exist.
When brake pedal is depressed.	Should not exist.

If NG, adjust ICC brake switch installation, refer to BR-6, "BRAKE PEDAL" , and perform step 3 again.



MBIB0062E

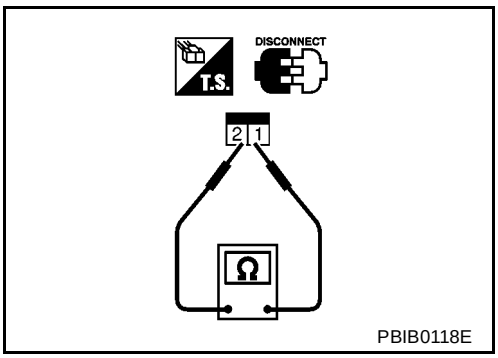
STOP LAMP SWITCH

1. Turn ignition switch “OFF”.
2. Disconnect stop lamp switch harness connector.

3. Check continuity between stop lamp switch terminals 1 and 2 under the following conditions.

Condition	Continuity
When brake pedal is fully released.	Should not exist.
When brake pedal is depressed.	Should exist.

If NG, adjust stop lamp switch installation, refer to BR-6, "BRAKE PEDAL" , and perform step 3 again.

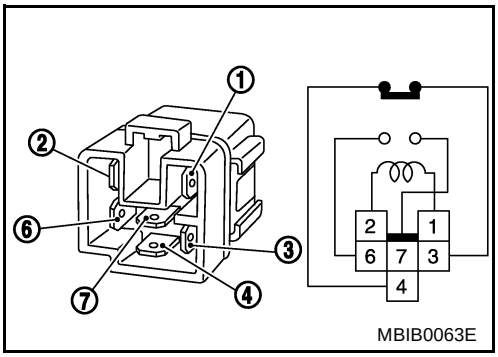


ICC BRAKE HOLD RELAY

1. Apply 12V direct current between ICC brake hold relay terminals 1 and 2.
2. Check continuity between relay terminals 3 and 4, 6 and 7 under the following conditions.

Condition	Between terminals	Continuity
12V direct current supply between terminals 1 and 2	3 and 4	Should not exist
	6 and 7	Should exist
No current supply	3 and 4	Should exist
	6 and 7	Should not exist

3. If NG, replace ICC brake hold relay.

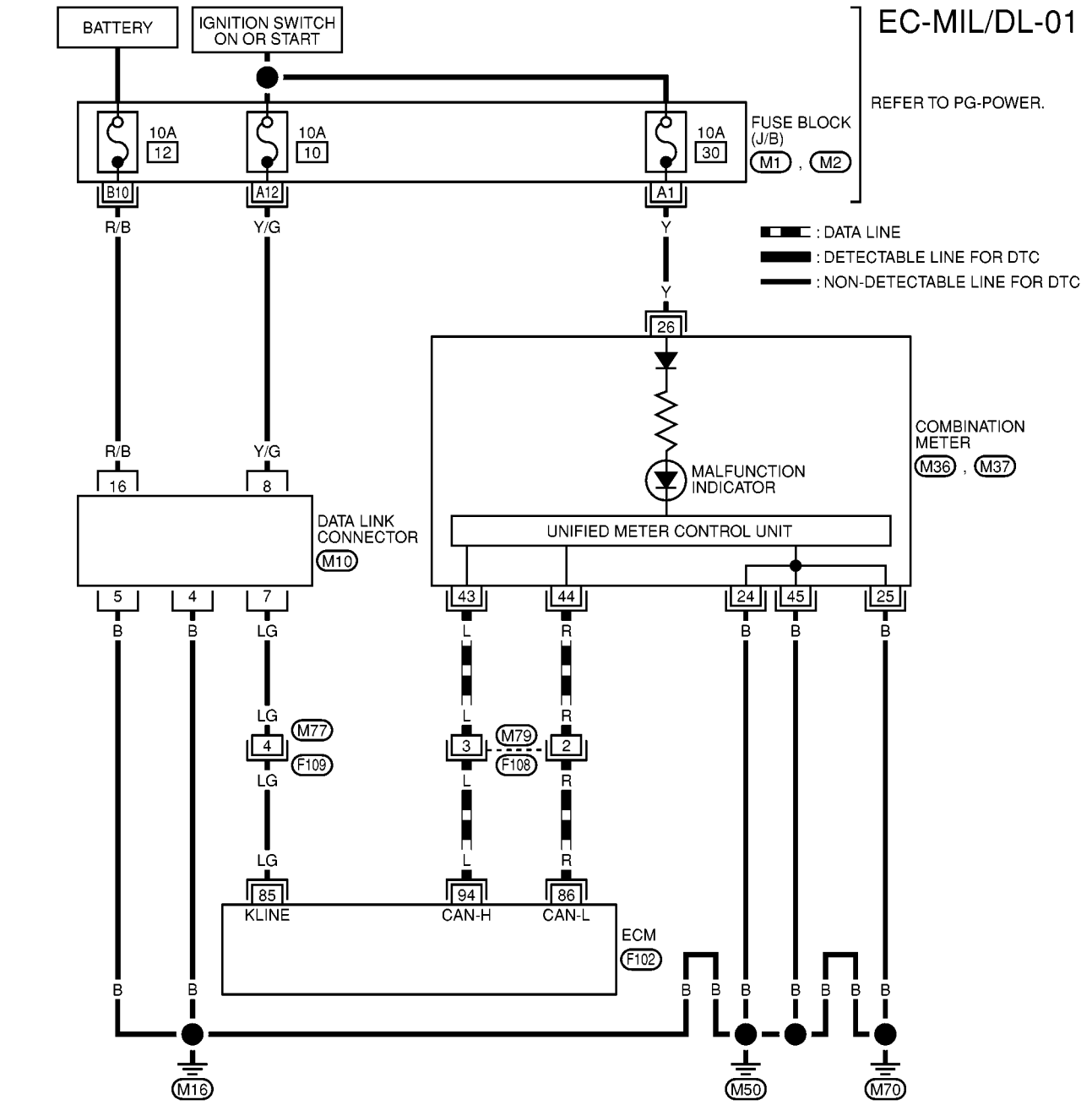


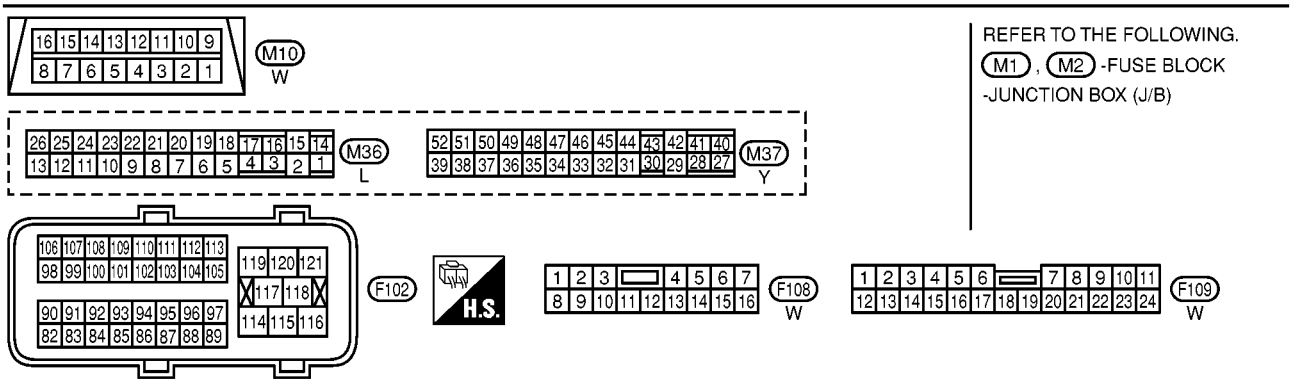
MI & DATA LINK CONNECTORS

PFP:24814

Wiring Diagram (LHD Models)

EBS00FDA

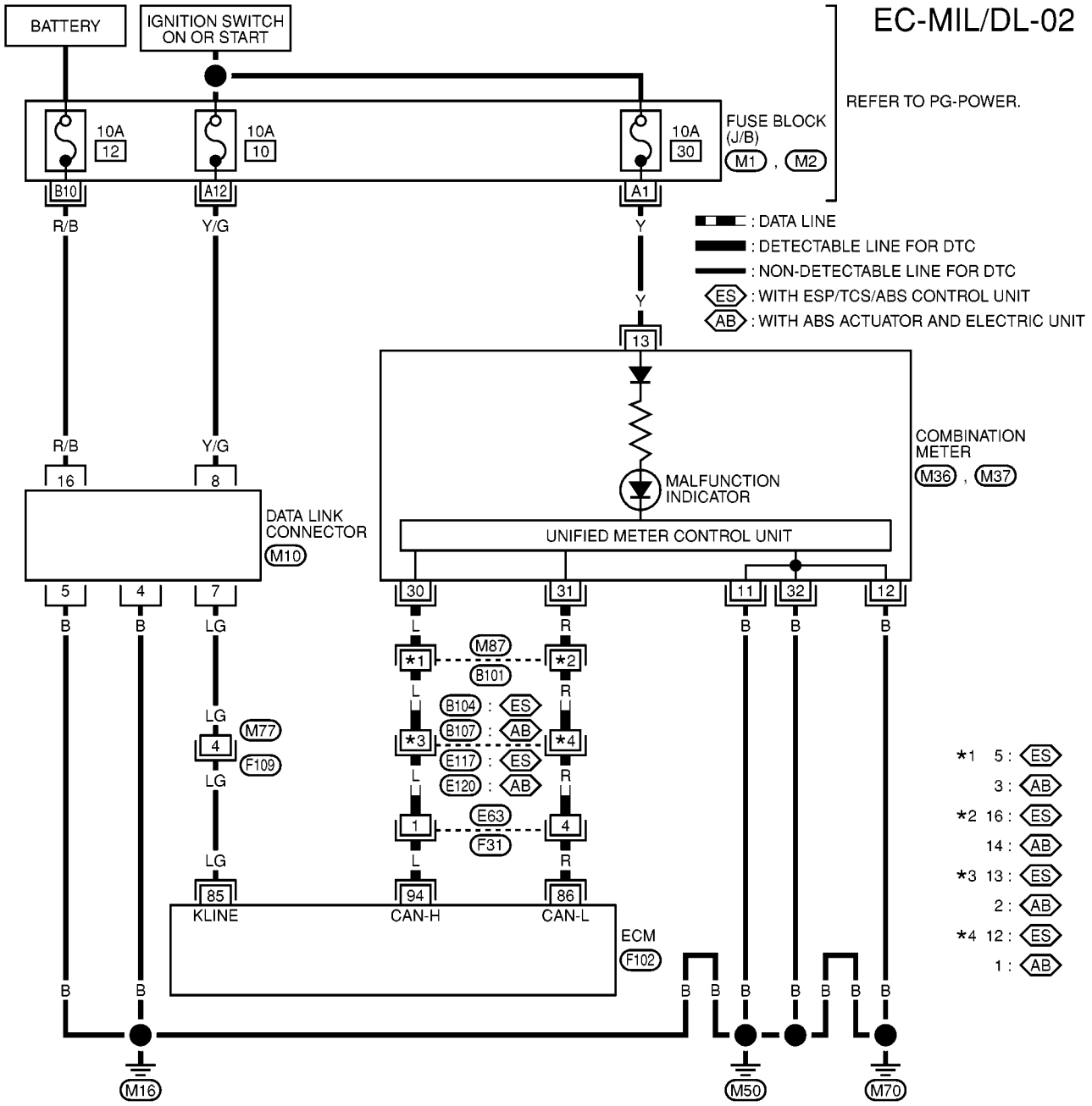


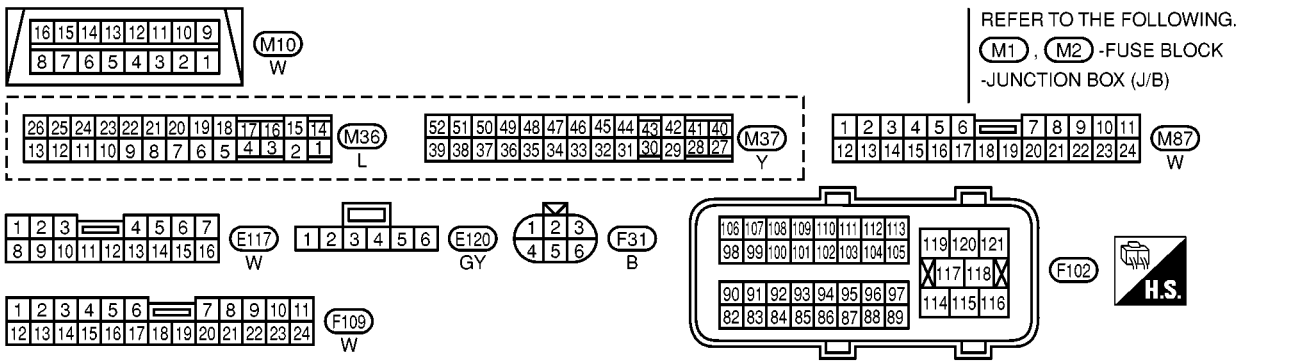


MBWA0039E

Wiring Diagram (RHD Models)

EBS00GTM





MBWA0148E

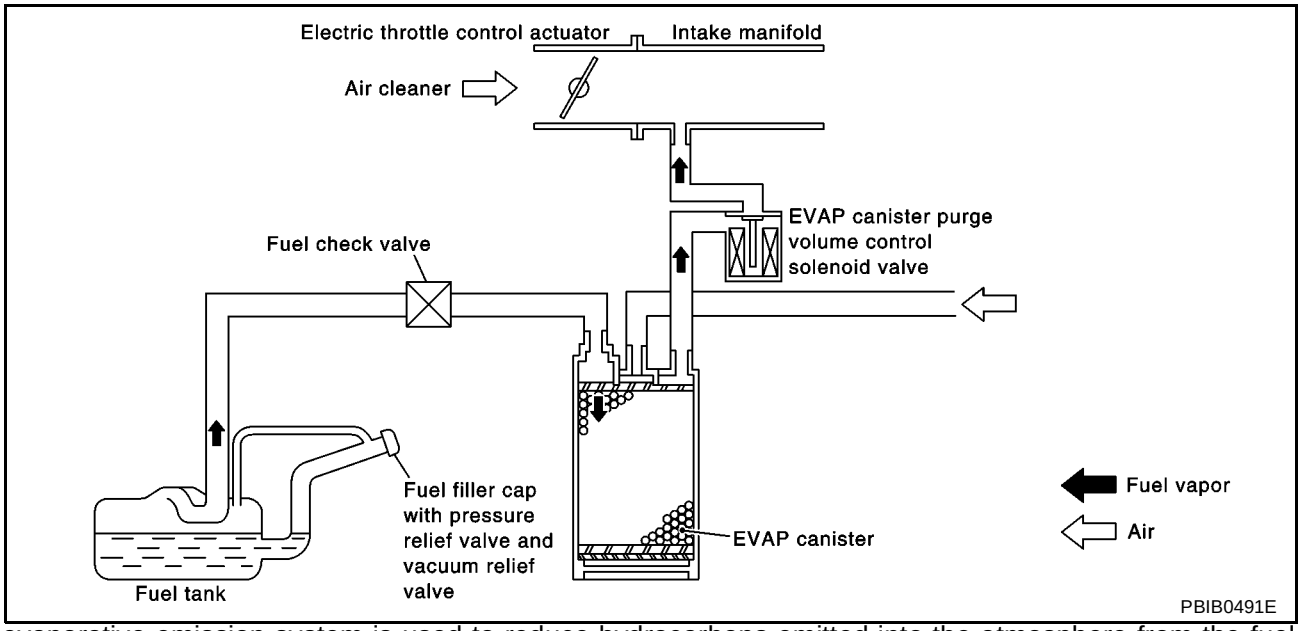
EVAPORATIVE EMISSION SYSTEM

PFP:14950

Description

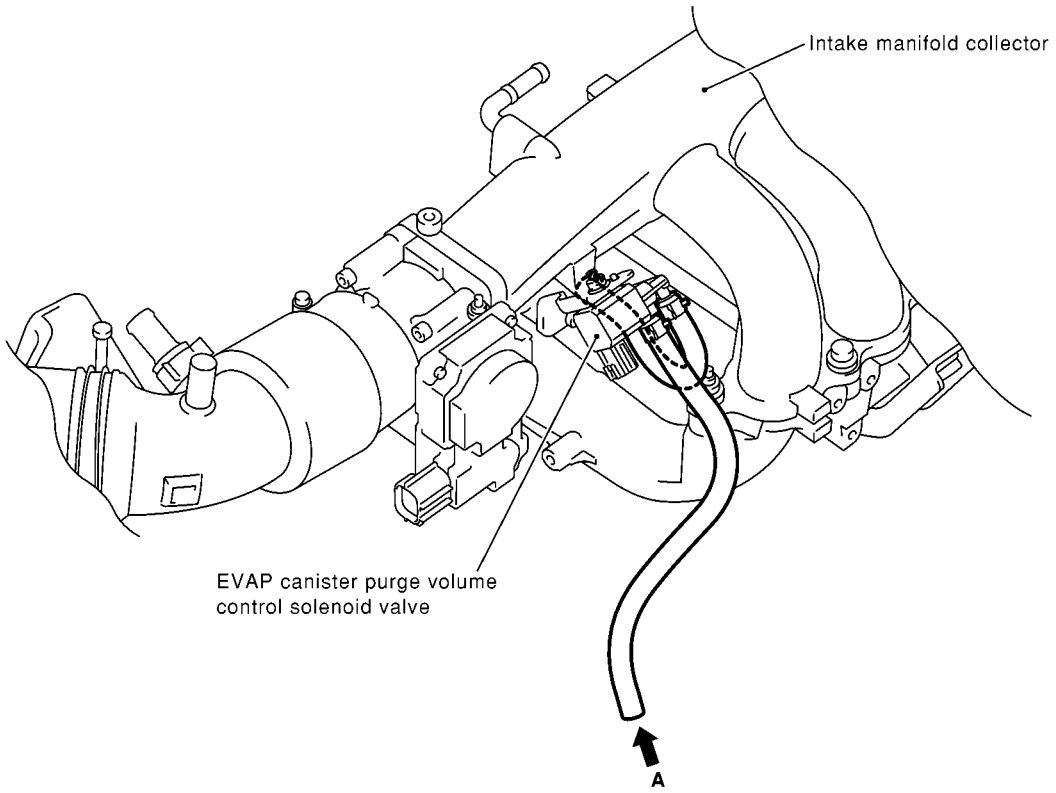
EBS00FDB

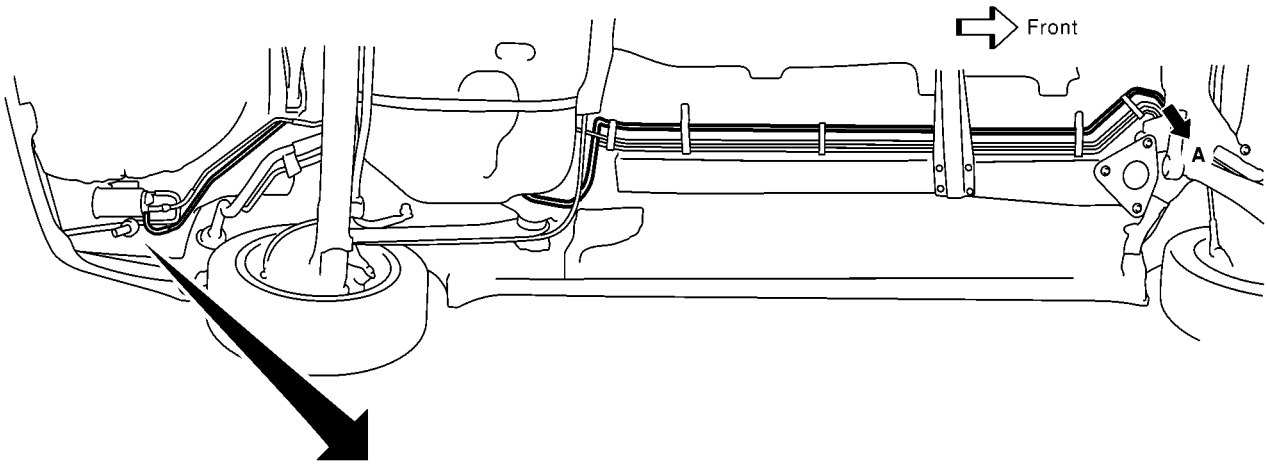
SYSTEM DESCRIPTION



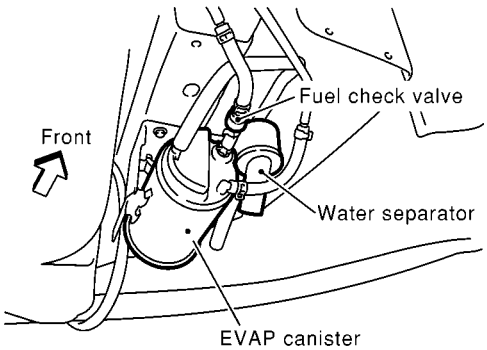
The evaporative emission system is used to reduce hydrocarbons emitted into the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the EVAP canister.
The fuel vapor in the sealed fuel tank is led into the EVAP canister which contains activated carbon and the vapor is stored there when the engine is not operating or when refueling to the fuel tank.
The vapor in the EVAP canister is purged by the air through the purge line to the intake manifold when the engine is operating. EVAP canister purge volume control solenoid valve is controlled by ECM. When the engine operates, the flow rate of vapor controlled by EVAP canister purge volume control solenoid valve is proportionally regulated as the air flow increases.
EVAP canister purge volume control solenoid valve also shuts off the vapor purge line during decelerating and idling.

EVAPORATIVE EMISSION LINE DRAWING





View from under the vehicle



NOTE:
Do not use soapy water or any type of solvent while installing vacuum hose or purge hoses.

MBIB0144E

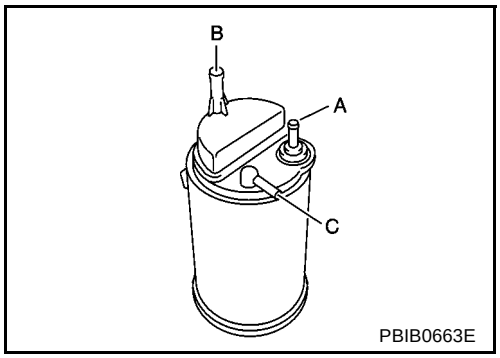
Component Inspection

EBS00FDC

EVAP CANISTER

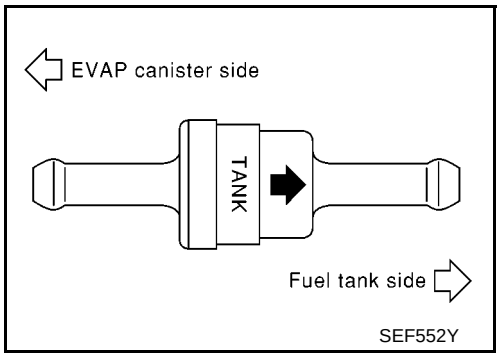
Check EVAP canister as follows:

1. Block port **B** . Orally blow air through port **A** . Check that air flows freely through port **C** .
2. Block port **A** . Orally blow air through port **B** . Check that air flows freely through port **C** .



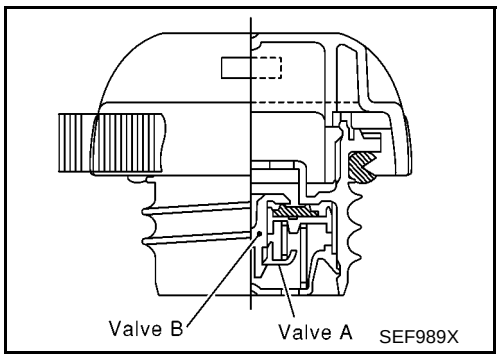
FUEL CHECK VALVE

1. Blow air through connector on fuel tank side. A considerable resistance should be felt and a portion of air flow should be directed toward the EVAP canister side.
2. Blow air through connector on EVAP canister side. Air flow should be smoothly directed toward fuel tank side.
3. If fuel check valve is suspected of not properly functioning in steps 1 and 2 above, replace it.



FUEL TANK VACUUM RELIEF VALVE (BUILT INTO FUEL FILLER CAP)

1. Wipe clean valve housing.

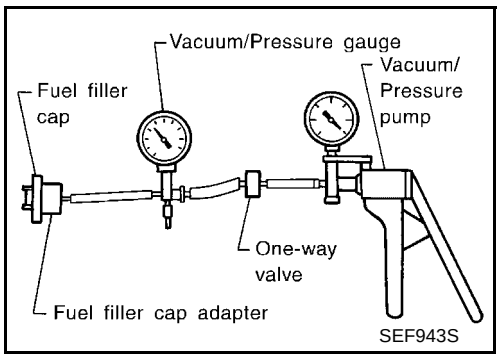


2. Check valve opening pressure and vacuum.

Pressure: 15.3 - 20.0 kPa (0.153 - 0.200 bar, 0.156 - 0.204 kg/cm^2 , 2.22 - 2.90 psi)

Vacuum: –6.0 to –3.4 kPa (–0.060 to –0.034 bar, –0.061 to –0.035 kg/cm^2 , –0.87 to –0.49 psi)

3. If out of specification, replace fuel filler cap as an assembly.



EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-1227, "Component Inspection" .

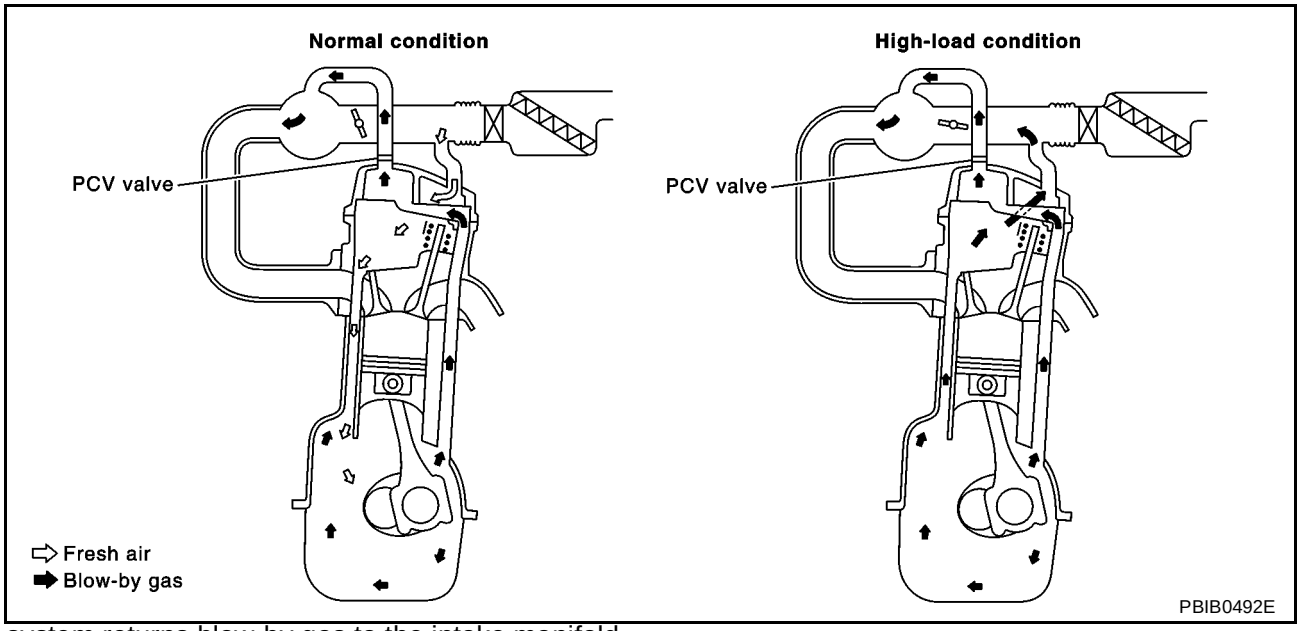
POSITIVE CRANKCASE VENTILATION

PFP:11810

Description

EBS00FDD

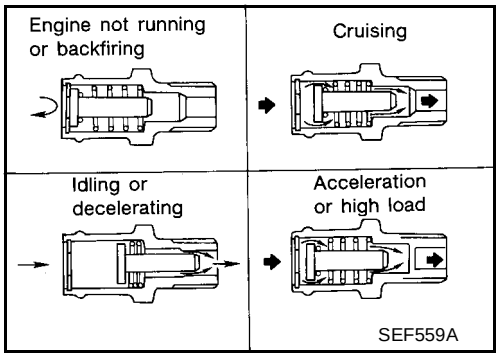
SYSTEM DESCRIPTION



This system returns blow-by gas to the intake manifold.

The positive crankcase ventilation (PCV) valve is provided to conduct crankcase blow-by gas to the intake manifold. During partial throttle operation of the engine, the intake manifold sucks the blow-by gas through the PCV valve. Normally, the capacity of the valve is sufficient to handle any blow-by and a small amount of ventilating air. The ventilating air is then drawn from the air inlet tubes into the crankcase. In this process the air passes through the hose connecting air inlet tubes to rocker cover. Under full-throttle condition, the manifold vacuum is insufficient to draw the blow-by flow through the valve. The flow goes through the hose connection in the reverse direction.

On vehicles with an excessively high blow-by, the valve does not meet the requirement. This is because some of the flow will go through the hose connection to the air inlet tubes under all conditions.

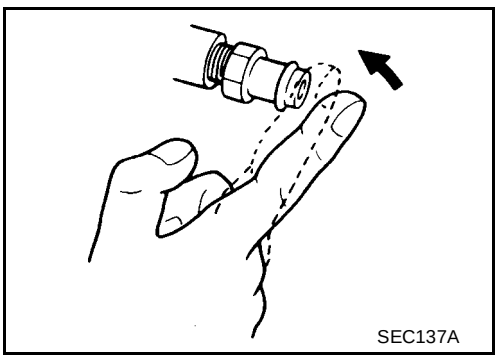


Component Inspection

EBS00FDE

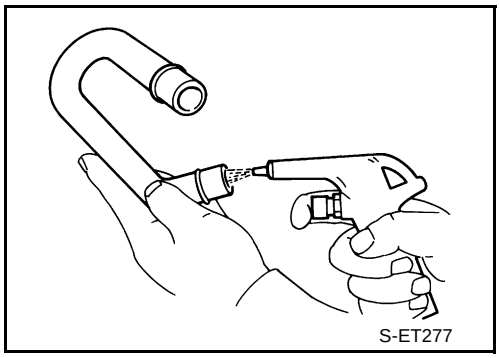
PCV (POSITIVE CRANKCASE VENTILATION) VALVE

With engine running at idle, remove PCV valve from rocker cover. A properly working valve makes a hissing noise as air passes through it. A strong vacuum should be felt immediately when a finger is placed over valve inlet.



PCV VALVE VENTILATION HOSE

1. Check hoses and hose connections for leaks.
2. Disconnect all hoses and clean with compressed air. If any hose cannot be freed of obstructions, replace.


S-ET277

SERVICE DATA AND SPECIFICATIONS (SDS)

PFP:00030

Fuel Pressure

EBS00FDH

Fuel pressure at idle	Approximately 350 kPa (3.7kg/cm^2 , 51psi)

Idle Speed and Ignition Timing

EBS00FDI

Target idle speed	No-load*1 (in “P” or N” position)	M/T: 600±50 rpm CVT: 650±50 rpm
Air conditioner: ON	In “P” or N” position	725 rpm or more
Ignition timing	In “P” or N” position	M/T: 14°±5° BTDC CVT:15°±5° BTDC

*1: Under the following conditions:

- Air conditioner switch: OFF
- Electric load: OFF (Lights, heater fan & rear window defogger)
- Steering wheel: Kept in straight-ahead position

Calculated Load Value

EBS00FDJ

	Calculated load value % (Using CONSULT-II or GST)
At idle	10 - 35
At 2,500 rpm	10 - 35

Mass Air Flow Sensor

EBS00FDK

Supply voltage	Battery voltage (11 - 14V)
Output voltage at idle	1.1 - 1.5*V
Mass air flow (Using CONSULT-II or GST)	1.4 - 4.0 g·m/sec at idle* 4.0 - 10.0 g·m/sec at 2,500 rpm*

*: Engine is warmed up to normal operating temperature and running under no-load.

Intake Air Temperature Sensor

EBS00FDL

Temperature °C (°F)	Resistance kΩ
25 (77)	1.9 - 2.1
80 (176)	0.31 - 0.37

Engine Coolant Temperature Sensor

EBS00FDM

Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.00
90 (194)	0.236 - 0.260

Heated Oxygen Sensor 1 Heater

EBS00FDN

Resistance [at 25°C (77°F)]	2.3 - 4.3Ω

Heated Oxygen sensor 2 Heater

EBS00FDO

Resistance [at 25°C (77°F)]	2.3 - 4.3Ω

Crankshaft Position Sensor (POS)

EBS00FDP

Refer to EC-1210, "Component Inspection" .

Camshaft Position Sensor (PHASE)

EBS00FDQ

Refer to EC-1216, "Component Inspection" .

Throttle Control Motor

EBS00FDR

Resistance [at 25°C (77°F)]	Approximately 1 - 15Ω

Injector

EBS00FDS

Resistance [at 20°C (68°F)]	13.5 - 17.5Ω

Fuel Pump

EBS00FDT

Resistance [at 25°C (77°F)]	Approximately 1.0Ω

INDEX FOR DTC

PFP:00024

Alphabetical Index

EBS00GXE

Check if the vehicle is a model with Euro-OBD (E-OBD) system or not by the “Type approval number” on the identification plate. Refer to GI-46, "IDENTIFICATION PLATE" .

NOTE:
If DTC U1000 or U1001 is displayed with other DTC, first perform the trouble diagnosis for DTC U1000, U1001. Refer to EC-1505, "DTC U1000, U1001 CAN COMMUNICATION LINE" .

Items (CONSULT-II screen terms)	DTC*1		Reference page
	CONSULT-II*2	ECM*3	
APP SEN 1/CIRC*5	P0227	0227	EC-1544
APP SEN 1/CIRC*5	P0228	0228	EC-1544
APP SEN 2/CIRC*5	P1227	1227	EC-1630
APP SEN 2/CIRC*5	P1228	1228	EC-1630
APP SENSOR*5	P0226	0226	EC-1537
BRAKE SW/CIRCUIT	P1805	1805	EC-1641
CAN COMM CIRCUIT	U1000	1000*6	EC-1505
CAN COMM CIRCUIT	U1001	1001*6	EC-1505
CKP SEN/CIRCUIT	P0335	0335	EC-1555
CMP SEN/CIRC-B1	P0340	0340	EC-1562
CTP LEARNING	P1225	1225	EC-1626
CTP LEARNING	P1226	1226	EC-1628
ECM	P0605	0605	EC-1576
ECM BACK UP/CIRC	P1065	1065	EC-1579
ECT SEN/CIRCUIT*5	P0117	0117	EC-1514
ECT SEN/CIRCUIT*5	P0118	0118	EC-1514
ENG OVER TEMP	P1217	1217	EC-1603
ETC ACTR*5	P1121	1121	EC-1583
ETC FUNCTION/CIRC*5	P1122	1122	EC-1585
ETC MOT*5	P1128	1128	EC-1598
ETC MOT PWR*5	P1124	1124	EC-1592
ETC MOT PWR*5	P1126	1126	EC-1592
HO2S1 (B1)	P0134	0134	EC-1519
KNOCK SEN/CIRC-B1	P0327	0327	EC-1551
KNOCK SEN/CIRC-B1	P0328	0328	EC-1551
MAF SEN/CIRCUIT*5	P0102	0102	EC-1508
MAF SEN/CIRCUIT*5	P0103	0103	EC-1508
NATS MALFUNCTION	P1610 - P1615	1610 - 1615	EC-1447
NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	No DTC	Flashing*4	EC-1448
NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	**P0000**	**0000**	—
PW ST P SEN/CIRC	P0550	0550	EC-1571

Items (CONSULT-II screen terms)	DTC*1		Reference page
	CONSULT-II*2	ECM*3	
SENSOR POWER/CIRC*5	P1229	1229	EC-1637
TP SEN 1/CIRC*5	P0222	0222	EC-1531
TP SEN 1/CIRC*5	P0223	0223	EC-1531
TP SEN 2/CIRC*5	P1223	1223	EC-1620
TP SEN 2/CIRC*5	P1224	1224	EC-1620
TP SENSOR*5	P0221	0221	EC-1525
VEH SPEED SEN/CIRC	P0500	0500	EC-1569

*1: 1st trip DTC No. is the same as DTC No.
*2: These numbers are prescribed by ISO 15031-5.
*3: In Diagnostic Test Mode II (Self-diagnostic results), these numbers are controlled by NISSAN.
*4: When engine is running.
*5: When the fail-safe operation occurs, the MI illuminates.
*6: The troubleshooting for these DTCs needs CONSULT-II.

DTC No. Index

EBS00GXF

NOTE:
If DTC U1000 or U1001 is displayed with other DTC, first perform the trouble diagnosis for DTC U1000, U1001. Refer to EC-1505, "DTC U1000, U1001 CAN COMMUNICATION LINE" .

DTC*1		Items (CONSULT-II screen terms)	Reference page
CONSULT-II*2	ECM*3		
No DTC	Flashing*4	NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	EC-1448
U1000	1000*6	CAN COMM CIRCUIT	EC-1505
U1001	1001*6	CAN COMM CIRCUIT	EC-1505
P0000	**0000**	**NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.**	—
P0102	0102	MAF SEN/CIRCUIT*5	EC-1508
P0103	0103	MAF SEN/CIRCUIT*5	EC-1508
P0117	0117	ECT SEN/CIRCUIT*5	EC-1514
P0118	0118	ECT SEN/CIRCUIT*5	EC-1514
P0134	0134	HO2S1 (B1)	EC-1519
P0221	0221	TP SENSOR*5	EC-1525
P0222	0222	TP SEN 1/CIRC*5	EC-1531
P0223	0223	TP SEN 1/CIRC*5	EC-1531
P0226	0226	APP SENSOR*5	EC-1537
P0227	0227	APP SEN 1/CIRC*5	EC-1544
P0228	0228	APP SEN 1/CIRC*5	EC-1544
P0327	0327	KNOCK SEN/CIRC-B1	EC-1551
P0328	0328	KNOCK SEN/CIRC-B1	EC-1551
P0335	0335	CKP SEN/CIRCUIT	EC-1555
P0340	0340	CMP SEN/CIRC-B1	EC-1562

DTC*1		Items (CONSULT-II screen terms)	Reference page
CONSULT-II*2	ECM*3		
P0500	0500	VEH SPEED SEN/CIRC	EC-1569
P0550	0550	PW ST P SEN/CIRC	EC-1571
P0605	0605	ECM	EC-1576
P1065	1065	ECM BACK UP/CIRC	EC-1579
P1121	1121	ETC ACTR*5	EC-1583
P1122	1122	ETC FUNCTION/CIRC*5	EC-1585
P1124	1124	ETC MOT PWR*5	EC-1592
P1126	1126	ETC MOT PWR*5	EC-1592
P1128	1128	ETC MOT*5	EC-1598
P1217	1217	ENG OVER TEMP	EC-1603
P1223	1223	TP SEN 2/CIRC*5	EC-1620
P1224	1224	TP SEN 2/CIRC*5	EC-1620
P1225	1225	CTP LEARNING	EC-1626
P1226	1226	CTP LEARNING	EC-1628
P1227	1227	APP SEN 2/CIRC*5	EC-1630
P1228	1228	APP SEN 2/CIRC*5	EC-1630
P1229	1229	SENSOR POWER/CIRC*5	EC-1637
P1610 - P1615	1610 - 1615	NATS MALFUNCTION	EC-1447
P1805	1805	BRAKE SW/CIRCUIT	EC-1641

*1: 1st trip DTC No. is the same as DTC No.
*2: These numbers are prescribed by ISO 15031-5.
*3: In Diagnostic Test Mode II (Self-diagnostic results), these numbers are controlled by NISSAN.
*4: When engine is running.
*5: When the fail-safe operation occurs, the MI illuminates.
*6: The troubleshooting for these DTCs needs CONSULT-II.

PRECAUTIONS

PFP:00001

Precautions for Supplemental Restraint System (SRS) “AIR BAG” and “SEAT BELT PRE-TENSIONER”

EBS00GXG

The Supplemental Restraint System such as "AIR BAG" and "SEAT BELT PRE-TENSIONER", used along with a front seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. Information necessary to service the system safely is included in the SRS and SB section of this Service Manual.

WARNING:

- **To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance must be performed by an authorized NISSAN/INFINITI dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system. For removal of Spiral Cable and Air Bag Module, see the SRS section.**
- **Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses can be identified by yellow and/or orange harness connectors.**

On Board Diagnostic (OBD) System of Engine

EBS00GXH

The ECM has an on board diagnostic system. It will light up the malfunction indicator (MI) to warn the driver of a malfunction causing emission deterioration.

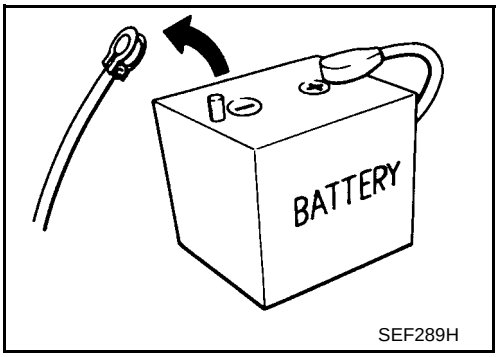
CAUTION:

- **Be sure to turn the ignition switch OFF and disconnect the battery ground cable before any repair or inspection work. The open/short circuit of related switches, sensors, solenoid valves, etc. will cause the MI to light up.**
- **Be sure to connect and lock the connectors securely after work. A loose (unlocked) connector will cause the MI to light up due to the open circuit. (Be sure the connector is free from water, grease, dirt, bent terminals, etc.)**
- **Certain systems and components, especially those related to OBD, may use a new style slide-locking type harness connector. For description and how to disconnect, refer to PG-86, "HARNESS CONNECTOR" .**
- **Be sure to route and secure the harnesses properly after work. The interference of the harness with a bracket, etc. may cause the MI to light up due to the short circuit.**
- **Be sure to connect rubber tubes properly after work. A misconnected or disconnected rubber tube may cause the MI to light up due to the malfunction of the fuel injection system, etc.**
- **Be sure to erase the unnecessary malfunction information (repairs completed) from the ECM.**

Precaution

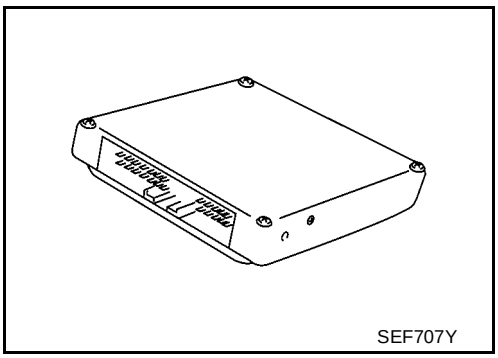
EBS00GXI

- **Always use a 12 volt battery as power source.**
- **Do not attempt to disconnect battery cables while engine is running.**
- **Before connecting or disconnecting the ECM harness connector, turn ignition switch OFF and disconnect battery ground cable. Failure to do so may damage the ECM because battery voltage is applied to ECM even if ignition switch is turned off.**
- **Before removing parts, turn ignition switch OFF and then disconnect battery ground cable.**

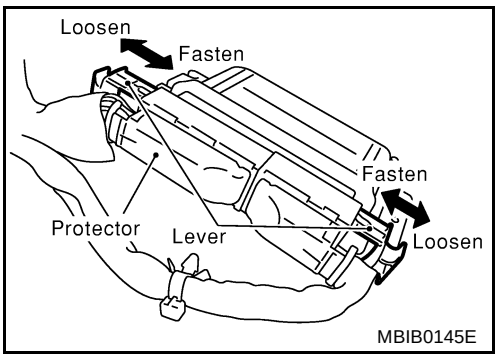


SEF289H

- **Do not disassemble ECM.**
- **If battery cable is disconnected, the memory will return to the initial ECM values.**
  The ECM will now start to self-control at its initial values. Engine operation can vary slightly when the cable is disconnected. However, this is not an indication of a problem. Do not replace parts because of a slight variation.

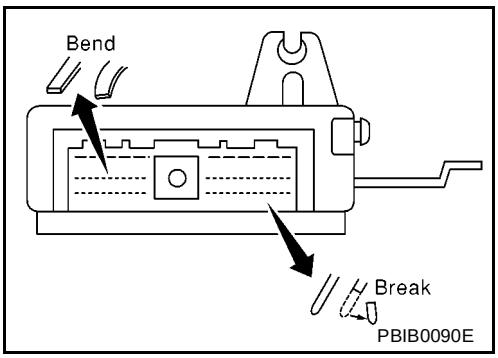

SEF707Y

- **When connecting ECM harness connector, fasten it securely with levers as far as they will go as shown at right.**



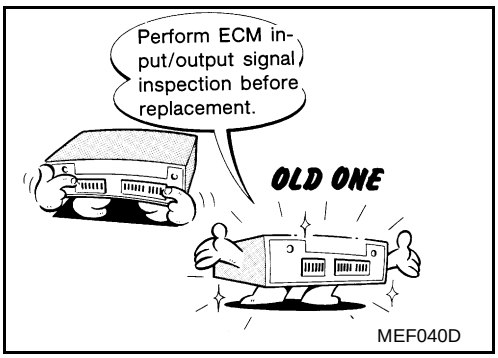
MBIB0145E

- **When connecting or disconnecting pin connectors into or from ECM, take care not to damage pin terminals (bend or break).**
  Make sure that there are not any bends or breaks on ECM pin terminal, when connecting pin connectors.
- **Securely connect ECM harness connectors.**
  A poor connection can cause an extremely high (surge) voltage to develop in coil and condenser, thus resulting in damage to ICs.
- **Keep engine control system harness at least 10 cm (4 in) away from adjacent harness, to prevent engine control system malfunctions due to receiving external noise, degraded operation of ICs, etc.**
- **Keep engine control system parts and harness dry.**



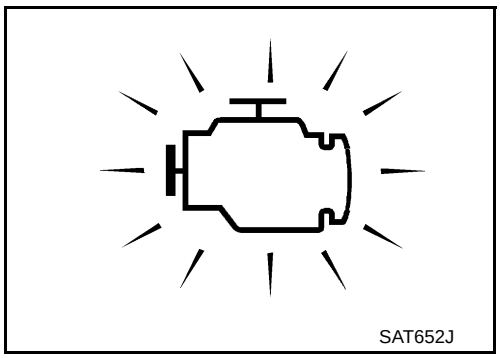
PBIB0090E

- **Before replacing ECM, perform “ECM Terminals and Reference Value” inspection and make sure ECM functions properly. Refer to EC-1472 .**
- **Handle mass air flow sensor carefully to avoid damage.**
- **Do not disassemble mass air flow sensor.**
- **Do not clean mass air flow sensor with any type of detergent.**
- **Do not disassemble electric throttle control actuator.**
- **Even a slight leak in the air intake system can cause serious problems.**
- **Do not shock or jar the camshaft position sensor (PHASE), crankshaft position sensor (POS).**

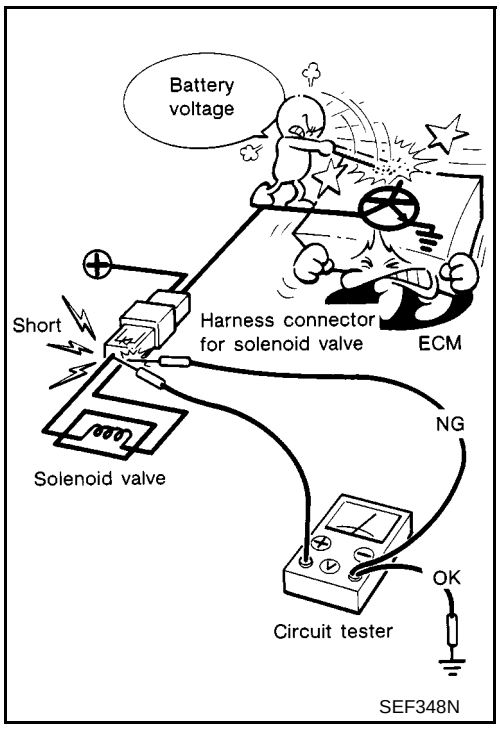


MEF040D

- **After performing each TROUBLE DIAGNOSIS, perform "DTC Confirmation Procedure" or "Overall Function Check".**
  The DTC should not be displayed in the "DTC Confirmation Procedure" if the repair is completed. The "Overall Function Check" should be a good result if the repair is completed.

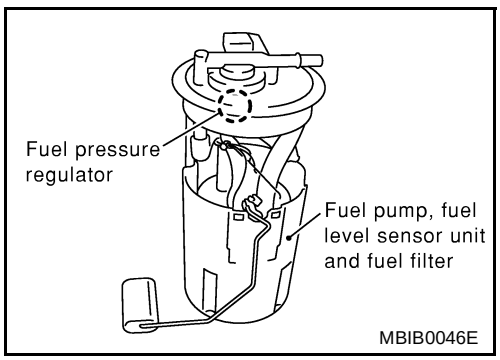

SAT652J

- **When measuring ECM signal with a circuit tester, connect break-out box (SST) and Y-cable adapter (SST) between the ECM and ECM harness connector.**
- **When measuring ECM signals with a circuit tester, never allow the two tester probes to contact.**
  Accidental contact of probes will cause a short circuit and damage the ECM power transistor.
- **Do not use ECM ground terminals when measuring input/ output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**



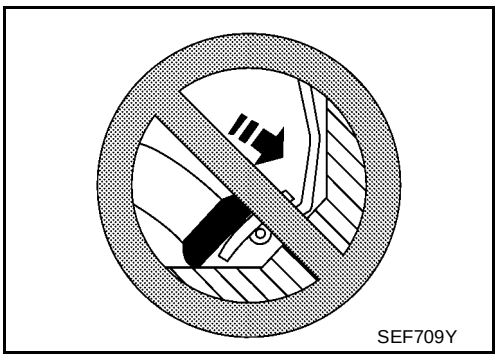
SEF348N

- **Do not operate fuel pump when there is no fuel in lines.**
- **Tighten fuel hose clamps to the specified torque.**

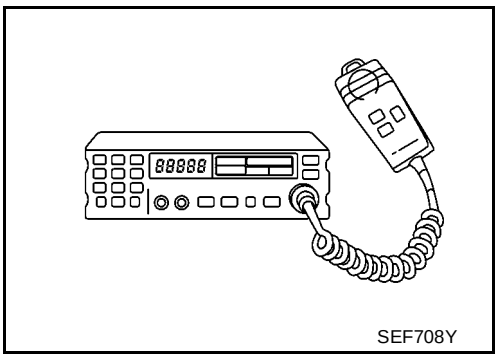


MBIB0046E

- **Do not depress accelerator pedal when starting.**
- **Immediately after starting, do not rev up engine unnecessarily.**
- **Do not rev up engine just prior to shutdown.**


SEF709Y

- **When installing C.B. ham radio or a mobile phone, be sure to observe the following as it may adversely affect electronic control systems depending on installation location.**
  - **Keep the antenna as far as possible from the electronic control units.**
  - **Keep the antenna feeder line more than 20 cm (8 in) away from the harness of electronic controls.**
    Do not let them run parallel for a long distance.
  - **Adjust the antenna and feeder line so that the standing-wave radio can be kept smaller.**
  - **Be sure to ground the radio to vehicle body.**


SEF708Y

Wiring Diagrams and Trouble Diagnosis

EBS00GXJ

When you read wiring diagrams, refer to the following:

- GI-14, "How to Read Wiring Diagrams"
- PG-3, "POWER SUPPLY ROUTING" for power distribution circuit

When you perform trouble diagnosis, refer to the following:

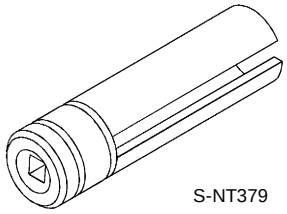
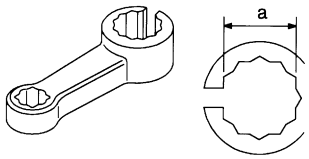
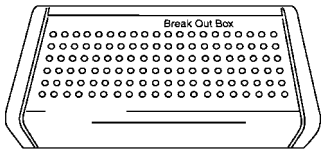
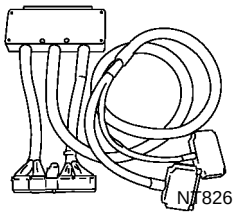
- GI-11, "HOW TO FOLLOW TEST GROUPS IN TROUBLE DIAGNOSES"
- GI-24, "How to Perform Efficient Diagnosis for an Electrical Incident"

PREPARATION

PFP:00002

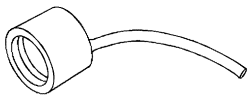
Special Service Tools

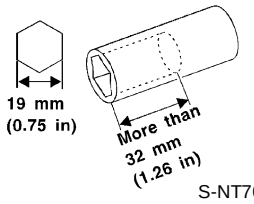
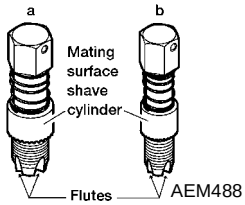
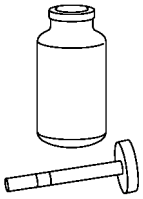
EBS00GXK

Tool number Tool name	Description	
KV10117100 Heated oxygen sensor wrench	 S-NT379	Loosening or tightening heated oxygen sensors with 22 mm (0.87 in) hexagon nut
KV10114400 Heated oxygen sensor wrench	 S-NT636	Loosening or tightening heated oxygen sensors **a: 22 mm (0.87 in)**
KV109E0010 Break-out box	 NT825	Measuring ECM signals with a circuit tester
KV109E0080 Y-cable adapter	 NT826	Measuring ECM signals with a circuit tester

Commercial Service Tools

EBS00GXL

Tool name	Description	
Quick connector release	 PBIC0198E	Removing fuel tube quick connectors in engine room (Available in SEC. 164 of PARTS CATALOG: Part No. 16441 6N210)
Fuel filler cap adapter	 S-NT653	Checking fuel tank vacuum relief valve opening pressure

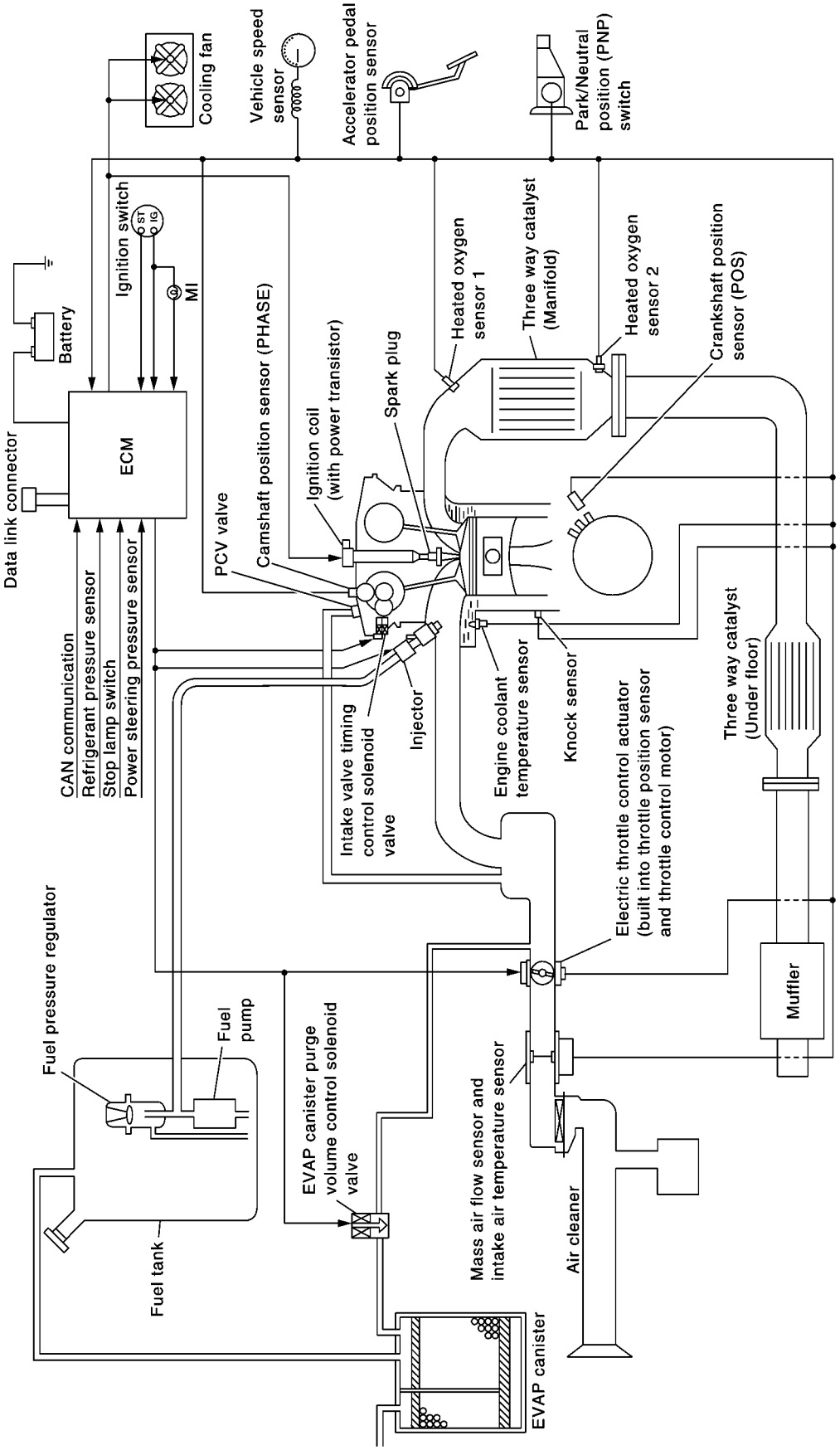
Tool name	Description	
Socket wrench	 S-NT705	Removing and installing engine coolant temperature sensor
Oxygen sensor thread cleaner ie: (J-43897-18) (J-43897-12)	 AEM488	Reconditioning the exhaust system threads before installing a new oxygen sensor. Use with anti-seize lubricant shown below. **a: 18 mm diameter with pitch 1.5 mm for Zirconia Oxygen Sensor** **b: 12 mm diameter with pitch 1.25 mm for Titania Oxygen Sensor**
Anti-seize lubricant i.e.: (Permatex™ 133AR or equivalent meeting MIL specification MIL-A-907)	 S-NT779	Lubricating oxygen sensor thread cleaning tool when reconditioning exhaust system threads.

ENGINE CONTROL SYSTEM

PFP:23710

System Diagram

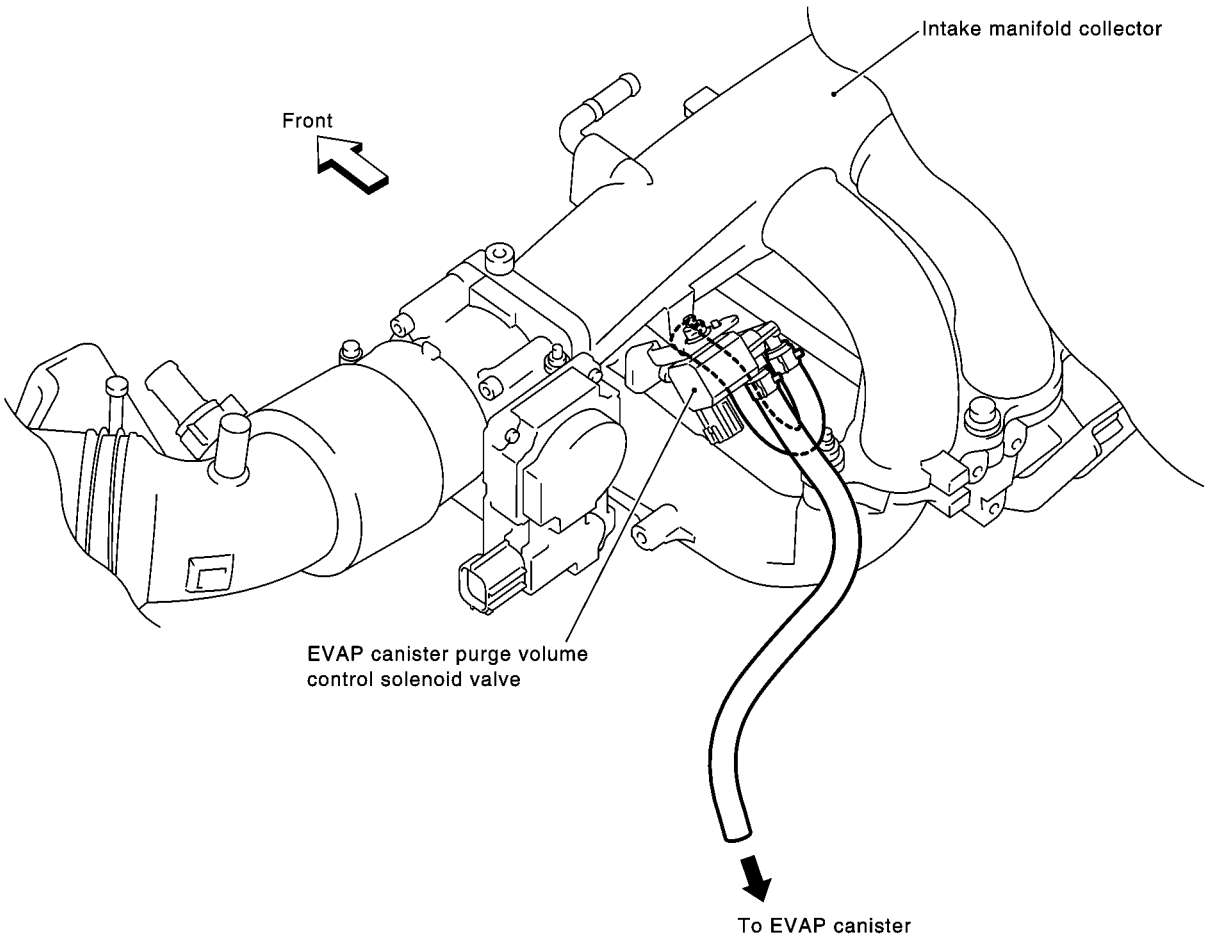
EBS00GXM



MBIB0051E

Vacuum Hose Drawing

EBS00GXN



NOTE: Do not use soapy water or any type of solvent while installing vacuum hose or purge hoses.

PBIB0489E

Refer to EC-1424, "System Diagram" for Vacuum Control System.

System Chart

EBS00GXO

Input (Sensor)	ECM Function	Output (Actuator)
● Camshaft position sensor (PHASE) ● Crankshaft position sensor (POS) ● Mass air flow sensor ● Engine coolant temperature sensor ● Heated oxygen sensor 1 ● Throttle position sensor ● Accelerator pedal position sensor ● Park/neutral position (PNP) switch ● Intake air temperature sensor ● Power steering pressure sensor ● Ignition switch ● Battery voltage ● Knock sensor ● Refrigerant pressure sensor ● Stop lamp switch ● Heated oxygen sensor 2 *1 ● TCM (Transmission control module) *2 ● Air conditioner switch *2 ● Vehicle speed signal *2 ● Electrical load signal *2	Fuel injection & mixture ratio control	Fuel injectors
	Electronic ignition system	Power transistor
	Fuel pump control	Fuel pump relay
	On board diagnostic system	MI (On the instrument panel) *3
	Heated oxygen sensor 1 heater control	Heated oxygen sensor 1 heater
	Heated oxygen sensor 2 heater control	Heated oxygen sensor 2 heater
	EVAP canister purge flow control	EVAP canister purge volume control solenoid valve
	Air conditioning cut control	Air conditioner relay *3
	Cooling fan control	Cooling fan relays *3

*1: This sensor is not used to control the engine system under normal conditions.
*2: These input signals are sent to the ECM through CAN communication line.
*3: These output signals are sent from the ECM through CAN communication line.

Multiport Fuel Injection (MFI) System

EBS00GXP

INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed *3 and piston position	Fuel injection & mixture ratio control	Fuel injectors
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Heated oxygen sensor 1	Density of oxygen in exhaust gas		
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Accelerator pedal position		
Park/neutral position (PNP) switch	Gear position		
Knock sensor	Engine knocking condition		
Battery	Battery voltage *3		
Power steering pressure sensor	Power steering operation		
Heated oxygen sensor 2 *1	Density of oxygen in exhaust gas		
Vehicle speed signal *2	Vehicle speed		
Air conditioner switch *2	Air conditioner operation		

*1: Under normal conditions, this sensor is not for engine control operation.
*2: These signals are sent to the ECM through CAN communication line.
*3: ECM determines the start signal status by the signals of engine speed and battery voltage.

SYSTEM DESCRIPTION

The amount of fuel injected from the fuel injector is determined by the ECM. The ECM controls the length of time the valve remains open (injection pulse duration). The amount of fuel injected is a program value in the ECM memory. The program value is preset by engine operating conditions. These conditions are determined by input signals (for engine speed and intake air) from both the crankshaft position sensor and the mass air flow sensor.

VARIOUS FUEL INJECTION INCREASE/DECREASE COMPENSATION

In addition, the amount of fuel injected is compensated to improve engine performance under various operating conditions as listed below.

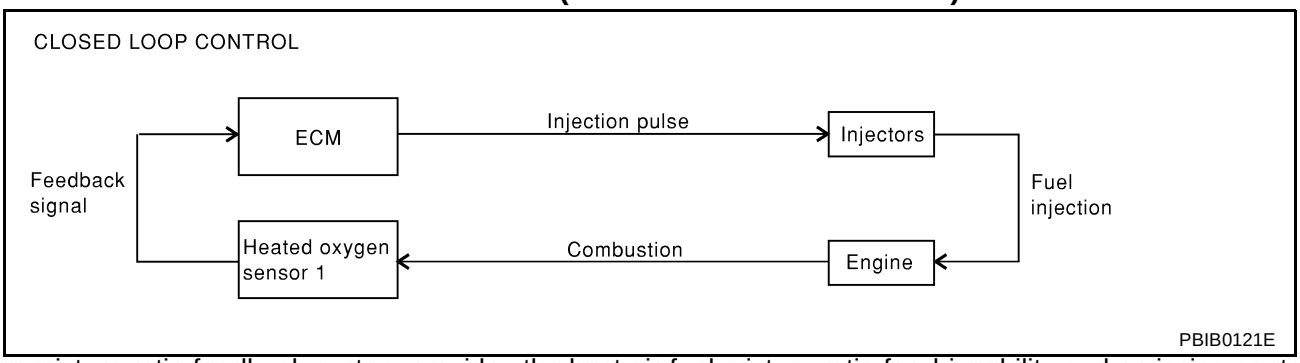
<Fuel increase>

- During warm-up
- When starting the engine
- During acceleration
- Hot-engine operation
- When selector lever is changed from “N” to “D” (CVT models)
- High-load, high-speed operation

<Fuel decrease>

- During deceleration
- During high engine speed operation

MIXTURE RATIO FEEDBACK CONTROL (CLOSED LOOP CONTROL)



The mixture ratio feedback system provides the best air-fuel mixture ratio for driveability and emission control. The three way catalyst (manifold) can then better reduce CO, HC and NOx emissions. This system uses heated oxygen sensor 1 in the exhaust manifold to monitor if the engine operation is rich or lean. The ECM adjusts the injection pulse width according to the sensor voltage signal. For more information about heated oxygen sensor 1, refer to EC-1119 . This maintains the mixture ratio within the range of stoichiometric (ideal air-fuel mixture).

This stage is referred to as the closed loop control condition.

Heated oxygen sensor 2 is located downstream of the three way catalyst (manifold). Even if the switching characteristics of heated oxygen sensor 1 shift, the air-fuel ratio is controlled to stoichiometric by the signal from heated oxygen sensor 2.

Open Loop Control

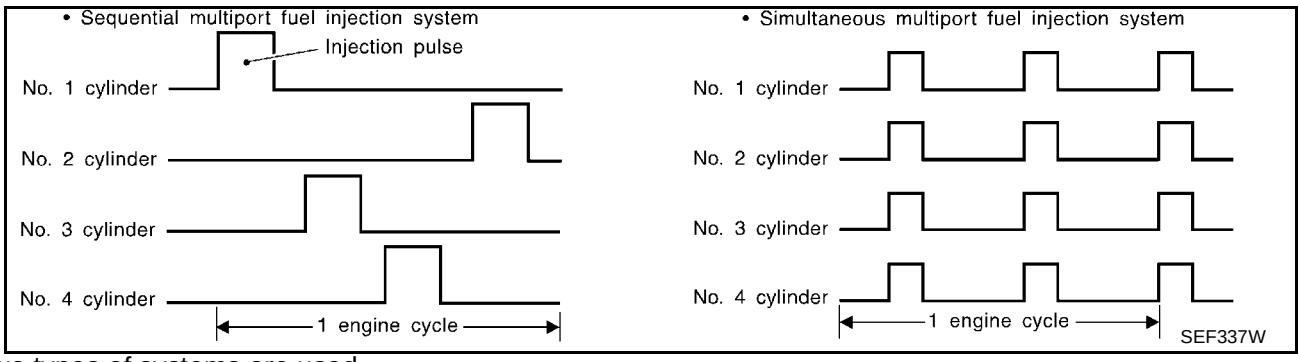
The open loop system condition refers to when the ECM detects any of the following conditions. Feedback control stops in order to maintain stabilized fuel combustion.

- Deceleration and acceleration
- High-load, high-speed operation
- Malfunction of heated oxygen sensor 1 or its circuit
- Insufficient activation of heated oxygen sensor 1 at low engine coolant temperature
- High engine coolant temperature
- During warm-up
- After shifting from “N” to “D” (CVT models)
- When starting the engine

MIXTURE RATIO SELF-LEARNING CONTROL

The mixture ratio feedback control system monitors the mixture ratio signal transmitted from heated oxygen sensor 1. This feedback signal is then sent to the ECM. The ECM controls the basic mixture ratio as close to the theoretical mixture ratio as possible. However, the basic mixture ratio is not necessarily controlled as originally designed. Both manufacturing differences (i.e., mass air flow sensor hot film) and characteristic changes during operation (i.e., injector clogging) directly affect mixture ratio.
Accordingly, the difference between the basic and theoretical mixture ratios is monitored in this system. This is then computed in terms of “injection pulse duration” to automatically compensate for the difference between the two ratios.
“Fuel trim” refers to the feedback compensation value compared against the basic injection duration. Fuel trim includes short term fuel trim and long term fuel trim.
“Short term fuel trim” is the short-term fuel compensation used to maintain the mixture ratio at its theoretical value. The signal from heated oxygen sensor 1 indicates whether the mixture ratio is RICH or LEAN compared to the theoretical value. The signal then triggers a reduction in fuel volume if the mixture ratio is rich, and an increase in fuel volume if it is lean.
“Long term fuel trim” is overall fuel compensation carried out long-term to compensate for continual deviation of the short term fuel trim from the central value. Such deviation will occur due to individual engine differences, wear over time and changes in the usage environment.

FUEL INJECTION TIMING



Two types of systems are used.

Sequential Multiport Fuel Injection System

Fuel is injected into each cylinder during each engine cycle according to the firing order. This system is used when the engine is running.

Simultaneous Multiport Fuel Injection System

Fuel is injected simultaneously into all four cylinders twice each engine cycle. In other words, pulse signals of the same width are simultaneously transmitted from the ECM.
The four injectors will then receive the signals two times for each engine cycle.
This system is used when the engine is being started and/or if the fail-safe system (CPU) is operating.

FUEL SHUT-OFF

Fuel to each cylinder is cut off during deceleration or operation of the engine at excessively high speeds.

Electronic Ignition (EI) System

EBS00GXQ

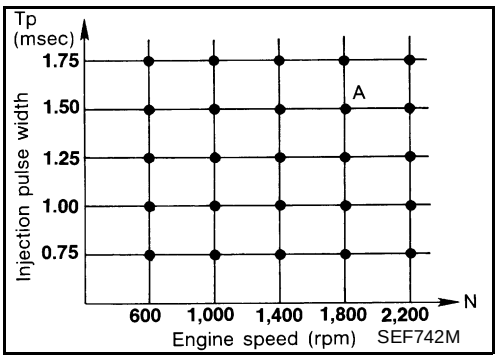
INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed *2 and piston position	Ignition timing control	Power transistor
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Accelerator pedal position		
Knock sensor	Engine knocking		
Park/neutral position (PNP) switch	Gear position		
Battery	Battery voltage *2		
Vehicle speed signal *1	Vehicle speed		

*1: This signal is sent to the ECM through CAN communication line.
*2: ECM determines the start signal status by the signals of engine speed and battery voltage.

SYSTEM DESCRIPTION

The ignition timing is controlled by the ECM to maintain the best air-fuel ratio for every running condition of the engine. The ignition timing data is stored in the ECM. This data forms the map shown.
The ECM receives information such as the injection pulse width and camshaft position sensor signal. Computing this information, ignition signals are transmitted to the power transistor.
e.g., N: 1,800 rpm, Tp: 1.50 msec
A °BTDC
During the following conditions, the ignition timing is revised by the ECM according to the other data stored in the ECM.



- At starting
- During warm-up
- At idle
- At low battery voltage
- During acceleration

The knock sensor retard system is designed only for emergencies. The basic ignition timing is programmed within the anti-knocking zone, if recommended fuel is used under dry conditions. The retard system does not operate under normal driving conditions. If engine knocking occurs, the knock sensor monitors the condition. The signal is transmitted to the ECM. The ECM retards the ignition timing to eliminate the knocking condition.

Air Conditioning Cut Control

EBS00GXR

INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM function	Actuator
Air conditioner switch *1	Air conditioner “ON” signal	Air conditioner cut control	Air conditioner relay
Throttle position sensor	Throttle valve opening angle		
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed *2		
Engine coolant temperature sensor	Engine coolant temperature		
Refrigerant pressure sensor	Refrigerant pressure		
Power steering pressure sensor	Power steering operation		
Vehicle speed signal *1	Vehicle speed		

*1: These signals are sent to the ECM through CAN communication line.
*2: ECM determines the start signal status by the signals of engine speed and battery voltage.

SYSTEM DESCRIPTION

This system improves engine operation when the air conditioner is used.
Under the following conditions, the air conditioner is turned off.

- When the accelerator pedal is fully depressed.
- When cranking the engine.
- At high engine speeds.
- When the engine coolant temperature becomes excessively high.
- When operating power steering during low engine speed or low vehicle speed.
- When engine speed is excessively low.
- When refrigerant pressure is excessively low or high.

Fuel Cut Control (at No Load and High Engine Speed)

EBS00GXS

INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM function	Actuator
Park/neutral position (PNP) switch	Neutral position	Fuel cut control	Fuel injectors
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Accelerator pedal position		
Engine coolant temperature sensor	Engine coolant temperature		
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed		
Vehicle speed signal*1	Vehicle speed		

*1: This signal is sent to the ECM through CAN communication line.

SYSTEM DESCRIPTION

If the engine speed is above 1,800 rpm with no load (for example, in neutral and engine speed over 1,800 rpm) fuel will be cut off after some time. The exact time when the fuel is cut off varies based on engine speed. Fuel cut will operate until the engine speed reaches 1,500 rpm, then fuel cut is cancelled.

NOTE:
This function is different from deceleration control listed under “Multiport Fuel Injection (MFI) System”, EC-1426 .

CAN communication

EBS00GXT

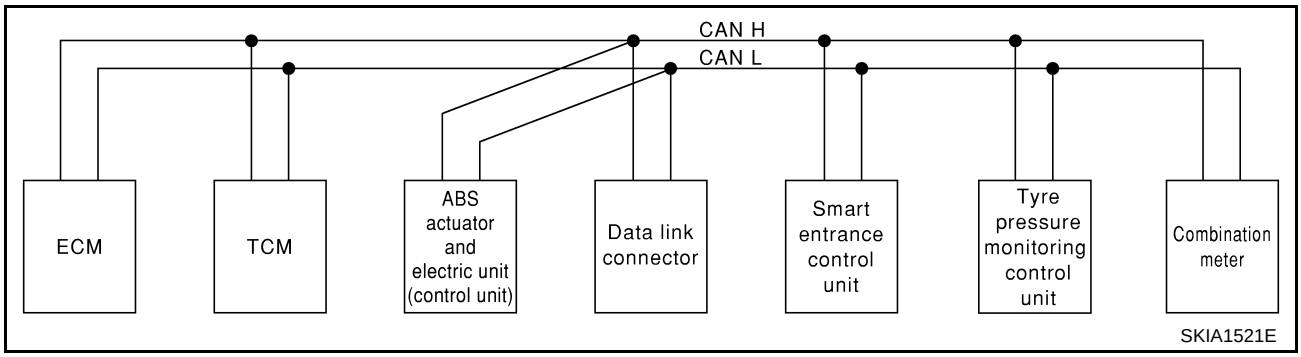
SYSTEM DESCRIPTION

CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent error detection ability. Many electronic control units are equipped onto a vehicle, and each control unit shares information and links with other control units during operation (not independent). In CAN communication, control units are connected with 2 communication lines (CAN H line, CAN L line) allowing a high rate of information transmission with less wiring. Each control unit transmits/receives data but selectively reads required data only.

CAN COMMUNICATION UNIT FOR LHD MODELS WITH TYRE PRESSURE MONITORING SYSTEM

CVT Models

SYSTEM DIAGRAM



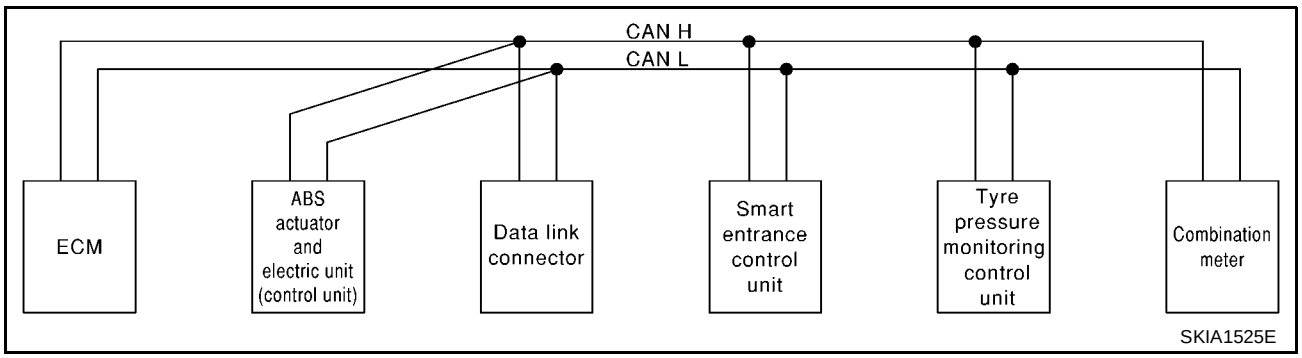
INPUT/OUTPUT SIGNAL CHART

T: Transmit R: Receive

Signals	ECM	TCM	ABS actuator and electric unit (control unit)	Smart entrance control unit	Tyre pressure monitoring control unit	Combination meter
Engine speed signal	T	R				R
Stop lamp switch signal		R	T			
Rear window defogger signal	R			T		
Heater fan switch signal	R					T
Air conditioner switch signal	R					T
Primary pulley revolution signal	R	T				
Secondary pulley revolution signal	R	T				
MI signal	T					R
Current gear position signal		T				R
Engine coolant temperature signal	T					R
Fuel consumption signal	T					R
Vehicle speed signal			T			R
	R					T
Seat belt reminder signal				R		T
Headlamp switch signal				T		R
Flashing indicator signal				T		R
Engine cooling fan speed signal	T			R		
Child lock indicator signal				T		R
Door switches state signal				T		R
Key ID signal	R			T		
	T			R		
A/C compressor signal	T			R		
Tire pressure signal					T	R

M/T Models

SYSTEM DIAGRAM



INPUT/OUTPUT SIGNAL CHART

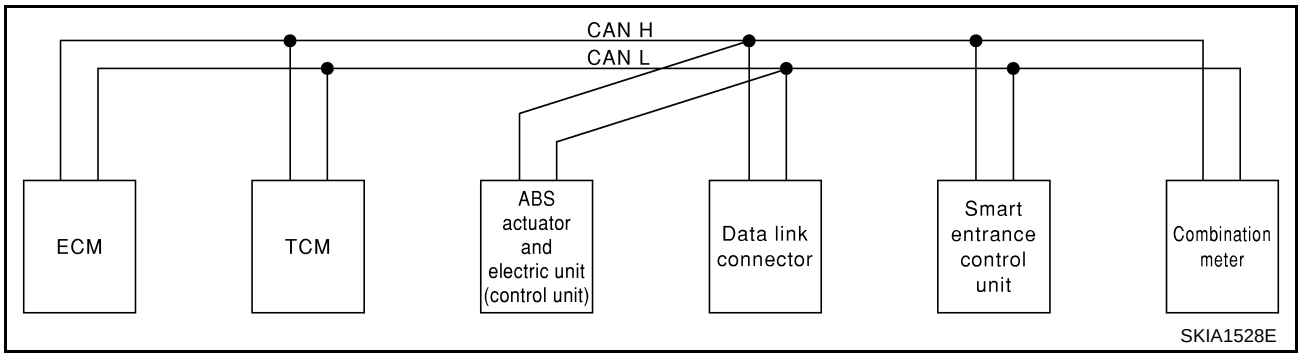
T: Transmit R: Receive

Signals	ECM	ABS actuator and electric unit (control unit)	Smart entrance control unit	Tyre pressure monitoring control unit	Combination meter
Engine speed signal	T				R
Rear window defogger signal	R		T		
Heater fan switch signal	R				T
Air conditioner switch signal	R				T
MI signal	T				R
Engine coolant temperature signal	T				R
Fuel consumption signal	T				R
Vehicle speed signal		T			R
	R				T
Seat belt reminder signal			R		T
Headlamp switch signal			T		R
Flashing indicator signal			T		R
Engine cooling fan speed signal	T		R		
Child lock indicator signal			T		R
Door switches state signal			T		R
Key ID signal	R		T		
	T		R		
A/C compressor signal	T		R		
Tire pressure signal				T	R

CAN COMMUNICATION UNIT FOR LHD MODELS WITHOUT TYRE PRESSURE MONITORING SYSTEM

CVT Models

SYSTEM DIAGRAM



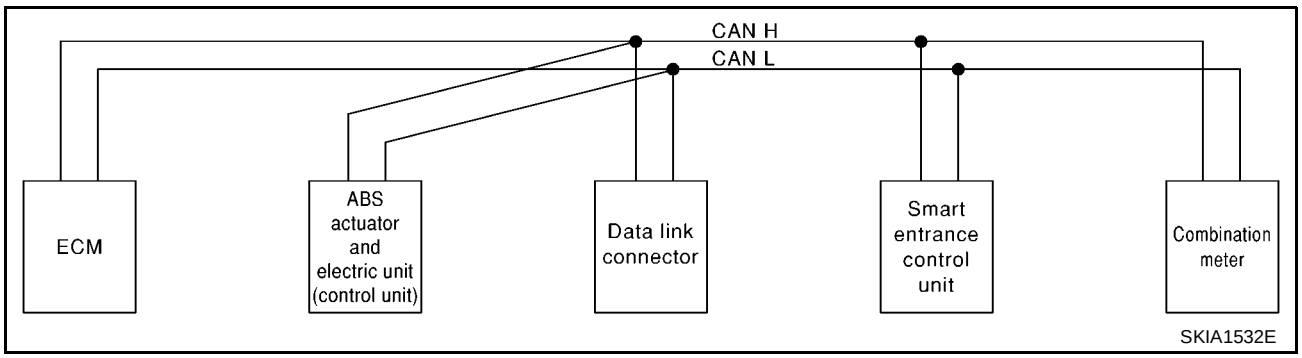
INPUT/OUTPUT SIGNAL CHART

T: Transmit R: Receive

Signals	ECM	TCM	ABS actuator and electric unit (control unit)	Smart entrance control unit	Combination meter
Engine speed signal	T	R			R
Stop lamp switch signal		R	T		
Rear window defogger signal	R			T	
Heater fan switch signal	R				T
Air conditioner switch signal	R				T
Primary pulley revolution signal	R	T			
Secondary pulley revolution signal	R	T			
MI signal	T				R
Current gear position signal		T			R
Engine coolant temperature signal	T				R
Fuel consumption signal	T				R
Vehicle speed signal			T		R
	R				T
Seat belt reminder signal				R	T
Headlamp switch signal				T	R
Flashing indicator signal				T	R
Engine cooling fan speed signal	T			R	
Child lock indicator signal				T	R
Door switches state signal				T	R
Key ID signal	R			T	
	T			R	
A/C compressor signal	T			R	

M/T Models

SYSTEM DIAGRAM



INPUT/OUTPUT SIGNAL CHART

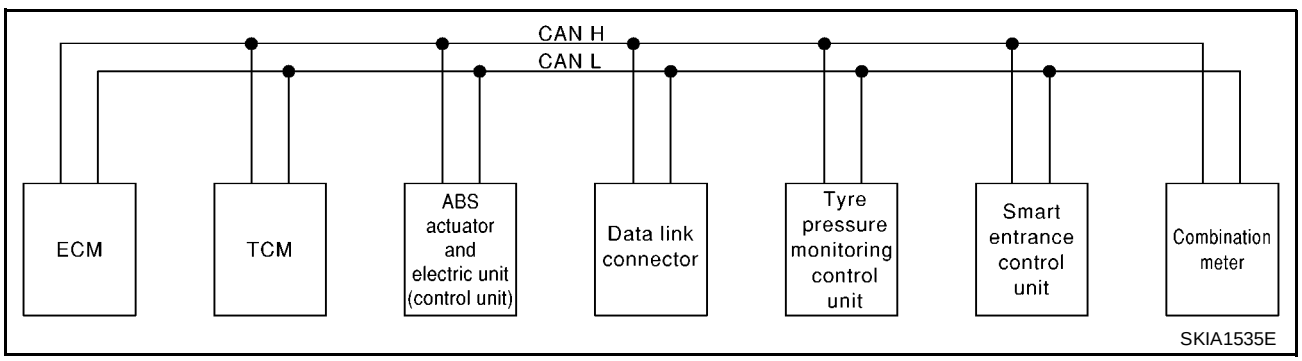
T: Transmit R: Receive

Signals	ECM	ABS actuator and electric unit (control unit)	Smart entrance control unit	Combination meter
Engine speed signal	T			R
Rear window defogger signal	R		T	
Heater fan switch signal	R			T
Air conditioner switch signal	R			T
MI signal	T			R
Engine coolant temperature signal	T			R
Fuel consumption signal	T			R
Vehicle speed signal		T		R
	R			T
Seat belt reminder signal			R	T
Headlamp switch signal			T	R
Flashing indicator signal			T	R
Engine cooling fan speed signal	T		R	
Child lock indicator signal			T	R
Door switches state signal			T	R
Key ID signal	R		T	
	T		R	
A/C compressor signal	T		R	

CAN COMMUNICATION UNIT FOR RHD MODELS WITH TYRE PRESSURE MONITORING SYSTEM

CVT Models

SYSTEM DIAGRAM



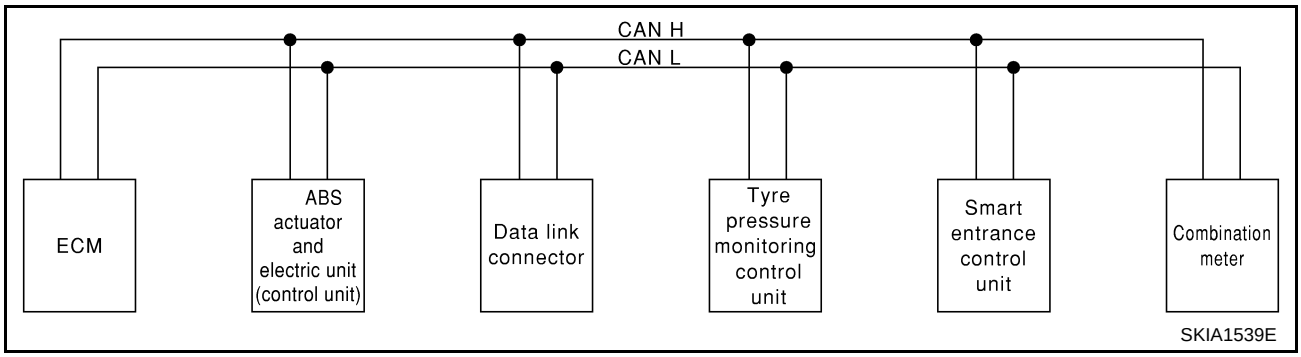
INPUT/OUTPUT SIGNAL CHART

T: Transmit R: Receive

Signals	ECM	TCM	ABS actuator and electric unit (control unit)	Tyre pressure monitoring control unit	Smart entrance control unit	Combination meter
Engine speed signal	T	R				R
Stop lamp switch signal		R	T			
Rear window defogger signal	R				T	
Heater fan switch signal	R					T
Air conditioner switch signal	R					T
Primary pulley revolution signal	R	T				
Secondary pulley revolution signal	R	T				
MI signal	T					R
Current gear position signal		T				R
Engine coolant temperature signal	T					R
Fuel consumption signal	T					R
Vehicle speed signal			T			R
	R					T
Seat belt reminder signal					R	T
Headlamp switch signal					T	R
Flashing indicator signal					T	R
Engine cooling fan speed signal	T				R	
Child lock indicator signal					T	R
Door switches state signal					T	R
Key ID signal	R				T	
	T				R	
A/C compressor signal	T				R	
Tire pressure signal				T		R

M/T Models

SYSTEM DIAGRAM



INPUT/OUTPUT SIGNAL CHART

T: Transmit R: Receive

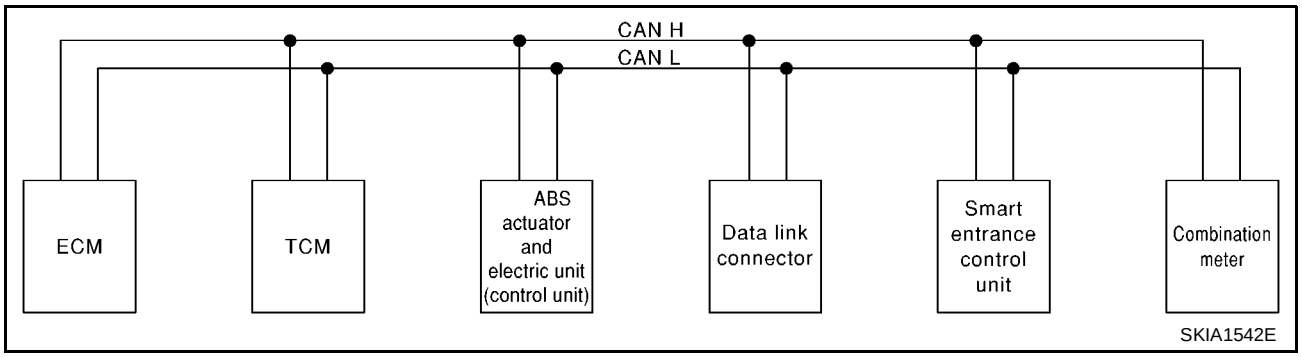
Signals	ECM	ABS actuator and electric unit (control unit)	Tyre pressure monitoring control unit	Smart entrance control unit	Combination meter
Engine speed signal	T				R
Rear window defogger signal	R			T	

Signals	ECM	ABS actuator and electric unit (control unit)	Tyre pressure monitoring control unit	Smart entrance control unit	Combination meter
Heater fan switch signal	R				T
Air conditioner switch signal	R				T
MI signal	T				R
Engine coolant temperature signal	T				R
Fuel consumption signal	T				R
Vehicle speed signal		T			R
	R				T
Seat belt reminder signal				R	T
Headlamp switch signal				T	R
Flashing indicator signal				T	R
Engine cooling fan speed signal	T			R	
Child lock indicator signal				T	R
Door switches state signal				T	R
Key ID signal	R			T	
	T			R	
A/C compressor signal	T			R	
Tire pressure signal			T		R

CAN COMMUNICATION UNIT FOR RHD MODELS WITHOUT TYRE PRESSURE MONITORING SYSTEM

CVT Models

SYSTEM DIAGRAM



INPUT/OUTPUT SIGNAL CHART

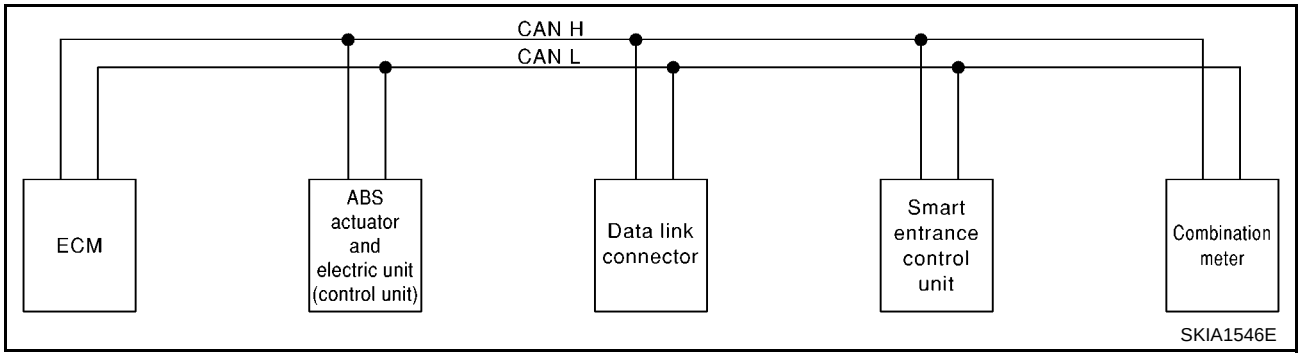
T: Transmit R: Receive

Signals	ECM	TCM	ABS actuator and electric unit (control unit)	Smart entrance control unit	Combination meter
Engine speed signal	T	R			R
Stop lamp switch signal		R	T		
Rear window defogger signal	R			T	
Heater fan switch signal	R				T
Air conditioner switch signal	R				T
Primary pulley revolution signal	R	T			
Secondary pulley revolution signal	R	T			
MI signal	T				R
Current gear position signal		T			R

Signals	ECM	TCM	ABS actuator and electric unit (control unit)	Smart entrance control unit	Combination meter
Engine coolant temperature signal	T				R
Fuel consumption signal	T				R
Vehicle speed signal			T		R
	R				T
Seat belt reminder signal				R	T
Headlamp switch signal				T	R
Flashing indicator signal				T	R
Engine cooling fan speed signal	T			R	
Child lock indicator signal				T	R
Door switches state signal				T	R
Key ID signal	R			T	
	T			R	
A/C compressor signal	T			R	

M/T Models

SYSTEM DIAGRAM



INPUT/OUTPUT SIGNAL CHART

T: Transmit R: Receive

Signals	ECM	ABS actuator and electric unit (control unit)	Smart entrance control unit	Combination meter
Engine speed signal	T			R
Rear window defogger signal	R		T	
Heater fan switch signal	R			T
Air conditioner switch signal	R			T
MI signal	T			R
Engine coolant temperature signal	T			R
Fuel consumption signal	T			R
Vehicle speed signal		T		R
	R			T
Seat belt reminder signal			R	T
Headlamp switch signal			T	R
Flashing indicator signal			T	R
Engine cooling fan speed signal	T		R	
Child lock indicator signal			T	R
Door switches state signal			T	R

Signals	ECM	ABS actuator and electric unit (control unit)	Smart entrance control unit	Combination meter
Key ID signal	R		T	
	T		R	
A/C compressor signal	T		R	

BASIC SERVICE PROCEDURE

PFP:00018

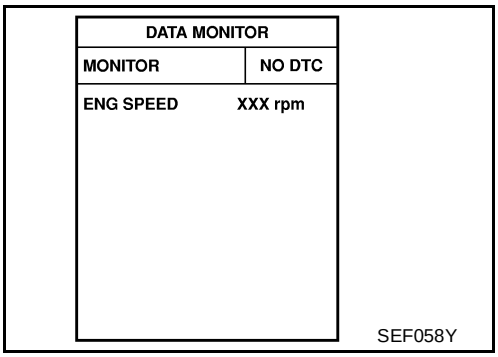
Idle Speed and Ignition Timing Check

EBS00GXU

IDLE SPEED

With CONSULT-II

Check idle speed in “DATA MONITOR” mode with CONSULT-II.

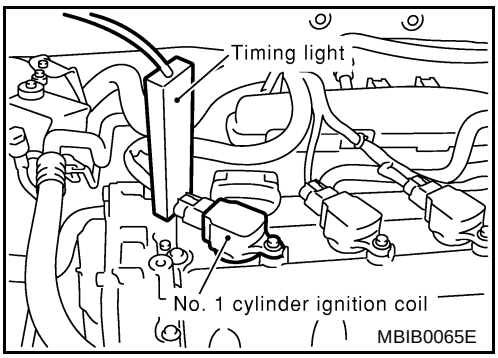


IGNITION TIMING

Any of following two methods may be used.

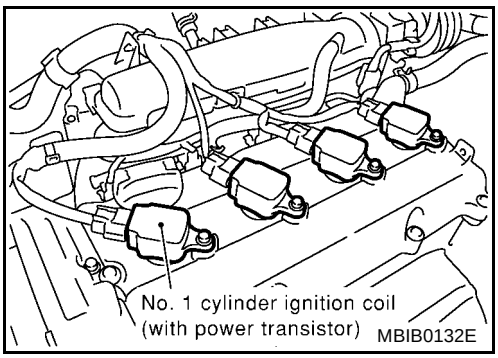
Method A

1. Slide the harness protector of ignition coil No.1 to clear the wires.
2. Attach timing light to the wires as shown in the figure.
3. Check ignition timing.

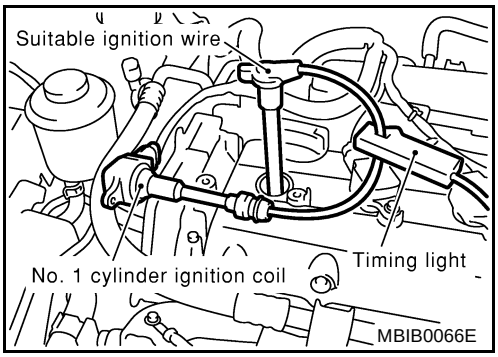


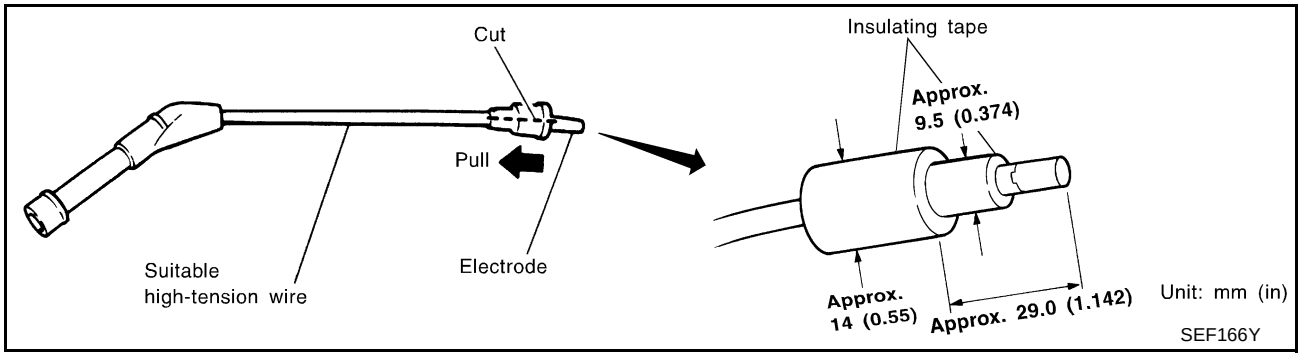
Method B

1. Remove No. 1 ignition coil.

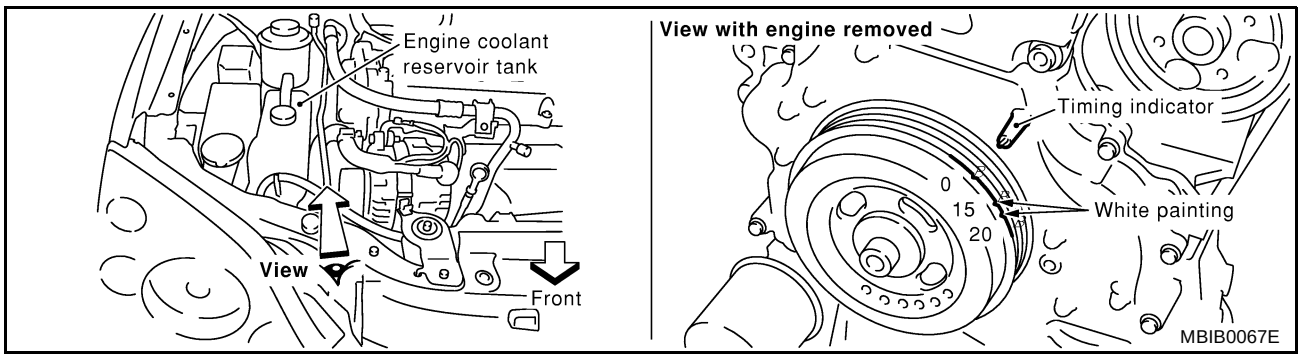


2. Connect No. 1 ignition coil and No. 1 spark plug with suitable high-tension wire as shown, and attach timing light clamp to this wire.





3. Check ignition timing.



Accelerator Pedal Released Position Learning

EBS00GXV

DESCRIPTION

"Accelerator Pedal Released Position Learning" is an operation to learn the fully released position of the accelerator pedal by monitoring the accelerator pedal position sensor output signal. It must be performed each time harness connector of accelerator pedal position sensor or ECM is disconnected.

OPERATION PROCEDURE

1. Make sure that accelerator pedal is fully released.
2. Turn ignition switch "ON" and wait at least 2 seconds.
3. Turn ignition switch "OFF" wait at least 10 seconds.
4. Turn ignition switch "ON" and wait at least 2 seconds.
5. Turn ignition switch "OFF" wait at least 10 seconds.

Throttle Valve Closed Position Learning

EBS00GXW

DESCRIPTION

"Throttle Valve Closed Position Learning" is an operation to learn the fully closed position of the throttle valve by monitoring the throttle position sensor output signal. It must be performed each time harness connector of electric throttle control actuator or ECM is disconnected.

OPERATION PROCEDURE

1. Make sure that accelerator pedal is fully released.
2. Turn ignition switch "ON".
3. Turn ignition switch "OFF" and wait at least 10 seconds.
   Make sure that throttle valve moves during above 10 seconds by confirming the operating sound.

Idle Air Volume Learning

EBS00GXX

DESCRIPTION

"Idle Air Volume Learning" is an operation to learn the idle air volume that keeps each engine within the specific range. It must be performed under any of the following conditions:

- Each time electric throttle control actuator or ECM is replaced.
- Idle speed or ignition timing is out of specification.

PREPARATION

Before performing "Idle Air Volume Learning", make sure that all of the following conditions are satisfied.

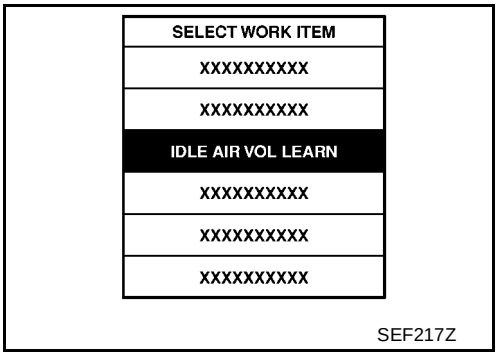
Learning will be cancelled if any of the following conditions are missed for even a moment.

- Battery voltage: More than 12.9V (At idle)
- Engine coolant temperature: 70 - 95°C (158 - 203°F)
- PNP switch: ON
- Electric load switch: OFF
  (Air conditioner, headlamp, rear window defogger)
  On vehicles equipped with daytime light systems, set lighting switch to the 1st position to light only small lamps.
- Steering wheel: Neutral (Straight-ahead position)
- Vehicle speed: Stopped
- Transmission: Warmed-up
  For CVT models with CONSULT-II, drive vehicle until “FLUID TEMP SE” in “DATA MONITOR” mode of “CVT” system indicates less than 0.9V.
  For CVT models without CONSULT-II and M/T models, drive vehicle for 10 minutes.

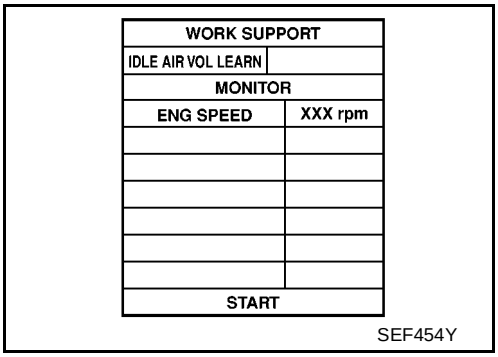
OPERATION PROCEDURE

With CONSULT-II

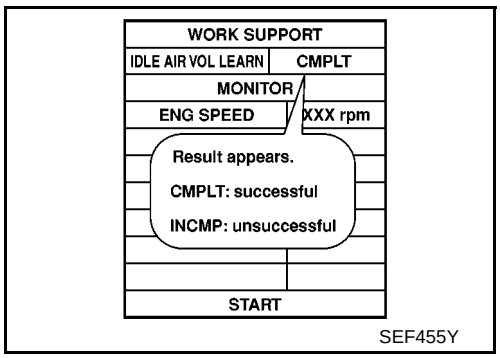
1. Perform EC-1440, "Accelerator Pedal Released Position Learning" .
2. Perform EC-1440, "Throttle Valve Closed Position Learning" .
3. Start engine and warm it up to normal operating temperature.
4. Check that all items listed under the topic “PRE-CONDITIONING” (previously mentioned) are in good order.
5. Select “IDLE AIR VOL LEARN” in “WORK SUPPORT” mode.



6. Touch “START” and wait 20 seconds.



7. Make sure that “CMPLT” is displayed on CONSULT-II screen. If “INCMP” is displayed, “Idle Air Volume Learning” will not be carried out successfully. In this case, find the cause of the problem by referring to the “Diagnostic Procedure” below.
8. Rev up the engine two or three times and make sure that idle speed and ignition timing are within the specifications.



ITEM	SPECIFICATION
Idle speed	M/T: 600±50 rpm CVT: 650±50 rpm (in “P” or “N” position)
Ignition timing	M/T: 14±5° BTDC CVT: 15±5° BTDC (in “P” or “N” position)

Without CONSULT-II

NOTE:

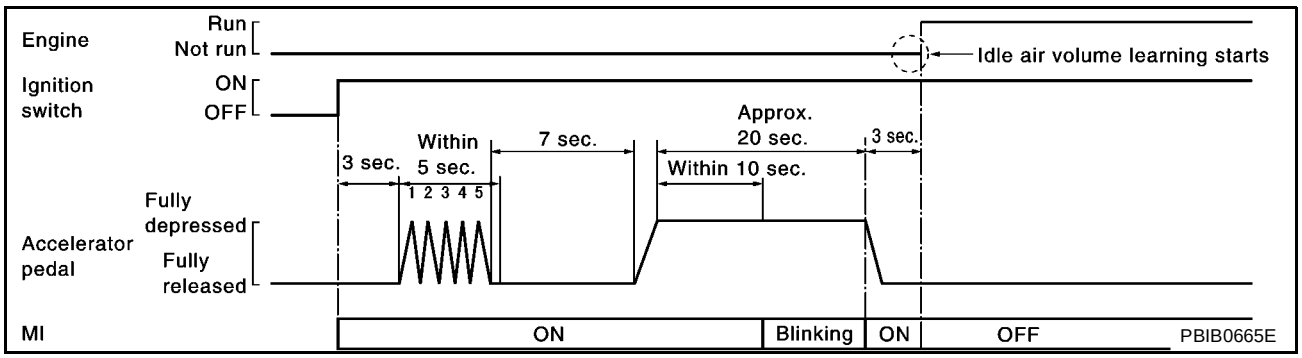
- **It is better to count the time accurately with a clock.**
- **It is impossible to switch the diagnostic mode when an accelerator pedal position sensor circuit has a malfunction.**

1. Perform EC-1440, "Accelerator Pedal Released Position Learning" .
2. Perform EC-1440, "Throttle Valve Closed Position Learning" .
3. Start engine and warm it up to normal operating temperature.
4. Check that all items listed under the topic “PRE-CONDITIONING” (previously mentioned) are in good order.
5. Turn ignition switch “OFF” and wait at least 10 seconds.
6. Confirm that accelerator pedal is fully released, turn ignition switch “ON” and wait 3 seconds.
7. Repeat the following procedure quickly five times within 5 seconds.

a. Fully depress the accelerator pedal.

b. Fully release the accelerator pedal.

8. Wait 7 seconds, fully depress the accelerator pedal and keep it for approx. 20 seconds until the MI stops blinking and turned ON.
9. Fully release the accelerator pedal within 3 seconds after the MI goes off.
10. Start engine and let it idle.
11. Wait 20 seconds.



12. Rev up the engine two or three times and make sure that idle speed and ignition timing are within the specifications.

ITEM	SPECIFICATION
Idle speed	M/T: 600±50 rpm CVT: 650±50 rpm (in “P” or “N” position)
Ignition timing	M/T: 14±5° BTDC CVT: 15±5° BTDC (in “P” or “N” position)

13. If idle speed and ignition timing are not within the specification, the result will be incomplete. In this case, find the cause of the problem by referring to the “Diagnostic Procedure” below.

DIAGNOSTIC PROCEDURE

If idle air volume learning cannot be performed successfully, proceed as follows:

1. **Check that throttle valve is fully closed.**
2. **Check PCV valve operation.**
3. **Check that downstream of throttle valve is free from air leakage.**
4. **When the above three items check out OK, engine component parts and their installation condition are questionable. Check and eliminate the cause of the problem.**
   It is useful to perform EC-1494, "TROUBLE DIAGNOSIS - SPECIFICATION VALUE" .
5. **If any of the following conditions occur after the engine has started, eliminate the cause of the problem and perform "Idle air volume learning" all over again:**
   - **Engine stalls.**
   - **Erroneous idle.**

Fuel Pressure Check

EBS00GXY

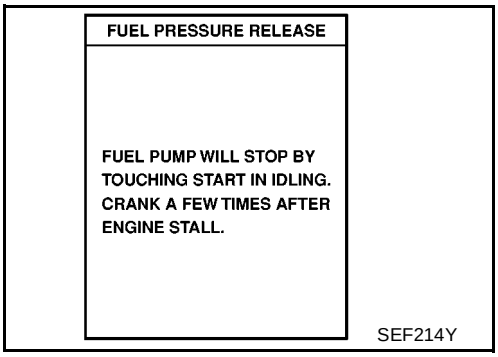
FUEL PRESSURE RELEASE

Before disconnecting fuel line, release fuel pressure from fuel line to eliminate danger.

NOTE:
Prepare pans or saucers under the disconnected fuel line because the fuel may spill out. The fuel pressure cannot be completely released because QR engine models do not have fuel return system.

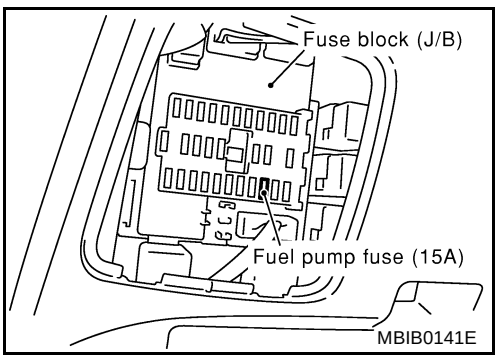
With CONSULT-II

1. Turn ignition switch "ON".
2. Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode with CONSULT-II.
3. Start engine.
4. After engine stalls, crank it two or three times to release all fuel pressure.
5. Turn ignition switch "OFF".



Without CONSULT-II

1. Remove fuel pump fuse located in fuse box.
2. Start engine.
3. After engine stalls, crank it two or three times to release all fuel pressure.
4. Turn ignition switch "OFF".
5. Reinstall fuel pump fuse after servicing fuel system.



FUEL PRESSURE CHECK

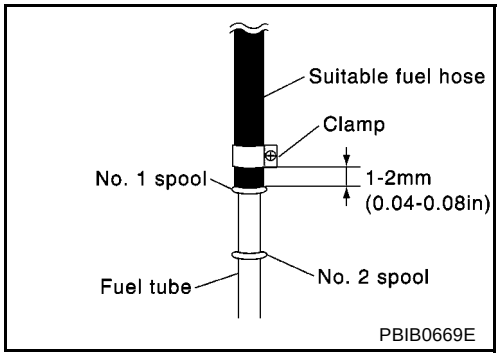
CAUTION:

- **The fuel hose connection method used when taking fuel pressure check must not be used for other purposes.**
- **Be careful not to scratch or put debris around connection area when servicing, so that the quick connector maintains sealability with O-rings inside.**
- **When installing fuel hose quick connetor, refer to EM-116, "INTAKE MANIFOLD" .**

1. Release fuel pressure to zero. Refer to EC-1443, "FUEL PRESSURE RELEASE" .
2. Prepare fuel hose and fuel hose clamp for fuel pressure check, and connect fuel pressure gauge.

- Use suitable fuel hose for fuel pressure check (genuine NISSAN fuel hose without quick connector).
- To avoid unnecessary force or tension to hose, use moderately long fuel hose for fuel pressure check.
- Do not use the fuel hose for checking fuel pressure with damage or cracks on it.
- Use Pressure Gauge to check fuel pressure.

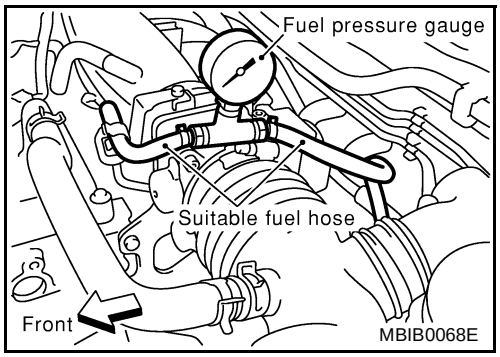
3. Remove fuel hose. Refer to EM-116, "INTAKE MANIFOLD" .
   - Do not twist or kink fuel hose because it is plastic hose.
   - Do not remove fuel hose from quick connector.
   - Keep the original fuel hose to be free from intrusion of dust or foreign substances with a suitable cover.
4. Install the fuel pressure gauge as shown in the figure.
   - Wipe off oil or dirt from hose insertion part using cloth moistened with gasoline.
   - Apply proper amount of gasoline between top of the fuel tube and No.1 spool.
   - Insert fuel hose for fuel pressure check until it touches the No.1 spool on fuel tube.
   - Use NISSAN genuine hose clamp (part number: 16439 N4710 or 16439 40U00).
   - When reconnecting fuel line, always use new clamps.
   - When reconnecting fuel hose, check the original fuel hose for damage and abnormality.
   - Use a torque driver to tighten clamps.
   - Install hose clamp to the position within 1 - 2 mm (0.04 - 0.08 in).



   Tightening torque:

   1 - 1.5 N·m (0.1 - 0.15 kg-m, 9 - 13 in-lb)

   - Make sure that clamp screw does not contact adjacent parts.
5. After connecting fuel hose for fuel pressure check, pull the hose with a force of approximately 98 N (10 kg, 22 lb) to confirm fuel tube does not come off.
6. Turn ignition switch "ON", and check for fuel leakage.
7. Start engine and check for fuel leakage.
8. Read the indication of fuel pressure gauge.
   - Do not perform fuel pressure check with system operating. Fuel pressure gauge may indicate false readings.
   - During fuel pressure check, confirm for fuel leakage from fuel connection every 3 minutes.



   At idling: Approximately 350 kPa (3.5 bar, 3.7 kg/cm^2 , 51 psi)

9. If result is unsatisfactory, go to next step.
10. Check the following.
    - Fuel hoses and fuel tubes for clogging
    - Fuel filter for clogging
    - Fuel pump
    - Fuel pressure regulator for clogging

    If OK, replace fuel pressure regulator.
    If NG, repair or replace.

ON BOARD DIAGNOSTIC (OBD) SYSTEM

PFP:00028

Introduction

EBS00GXZ

The ECM has an on board diagnostic system, which detects malfunctions related to engine sensors or actuators. The ECM also records various emission-related diagnostic information including:

Emission-related diagnostic information
Diagnostic Trouble Code (DTC)
Freeze Frame data
1st Trip Diagnostic Trouble Code (1st Trip DTC)
1st Trip Freeze Frame data

The above information can be checked using procedures listed in the table below.

×: Applicable —: Not applicable

	DTC	1st trip DTC	Freeze Frame data	1st trip Freeze Frame data
CONSULT-II	×	×	×	×
ECM	×	×*1	—	—

*: When DTC and 1st trip DTC simultaneously appear on the display, they cannot be clearly distinguished from each other.

The malfunction indicator (MI) on the instrument panel lights up when the same malfunction is detected in two consecutive trips (Two trip detection logic), or when the ECM enters fail-safe mode. (Refer to EC-1456 .)

Two Trip Detection Logic

EBS00GY0

When a malfunction is detected for the first time, 1st trip DTC and 1st trip Freeze Frame data are stored in the ECM memory. The MI will not light up at this stage. <1st trip>
If the same malfunction is detected again during the next drive, the DTC and Freeze Frame data are stored in the ECM memory, and the MI lights up. The MI lights up at the same time when the DTC is stored. <2nd trip>
The “trip” in the “Two Trip Detection Logic” means a driving mode in which self-diagnosis is performed during vehicle operation. When the ECM enters fail-safe mode (Refer to EC-1456 .), the DTC is stored in the ECM memory even in the 1st trip.

Emission-related Diagnostic Information

EBS00GY1

DTC AND 1ST TRIP DTC

The 1st trip DTC (whose number is the same as the DTC number) is displayed for the latest self-diagnostic result obtained. If the ECM memory was cleared previously, and the 1st trip DTC did not reoccur, the 1st trip DTC will not be displayed.
If a malfunction is detected during the 1st trip, the 1st trip DTC is stored in the ECM memory. The MI will not light up (two trip detection logic). If the same malfunction is not detected in the 2nd trip (meeting the required driving pattern), the 1st trip DTC is cleared from the ECM memory. If the same malfunction is detected in the 2nd trip, both the 1st trip DTC and DTC are stored in the ECM memory and the MI lights up. In other words, the DTC is stored in the ECM memory and the MI lights up when the same malfunction occurs in two consecutive trips. If a 1st trip DTC is stored and a non-diagnostic operation is performed between the 1st and 2nd trips, only the 1st trip DTC will continue to be stored. For fail-safe items, DTC is stored in the ECM memory even in the 1st trip.
Procedures for clearing the DTC and the 1st trip DTC from the ECM memory are described in EC-1446, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .
When a 1st trip DTC is detected, check, print out or write down and erase (1st trip) DTC and Freeze Frame data as specified in “Work Flow” procedure Step II, refer to EC-1452 . Then perform “DTC Confirmation Procedure” or “Overall Function Check” to try to duplicate the problem. If the malfunction is duplicated, the item requires repair.

How to Read DTC and 1st Trip DTC

DTC and 1st trip DTC can be read by the following methods.

With CONSULT-II

CONSULT-II displays the DTC in “SELF-DIAG RESULTS” mode. Examples: P0117, P0340, P1065, etc. (CONSULT-II also displays the malfunctioning component or system.)

Without CONSULT-II

The number of blinks of the MI in the Diagnostic Test Mode II (Self-Diagnostic Results) indicates the DTC. Example: 0117, 0340, 1065 etc.

- **1st trip DTC No. is the same as DTC No.**
- **Output of a DTC indicates a malfunction. However, the Diagnostic Test Mode II do not indicate whether the malfunction is still occurring or has occurred in the past and has returned to normal. CONSULT-II can identify malfunction status as shown below. Therefore, using CONSULT-II (if available) is recommended.**

A sample of CONSULT-II display for DTC and 1st trip DTC is shown below. DTC or 1st trip DTC of a malfunction is displayed in SELF-DIAGNOSTIC RESULTS mode of CONSULT-II. Time data indicates how many times the vehicle was driven after the last detection of a DTC.
If the DTC is being detected currently, the time data will be “0”.
If a 1st trip DTC is stored in the ECM, the time data will be “[1t]”.

DTC display

SELF DIAG RESULTS	
DTC RESULTS	TIME
CKP SEN/CIRCUIT [P0335]	0

1st trip DTC display

SELF DIAG RESULTS	
DTC RESULTS	TIME
CKP SEN/CIRCUIT [P0335]	1t

PBIB0911E

FREEZE FRAME DATA AND 1ST TRIP FREEZE FRAME DATA

The ECM records the driving conditions such as fuel system status, calculated load value, engine coolant temperature, short term fuel trim, long term fuel trim, engine speed, vehicle speed, base fuel schedule and intake air temperature at the moment a malfunction is detected.
Data which are stored in the ECM memory, along with the 1st trip DTC, are called 1st trip freeze frame data. The data, stored together with the DTC data, are called freeze frame data and displayed on CONSULT-II. For details, see EC-1482 .
Only one set of freeze frame data (either 1st trip freeze frame data or freeze frame data) can be stored in the ECM. 1st trip freeze frame data is stored in the ECM memory along with the 1st trip DTC. There is no priority for 1st trip freeze frame data and it is updated each time a different 1st trip DTC is detected. However, once freeze frame data (2nd trip detection/MI on) is stored in the ECM memory, 1st trip freeze frame data is no longer stored. Remember, only one set of freeze frame data can be stored in the ECM.
Both 1st trip freeze frame data and freeze frame data (along with the DTCs) are cleared when the ECM memory is erased. Procedures for clearing the ECM memory are described in EC-1446, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .

HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION

How to Erase DTC (With CONSULT-II)

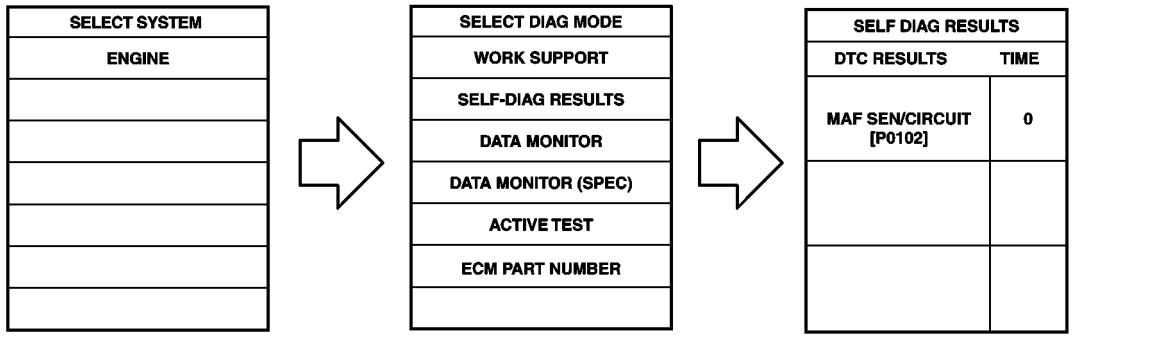
The emission related diagnostic information in the ECM can be erased by selecting “ERASE” in the “SELF-DIAG RESULTS” mode with CONSULT-II.

1. If the ignition switch stays “ON” after repair work, be sure to turn ignition switch “OFF” once. Wait at least 10 seconds and then turn it “ON” (engine stopped) again.
2. Touch “ENGINE”.
3. Touch “SELF-DIAG RESULTS”.

4. Touch “ERASE”. (The DTC in the ECM will be erased.)

How to erase DTC (With CONSULT-II)

1. If the ignition switch stays “ON” after repair work, be sure to turn ignition switch “OFF” once. Wait at least 10 seconds and then turn it “ON” again.



2. Turn **CONSULT-II** “ON” and touch “ENGINE”.
3. Touch “SELF-DIAG RESULTS”.
4. Touch “ERASE”. (The DTC in the ECM will be erased.)

PBIB0671E

How to Erase DTC (Without CONSULT-II)

1. If the ignition switch stays “ON” after repair work, be sure to turn ignition switch “OFF” once.
2. Wait at least 10 seconds and then turn it “ON” (engine stopped) again.
3. Change the diagnostic test mode from Mode II to Mode I by depressing the accelerator pedal. Refer to EC-1449, "HOW TO SWITCH DIAGNOSTIC TEST MODE" .

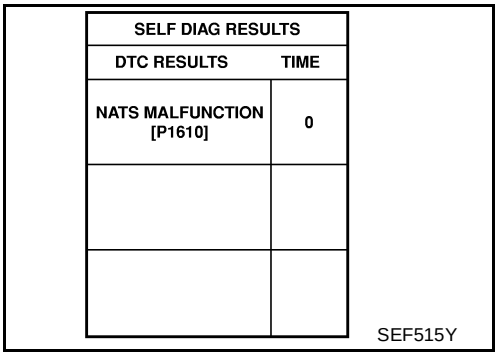
- **If the battery is disconnected, the emission-related diagnostic information will be lost after approx. 24 hours.**
- **The following data are cleared when the ECM memory is erased.**
  - Diagnostic trouble codes
  - 1st trip diagnostic trouble codes
  - Freeze frame data
  - 1st trip freeze frame data
  - Others

Actual work procedures are explained using a DTC as an example. Be careful so that not only the DTC, but all of the data listed above, are cleared from the ECM memory during work procedures.

NATS (Nissan Anti-theft System)

EBS00GY2

- **If the security indicator lights up with the ignition switch in the “ON” position or “NATS MALFUNCTION” is displayed on “SELF-DIAG RESULTS” screen, perform self-diagnostic results mode with CONSULT-II using NATS program card. Refer to BL-156, "NATS (NISSAN ANTI-THEFT SYSTEM)" .**
- **Confirm no self-diagnostic results of NATS is displayed before touching “ERASE” in “SELF-DIAG RESULTS” mode with CONSULT-II.**
- **When replacing ECM, initialization of NATS system and registration of all NATS ignition key IDs must be carried out with CONSULT-II using NATS program card. Therefore, be sure to receive all keys from vehicle owner. Regarding the procedures of NATS initialization and NATS ignition key ID registration, refer to CONSULT-II operation manual, NATS.**



SEF515Y

Malfunction Indicator (MI)

EBS00GY3

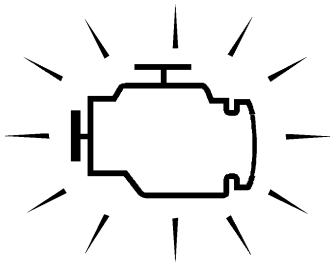
DESCRIPTION

The MI is located on the instrument panel.

1. The MI will light up when the ignition switch is turned ON without the engine running. This is a bulb check.

- If the MI does not light up, refer to DI-95, "WARNING LAMPS" or see EC-1721 .

2. When the engine is started, the MI should go off.
   If the MI remains on, the on board diagnostic system has detected an engine system malfunction.


SAT652J

ON BOARD DIAGNOSTIC SYSTEM FUNCTION

The on board diagnostic system has the following four functions.

Diagnostic Test Mode	KEY and ENG. Status	Function	Explanation of Function
Mode I	Ignition switch in “ON” position  Engine stopped 	BULB CHECK	This function checks the MI bulb for damage (blown, open circuit, etc.). If the MI does not come on, check MI circuit.
	Engine running 	MALFUNCTION WARNING	This is a usual driving condition. When a malfunction is detected twice in two consecutive driving cycles (two trip detection logic), the MI will light up to inform the driver that a malfunction has been detected. The following malfunctions will light up or blink the MI in the 1st trip. ● Fail-safe mode
Mode II	Ignition switch in “ON” position  Engine stopped 	SELF-DIAGNOSTIC RESULTS	This function allows DTCs and 1st trip DTCs to be read.
	Engine running 	HEATED OXYGEN SENSOR 1 MONITOR	This function allows the fuel mixture condition (lean or rich), monitored by heated oxygen sensor 1, to be read.

MI Flashing without DTC

If the ECM is in Diagnostic Test Mode II, MI may flash when engine is running. In this case, check ECM diagnostic test mode. EC-1449, "HOW TO SWITCH DIAGNOSTIC TEST MODE" .
How to switch the diagnostic test (function) modes, and details of the above functions are described later, EC-1449 .
The following emission-related diagnostic information is cleared when the ECM memory is erased.

- Diagnostic trouble codes
- 1st trip diagnostic trouble codes
- Freeze frame data

- 1st trip freeze frame data
- Others

HOW TO SWITCH DIAGNOSTIC TEST MODE

NOTE:

- **It is better to count the time accurately with a clock.**
- **It is impossible to switch the diagnostic mode when an accelerator pedal position sensor circuit has a malfunction.**
- **Always ECM returns to Diagnostic Test Mode I after ignition switch is turned "OFF".**

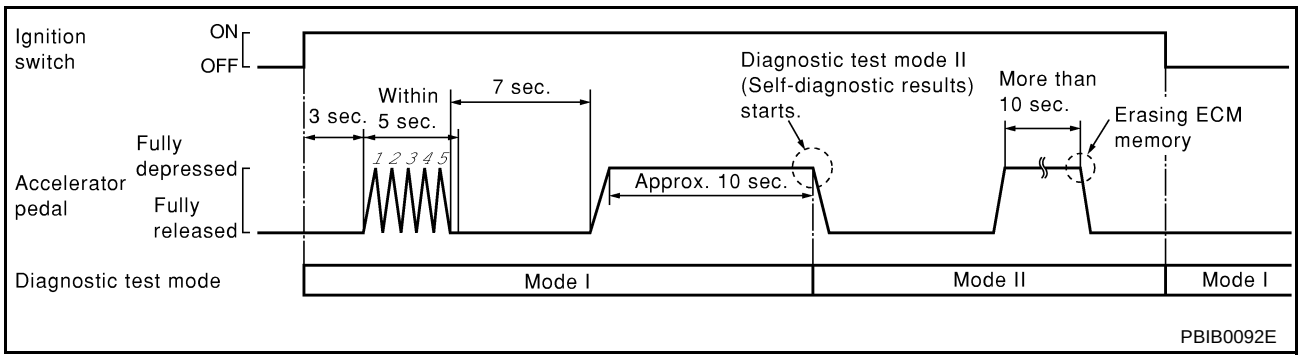
How to Set Diagnostic Test Mode II (Self-diagnostic Results)

1. Confirm that accelerator pedal is fully released, turn ignition switch "ON" and wait 3 seconds.
2. Repeat the following procedure quickly five times within 5 seconds.

a. Fully depress the accelerator pedal.

b. Fully release the accelerator pedal.

3. Wait 7 seconds, fully depress the accelerator pedal and keep it for approx. 10 seconds until the MI starts blinking.
4. Fully release the accelerator pedal.
   ECM has entered to Diagnostic Test Mode II (Self-diagnostic results).



How to Set Diagnostic Test Mode II (Heated Oxygen Sensor 1 Monitor)

1. Set the ECM in Diagnostic Test Mode II (Self-diagnostic results). Refer to EC-1449, "How to Set Diagnostic Test Mode II (Self-diagnostic Results)" .
2. Start Engine.
   ECM has entered to Diagnostic Test Mode II (Heated oxygen sensor 1 monitor).

How to Erase Diagnostic Test Mode II (Self-diagnostic Results)

1. Set ECM in Diagnostic Test Mode II (Self-diagnostic results). Refer to EC-1449, "How to Set Diagnostic Test Mode II (Self-diagnostic Results)" .
2. Fully depress the accelerator pedal and keep it for more than 10 seconds.
   The emission-related diagnostic information has been erased from the backup memory in the ECM.
3. Fully release the accelerator pedal, and confirm the DTC 0000 is displayed.

DIAGNOSTIC TEST MODE I — BULB CHECK

In this mode, the MI on the instrument panel should stay ON. If it remains OFF, check the bulb. Refer to DI-95, "WARNING LAMPS" or see EC-1721 .

DIAGNOSTIC TEST MODE I — MALFUNCTION WARNING

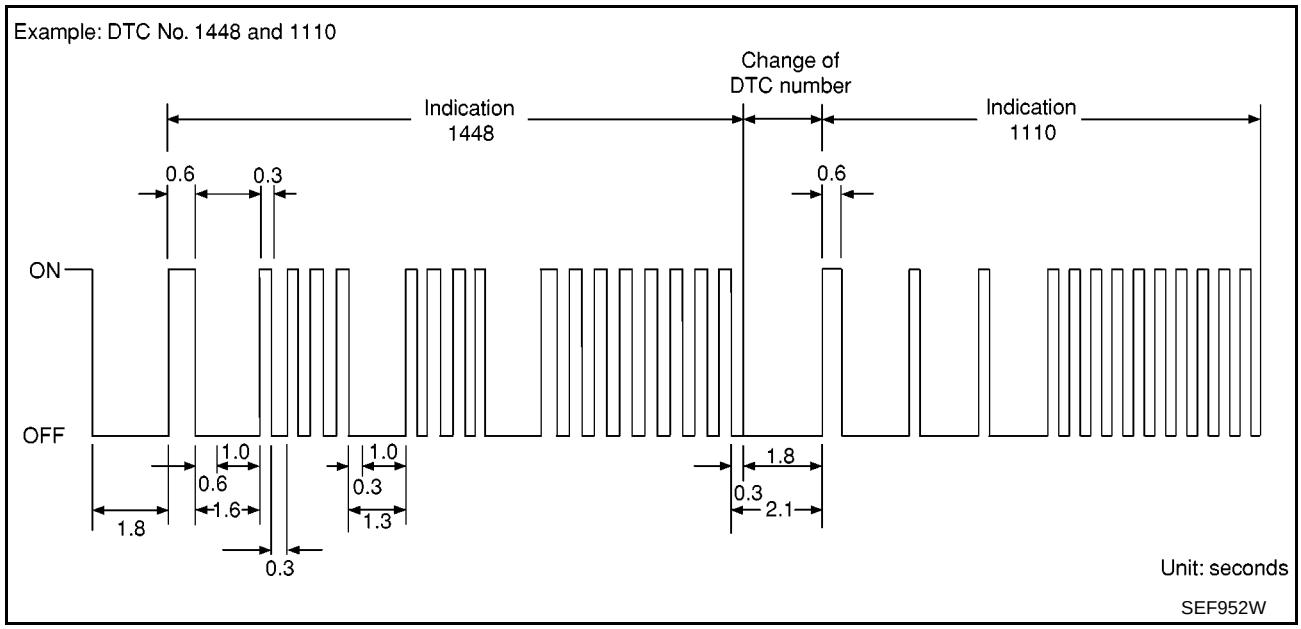
MI	Condition
ON	When the malfunction is detected.
OFF	No malfunction.

- These DTC numbers are clarified in Diagnostic Test Mode II (SELF-DIAGNOSTIC RESULTS)

DIAGNOSTIC TEST MODE II — SELF-DIAGNOSTIC RESULTS

In this mode, the DTC and 1st trip DTC are indicated by the number of blinks of the MI as shown below.

The DTC and 1st trip DTC are displayed at the same time. If the MI does not illuminate in diagnostic test mode I (Malfunction warning), all displayed items are 1st trip DTCs. If only one code is displayed when the MI illuminates in diagnostic test mode II (SELF-DIAGNOSTIC RESULTS), it is a DTC; if two or more codes are displayed, they may be either DTCs or 1st trip DTCs. DTC No. is same as that of 1st trip DTC. These unidentified codes can be identified by using the CONSULT-II. A DTC will be used as an example for how to read a code.



A particular trouble code can be identified by the number of four-digit numeral flashes. The “zero” is indicated by the number of ten flashes. The length of time the 1,000th-digit numeral flashes on and off is 1.2 seconds consisting of an ON (0.6-second) - OFF (0.6-second) cycle.
The 100th-digit numeral and lower digit numerals consist of a 0.3-second ON and 0.3-second OFF cycle.
A change from one digit numeral to another occurs at an interval of 1.0-second OFF. In other words, the later numeral appears on the display 1.3 seconds after the former numeral has disappeared.
A change from one trouble code to another occurs at an interval of 1.8-second OFF.
In this way, all the detected malfunctions are classified by their DTC numbers. The DTC “0000” refers to no malfunction. (See EC-1415, "INDEX FOR DTC")

How to Erase Diagnostic Test Mode II (Self-diagnostic Results)

The DTC can be erased from the back up memory in the ECM by depressing accelerator pedal. Refer to EC-1449, "HOW TO SWITCH DIAGNOSTIC TEST MODE" .

- **If the battery is disconnected, the DTC will be lost from the backup memory after approx 24 hours.**
- **Be careful not to erase the stored memory before starting trouble diagnoses.**

DIAGNOSTIC TEST MODE II — HEATED OXYGEN SENSOR 1 MONITOR

In this mode, the MI displays the condition of the fuel mixture (lean or rich) which is monitored by the heated oxygen sensor 1.

MI	Fuel mixture condition in the exhaust gas	Air fuel ratio feedback control condition
ON	Lean	Closed loop system
OFF	Rich	
*Remains ON or OFF	Any condition	Open loop system

*: Maintains conditions just before switching to open loop.

To check the heated oxygen sensor 1 function, start engine in the Diagnostic Test Mode II and warm it up until engine coolant temperature indicator points to the middle of the gauge.
Next run engine at about 2,000 rpm for about 2 minutes under no-load conditions. Then make sure that the MI comes ON more than 5 times within 10 seconds with engine running at 2,000 rpm under no-load.

TROUBLE DIAGNOSIS

PFP:00004

Trouble Diagnosis Introduction

EBS00GY5

INTRODUCTION

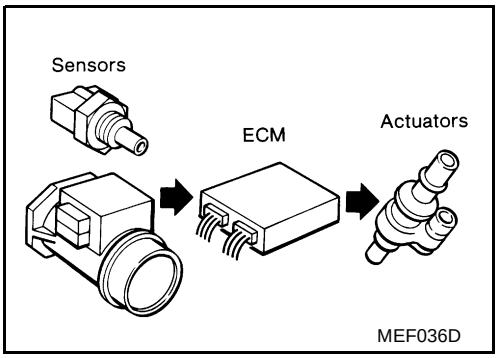
The engine has an ECM to control major systems such as fuel control, ignition control, idle air control system, etc. The ECM accepts input signals from sensors and instantly drives actuators. It is essential that both input and output signals are proper and stable. At the same time, it is important that there are no problems such as vacuum leaks, fouled spark plugs, or other problems with the engine.

It is much more difficult to diagnose a problem that occurs intermittently rather than continuously. Most intermittent problems are caused by poor electric connections or improper wiring. In this case, careful checking of suspected circuits may help prevent the replacement of good parts.

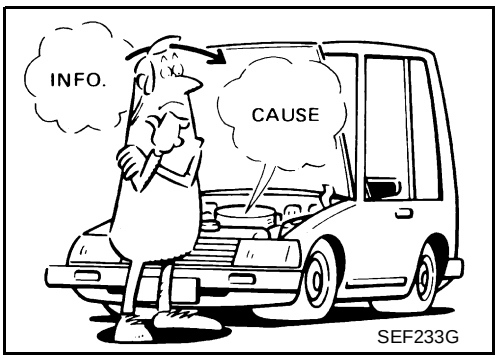
A visual check only may not find the cause of the problems. A road test with CONSULT-II or a circuit tester connected should be performed. Follow the “Work Flow” on EC-1452 .

Before undertaking actual checks, take a few minutes to talk with a customer who approaches with a driveability complaint. The customer can supply good information about such problems, especially intermittent ones. Find out what symptoms are present and under what conditions they occur. A “Diagnostic Worksheet” like the example on EC-1455 should be used.

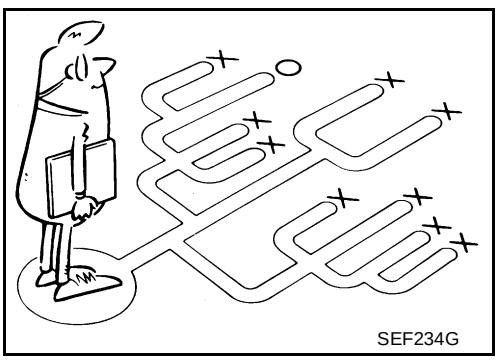
Start your diagnosis by looking for “conventional” problems first. This will help troubleshoot driveability problems on an electronically controlled engine vehicle.



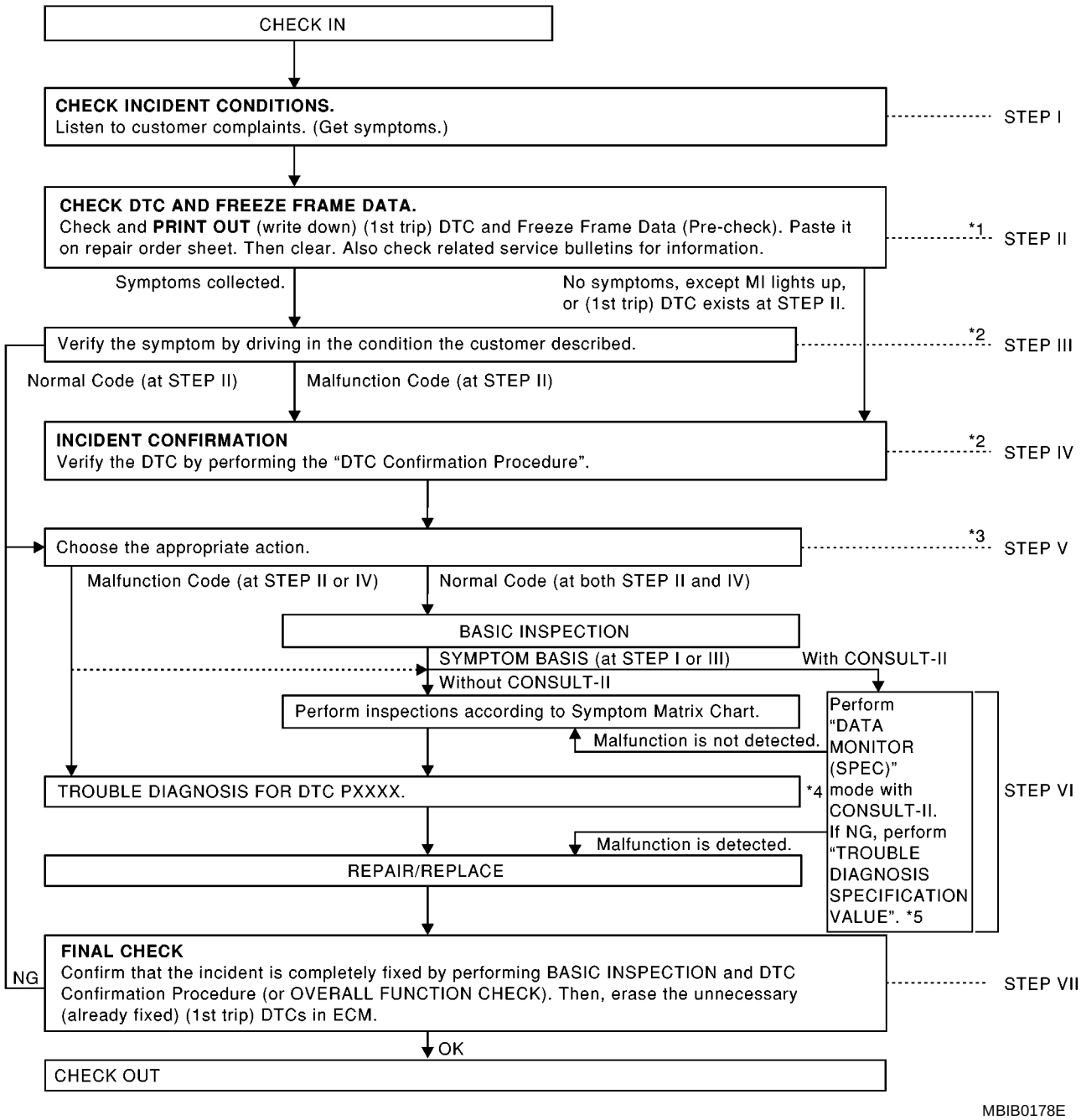
MEF036D



SEF233G


SEF234G

WORK FLOW
Flow Chart



MBIB0178E

*1 If time data of "SELF-DIAG RESULTS" is other than "0" or "[1t]", perform EC-1498, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

*2 If the incident cannot be verified, perform EC-1498, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

*3 If the on board diagnostic system cannot be performed, check main power supply and ground circuit. Refer to EC-1499, "POWER SUPPLY CIRCUIT FOR ECM" .

*4 If malfunctioning part cannot be detected, perform EC-1498, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

*5 EC-1494

Description for Work Flow

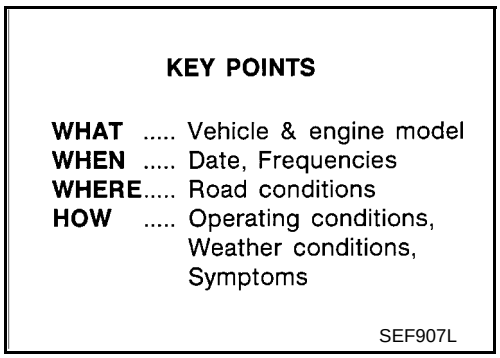
STEP	DESCRIPTION
STEP I	Get detailed information about the conditions and the environment when the incident/symptom occurred using the “DIAGNOSTIC WORK SHEET”, EC-1454 .
STEP II	Before confirming the concern, check and write down (print out using CONSULT-II) the (1st trip) DTC and the (1st trip) freeze frame data, then erase the DTC and the data. (Refer to EC-1446 .) The (1st trip) DTC and the (1st trip) freeze frame data can be used when duplicating the incident at STEP III & IV. If the incident cannot be verified, perform EC-1498, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" . Study the relationship between the cause, specified by (1st trip) DTC, and the symptom described by the customer. (The “Symptom Matrix Chart” will be useful. See EC-1462 .) Also check related service bulletins for information.
STEP III	Try to confirm the symptom and under what conditions the incident occurs. The “DIAGNOSTIC WORK SHEET” and the freeze frame data are useful to verify the incident. Connect CONSULT-II to the vehicle in DATA MONITOR (AUTO TRIG) mode and check real time diagnosis results. If the incident cannot be verified, perform EC-1498, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" . If the malfunction code is detected, skip STEP IV and perform STEP V.
STEP IV	Try to detect the (1st trip) DTC by driving in (or performing) the “DTC Confirmation Procedure”. Check and read the (1st trip) DTC and (1st trip) freeze frame data by using CONSULT-II. During the (1st trip) DTC verification, be sure to connect CONSULT-II to the vehicle in DATA MONITOR (AUTO TRIG) mode and check real time diagnosis results. If the incident cannot be verified, perform EC-1498, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" . In case the “DTC Confirmation Procedure” is not available, perform the “Overall Function Check” instead. The (1st trip) DTC cannot be displayed by this check, however, this simplified “check” is an effective alternative. The “NG” result of the “Overall Function Check” is the same as the (1st trip) DTC detection.
STEP V	Take the appropriate action based on the results of STEP I through IV. If the malfunction code is indicated, proceed to TROUBLE DIAGNOSIS FOR DTC PXXXX. If the normal code is indicated, proceed to the BASIC INSPECTION. (Refer to EC-1457 .) If COSULT-II is available, perform "DATA MONITOR (SPEC)" mode with CONSULT-II and proceed to the "TOROUBLE DIAGNOSIS – SPECIFICATION VALUE". (Refer to EC-1494 .) (If malfunction is detected, proceed to "PERAIR/REPLACE".) Then perform inspections according to the Symptom Matrix Chart. (Refer to EC-1462 .)
STEP VI	Identify where to begin diagnosis based on the relationship study between symptom and possible causes. Inspect the system for mechanical binding, loose connectors or wiring damage using (tracing) “Harness Layouts”. Gently shake the related connectors, components or wiring harness with CONSULT-II set in “DATA MONITOR (AUTO TRIG)” mode. Check the voltage of the related ECM terminals or monitor the output data from the related sensors with CONSULT-II. Refer to EC-1472 , EC-1489 . The “Diagnostic Procedure” in EC section contains a description based on open circuit inspection. A short circuit inspection is also required for the circuit check in the Diagnostic Procedure. For details, refer to “Circuit Inspection” in GI-24, "How to Perform Efficient Diagnosis for an Electrical Incident" . Repair or replace the malfunction parts. If malfunctioning part cannot be detected, perform EC-1498, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .
STEP VII	Once you have repaired the circuit or replaced a component, you need to run the engine in the same conditions and circumstances which resulted in the customer's initial complaint. Perform the “DTC Confirmation Procedure” and confirm the normal code [DTC No. P0000] is detected. If the incident is still detected in the final check, perform STEP VI by using a method different from the previous one. Before returning the vehicle to the customer, be sure to erase the unnecessary (already fixed) (1st trip) DTC in ECM. (Refer to EC-1446, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .)

DIAGNOSTIC WORKSHEET

Description

There are many operating conditions that lead to the malfunction of engine components. A good grasp of such conditions can make troubleshooting faster and more accurate.
In general, each customer feels differently about a problem. It is important to fully understand the symptoms or conditions for a customer complaint.
Utilize a diagnostic worksheet like the one on the next page in order to organize all the information for troubleshooting.
Some conditions may cause the MIL to come on steady or blink and DTC to be detected. Examples:

- Vehicle ran out of fuel, which caused the engine to misfire.
- Fuel filler cap was left off or incorrectly screwed on, allowing fuel to evaporate into the atmosphere.



Worksheet Sample

Customer name MR/MS		Model & Year	VIN
Engine #		Trans.	Mileage
Incident Date		Manuf. Date	In Service Date
Fuel and fuel filler cap		☐ Vehicle ran out of fuel causing misfire ☐ Fuel filler cap was left off or incorrectly screwed on.	
Symptoms	☐ Startability	☐ Impossible to start ☐ No combustion ☐ Partial combustion ☐ Partial combustion affected by throttle position ☐ Partial combustion NOT affected by throttle position ☐ Possible but hard to start ☐ Others [ ]	
	☐ Idling	☐ No fast idle ☐ Unstable ☐ High idle ☐ Low idle ☐ Others [ ]	
	☐ Driveability	☐ Stumble ☐ Surge ☐ Knock ☐ Lack of power ☐ Intake backfire ☐ Exhaust backfire ☐ Others [ ]	
	☐ Engine stall	☐ At the time of start ☐ While idling ☐ While accelerating ☐ While decelerating ☐ Just after stopping ☐ While loading	
Incident occurrence		☐ Just after delivery ☐ Recently ☐ In the morning ☐ At night ☐ In the daytime	
Frequency		☐ All the time ☐ Under certain conditions ☐ Sometimes	
Weather conditions		☐ Not affected	
	Weather	☐ Fine ☐ Raining ☐ Snowing ☐ Others [ ]	
	Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold ☐ Humid ˚F	
Engine conditions		☐ Cold ☐ During warm-up ☐ After warm-up Engine speed 0 2,000 4,000 6,000 8,000 rpm	
Road conditions		☐ In town ☐ In suburbs ☐ Highway ☐ Off road (up/down)	
Driving conditions		☐ Not affected ☐ At starting ☐ While idling ☐ At racing ☐ While accelerating ☐ While cruising ☐ While decelerating ☐ While turning (RH/LH) Vehicle speed 0 10 20 30 40 50 60 MPH	
Malfunction indicator lamp		☐ Turned on ☐ Not turned on	

MTBL0017

DTC Inspection Priority Chart

EBS00GY6

If some DTCs are displayed at the same time, perform inspections one by one based on the following priority chart.

NOTE:
If DTC U1000 and/or U1001 is displayed with other DTC, first perform the trouble diagnosis for DTC U1000 and U1001. Refer to EC-1505 .

Priority	Detected items (DTC)
1	● U1000 U1001 CAN communication line ● P0102 P0103 Mass air flow sensor ● P0117 P0118 Engine coolant temperature sensor ● P0221 P0222 P0223 P1223 P1224 P1225 P1226 Throttle position sensor ● P0226 P0227 P0228 P1227 P1228 Accelerator pedal position sensor ● P0327 P0328 Knock sensor ● P0335 Crankshaft position sensor (POS) ● P0340 Camshaft position sensor (PHASE) ● P0500 Vehicle speed sensor ● P0605 ECM ● P1229 Sensor power supply ● P1610-P1615 NATS
2	● P0134 Heated oxygen sensor 1 ● P0550 Power steering pressure sensor ● P1065 ECM power supply ● P1122 Electric throttle control function ● P1124 P1126 Throttle control moter relay ● P1128 Throttle control moter ● P1805 Brake switch
3	● P1121 Electric throttle control actuator ● P1217 Engine over temperature (OVERHEAT)

Fail-safe Chart

EBS00GY7

When the DTC listed bellow is detected, the ECM enters fail-safe mode and the MI lights up.

<table>
<tr><th>DTC No.</th><th>Detected items</th><th colspan="2">Engine operating condition in fail-safe mode</th></tr>
<tr><td>P0102
P0103</td><td>Mass air flow sensor circuit</td><td colspan="2">Engine speed will not rise more than 2,400 rpm due to the fuel cut.</td></tr>
<tr><td rowspan="6">P0117
P0118</td><td rowspan="6">Engine coolant temperature sensor circuit</td><td colspan="2">Engine coolant temperature will be determined by ECM based on the time after turning ignition switch “ON” or “START”.
CONSULT-II displays the engine coolant temperature decided by ECM.</td></tr>
<tr><td>Condition</td><td>Engine coolant temperature decided (CONSULT-II display)</td></tr>
<tr><td>Just as ignition switch is turned ON or Start</td><td>40°C (104°F)</td></tr>
<tr><td>More than approx. 4 minutes after ignition ON or Start</td><td>80°C (176°F)</td></tr>
<tr><td>Except as shown above</td><td>40 - 80°C (104 - 176°F)
(Depends on the time)</td></tr>
<tr><td colspan="2">When the fail-safe system for engine coolant temperature sensor is activated, the cooling fan operates while engine is running.</td></tr>
<tr><td>P0221
P0222
P0223
P1223
P1224</td><td>Throttle position sensor</td><td colspan="2">The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees.
The ECM regulates the opening speed of the throttle valve to be slower than the normal condition.
So, the acceleration will be poor.</td></tr>
<tr><td>P0226
P0227
P0228
P1227
P1228</td><td>Accelerator pedal position sensor</td><td colspan="2">The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees.
The ECM regulates the opening speed of the throttle valve to be slower than the normal condition.
So, the acceleration will be poor.</td></tr>
</table>

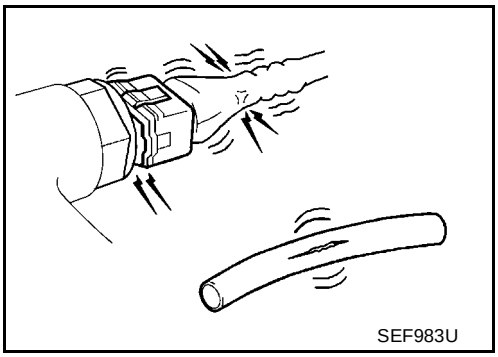
DTC No.	Detected items	Engine operating condition in fail-safe mode
P1121	Electric throttle control actuator (ECM detect the throttle valve is stuck open.)	While the vehicle is driving, it slows down gradually by fuel cut. After the vehicle stops, the engine stalls. The engine can restart in “N” or “P” position, and engine speed will not exceed 1,000 rpm or more.
P1122	Electric throttle control function	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.
P1124 P1126	Throttle control motor relay	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.
P1128	Throttle control motor	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.
P1229	Sensor power supply	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

Basic Inspection

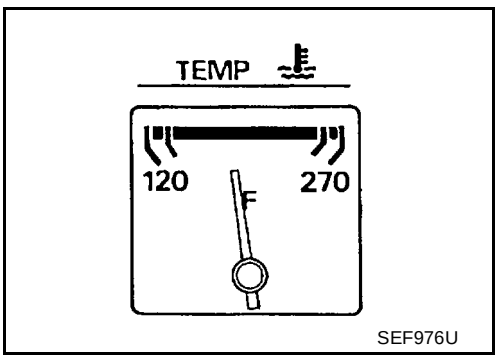
EBS00GY8

1. INSPECTION START

1. Check service records for any recent repairs that may indicate a related problem, or a current need for scheduled maintenance.
2. Open engine hood and check the following:
- Harness connectors for improper connections
- Wiring harness for improper connections, pinches and cut
- Vacuum hoses for splits, kinks and improper connections
- Hoses and ducts for leaks
- Air cleaner clogging
- Gasket

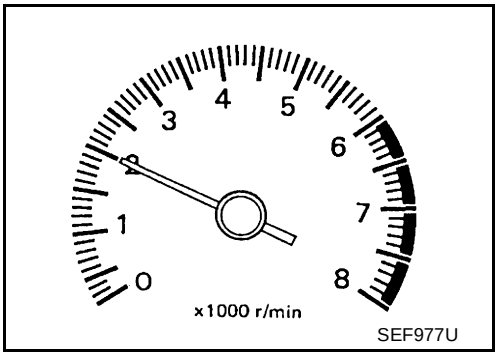

SEF983U

3. Confirm that electrical or mechanical loads are not applied.
- Headlamp switch is OFF.
- Air conditioner switch is OFF.
- Rear window defogger switch is OFF.
- Steering wheel is in the straight-ahead position, etc.
4. Start engine and warm it up until engine coolant temperature indicator points the middle of gauge.
Ensure engine stays below 1,000 rpm.



SEF976U

5. Run engine at about 2,000 rpm for about 2 minutes under no-load.
6. Make sure that no DTC is displayed with CONSULT-II.



SEF977U

OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. REPAIR OR REPLACE

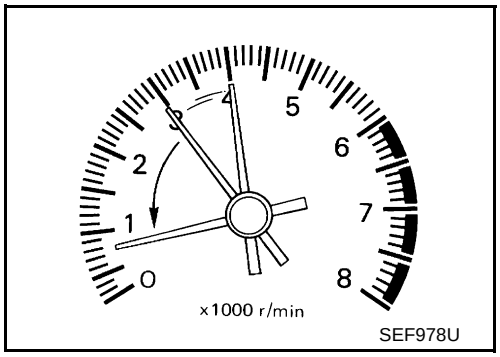
Repair or replace components as necessary according to corresponding “Diagnostic Procedure”.

>> GO TO 3

3. CHECK TARGET IDLE SPEED

With CONSULT-II

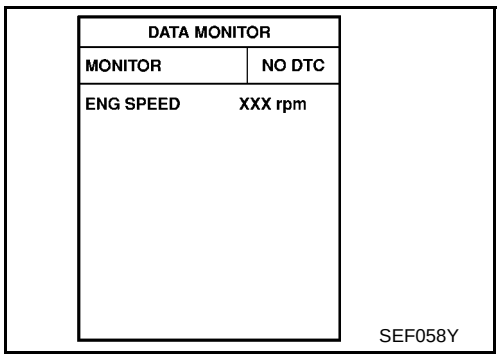
1. Run engine at about 2,000 rpm for about 2 minutes under no-load.
2. Rev engine (2,000 to 3,000 rpm) two or three times under no-load, then run engine at idle speed for about 1 minute.



SEF978U

3. Read idle speed in “DATA MONITOR” mode with CONSULT-II.

M/T: 600 ± 50 rpm
CVT: 650 ± 50 rpm (in "P" or "N" position)



SEF058Y

Without CONSULT-II

1. Run engine at about 2,000 rpm for about 2 minutes under no-load.
2. Rev engine (2,000 to 3,000 rpm) two or three times under no-load, then run engine at idle speed for about 1 minute.
3. Check idle speed.

M/T: 600 ± 50 rpm
CVT: 650 ± 50 rpm (in "P" or "N" position)

OK or NG

OK >> GO TO 10.
NG >> GO TO 4.

4. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

1. Stop engine.
2. Perform EC-1440, "Accelerator Pedal Released Position Learning" .

>> GO TO 5.

5. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform EC-1440, "Throttle Valve Closed Position Learning" .

>> GO TO 6.

6. PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-1440, "Idle Air Volume Learning" .

Which is the result CMPLT or INCMP ?

CMPLT or INCMP

CMPLT >> GO TO 7.
INCMP >> 1. Follow the construction of “Idle Air Volume Learning”.
2. GO TO 4.

7. CHECK TARGET IDLE SPEED AGAIN

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Read idle speed in “DATA MONITOR” mode with CONSULT-II.

M/T: 600 ± 50 rpm
CVT: 650 ± 50 rpm (in "P" or "N" position)

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Check idle speed.

M/T: 600 ± 50 rpm
CVT: 650 ± 50 rpm (in "P" or "N" position)

OK or NG

OK >> GO TO 10.
NG >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the Following.

- Check camshaft position sensor (PHASE) and circuit. Refer to EC-1562 .
- Check crankshaft position sensor (POS) and circuit. Refer to EC-1555 .

OK or NG

OK >> GO TO 9.
NG >> 1. Repair or replace.
2. GO TO 4.

9. CHECK ECM FUNCTION

1. Substitute another known-good ECM to check ECM function. (ECM may be the cause of a problem, but this is the rarely the case.)
2. Perform initialization of NATS system and registration of NATS ignition key IDs. Refer to EC-1447, "NATS (Nissan Anti-theft System)" .

>> GO TO 4.

10. CHECK IGNITION TIMING

1. Run engine at idle.
2. Check ignition timing with a timing light.

M/T: 14 ± 5° BTDC
CVT: 15 ± 5° BTDC (in "P" or "N" position)

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 11.

11. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

1. Stop engine.
2. Perform EC-1440, "Accelerator Pedal Released Position Learning" .

>> GO TO 12.

12. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform EC-1440, "Throttle Valve Closed Position Learning" .

>> GO TO 13.

13. PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-1440, "Idle Air Volume Learning" .

Which is the result CMPLT or INCMP ?

CMPLT or INCMP

CMPLT >> GO TO 14.
INCMP >> 1. Follow the construction of “Idle Air Volume Learning”.
2. GO TO 4.

14. CHECK TARGET IDLE SPEED AGAIN

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Read idle speed in “DATA MONITOR” mode with CONSULT-II.

M/T: 600 ± 50 rpm
CVT: 650 ± 50 rpm (in "P" or "N" position)

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Check idle speed.

M/T: 600 ± 50 rpm
CVT: 650 ± 50 rpm (in "P" or "N" position)

OK or NG

OK >> GO TO 15.
NG >> GO TO 17.

15. CHECK IGNITION TIMING AGAIN

1. Run engine at idle.
2. Check ignition timing with a timing light.

M/T: 14 ± 5° BTDC
CVT: 15 ± 5° BTDC (in "P" or "N" position)

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 16.

16. CHECK TIMING CHAIN INSTALLATION

Check timing chain installation. Refer to EM-143, "TIMING CHAIN" .

OK or NG

OK >> GO TO 17.
NG >> 1. Repair the timing chain installation.
2. GO TO 4.

17. DETECT MALFUNCTIONING PART

Check the following.

- Check camshaft position sensor (PHASE) and circuit. Refer to EC-1562 .
- Check crankshaft position sensor (POS) and circuit. Refer to EC-1555 .

OK or NG

OK >> GO TO 18.
NG >> 1. Repair or replace.
2. GO TO 4.

18. CHECK ECM FUNCTION

1. Substitute another known-good ECM to check ECM function. (ECM may be the cause of a problem, but this is the rarely the case.)
2. Perform initialization of NATS system and registration of NATS ignition key IDs. Refer to EC-1447, "NATS (Nissan Anti-theft System)" .

>> GO TO 4.

Symptom Matrix Chart

EBS00GY9

SYSTEM — BASIC ENGINE CONTROL SYSTEM

		SYMPTOM													Reference page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Fuel	Fuel pump circuit	1	1	2	3	2		2	2			3		2	EC-1705
	Fuel pressure regulator system	3	3	4	4	4	4	4	4	4		4			EC-1443
	Injector circuit	1	1	2	3	2		2	2			2			EC-1699
	Evaporative emission system	3	3	4	4	4	4	4	4	4		4			EC-1723
Air	Positive crankcase ventilation system	3	3	4	4	4	4	4	4	4		4	1		EC-1726
	Incorrect idle speed adjustment	3	3				1	1	1	1		1			EC-1457
	Electric throttle control actuator	1	1	2	3	3	2	2	2	2		2		2	EC-1583, EC-1585, EC-1592, EC-1598
Ignition	Incorrect ignition timing adjustment	3	3	1	1	1		1	1			1			EC-1457
	Ignition circuit	1	1	2	2	2		2	2			2			EC-1672
Main power supply and ground circuit		2	2	3	3	3		3	3		2	3			EC-1499
Mass air flow sensor circuit		1	1	2	2	2		2	2			2			EC-1508
Engine coolant temperature sensor circuit		1	1	2	2	2	3	2	2	3	1	2			EC-1514
Throttle position sensor circuit			1	2		2	2	2	2	2		2			EC-1525, EC-1531, EC-1620, EC-1626, EC-1628, EC-1637
Accelerator pedal position sensor circuit				3	2	1	2			2					EC-1537, EC-1544, EC-1630
Heated oxygen sensor 1 circuit			1	2	3	2		2	2			2			EC-1519, EC-1660
Knock sensor circuit				2	2							3			EC-1551
Crankshaft position sensor (POS) circuit		2	2												EC-1555
Camshaft position sensor (PHASE) circuit		2	2												EC-1562
Vehicle speed signal circuit			2	3		3						3			EC-1569
Power steering pressure sensor circuit			2				3	3	3	3					EC-1571

	SYMPTOM													Reference page
	HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code	AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
ECM	2	2	3	3	3	3	3	3	3	3	3			EC-1576, EC-1579
Intake valve timing control solenoid valve circuit	3	3	2		1	3	2	2	3		3			EC-1689
PNP switch circuit			3		3	3	3	3	3		3			EC-1695
Refrigerant pressure sensor circuit		2				3	3	3	3		4			EC-1711
Electrical load signal circuit						3	3	3	3					EC-1716
Air conditioner circuit	2	2	3	3	3	3	3	3	3		3		2	ATC-30

1 - 6: The numbers refer to the order of inspection.
(continued on next page)

SYSTEM — ENGINE MECHANICAL & OTHER

		SYMPTOM													Reference page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Fuel	Fuel tank	5	5												FL-13
	Fuel piping			5	5	5		5	5			5			MA-23, EM-128
	Vapor lock														—
	Valve deposit	5		5	5	5		5	5			5			—
	Poor fuel (Heavy weight gasoline, Low octane)														—

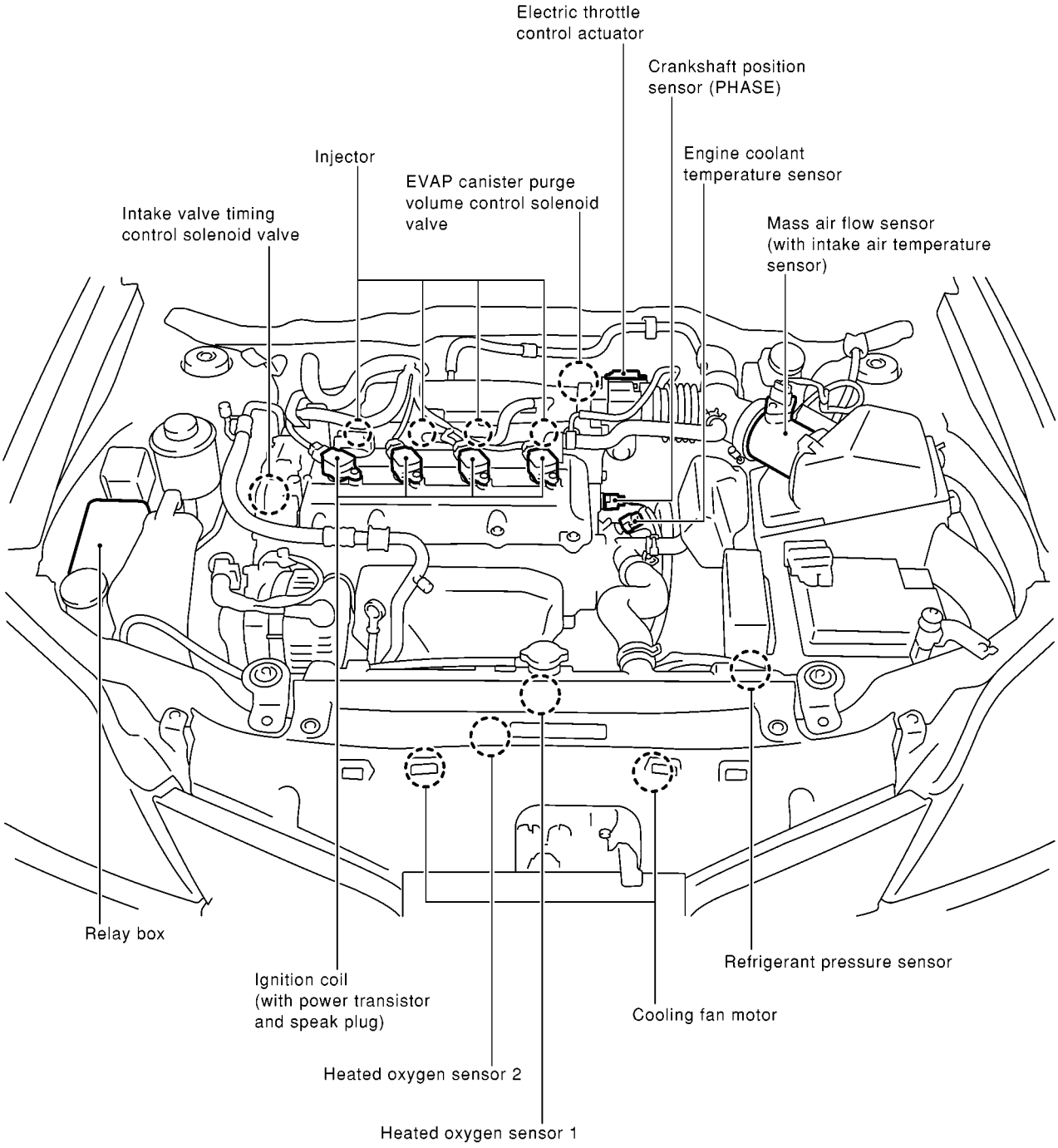
		SYMPTOM													Reference page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Air	Air duct		5	5		5		5	5			5			EM-114
	Air cleaner														EM-114
	Air leakage from air duct (Mass air flow sensor —electric throttle control actuator)	5			5		5			5					EM-114
	Electric throttle control actuator														EM-116
	Air leakage from intake manifold/ Collector/Gasket														EM-116
Cranking	Battery	1	1	1		1		1	1			1		1	SC-3
	Alternator circuit														SC-12
	Starter circuit	3													SC-22
	Signal plate/Flywheel/Drive plate	6													EM-165
	PNP switch	4													MT-126 or CVT-67
Engine	Cylinder head	5	5	5	5	5		5	5			5			EM-152
	Cylinder head gasket										4		3		
	Cylinder block	6	6	6	6	6		6	6			6	4		EM-165
	Piston														
	Piston ring														
	Connecting rod														
	Bearing														
	Crankshaft														
Valve mecha-nism	Timing chain	5	5	5	5	5		5	5			5			EM-143
	Camshaft														EM-133
	Intake valve timing control														EM-143
	Intake valve												3		EM-152
	Exhaust valve														
Exhaust	Exhaust manifold/Tube/Muffler/ Gasket	5	5	5	5	5		5	5			5			EM-121, EX-3
	Three way catalyst														

		SYMPTOM													Reference page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Lubrication	Oil pan/Oil strainer/Oil pump/Oil filter/Oil gallery	5	5	5	5	5		5	5			5	2		EM-123, LU-18 , LU-19 , LU-14
	Oil level (Low)/Filthy oil														LU-16
Cooling	Radiator/Hose/Radiator filler cap	5	5	5	5	5		5	5		2	5			CO-31
	Thermostat									5					CO-40
	Water pump														CO-38
	Water gallery														CO-27
	Cooling fan									5					CO-31
	Coolant level (low)/Contaminated coolant														CO-29
NATS (Nissan Anti-theft System)		1	1												EC-1448 or BL-156

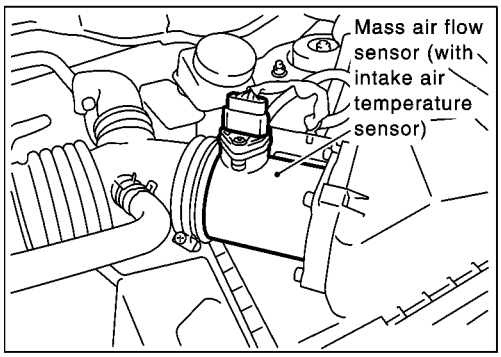
1 - 6: The numbers refer to the order of inspection.

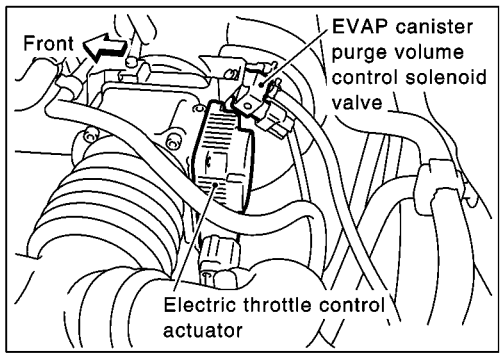
Engine Control Component Parts Location

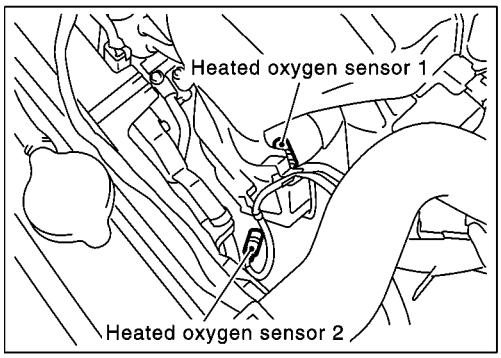
EBS00GYA

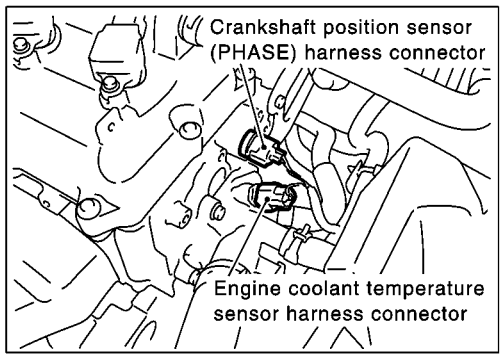


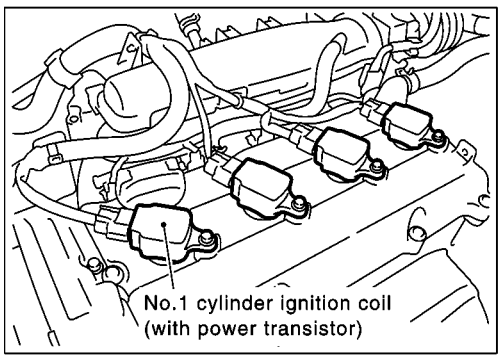
MBIB0070E

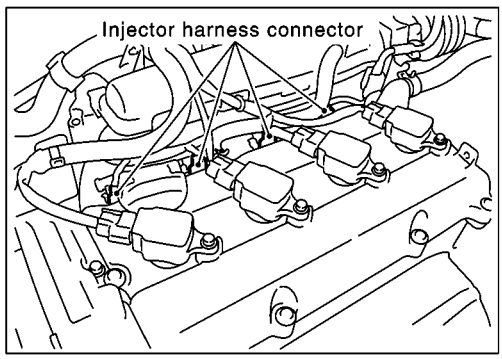

Mass air flow sensor (with intake air temperature sensor)

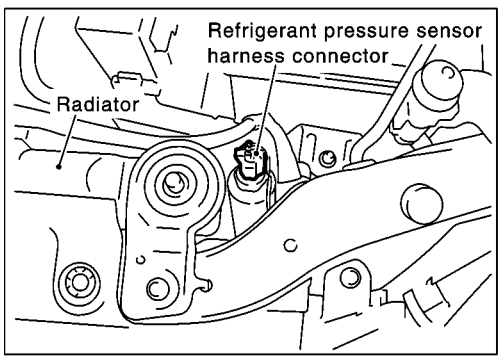

Front
EVAP canister purge volume control solenoid valve
Electric throttle control actuator

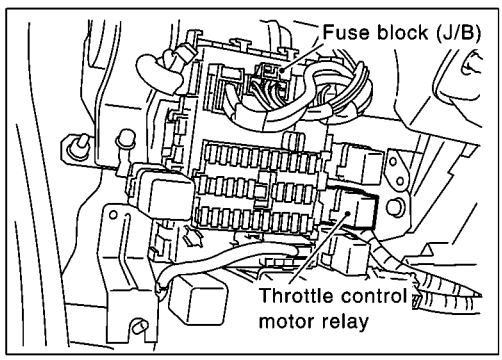

Heated oxygen sensor 1
Heated oxygen sensor 2


Crankshaft position sensor (PHASE) harness connector
Engine coolant temperature sensor harness connector

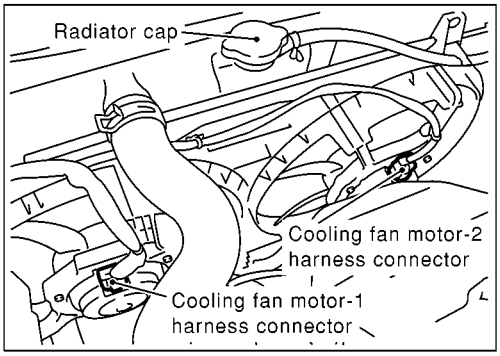

No.1 cylinder ignition coil (with power transistor)

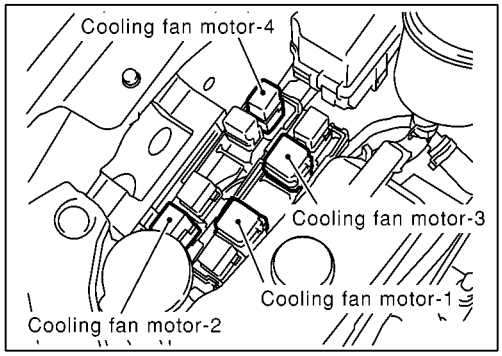

Injector harness connector

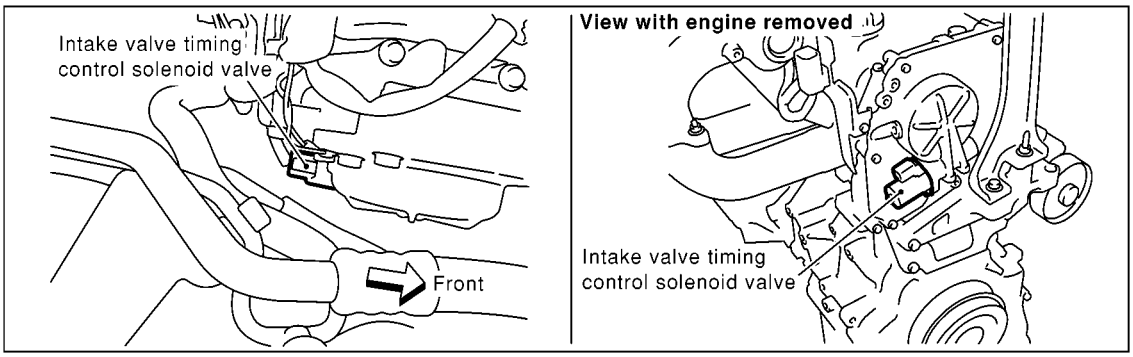

Refrigerant pressure sensor harness connector
Radiator

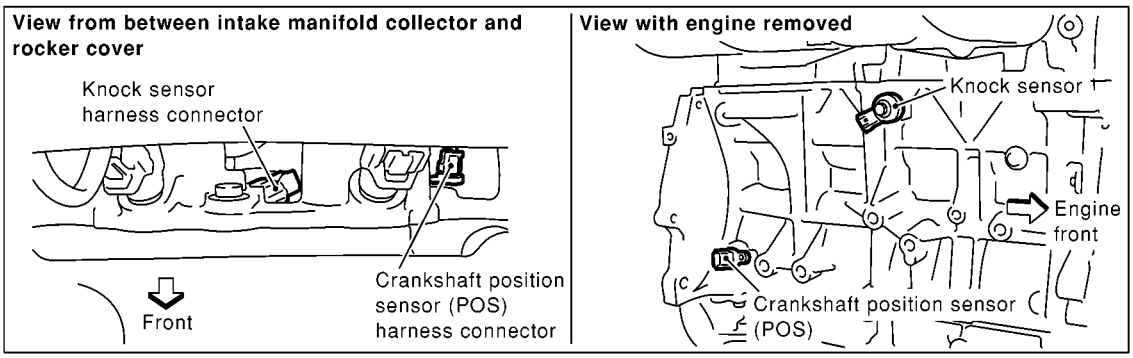

Fuse block (J/B)
Throttle control motor relay

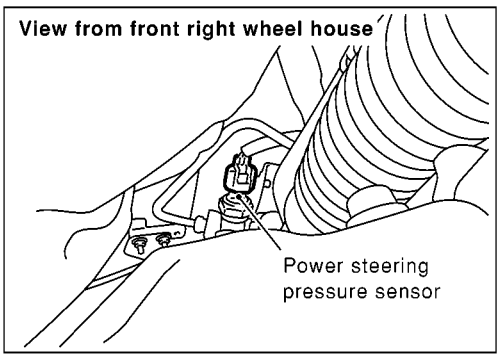
MBIB0147E

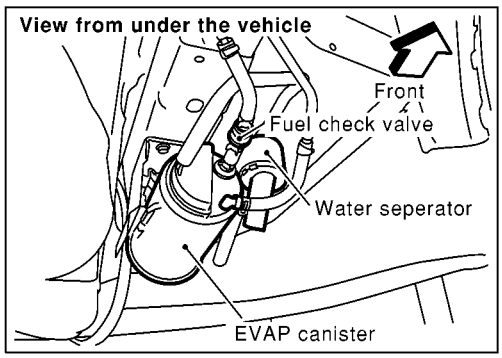

Radiator cap
Cooling fan motor-2 harness connector
Cooling fan motor-1 harness connector


Cooling fan motor-4
Cooling fan motor-3
Cooling fan motor-1
Cooling fan motor-2

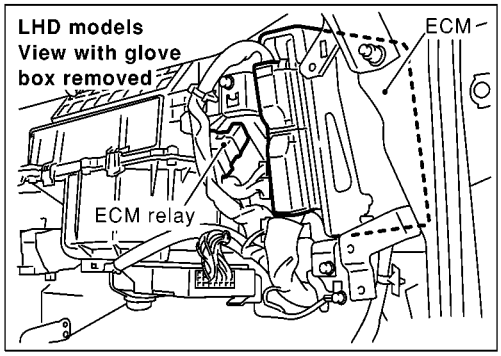

Intake valve timing control solenoid valve
Front
View with engine removed
Intake valve timing control solenoid valve

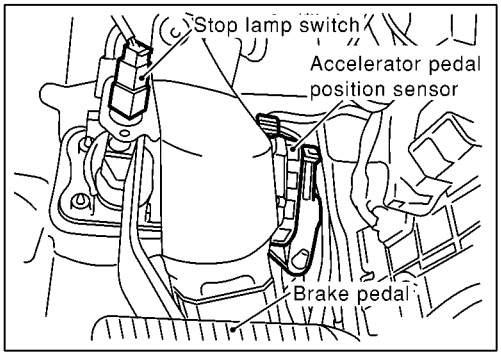

View from between intake manifold collector and rocker cover
Knock sensor harness connector
Front
Crankshaft position sensor (POS) harness connector
View with engine removed
Knock sensor
Engine front
Crankshaft position sensor (POS)

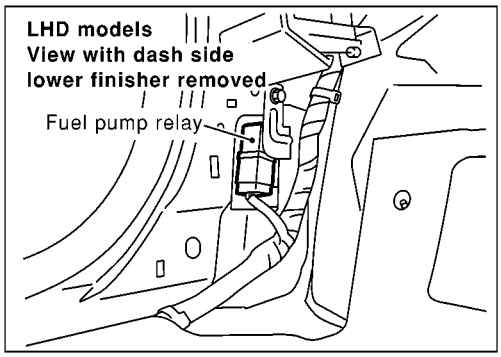

View from front right wheel house
Power steering pressure sensor

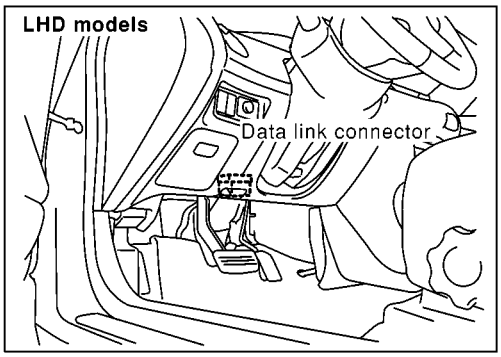

View from under the vehicle
Front
Fuel check valve
Water seperator
EVAP canister

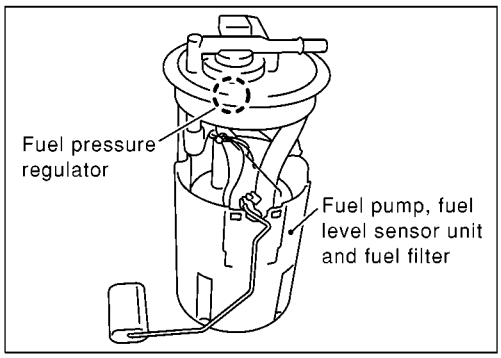
MBIB0148E

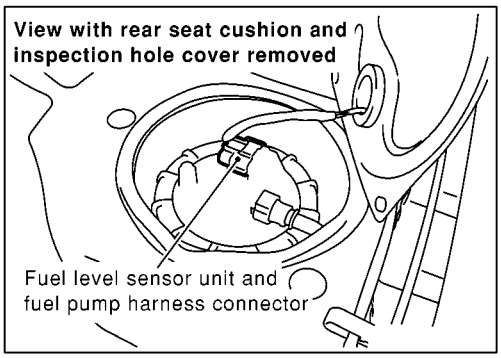

LHD models
View with glove
box removed
ECM
ECM relay


Stop lamp switch
Accelerator pedal
position sensor
Brake pedal


LHD models
View with dash side
lower finisher removed
Fuel pump relay


LHD models
Data link connector

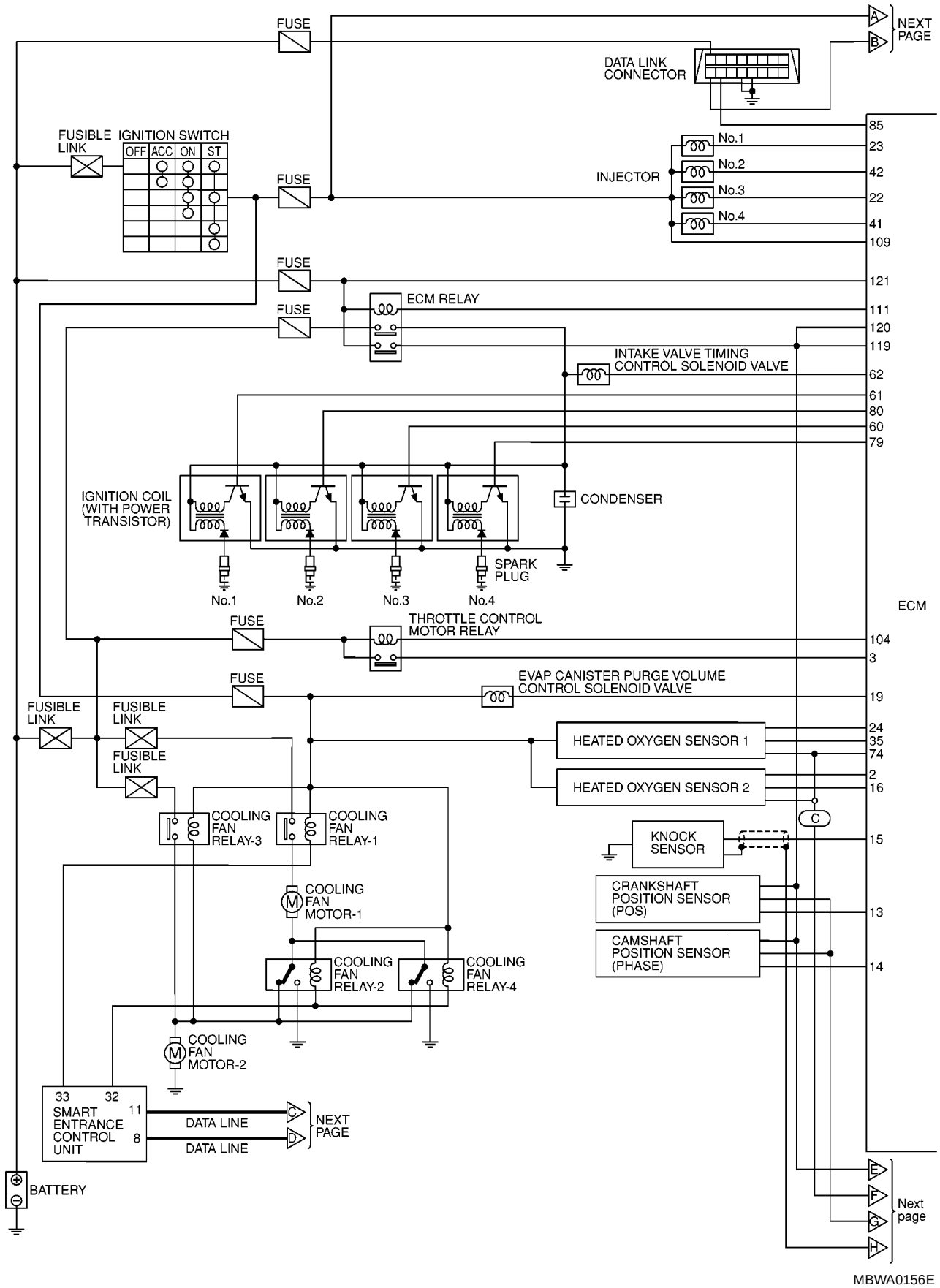

Fuel pressure
regulator
Fuel pump, fuel
level sensor unit
and fuel filter

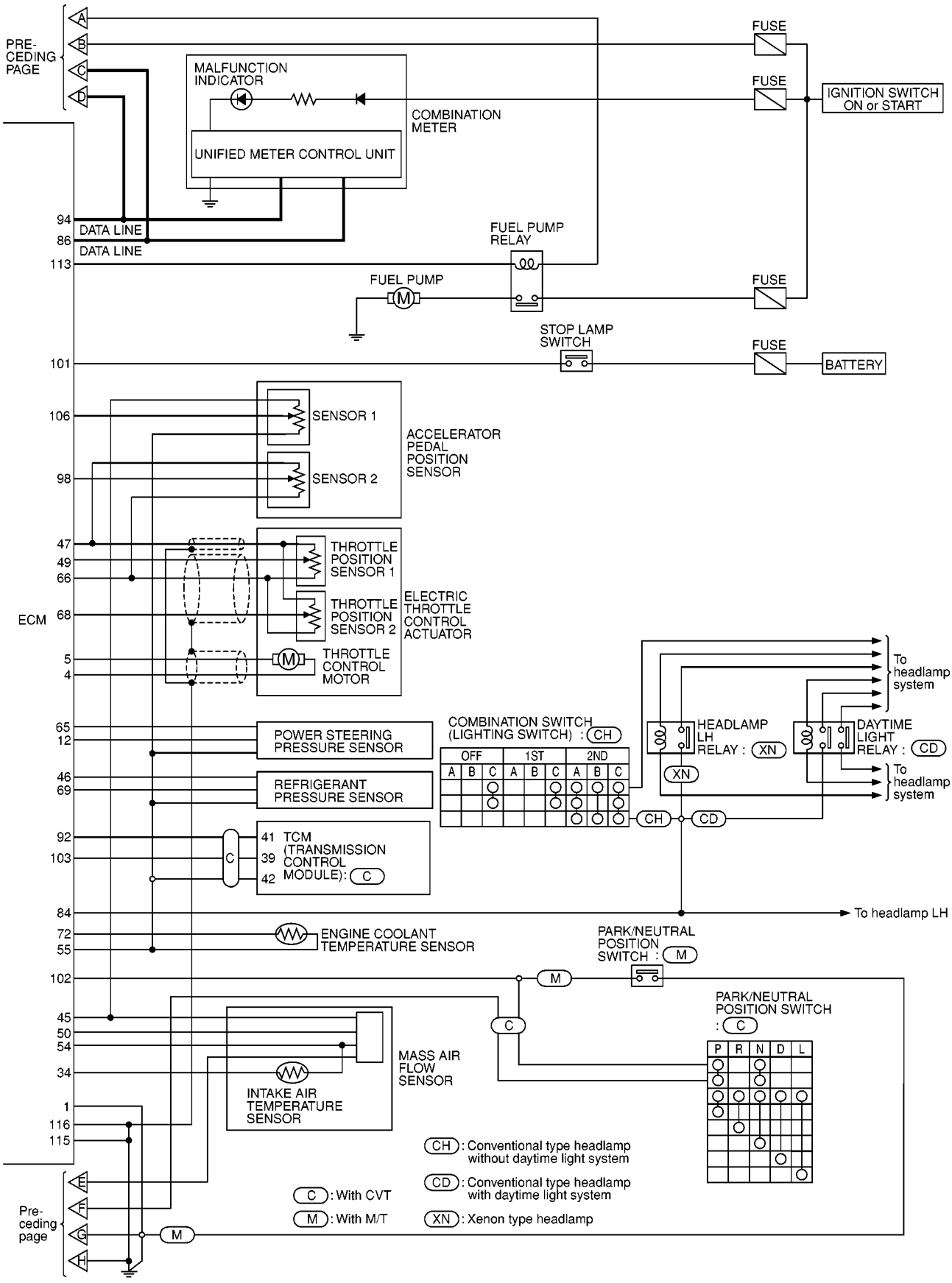

View with rear seat cushion and
inspection hole cover removed
Fuel level sensor unit and
fuel pump harness connector

MBIB0149E

Circuit Diagram

EBS00GYB

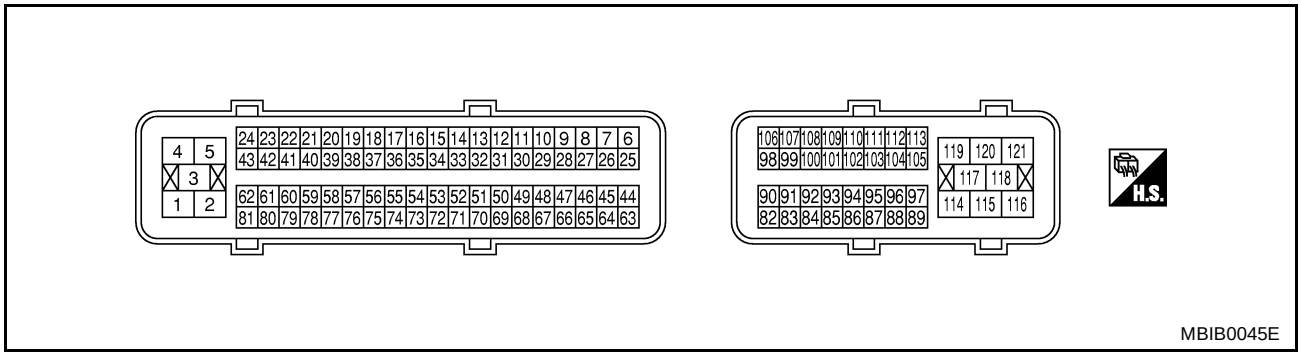



PRE-CEDING PAGE
A
B
C
D
MALFUNCTION INDICATOR
COMBINATION METER
UNIFIED METER CONTROL UNIT
FUSE
FUSE
IGNITION SWITCH ON or START
94
DATA LINE
86
DATA LINE
113
FUEL PUMP RELAY
FUEL PUMP
M
FUSE
STOP LAMP SWITCH
FUSE
101
BATTERY
106
SENSOR 1
98
SENSOR 2
ACCELERATOR PEDAL POSITION SENSOR
47
49
66
THROTTLE POSITION SENSOR 1
ECM
68
THROTTLE POSITION SENSOR 2
ELECTRIC THROTTLE CONTROL ACTUATOR
5
4
THROTTLE CONTROL MOTOR
To headlamp system
COMBINATION SWITCH (LIGHTING SWITCH) : CH
OFF
1ST
2ND
A B C A B C A B C
HEADLAMP LH RELAY : XN
DAYTIME LIGHT RELAY : CD
XN
To headlamp system
CH
CD
65
12
POWER STEERING PRESSURE SENSOR
46
69
REFRIGERANT PRESSURE SENSOR
92
103
C
41 TCM (TRANSMISSION CONTROL MODULE): C
39
42
84
To headlamp LH
72
55
ENGINE COOLANT TEMPERATURE SENSOR
PARK/NEUTRAL POSITION SWITCH : M
102
M
PARK/NEUTRAL POSITION SWITCH : C
P R N D L
45
50
54
34
MASS AIR FLOW SENSOR
INTAKE AIR TEMPERATURE SENSOR
1
116
115
CH : Conventional type headlamp without daytime light system
CD : Conventional type headlamp with daytime light system
C : With CVT
M : With M/T
XN : Xenon type headlamp
Pre-ceding page
E
F
G
H
M

MBWA0157E

ECM Harness Connector Terminal Layout

EBS00GYC

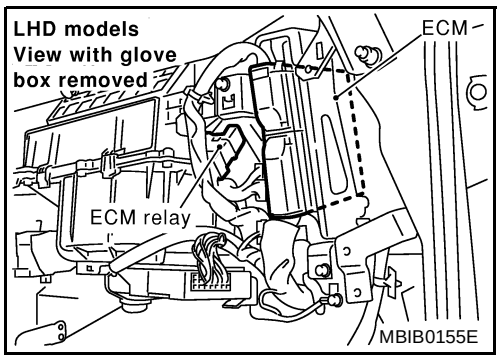


ECM Terminals and Reference Value

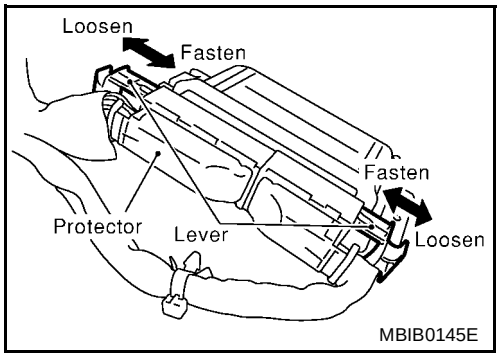
EBS00GYD

PREPARATION

1. ECM is located behind the glove box. For this inspection, remove glove box.
2. Remove ECM harness protector.



3. When disconnecting ECM harness connector, loosen it with levers as far as they will go as shown at right.
4. Connect a break-out box (SST) and Y-cable adapter (SST) between the ECM and ECM harness connector.
   - Use extreme care not to touch 2 pins at one time.
   - Data is for comparison and may not be exact.



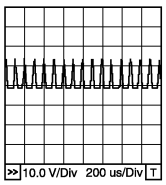
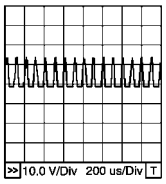
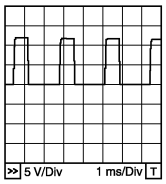
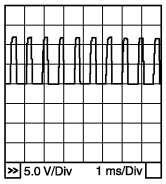
ECM INSPECTION TABLE

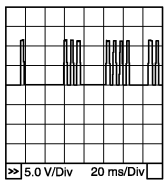
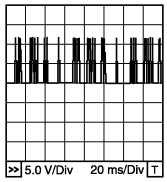
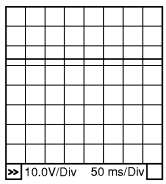
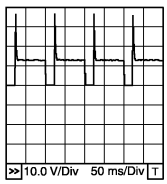
Specification data are reference values and are measured between each terminal and ground.

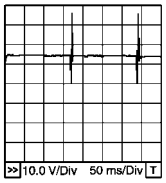
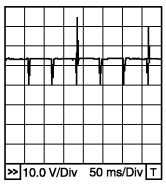
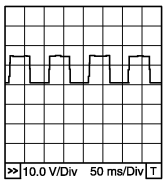
CAUTION:

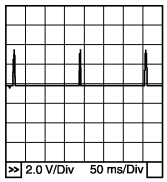
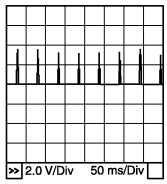
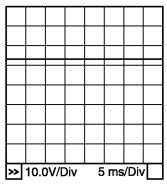
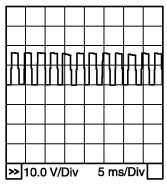
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
1	B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground

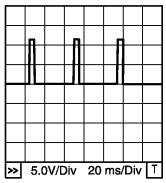
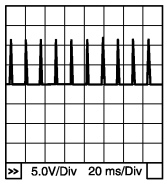
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
2	R/W	Heated oxygen sensor 2 heater	**[Engine is running]** ● Engine speed is below 3,800 rpm. ● After driving for 2 minutes at a speed of 70 km/h (43 MPH) or more	0 - 1.0V
			[Ignition switch "ON"] ● Engine stopped **[Engine is running]** ● Engine speed is above 3,800 rpm	BATTERY VOLTAGE (11 - 14V)
3	R	Throttle control motor relay power supply	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)
4	BR	Throttle control motor (Close)	**[Ignition switch "ON"]** ● Shift lever position is "D" (CVT model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal is releasing	0 - 14V★  PBIB0534E
5	Y	Throttle control motor (Open)	**[Ignition switch "ON"]** ● Shift lever position is "D" (CVT model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal is depressing	0 - 14V★  PBIB0533E
12	Y	Power steering pressure sensor	**[Engine is running]** ● Steering wheel is being turned	0.5 - 4.0V
			[Engine is running] ● Steering wheel is not being turned	0.4 - 0.8V
13	L	Crankshaft position sensor (POS)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 3.0V★  PBIB0527E
			[Engine is running] ● Engine speed is 2,000 rpm	Approximately 3.0V★  PBIB0528E

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
14	L	Camshaft position sensor (PHASE)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.0 - 4.0V★  PBIB0525E
			[Engine is running] ● Engine speed is 2,000 rpm.	1.0 - 4.0V★  PBIB0526E
15	W	Knock sensor	**[Engine is running]** ● Idle speed	Approximately 2.5V
16	W/Y	Heated oxygen sensor 2	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V
19	P	EVAP canister purge volume control solenoid valve	**[Engine is running]** ● Idle speed	BATTERY VOLTAGE (11 - 14V)★  PBIB0050E
			[Engine is running] ● Engine speed is about 2,000 rpm (More than 100 seconds after starting engine)	Approximately 10V★  PBIB0520E

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
22 23 41 42	G/B SB L R/W	Injector No. 3 Injector No. 1 Injector No. 4 Injector No. 2	**[Engine is running]** ● **Warm-up condition** ● Idle speed	BATTERY VOLTAGE (11 - 14V)★  PBIB0529E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	BATTERY VOLTAGE (11 - 14V)★  PBIB0530E
24	P/L	Heated oxygen sensor 1 heater	**[Engine is running]** ● **Warm-up condition** ● Engine speed is below 3,600 rpm.	Approximately 7.0V  PBIB0519E
			[Engine is running] ● Engine speed is above 3,600 rpm.	BATTERY VOLTAGE (11 - 14V)
34	G	Intake air temperature sensor	**[Engine is running]**	Approximately 0 - 4.8V Output voltage varies with intake air temperature.
35	PU	Heated oxygen sensor 1	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V (Periodically change)
45	R	Sensor's power supply	**[Ignition switch "ON"]**	Approximately 5V
46	R	Sensor's power supply (Refrigerant pressure sensor)	**[Ignition switch "ON"]**	Approximately 5V
47	G	Sensor's power supply	**[Ignition switch "ON"]**	Approximately 5V
49	W	Throttle position sensor 1	**[Ignition switch "ON"]** ● Shift lever position is "D" (CVT model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully released	More than 0.36V
			[Ignition switch "ON"] ● Shift lever position is "D" (CVT model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully depressed	Less than 4.75V

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
50	B	Mass air flow sensor	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.1 - 1.5V
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,500 rpm.	1.6 - 2.0V
54	W	Sensors' ground (Mass air flow sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
55	B	Sensors' ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
60 61 79 80	L/Y Y/R GY/L PU/G	Ignition signal No. 3 Ignition signal No. 1 Ignition signal No. 4 Ignition signal No. 2	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0 - 0.1V★  PBIB0521E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - 0.2V★  PBIB0522E
62	Y	Intake valve timing control solenoid valve	**[Engine is running]** ● **Warm-up condition** ● Idle speed	BATTERY VOLTAGE (11 - 14V)  MBIB0052E
			[Engine is running] ● **Warm-up condition** ● When revving engine up to 2,000 rpm quickly	Approximately 4V - BATTERY VOLTAGE (11 - 14V)★  PBIB0532E
65	R	Sensor's power supply (Power steering pressure sensor)	**[Ignition switch "ON"]**	Approximately 5V
66	B	Sensors' ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
68	R	Throttle position sensor 2	**[Ignition switch "ON"]** ● Shift lever position is "D" (CVT model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully released	Less than 4.75V
			[Ignition switch "ON"] ● Shift lever position is "D" (CVT model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully depressed	More than 0.36V
69	L	Refrigerant pressure sensor	**[Engine is running]** ● **Warm-up condition** ● Both A/C switch and blower switch are "ON" (Compressor operates.)	1.0 - 4.0V
72	L/OR	Engine coolant temperature sensor	**[Engine is running]**	Approximately 0 - 4.8V Output voltage varies with engine coolant temperature.
74	B	Sensors' ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
84	R/Y	Electrical load signal (Headlamp signal)	**[Ignition switch "ON"]** ● Lighting switch is "2ND" position	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"] ● Lighting switch is "OFF"	Approximately 0V
85	LG	DATA link connector	**[Ignition switch "ON"]** ● CONSULT-II or GST is disconnected.	BATTERY VOLTAGE (11 - 14V)
86	R	CAN communication line	**[Ignition switch "ON"]**	1.0 - 2.5V
92*	GY	Accelerator pedal position sensor signal output	**[Ignition switch "ON"]** ● Shift lever position is "D" (CVT models) ● Shift lever position is "1st" (M/T models) ● Accelerator pedal fully released	Approximately 0.5V
			[Ignition switch "ON"] ● Shift lever position is "D" (CVT models) ● Shift lever position is "1st" (M/T models) ● Accelerator pedal fully depressed	Approximately 4.2V
94	L	CAN communication line	**[Ignition switch "ON"]**	2.5 - 4.0V
98	LG	Accelerator pedal position sensor 2	**[Ignition switch "ON"]** ● Shift lever position is "D" (CVT models) ● Shift lever position is "1st" (M/T models) ● Accelerator pedal fully released	0.175 - 0.335V
			[Ignition switch "ON"] ● Shift lever position is "D" (CVT models) ● Shift lever position is "1st" (M/T models) ● Accelerator pedal fully depressed	More than 1.95V
101	R/G	Stop lamp switch	**[Ignition switch "ON"]** ● Brake pedal fully released	Approximately 0V
			[Ignition switch "ON"] ● Brake pedal fully depressed	BATTERY VOLTAGE (11 - 14V)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
102	P (CVT) L (M/T)	PNP switch	**[Ignition switch "ON"]** ● Gear position is "P" or "N"	Approximately 0V
			[Ignition switch "ON"] ● Except the above gear position	**CVT models** BATTERY VOLTAGE (11 - 14V) **M/T models** Approximately 5V
103*	L/OR	Tachometer signal output	**[Engine is running]** ● **Warm-up condition** ● Idle speed	10 - 11V★  MBIB0053E
			[Engine is running] ● Engine speed is 2,000 rpm	10 - 11V★  MBIB0054E
104	OR	Throttle control motor relay	**[Ignition switch "OFF"]**	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"]	0 - 1.0V
106	L	Accelerator pedal position sensor 1	**[Ignition switch "ON"]** ● Shift lever position is "D" (CVT models) ● Shift lever position is "1st" (M/T models) ● Accelerator pedal fully released	0.35 - 0.67V
			[Ignition switch "ON"] ● Shift lever position is "D" (CVT models) ● Shift lever position is "1st" (M/T models) ● Accelerator pedal fully depressed	More than 3.9V
109	B/R	Ignition switch	**[Ignition switch "OFF"]**	0V
			[Ignition switch "ON"]	BATTERY VOLTAGE (11 - 14V)
111	W/G	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch "OFF"]** ● For 5 seconds after turning ignition switch "OFF"	0 - 1.0V
			[Ignition switch "OFF"] ● 5 seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
113	B/P	Fuel pump relay	**[Ignition switch "ON"]** ● For 1 seconds after turning ignition switch "ON" **[Engine is running]**	0 - 1.0V
			[Ignition switch "ON"] ● More than 1 seconds after turning ignition switch "ON".	BATTERY VOLTAGE (11 - 14V)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
115 116	B B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
119 120	W/R W/R	Power supply for ECM	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)
121	W/L	Power supply for ECM (Buck-up)	**[Ignition switch "OFF"]**	BATTERY VOLTAGE (11 - 14V)

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)
*: CVT models

CONSULT-II Function

EBS00GYE

FUNCTION

Diagnostic test mode	Function
Work support	This mode enables a technician to adjust some devices faster and more accurately by following the indications on the CONSULT-II unit.
Self-diagnostic results	Self-diagnostic results such as 1st trip DTC, DTCs and 1st trip freeze frame data or freeze frame data can be read and erased quickly.*
Data monitor	Input/Output data in the ECM can be read.
Data monitor (SPEC)	Input/Output of the specification for Basic fuel schedule, AFM, A/F feedback control value and the other data monitor items can be read.
Active test	Diagnostic Test Mode in which CONSULT-II drives some actuators apart from the ECMs and also shifts some parameters in a specified range.
Function test	This mode is used to inform customers when their vehicle condition requires periodic maintenance.
ECM part number	ECM part number can be read.

*: The following emission-related diagnostic information is cleared when the ECM memory is erased.

- Diagnostic trouble codes
- 1st trip diagnostic trouble codes
- Freeze frame data
- 1st trip freeze frame data
- Others

ENGINE CONTROL COMPONENT PARTS/CONTROL SYSTEMS APPLICATION

		Item	DIAGNOSTIC TEST MODE					
			WORK SUPPORT	SELF-DIAGNOSTIC RESULTS		DATA MONITOR	DATA MONITOR (SPEC)	ACTIVE TEST
				DTC*1	FREEZE FRAME DATA*2			
ENGINE CONTROL COMPONENT PARTS	INPUT	Crankshaft position sensor (POS)		×	×	×	×	
		Camshaft position sensor (PHASE)		×		×	×	
		Mass air flow sensor		×		×	×	
		Engine coolant temperature sensor		×	×	×	×	×
		Heated oxygen sensor 1		×		×	×	
		Heated oxygen sensor 2				×	×	
		Vehicle speed signal		×	×	×	×	
		Accelerator pedal position sensor		×		×	×	
		Throttle position sensor		×		×	×	
		Intake air temperature sensor				×	×	
		Knock sensor		×				
		Refrigerant pressure sensor				×	×	
		Closed throttle position switch (accelerator pedal position sensor signal)				×	×	
		Air conditioner switch				×	×	
		Park/neutral position (PNP) switch				×	×	
		Stop lamp switch		×		×	×	
		Power steering pressure sensor		×		×	×	
		Battery voltage				×	×	
		Electrical load signal				×	×	
ENGINE CONTROL COMPONENT PARTS	OUTPUT	Injectors				×	×	×
		Power transistor (Ignition timing)				×	×	×
		Throttle control motor relay		×		×	×	
		Throttle control motor		×				
		EVAP canister purge volume control solenoid valve				×	×	×
		Air conditioner relay				×	×	
		Fuel pump relay	×			×	×	×
		Cooling fan relay		×		×	×	×
		Heated oxygen sensor 1 heater				×	×	
		Heated oxygen sensor 2 heater				×	×	
		Intake valve timing control solenoid valve				×	×	×

X: Applicable

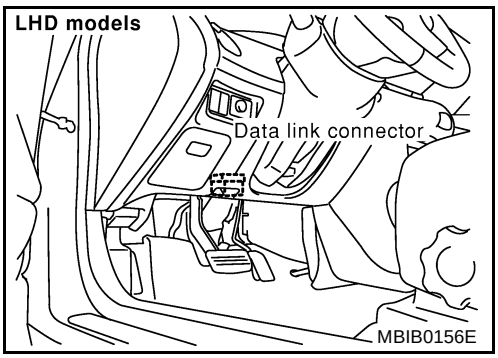
*1: This item includes 1st trip DTCs.

*2: This mode includes 1st trip freeze frame data or freeze frame data. The items appear on CONSULT-II screen in freeze frame data mode only if a 1st trip DTC or DTC is detected. For details, refer to EC-1446 .

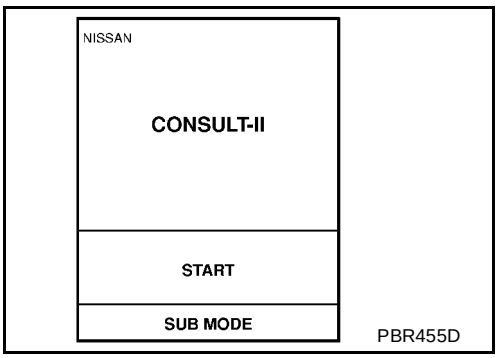
CONSULT-II INSPECTION PROCEDURE

1. Turn ignition switch OFF.

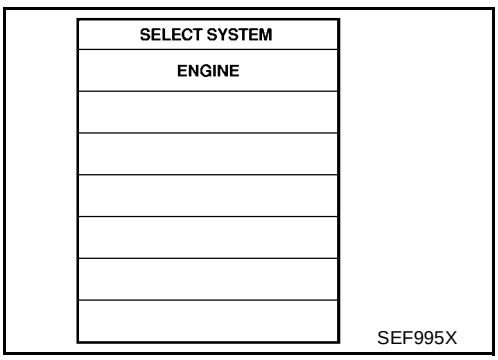
2. Connect “CONSULT-II” to data link connector, which is located under drivers side dash panel.
3. Turn ignition switch ON.



4. Touch “START”.

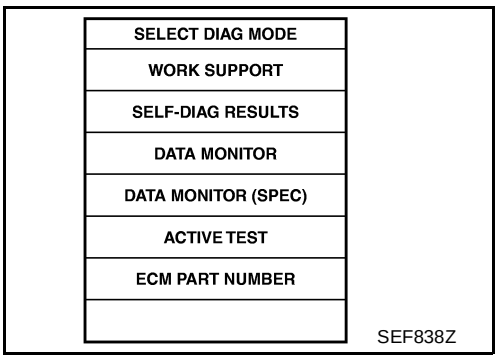


5. Touch “ENGINE”.



6. Perform each diagnostic test mode according to each service procedure.

For further information, see the CONSULT-II Operation Manual.



WORK SUPPORT MODE

Work Item

WORK ITEM	CONDITION	USAGE
FUEL PRESSURE RELEASE	● FUEL PUMP WILL STOP BY TOUCHING “START” DURING IDLING. CRANK A FEW TIMES AFTER ENGINE STALLS.	When releasing fuel pressure from fuel line
IDLE AIR VOL LEARN	● THE IDLE AIR VOLUME THAT KEEPS THE ENGINE WITHIN THE SPECIFIED RANGE IS MEMORIZED IN ECM.	When learning the idle air volume

WORK ITEM	CONDITION	USAGE
SELF-LEARNING CONT	● THE COEFFICIENT OF SELF-LEARNING CONTROL MIXTURE RATIO RETURNS TO THE ORIGINAL COEFFICIENT.	When clearing the coefficient of self-learning control value
TARGET IDLE RPM ADJ*	● IDLE CONDITION	When setting target idle speed
TARGET IGN TIM ADJ*	● IDLE CONDITION	When adjusting target ignition timing After adjustment, confirm target ignition timing with a timing light.

*: This function is not necessary in the usual service procedure.

SELF-DIAG RESULTS MODE

Self Diagnostic Item

Regarding items of “DTC and 1st trip DTC”, refer to EC-1415, "INDEX FOR DTC" .)

Freeze Frame Data and 1st Trip Freeze Frame Data

Freeze frame data item*	Description
DIAG TROUBLE CODE [PXXXX]	● The engine control component part/control system has a trouble code, it is displayed as “PXXXX”. (Refer to EC-1415, "INDEX FOR DTC" .)
FUEL SYS-B1	● “Fuel injection system status” at the moment a malfunction is detected is displayed. ● One mode in the following is displayed. “MODE 2”: Open loop due to detected system malfunction “MODE 3”: Open loop due to driving conditions (power enrichment, deceleration enrichment) “MODE 4”: Closed loop - using oxygen sensor(s) as feedback for fuel control “MODE 5”: Open loop - has not yet satisfied condition to go to closed loop
COOLANT TEMP [°C] or [°F]	● The engine coolant temperature at the moment a malfunction is detected is displayed.
L-FUEL TRIM-B1 [%]	● “Long-term fuel trim” at the moment a malfunction is detected is displayed. ● The long-term fuel trim indicates much more gradual feedback compensation to the base fuel schedule than short-term fuel trim.
S-FUEL TRIM-B1 [%]	● “Short-term fuel trim” at the moment a malfunction is detected is displayed. ● The short-term fuel trim indicates dynamic or instantaneous feedback compensation to the base fuel schedule.
ENGINE SPEED [rpm]	● The engine speed at the moment a malfunction is detected is displayed.
VHCL SPEED [km/h] or [mph]	● The vehicle speed at the moment a malfunction is detected is displayed.
B/FUEL SCHDL [msec]	● The base fuel schedule at the moment a malfunction is detected is displayed.
INT/A TEMP SE [°C] or [°F]	● The intake air temperature at the moment a malfunction is detected is displayed.

*: The items are the same as those of 1st trip freeze frame data.

DATA MONITOR MODE
Monitored Item

×: Applicable

Monitored item [Unit]	ECM INPUT SIGNALS	MAIN SIGNALS	CAN DIAG SUPPORT MNTR	Description	Remarks
ENG SPEED [rpm]	×	×		● Indicates the engine speed computed from the signals of the crankshaft position sensor (POS) and camshaft position sensor (PHASE).	● Accuracy becomes poor if engine speed drops below the idle rpm. ● If the signal is interrupted while the engine is running, an abnormal value may be indicated.
MAS A/F SE-B1 [V]	×	×		● The signal voltage of the mass air flow sensor is displayed.	● When the engine is stopped, a certain value is indicated.
B/FUEL SCHDL [msec]		×		● “Base fuel schedule” indicates the fuel injection pulse width programmed into ECM, prior to any learned on board correction.	
A/F ALPHA-B1 [%]		×		● The mean value of the air-fuel ratio feedback correction factor per cycle is indicated.	● When the engine is stopped, a certain value is indicated. ● This data also includes the data for the air-fuel ratio learning control.
COOLAN TEMP/S [°C] or [°F]	×	×		● The engine coolant temperature (determined by the signal voltage of the engine coolant temperature sensor) is displayed.	● When the engine coolant temperature sensor is open or short-circuited, ECM enters fail-safe mode. The engine coolant temperature determined by the ECM is displayed.
HO2S1 (B1) [V]	×	×		● The signal voltage of the heated oxygen sensor 1 is displayed.	
HO2S2 (B1) [V]	×			● The signal voltage of the heated oxygen sensor 2 is displayed.	
HO2S1 MNTR (B1) [RICH/LEAN]	×	×		● Display of heated oxygen sensor 1 signal during air-fuel ratio feedback control: RICH ... means the mixture became “rich”, and control is being affected toward a leaner mixture. LEAN ... means the mixture became “lean”, and control is being affected toward a rich mixture.	● After turning ON the ignition switch, “RICH” is displayed until air-fuel mixture ratio feedback control begins. ● When the air-fuel ratio feedback is clamped, the value just before the clamping is displayed continuously.
HO2S2 MNTR (B1) [RICH/LEAN]	×			● Display of heated oxygen sensor 2 signal: RICH ... means the amount of oxygen after three way catalyst is relatively small. LEAN ... means the amount of oxygen after three way catalyst is relatively large.	● When the engine is stopped, a certain value is indicated.
VHCL SPEED SE [km/h] or [mph]	×	×		● The vehicle speed computed from the vehicle speed signal is displayed.	
BATTERY VOLT [V]	×	×		● The power supply voltage of ECM is displayed.	
ACCEL SEN 1 [V]	×	×		● The accelerator pedal position sensor signal voltage is displayed.	
ACCEL SEN 2 [V]	×				

Monitored item [Unit]	ECM INPUT SIG-NALS	MAIN SIG-NALS	CAN DIAG SUP-PORT MNTR	Description	Remarks
THRTL SEN 1 [V]	×	×		● The throttle position sensor signal voltage is displayed.	
THRTL SEN 2 [V]	×				
INT/A TEMP SE [°C] or [°F]	×	×		● The intake air temperature (determined by the signal voltage of the intake air temperature sensor) is indicated.	
START SIGNAL [ON/OFF]	×	×		● Indicates start signal status [ON/OFF] computed by the ECM according to the signals of engine speed and battery voltage.	● After starting the engine, [OFF] is displayed regardless of the starter signal.
CLSD THL POS [ON/OFF]	×	×		● Indicates idle position [ON/OFF] computed by ECM according to the accelerator pedal position sensor signal.	
AIR COND SIG [ON/OFF]	×	×		● Indicates [ON/OFF] condition of the air conditioner switch as determined by the air conditioner signal.	
P/N POSI SW [ON/OFF]	×	×		● Indicates [ON/OFF] condition from the park/neutral position (PNP) switch signal.	
PW/ST SIGNAL [ON/OFF]	×	×		● [ON/OFF] condition of the power steering oil pressure switch as determined by the power steering oil pressure signal is indicated.	
LOAD SIGNAL [ON/OFF]	×	×		● Indicates [ON/OFF] condition from the electrical load signal. ON ... Rear window defogger switch is ON and/or lighting switch is in 2nd position. OFF ... Both rear window defogger switch and lighting switch are OFF.	
IGNITION SW [ON/OFF]	×			● Indicates [ON/OFF] condition from ignition switch.	
HEATER FAN SW [ON/OFF]	×			● Indicates [ON/OFF] condition from the heater fan switch signal.	
BRAKE SW [ON/OFF]	×			● Indicates [ON/OFF] condition from the stop lamp switch signal.	
INJ PULSE-B1 [msec]		×		● Indicates the actual fuel injection pulse width compensated by ECM according to the input signals.	● When the engine is stopped, a certain computed value is indicated.
IGN TIMING [BTDC]		×		● Indicates the ignition timing computed by ECM according to the input signals.	● When the engine is stopped, a certain value is indicated.
PURG VOL C/V [%]				● Indicates the EVAP canister purge volume control solenoid valve control value computed by the ECM according to the input signals. ● The opening becomes larger as the value increases.	
INT/V TIM (B1) [°CA]				● Indicates [°CA] of intake camshaft advanced angle.	

Monitored item [Unit]	ECM INPUT SIG-NALS	MAIN SIG-NALS	CAN DIAG SUP-PORT MNTR	Description	Remarks
INT/V SOL (B1) [%]				● The control condition of the intake valve timing control solenoid valve (determined by ECM according to the input signals) is indicated. ON ... intake valve timing control is operating. OFF ... Intake valve timing control is not operating.	
AIR COND RLY [ON/OFF]		×		● The air conditioner relay control condition (determined by ECM according to the input signals) is indicated.	
FUEL PUMP RLY [ON/OFF]		×		● Indicates the fuel pump relay control condition determined by ECM according to the input signals.	
THRTL RELAY [ON/OFF]		×		● Indicates the throttle control motor relay control condition determined by the ECM according to the input signals.	
COOLING FAN [HI/LOW/OFF]				● Indicates the condition of the cooling fan (determined by ECM according to the input signals). HI ... High speed operation LOW ... Low speed operation OFF ... Stop	
HO2S1 HTR (B1) [ON/OFF]				● Indicates [ON/OFF] condition of heated oxygen sensor 1 heater determined by ECM according to the input signals.	
HO2S2 HTR (B1) [ON/OFF]				● Indicates [ON/OFF] condition of heated oxygen sensor 2 heater determined by ECM according to the input signals.	
I/P PULLY SPD [rpm]	×			● Indicates the engine speed computed from the primary speed sensor signal.	
VEHICLE SPEED [km/h] or [mph]	×			● Indicates the vehicle speed computed from the secondary speed sensor signal.	
IDL A/V LEARN [YET/CMPLT/ INCMP]				● Display the condition of idle air volume learning YET ... Idle air volume learning has not been performed yet. CMPLT ... Idle air volume learning has already been performed successfully. INCMP ... Idle air volume learning has not been performed successfully.	
AC PRESS SEN [V]				● The signal voltage from the refrigerant pressure sensor is displayed.	
Voltage [V]				● Voltage, frequency, duty cycle or pulse width measured by the probe.	● Only “#” is displayed if item is unable to be measured. ● Figures with “#”s are temporary ones. They are the same figures as an actual piece of data which was just previously measured.
Frequency [msec], [Hz] or [%]					
DUTY-HI					
DUTY-LOW					
PLS WIDTH-HI					
PLS WIDTH-LOW					

Monitored item [Unit]	ECM INPUT SIG-NALS	MAIN SIG-NALS	CAN DIAG SUP-PORT MNTR	Description	Remarks
CAN COMM [OK/NG]			×	● Indicates the communication condition of CAN communication line.	● These items are not displayed in "SELECTION FROM MENU" mode.
CAN CIRC 1 [OK/UNKWN]			×		
CAN CIRC 2 [OK/UNKWN]			×		
CAN CIRC 3 [OK/UNKWN]			×		
CAN CIRC 4 [OK/UNKWN]			×		
CAN CIRC 5 [OK/UNKWN]			×		
CAN CIRC 6 [OK/UNKWN]			×		
CAN CIRC 7 [OK/UNKWN]			×		

NOTE:
- Any monitored item that does not match the vehicle being diagnosed is deleted from the display automatically.

DATA MONITOR (SPEC) MODE
Monitored Item

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
ENG SPEED [rpm]	×		● Indicates the engine speed computed from the signal of the crankshaft position sensor (POS).	
MAS A/F SE-B1 [V]	×	×	● The signal voltage of the mass air flow sensor specification is displayed.	● When engine is running specification range is indicated.
B/FUEL SCHDL [msec]			● “Base fuel schedule” indicates the fuel injection pulse width programmed into ECM, prior to any learned on board correction.	● When engine is running specification range is indicated.
A/F ALPHA-B1 [%]		×	● The mean value of the air-fuel ratio feedback correction factor per cycle is indicated.	● When engine is running specification range is indicated. ● This data also includes the data for the air-fuel ratio learning control.

NOTE:
- Any monitored item that does not match the vehicle being diagnosed is deleted from the display automatically.

ACTIVE TEST MODE

Test Item

TEST ITEM	CONDITION	JUDGEMENT	CHECK ITEM (REMEDY)
FUEL INJECTION	● Engine: Return to the original trouble condition ● Change the amount of fuel injection using CONSULT-II.	If trouble symptom disappears, see CHECK ITEM.	● Harness and connectors ● Fuel injectors ● Heated oxygen sensor 1
IGNITION TIMING	● Engine: Return to the original trouble condition ● Timing light: Set ● Retard the ignition timing using CONSULT-II.	If trouble symptom disappears, see CHECK ITEM.	● Perform “Idle Air Volume Learning”.
POWER BALANCE	● Engine: After warming up, idle the engine. ● A/C switch “OFF” ● Shift lever “N” ● Cut off each injector signal one at a time using CONSULT-II.	Engine runs rough or dies.	● Harness and connectors ● Compression ● Fuel injectors ● Power transistor ● Spark plugs ● Ignition coils
COOLING FAN	● Ignition switch: ON ● Turn the cooling fan “ON” and “OFF” with CONSULT-II.	Cooling fan moves and stops.	● Harness and connectors ● Cooling fan relay ● Cooling fan motor
ENG COOLANT TEMP	● Engine: Return to the original trouble condition ● Change the engine coolant temperature using CONSULT-II.	If trouble symptom disappears, see CHECK ITEM.	● Harness and connectors ● Engine coolant temperature sensor ● Fuel injectors
FUEL PUMP RELAY	● Ignition switch: ON (Engine stopped) ● Turn the fuel pump relay “ON” and “OFF” using CONSULT-II and listen to operating sound.	Fuel pump relay makes the operating sound.	● Harness and connectors ● Fuel pump relay
PURG VOL CONT/V	● Engine: After warming up, run engine at 1,500 rpm. ● Change the EVAP canister purge volume control solenoid valve opening percent using CONSULT-II.	Engine speed changes according to the opening percent.	● Harness and connectors ● Solenoid valve
V/T ASSIGN ANGLE	● Engine: Return to the original trouble condition ● Change intake valve timing using CONSULT-II.	If trouble symptom disappears, see CHECK ITEM.	● Harness and connectors ● Intake valve timing control solenoid valve

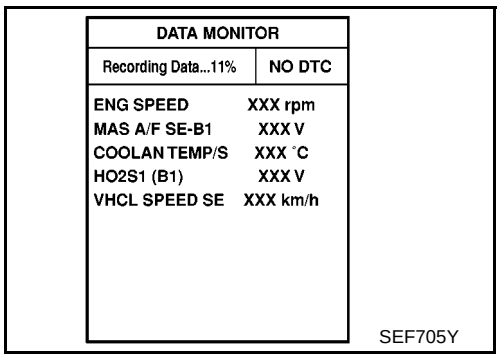
REAL TIME DIAGNOSIS IN DATA MONITOR MODE (RECORDING VEHICLE DATA)

Description

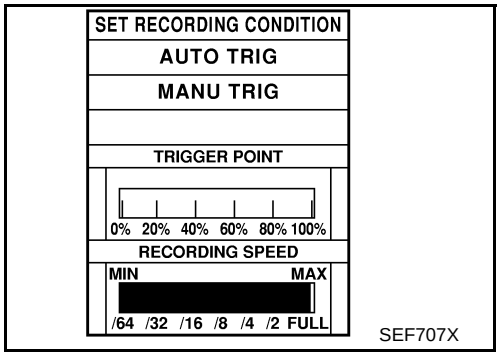
CONSULT-II has two kinds of triggers and they can be selected by touching “SETTING” in “DATA MONITOR” mode.

1. “AUTO TRIG” (Automatic trigger):

- The malfunction will be identified on the CONSULT-II screen in real time.
  In other words, DTC/1st trip DTC and malfunction item will be displayed if the malfunction is detected by ECM.
  At the moment a malfunction is detected by ECM, “MONITOR” in “DATA MONITOR” screen is changed to “Recording Data ... xx%” as shown at right, and the data after the malfunction detection is recorded. Then when the percentage reached 100%, “REAL-TIME DIAG” screen is displayed. If “STOP” is touched on the screen during “Recording Data ... xx%”, “REAL-TIME DIAG” screen is also displayed.
  The recording time after the malfunction detection and the recording speed can be changed by “TRIGGER POINT” and “Recording Speed”. Refer to CONSULT-II OPERATION MANUAL.

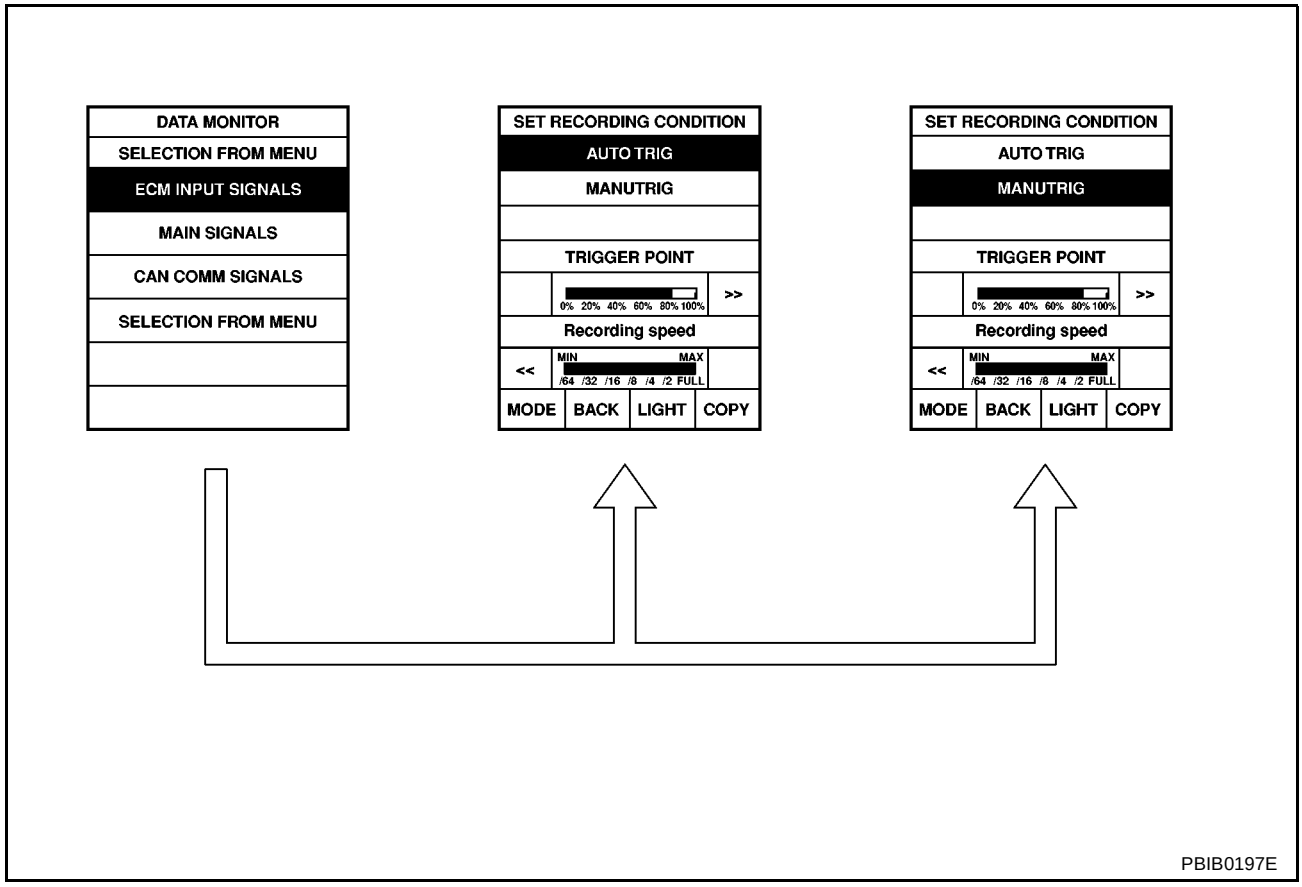


2. “MANU TRIG” (Manual trigger):
   - DTC/1st trip DTC and malfunction item will not be displayed automatically on CONSULT-II screen even though a malfunction is detected by ECM.
     DATA MONITOR can be performed continuously even though a malfunction is detected.



Operation

1. “AUTO TRIG”
   - While trying to detect the DTC/1st trip DTC by performing the “DTC Confirmation Procedure”, be sure to select to “DATA MONITOR (AUTO TRIG)” mode. You can confirm the malfunction at the moment it is detected.
   - While narrowing down the possible causes, CONSULT-II should be set in “DATA MONITOR (AUTO TRIG)” mode, especially in case the incident is intermittent.
     When you are inspecting the circuit by gently shaking (or twisting) the suspicious connectors, components and harness in the “DTC Confirmation Procedure”, the moment a malfunction is found the DTC/1st trip DTC will be displayed. (Refer to “Incident Simulation Tests” in GI-24, "How to Perform Efficient Diagnosis for an Electrical Incident" .)
2. “MANU TRIG”
   - If the malfunction is displayed as soon as “DATA MONITOR” is selected, reset CONSULT-II to “MANU TRIG”. By selecting “MANU TRIG” you can monitor and store the data. The data can be utilized for further diagnosis, such as a comparison with the value for the normal operating condition.



PBIB0197E

CONSULT-II Reference Value in Data Monitor Mode

EBS00GYG

Remarks:
- Specification data are reference values.
- Specification data are output/input values which are detected or supplied by the ECM at the connector.
  * Specification data may not be directly related to their components signals/values/operations.
  i.e. Adjust ignition timing with a timing light before monitoring IGN TIMING, because the monitor may show the specification data in spite of the ignition timing not being adjusted to the specification data. This IGN TIMING monitors the data calculated by the ECM according to the signals input from the camshaft position sensor and other ignition timing related sensors.

MONITOR ITEM	CONDITION		SPECIFICATION
ENG SPEED	● Tachometer: Connect ● Run engine and compare tachometer indication with the CONSULT-II value.		Almost the same speed as the CONSULT-II value.
MAS A/F SE-B1	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: N ● No-load	Idle	Approx. 1.1 - 1.5V
		2,500 rpm	Approx. 1.6 - 2.0V
B/FUEL SCHDL	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	2.5 - 3.5 msec
		2,000 rpm	2.5 - 3.5 msec
A/F ALPHA-B1	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	54% - 155%
COOLAN TEMP/S	● Engine: After warming up		More than 70°C (158°F)
HO2S1 (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S2 (B1)	● Engine: After warming up	Revving engine from idle to 3,000 rpm quickly.	0 - 0.3V ←→ Approx. 0.6 - 1.0V

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S1 MNTR (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	LEAN ←→ RICH Changes more than 5 times during 10 seconds.
HO2S2 MNTR (B1)	● Engine: After warming up	Revving engine from idle to 3,000 rpm quickly.	LEAN ←→ RICH
VEH SPEED SE	● Turn drive wheels and compare speedometer indication with the CONSULT-II value.		Almost the same speed as the CONSULT-II value
BATTERY VOLT	● Ignition switch: ON (Engine stopped)		11 - 14V
ACCEL SEN1 ACCEL SEN2	● Ignition switch: ON (engine stopped)	Accelerator pedal: Fully released	0.35 - 0.67V
		Accelerator pedal: Fully depressed	More than 3.9V
THRTL SEN1 THRTL SEN2	● Ignition switch: ON (Engine stopped) ● Shift lever: D (CVTCVT model) 1st (M/T model)	Accelerator pedal: Fully released	More than 0.36V
		Accelerator pedal: Fully depressed	Less than 4.75V
START SIGNAL	● Ignition switch: ON → START → ON		OFF → ON → OFF
CLSD THL POS	● Ignition switch: ON	Accelerator pedal: Fully released	ON
		Accelerator pedal: Slightly depressed	OFF
AIR COND SIG	● Engine: After warming up, idle the engine	Air conditioner switch: OFF	OFF
		Air conditioner switch: ON (Compressor operates.)	ON
P/N POSI SW	● Ignition switch: ON	Shift lever: P or N (CVT model) Neutral (M/T model)	ON
		Shift lever: Except above	OFF
PW/ST SIGNAL	● Engine: After warming up, idle the engine	Steering wheel is in neutral position. (Forward direction)	OFF
		Steering wheel is turned.	ON
LOAD SIGNAL	● Ignition switch: ON	Rear window defogger switch is ON and/or lighting switch is in 2nd.	ON
		Rear window defogger switch is OFF and lighting switch is OFF.	OFF
IGNITION SW	● Ignition switch: ON → OFF → ON		ON → OFF → ON
HEATER FAN SW	● Engine: After warming up, idle the engine	Heater fan is operating.	ON
		Heater fan is not operating	OFF
BRAKE SW	● Ignition switch: ON	Brake pedal: Fully released	OFF
		Brake pedal: Slightly depressed	ON
INJ PULSE-B1	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	2.0 - 3.0 msec
		2,000 rpm	1.9 - 2.9 msec
IGN TIMING	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	M/T 12° - 16° BTDC CVT 13° - 17° BTDC
		2,000 rpm	25° - 45° BTDC
PURG VOL C/V	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	0%
		2,000 rpm	20 - 30%

MONITOR ITEM	CONDITION		SPECIFICATION
INT/V TIM (B1)	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	–5° - 5°CA
		When revving up to 2,000 rpm quickly	Approx. 0° - 20°CA
INT/V SOL (B1)	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	0% - 2%
		When revving up to 2,000 rpm quickly	Approx. 0% - 50%
AIR COND RLY	● Engine: After warming up, idle the engine	Air conditioner switch: OFF	OFF
		Air conditioner switch: ON (Compressor operates)	ON
FUEL PUMP RLY	● For 1 seconds after turning ignition switch ON ● Engine running or cranking		ON
	● Except above conditions		OFF
THRTL RELAY	● Ignition switch: ON		ON
COOLING FAN	● Engine: After warming up, idle the engine ● Air conditioner switch: OFF	Engine coolant temperature is 94°C (201°F) or less	OFF
		Engine coolant temperature is between 95°C (203°F) and 99°C (210°F)	LOW
		Engine coolant temperature is 100°C (212°F) or more	HIGH
HO2S1 HTR (B1)	● Engine: After warming up ● Engine speed: Below 3,600 rpm		ON
	● Engine speed: Above 3,600 rpm		OFF
HO2S2 HTR (B1)	● Engine speed: Below 3,800 rpm [After driving for 2 minutes at a speed of 70 km/h (43 MPH) or more]		ON
	● Engine speed: Above 3,800 rpm		OFF
I/P PULLY SPD	● Vehicle speed: More than 20 km/h		Almost the same speed as the CONSULT-II value
VEHICLE SPEED	● Turn drive wheels and compare speedometer indication with the CONSULT-II value.		Almost the same speed as the CONSULT-II value
O2SEN HTR DTY	● Engine coolant temperature when engine started: More than 80°C (176°F) ● Engine speed: below 3,600 rpm		Approx. 50 %
AC PRESS SEN	● Ignition switch: ON (Engine stopped)		Approx. 0V
	● Engine: Idle ● Air conditioner switch: OFF		1.0 - 4.0V
CAN COMM	● Ignition switch: ON		OK
CAN CIRC 1			OK
CAN CIRC 2			OK or ONKWN
CAN CIRC 3			OK
CAN CIRC 4			OK
CAN CIRC 5			OK or UNKWN
CAN CIRC 6			OK
CAN CIRC 7			UNKWN

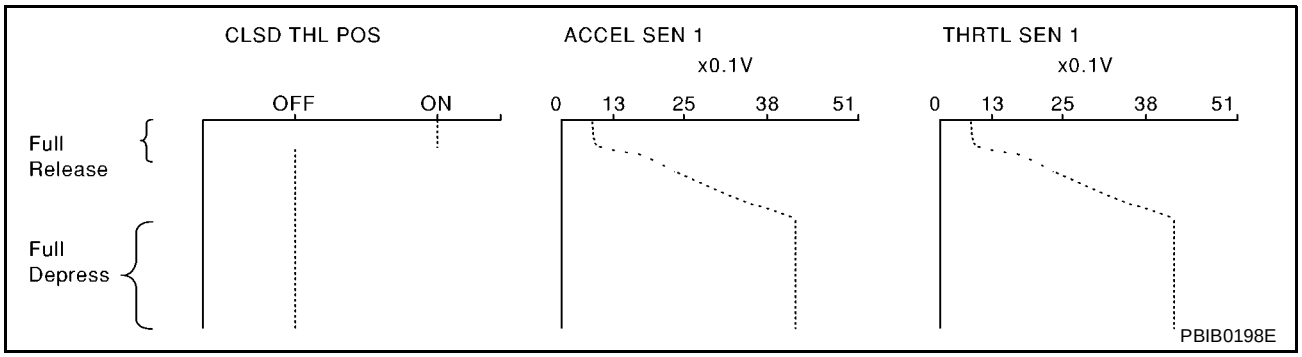
Major Sensor Reference Graph in Data Monitor Mode

EBS00GYH

The following are the major sensor reference graphs in “DATA MONITOR” mode.

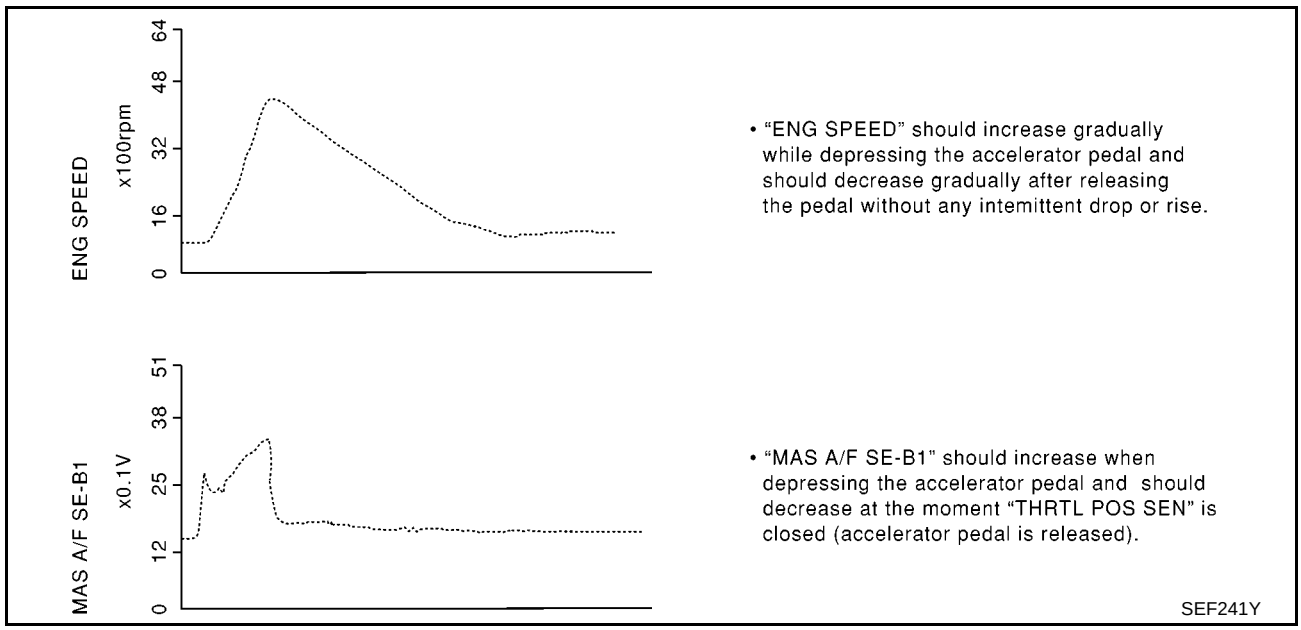
CLSD THL POS, ACCEL SEN 1, THRTL SEN 1

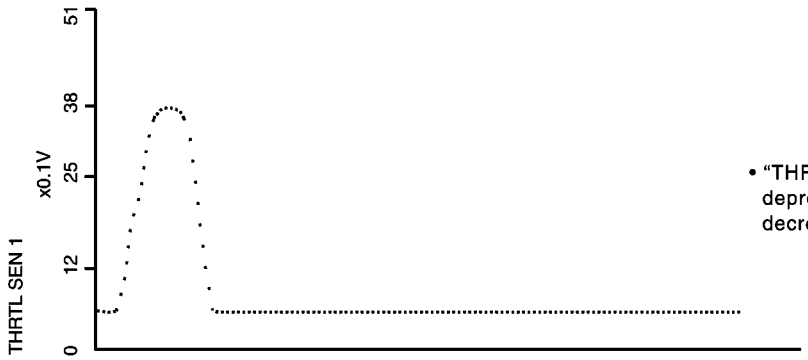
Below is the data for “CLSD THL POS”, “ACCEL SEN 1” and “THRTL SEN 1” when depressing the accelerator pedal with the ignition switch “ON” and with selector lever in "D" position (CVT models) or with shift lever in "1st" position (M/T models).
The signal of “ACCEL SEN 1” and “THRTL SEN 1” should rise gradually without any intermittent drop or rise after “CLSD THL POS” is changed from “ON” to “OFF”.



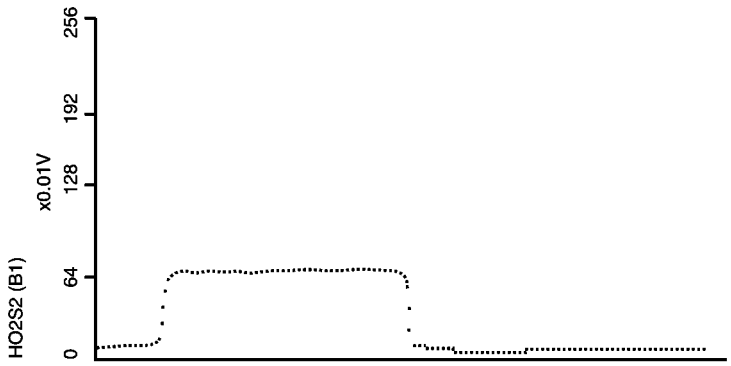
ENG SPEED, MAS A/F SE-B1, THRTL SEN 1, HO2S2 (B1), HO2S1 (B1), INJ PULSE-B1

Below is the data for “ENG SPEED”, “MAS A/F SE-B1”, “THRTL SEN 1”, “HO2S2 (B1)”, “HO2S1 (B1)” and “INJ PULSE-B1” when revving engine quickly up to 4,800 rpm under no load after warming up engine sufficiently.
Each value is for reference, the exact value may vary.

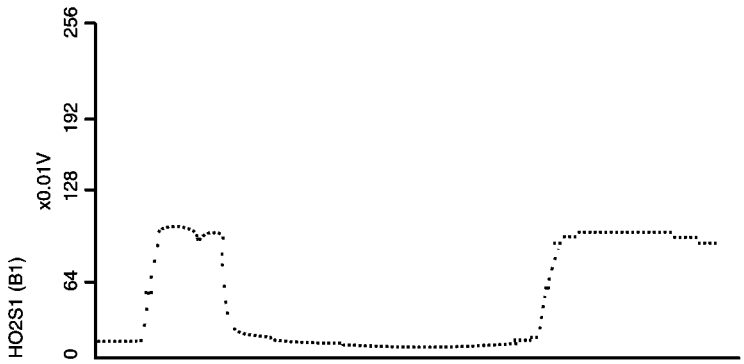




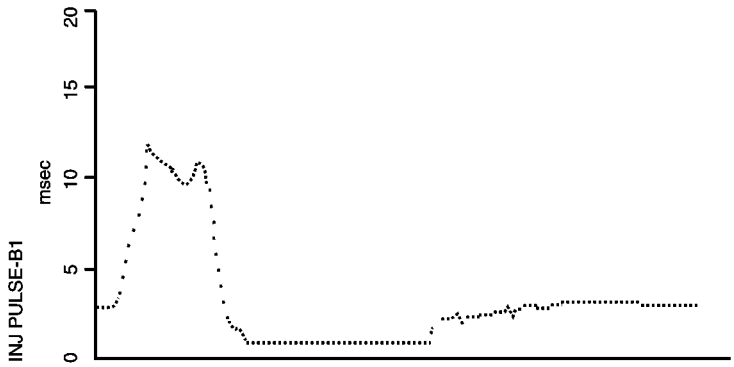
- "THRTL SEN 1" should increase while depressing the accelerator pedal and should decrease while releasing it.



- "HO2S2 (B1)" may increase immediately after depressing the accelerator pedal and may decrease after releasing the pedal.



- "HO2S1 (B1)" may increase immediately after depressing the accelerator pedal and may decrease after releasing the pedal.



- "INJ PULSE-B1" should increase when depressing the accelerator pedal and should decrease when the pedal is released.

PBIB0668E

TROUBLE DIAGNOSIS - SPECIFICATION VALUE

PFP:00031

Description

EBS00GYI

The specification (SP) value indicates the tolerance of the value that is displayed in “DATA MONITOR (SPEC)” mode of CONSULT-II during normal operation of the Engine Control System. When the value in “DATA MONITOR (SPEC)” mode is within the SP value, the Engine Control System is confirmed OK. When the value in “DATA MONITOR (SPEC)” mode is NOT within the SP value, the Engine Control System may have one or more malfunctions.
The SP value is used to detect malfunctions that may affect the Engine Control System, but will not light the MIL.
The SP value will be displayed for the following three items:

- B/FUEL SCHDL (The fuel injection pulse width programmed into ECM prior to any learned on board correction)
- A/F ALPHA-B1 (The mean value of air-fuel ratio feedback correction factor per cycle)
- MAS A/F SE-B1 (The signal voltage of the mass air flow sensor)

Testing Condition

EBS00GYJ

- Vehicle driven distance: More than 5,000 km (3,017 miles)
- Barometric pressure: 98.3 - 104.3 kPa (0.983 - 1.043 bar, 1.003 - 1.064 kg/cm^2 , 14.25 - 15.12 psi)
- Atmospheric temperature: 20 - 30°C (68 - 86°F)
- Engine coolant temperature: 75 - 95°C (167 - 203°F)
- Transmission: Warmed-up*1
- Electrical load: Not applied*2
- Engine speed: Idle

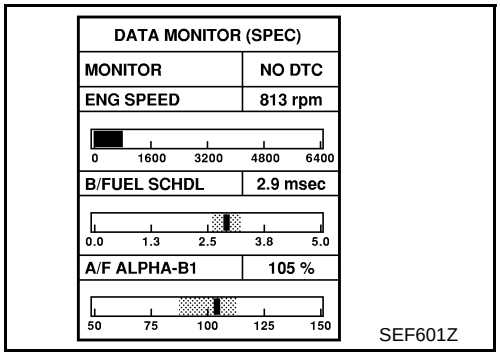
*1: For CVT models with CONSULT-II, after the engine is warmed up to normal operating temperature, drive vehicle until “FLUID TEMP SE” (CVT fluid temperature sensor signal) indicates more than 60°C (140°F).
For CVT models without CONSUT-II and M/T models, after the engine is warmed up to normal operating temperature, drive vehicle for 5 minutes.
*2: Rear window defogger switch, air conditioner switch, lighting switch are “OFF”. Steering wheel is straight ahead.

Inspection Procedure

EBS00GYK

NOTE:
Perform “DATA MONITOR (SPEC)” mode in maximum scale display.

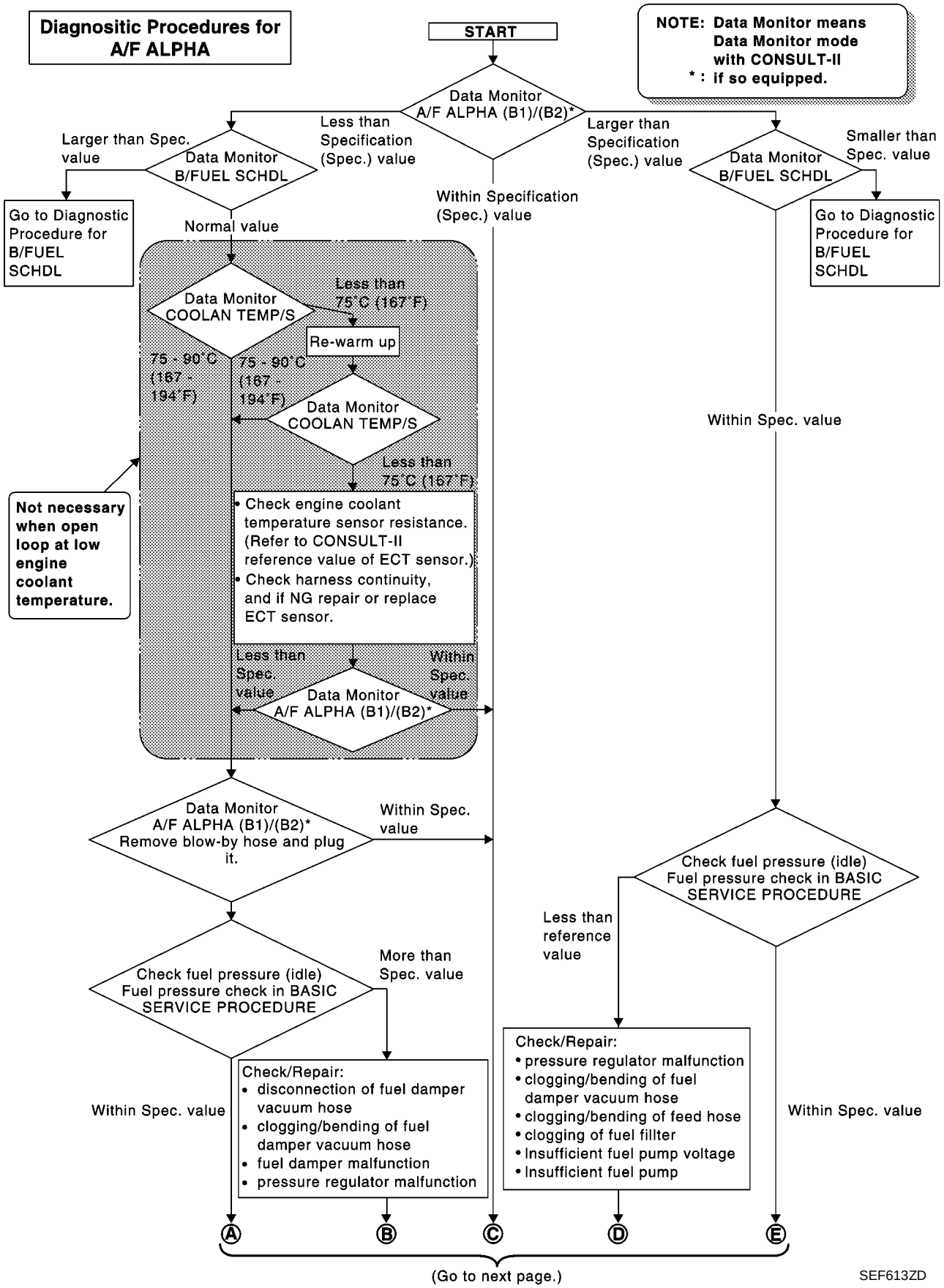
1. Perform EC-1457, "Basic Inspection" .
2. Confirm that the testing conditions indicated above are met.
3. Select “B/FUEL SCHDL”, “A/F ALPHA-B1” and “MAS A/F SE-B1” in “DATA MONITOR (SPEC)” mode with CONSULT-II.
4. Make sure that monitor items are within the SP value.
5. If NG, go to EC-1495, "Diagnostic Procedure" .

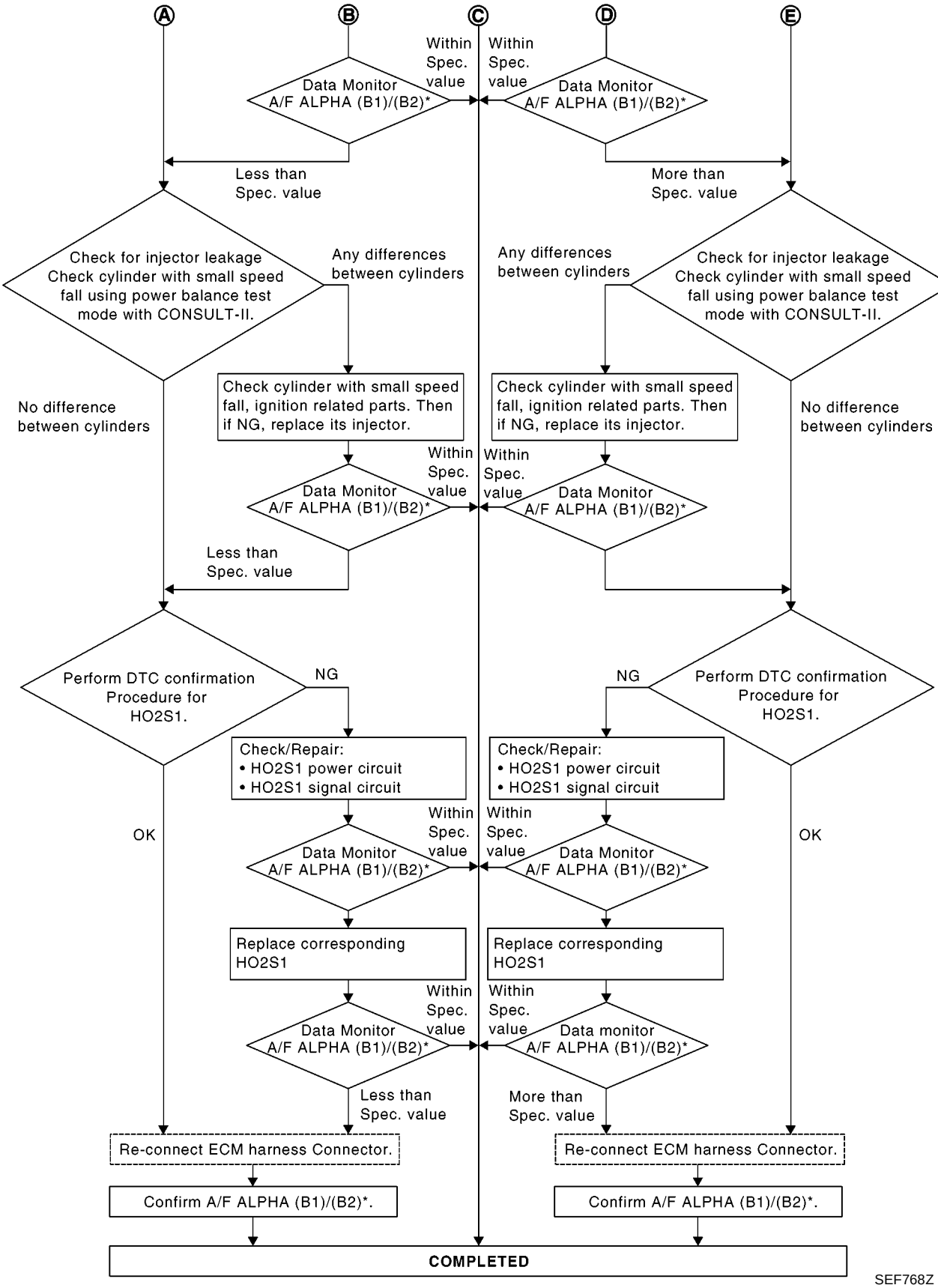


SEF601Z

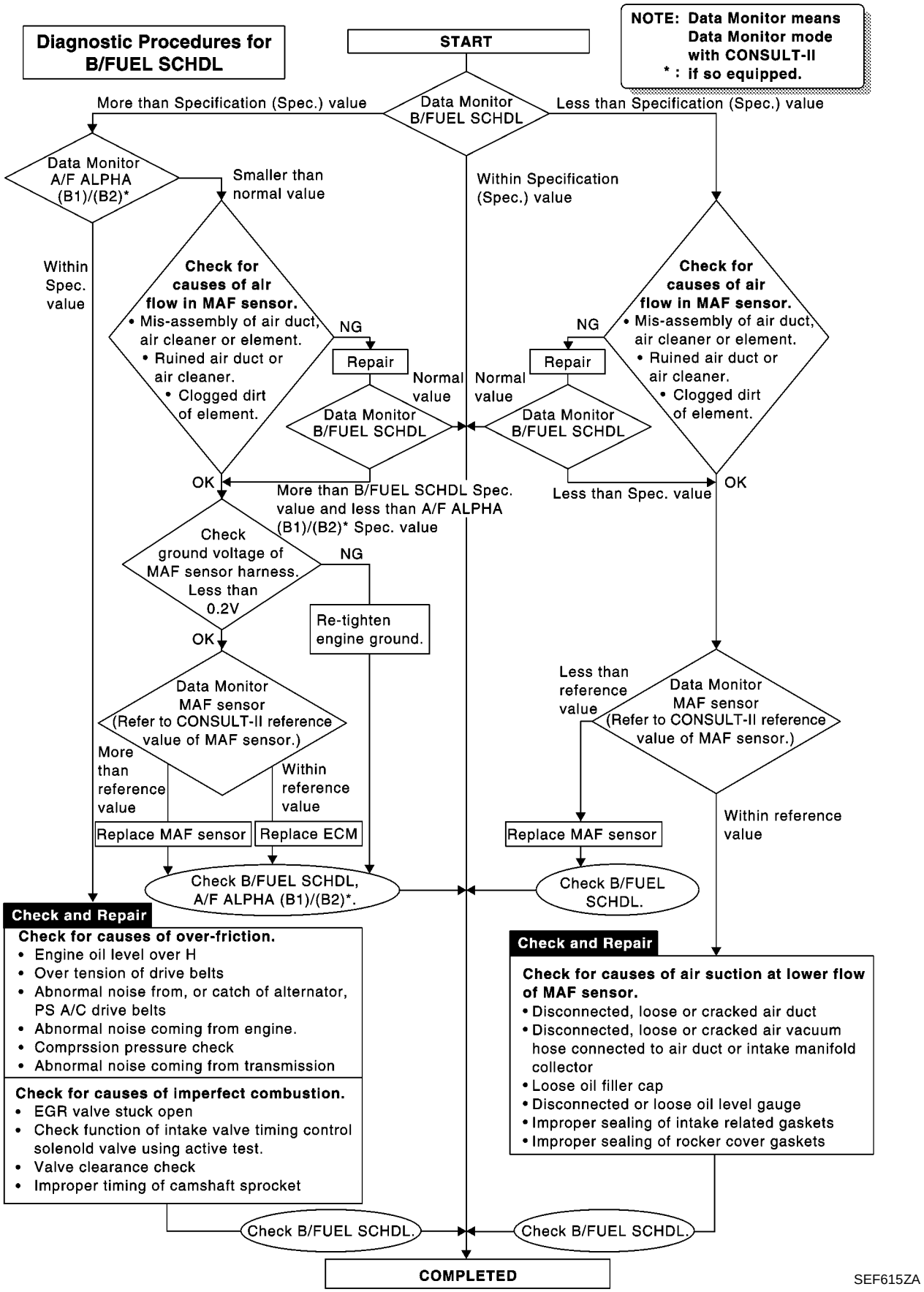
Diagnostic Procedure

EBS00GYL




Ⓐ
Ⓑ
Ⓒ
Ⓓ
Ⓔ
Within Spec. value
Within Spec. value
Data Monitor A/F ALPHA (B1)/(B2)*
Data Monitor A/F ALPHA (B1)/(B2)*
Less than Spec. value
More than Spec. value
Check for injector leakage Check cylinder with small speed fall using power balance test mode with CONSULT-II.
Any differences between cylinders
Any differences between cylinders
Check for injector leakage Check cylinder with small speed fall using power balance test mode with CONSULT-II.
No difference between cylinders
Check cylinder with small speed fall, ignition related parts. Then if NG, replace its injector.
Check cylinder with small speed fall, ignition related parts. Then if NG, replace its injector.
No difference between cylinders
Within Spec. value
Within Spec. value
Data Monitor A/F ALPHA (B1)/(B2)*
Data Monitor A/F ALPHA (B1)/(B2)*
Less than Spec. value
Perform DTC confirmation Procedure for HO2S1.
NG
NG
Perform DTC confirmation Procedure for HO2S1.
Check/Repair:
• HO2S1 power circuit
• HO2S1 signal circuit
Check/Repair:
• HO2S1 power circuit
• HO2S1 signal circuit
OK
Within Spec. value
Within Spec. value
OK
Data Monitor A/F ALPHA (B1)/(B2)*
Data Monitor A/F ALPHA (B1)/(B2)*
Replace corresponding HO2S1
Replace corresponding HO2S1
Within Spec. value
Within Spec. value
Data Monitor A/F ALPHA (B1)/(B2)*
Data monitor A/F ALPHA (B1)/(B2)*
Less than Spec. value
More than Spec. value
Re-connect ECM harness Connector.
Re-connect ECM harness Connector.
Confirm A/F ALPHA (B1)/(B2)*.
Confirm A/F ALPHA (B1)/(B2)*.
COMPLETED

SEF768Z


Diagnostic Procedures for B/FUEL SCHDL
START
NOTE: Data Monitor means Data Monitor mode with CONSULT-II
* : if so equipped.
Data Monitor B/FUEL SCHDL
More than Specification (Spec.) value
Less than Specification (Spec.) value
Within Specification (Spec.) value
Data Monitor A/F ALPHA (B1)/(B2)*
Smaller than normal value
Within Spec. value
Check for causes of air flow in MAF sensor.
• Mis-assembly of air duct, air cleaner or element.
• Ruined air duct or air cleaner.
• Clogged dirt of element.
NG
Repair
Normal value
Data Monitor B/FUEL SCHDL
Check for causes of air flow in MAF sensor.
• Mis-assembly of air duct, air cleaner or element.
• Ruined air duct or air cleaner.
• Clogged dirt of element.
NG
Repair
Normal value
Data Monitor B/FUEL SCHDL
OK
More than B/FUEL SCHDL Spec. value and less than A/F ALPHA (B1)/(B2)* Spec. value
Less than Spec. value
OK
Check ground voltage of MAF sensor harness. Less than 0.2V
NG
Re-tighten engine ground.
OK
Data Monitor MAF sensor (Refer to CONSULT-II reference value of MAF sensor.)
More than reference value
Within reference value
Replace MAF sensor
Replace ECM
Less than reference value
Data Monitor MAF sensor (Refer to CONSULT-II reference value of MAF sensor.)
Replace MAF sensor
Within reference value
Check B/FUEL SCHDL, A/F ALPHA (B1)/(B2)*.
Check B/FUEL SCHDL.
Check and Repair
Check for causes of over-friction.
• Engine oil level over H
• Over tension of drive belts
• Abnormal noise from, or catch of alternator, PS A/C drive belts
• Abnormal noise coming from engine.
• Comprssion pressure check
• Abnormal noise coming from transmission
Check for causes of imperfect combustion.
• EGR valve stuck open
• Check function of intake valve timing control solenold valve using active test.
• Valve clearance check
• Improper timing of camshaft sprocket
Check and Repair
Check for causes of air suction at lower flow of MAF sensor.
• Disconnected, loose or cracked air duct
• Disconnected, loose or cracked air vacuum hose connected to air duct or intake manifold collector
• Loose oil filler cap
• Disconnected or loose oil level gauge
• Improper sealing of intake related gaskets
• Improper sealing of rocker cover gaskets
Check B/FUEL SCHDL.
Check B/FUEL SCHDL.
COMPLETED
SEF615ZA

TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT

PFP:00006

Description

EBS00GYM

Intermittent incidents (I/I) may occur. In many cases, the problem resolves itself (the part or circuit function returns to normal without intervention). It is important to realize that the symptoms described in the customer's complaint often do not recur on (1st trip) DTC visits. Realize also that the most frequent cause of I/I occurrences is poor electrical connections. Because of this, the conditions under which the incident occurred may not be clear. Therefore, circuit checks made as part of the standard diagnostic procedure may not indicate the specific problem area.

Common I/I Report Situations

STEP in Work Flow	Situation
II	The CONSULT-II is used. The SELF-DIAG RESULTS screen shows time data other than “0” or “[1t]”.
III	The symptom described by the customer does not recur.
IV	(1st trip) DTC does not appear during the DTC Confirmation Procedure.
VI	The Diagnostic Procedure for PXXXX does not indicate the problem area.

Diagnostic Procedure

EBS00GYN

1. INSPECTION START

Erase (1st trip) DTCs. Refer to EC-1446, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" .

>> GO TO 2.

2. CHECK GROUND TERMINALS

Check ground terminals for corroding or loose connection.
Refer to GI-24, "How to Perform Efficient Diagnosis for an Electrical Incident" , "Incident Simulation Tests", “Ground Inspection”.

OK or NG

OK >> GO TO 3.
NG >> Repair or replace.

3. SEARCH FOR ELECTRICAL INCIDENT

Perform GI-24, "How to Perform Efficient Diagnosis for an Electrical Incident" , "Incident Simulation Tests".

OK or NG

OK >> **INSPECTION END**
NG >> Repair or replace.

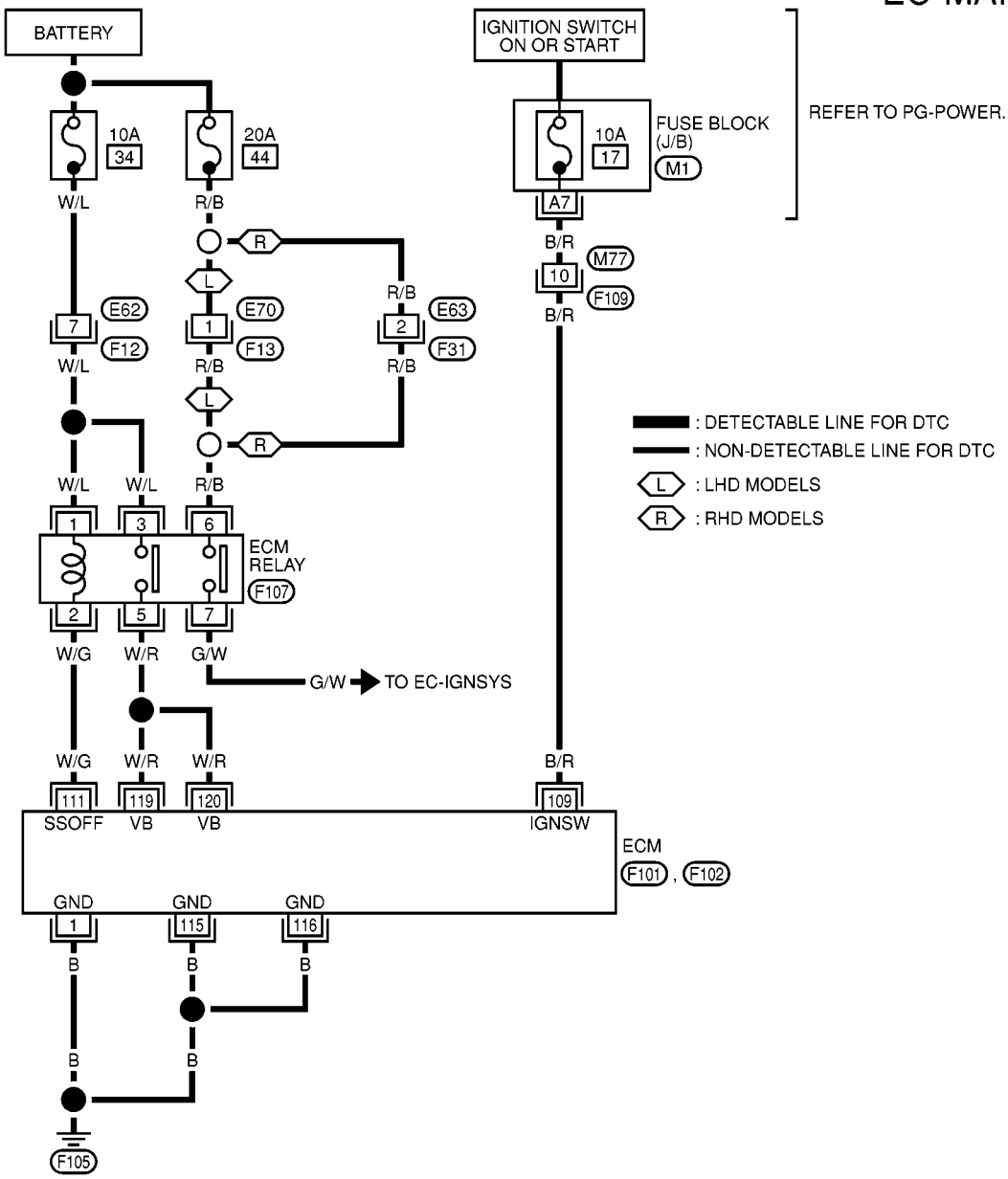
POWER SUPPLY CIRCUIT FOR ECM

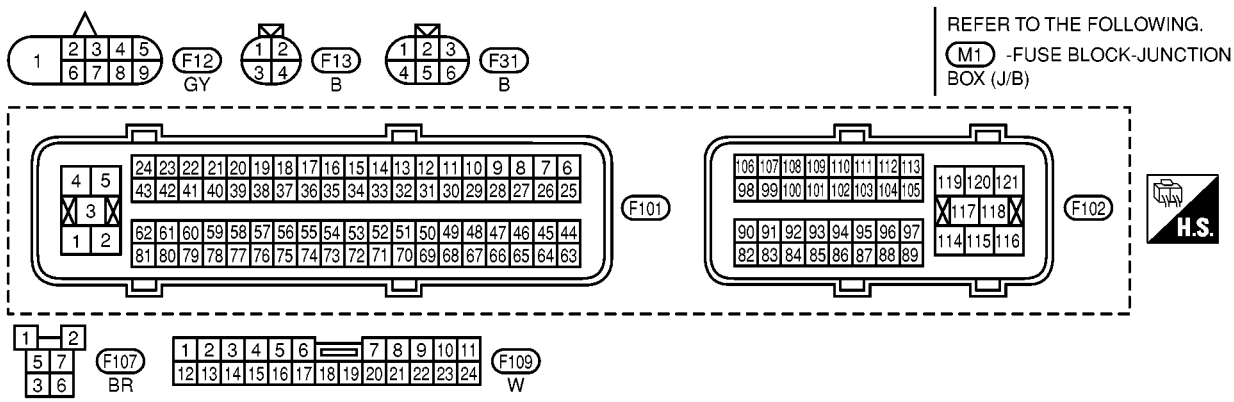
PFP:24110

Wiring Diagram

EBS00GYO

EC-MAIN-01





MBWA0003E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
1 115 116	B B B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
109	B/R	Ignition switch	**[Ignition switch "OFF"]**	0V
			[Ignition switch "ON"]	BATTERY VOLTAGE (11 - 14V)
111	W/G	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch "OFF"]** ● For 5 seconds after turning ignition switch "OFF"	0 - 1.0V
			[Ignition switch "OFF"] ● 5 seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
119 120	W/R W/R	Power supply for ECM	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

EBS00GYP

1. INSPECTION START

Start engine.

Is engine running?

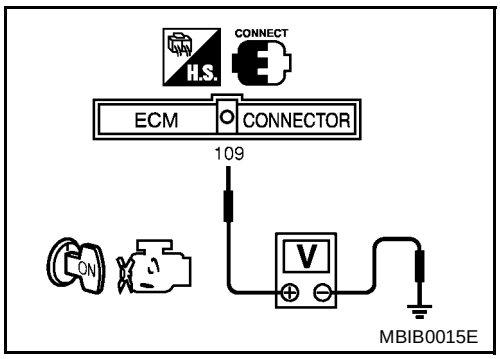
Yes or No

Yes >> GO TO 8.
No >> GO TO 2.

2. CHECK ECM POWER SUPPLY CIRCUIT-I

1. Turn ignition switch "OFF" and then "ON".
2. Check voltage between ECM terminal 109 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M77, F109
- Fuse block (J/B) connector M1
- 10A fuse
- Harness for open or short between ECM and fuse

>> Repair harness or connectors.

4. CHECK ECM GROUND CIRCUIT FOR OPEN AND SHORT-I

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminals 1, 115, 116 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

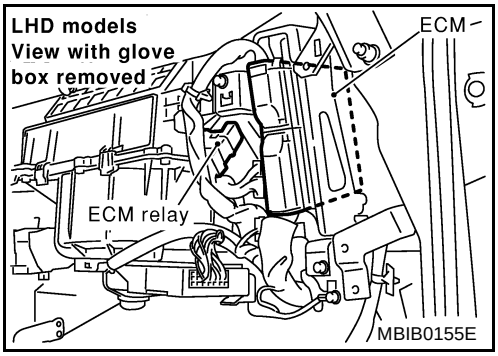
4. Also check harness for short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to power in harness or connectors.

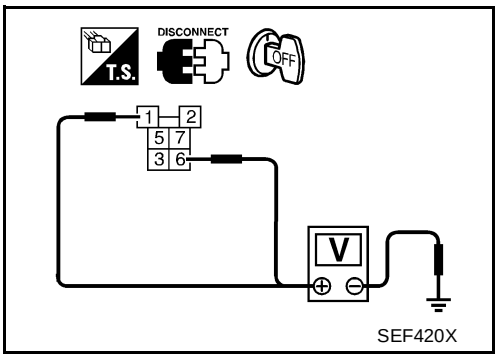
5. CHECK ECM POWER SUPPLY CIRCUIT-II

1. Disconnect ECM relay.



2. Check voltage between ECM relay terminals 1 and 6 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E62, F12
- Harness connectors E70, F13 (LHD models)
- Harness connectors E63, F31 (RHD models)
- 10A fuse
- 20A fuse
- Harness for open or short between ECM relay and battery

>> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 111 and ECM relay terminal 2. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

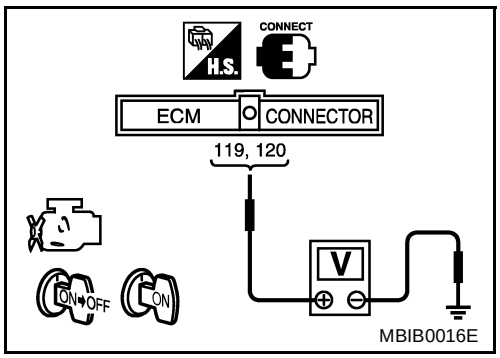
OK or NG

OK >> Go to EC-1672, "IGNITION SIGNAL" .
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK ECM POWER SUPPLY CIRCUIT-III

1. Stop engine and wait at least 10 seconds.
2. Turn ignition switch “ON” and then “OFF”.
3. Check voltage between ECM terminals 119, 120 and ground with CONSULT-II or tester.

Voltage: After turning ignition switch “OFF”, battery voltage will exist for a few seconds, then drop approximately 0V.

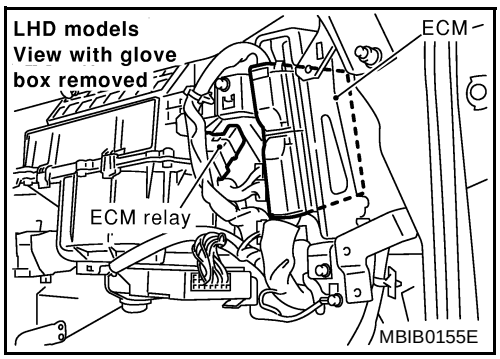


OK or NG

OK >> GO TO 13.
NG (Battery voltage does not exist.)>>GO TO 9.
NG (Battery voltage exists for more than a few seconds.)>>GO TO 11.

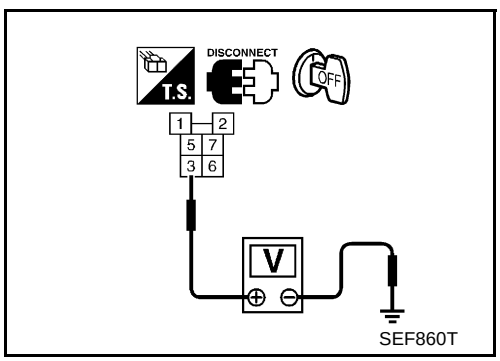
9. CHECK ECM POWER SUPPLY CIRCUIT-IV

1. Disconnect ECM relay.



2. Check voltage between ECM relay terminal 3 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 11.
NG >> GO TO 10.

10. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E62, F12
- Harness for open or short between ECM relay and 10A fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

11. CHECK ECM POWER SUPPLY CIRCUIT-V

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminals 119, 120 and ECM relay terminal 5. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 12.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

12. CHECK ECM RELAY

Refer to EC-1504, "Component Inspection" .

OK or NG

OK >> GO TO 13.
NG >> Replace ECM relay.

13. CHECK ECM GROUND CIRCUIT FOR OPEN AND SHORT-II

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminals 1, 115, 116 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to power.

OK or NG

OK >> GO TO 14.
NG >> Repair open circuit or short to power in harness or connectors.

14. CHECK INTERMITTENT INCIDENT

Refer to EC-1498, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

OK or NG

OK >> **INSPECTION END**

Component Inspection

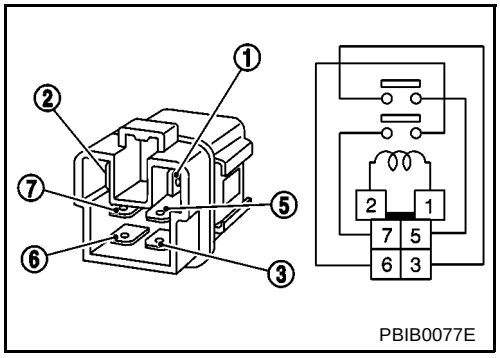
EBS00GYQ

ECM RELAY

1. Apply 12V direct current between ECM relay terminals 1 and 2.
2. Check continuity between relay terminals 3 and 5, 6 and 7.

Condition	Continuity
12V direct current supply between terminals 1 and 2	Yes
OFF	No

3. If NG, replace ECM relay.



PBIB0077E

DTC U1000, U1001 CAN COMMUNICATION LINE

PFP:23710

Description

EBS00GYR

CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent error detection ability. Many electronic control units are equipped onto a vehicle, and each control unit shares information and links with other control units during operation (not independent). In CAN communication, control units are connected with 2 communication lines (CAN H line, CAN L line) allowing a high rate of information transmission with less wiring. Each control unit transmits/receives data but selectively reads required data only.

On Board Diagnosis Logic

EBS00GYS

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
U1000 1000 U1001 1001	CAN communication line	● ECM cannot communicate to other control unit. ● ECM cannot communicate for more than the specified time.	● Harness or connectors (CAN communication line is open or shorted)

DTC Confirmation Procedure

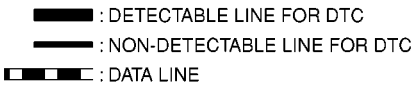
EBS00GYT

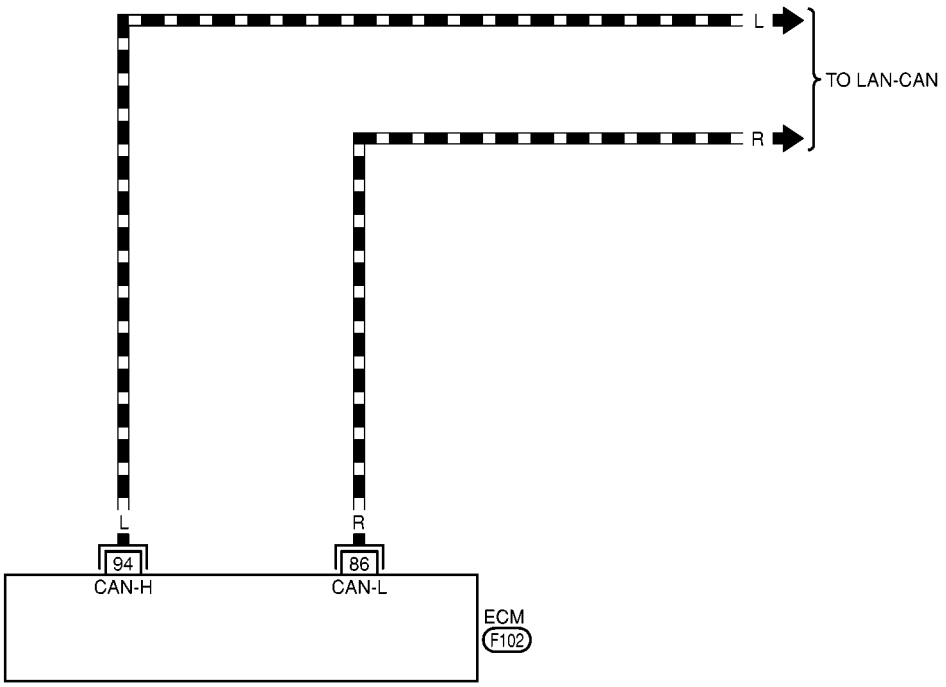
1. Turn ignition switch “ON” and wait at least 3 seconds.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. If 1st trip DTC is detected, go to EC-1507, "Diagnostic Procedure" .

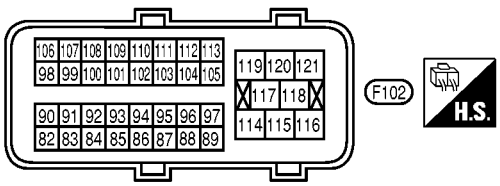
Wiring Diagram

EBS00GYU

EC-CAN-01







MBWA0038E

Diagnostic Procedure

EBS00GYV

1. INSPECTION START

1. Turn ignition switch “ON”.
2. Select “CAN DIAG SUPPORT MNTR” in “DATA MONITOR” mode with CONSULT-II.
3. Print out the CONSULT-II screen.

CVT Models

OK data

DATA MONITOR	
MONITOR	NO DTC
CAN COMM	OK
CAN CIRC 1	OK
CAN CIRC 2	OK
CAN CIRC 3	UNKWN
CAN CIRC 4	OK
CAN CIRC 5	UNKWN
CAN CIRC 6	OK
CAN CIRC 7	UNKWN

NG data

DATA MONITOR	
MONITOR	NO DTC
CAN COMM	OK
CAN CIRC 1	UNKWN
CAN CIRC 2	UNKWN
CAN CIRC 3	UNKWN
CAN CIRC 4	UNKWN
CAN CIRC 5	UNKWN
CAN CIRC 6	UNKWN
CAN CIRC 7	UNKWN

MBIB0180E

M/T Models

OK data

DATA MONITOR	
MONITOR	NO DTC
CAN COMM	OK
CAN CIRC 1	OK
CAN CIRC 2	UNKWN
CAN CIRC 3	UNKWN
CAN CIRC 4	OK
CAN CIRC 5	UNKWN
CAN CIRC 6	OK
CAN CIRC 7	UNKWN

NG data

DATA MONITOR	
MONITOR	NO DTC
CAN COMM	OK
CAN CIRC 1	UNKWN
CAN CIRC 2	UNKWN
CAN CIRC 3	UNKWN
CAN CIRC 4	UNKWN
CAN CIRC 5	UNKWN
CAN CIRC 6	UNKWN
CAN CIRC 7	UNKWN

MBIB0179E

>> Go to LAN-8, "CAN COMMUNICATION" .

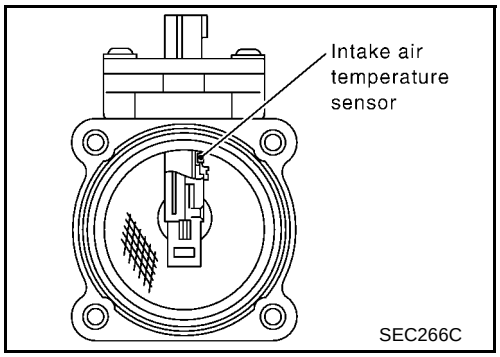
DTC P0102, P0103 MAF SENSOR

PFP:22680

Component Description

EBS00GYW

The mass air flow sensor is placed in the stream of intake air. It measures the intake flow rate by measuring a part of the entire intake flow. It consists of a hot film that is supplied with electric current from the ECM. The temperature of the hot film is controlled by the ECM a certain amount. The heat generated by the hot film is reduced as the intake air flows around it. The more air, the greater the heat loss.
Therefore, the ECM must supply more electric current to maintain the temperature of the hot film as air flow increases. The ECM detects the air flow by means of this current change.



CONSULT-II Reference Value in Data Monitor Mode

EBS00GYX

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
MAS A/F SE-B1	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: N ● No-load	Idle	Approx. 1.1 - 1.5V
		2,500 rpm	Approx. 1.6 - 2.0V
CAL/LD VALUE	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	10% - 35%
		2,500 rpm	10% - 35%
MASS AIRFLOW	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	1.0 - 4.0 g·m/s
		2,500 rpm	4.0 - 10.0 g·m/s

On Board Diagnosis Logic

EBS00GYY

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0102 0102	Mass air flow sensor circuit low input	An excessively low voltage from the sensor is sent to ECM when engine is running.	● Harness or connectors (The sensor circuit is open or shorted.) ● Intake air leaks ● Mass air flow sensor
P0103 0103	Mass air flow sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Mass air flow sensor

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MI lights up.

Detected items	Engine operating condition in fail-safe mode
Mass air flow sensor circuit	Engine speed will not rise more than 2,400 rpm due to the fuel cut.

DTC Confirmation Procedure

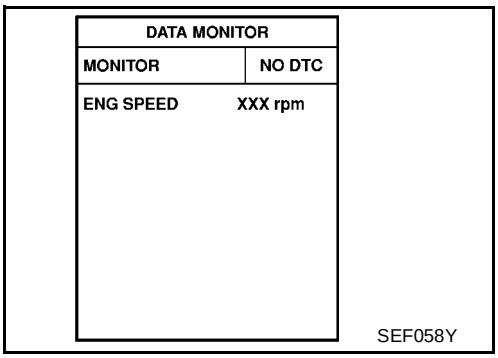
EBS00GYZ

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

PROCEDURE FOR DTC P0102

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and wait 5 seconds at most.
4. If DTC is detected, go to EC-1511, "Diagnostic Procedure" .



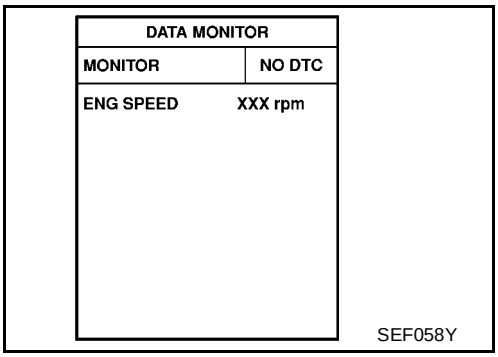
Without CONSULT-II

1. Start engine and wait 5 seconds at most.
2. Tarn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
3. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
4. If DTC is detected, go to EC-1511, "Diagnostic Procedure" .

PROCEDURE FOR DTC P0103

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Wait at least 5 seconds.
4. If DTC is detected, go to EC-1511, "Diagnostic Procedure" .
   If DTC is not detected, go to next step.
5. Start engine and wait at least 5 seconds.
6. If DTC is detected, go to EC-1511, "Diagnostic Procedure" .



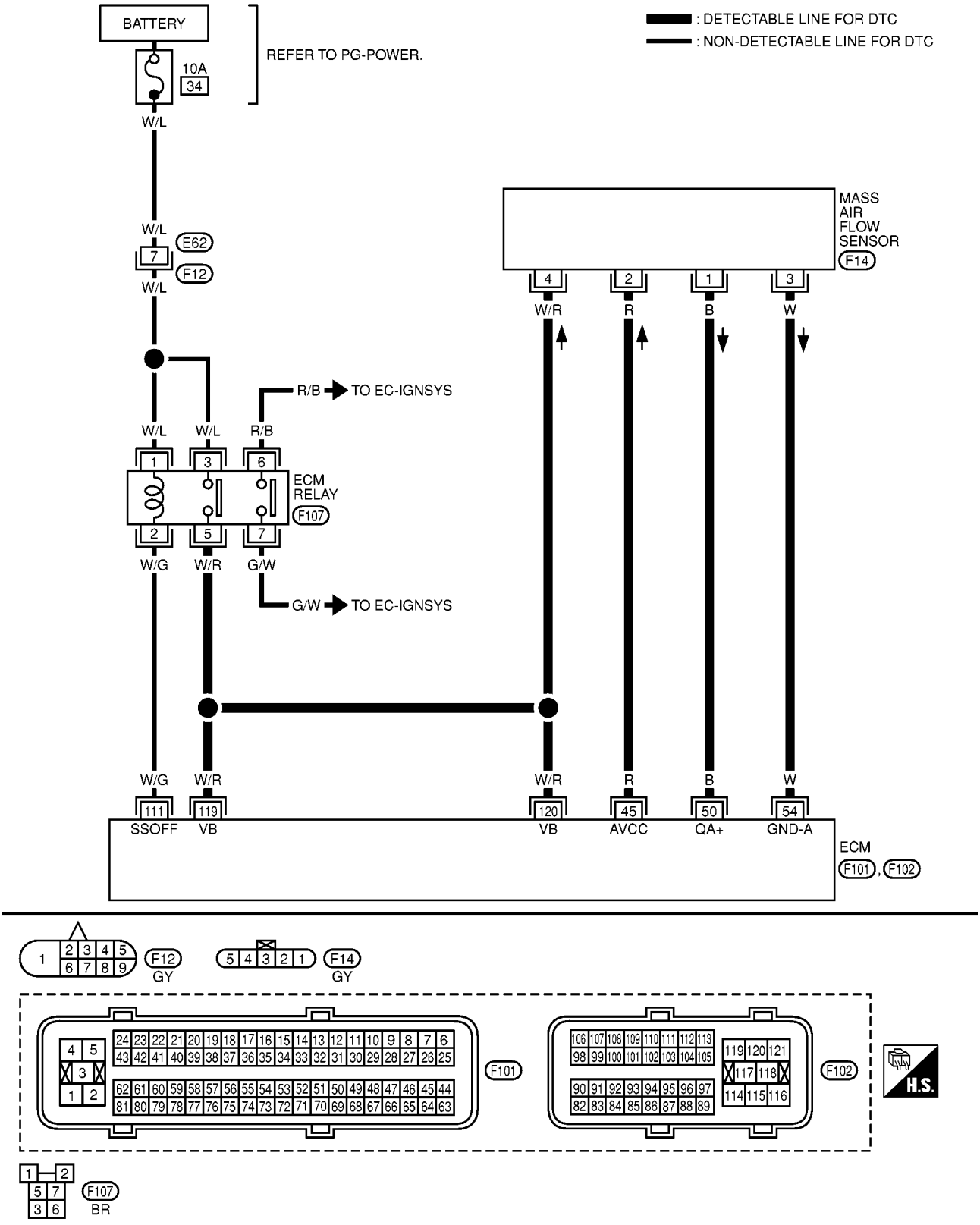
Without CONSULT-II

1. Turn ignition switch “ON” and wait at least 5 seconds.
2. Tarn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
3. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
4. If DTC is detected, go to EC-1511, "Diagnostic Procedure" .
   If DTC is not detected, go to next step.
5. Turn ignition switch “OFF” and wait at least 10 seconds.
6. Start engine and wait at least 5 seconds.
7. Tarn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
8. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
9. If DTC is detected, go to EC-1511, "Diagnostic Procedure" .

Wiring Diagram

EBS00GZ0

EC-MAFS-01



MBWA0004E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
45	R	Sensor's power supply	**[Ignition switch "ON"]**	Approximately 5V
50	B	Mass air flow sensor	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.1 - 1.5V
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,500 rpm.	1.6 - 2.0V
54	W	Sensor's ground (Mass air flow sensor)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V

Diagnostic Procedure

EBS00GZ1

1. INSPECTION START

Which malfunction (P0102 or P0103) is duplicated?

P0102 or P0103

P0102 >> GO TO 2.
P0103 >> GO TO 3.

2. CHECK INTAKE SYSTEM

Check the following for connection.

- Air duct
- Vacuum hoses
- Intake air passage between air duct to intake manifold

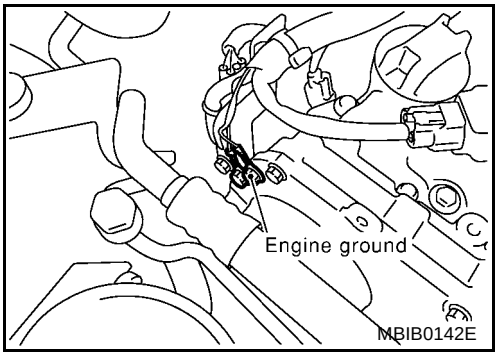
OK or NG

OK >> GO TO 3.
NG >> Reconnect the parts.

3. RETIGHTEN GROUND SCREWS

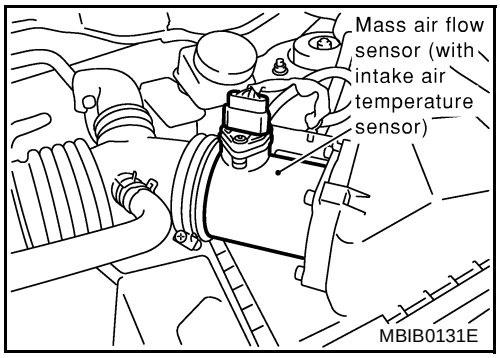
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 4.



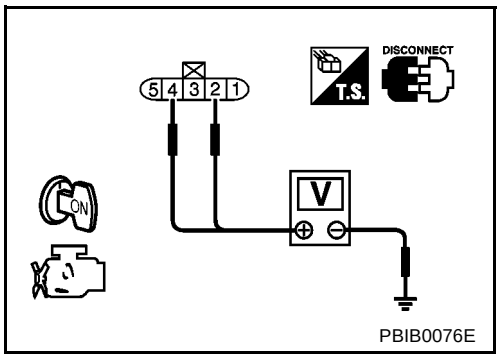
4. CHECK MAF SENSOR POWER SUPPLY CIRCUIT

1. Disconnect MAF sensor harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between MAF sensor terminals 2, 4 and ground with CONSULT-II or tester.

Terminal	Voltage
2	Approximately 5V
4	Battery voltage



OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between mass air flow sensor and ECM
- Harness for open or short between mass air flow sensor and ECM relay

>> Repair harness or connectors.

6. CHECK MAF SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between MAF sensor terminal 3 and ECM terminal 54. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK MAF SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between MAF sensor terminal 1 and ECM terminal 50. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK MASS AIR FLOW SENSOR

Refer to EC-1513, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> Replace mass air flow sensor.

9. CHECK INTERMITTENT INCIDENT

Refer to EC-1498, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

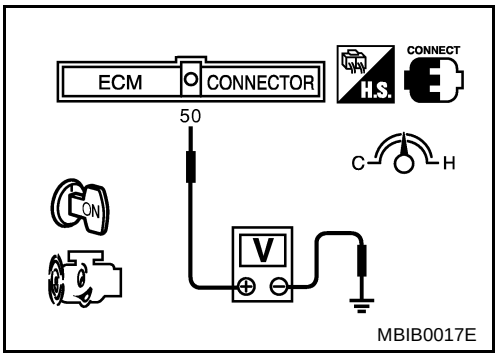
EBS00GZ2

MASS AIR FLOW SENSOR

1. Reconnect harness connectors disconnected.
2. Start engine and warm it up to normal operating temperature.
3. Check voltage between ECM terminal 50 (Mass air flow sensor signal) and ground.

Condition	Voltage V
Ignition switch “ON” (Engine stopped.)	Approx. 1.0
Idle (Engine is warmed-up to normal operating temperature.)	1.1 - 1.5
2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.6 - 2.0
Idle to about 4,000 rpm*	1.5 - 2.0 to Approx. 4.0

*: Check for liner voltage rise in response to engine being increased to about 4,000 rpm.



4. If the voltage is out of specification, proceed the following.

a. Turn ignition switch “OFF”.
b. Disconnect mass air flow sensor harness connector and reconnect it again.
c. Perform steps 2 and 3 again.

5. If NG, remove mass air flow sensor from air duct. Check hot film for damage or dust.
6. If NG, clean or replace mass air flow sensor.

Removal and Installation

EBS00GZ3

MASS AIR FLOW SENSOR

Refer to EM-114, "AIR CLEANER AND AIR DUCT" .

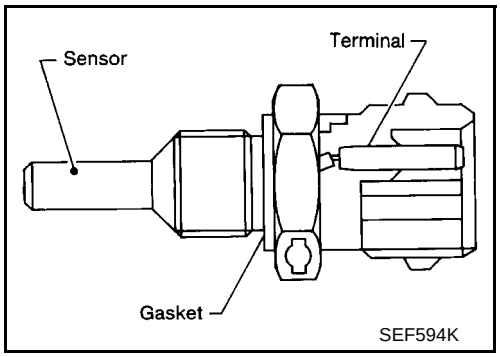
DTC P0117, P0118 ECT SENSOR

PFP:22630

Component Description

EBS00GZ4

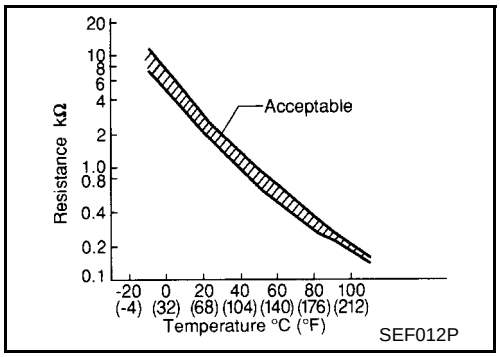
The engine coolant temperature sensor is used to detect the engine coolant temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine coolant temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.



<Reference data>

Engine coolant temperature °C (°F)	Voltage* V	Resistance kΩ
–10 (14)	4.4	7.0 - 11.4
20 (68)	3.5	2.1 - 2.9
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260

*: These data are reference values and are measured between ECM terminal 72 (Engine coolant temperature sensor) and ground.



CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

On Board Diagnosis Logic

EBS00GZ5

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P0117 0117	Engine coolant temperature sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Engine coolant temperature sensor
P0118 0118	Engine coolant temperature sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	

FAIL-SAFE MODE

When this malfunction is detected, the ECM enters fail-safe mode and the MI lights up.

<table>
<tr><th>Detected items</th><th colspan="2">Engine operating condition in fail-safe mode</th></tr>
<tr><td rowspan="5">Engine coolant temperature sensor circuit</td><td colspan="2">Engine coolant temperature will be determined by ECM based on the time after turning ignition switch “ON” or “START”. CONSULT-II displays the engine coolant temperature decided by ECM.</td></tr>
<tr><td>Condition</td><td>Engine coolant temperature decided
(CONSULT-II display)</td></tr>
<tr><td>Just as ignition switch is turned ON or Start</td><td>40°C (104°F)</td></tr>
<tr><td>More than approx. 4 minutes after ignition ON or Start</td><td>80°C (176°F)</td></tr>
<tr><td>Except as shown above</td><td>40 - 80°C (104 - 176°F)
(Depends on the time)</td></tr>
<tr><td colspan="2">When the fail-safe system for engine coolant temperature sensor is activated, the cooling fan operates while engine is running.</td></tr>
</table>

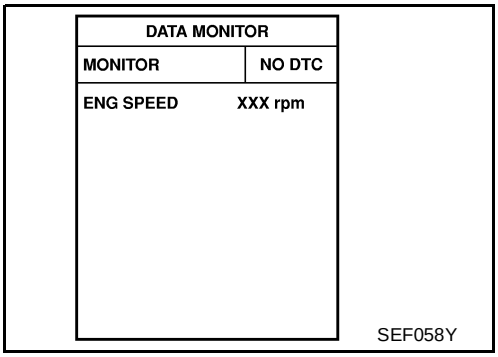
DTC Confirmation Procedure

EBS00GZ6

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Wait at least 5 seconds.
4. If DTC is detected, go to EC-1517, "Diagnostic Procedure" .



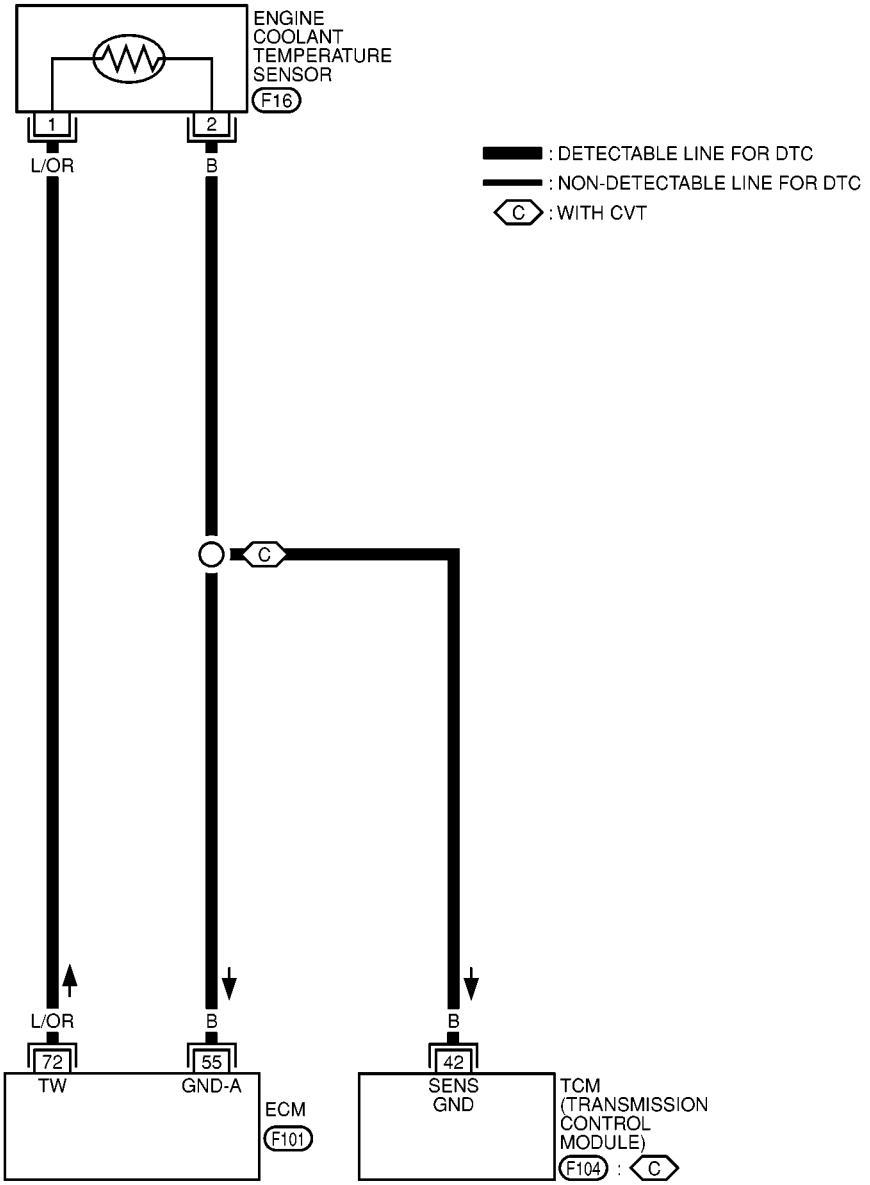
WITHOUT CONSULT-II

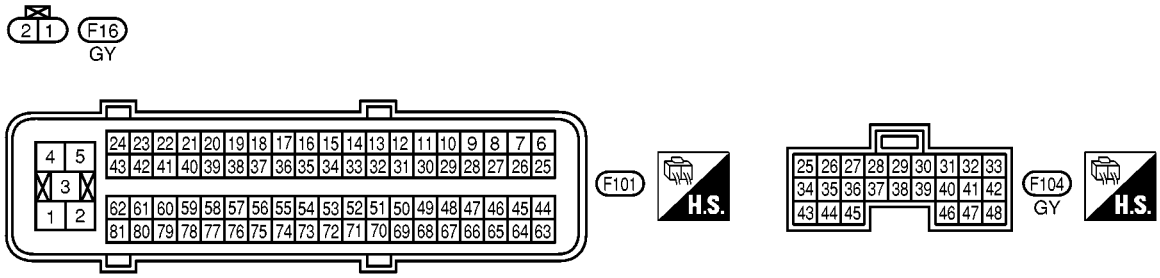
1. Turn ignition switch “ON” and wait at least 5 seconds.
2. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
3. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
4. If DTC is detected, go to EC-1517, "Diagnostic Procedure" .

Wiring Diagram

EBS00GZ7

EC-ECTS-01





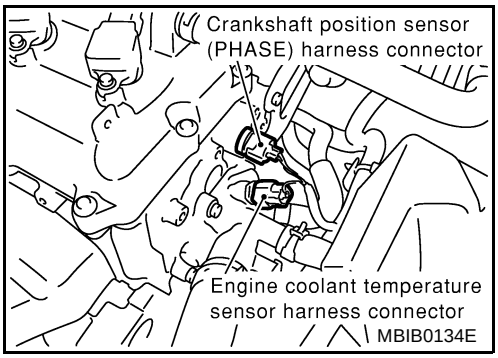
MBWA0006E

Diagnostic Procedure

EBS00GZ8

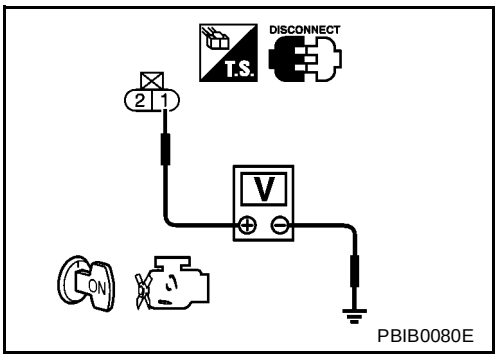
1. CHECK ECT SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect engine coolant temperature (ECT) sensor harness connector.
3. Turn ignition switch “ON”.



4. Check voltage between ECT sensor terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 2.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

2. CHECK ECT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between ECT sensor terminal 2 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between engine coolant temperature sensor and ECM
- Harness for open or short between engine coolant temperature sensor and TCM

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-1518, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace engine coolant temperature sensor.

5. CHECK INTERMITTENT INCIDENT

Refer to EC-1498, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

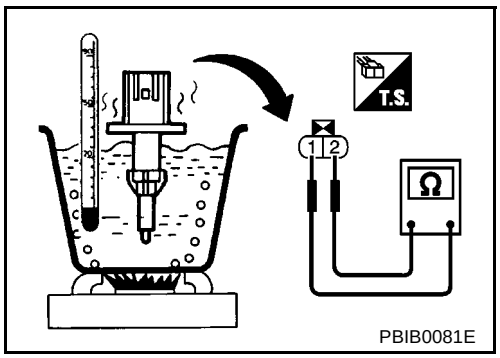
>> **INSPECTION END**

Component Inspection

EBS00GZ9

ENGINE COOLANT TEMPERATURE SENSOR

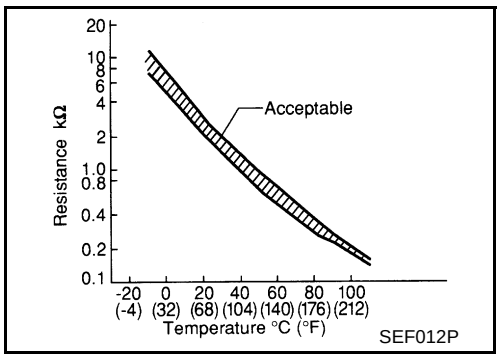
1. Check resistance between engine coolant temperature sensor terminals 1 and 2 as shown in the figure.



<Reference data>

Engine coolant temperature °C (°F)	Voltage* V	Resistance kΩ
–10 (14)	4.4	7.0 - 11.4
20 (68)	3.5	2.1 - 2.9
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260

*: These data are reference values and are measured between ECM terminal 72 (Engine coolant temperature sensor) and ground.



2. If NG, replace engine coolant temperature sensor.

Removal and Installation

EBS00GZA

ENGINE COOLANT TEMPERATURE SENSOR

Refer to CO-40, "THERMOSTAT AND WATER CONTROL VALVE" .

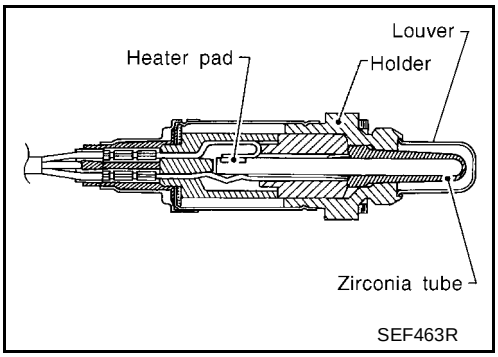
DTC P0134 HO2S1

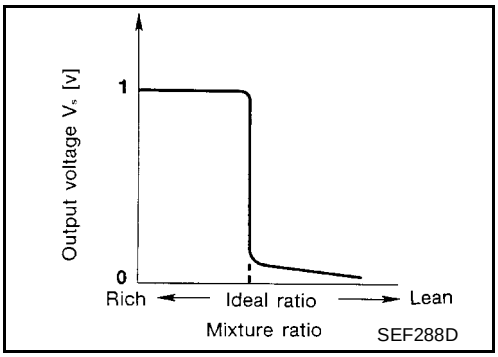
PFP:22690

Component Description

EBS00GZB

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.





CONSULT-II Reference Value in Data Monitor Mode

EBS00GZC

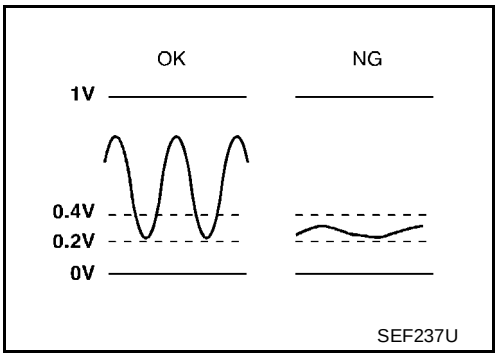
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S1 (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S1 MNTR (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	LEAN ←→ RICH Changes more than 5 times during 10 seconds.

On Board Diagnosis Logic

EBS00GZD

Under the condition in which the heated oxygen sensor 1 signal is not input, the ECM circuits will read a continuous approximately 0.3V. Therefore, for this diagnosis, the time that output voltage is within 200 to 400 mV range is monitored, and the diagnosis checks that this time is not inordinately long.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0134 0134	Heated oxygen sensor 1 circuit no activity detected	The voltage from the sensor is constantly approx. 0.3V.	● Harness or connectors (The sensor circuit is open or shorted.) ● Heated oxygen sensor 1

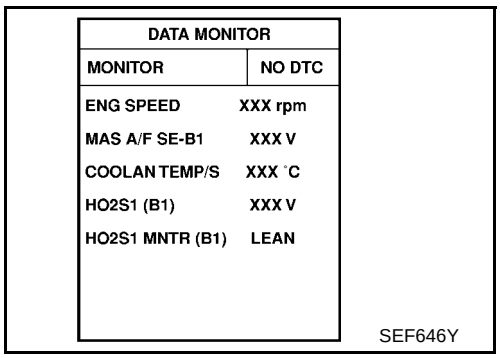
Overall Function Check

EBS00GZF

Use this procedure to check the overall function of the heated oxygen sensor 1 circuit. During this check, a 1st trip DTC might not be confirmed.

WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “MANU TRIG” in “DATA MONITOR” mode with CONSULT-II, and select “H02S1 (B1)”.
3. Hdd engine speed at 2,000 rpm under no load.
4. Make sure that the indications do not remain in the range between 0.2V to 0.4V.
5. If NG, go to EC-1522, "Diagnostic Procedure" .

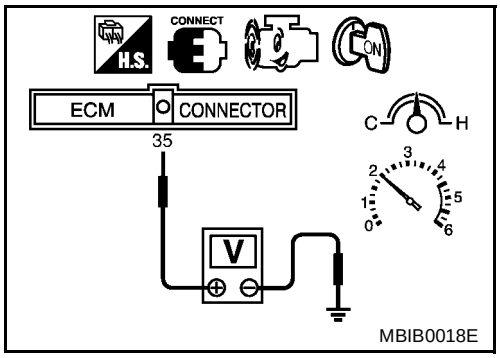


WITHOUT CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 (HO2S1 signal) and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no load.

- The voltage does not remain in the range of 0.2 - 0.4V.

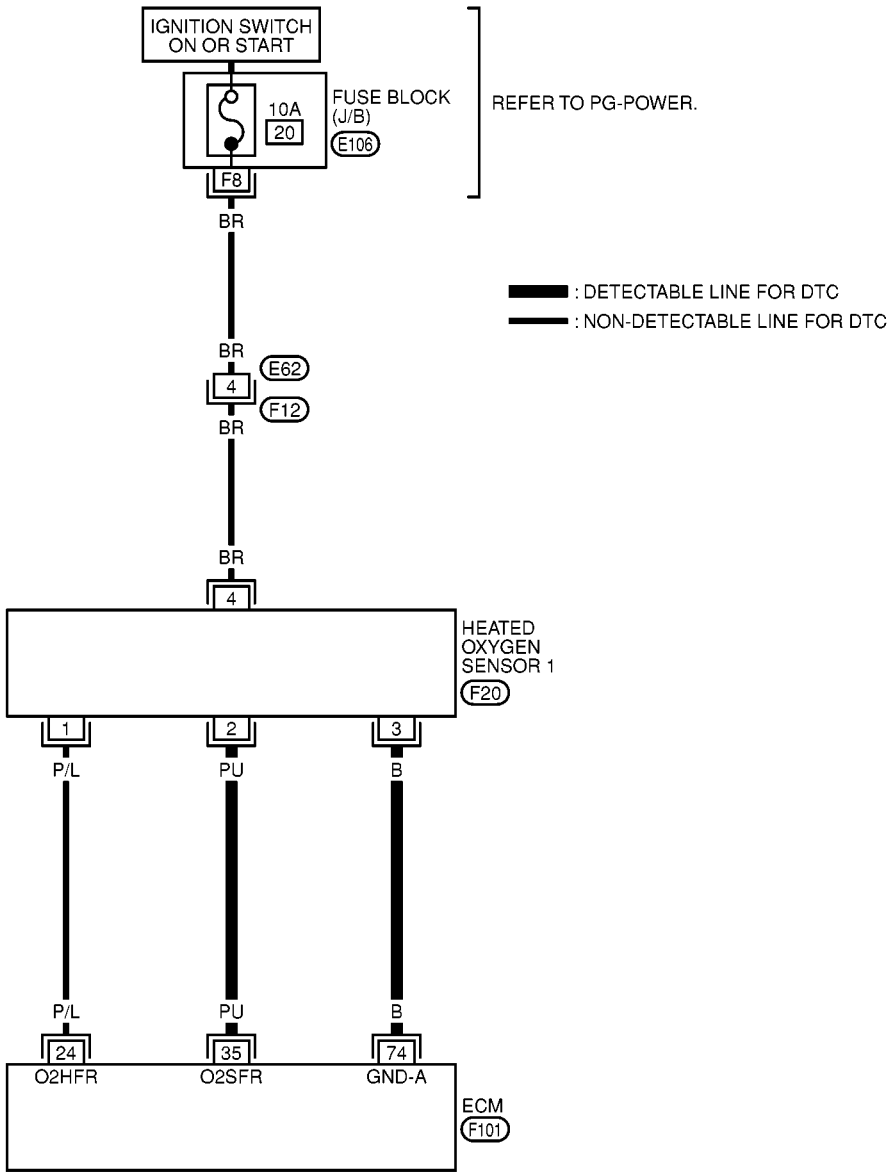
4. If NG, go to EC-1522, "Diagnostic Procedure" .

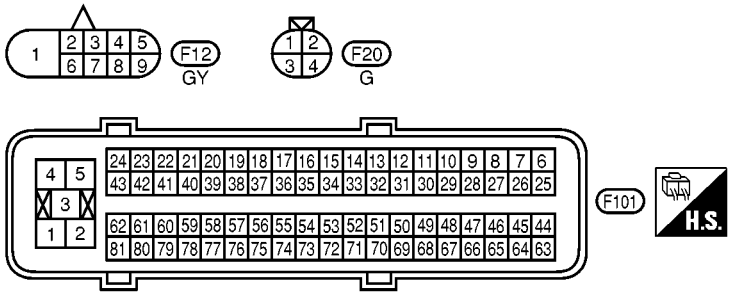


Wiring Diagram

EBS00GZG

EC-HO2S1-01





REFER TO THE FOLLOWING.
E106 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0008E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
35	PU	Heated oxygen sensor 1	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V (Periodically change)
74	B	Sensors' ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V

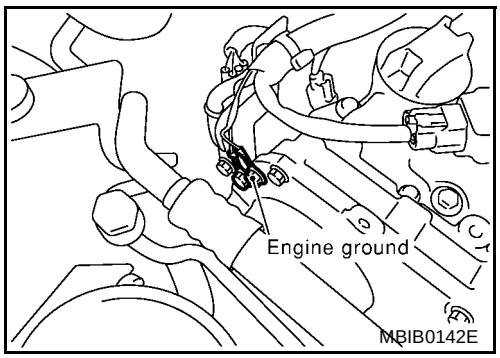
Diagnostic Procedure

EBS00GZH

1. INSPECTION START

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

>> GO TO 2.



2. CHECK HO2S1 GROUND CIRCUIT FOR OPEN AND SHORT

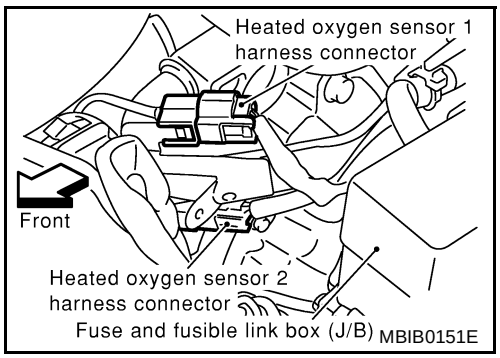
1. Disconnect heated oxygen sensor 1 harness connector.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 74 and HO2S1 terminal 3. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.



3. CHECK HO2S1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 35 and HO2S1 terminal 2. Refer to Wiring Diagram.

   Continuity should exist.

2. Check harness continuity between ECM terminal 35 or HO2S1 terminal 2 and ground. Refer to Wiring Diagram.

   Continuity should not exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK HEATED OXYGEN SENSOR 1

Refer to EC-1523, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace heated oxygen sensor 1.

5. CHECK INTERMITTENT INCIDENT

Refer to EC-1498, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

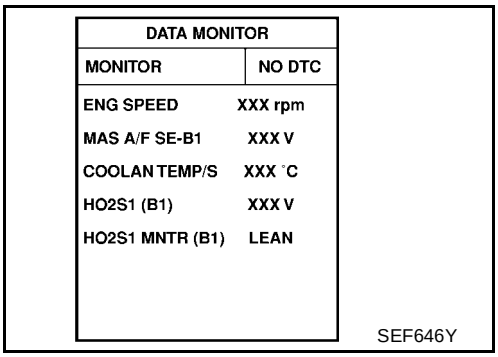
Component Inspection

EBS00GZI

HEATED OXYGEN SENSOR 1

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “MANU TRIG” and adjust “TRIGGER POINT” to 100% in “DATA MONITOR” mode with CONSULT-II.
3. Select “HO2S1 (B1)” and “HO2S1 MNTR (B1)”.
4. Hold engine speed at 2,000 rpm under no load during the following steps.
5. Touch “RECORD” on CONSULT-II screen.



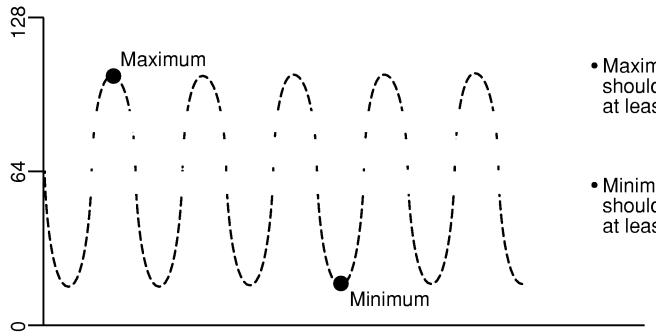
6. Check the following.
   - “HO2S1 MNTR (B1)” in “DATA MONITOR” mode changes from “RICH” to “LEAN” to “RICH” 5 times in 10 seconds.
     5 times (cycles) are counted as shown at right.
   - “HO2S1 (B1)” voltage goes above 0.6V at least once.
   - “HO2S1 (B1)” voltage goes below 0.3V at least once.
   - “HO2S1 (B1)” voltage never exceeds 1.0V.

cycle	1	2	3	4	5
HO2S1 MNTR (B1)	R-L-R-L-R-L-R-L-R-L-R				

R means HO2S1 MNTR (B1) indicates RICH
L means HO2S1 MNTR (B1) indicates LEAN

SEF217YA

Trigger	ENG SPEED	HO2S1 (B1)
	rpm	V
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX



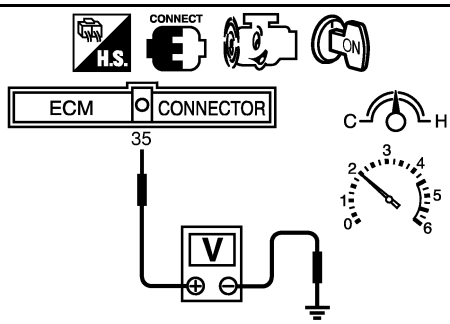
SEF648Y

CAUTION:
- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 (HO2S1 signal) and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no load.
   - The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds.
   - The maximum voltage is over 0.6V at least one time.
   - The minimum voltage is below 0.3V at least one time.
   - The voltage never exceeds 1.0V.

   1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V
   2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V



MBIB0018E

CAUTION:
- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

EBS00GZJ

HEATED OXYGEN SENSOR 1

Refer to EM-121, "EXHAUST MANIFOLD AND THREE WAY CATALYST" .

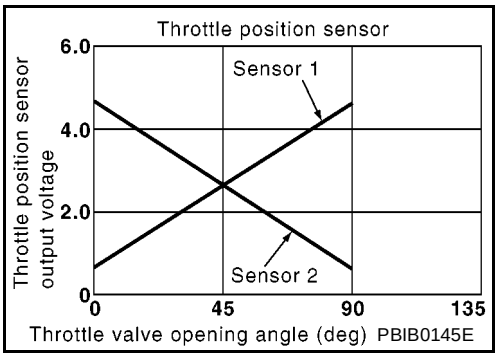
DTC P0221 TP SENSOR

PFP:16119

Component Description

EBS00GZK

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.
The throttle position sensor has the two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.



CONSULT-II Reference Value in Data Monitor Mode

EBS00GZL

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
THRTL SEN1 THRTL SEN2	● Ignition switch: ON (Engine stopped) ● Shift lever: D (CVT model) 1st (M/T model)	Accelerator pedal: Fully released	More than 0.36V
		Accelerator pedal: Fully depressed	Less than 4.75V

On Board Diagnosis Logic

EBS00GZM

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0221 0221	Throttle position sensor circuit range/performance problem	Rationally incorrect voltage is sent to ECM compared with the signals from TP sensor 1 and TP sensor 2.	● Harness or connector (The TP sensor 1 and 2 circuit is open or shorted.) ● Electric throttle control actuator (TP sensor 1 and 2)

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MI lights up.

Engine operation condition in fail-safe mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.

DTC Confirmation Procedure

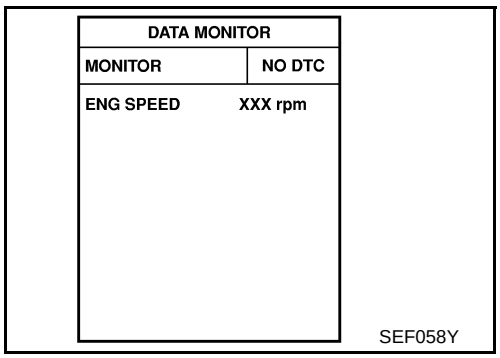
EBS00GZN

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.

2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-1528, "Diagnostic Procedure" .



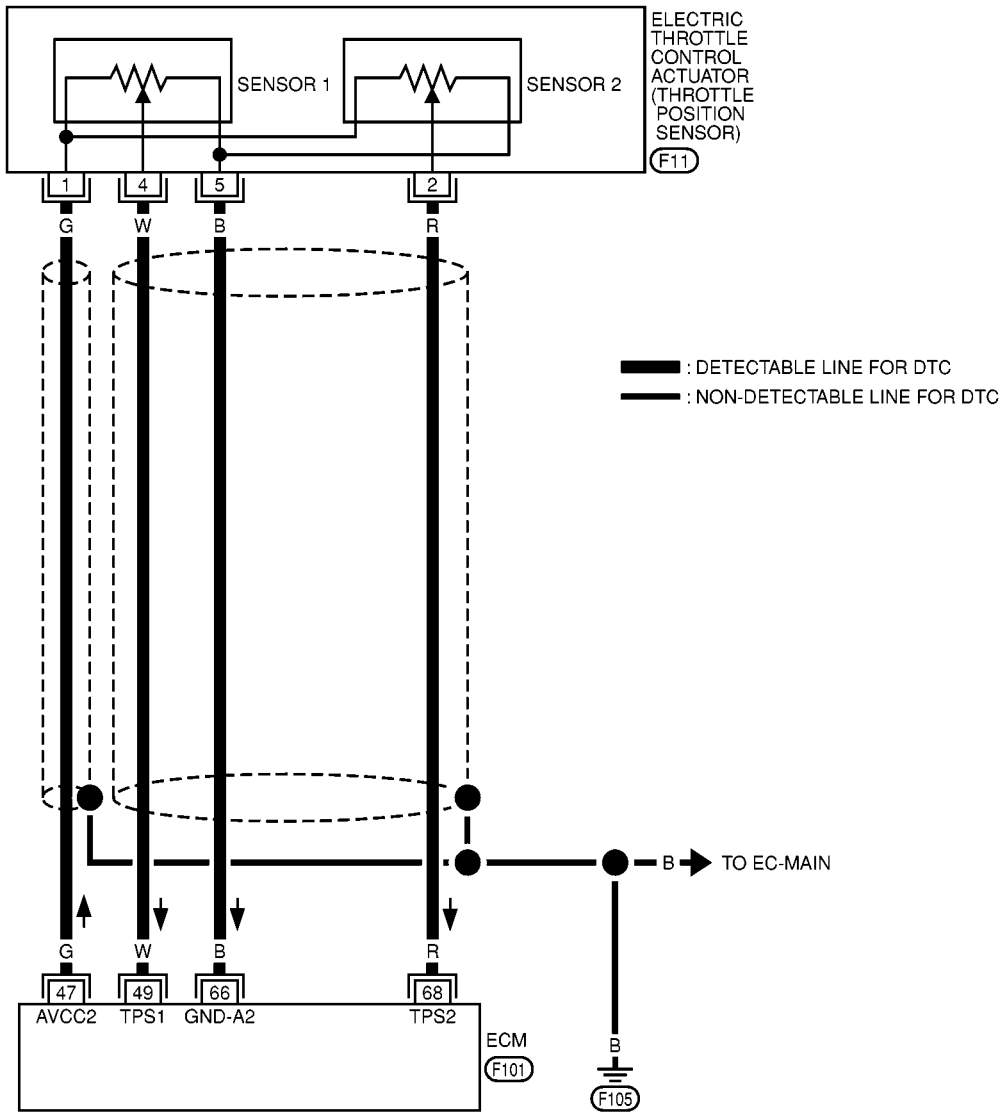
WITHOUT CONSULT-II

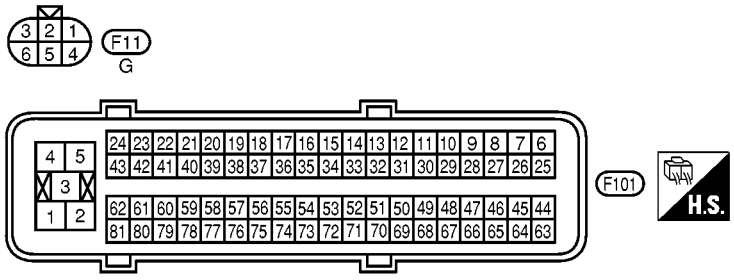
1. Start engine and let it idle for 1 second.
2. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
3. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
4. If DTC is detected, go to EC-1528, "Diagnostic Procedure" .

Wiring Diagram

EBS00GZO

EC-TPS3-01





MBWA0127E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
47	G	Throttle position sensor power supply	**[Ignition switch "ON"]**	Approximately 5V
49	W	Throttle position sensor 1	**[Ignition switch "ON"]** ● Shift lever position is "D" (CVT model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully released	More than 0.36V
			[Ignition switch "ON"] ● Shift lever position is "D" (CVT model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully depressed	Less than 4.75V
66	B	Sensors' ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
68	R	Throttle position sensor 2	**[Ignition switch "ON"]** ● Shift lever position is "D" (CVT model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully released	Less than 4.75V
			[Ignition switch "ON"] ● Shift lever position is "D" (CVT model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully depressed	More than 0.36V

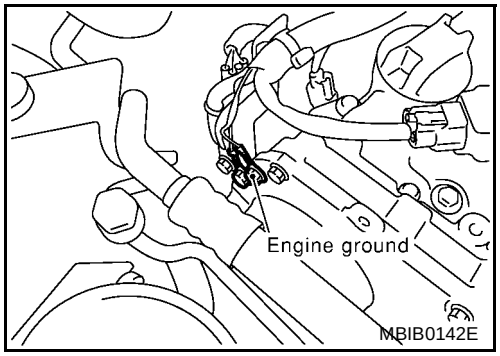
Diagnostic Procedure

EBS00GZP

1. RETIGHTEN GROUND SCREWS

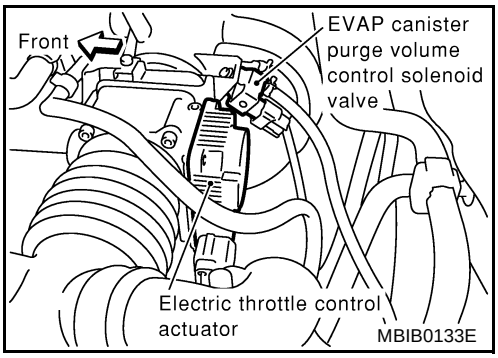
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



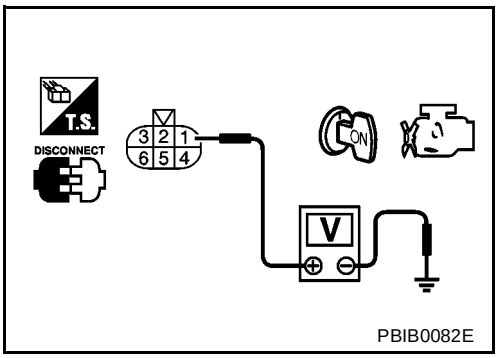
2. CHECK THROTTLE POSITION SENSOR POWER SUPPLY CIRCUIT

1. Disconnect electric throttle control actuator harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between electric throttle control actuator terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK THROTTLE POSITION SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 66 and electric throttle control actuator terminal 5. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK THROTTLE POSITION SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 49 and electric throttle control actuator terminal 4, ECM terminal 68 and electric throttle control actuator terminal 2. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK THROTTLE POSITION SENSOR

Refer to EC-1530, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-1440, "Throttle Valve Closed Position Learning" .
3. Perform EC-1440, "Idle Air Volume Learning" .

>> **INSPECTION END**

7. CHECK INTERMITTENT INCIDENT

Refer to EC-1498, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

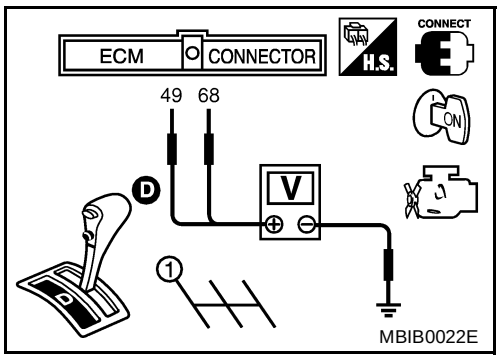
Component Inspection

EBS00GZQ

THROTTLE POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Perform EC-1440, "Throttle Valve Closed Position Learning" .
3. Turn ignition switch “ON”.
4. Set selector lever to “D” position (CVT models) or “1st” position (M/T models).
5. Check voltage between ECM terminals 49 (TP sensor 1 signal), 68 (TP sensor 2 signal) and engine ground under the following conditions.

Terminal	Accelerator pedal	Voltage
49 (Throttle position sensor 1)	Fully released	More than 0.36V
	Fully depressed	Less than 4.75V
68 (Throttle position sensor 2)	Fully released	Less than 4.75V
	Fully depressed	More than 0.36V



6. If NG, replace electric throttle control actuator and go to the next step.
7. Perform EC-1440, "Throttle Valve Closed Position Learning" .
8. Perform EC-1440, "Idle Air Volume Learning" .

Remove and Installation

EBS00GZR

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-116, "INTAKE MANIFOLD" .

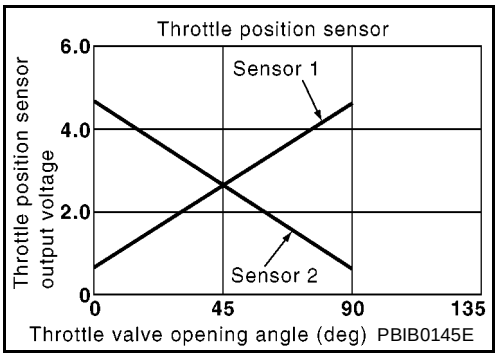
DTC P0222, P0223 TP SENSOR

PFP:16119

Component Description

EBS00GZS

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.
The throttle position sensor has the two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.



CONSULT-II Reference Value in Data Monitor Mode

EBS00GZT

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
THRTL SEN1	● Ignition switch: ON (Engine stopped) ● Shift lever: D (CVT model) 1st (M/T model)	Accelerator pedal: Fully released	More than 0.36V
		Accelerator pedal: Fully depressed	Less than 4.75V

On Board Diagnosis Logic

EBS00GZU

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0222 0222	Throttle position sensor 1 circuit low input	An excessively low voltage from the TP sensor 1 is sent to ECM.	● Harness or connectors (The TP sensor 1 circuit is open or shorted.) ● Electric throttle control actuator (TP sensor 1)
P0223 0223	Throttle position sensor 1 circuit high input	An excessively high voltage from the TP sensor 1 is sent to ECM.	

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters in fail-safe mode and the MI lights up.

Engine operation condition in fail-safe mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.

DTC Confirmation Procedure

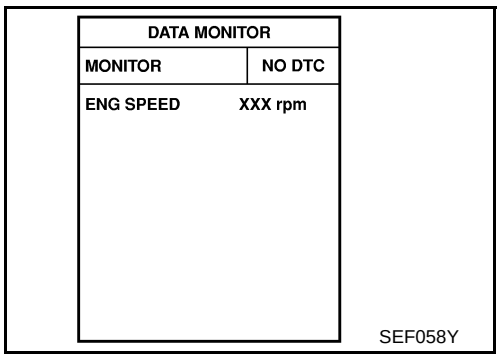
EBS00GZV

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.

2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-1534, "Diagnostic Procedure" .



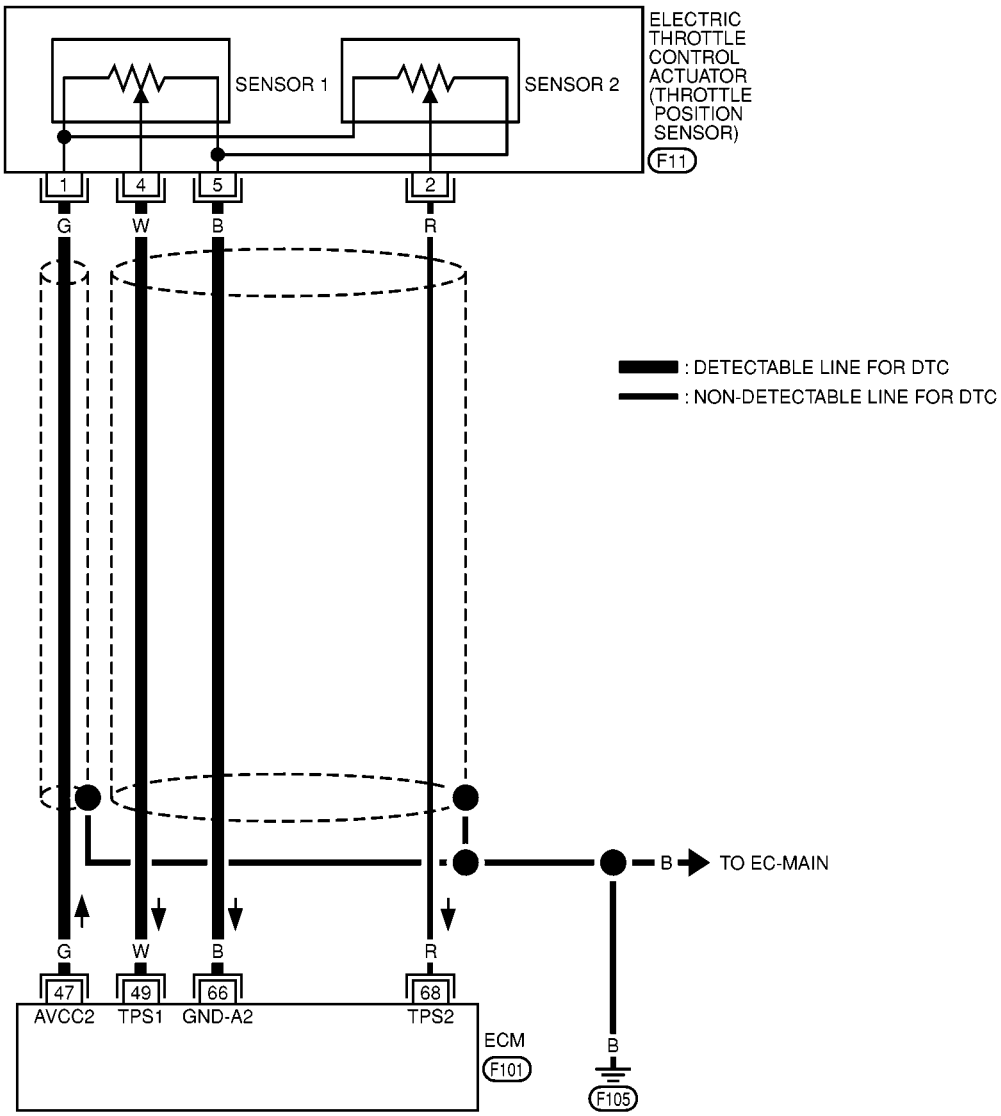
WITHOUT CONSULT-II

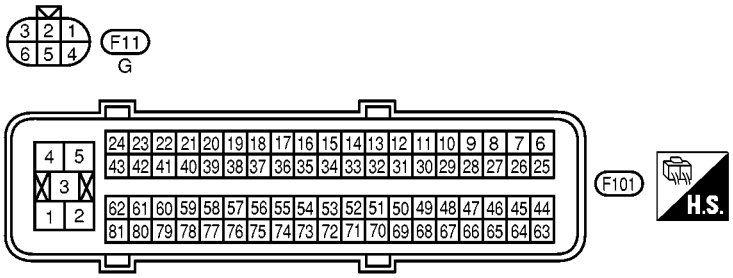
1. Start engine and let it idle for 1 second.
2. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
3. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
4. If DTC is detected, go to EC-1534, "Diagnostic Procedure" .

Wiring Diagram

EBS00GZW

EC-TPS1-01





MBWA0125E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
47	G	Throttle position sensor power supply	**[Ignition switch "ON"]**	Approximately 5V
49	W	Throttle position sensor 1	**[Ignition switch "ON"]** ● Shift lever position is "D" (CVT model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully released	More than 0.36V
			[Ignition switch "ON"] ● Shift lever position is "D" (CVT model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully depressed	Less than 4.75V
66	B	Sensors' ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
68	R	Throttle position sensor 2	**[Ignition switch "ON"]** ● Shift lever position is "D" (CVT model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully released	Less than 4.75V
			[Ignition switch "ON"] ● Shift lever position is "D" (CVT model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully depressed	More than 0.36V

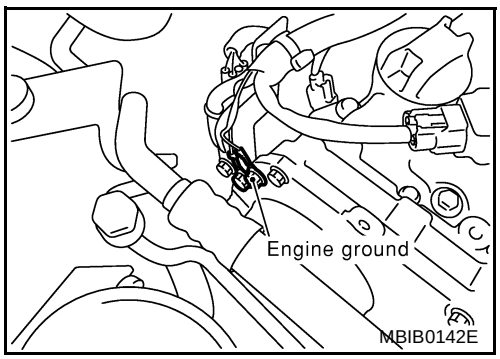
Diagnostic Procedure

EBS00GZX

1. RETIGHTEN GROUND SCREWS

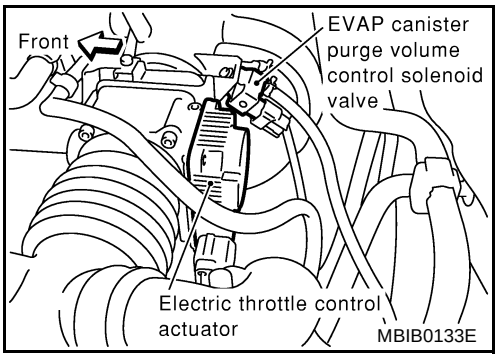
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



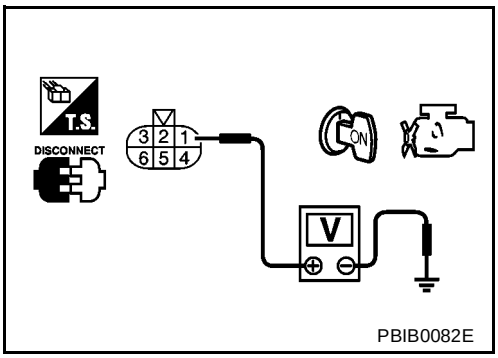
2. CHECK THROTTLE POSITION SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect electric throttle control actuator harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between electric throttle control actuator terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK THROTTLE POSITION SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 66 and electric throttle control actuator terminal 5. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK THROTTLE POSITION SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 49 and electric throttle control actuator terminal 4. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK THROTTLE POSITION SENSOR

Refer to EC-1536, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-1440, "Throttle Valve Closed Position Learning" .
3. Perform EC-1440, "Idle Air Volume Learning" .

>> **INSPECTION END**

7. CHECK INTERMITTENT INCIDENT

Refer to EC-1498, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

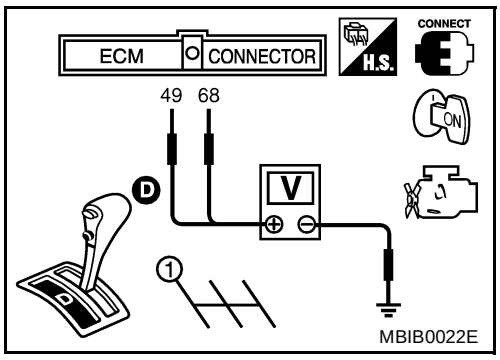
Component Inspection

EBS00GZY

THROTTLE POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Perform EC-1440, "Throttle Valve Closed Position Learning" .
3. Turn ignition switch “ON”.
4. Set selector lever to “D” position (CVT models) or “1st” position (M/T models).
5. Check voltage between ECM terminals 49 (TP sensor 1 signal), 68 (TP sensor 2 signal) and engine ground under the following conditions.

Terminal	Accelerator pedal	Voltage
49 (Throttle position sensor 1)	Fully released	More than 0.36V
	Fully depressed	Less than 4.75V
68 (Throttle position sensor 2)	Fully released	Less than 4.75V
	Fully depressed	More than 0.36V



6. If NG, replace electric throttle control actuator and go to the next step.
7. Perform EC-1440, "Throttle Valve Closed Position Learning" .
8. Perform EC-1440, "Idle Air Volume Learning" .

Remove and Installation

EBS00GZZ

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-116, "INTAKE MANIFOLD" .

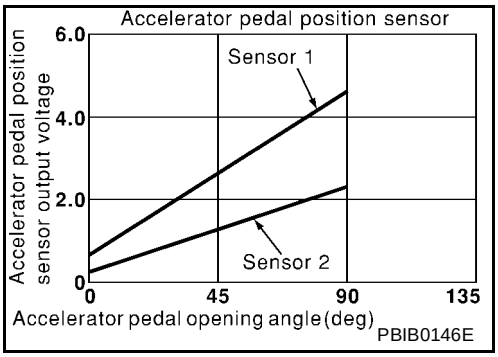
DTC P0226 APP SENSOR

PFP:18002

Component Description

EBS00H00

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.
Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometers which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the accelerator pedal and feed the voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.
Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for the engine operation such as fuel cut.



CONSULT-II Reference Value in Data Monitor Mode

EBS00H01

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
ACCEL SEN1 ACCEL SEN2	● Ignition switch: ON (engine stopped)	Accelerator pedal: Fully released	0.35 - 0.67V
		Accelerator pedal: Fully depressed	More than 3.9V
CLSD THL POS	● Ignition switch: ON	Accelerator pedal: Fully released	ON
		Accelerator pedal: Slightly depressed	OFF

On Board Diagnosis Logic

EBS00H02

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0226 0226	Accelerator pedal position sensor circuit range/performance problem	Rationally incorrect voltage is sent to ECM compared with the signals from APP sensor 1 and APP sensor 2.	● Harness or connector (The APP sensor 1 and 2 circuit is open or shorted.) ● Accelerator pedal position sensor 1 and 2

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters in fail-safe mode and the MI lights up.

Engine operating condition in fail-safe mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.

DTC Confirmation Procedure

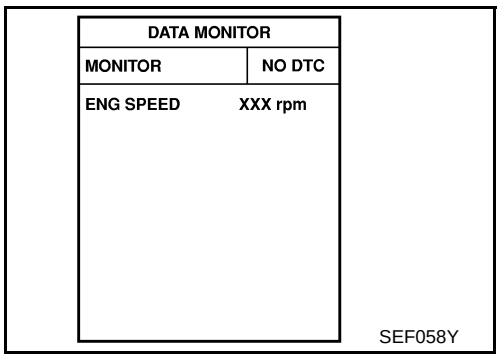
EBS00H03

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.

2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-1540, "Diagnostic Procedure" .

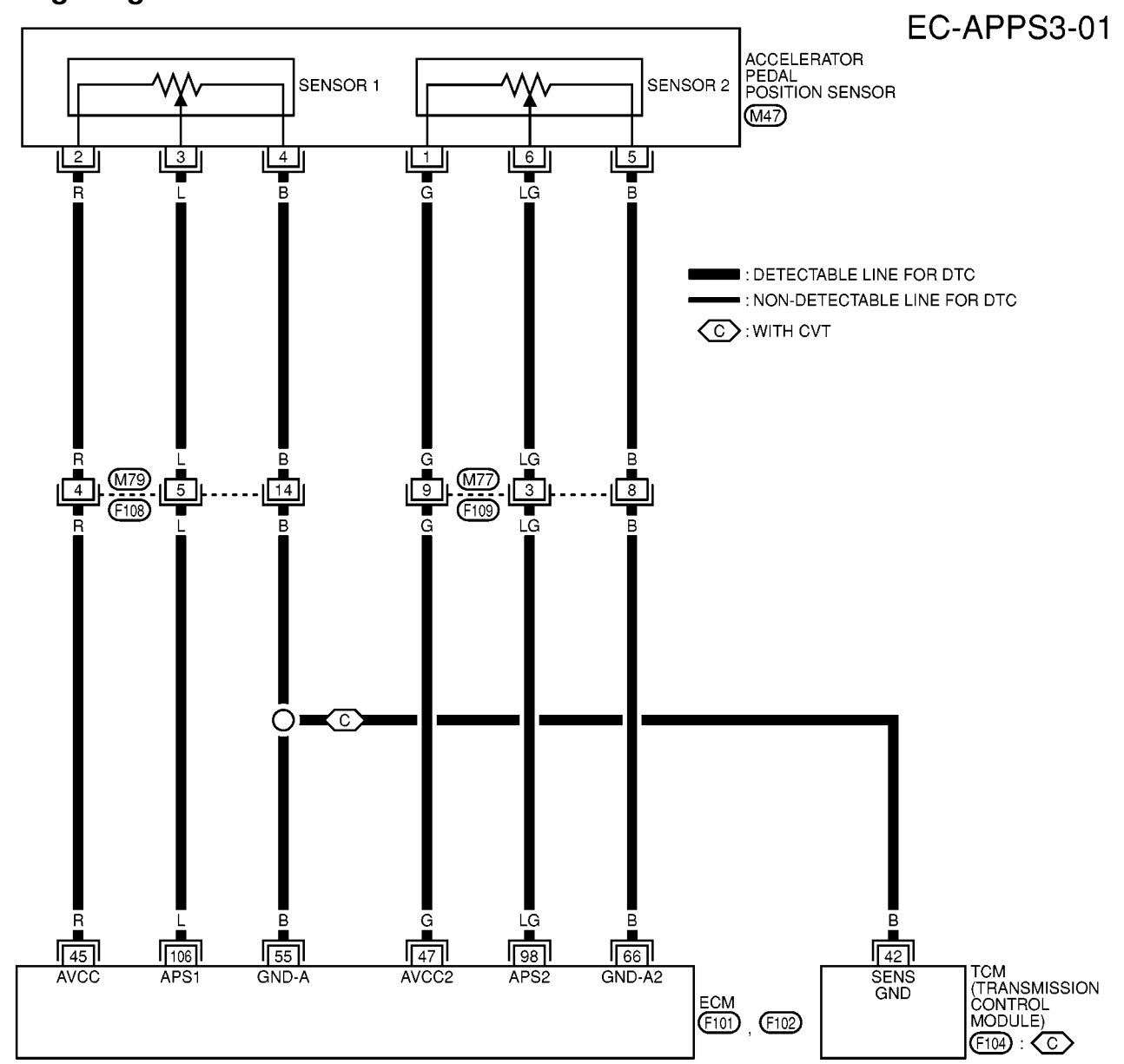


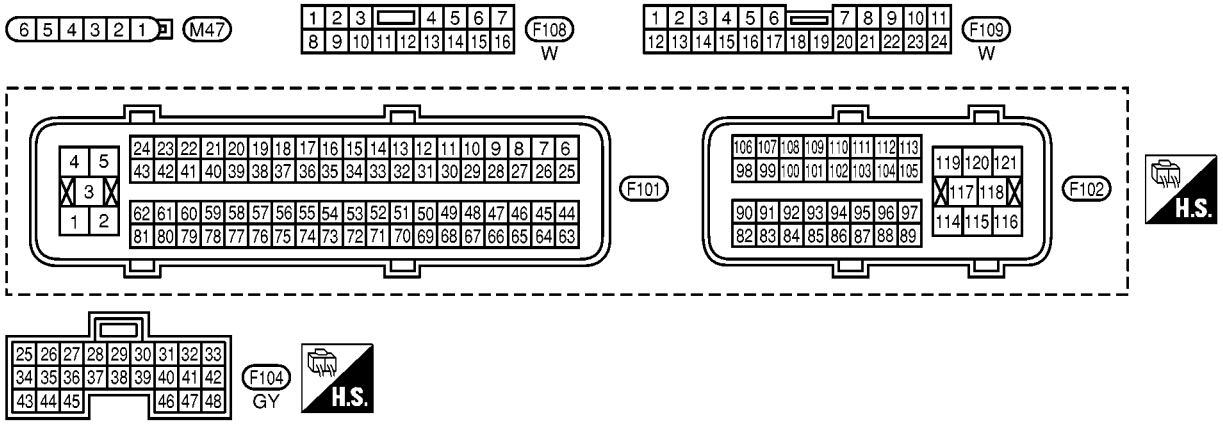
WITHOUT CONSULT-II

1. Start engine and let it idle for 1 second.
2. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
3. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
4. If DTC is detected, go to EC-1540, "Diagnostic Procedure" .

Wiring Diagram

EBS00H04





MBWA0131E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
45	R	Sensors′ power supply	**[Ignition switch “ON”]**	Approximately 5V
47	G	Sensors′ power supply	**[Ignition switch “ON”]**	Approximately 5V
55	B	Sensor′s ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
66	B	Sensor′s ground	**[Ignition switch “ON”]** ● **Warm-up condition** ● Idle speed	Approximately 0V
98	LG	Accelerator pedal position sensor 2	**[Ignition switch “ON”]** ● Shift lever position is “D” (CVT models) ● Shift lever position is “1st” (M/T models) ● Accelerator pedal fully released	0.175 - 0.335V
			[Ignition switch “ON”] ● Shift lever position is “D” (CVT models) ● Shift lever position is “1st” (M/T models) ● Accelerator pedal fully depressed	More than 1.95V
106	L	Accelerator pedal position sensor 1	**[Ignition switch “ON”]** ● Shift lever position is “D” (CVT models) ● Shift lever position is “1st” (M/T models) ● Accelerator pedal fully released	0.35 - 0.67V
			[Ignition switch “ON”] ● Shift lever position is “D” (CVT models) ● Shift lever position is “1st” (M/T models) ● Accelerator pedal fully depressed	More than 3.9V

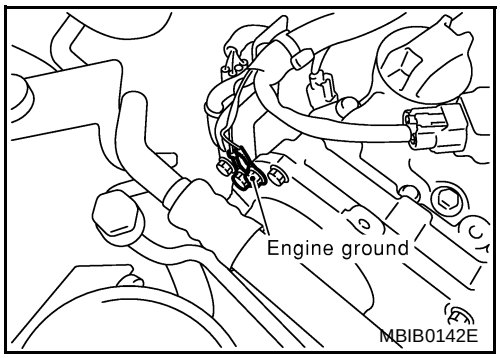
Diagnostic Procedure

EBS00H05

1. RETIGHTEN GROUND SCREWS

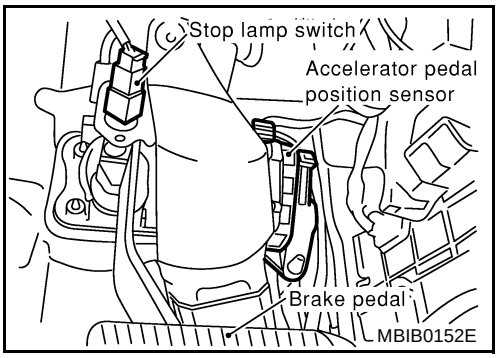
1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

>> GO TO 2.



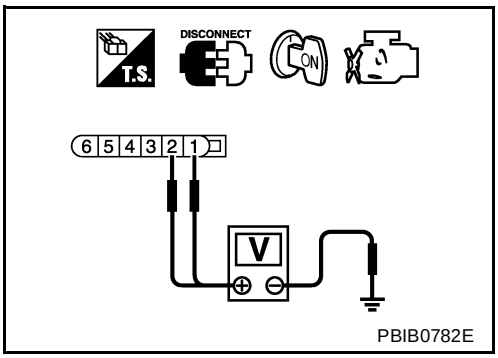
2. CHECK APP SENSOR POWER SUPPLY CIRCUIT

1. Disconnect accelerator pedal position (APP) sensor harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between APP sensor terminals 1, 2 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M77, F109
- Harness connectors M79, F108
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK APP SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 55 and APP sensor terminal 4, ECM terminal 66 and APP sensor terminal 5.
   Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M77, F109
- Harness connectors M79, F108
- Harness for open or short between ECM and accelerator pedal position sensor
- Harness for open or short between TCM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK APP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 106 and APP sensor terminal 3, ECM terminal 98 and APP sensor terminal 6.
   Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M77, F109
- Harness connectors M79, F108
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK APP SENSOR

Refer to EC-1543, "Component Inspection" .

OK or NG

OK >> GO TO 10.
NG >> GO TO 9.

9. REPLACE APP SENSOR

1. Replace the accelerator pedal position sensor.
2. Perform EC-1440, "Accelerator Pedal Released Position Learning" .
3. Perform EC-1440, "Throttle Valve Closed Position Learning" .
4. Perform EC-1440, "Idle Air Volume Learning" .

>> **INSPECTION END**

10. CHECK INTERMITTENT INCIDENT

Refer to EC-1498, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

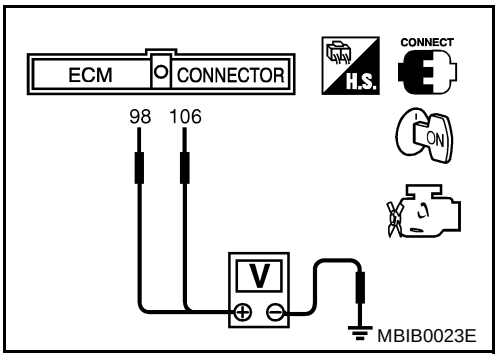
Component Inspection

EBS00H06

ACCELERATOR PEDAL POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Turn ignition switch “ON”.
3. Check voltage between ECM terminals 106 (APP sensor 1 signal), 98 (APP sensor 2 signal) and engine ground under the following conditions.

Terminal	Accelerator pedal	Voltage
106 (Accelerator pedal position sensor 1)	Fully released	0.35 - 0.67V
	Fully depressed	More than 3.9V
98 (Accelerator pedal position sensor 2)	Fully released	0.175 - 0.335V
	Fully depressed	More than 1.95V



4. If NG, replace accelerator pedal assembly and go to the next step.
5. Perform EC-1440, "Accelerator Pedal Released Position Learning" .
6. Perform EC-1440, "Throttle Valve Closed Position Learning" .
7. Perform EC-1440, "Idle Air Volume Learning" .

Remove and Installation

EBS00H07

ACCELERATOR PEDAL

Refer to ACC-2, "ACCELERATOR CONTROL SYSTEM" .

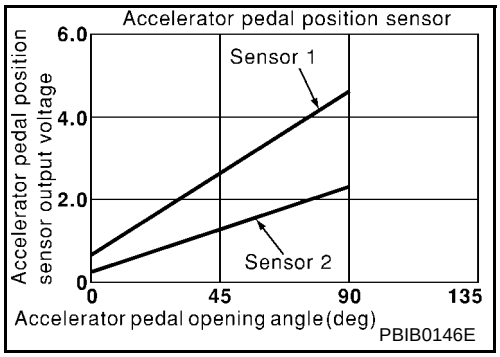
DTC P0227, P0228 APP SENSOR

PFP:18002

Component Description

EBS00H08

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.
Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometers which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the accelerator pedal and feed the voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.



Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for the engine operation such as fuel cut.

CONSULT-II Reference Value in Data Monitor Mode

EBS00H09

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
ACCEL SEN1	● Ignition switch: ON (engine stopped)	Accelerator pedal: Fully released	0.35 - 0.67V
		Accelerator pedal: Fully depressed	More than 3.9V
CLSD THL POS	● Ignition switch: ON	Accelerator pedal: Fully released	ON
		Accelerator pedal: Slightly depressed	OFF

On Board Diagnosis Logic

EBS00H0A

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0227 0227	Accelerator pedal position sensor 1 circuit low input	An excessively low voltage from the APP sensor 1 is sent to ECM.	● Harness or connectors (The APP sensor 1 circuit is open or shorted.) ● Accelerator pedal position sensor (Accelerator pedal position sensor 1)
P0228 0228	Accelerator pedal position sensor 1 circuit high input	An excessively high voltage from the APP sensor 1 is sent to ECM.	

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters in fail-safe mode and the MI lights up.

Engine operating condition in fail-safe mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.

DTC Confirmation Procedure

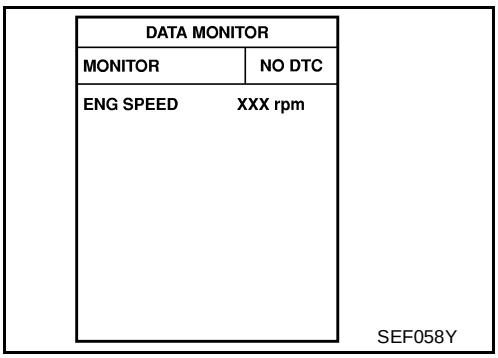
EBS00H0B

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.

2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-1547, "Diagnostic Procedure" .

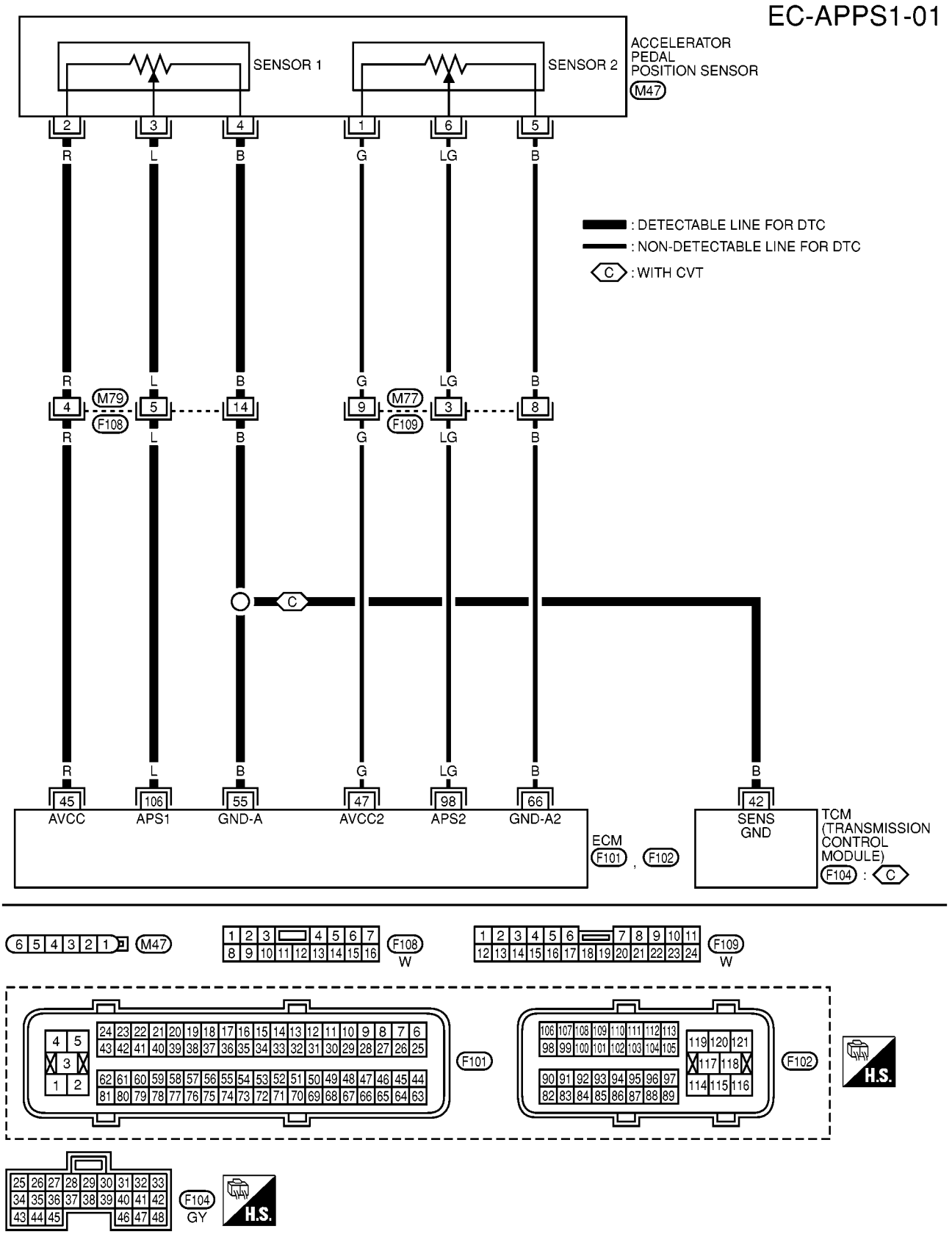


WITHOUT CONSULT-II

1. Start engine and let it idle for 1 second.
2. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
3. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
4. If DTC is detected, go to EC-1547, "Diagnostic Procedure" .

Wiring Diagram

EBS00H0C



MBWA0129E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
45	R	Sensors′ power supply	**[Ignition switch “ON”]**	Approximately 5V
47	G	Sensors′ power supply	**[Ignition switch “ON”]**	Approximately 5V
55	B	Sensor′s ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
66	B	Sensor′s ground	**[Ignition switch “ON”]** ● **Warm-up condition** ● Idle speed	Approximately 0V
98	LG	Accelerator pedal position sensor 2	**[Ignition switch “ON”]** ● Shift lever position is “D” (CVT models) ● Shift lever position is “Ist” (M/T models) ● Accelerator pedal fully released	0.175 - 0.335V
			[Ignition switch “ON”] ● Shift lever position is “D” (CVT models) ● Shift lever position is “Ist” (M/T models) ● Accelerator pedal fully depressed	More than 1.95V
106	L	Accelerator pedal position sensor 1	**[Ignition switch “ON”]** ● Shift lever position is “D” (CVT models) ● Shift lever position is “Ist” (M/T models) ● Accelerator pedal fully released	0.35 - 0.67V
			[Ignition switch “ON”] ● Shift lever position is “D” (CVT models) ● Shift lever position is “Ist” (M/T models) ● Accelerator pedal fully depressed	More than 3.9V

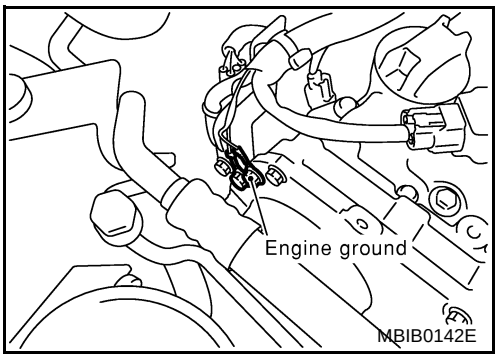
Diagnostic Procedure

EBS00H0D

1. RETIGHTEN GROUND SCREWS

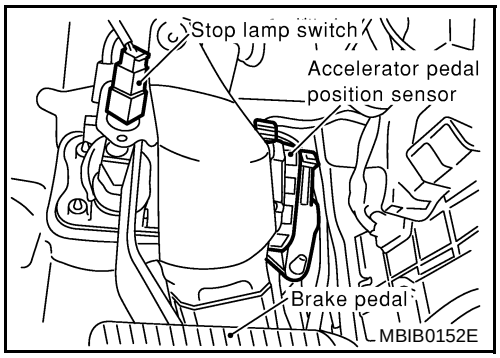
1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

>> GO TO 2.



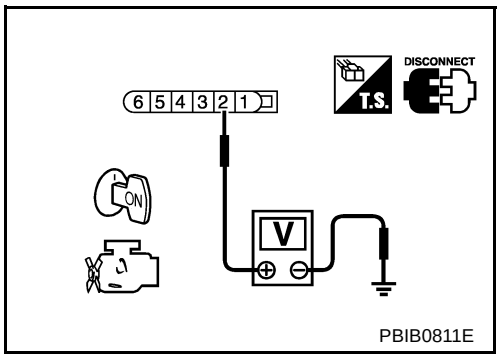
2. CHECK APP SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect accelerator pedal position (APP) sensor harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between APP sensor terminal 2 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M79, F108
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK APP SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 55 and APP sensor terminal 4. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M79, F108
- Harness for open or short between ECM and accelerator pedal position sensor
- Harness for open or short between TCM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK APP SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 106 and APP sensor terminal 3. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M79, F108
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK APP SENSOR

Refer to EC-1549, "Component Inspection" .

OK or NG

OK >> GO TO 10.
NG >> GO TO 9.

9. REPLACE APP SENSOR

1. Replace the accelerator pedal position sensor.
2. Perform EC-1440, "Accelerator Pedal Released Position Learning" .
3. Perform EC-1440, "Throttle Valve Closed Position Learning" .
4. Perform EC-1440, "Idle Air Volume Learning" .

>> **INSPECTION END**

10. CHECK INTERMITTENT INCIDENT

Refer to EC-1498, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

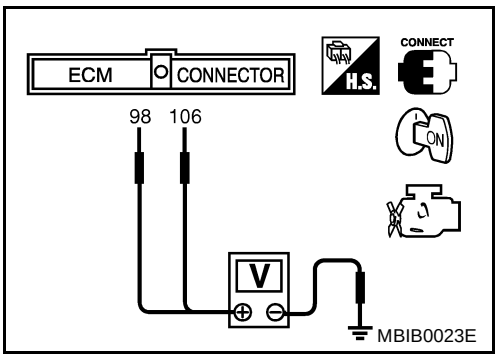
Component Inspection

EBS00H0E

ACCELERATOR PEDAL POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Turn ignition switch “ON”.
3. Check voltage between ECM terminals 106 (APP sensor 1 signal), 98 (APP sensor 2 signal) and engine ground under the following conditions.

Terminal	Accelerator pedal	Voltage
106 (Accelerator pedal position sensor 1)	Fully released	0.35 - 0.67V
	Fully depressed	More than 3.9V
98 (Accelerator pedal position sensor 2)	Fully released	0.175 - 0.335V
	Fully depressed	More than 1.95V



4. If NG, replace accelerator pedal assembly and go to the next step.
5. Perform EC-1440, "Accelerator Pedal Released Position Learning" .
6. Perform EC-1440, "Throttle Valve Closed Position Learning" .
7. Perform EC-1440, "Idle Air Volume Learning" .

Remove and Installation

EBS00H0F

ACCELERATOR PEDAL

Refer to ACC-2, "ACCELERATOR CONTROL SYSTEM" .

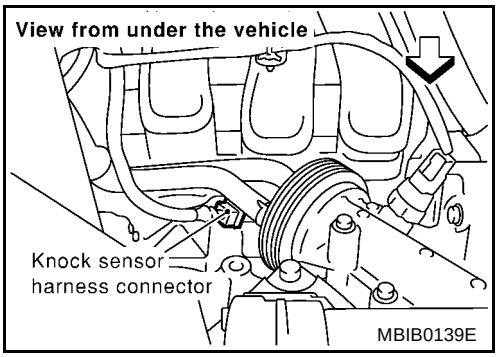
DTC P0327, P0328 KS

PFP:22060

Component Description

EBS00H0G

The knock sensor is attached to the cylinder block. It senses engine knocking using a piezoelectric element. A knocking vibration from the cylinder block is sensed as vibrational pressure. This pressure is converted into a voltage signal and sent to the ECM.



On Board Diagnosis Logic

EBS00H0H

The MI will not light for knock sensor malfunction.

DTC No.	Trouble Diagnosis Name	DTC Detected Condition	Possible Cause
P0327 0327	Knock sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Knock sensor
P0328 0328	Knock sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	

DTC Confirmation Procedure

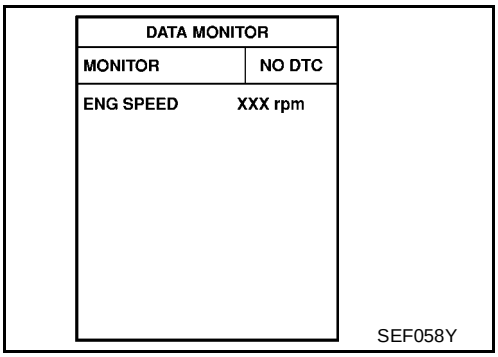
EBS00H0I

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2. Start engine and run it for at least 5 seconds at idle speed.
3. If 1st trip DTC is detected, go to EC-1553, "Diagnostic Procedure" .



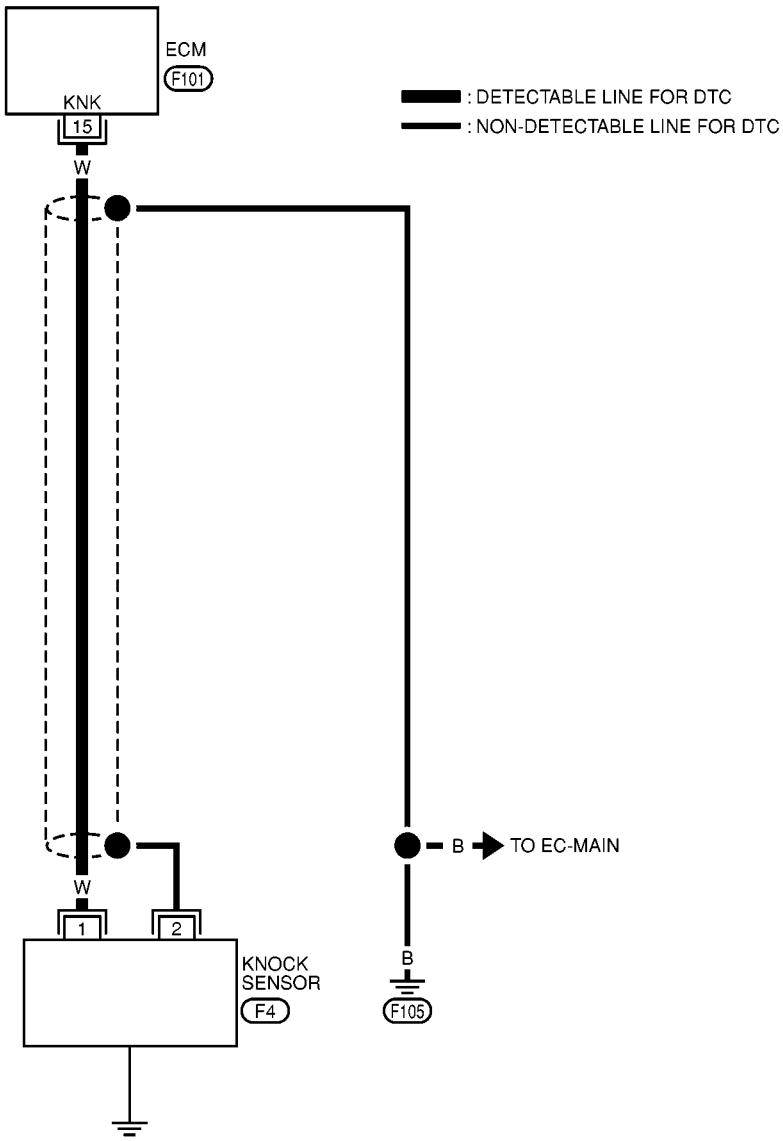
WITHOUT CONSULT-II

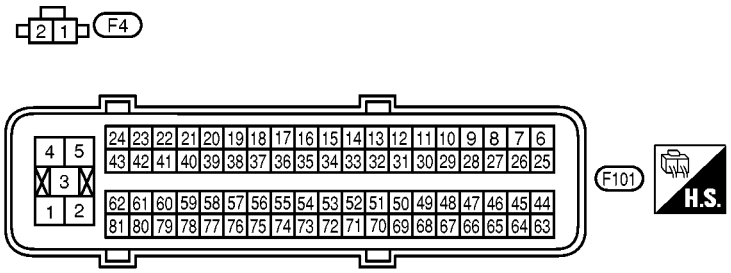
1. Start engine and run it for at least 5 seconds at idle speed.
2. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
3. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
4. If 1st trip DTC is detected, go to EC-1553, "Diagnostic Procedure" .

Wiring Diagram

EBS00H0J

EC-KS-01





MBWA0013E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
15	W	Knock sensor	**[Engine is running]** ● Idle speed	Approximately 2.5V

Diagnostic Procedure

EBS00H0K

1. CHECK KNOCK SENSOR INPUT SIGNAL CIRCUIT-I

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check resistance between ECM terminal 15 and engine ground. Refer to Wiring Diagram.

   NOTE:
   It is necessary to use an ohmmeter which can measure more than 10 MΩ.

   Resistance: Approximately 530 - 590kΩ [at 20°C (68°F)]

4. Also check harness for short to ground and short to power.

OK or NG

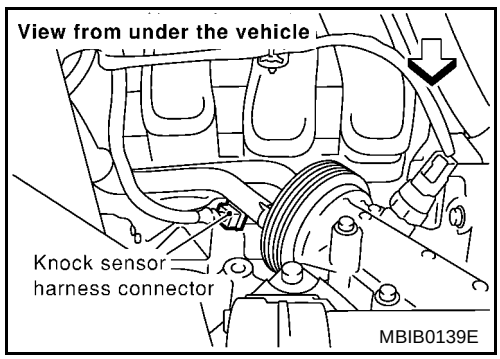
OK >> GO TO 4.
NG >> GO TO 2.

2. CHECK KNOCK SENSOR INPUT SIGNAL CIRCUIT-II

1. Disconnect knock sensor harness connector.
2. Check harness continuity between ECM terminal 15 and knock sensor terminal 1.
   Refer to Wiring Diagram.

   Continuity should exist.

3. Also check harness for short to ground and short to power.



OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK KNOCK SENSOR

Refer to EC-1554, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace knock sensor.

4. CHECK KNOCK SENSOR SHIELD CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between knock sensor terminal 2 and engine ground.

   Continuity should exist

2. Also check harness for short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to power in harness or connectors.

5. CHECK INTERMITTENT INCIDENT

Refer to EC-1498, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

EBS00H0L

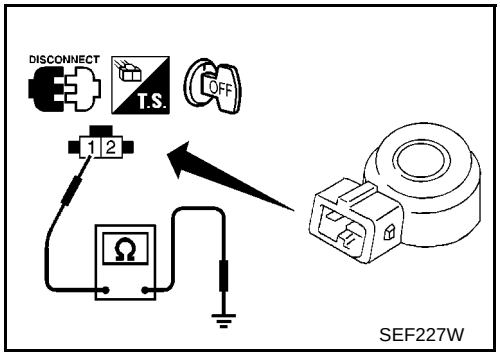
KNOCK SENSOR

Check resistance between knock sensor terminal 1 and ground.

NOTE:
It is necessary to use an ohmmeter which can measure more than 10 MΩ.

Resistance: Approximately 530 - 590kΩ [at 20°C (68°F)]

CAUTION:
Do not use any knock sensors that have been dropped or physically damaged. Use only new ones.



SEF227W

Removal and Installation

EBS00H0M

KNOCK SENSOR

Refer to EM-165, "CYLINDER BLOCK" .

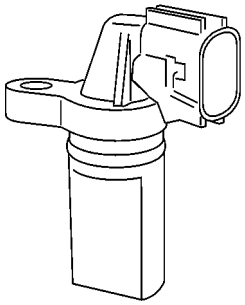
DTC P0335 CKP SENSOR (POS)

PFP:23731

Component Description

EBS00H0N

The crankshaft position sensor (POS) is located on the cylinder block rear housing facing the gear teeth (cogs) of the signal plate at the end of the crankshaft. It detects the fluctuation of the engine revolution.
The sensor consists of a permanent magnet and Hall IC.
When the engine is running, the high and low parts of the teeth cause the gap with the sensor change.
The changing gap causes the magnetic field near the sensor to change.
Due to the changing magnetic field, the voltage from the sensor changes.
The ECM receives the voltage signal and detects the fluctuation of the engine revolution.


PBIB0562E

CONSULT-II Reference Value in Data Monitor Mode

EBS00H0O

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
ENG SPEED·	● Tachometer: Connect ● Run engine and compare tachometer indication with the CONSULT-II value.	Almost the same speed as the CONSULT-II value.

On Board Diagnosis Logic

EBS00H0P

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0335 0335	Crankshaft position sensor (POS) circuit	● The crankshaft position sensor (POS) signal is not detected by the ECM during the first few seconds of engine cranking. ● The proper pulse signal from the crankshaft position sensor (POS) is not sent to ECM while the engine is running. ● The crankshaft position sensor (POS) signal is not in the normal pattern during engine running.	● Harness or connectors (The sensor circuit is open or shorted.) ● Crankshaft position sensor (POS) ● Signal plate

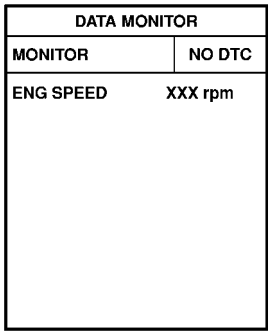
DTC Confirmation Procedure

EBS00H0Q

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10.5V with ignition switch ON”.

WITH CONSULT-II

1. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2. Crank engine for at least 2 seconds and run it for at least 5 seconds at idle speed.
3. If 1st trip DTC is detected, go to EC-1558, "Diagnostic Procedure" .



SEF058Y

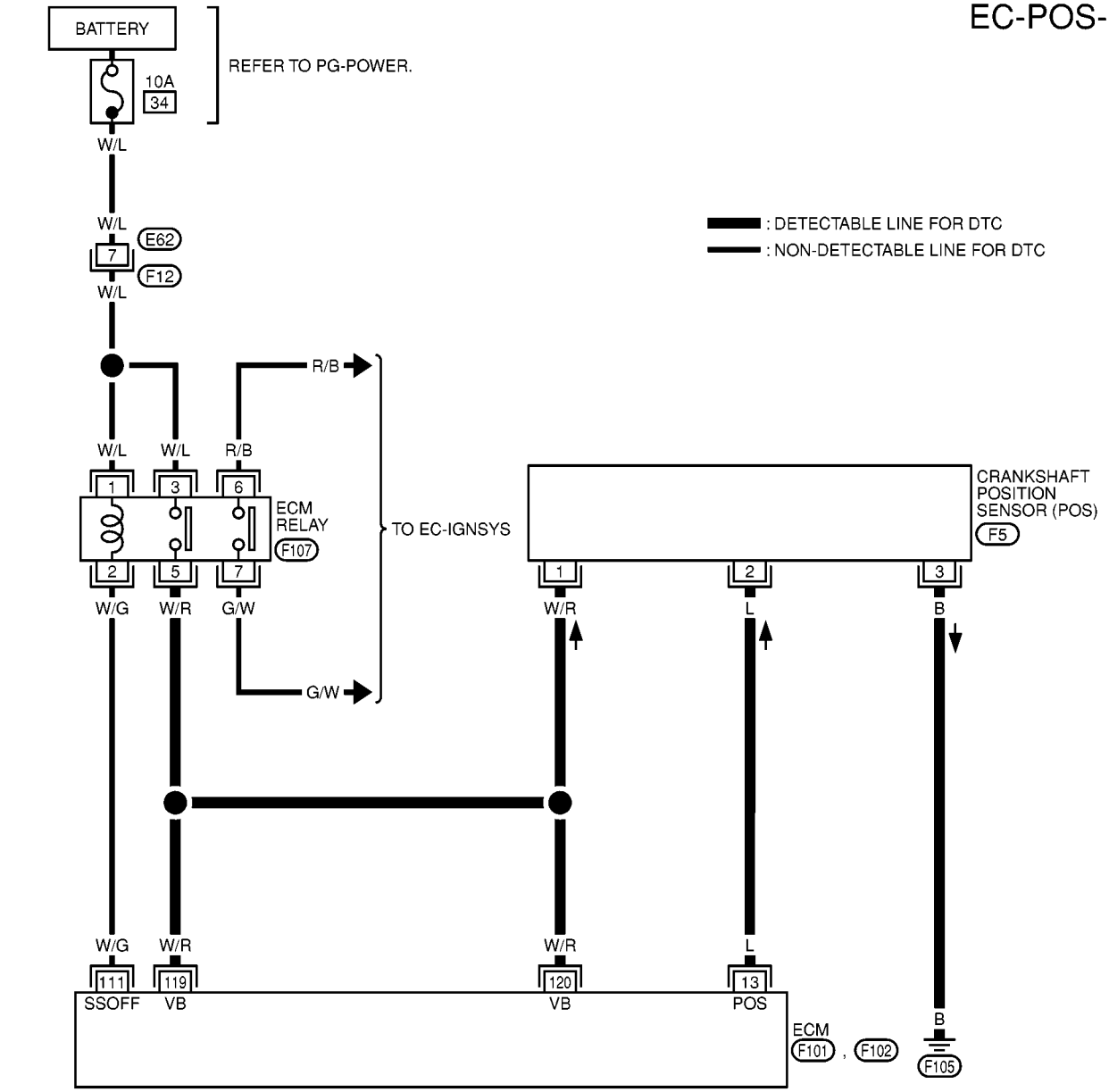
WITHOUT CONSULT-II

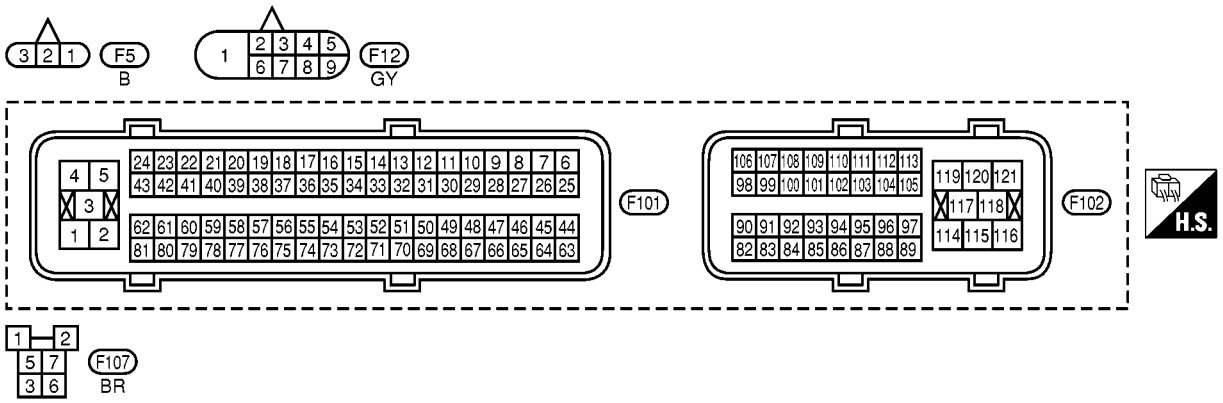
1. Crank engine for at least 2 seconds and run it for at least 5 seconds at idle speed.
2. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
3. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
4. If 1st trip DTC is detected, go to EC-1558, "Diagnostic Procedure" .

Wiring Diagram

EBS00H0R

EC-POS-01



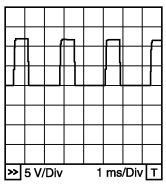
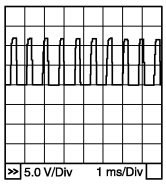


MBWA0014E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
13	L	Crankshaft position sensor (POS)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 3V★  PBIB0527E
			[Engine is running] ● Engine speed is 2,000 rpm	Approximately 3V★  PBIB0528E

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

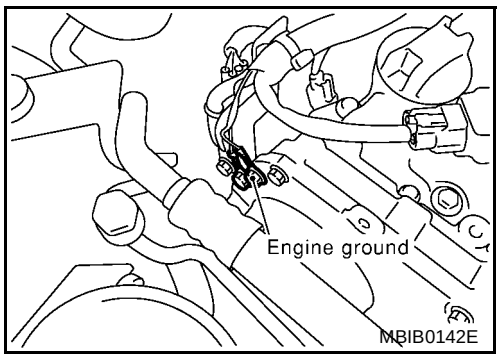
Diagnostic Procedure

EBS00H0S

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

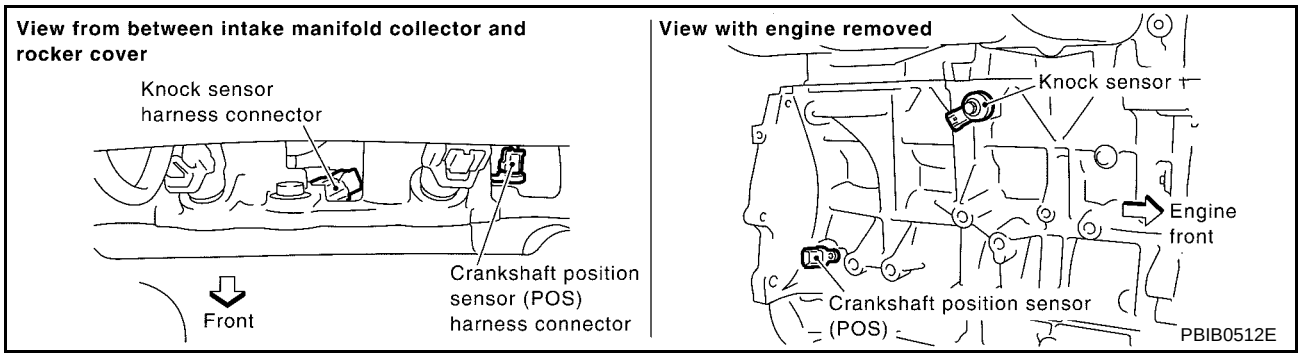
>> GO TO 2.



MBIB0142E

2. CHECK CRANKSHAFT POSITION (CKP) SENSOR (POS) POWER SUPPLY CIRCUIT

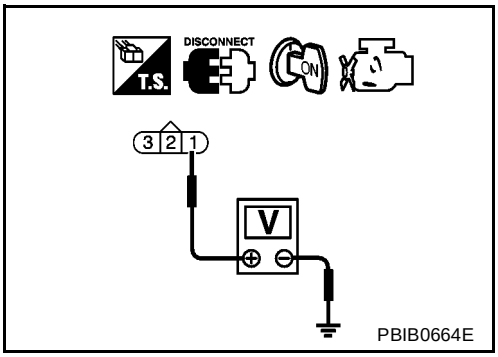
1. Disconnect crankshaft position (CKP) sensor (POS) harness connector.



2. Turn ignition switch “ON”.

3. Check voltage between CKP sensor (POS) terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage



4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between crankshaft position sensor (POS) and ECM
- Harness for open or short between crankshaft position sensor (POS) and ECM relay

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK CKP SENSOR (POS) GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between CKP sensor (POS) terminal 3 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for and short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK CKP SENSOR (POS) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 13 and CKP sensor (POS) terminal 2. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK CRANKSHAFT POSITION SENSOR (POS)

Refer to EC-1560, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace crankshaft position sensor (POS).

7. CHECK GEAR TOOTH

Visually check for chipping signal plate gear tooth.

OK or NG

OK >> GO TO 8.
NG >> Replace the signal plate.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-1498, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

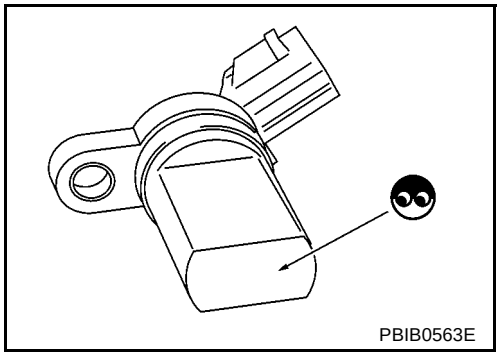
>> **INSPECTION END**

Component Inspection

EBS00H0T

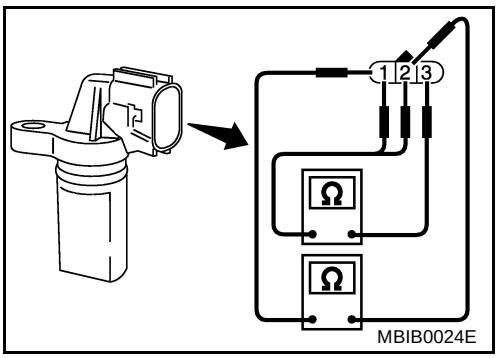
CRANKSHAFT POSITION SENSOR (POS)

1. Loosen the fixing bolt of the sensor.
2. Disconnect crankshaft position sensor (POS) harness connector.
3. Remove the sensor.
4. Visually check the sensor for chipping.


PBIB0563E

5. Check resistance as shown in the figure.

Terminal No. (Polarity)	Resistance Ω [at 25°C (77°F)]
3 (+) - 1 (-)	Except 0 or ∞
3 (+) - 2 (-)	
2 (+) - 1 (-)	



6. If NG, replace crankshaft position sensor (POS).

Removal and Installation

CRANKSHAFT POSITION SENSOR (POS)

EBS00H0U

Refer to EM-165, "CYLINDER BLOCK" .

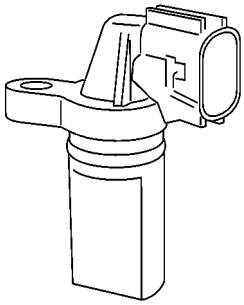
DTC P0340 CMP SENSOR (PHASE)

PFP:23731

Component Description

EBS00H0V

The camshaft position sensor (PHASE) senses the retraction with intake valve camshaft to identify a particular cylinder. The camshaft position sensor (PHASE) senses the piston position.
When the crankshaft position sensor (POS) system becomes inoperative, the camshaft position sensor (PHASE) provides various controls of engine parts instead, utilizing timing of cylinder identification signals.
The sensor consists of a permanent magnet and Hall IC.
When engine is running, the high and low parts of the teeth cause the gap with the sensor to change.
The changing gap causes the magnetic field near the sensor to change.
Due to the changing magnetic field, the voltage from the sensor changes.


PBIB0562E

On Board Diagnosis Logic

EBS00H0W

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0340 0340	Camshaft position sensor (PHASE) circuit	● The cylinder No. signal is not sent to ECM for the first few seconds during engine cranking. ● The cylinder No. signal is not set to ECM during engine running. ● The cylinder No. signal is not in the normal pattern during engine running.	● Harness or connectors (The sensor circuit is open or shorted.) ● Camshaft position sensor (PHASE) ● Camshaft (Intake) ● Starter motor (Refer to SC-22 .) ● Starting system circuit (Refer to SC-22 .) ● Dead (Weak) battery

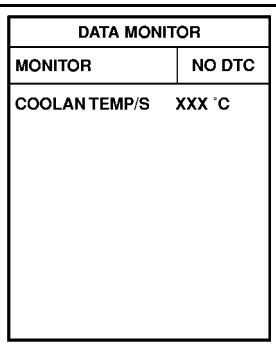
DTC Confirmation Procedure

EBS00H0X

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10.5V with ignition switch “ON”.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Crank engine for at least 2 seconds and run it for at least 5 seconds at idle speed.
4. If 1st trip DTC is detected, go to EC-1565, "Diagnostic Procedure" .
   If 1st trip DTC is not detected, go to next step.
5. Maintain engine speed at more than 800 rpm for at least 5 seconds.
6. If 1st trip DTC is detected, go to EC-1565, "Diagnostic Procedure" .



SEF013Y

WITHOUT CONSULT-II

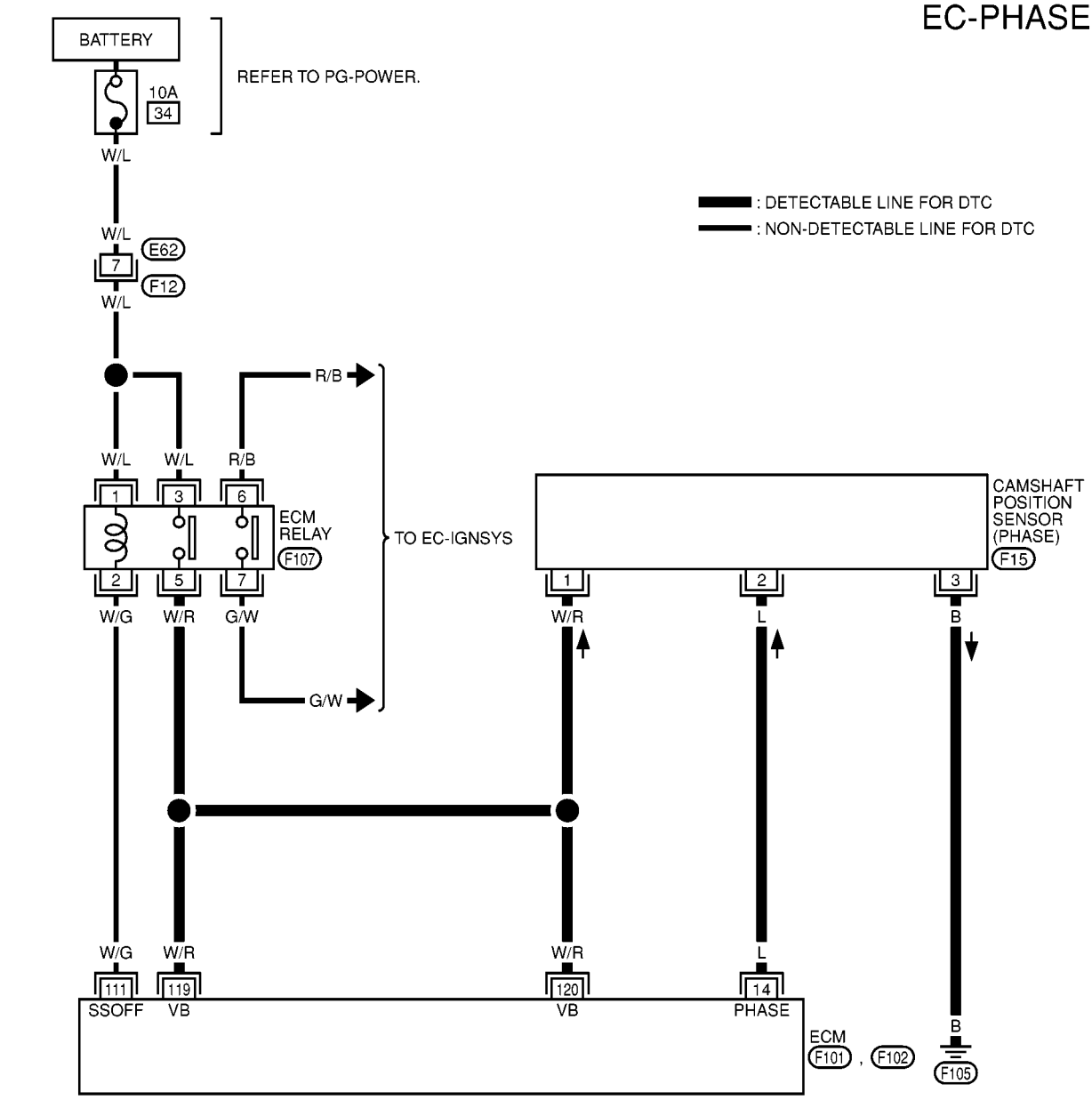
1. Crank engine for at least 2 seconds and run it for at least 5 seconds at idle speed.
2. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
3. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
4. If 1st trip DTC is detected, go to EC-1565, "Diagnostic Procedure" .
   If 1st trip DTC is not detected, go to next step.
5. Turn ignition switch “OFF” and wait at least 10 seconds.

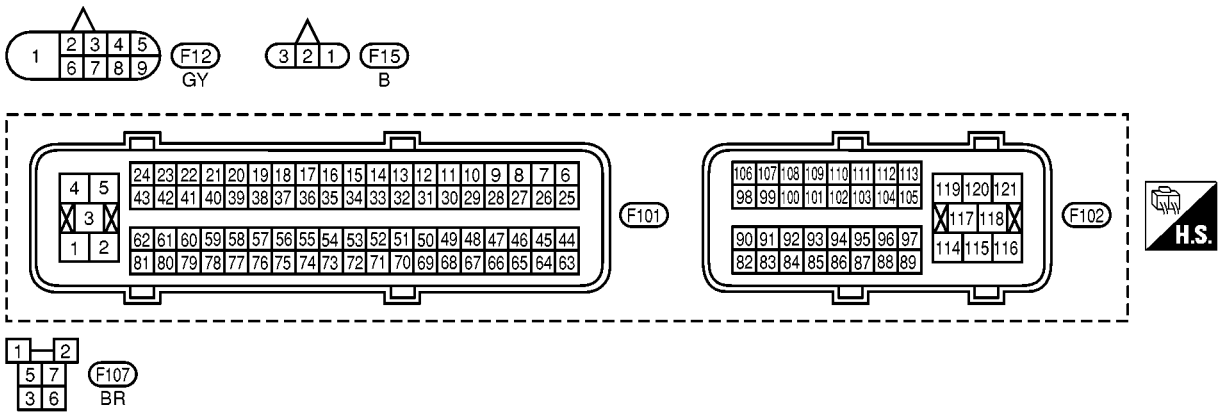
6. Start engine and maintain engine speed at more than 800 rpm for at least 5 seconds.
7. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
8. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
9. If 1st trip DTC is detected, go to EC-1565, "Diagnostic Procedure" .

Wiring Diagram

EBS00H0Y

EC-PHASE-01

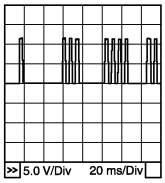
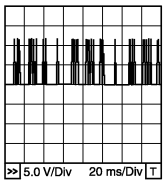




MBWA0015E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
14	L	Camshaft position sensor (PHASE)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.0 - 4.0V★  PBIB0525E
			[Engine is running] ● Engine speed is 2,000 rpm.	1.0 - 4.0V★  PBIB0526E

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnostic Procedure

EBS00H0Z

1. CHECK STARTING SYSTEM

Turn ignition switch to “START” position.

Does the engine turn over?

Does the starter motor operate?

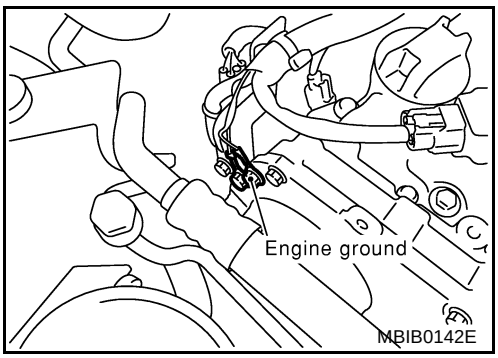
Yes or No

Yes >> GO TO 2.
No >> Check starting system. (Refer to SC-22, "STARTING SYSTEM" .)

2. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

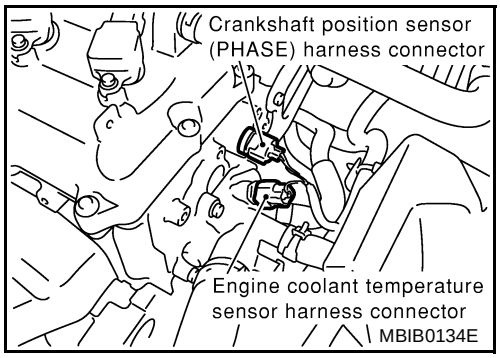
>> GO TO 3.



MBIB0142E

3. CHECK CAMSHAFT POSITION (CMP) SENSOR (PHASE) POWER SUPPLY CIRCUIT

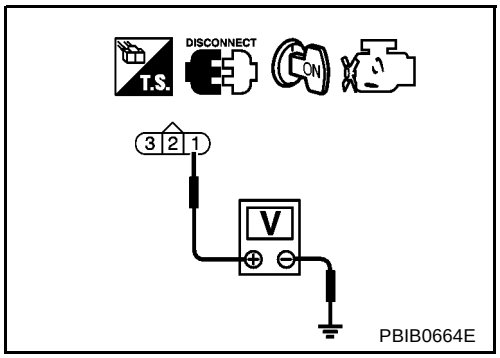
1. Disconnect camshaft position (CMP) sensor (PHASE) harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between CMP sensor (PHASE) terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage

4. Also check harness for short to ground and short to power.



OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between camshaft position sensor (PHASE) and ECM
- Harness for open or short between camshaft position sensor (PHASE) and ECM relay

>> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK CMP SENSOR (PHASE) GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between CMP sensor (PHASE) terminal 3 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK CMP SENSOR (PHASE) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 14 and CMP sensor (PHASE) terminal 2. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground or short to power.

OK or NG

OK >> GO TO 7.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK CAMSHAFT POSITION SENSOR (PHASE)

Refer to EC-1567, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> Replace camshaft position sensor (PHASE).

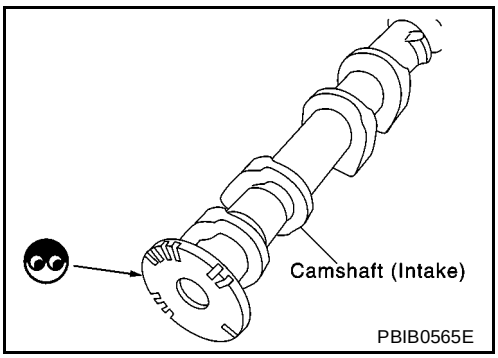
8. CHECK CAMSHAFT (INTAKE)

Check the following.

- Accumulation of debris to the signal plate of camshaft rear end
- Chipping signal plate of camshaft rear end

OK or NG

OK >> GO TO 9.
NG >> Remove debris and clean the signal plate of camshaft rear end or replace camshaft.



9. CHECK INTERMITTENT INCIDENT

Refer to EC-1498, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

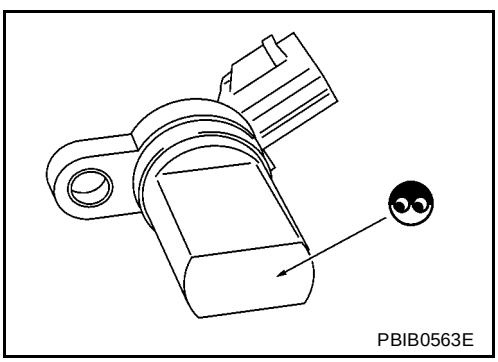
>> **INSPECTION END**

Component Inspection

EBS00H10

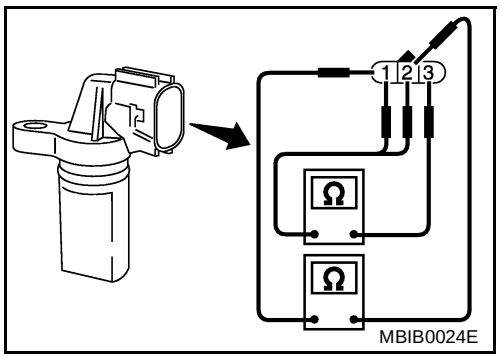
CAMSHAFT POSITION SENSOR (PHASE)

1. Loosen the fixing bolt of the sensor.
2. Disconnect camshaft position sensor (PHASE) harness connector.
3. Remove the sensor.
4. Visually check the sensor for chipping.



5. Check resistance as shown in the figure.

Terminal No. (Polarity)	Resistance Ω [at 25°C (77°F)]
3 (+) - 1 (-)	Except 0 or ∞
3 (+) - 2 (-)	
2 (+) - 1 (-)	



Removal and Installation

EBS00H11

CAMSHAFT POSITION SENSOR (PHASE)

Refer to EM-133, "CAMSHAFT" .

DTC P0500 VSS

PFP:32702

Description

EBS00H12

NOTE:
If DTC P0500 is displayed with DTC U1000 or U1001, first perform the trouble diagnosis for DTC U1000, U1001. Refer to EC-1505, "DTC U1000, U1001 CAN COMMUNICATION LINE" .
The vehicle speed signal is sent to the combination meter from the ABS actuator and electric unit (control unit) through CAN communication line. The combination meter then sends a signal to the ECM through CAN communication line.

On Board Diagnosis Logic

EBS00H13

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0500 0500	Vehicle speed sensor	The almost 0 km/h (0 MPH) signal from vehicle speed sensor is sent to ECM even when vehicle is being driven.	● Harness or connectors (The CAN communication line is open or shorted.) ● ABS actuator and electric unit (control unit) ● Wheel sensor ● Combination meter

DTC Confirmation Procedure

EBS00H14

CAUTION:
Always drive vehicle at a safe speed.

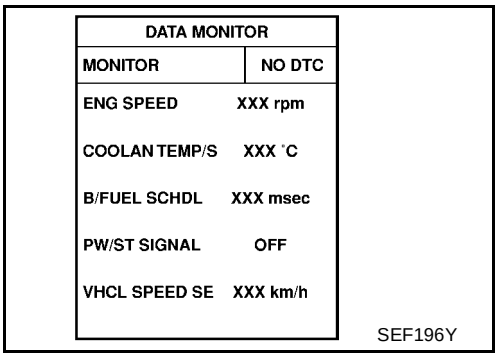
NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:
Steps 1 and 2 may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

WITH CONSULT-II

1. Start engine.
2. Read “VHCL SPEED SE” in “DATA MONITOR” mode with CONSULT-II. The vehicle speed on CONSULT-II should exceed 10 km/h (6 MPH) when rotating wheels with suitable gear position.
   If NG, go to EC-1570, "Diagnostic Procedure" .
   If OK, go to following step.
3. Select “DATA MONITOR” mode with CONSULT-II.
4. Warm engine up to normal operating temperature.
5. Maintain the following conditions for at least 60 consecutive seconds.

ENG SPEED	2,000 - 6,000 rpm
COOLAN TEMP/S	More than 70°C (158°F)
B/FUEL SCHDL	4.9 - 31.8 msec
Selector lever	Suitable position
PW/ST SIGNAL	OFF



6. If 1st trip DTC is detected, go to EC-1570, "Diagnostic Procedure" .

Overall Function Check

EBS00H15

Use this procedure to check the overall function of the vehicle speed signal circuit. During this check, a 1st trip DTC might not be confirmed.

WITHOUT CONSULT-II

1. Lift up drive wheels.
2. Start engine.

3. Read vehicle speed with combination meter.
   The vehicle speed indication should be able to exceed 10 km/h (6 MPH) when rotating wheels with suitable gear position.
4. If NG, go to EC-1570, "Diagnostic Procedure" .

Diagnostic Procedure

EBS00H16

1. CHECK DTC

Refer to BRC-17, "TROUBLE DIAGNOSIS" (Models without ESP) or BRC-60, "TROUBLE DIAGNOSIS" (Models with ESP).

OK or NG

OK >> GO TO 2.
NG >> Repair or replace.

2. CHECK COMBINATION METER

Check combination meter function.
Refer to DI-5, "COMBINATION METERS (LHD MODELS)" or DI-34, "COMBINATION METERS (RHD MODELS)" .

>> **INSPECTION END**

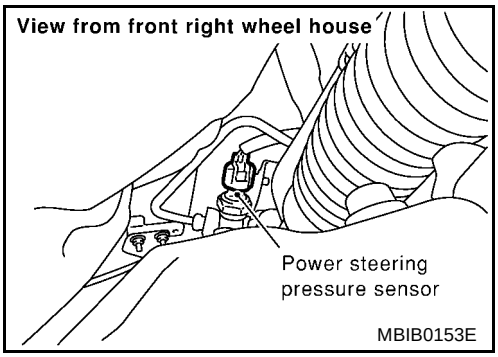
DTC P0550 PSP SENSOR

PFP:49763

Component Description

EBS00H17

Power steering pressure (PSP) sensor is installed to the power steering high-pressure tube and detects a power steering load. This sensor is a potentiometer which transforms the power steering load into output voltage, and emits the voltage signal to the ECM. The ECM controls the electric throttle control actuator and adjusts the throttle valve opening angle to increase the engine speed and adjusts the idle speed for the increased load.



CONSULT-II Reference Value in Data Monitor Mode

EBS00H18

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
PW/ST SIGNAL	● Engine: After warming up, idle the engine	Steering wheel is in neutral position. (Forward direction)	OFF
		Steering wheel is turned.	ON

On Board Diagnosis Logic

EBS00H19

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0550 0550	Power steering pressure sensor circuit	An excessively low or high voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Power steering pressure sensor

DTC Confirmation Procedure

EBS00H1A

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for at least 5 seconds.
4. If 1st trip DTC is detected, go to EC-1573, "Diagnostic Procedure" .

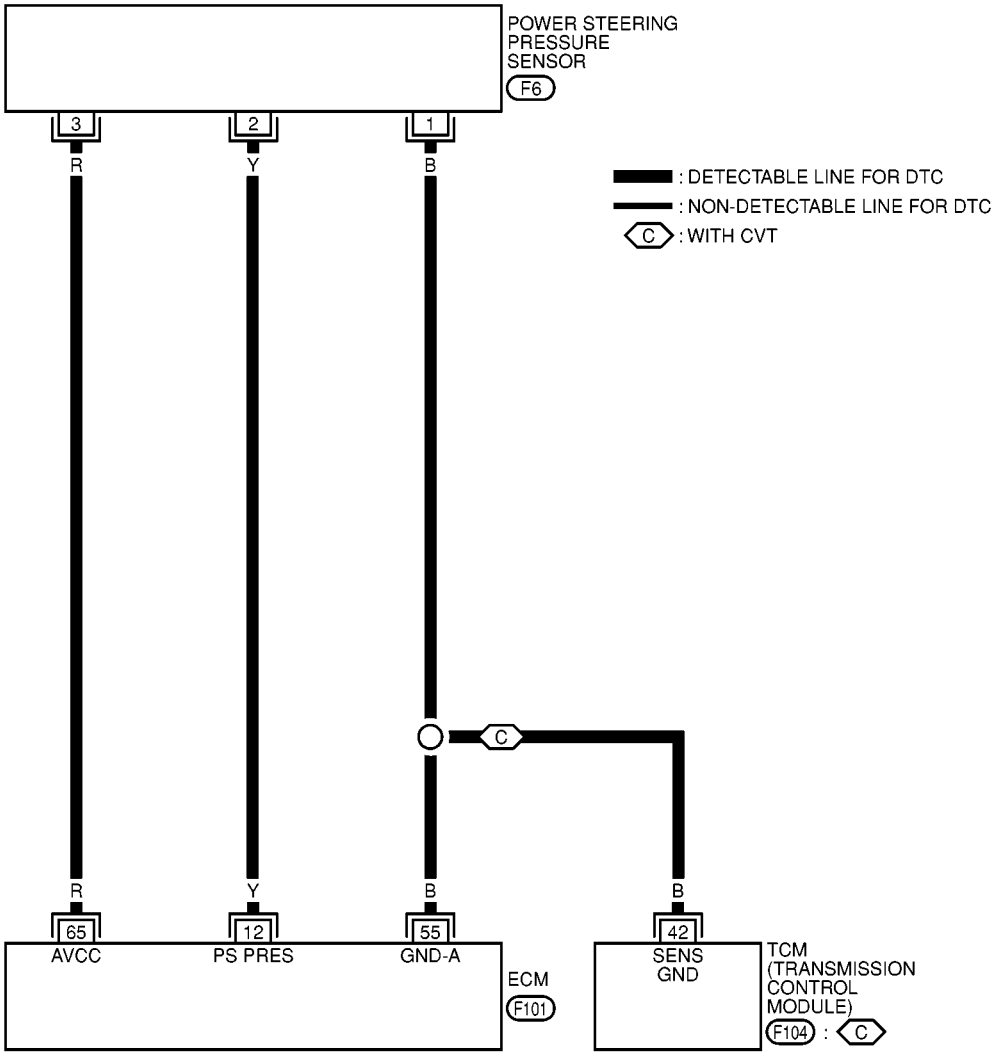
WITHOUT CONSULT-II

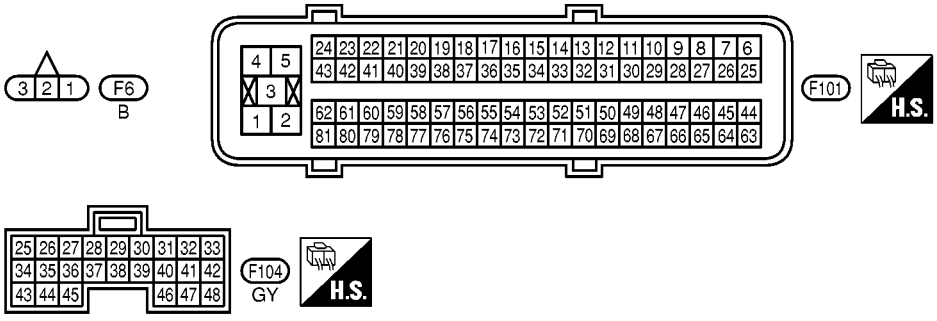
1. Start engine and let it idle for at least 5 seconds.
2. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
3. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
4. If 1st trip DTC is detected, go to EC-1573, "Diagnostic Procedure" .

Wiring Diagram

EBS00H1B

EC-PS/SEN-01





MBWA0032E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
12	Y	Power steering pressure sensor	**[Engine is running]** ● Steering wheel is being turned.	Approximately 3.6V
			[Engine is running] ● Steering wheel is not being turned.	Approximately 0.6V
55	B	Sensors' ground	**[Engine is running]** ● Warm-up condition ● Idle speed	Approximately 0V
65	R	Sensor's power supply (Power steering pressure sensor)	**[Ignition switch "ON"]**	Approximately 5V

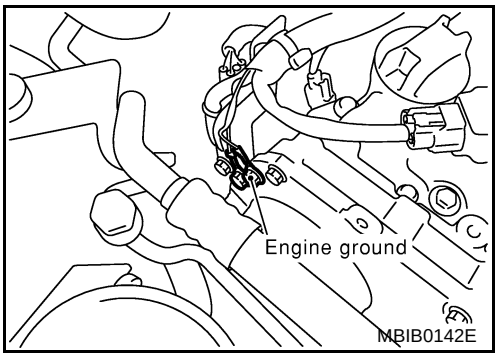
Diagnostic Procedure

EBS00H1C

1. RETIGHTEN GROUND SCREWS

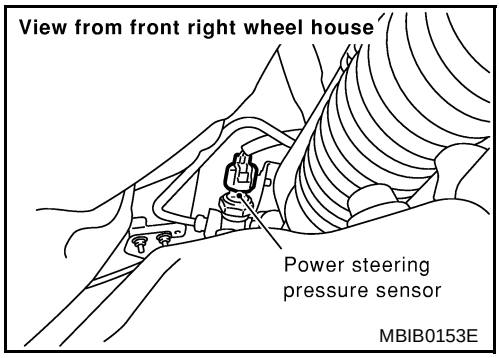
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



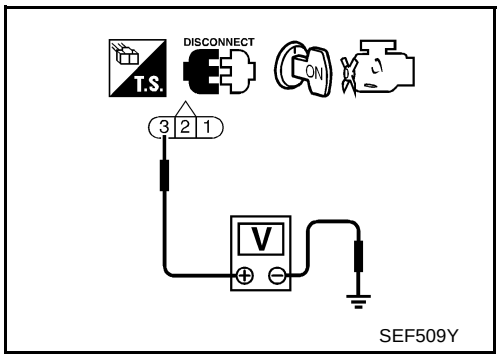
2. CHECK PSP SENSOR POWER SUPPLY CIRCUIT

1. Disconnect PSP sensor harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between PSP sensor terminal 3 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 3.
NG >> Repair harness or connectors.

3. CHECK PSP SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 55 and PSP sensor terminal 1. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between power steering pressure sensor and ECM
- Harness for open or short between power steering pressure sensor and TCM

>> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK PSP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 12 and PSP sensor terminal 2.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK PSP SENSOR

Refer to EC-1575, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace PSP sensor.

7. CHECK INTERMITTENT INCIDENT

Refer to EC-1498, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

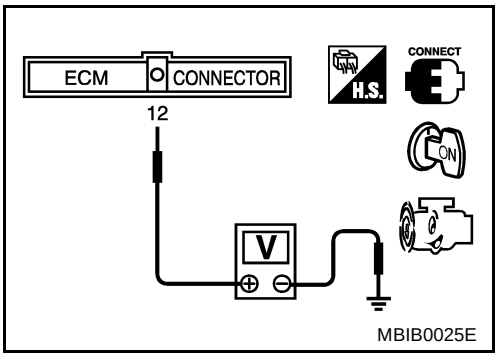
Component Inspection

EBS00H1D

POWER STEERING PRESSURE SENSOR

1. Reconnect all harness connectors disconnected.
2. Start engine and let it idle.
3. Check voltage between ECM terminal 12 and ground under the following conditions.

Condition	Voltage
Steering wheel is being turned fully.	Approximately 3.6V
Steering wheel is not being turned.	Approximately 0.6V



MBIB0025E

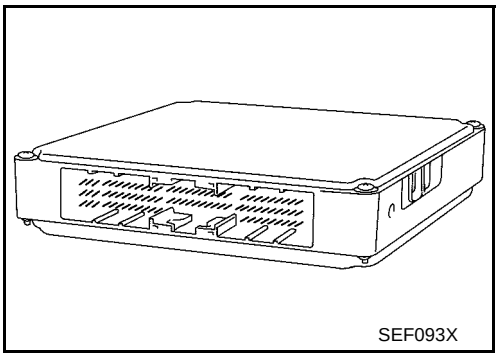
DTC P0605 ECM

PFP:23710

Component Description

EBS00H1E

The ECM consists of a microcomputer and connectors for signal input and output and for power supply. The ECM controls the engine.


SEF093X

On Board Diagnosis Logic

EBS00H1F

DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause
P0605 0605	Engine control module	A)	ECM calculation function is malfunctioning.	● ECM
		B)	ECM EEP-ROM system is malfunctioning.	
		C)	ECM self shut-off function is malfunctioning.	

FAIL-SAFE MODE

ECM enters fail-safe mode when malfunction A is detected.

Detected items	Engine operation condition in fail-safe mode
Malfunction A	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

DTC Confirmation Procedure

EBS00H1G

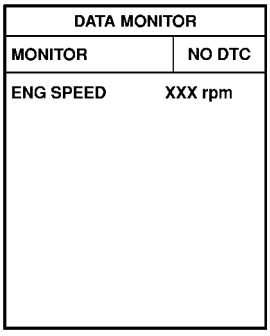
Perform “PROCEDURE FOR MALFUNCTION A” first. If the DTC cannot be confirmed, perform “PROCEDURE FOR MALFUNCTION B”. If there is no problem on “PROCEDURE FOR MALFUNCTION B”, perform “PROCEDURE FOR MALFUNCTION C”.

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

PROCEDURE FOR MALFUNCTION A

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. If DTC is detected, go to EC-1578, "Diagnostic Procedure" .



SEF058Y

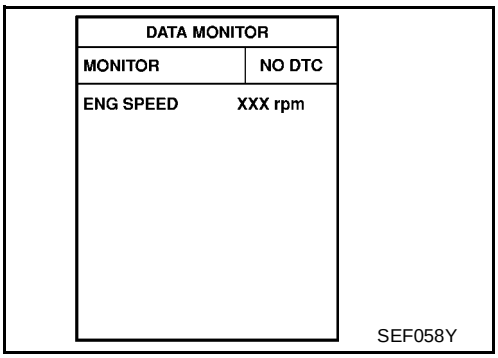
Without CONSULT-II

1. Turn ignition switch “ON”.
2. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
3. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
4. If DTC is detected, go to EC-1578, "Diagnostic Procedure" .

PROCEDURE FOR MALFUNCTION B

With CONSULT-II

1. Turn ignition switch “ON” and wait at least 1 second.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Turn ignition switch “OFF”, wait at least 10 seconds, and then turn “ON”.
4. If 1st trip DTC is detected, go to EC-1578, "Diagnostic Procedure" .



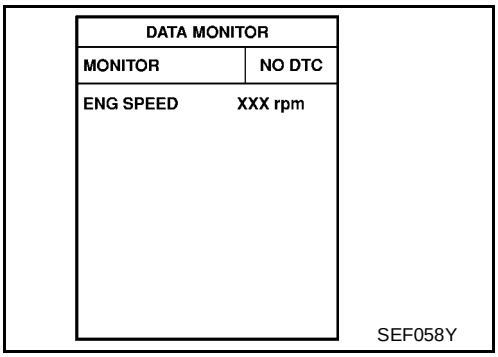
Without CONSULT-II

1. Turn ignition switch “ON” and wait at least 1 second.
2. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
3. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
4. If 1st trip DTC is detected, go to EC-1578, "Diagnostic Procedure" .

PROCEDURE FOR MALFUNCTION C

With CONSULT-II

1. Turn ignition switch “ON” and wait at least 1 second.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Turn ignition switch “OFF”, wait at least 10 seconds, and then turn “ON”.
4. Repeat step 3 procedure, 32 times.
5. If 1st trip DTC is detected, go to EC-1578, "Diagnostic Procedure" .



Without CONSULT-II

1. Turn ignition switch “ON” and wait at least 1 second.
2. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
3. Repeat step 2 procedure, 32 times.
4. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
5. If 1st trip DTC is detected, go to EC-1578, "Diagnostic Procedure" .

Diagnostic Procedure

EBS00H1H

1. INSPECTION START

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “SELF DIAG RESULTS” mode with CONSULT-II.
3. Touch “ERASE”.
4. **Perform “DTC Confirmation Procedure”.**
   See EC-1576 .
5. Is the 1st trip DTC P0605 displayed again?

Without CONSULT-II

1. Turn ignition switch “ON”.
2. Erase the “Diagnostic Test Mode II (Self-diagnostic results)” memory. Refer to EC-1449 .
3. **Perform “DTC Confirmation Procedure”.**
   See EC-1576 .
4. Is the 1st trip DTC P0605 displayed again?

Yes or No

Yes >> GO TO 2.
No >> **INSPECTION END**

2. REPLACE ECM

1. Replace ECM.
2. Perform initialization of NATS system and registration of all NATS ignition key IDs. Refer to EC-1447, "NATS (Nissan Anti-theft System)" .
3. Perform EC-1440, "Accelerator Pedal Released Position Learning" .
4. Perform EC-1440, "Throttle Valve Closed Position Learning" .
5. Perform EC-1440, "Idle Air Volume Learning" .

>> **INSPECTION END**

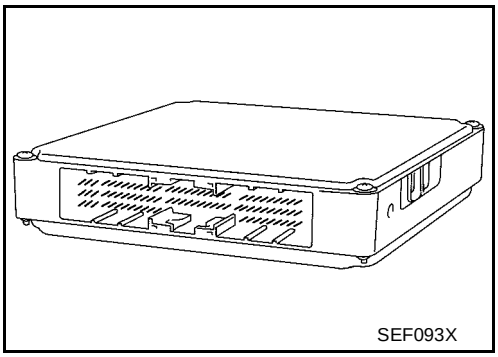
DTC P1065 ECM POWER SUPPLY

PFP:23710

Component Description

EBS00H1I

Battery voltage is supplied to the ECM even when the ignition switch is turned OFF for the ECM memory function of the DTC memory, the air fuel ratio feedback compensation value memory, the idle air volume learning value memory, etc.


SEF093X

On Board Diagnosis Logic

EBS00H1J

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1065 1065	ECM power supply circuit	ECM back up RAM system does not function properly.	● Harness or connectors [ECM power supply (back-up) circuit is open or shorted.] ● ECM

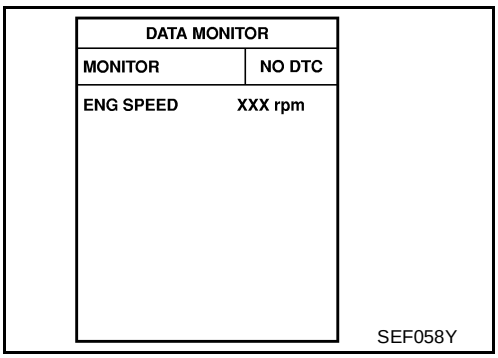
DTC Confirmation Procedure

EBS00H1K

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON” and wait at least 1 second.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. Turn ignition switch “OFF”, wait at least 10 seconds, and then turn “ON”.
5. Repeat steps 3 and 4 four times.
6. If 1st trip DTC is detected, go to EC-1581, "Diagnostic Procedure" .



SEF058Y

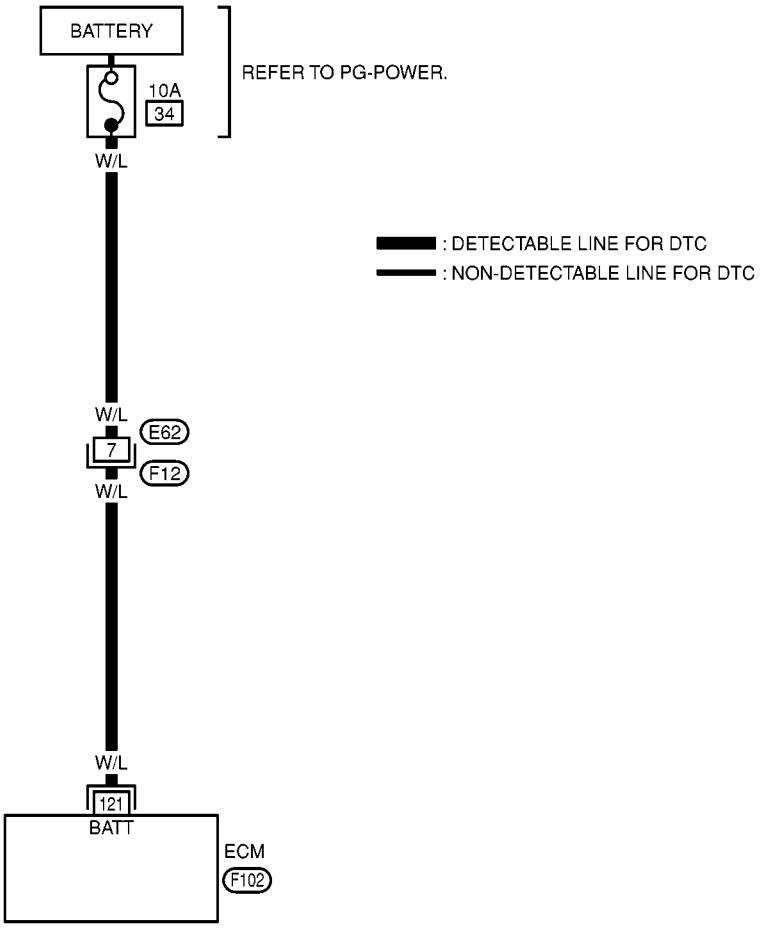
WITHOUT CONSULT-II

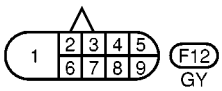
1. Turn ignition switch “ON” and wait at least 1 second.
2. Start engine and let it idle for 1 second.
3. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
4. Repeat steps 2 and 3 four times.
5. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
6. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
7. If 1st trip DTC is detected, go to EC-1581, "Diagnostic Procedure" .

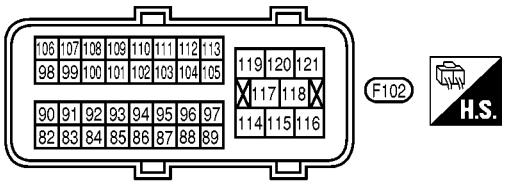
Wiring Diagram

EBS00H1L

EC-ECM/PW-01







MBWA0040E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
121	W/L	Power supply for ECM (Buck-up)	**[Ignition switch "OFF"]**	BATTERY VOLTAGE (11 - 14V)

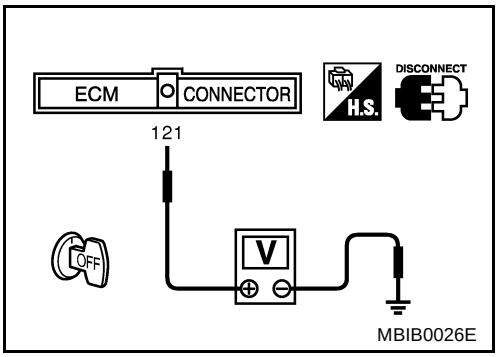
Diagnostic Procedure

EBS00H1M

1. CHECK ECM POWER SUPPLY

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check voltage between ECM terminal 121 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E62, F12
- 10A fuse
- Harness for open or short between ECM and battery

>> Repair or replace harness or connectors.

3. CHECK INTERMITTENT INCIDENT

Refer to EC-1498, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

OK or NG

OK >> GO TO 4.
NG >> Repair or replace harness or connectors.

4. PERFORM DTC CONFIRMATION PROCEDURE

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “SELF DIAG RESULTS” mode with CONSULT-II.
3. Touch “ERASE”.
4. **Perform “DTC Confirmation Procedure”.**
   See EC-1579 .
5. Is the 1st trip DTC P1065 displayed again?

Without CONSULT-II

1. Turn ignition switch “ON”.
2. Erase the “Diagnostic Test Mode II (Self-diagnostic results)” memory. Refer to EC-1449 .
3. **Perform “DTC Confirmation Procedure”.**
   See EC-1579 .
4. Is the 1st trip DTC P1065 displayed again?

Yes or No

Yes >> GO TO 5.
No >> **INSPECTION END**

5. REPLACE ECM

1. Replace ECM.
2. Perform initialization of NATS system and registration of all NATS ignition key IDs. Refer to EC-1447, "NATS (Nissan Anti-theft System)" .
3. Perform EC-1440, "Accelerator Pedal Released Position Learning" .
4. Perform EC-1440, "Throttle Valve Closed Position Learning" .
5. Perform EC-1440, "Idle Air Volume Learning" .

>> **INSPECTION END**

DTC P1121 ELECTRIC THROTTLE CONTROL ACTUATOR

PFP:16119

Component Description

EBS00H1O

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc.
The throttle control motor is operated by the ECM and it opens and closes the throttle valve.
The throttle position sensor detects the throttle valve position, and the opening and closing speed of the throttle valve and feeds the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

On Board Diagnosis Logic

EBS00H1P

DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause
P1121 1121	Electric throttle control actuator	A)	Electric throttle control actuator does not function properly due to the return spring malfunction.	● Electric throttle control actuator
		B)	Throttle valve opening angle in fail-safe mode is not in specified range.	
		C)	ECM detect the throttle valve is stuck open. **This self-diagnosis has the one trip detection logic.**	

FAIL-SAFE MODE

When the malfunction A or B is detected in the two consecutive trips, the ECM enters in fail-safe mode and MI lights up.
When the malfunction C is detected even in the 1st trip, the ECM enters in fail-safe mode and the MI lights up.

Detected items	Engine operating condition in fail-safe mode
Malfunction A	The ECM controls the electric throttle actuator by regulating the throttle opening around the idle position. The engine speed will not rise more than 2,000 rpm.
Malfunction B	ECM controls the electric throttle control actuator by regulating the throttle opening to 20 degrees or less.
Malfunction C	While the vehicle is driving, it slows down gradually by fuel cut. After the vehicle stops, the engine stalls. The engine can restart in “N” or “P” position, and engine speed will not exceed 1,000 rpm or more.

DTC Confirmation Procedure

EBS00H1Q

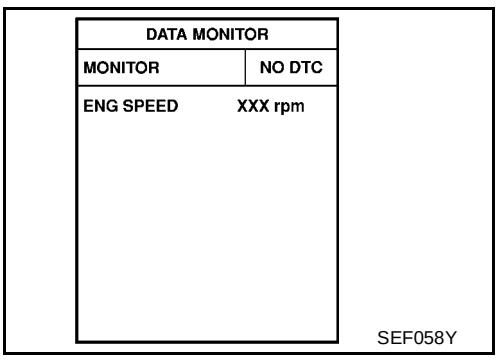
NOTE:

- **Perform “PROCEDURE FOR MALFUNCTION A AND B” first. If the 1st trip DTC cannot be confirmed, perform “PROCEDURE FOR MALFUNCTION C”.**
- If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

PROCEDURE FOR MALFUNCTION A AND B

With CONSULT-II

1. Turn ignition witch “ON” and wait at least 1 second.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Shift selector lever to “D” position (CVT), “1st” position (M/T) and wait at least 2 seconds.
4. Turn ignition switch “OFF”, wait at least 10 seconds, and then turn “ON”.
5. If 1st trip DTC is detected, go to EC-1584, "Diagnostic Procedure" .



Without CONSULT-II

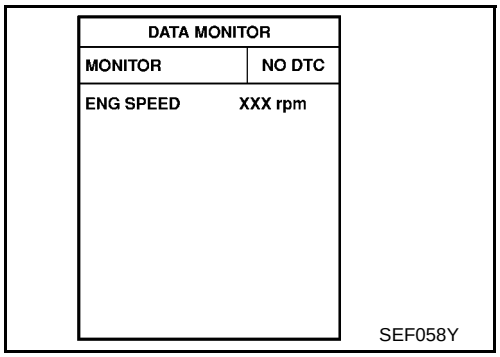
1. Turn ignition switch “ON” and wait at least 1 second.

2. Shift selector lever to “D” position (CVT), “1st” position (M/T) and wait at least 2 seconds.
3. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
4. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
5. If 1st trip DTC is detected, go to EC-1584, "Diagnostic Procedure" .

PROCEDURE FOR MALFUNCTION C

With CONSULT-II

1. Turn ignition switch “ON” and wait at least 1 second.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Shift selector lever to “D” position (CVT), “1st” position (M/T) and wait at least 2 seconds.
4. Shift selector lever to “N” or “P” position.
5. Start engine and let it idle for 3 seconds.
6. If DTC is detected, go to EC-1584, "Diagnostic Procedure" .



Without CONSULT-II

1. Turn ignition switch “ON” and wait at least 1 second.
2. Shift selector lever to “D” position (CVT), “1st” position (M/T) and wait at least 2 seconds.
3. Shift selector lever to “N” or “P” position.
4. Start engine and let it idle for the 3 seconds.
5. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
6. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
7. If DTC is detected, go to EC-1584, "Diagnostic Procedure" .

Diagnostic Procedure

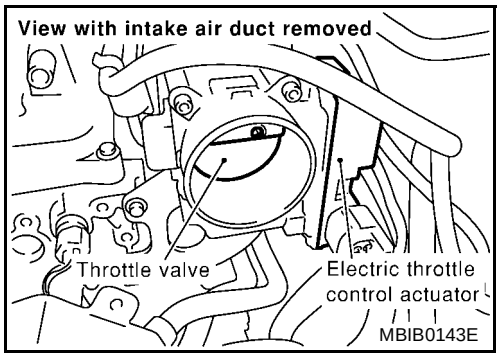
EBS00H1R

1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Remove the intake air duct.
2. Check if a foreign matter is caught between the throttle valve and the housing.

OK or NG

OK >> GO TO 2.
NG >> Remove the foreign matter and clean the electric throttle control actuator inside.



2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-1440, "Throttle Valve Closed Position Learning" .
3. Perform EC-1440, "Idle Air Volume Learning" .

>> **INSPECTION END**

Removal and Installation

EBS00HC6

Refer to EM-116, "INTAKE MANIFOLD" .

DTC P1122 ELECTRIC THROTTLE CONTROL FUNCTION

PFP:16119

Description

EBS00H1S

NOTE:
If DTC P1122 is displayed with DTC P1121 or 1126, first perform the trouble diagnosis for DTC P1121 or P1126. Refer to EC-1585 or EC-1592 .

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc.
The throttle control motor is operated by the ECM and it opens and closes the throttle valve.
The current opening angle of the throttle valve is detected by the throttle position sensor and it provides feedback to the ECM to control the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

On Board Diagnosis Logic

EBS00H1T

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1122 1122	Electric throttle control performance problem	Electric throttle control function does not operate properly.	● Harness or connectors (Throttle control motor circuit is open or shorted.) ● Harness or connectors (Throttle control motor relay circuit is open or shorted.) ● Electric throttle control actuator ● Throttle control motor relay

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MI lights up.

Engine operating condition in fail-safe mode
ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

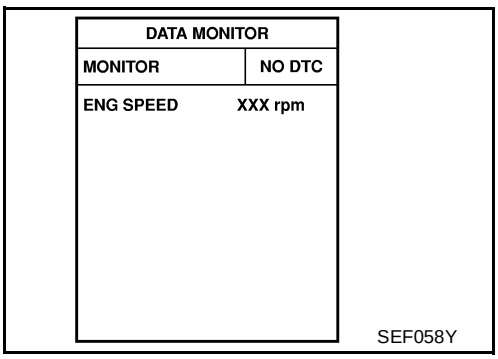
DTC Confirmation Procedure

EBS00H1U

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON” and wait at least 2 seconds.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 5 seconds.
4. If DTC is detected, go to EC-1587, "Diagnostic Procedure" .



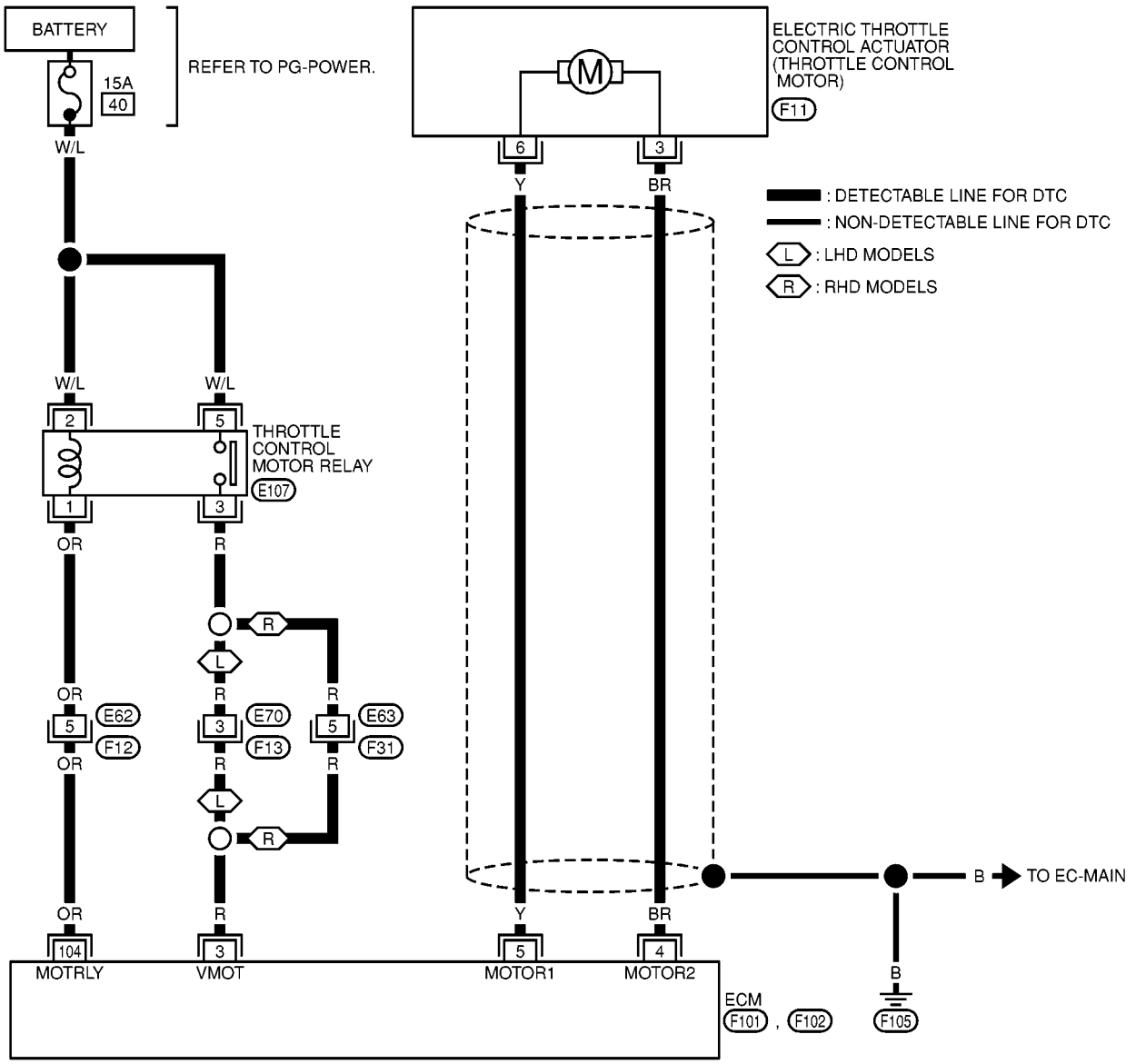
WITHOUT CONSULT-II

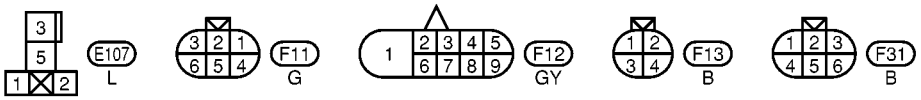
1. Turn ignition switch “ON” and wait at least 2 seconds.
2. Start engine and let it idle for 5 seconds.
3. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
4. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
5. If DTC is detected, go to EC-1587, "Diagnostic Procedure" .

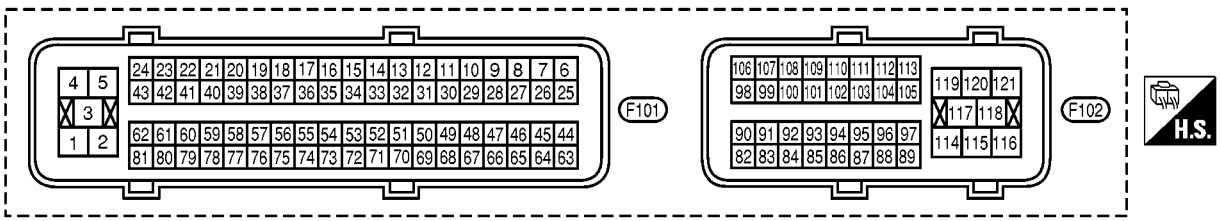
Wiring Diagram

EBS00H1V

EC-ETC1-01





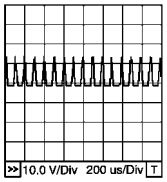
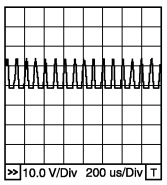


MBWA0132E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
3	R	Throttle control motor relay power supply	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)
4	BR	Throttle control motor (Close)	**[Ignition switch "ON"]** ● Shift lever position is "D" (CVT model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal is releasing	0 - 14V★  PBIB0534E
5	Y	Throttle control motor (Open)	**[Ignition switch "ON"]** ● Shift lever position is "D" (CVT model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal is depressing	0 - 14V★  PBIB0533E
104	OR	Throttle control motor relay	**[Ignition switch "OFF"]**	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"]	0 - 1.0V

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

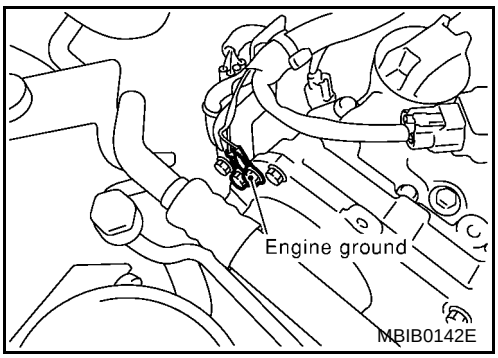
Diagnostic Procedure

EBS00H1W

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.

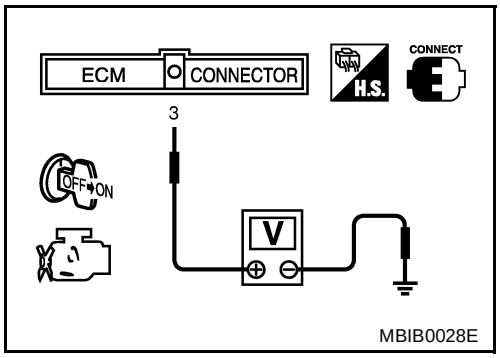


MBIB0142E

2. CHECK THROTTLE CONTROL MOTOR RELAY SIGNAL CIRCUIT

Check voltage between ECM terminal 3 and ground under the following conditions with CONSULT-II or tester.

Ignition switch	Voltage
OFF	Approximately 0V
ON	Battery voltage (11 - 14V)

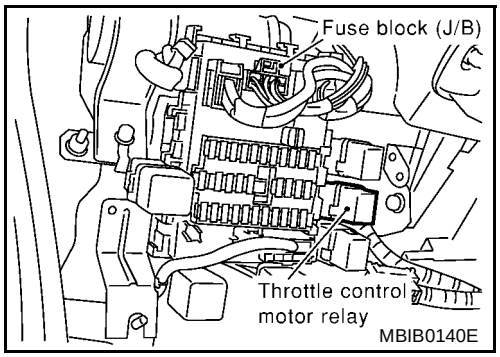


OK or NG

OK >> GO TO 10.
NG >> GO TO 3.

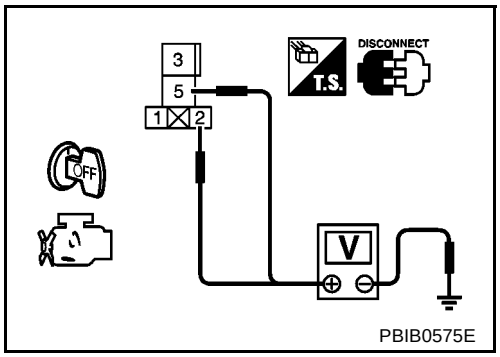
3. CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect throttle control motor relay.



3. Check voltage between throttle control motor relay terminals 2, 5 and ground.

Voltage: Battery voltage



OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

- 15A fuse
- Harness for open or short between throttle control motor relay and fuse

>> Repair or replace harness or connectors.

5. CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 3 and throttle control motor relay terminal 3. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E70, F13 (LHD models)
- Harness connectors E63, F31 (RHD models)
- Harness for open or short between ECM and throttle control motor relay

>> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK THROTTLE CONTROL MOTOR RELAY OUTPUT SIGNAL CIRCUIT

1. Check continuity between ECM terminal 104 and throttle control motor relay terminal 1. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 9.
NG >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E62, F12
- Harness for open or short between ECM and throttle control motor relay

>> Repair or replace harness or connectors.

9. CHECK THROTTLE CONTROL MOTOR RELAY

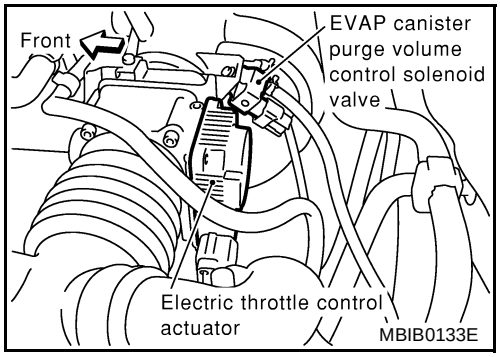
Refer to EC-1591, "Component Inspection" .

OK or NG

OK >> GO TO 13.
NG >> Replace throttle control motor relay.

10. CHECK THROTTLE CONTROL MOTOR OUTPUT SIGNAL CIRCUIT FOR OPEN OR SHORT

1. Turn ignition switch “OFF”.
2. Disconnect electric throttle control actuator harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between the following terminals. Refer to Wiring Diagram.



Electric throttle control actuator terminal	ECM terminal	Continuity
3	4	Should exist
	5	Should not exist
6	4	Should not exist
	5	Should exist

5. Also check harness for short to ground and short to power.

OK or NG

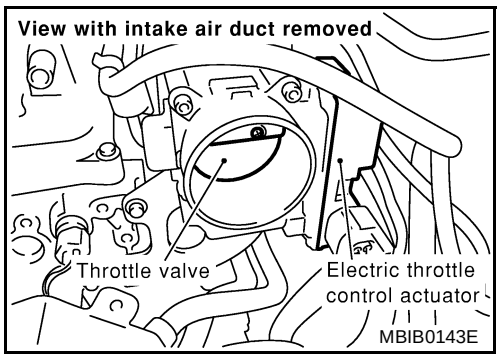
OK >> GO TO 11.
NG >> Repair or replace.

11. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Remove the intake air duct.
2. Check if foreign matter is caught between the throttle valve and the housing.

OK or NG

OK >> GO TO 12.
NG >> Remove the foreign matter and clean the electric throttle control actuator inside.



12. CHECK THROTTLE CONTROL MOTOR

Refer to EC-1591, "Component Inspection" .

OK or NG

OK >> GO TO 13.
NG >> GO TO 14.

13. CHECK INTERMITTENT INCIDENT

Refer to EC-1498, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

OK or NG

OK >> GO TO 14.
NG >> Repair or replace harness or connectors.

14. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-1440, "Throttle Valve Closed Position Learning" .
3. Perform EC-1440, "Idle Air Volume Learning" .

>> **INSPECTION END**

Component Inspection

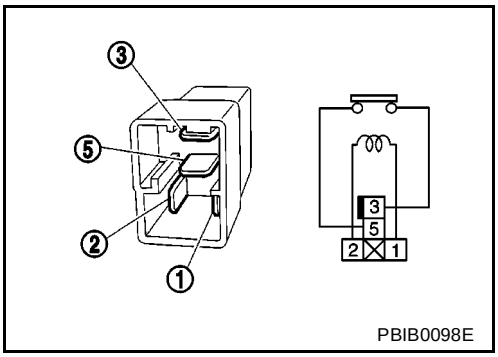
EBS00H1X

THROTTLE CONTROL MOTOR RELAY

1. Apply 12V direct current between relay terminals 1 and 2.
2. Check continuity between relay terminals 3 and 5.

Conditions	Continuity
12V direct current supply between terminals 1 and 2	Yes
No current supply	No

3. If NG, replace throttle control motor relay.



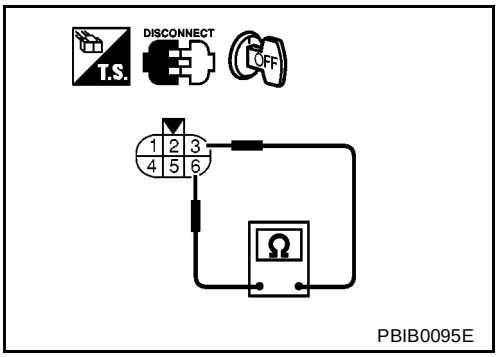
PBIB0098E

THROTTLE CONTROL MOTOR

1. Disconnect electric throttle control actuator harness connector.
2. Check resistance between terminals 3 and 6.

Resistance: Approximately 1 - 15 Ω [at 25 °C (77°F)]

3. If NG, replace electric throttle control actuator and go to next step.
4. Perform EC-1440, "Throttle Valve Closed Position Learning" .
5. Perform EC-1440, "Idle Air Volume Learning" .



PBIB0095E

Remove and Installation

EBS00H1Y

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-116, "INTAKE MANIFOLD" .

DTC P1124, P1126 THROTTLE CONTROL MOTOR RELAY

PFP:16119

Component Description

EBS00H1Z

Power supply for the Throttle Control motor is provided to the ECM via throttle control motor relay. The throttle control motor relay is ON/OFF controlled by the ECM. When the ignition switch is turned ON, the ECM sends an ON signal to throttle control motor relay and battery voltage is provided to the ECM. When the ignition switch is turned OFF, the ECM sends an OFF signal to throttle control motor relay and battery voltage is not provided to the ECM.

CONSULT-II Reference Value in Data Monitor Mode

EBS00H20

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
THRTL RELAY	● Ignition switch: ON	ON

On Board Diagnosis Logic

EBS00H21

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1124 1124	Throttle control motor relay circuit short	ECM detect the throttle control motor relay is stuck ON.	● Harness or connectors (Throttle control motor relay circuit is shorted.) ● Throttle control motor relay
P1126 1126	Throttle control motor relay circuit open	ECM detects a voltage of power source for throttle control motor is excessively low. **This self-diagnosis has the one trip detection logic.**	● Harness or connectors (Throttle control motor relay circuit is open.) ● Throttle control motor relay

FAIL-SAFE MODE

When the DTC P1124 is detected in the two consecutive trips, the ECM enters fail-safe mode and MI lights up.
When the DTC P1126 is detected even in the 1st trip, the ECM enters fail-safe mode and the MI lights up.

Engine operating condition in fail-safe mode
ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

DTC Confirmation Procedure

EBS00H22

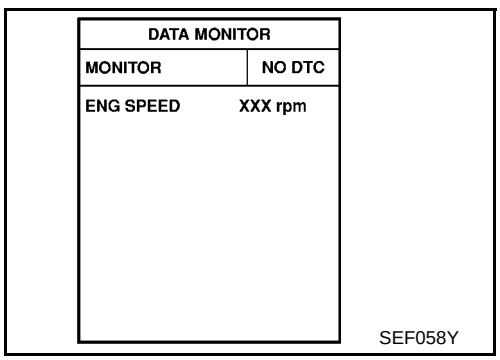
NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

PROCEDURE FOR DTC P1124

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

With CONSULT-II

1. Turn ignition switch “ON” and wait at least 1 second.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. If 1st trip DTC is detected, go to EC-1595, "Diagnostic Procedure" .



Without CONSULT-II

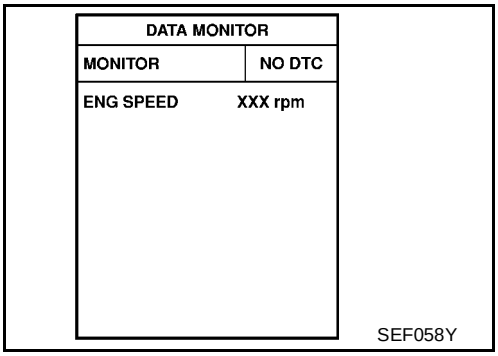
1. Turn ignition switch “ON” and wait at least 1 second.

2. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
3. If 1st trip DTC is detected, go to EC-1595, "Diagnostic Procedure" .

PROCEDURE FOR DTC P1126

With CONSULT-II

1. Turn ignition switch “ON” and wait at least 2 seconds.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 5 seconds.
4. If DTC is detected, go to EC-1595, "Diagnostic Procedure" .



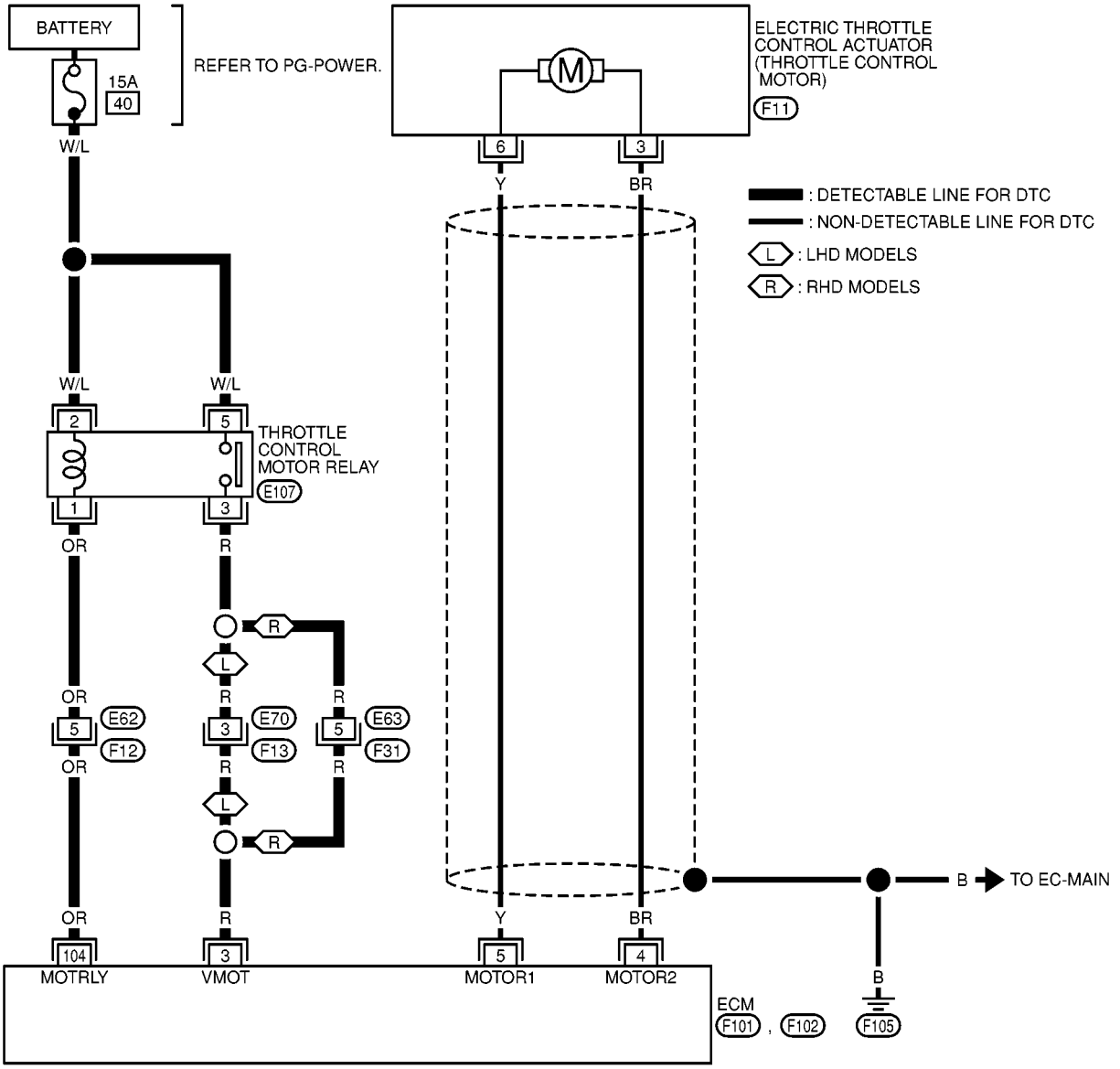
Without CONSULT-II

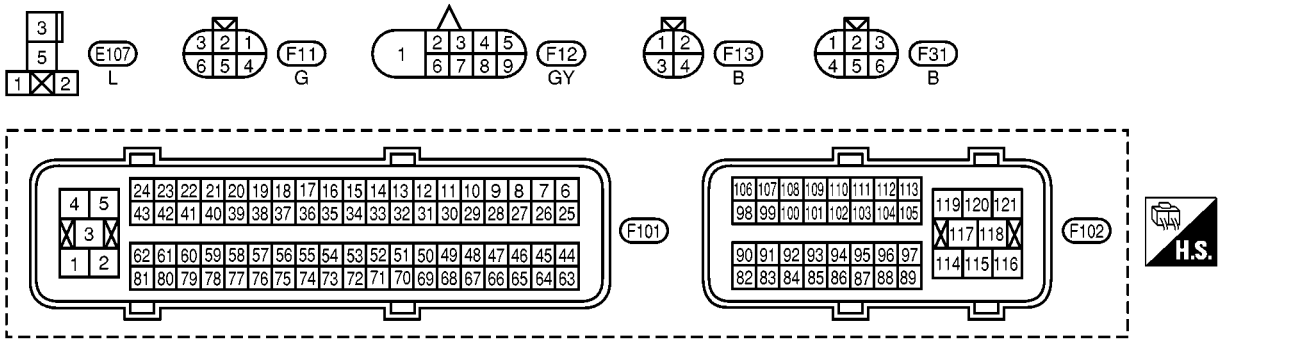
1. Turn ignition switch “ON” and wait at least 2 second.
2. Start engine and let it idle for 5 seconds.
3. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
4. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
5. If DTC is detected, go to EC-1595, "Diagnostic Procedure" .

Wiring Diagram

EBS00H23

EC-ETC2-01





MBWA0133E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

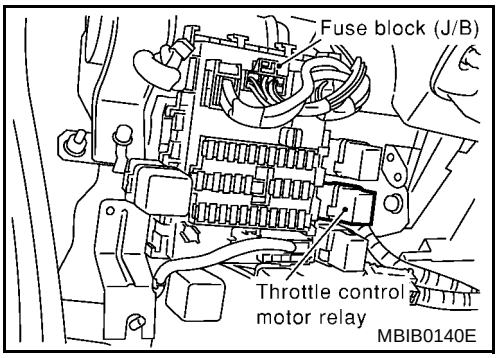
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
3	R	Throttle control motor relay power supply	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)
104	OR	Throttle control motor relay	**[Ignition switch "OFF"]**	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"]	0 - 1.0V

Diagnostic Procedure

EBS00H24

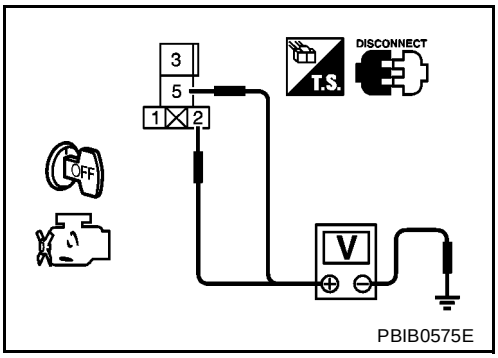
1. CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect throttle control motor relay.



3. Check voltage between throttle control motor relay terminals 2, 5 and ground.

Voltage: Battery voltage



OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

- 15A fuse
- Harness for open or short between throttle control motor relay and fuse

>> Repair or replace harness or connectors.

3. CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 3 and throttle control motor relay terminal 3. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E70, F13 (LHD models)
- Harness connectors E63, F31 (RHD models)
- Harness for open or short between ECM and throttle control motor relay

>> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK THROTTLE CONTROL MOTOR RELAY OUTPUT SIGNAL CIRCUIT

1. Check continuity between ECM terminal 104 and throttle control motor relay terminal 1. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E62, F12
- Harness for open or short between ECM and throttle control motor relay

>> Repair or replace harness or connectors.

7. CHECK THROTTLE CONTROL MOTOR RELAY

Refer to EC-1596, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> Replace throttle control motor relay.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-1498, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

EBS00H25

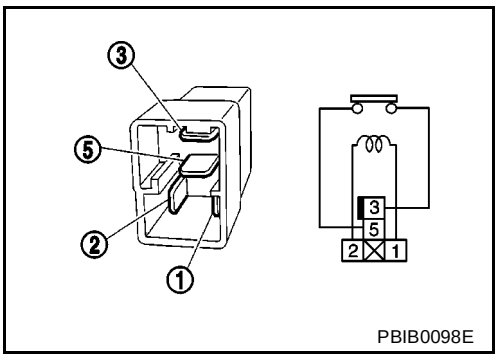
THROTTLE CONTROL MOTOR RELAY

1. Apply 12V direct current between relay terminals 1 and 2.

2. Check continuity between relay terminals 3 and 5.

Conditions	Continuity
12V direct current supply between terminals 1 and 2	Yes
No current supply	No

3. If NG, replace throttle control motor relay.



PBIB0098E

DTC P1128 THROTTLE CONTROL MOTOR

PFP:16119

Component Description

EBS00H26

The throttle control motor is operated by the ECM and it opens and closes the throttle valve.
The current opening angle of the throttle valve is detected by the throttle position sensor and it provides feedback to the ECM to control the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

On Board Diagnosis Logic

EBS00H27

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1128 1128	Throttle control motor circuit short	ECM detects short both circuits between ECM and throttle control motor.	● Harness or connectors (Throttle control motor circuit is shorted.) ● Electric throttle control actuator (Throttle control motor)

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MI lights up.

Engine operating condition in fail-safe mode
ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

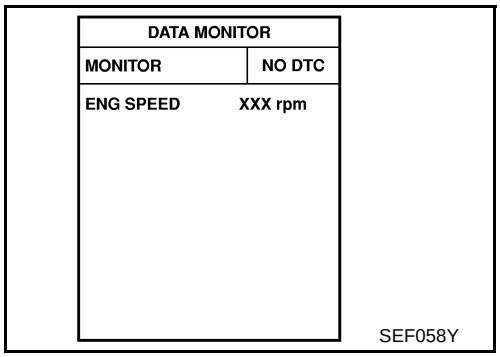
DTC Confirmation Procedure

EBS00H28

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

1. Turn ignition switch “ON” and wait at least 2 seconds.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 5 seconds.
4. If DTC is detected, go to EC-1600, "Diagnostic Procedure" .



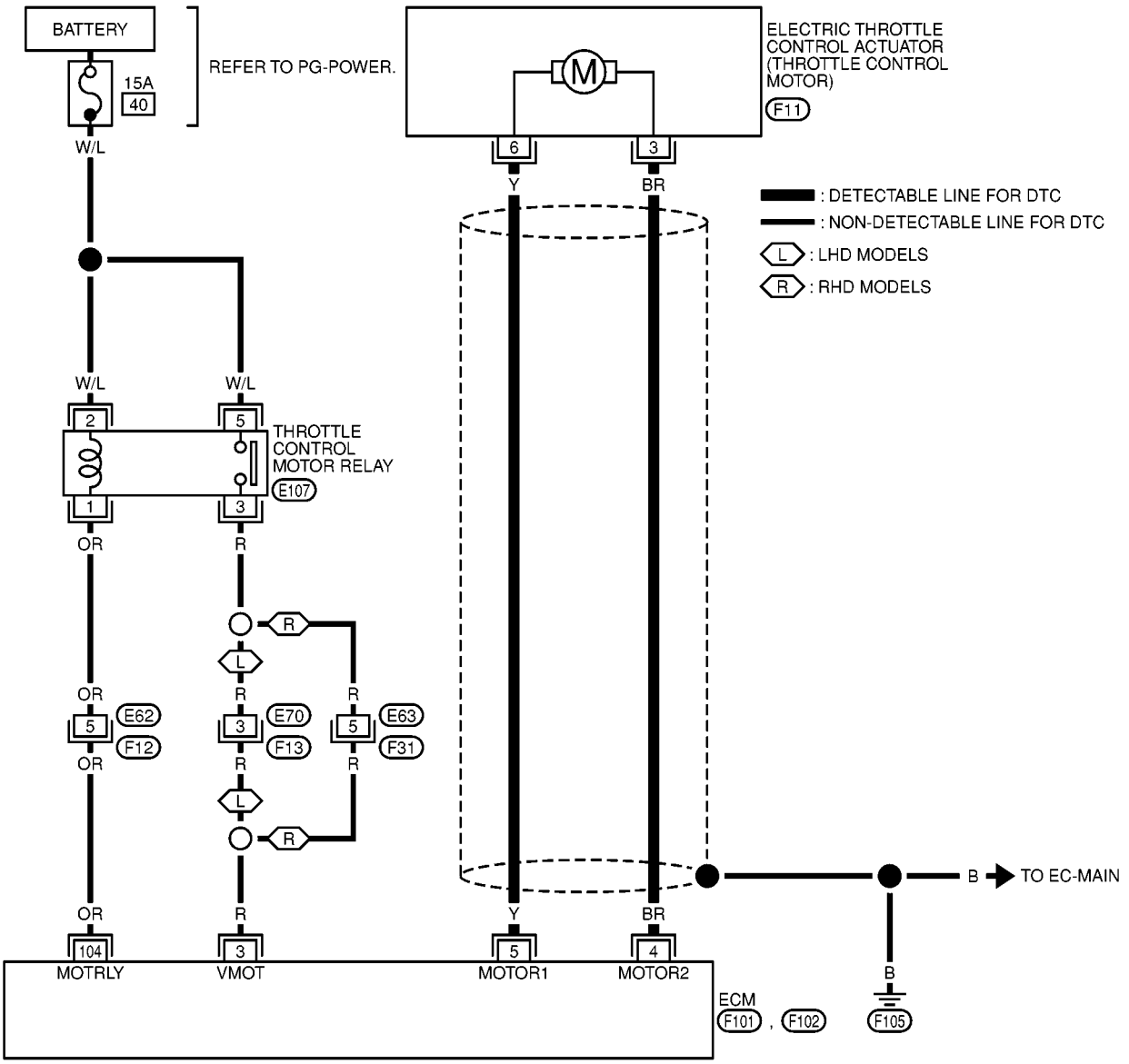
WITHOUT CONSULT-II

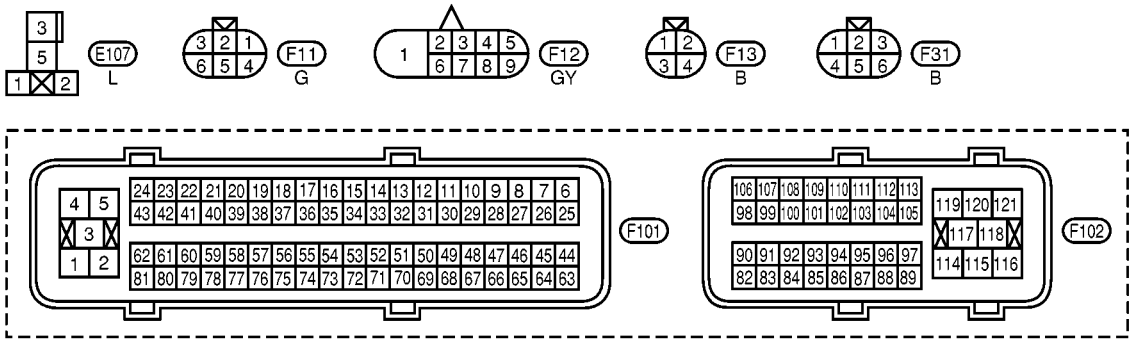
1. Turn ignition switch “ON” and wait at least 2 second.
2. Start engine and let it idle for 5 seconds.
3. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
4. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
5. If DTC is detected, go to EC-1600, "Diagnostic Procedure" .

Wiring Diagram

EBS00H29

EC-ETC3-01



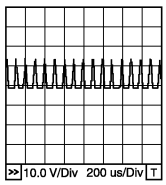
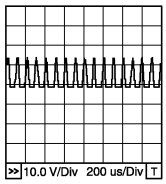


MBWA0134E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
4	BR	Throttle control motor (Close)	**[Ignition switch "ON"]** ● Shift lever position is "D" (CVT model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal is releasing	0 - 14V★  PBIB0534E
5	Y	Throttle control motor (Open)	**[Ignition switch "ON"]** ● Shift lever position is "D" (CVT model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal is depressing	0 - 14V★  PBIB0533E

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

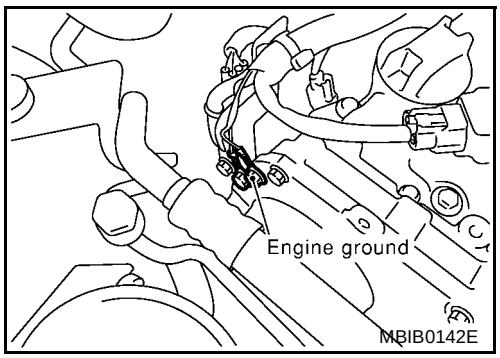
Diagnostic Procedure

EBS00H2A

1. RETIGHTEN GROUND SCREWS

1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

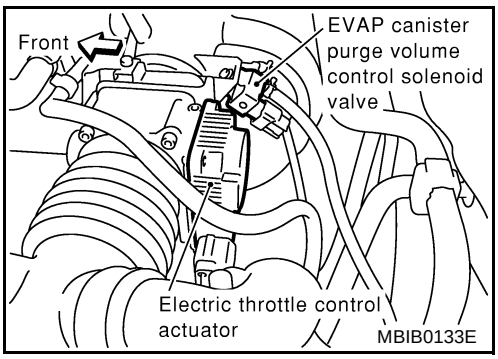
>> GO TO 2.



MBIB0142E

2. CHECK THROTTLE CONTROL MOTOR OUTPUT SIGNAL CIRCUIT FOR OPEN OR SHORT

1. Turn ignition switch “OFF”.
2. Disconnect electric throttle control actuator harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between the following terminals. Refer to Wiring Diagram.



Electric throttle control actuator terminal	ECM terminal	Continuity
3	4	Should exist
	5	Should not exist
6	4	Should not exist
	5	Should exist

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 3.
NG >> Repair or replace.

3. CHECK THROTTLE CONTROL MOTOR

Refer to EC-1601, "Component Inspection" .

OK or NG

OK >> GO TO 4.
NG >> GO TO 5.

4. CHECK INTERMITTENT INCIDENT

Refer to EC-1498, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

OK or NG

OK >> GO TO 5.
NG >> Repair or replace harness or connectors.

5. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-1440, "Throttle Valve Closed Position Learning" .
3. Perform EC-1440, "Idle Air Volume Learning" .

>> **INSPECTION END**

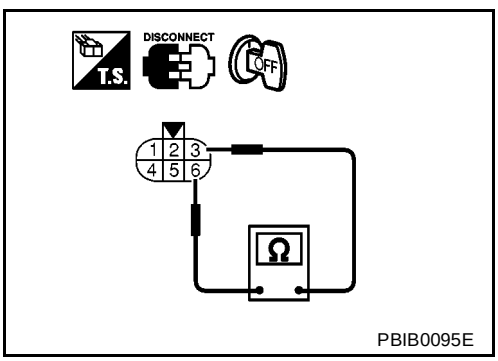
Component Inspection

EBS00H2B

THROTTLE CONTROL MOTOR

1. Disconnect electric throttle control actuator harness connector.
2. Check resistance between terminals 3 and 6.

Resistance: Approximately 1 - 15 Ω [at 25 °C (77°F)]



3. If NG, replace electric throttle control actuator and go to next step.
4. Perform EC-1440, "Throttle Valve Closed Position Learning" .
5. Perform EC-1440, "Idle Air Volume Learning" .

Remove and Installation

EBS00H2C

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-116, "INTAKE MANIFOLD" .

DTC P1217 ENGINE OVER TEMPERATURE

PFP:00000

System Description

EBS00H2D

NOTE:
If DTC P1217 is displayed with DTC U1000, U1001, first perform the trouble diagnosis for DTC U1000, U1001. Refer to EC-1505, "DTC U1000, U1001 CAN COMMUNICATION LINE" .

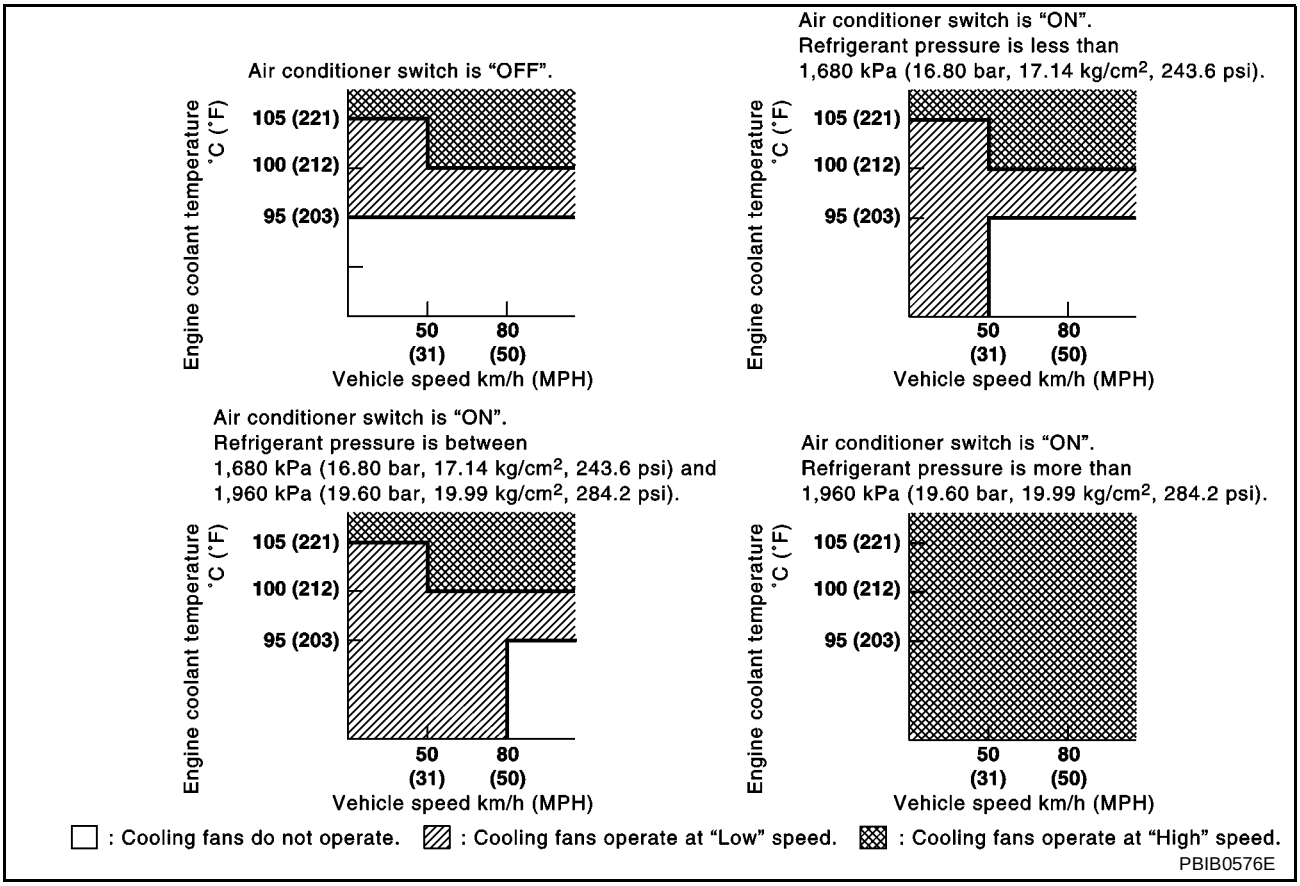
COOLING FAN CONTROL

Sensor	Input Signal to ECM	ECM function	Actuator
Vehicle speed signal	Vehicle speed*1	Cooling fan control	Cooling fan relay(s)
Engine coolant temperature sensor	Engine coolant temperature		
Air conditioner switch	Air conditioner “ON” signal*1		
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*2		
Battery	Battery voltage*2		
Refrigerant pressure sensor	Refrigerant pressure		

*1: These signals are sent to ECM through CAN communication line.
*2: ECM determines the start signal status by the signals of engine speed and battery voltage.

The ECM controls the cooling fan corresponding to the vehicle speed, engine coolant temperature, refrigerant pressure, and air conditioner ON signal. The control system has 3-step control [HIGH/LOW/OFF].
The ECM sends a cooling fan control signal to the smart entrance control unit through CAN communication line, and the smart entrance control unit controls cooling fan relays.

OPERATION



CONSULT-II Reference Value in Data Monitor Mode

EBS00H2E

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
AIR COND SIG	● Engine: After warming up, idle the engine	Air conditioner switch: OFF	OFF
		Air conditioner switch: ON (Compressor operates.)	ON
COOLING FAN	● Engine: After warming up, idle the engine ● Air conditioner switch: OFF	Engine coolant temperature is 99°C (210°F) or less	OFF
		Engine coolant temperature is 100°C (212°F) or more	ON

On Board Diagnosis Logic

EBS00H2F

If the cooling fan or another component in the cooling system malfunctions, engine coolant temperature will rise. When the engine coolant temperature reaches an abnormally high temperature condition, a malfunction is indicated.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1217 1217	Engine over temperature (Overheat)	● Cooling fan does not operate properly (Overheat). ● Cooling fan system does not operate properly (Overheat). ● Engine coolant was not added to the system using the proper filling method.	● Harness or connectors (The cooling fan circuit is open or shorted.) ● Cooling fan ● Radiator hose ● Radiator ● Radiator cap ● Water pump ● Thermostat For more information, refer to EC-1618, "Main 12 Causes of Overheating" .

CAUTION:

When a malfunction is indicated, be sure to replace the coolant. Refer to MA-20, "Changing Engine Coolant" . Also, replace the engine oil. Refer to MA-24, "Changing Engine Oil" .

1. **Fill radiator with coolant up to specified level with a filling speed of 2 liters per minute. Be sure to use coolant with the proper mixture ratio. Refer to MA-18, "Engine Coolant Mixture Ratio" .**
2. **After refilling coolant, run engine to ensure that no water-flow noise is emitted.**

Overall Function Check

EBS00H2G

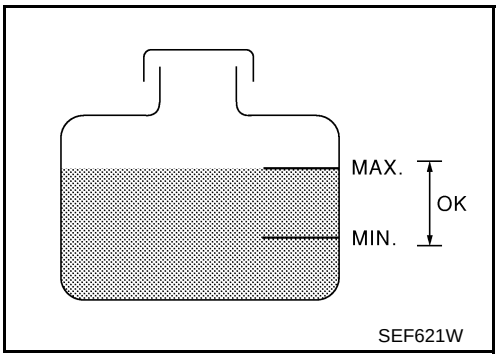
Use this procedure to check the overall function of the cooling fan. During this check, a DTC might not be confirmed.

WARNING:

Never remove the radiator cap when the engine is hot. Serious burns could be caused by high pressure fluid escaping from the radiator.
Wrap a thick cloth around cap. Carefully remove the cap by turning it a quarter turn to allow built-up pressure to escape. Then turn the cap all the way off.

WITH CONSULT-II

1. Check the coolant level in the reservoir tank and radiator.
   Allow engine to cool before checking coolant level.
   If the coolant level in the reservoir tank and/or radiator is below the proper range, skip the following steps and go to EC-1608, "Diagnostic Procedure" .
2. Confirm whether customer filled the coolant or not. If customer filled the coolant, skip the following steps and go to EC-1608, "Diagnostic Procedure" .
3. Turn ignition switch “ON”.



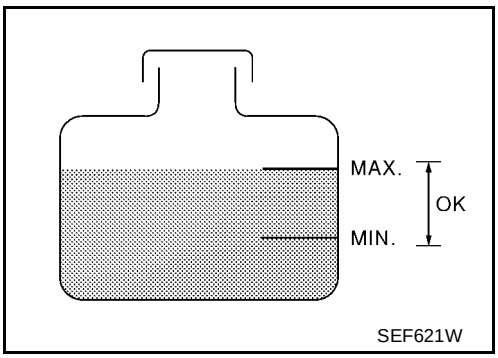
4. Perform “COOLING FAN” in “ACTIVE TEST” mode with CONSULT-II.
5. If the results are NG, go to EC-1608, "Diagnostic Procedure" .

ACTIVE TEST	
COOLING FAN	ON
MONITOR	
COOLAN TEMP/S	XXX °C

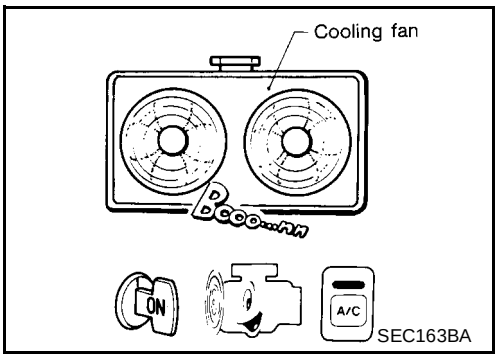
MBIB0037E

WITHOUT CONSULT-II

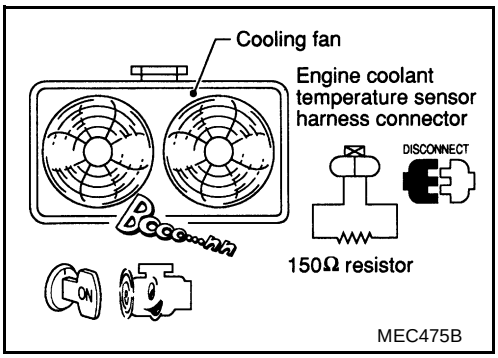
1. Check the coolant level in the reservoir tank and radiator.
   Allow engine to cool before checking coolant level.
   If the coolant level in the reservoir tank and/or radiator is below the proper range, skip the following steps and go to EC-1608, "Diagnostic Procedure" .
2. Confirm whether customer filled the coolant or not. If customer filled the coolant, skip the following steps and go to EC-1608, "Diagnostic Procedure" .
3. Start engine.
   Be careful not to overheat engine.
4. Set temperature control lever to full cold position.
5. Turn air conditioner switch “ON”.
6. Turn blower fan switch “ON”.



7. Run engine at idle for a few minutes with air conditioner operating.
   Be careful not to overheat engine.
8. Make sure that cooling fans operates at low speed.
   If NG, go to EC-1608, "Diagnostic Procedure" .
   If OK, go to the following step.
9. Turn ignition switch “OFF”.
10. Turn air conditioner switch and blower fan switch “OFF”.
11. Disconnect engine coolant temperature sensor harness connector.
12. Connect 150Ω resistor to engine coolant temperature sensor harness connector.



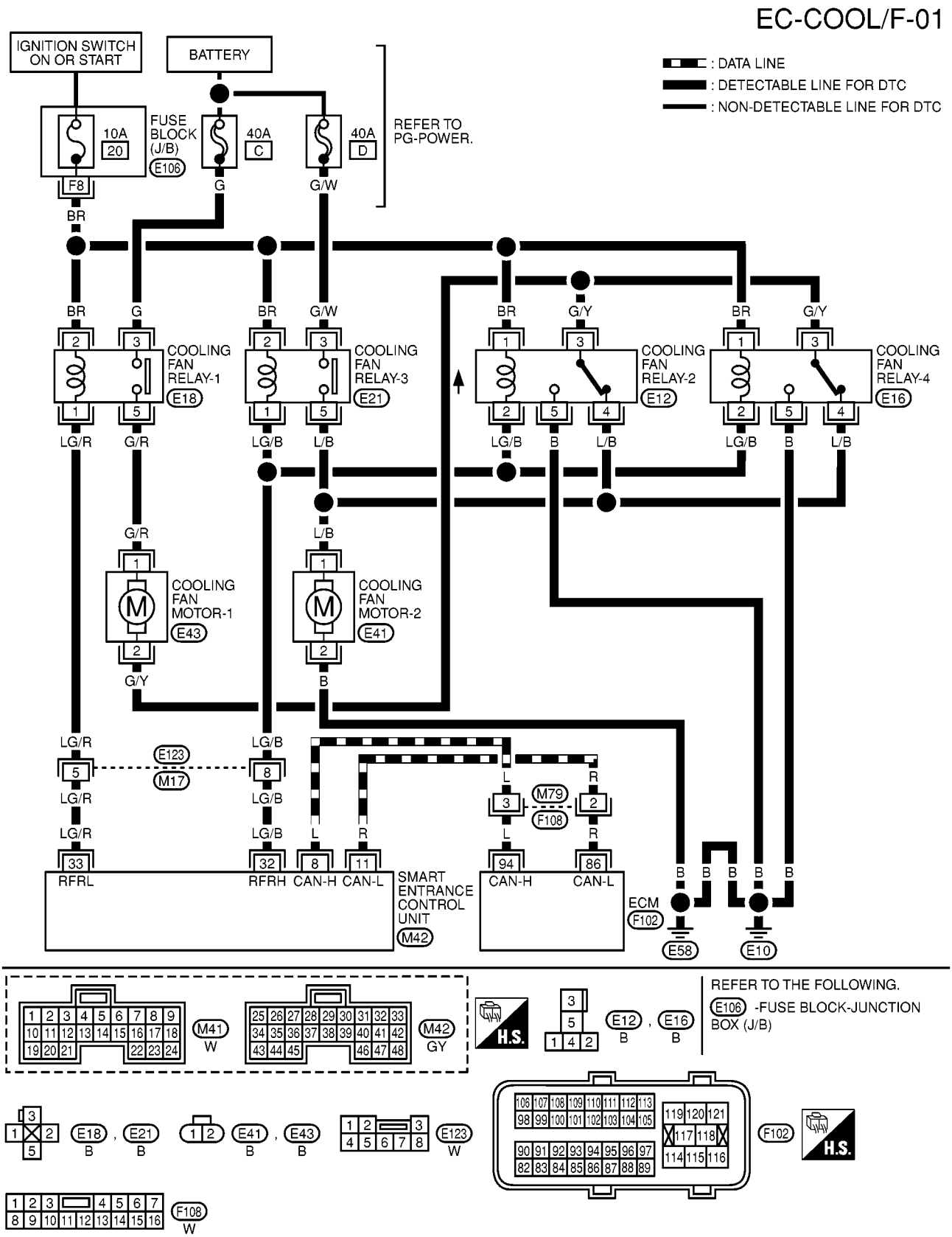
13. Restart engine and make sure that cooling fan operates at higher speed than low speed.
    Be careful not to overheat engine.
14. If NG, go to EC-1608, "Diagnostic Procedure" .



Wiring Diagram

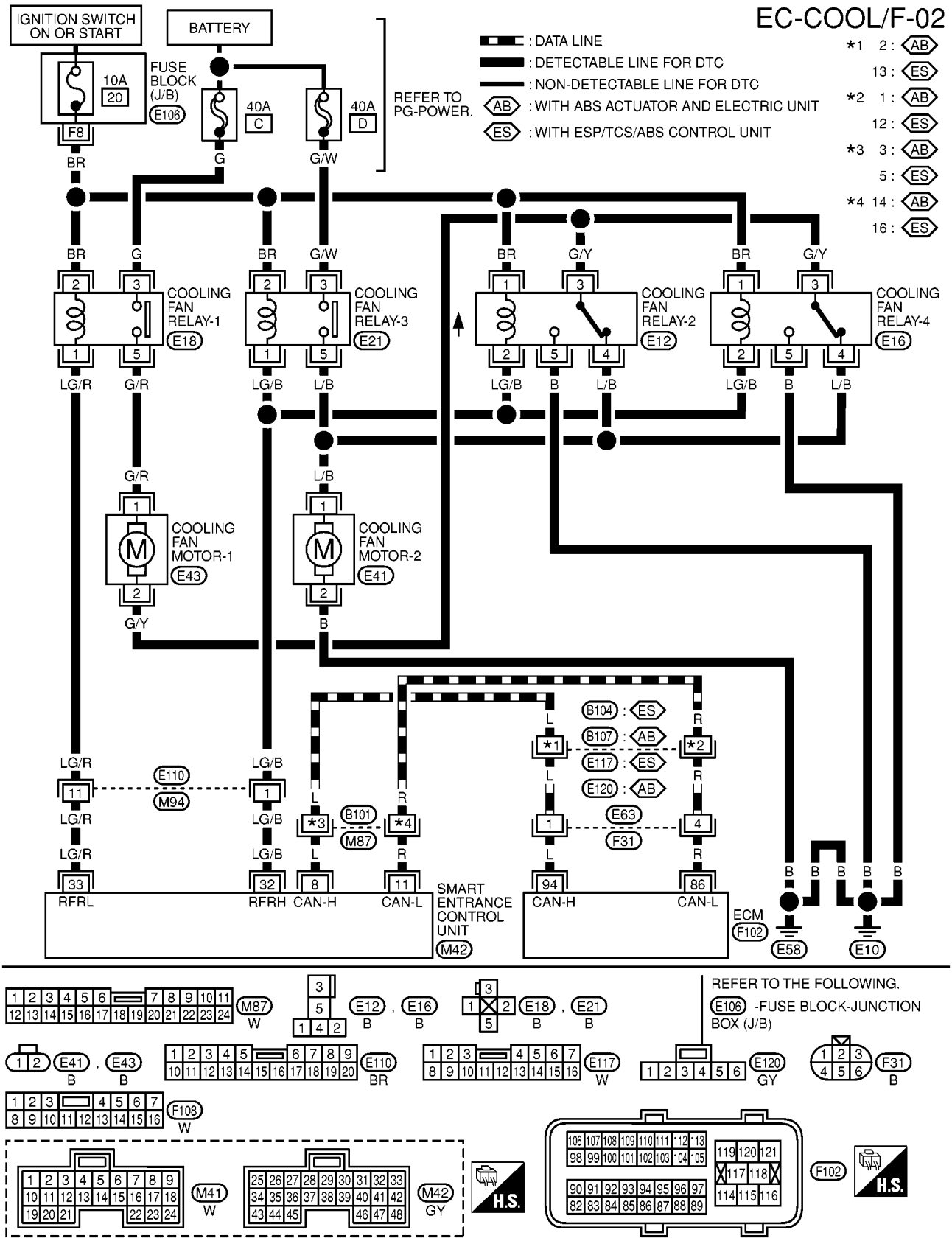
EBS00H2H

LHD MODELS



MBWA0018E

RHD MODELS



MBWA0146E

Diagnostic Procedure

EBS00H2I

1. INSPECTION START

Do you have CONSULT-II?

Yes or No

Yes >> GO TO 2.
No >> GO TO 5.

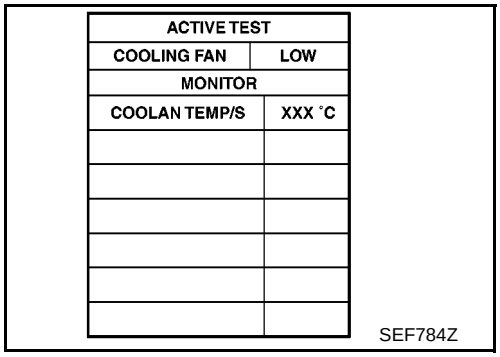
2. CHECK COOLING FAN LOW SPEED OPERATION

With CONSULT-II

1. Turn ignition switch “ON”.
2. Perform “COOLING FAN” in “ACTIVE TEST” mode with CONSULT-II and touch “LOW” on the CONSULT-II screen.
3. Make sure that cooling fans-1 and -2 operate at low speed.

OK or NG

OK >> GO TO 3.
NG >> Check cooling fan low speed control circuit. (Go to EC-1612, "PROCEDURE A" .)



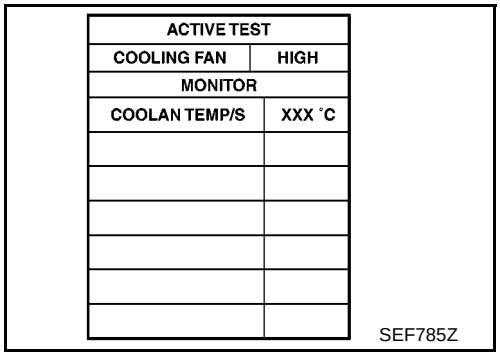
3. CHECK COOLING FAN HIGH SPEED OPERATION-I

With CONSULT-II

1. Touch “HIGH”on the CONSULT-II screen.
2. Make sure that cooling fan-1 operates at higher speed than low speed.

OK or NG

OK >> GO TO 4.
NG >> Check cooling fan high speed control circuit-1. (Go to EC-1614, "PROCEDURE B" .)



4. CHECK COOLING FAN HIGH SPEED OPERATION-II

With CONSULT-II

Make sure that cooling fan-2 operates at higher speed than low speed.

OK or NG

OK >> GO TO 8.
NG >> Check cooling fan high speed control circuit-2. (Go to EC-1616, "PROCEDURE C" .)

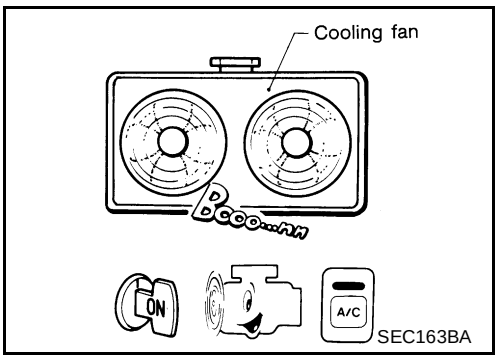
5. CHECK COOLING FAN LOW SPEED OPERATION

Without CONSULT-II

1. Start engine and let it idle.
2. Turn air conditioner switch “ON”.
3. Turn blower fan switch “ON”.
4. Make sure that cooling fans-1 and -2 operate at low speed.

OK or NG

OK >> GO TO 6.
NG >> Check cooling fan low speed control circuit. (Go to EC-1612, "PROCEDURE A" .)



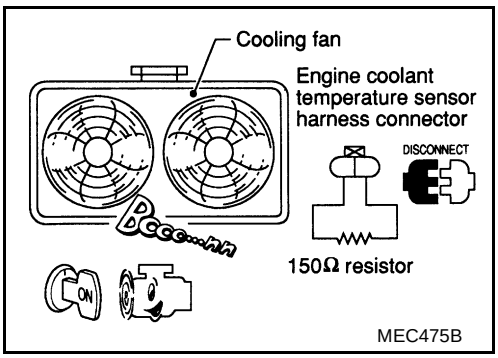
6. CHECK COOLING FAN HIGH SPEED OPERATION-I

Without CONSULT-II

1. Turn ignition switch “OFF”.
2. Turn air conditioner switch and blower fan switch “OFF”.
3. Disconnect engine coolant temperature sensor harness connector.
4. Connect 150Ω resistor to engine coolant temperature sensor harness connector.
5. Restart engine and make sure that cooling fan-1 operates at higher speed than low speed.

OK or NG

OK >> GO TO 7.
NG >> Check cooling fan high speed control circuit-1. (Go to EC-1614, "PROCEDURE B" .)



7. CHECK COOLING FAN HIGH SPEED OPERATION-II

Without CONSULT-II

Make sure that cooling fan-2 operates higher speed than lower speed.

OK or NG

OK >> GO TO 8.
NG >> Check cooling fan high speed control circuit-2. (Go to EC-1616, "PROCEDURE C" .)

8. CHECK COOLING SYSTEM FOR LEAK

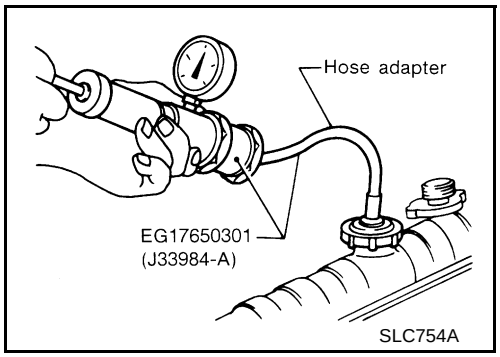
Apply pressure to the cooling system with a tester, and check if the pressure drops.

Testing pressure: 157 kPa (1.57 bar, 1.6 kg/cm^2 , 23psi)

CAUTION:

Higher than the specified pressure may cause radiator damage.

Pressure should not drop.



OK or NG

OK >> GO TO 9.
NG >> GO TO 8.

9. DETECT MALFUNCTIONING PART

Check the following for leak.

- Hose
- Radiator
- Water pump (Refer toCO-38, "WATER PUMP" .)

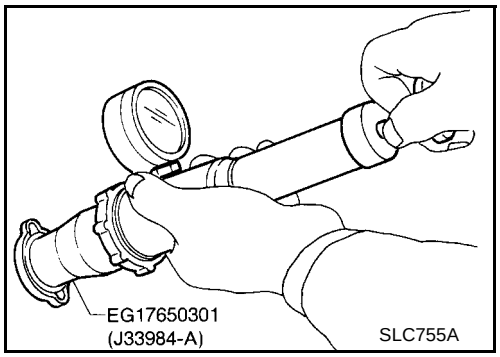
>> Repair or replace.

10. CHECK RADIATOR CAP

Apply pressure to cap with a tester and check radiator cap relief pressure.

Radiator cap relief pressure:

78 - 98 kPa (0.59 - 0.98 bar, 0.6 - 1.0 kg/cm^2 , 9 - 14 psi)



OK or NG

OK >> GO TO 11.
NG >> Replace radiator cap.

11. CHECK THERMOSTAT

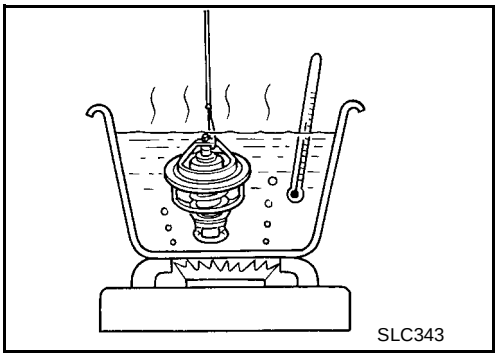
1. Remove thermostat.
2. Check valve seating condition at normal room temperatures.
   It should seat tightly.
3. Check valve opening temperature and valve lift.

   Valve opening temperature:

   80.5 - 83.5 °C (177 - 182 °F)

   Valve lift:

   More than 8 mm/95 °C (0.31 in/203 °F)



4. Check if valve is closed at 5°C (9°F) below valve opening temperature. For details, refer to CO-40, "THERMOSTAT AND WATER CONTROL VALVE" .

OK or NG

OK >> GO TO 12.
NG >> Replace thermostat.

12. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-1518, "Component Inspection" .

OK or NG

OK >> GO TO 13.
NG >> Replace engine coolant temperature sensor.

13. CHECK MAIN 12 CAUSES

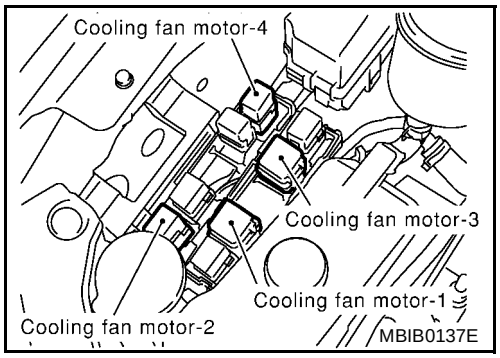
If the cause cannot be isolated, go to EC-1618, "Main 12 Causes of Overheating" .

>> **INSPECTION END**

PROCEDURE A

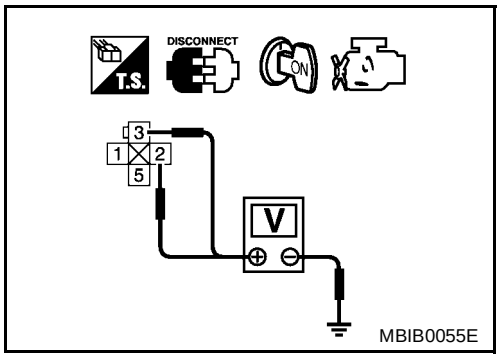
1. CHECK COOLING FAN POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect cooling fan relay-1.
3. Turn ignition switch “ON”.



4. Check voltage between cooling fan relay-1 terminals 2, 3 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

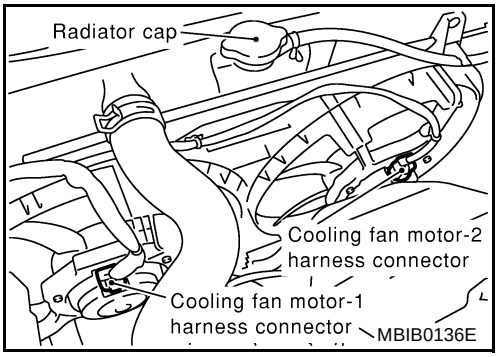
- Fuse block (J/B) connector E106
- 10A fuse
- 40A fusible link
- Harness for open or short between cooling fan relay-1 and fuse
- Harness for open or short between cooling fan relay-1 and battery

>> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK COOLING FAN MOTORS CONTROL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect cooling fan motor-1 harness connector and cooling fan motor-2 harness connector.
3. Disconnect cooling fan relay-2 and cooling fan relay-4.
4. Check harness continuity between the following.

- Cooling fan relay-1 terminal 5 and cooling fan motor-1 terminal 1
- Cooling fan motor-1 terminal 2 and cooling fan relay-2 terminal 3
- Cooling fan motor-1 terminal 2 and cooling fan relay-4 terminal 3
- Cooling fan relay-2 terminal 4 and cooling fan motor-2 terminal 1
- Cooling fan relay-4 terminal 4 and cooling fan motor-2 terminal 1
- Cooling fan motor-2 terminal 2 and ground
  Refer to Wiring Diagram.



Continuity should exist.

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK COOLING FAN MOTOR OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

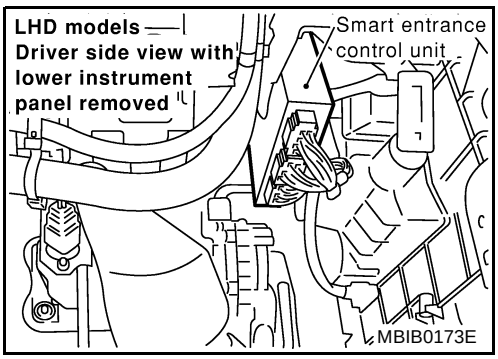
1. Disconnect smart entrance control unit harness connector.
2. Check harness continuity between cooling fan relay-1 terminal 1 and smart entrance control unit terminal 33. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.



5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E123, M17 (LHD models)
- Harness connectors E110, M94 (RHD models)
- Harness for open or short between cooling fan relay-1 and smart entrance control unit

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK COOLING FAN RELAY-1, -2 AND 4

Refer to EC-1619, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace cooling fan relay.

7. CHECK COOLING FAN MOTORS-1 AND -2

Refer to EC-1619, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> Replace cooling fan motors.

8. CHECK SMART ENTRANCE CONTROL UNIT

Refer to BCS-39, "Trouble Diagnoses" .

OK or NG

OK >> GO TO 9.
NG >> Replace smart entrance control unit.

9. CHECK INTERMITTENT INCIDENT

Perform EC-1498, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

PROCEDURE B

1. CHECK COOLING FAN RELAY GROUND CIRCUIT FOR OPEN AND SHORT

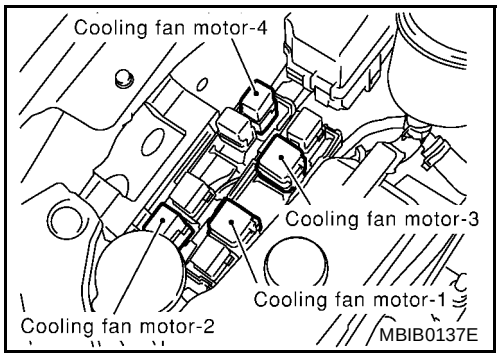
1. Turn ignition switch “OFF”.
2. Disconnect cooling fan relay-2 and cooling fan relay-4.
3. Check harness continuity between cooling fan relay-2 terminal 5 and ground, cooling fan relay-4 terminal 5 and ground. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 2.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.



2. CHECK COOLING FAN MOTOR OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

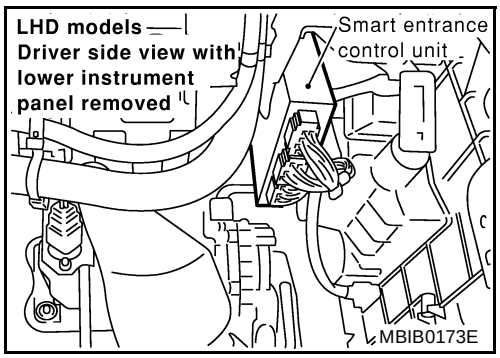
1. Disconnect smart entrance control unit harness connector.
2. Check harness continuity between cooling fan relay-2 terminal 2 and smart entrance control unit terminal 32, cooling fan relay-4 terminal 2 and smart entrance control unit terminal 32. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> GO TO 3.



3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E123, M17 (LHD models)
- Harness connectors E110, M94 (RHD models)
- Harness for open or short between cooling fan relay-2 and smart entrance control unit
- Harness for open or short between cooling fan relay-4 and smart entrance control unit

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK COOLING FAN RELAYS-2 AND -4

Refer to EC-1619, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace cooling fan relays.

5. CHECK SMART ENTRANCE CONTROL UNIT

Refer to BCS-39, "Trouble Diagnoses" .

OK or NG

OK >> GO TO 6.
NG >> Replace smart entrance control unit.

6. CHECK INTERMITTENT INCIDENT

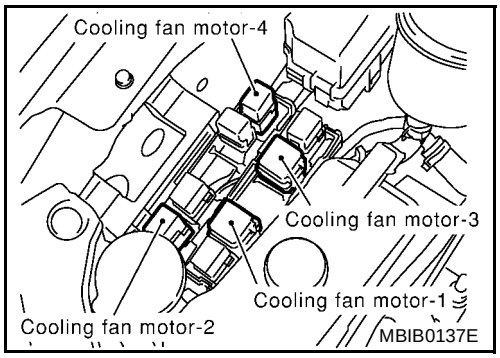
Perform EC-1498, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

PROCEDURE C

1. CHECK COOLING FAN MOTOR-2 POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect cooling fan relay-3.
3. Turn ignition switch “ON”.

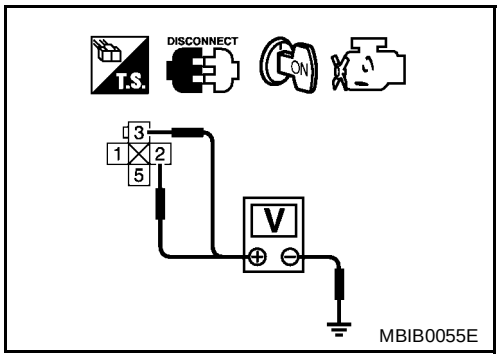


4. Check voltage between cooling fan relay-3 terminals 2, 3 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 3.
NG >> GO TO 2.



2. DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector E106
- 10A fuse
- 40A fusible link
- Harness for open or short between cooling fan relay-3 and fuse
- Harness for open or short between cooling fan relay-3 and battery

>> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK COOLING FAN MOTOR CONTROL CIRCUIT FOR OPEN AND SHORT

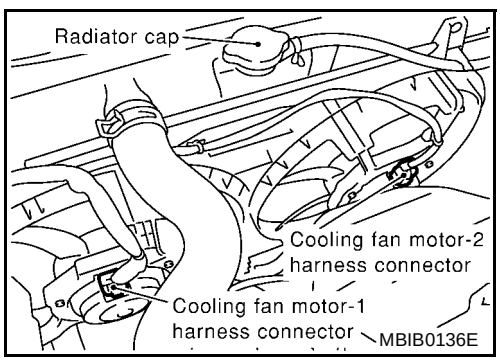
1. Turn ignition switch “OFF”.
2. Disconnect cooling fan motor-2 harness connector.
3. Check harness continuity between cooling fan relay-3 terminal 5 and cooling fan motor-2 terminal 1.
   Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to power in harness or connectors.



4. CHECK COOLING FAN MOTOR CONTROL CIRCUIT FOR SHORT TO GROUND

Check harness continuity between cooling fan relay-3 terminal 5 or cooling fan motor-2 terminal 1 and ground. Refer to Wiring Diagram.

Continuity should not exist.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Cooling fan relays-2 and -4 (Refer to EC-1619, "Component Inspection")
- Harness for short to ground between cooling fan relay-2 and cooling fan motor-2
- Harness for short to ground between cooling fan relay-3 and cooling fan motor-2
- Harness for short to ground between cooling fan relay-4 and cooling fan motor-2

>> Repair or replace.

6. CHECK COOLING FAN OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

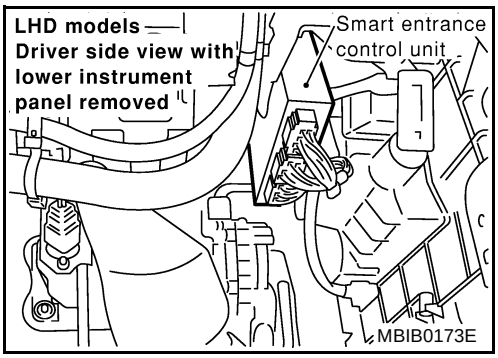
1. Disconnect smart entrance control unit harness connector.
2. Check harness continuity between cooling fan relay-3 terminal 1 and smart entrance control unit terminal 32. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> GO TO 7.



7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E123, M17 (LHD models)
- Harness connectors E110, M94 (RHD models)
- Harness for open or short between cooling fan relay-3 and smart entrance control unit

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK COOLING FAN RELAY-3

Refer to EC-1619, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> Replace cooling fan relay.

9. CHECK SMART ENTRANCE CONTROL UNIT

Refer to BCS-39, "Trouble Diagnoses" .

OK or NG

OK >> GO TO 10.
NG >> Replace smart entrance control unit.

10. CHECK INTERMITTENT INCIDENT

Perform EC-1498, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Main 12 Causes of Overheating

EBS00H2J

Engine	Step	Inspection item	Equipment	Standard	Reference page
OFF	1	● Blocked radiator ● Blocked condenser ● Blocked radiator grille ● Blocked bumper	● Visual	No blocking	—
	2	● Coolant mixture	● Coolant tester	50 - 50% coolant mixture	See MA-18, "Engine Coolant Mixture Ratio" .
	3	● Coolant level	● Visual	Coolant up to MAX level in reservoir tank and radiator filler neck	See CO-29, "LEVEL CHECK" .
	4	● Radiator cap	● Pressure tester	59 - 98 kPa (0.59 - 0.98 bar, 0.6 - 1.0 kg/cm^2 , 9 - 14 psi) (Limit)	See MA-22, "CHECKING RADIATOR CAP" .
ON*2	5	● Coolant leaks	● Visual	No leaks	See CO-29, "LEAK CHECK" .
ON*2	6	● Thermostat	● Touch the upper and lower radiator hoses	Both hoses should be hot	See CO-40, "THERMOSTAT AND WATER CONTROL VALVE" , and CO-31, "RADIATOR" .
ON*1	7	● Cooling fan	● CONSULT-II	Operating	See trouble diagnosis for DTC P1217 (EC-1603).
OFF	8	● Combustion gas leak	● Color checker chemical tester 4 Gas analyzer	Negative	—
ON*3	9	● Coolant temperature gauge	● Visual	Gauge less than 3/4 when driving	—
		● Coolant overflow to reservoir tank	● Visual	No overflow during driving and idling	See MA-20, "Changing Engine Coolant" .
OFF*4	10	● Coolant return from reservoir tank to radiator	● Visual	Should be initial level in reservoir tank	See CO-29, "LEVEL CHECK" .
OFF	11	● Cylinder head	● Straight gauge feeler gauge	0.1 mm (0.004 in) Maximum distortion (warping)	See EM-152, "CYLINDER HEAD" .
	12	● Cylinder block and pistons	● Visual	No scuffing on cylinder walls or piston	See EM-165, "CYLINDER BLOCK" .

*1: Turn the ignition switch ON.
*2: Engine running at 3,000 rpm for 10 minutes.
*3: Drive at 90 km/h (55 MPH) for 30 minutes and then let idle for 10 minutes.
*4: After 60 minutes of cool down time.
For more information, refer to CO-25, "OVERHEATING CAUSE ANALYSIS" .

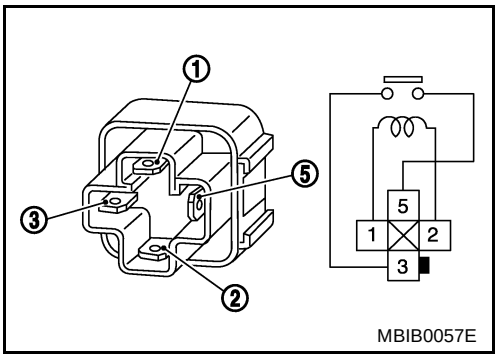
Component Inspection

EBS00H2K

COOLING FAN RELAY-1 AND -3

Check continuity between terminals 3 and 5 under the following conditions.

Conditions	Continuity
12V direct current supply between terminals 1 and 2	Yes
No current supply	No

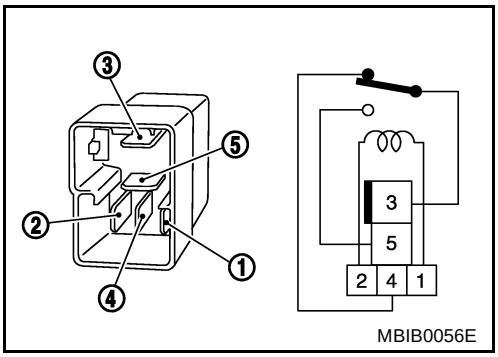


MBIB0057E

COOLING FAN RELAY-2 AND -4

Check continuity between terminals 3 and 4, 3 and 5 under the following conditions.

Conditions	Terminals	Continuity
12V direct current supply between terminals 1 and 2	3 and 4	No
	3 and 5	Yes
No current supply	3 and 4	Yes
	3 and 5	No

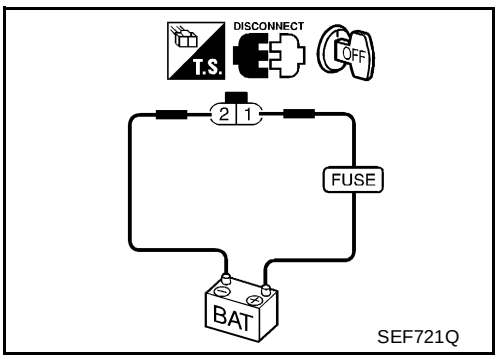


MBIB0056E

COOLING FAN MOTOR-1 AND -2

1. Disconnect cooling fan motor harness connectors.
2. Supply cooling fan motor terminals with battery voltage and check operation.

	Terminals	
	(+)	(-)
Cooling fan motor	1	2



SEF721Q

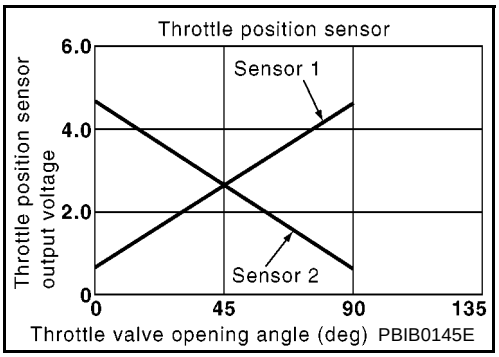
DTC P1223, P1224 TP SENSOR

PFP:16119

Component Description

EBS00H2L

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.
The throttle position sensor has the two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.



CONSULT-II Reference Value in Data Monitor Mode

EBS00H2M

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
THRTL SEN2	● Ignition switch: ON (Engine stopped) ● Shift lever: D (CVT model) 1st (M/T model)	Accelerator pedal: Fully released	More than 0.36V
		Accelerator pedal: Fully depressed	Less than 4.75V

On Board Diagnosis Logic

EBS00H2N

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1223 1223	Throttle position sensor 2 circuit low input	An excessively low voltage from the TP sensor 2 is sent to ECM.	● Harness or connectors (The TP sensor 2 circuit is open or shorted.) ● Electric throttle control actuator (TP sensor 2)
P1224 1224	Throttle position sensor 2 circuit high input	An excessively high voltage from the TP sensor 2 is sent to ECM.	

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters in fail-safe mode and the MI lights up.

Engine operation condition in fail-safe mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.

DTC Confirmation Procedure

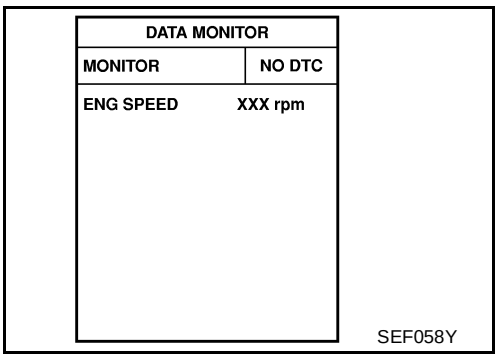
EBS00H2O

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.

2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-1623, "Diagnostic Procedure" .



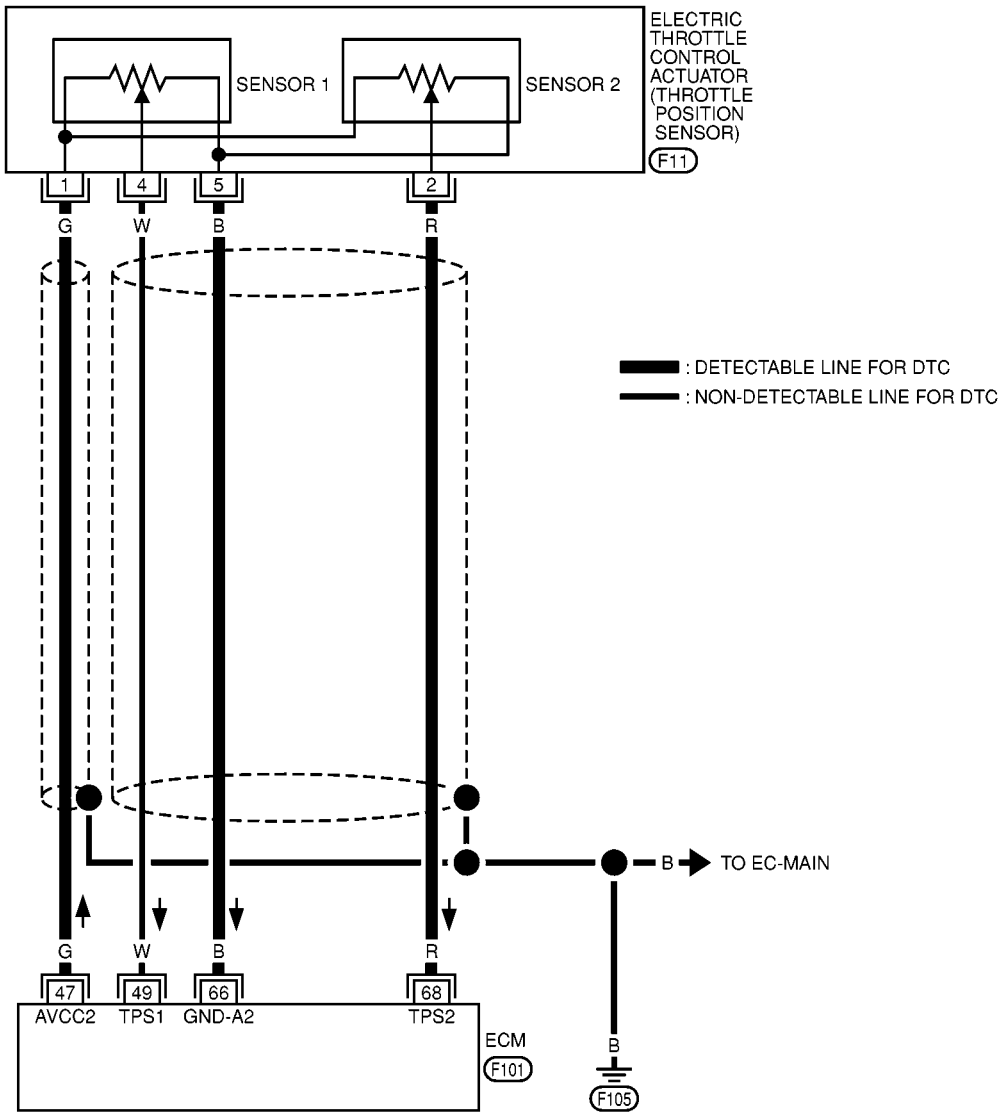
WITHOUT CONSULT-II

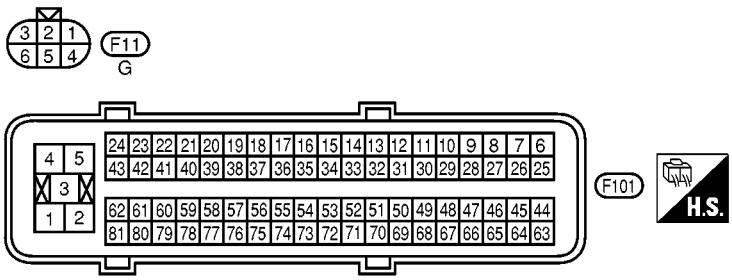
1. Start engine and let it idle for 1 seconds.
2. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
3. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
4. If DTC is detected, go to EC-1623, "Diagnostic Procedure" .

Wiring Diagram

EBS00H2P

EC-TPS2-01





MBWA0126E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
47	G	Throttle position sensor power supply	**[Ignition switch "ON"]**	Approximately 5V
49	W	Throttle position sensor 1	**[Ignition switch "ON"]** ● Shift lever position is "D" (CVT model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully released	More than 0.36V
			[Ignition switch "ON"] ● Shift lever position is "D" (CVT model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully depressed	Less than 4.75V
66	B	Sensors' ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
68	R	Throttle position sensor 2	**[Ignition switch "ON"]** ● Shift lever position is "D" (CVT model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully released	Less than 4.75V
			[Ignition switch "ON"] ● Shift lever position is "D" (CVT model) ● Shift lever position is "1st" (M/T model) ● Accelerator pedal fully depressed	More than 0.36V

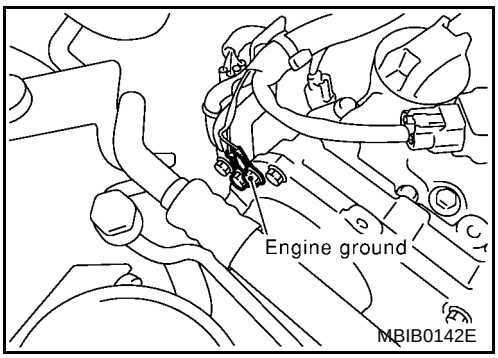
Diagnostic Procedure

EBS00H2Q

1. RETIGHTEN GROUND SCREWS

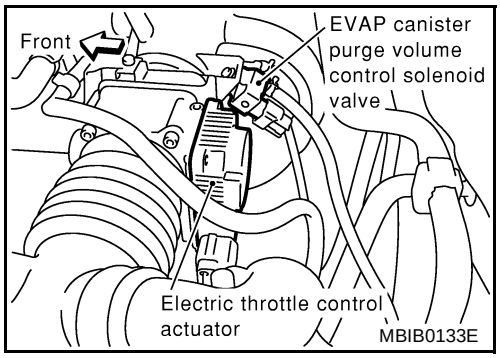
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



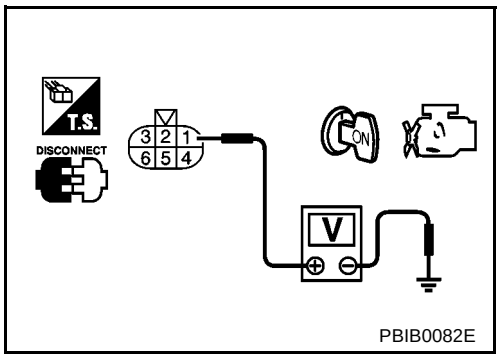
2. CHECK THROTTLE POSITION SENSOR 2 POWER SUPPLY CIRCUIT

1. Disconnect electric throttle control actuator harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between electric throttle control actuator terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK THROTTLE POSITION SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 66 and electric throttle control actuator terminal 5. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK THROTTLE POSITION SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 68 and electric throttle control actuator terminal 2. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK THROTTLE POSITION SENSOR

Refer to EC-1625, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-1440, "Throttle Valve Closed Position Learning" .
3. Perform EC-1440, "Idle Air Volume Learning" .

>> **INSPECTION END**

7. CHECK INTERMITTENT INCIDENT

Refer to EC-1498, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

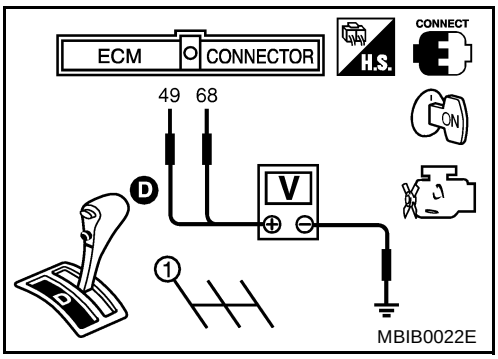
Component Inspection

EBS00H2R

THROTTLE POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Perform EC-1440, "Throttle Valve Closed Position Learning" .
3. Turn ignition switch “ON”.
4. Set selector lever to “D” position (CVT models) or “1st” position (M/T models).
5. Check voltage between ECM terminals 49 (TP sensor 1 signal), 68 (TP sensor 2 signal) and engine ground under the following conditions.

Terminal	Accelerator pedal	Voltage
49 (Throttle position sensor 1)	Fully released	More than 0.36V
	Fully depressed	Less than 4.75V
68 (Throttle position sensor 2)	Fully released	Less than 4.75V
	Fully depressed	More than 0.36V



6. If NG, replace electric throttle control actuator and go to the next step.
7. Perform EC-1440, "Throttle Valve Closed Position Learning" .
8. Perform EC-1440, "Idle Air Volume Learning" .

Remove and Installation

EBS00H2S

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-116, "INTAKE MANIFOLD" .

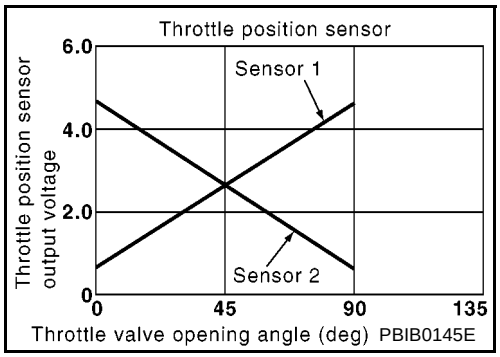
DTC P1225 TP SENSOR

PFP:16119

Component Description

EBS00H2T

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.
The throttle position sensor has the two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.



On Board Diagnosis Logic

EBS00H2U

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1225 1225	Closed throttle position learning performance problem	Closed throttle position learning value is excessively low.	● Electric throttle control actuator (TP sensor 1 and 2)

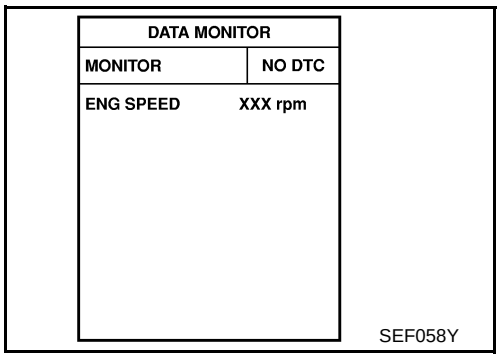
DTC Confirmation Procedure

EBS00H2V

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Turn ignition switch “OFF”, wait at least 10 seconds.
4. Turn ignition switch “ON”.
5. If 1st trip DTC is detected, go to EC-1627, "Diagnostic Procedure" .



WITHOUT CONSULT-II

1. Turn ignition switch “ON”.
2. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
3. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
4. If 1st trip DTC is detected, go to EC-1627, "Diagnostic Procedure" .

Diagnostic Procedure

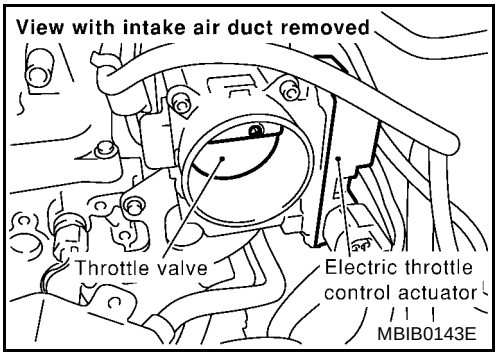
EBS00H2W

1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Turn ignition switch “OFF”.
2. Remove the intake air duct.
3. Check if foreign matter is caught between the throttle valve and the housing.

OK or NG

OK >> GO TO 2.
NG >> Remove the foreign matter and clean the electric throttle control actuator inside.



2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-1440, "Throttle Valve Closed Position Learning" .
3. Perform EC-1440, "Idle Air Volume Learning" .

>> **INSPECTION END**

Remove and Installation

EBS00H2X

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-116, "INTAKE MANIFOLD" .

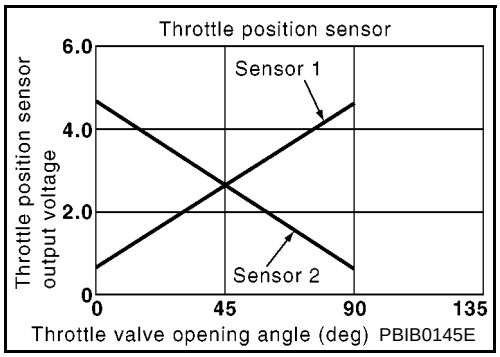
DTC P1226 TP SENSOR

PFP:16119

Component Description

EBS00H2Y

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.
The throttle position sensor has the two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.



On Board Diagnosis Logic

EBS00H2Z

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1226 1226	Closed throttle position learning performance problem	Closed throttle position learning is not performed successfully, repeatedly.	● Electric throttle control actuator (TP sensor 1 and 2)

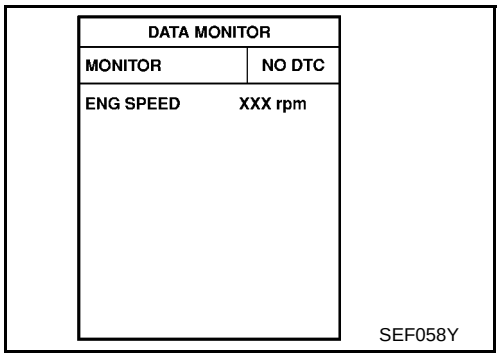
DTC Confirmation Procedure

EBS00H30

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Turn ignition switch “OFF”, wait at least 10 seconds.
4. Turn ignition switch “ON”.
5. Repeat steps 3 and 4, 32 times.
6. If 1st trip DTC is detected, go to EC-1629, "Diagnostic Procedure" .



WITHOUT CONSULT-II

1. Turn ignition switch “ON”.
2. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
3. Repeat step 2, 32 times.
4. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
5. If 1st trip DTC is detected, go to EC-1629, "Diagnostic Procedure" .

Diagnostic Procedure

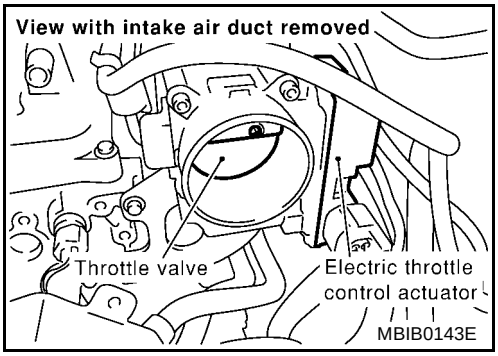
EBS00H31

1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Turn ignition switch “OFF”.
2. Remove the intake air duct.
3. Check if foreign matter is caught between the throttle valve and the housing.

OK or NG

OK >> GO TO 2.
NG >> Remove the foreign matter and clean the electric throttle control actuator inside.



2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-1440, "Throttle Valve Closed Position Learning" .
3. Perform EC-1440, "Idle Air Volume Learning" .

>> **INSPECTION END**

Remove and Installation

EBS00H32

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-116, "INTAKE MANIFOLD" .

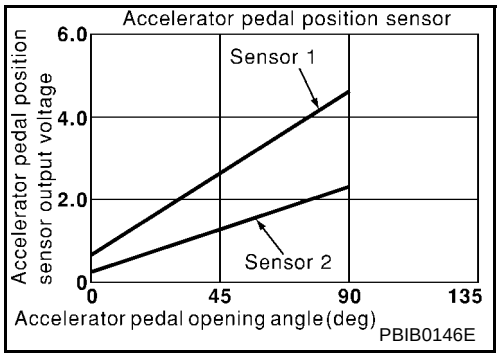
DTC P1227, P1228 APP SENSOR

PFP:18002

Component Description

EBS00H33

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.
Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometers which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the accelerator pedal and feed the voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.



Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for the engine operation such as fuel cut.

CONSULT-II Reference Value in Data Monitor Mode

EBS00H34

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
ACCEL SEN2	● Ignition switch: ON (engine stopped)	Accelerator pedal: Fully released	0.35 - 0.67V
		Accelerator pedal: Fully depressed	More than 3.9V
CLSD THL POS	● Ignition switch: ON	Accelerator pedal: Fully released	ON
		Accelerator pedal: Slightly depressed	OFF

On Board Diagnosis Logic

EBS00H35

These half-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1227 1227	Accelerator pedal position sensor 2 circuit low input	An excessively low voltage from the APP sensor 2 is sent to ECM.	● Harness or connectors (The APP sensor 2 circuit is open or shorted.) ● Accelerator pedal position sensor (Accelerator pedal position sensor 2)
P1228 1228	Accelerator pedal position sensor 2 circuit high input	An excessively high voltage from the APP sensor 2 is sent to ECM.	

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters in fail-safe mode and the MI lights up.

Engine operating condition in fail-safe mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of throttle valve to be shower than the normal condition. So, the acceleration will be poor.

DTC Confirmation Procedure

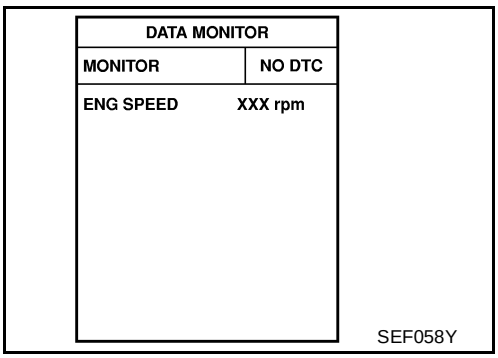
EBS00H36

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.

2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-1633, "Diagnostic Procedure" .

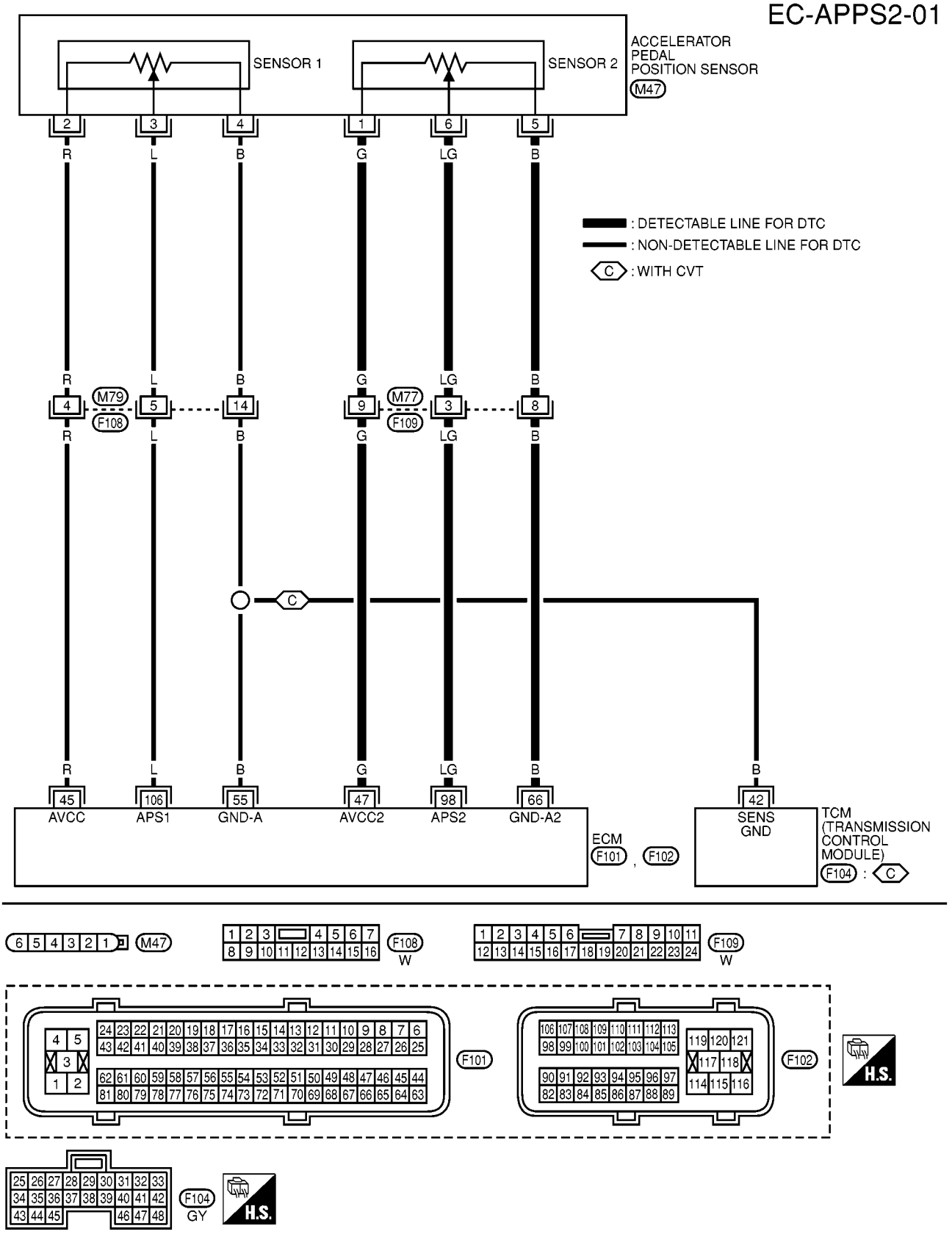


WITHOUT CONSULT-II

1. Start engine and let it idle for 1 seconds.
2. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
3. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
4. If DTC is detected, go to EC-1633, "Diagnostic Procedure" .

Wiring Diagram

EBS00H37



MBWA0130E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
45	R	Sensors′ power supply	**[Ignition switch “ON”]**	Approximately 5V
47	G	Sensors′ power supply	**[Ignition switch “ON”]**	Approximately 5V
55	B	Sensor′s ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
66	B	Sensor′s ground	**[Ignition switch “ON”]** ● **Warm-up condition** ● Idle speed	Approximately 0V
98	LG	Accelerator pedal position sensor 2	**[Ignition switch “ON”]** ● Shift lever position is “D” (CVT models) ● Shift lever position is “1st” (M/T models) ● Accelerator pedal fully released	0.175 - 0.335V
			[Ignition switch “ON”] ● Shift lever position is “D” (CVT models) ● Shift lever position is “1st” (M/T models) ● Accelerator pedal fully depressed	More than 1.95V
106	L	Accelerator pedal position sensor 1	**[Ignition switch “ON”]** ● Shift lever position is “D” (CVT models) ● Shift lever position is “1st” (M/T models) ● Accelerator pedal fully released	0.35 - 0.67V
			[Ignition switch “ON”] ● Shift lever position is “D” (CVT models) ● Shift lever position is “1st” (M/T models) ● Accelerator pedal fully depressed	More than 3.9V

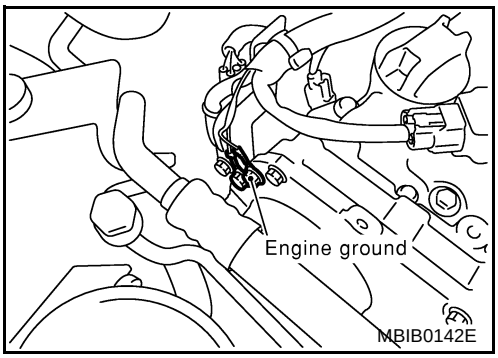
Diagnostic Procedure

EBS00H38

1. RETIGHTEN GROUND SCREWS

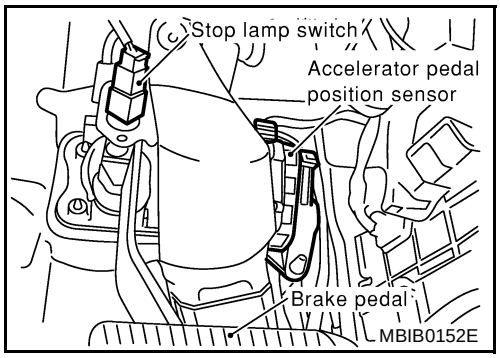
1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

>> GO TO 2.



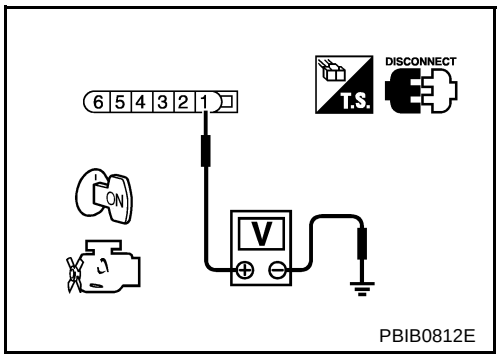
2. CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT

1. Disconnect accelerator pedal position (APP) sensor harness connector.
2. Turn ignition switch “ON”.



3. Check voltage between APP sensor terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M77, F109
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK APP SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 66 and APP sensor terminal 5. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M77, F109
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK APP SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 98 and APP sensor terminal 6. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M77, F109
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK APP SENSOR

Refer to EC-1635, "Component Inspection" .

OK or NG

OK >> GO TO 10.
NG >> GO TO 9.

9. REPLACE APP SENSOR

1. Replace the accelerator pedal position sensor.
2. Perform EC-1440, "Accelerator Pedal Released Position Learning" .
3. Perform EC-1440, "Throttle Valve Closed Position Learning" .
4. Perform EC-1440, "Idle Air Volume Learning" .

>> **INSPECTION END**

10. CHECK INTERMITTENT INCIDENT

Refer to EC-1498, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

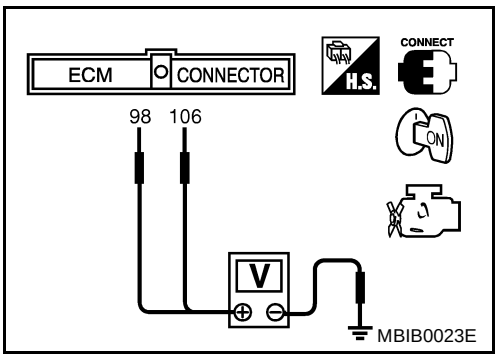
Component Inspection

EBS00H39

ACCELERATOR PEDAL POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Turn ignition switch “ON”.
3. Check voltage between ECM terminals 106 (APP sensor 1 signal), 98 (APP sensor 2 signal) and engine ground under the following conditions.

Terminal	Accelerator pedal	Voltage
106 (Accelerator pedal position sensor 1)	Fully released	0.35 - 0.67V
	Fully depressed	More than 3.9V
98 (Accelerator pedal position sensor 2)	Fully released	0.175 - 0.335V
	Fully depressed	More than 1.95V



4. If NG, replace accelerator pedal assembly and go to the next step.
5. Perform EC-1440, "Accelerator Pedal Released Position Learning" .
6. Perform EC-1440, "Throttle Valve Closed Position Learning" .
7. Perform EC-1440, "Idle Air Volume Learning" .

Remove and Installation

EBS00H3A

ACCELERATOR PEDAL

Refer to ACC-2, "ACCELERATOR CONTROL SYSTEM" .

DTC P1229 SENSOR POWER SUPPLY

PFP:16119

On Board Diagnosis Logic

EBS00H3B

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1229 1229	Sensor power supply circuit short	ECM detects a voltage of power source for sensor is excessively low or high.	● Harness or connectors (The TP sensor 1 and 2 circuit is shorted.) (APP sensor 2 circuit is shorted.) ● Electric throttle control actuator (TP sensor 1 and 2) ● Accelerator pedal position sensor (APP sensor 2) ● ECM pin terminal

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters in fail-safe mode and the MI lights up.

Engine operation condition in fail-safe mode
ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

DTC Confirmation Procedure

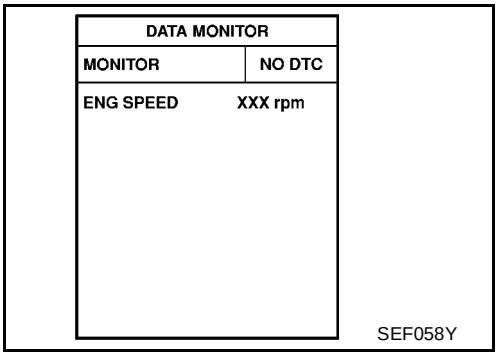
EBS00H3C

NOTE:
If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-1639, "Diagnostic Procedure" .



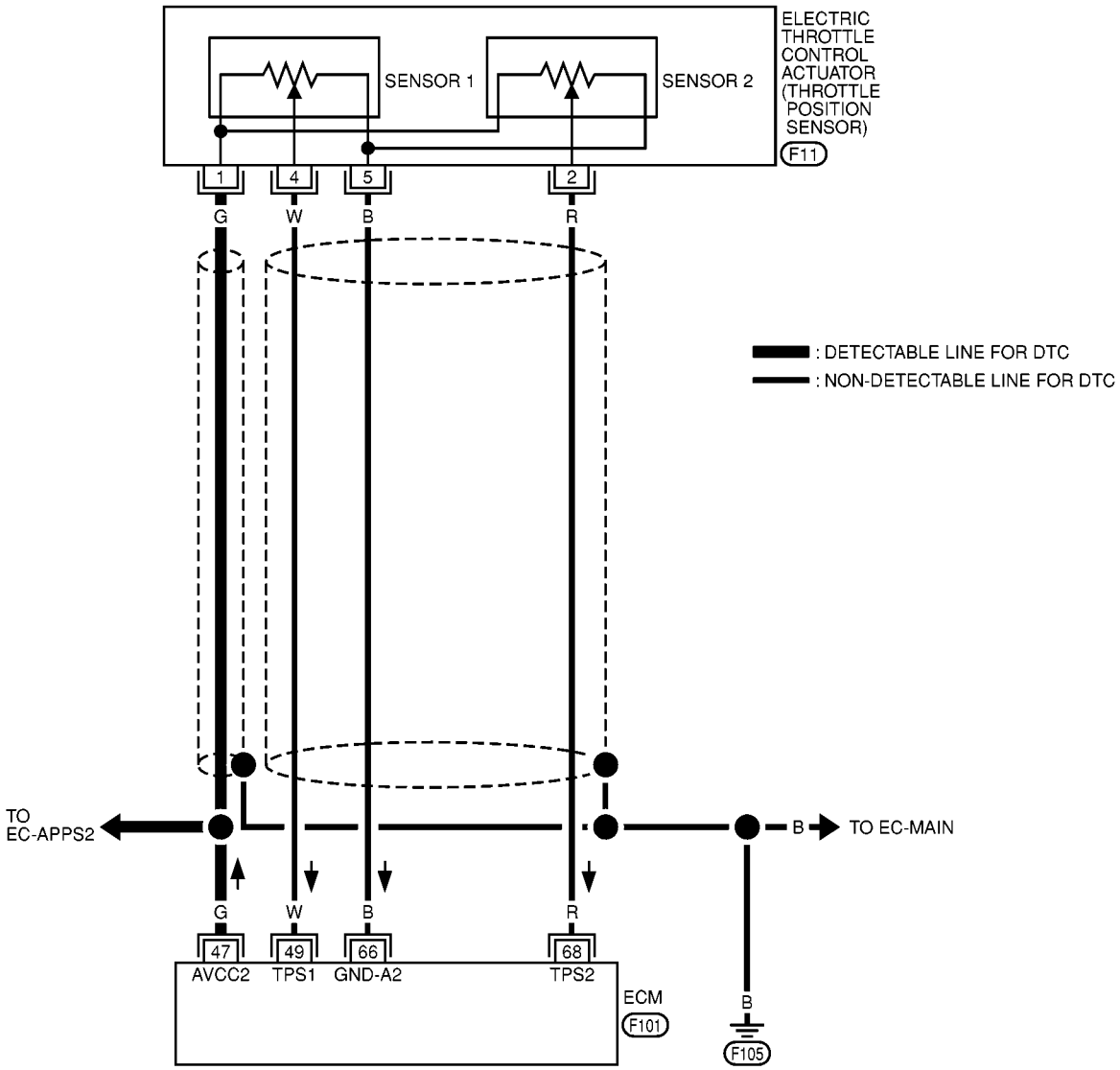
WITHOUT CONSULT-II

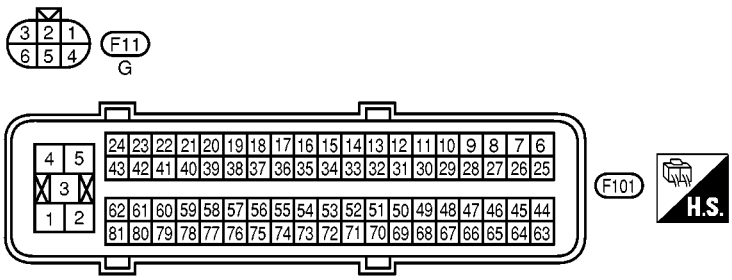
1. Start engine and let it idle for 1 seconds.
2. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
3. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
4. If DTC is detected, go to EC-1639, "Diagnostic Procedure" .

Wiring Diagram

EBS00H3D

EC-SEN/PW-01





MBWA0128E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
47	G	Sensor's power supply	**[Ignition switch "ON"]**	Approximately 5V

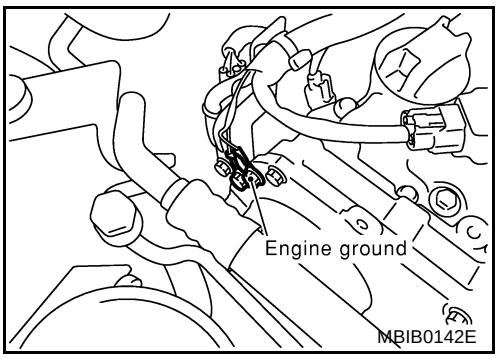
Diagnostic Procedure

EBS00H3E

1. RETIGHTEN GROUND SCREWS

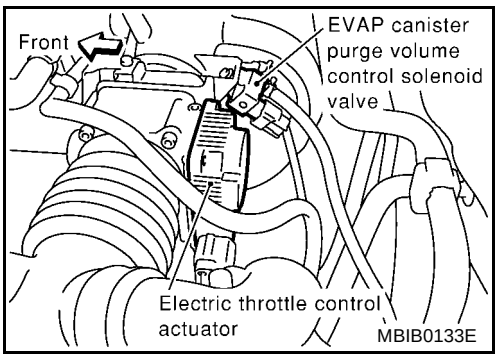
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

>> GO TO 2.



2. CHECK THROTTLE POSITION SENSOR POWER SUPPLY CIRCUIT

1. Disconnect electric throttle control actuator harness connector.
2. Turn ignition switch "ON".

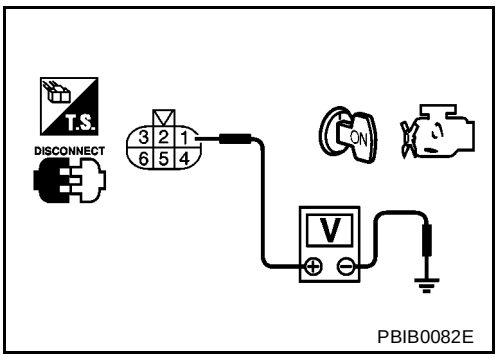


3. Check voltage between electric throttle control actuator terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 5V

OK or NG

OK >> GO TO 6.
NG >> GO TO 3.



3. CHECK SENSOR POWER SUPPLY CIRCUITS FOR SHORT

Check the following.

- Harness for short to power and short to ground between following terminals.

ECM terminal	Sensor terminals	Reference Wiring Diagram
47	Electric throttle control actuator terminal 1	EC-1638
	Accelerator pedal position sensor terminal 1	EC-1632

- ECM pin terminal.

OK or NG

OK >> GO TO 4.
NG >> Repair short to ground or short to power in harness or connectors.

4. CHECK ACCELERATOR PEDAL POSITON SENSOR

Refer to EC-1635, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> GO TO 5.

5. REPLACE ACCELERATOR PEDAL POSITION SENSOR

1. Replace accelerator pedal position sensor.
2. Perform EC-1440, "Accelerator Pedal Released Position Learning" .
3. Perform EC-1440, "Throttle Valve Closed Position Learning" .
4. Perform EC-1440, "Idle Air Volume Learning" .

>> **INSPECTION END**

6. CHECK THROTTLE POSITION SENSOR

Refer to EC-1530, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

7. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace electric throttle control actuator.
2. Perform EC-1440, "Throttle Valve Closed Position Learning" .
3. Perform EC-1440, "Idle Air Volume Learning" .

>> **INSPECTION END**

8. CHECK INTERMITTENT INCIDENT

Refer to EC-1498, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

DTC P1805 BRAKE SWITCH

PFP:25320

Description

EBS00H3F

Brake switch signal is applied to the ECM through the stop lamp switch when the brake pedal is depressed. This signal is used mainly to decrease the engine speed when the vehicle is driving.

CONSULT-II Reference Value in Data Monitor Mode

EBS00H3G

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
BRAKE SW	● Ignition switch: ON	Brake pedal: Fully released	OFF
		Brake pedal: Slightly depressed	ON

On Board Diagnosis Logic

EBS00H3H

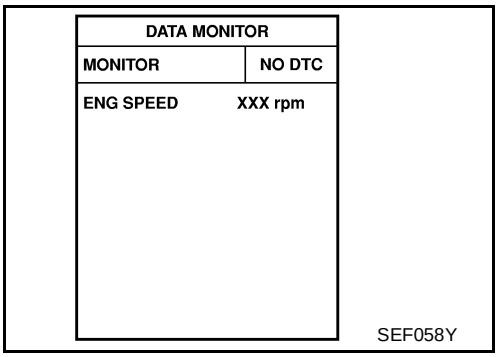
DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1805 1805	Brake switch	A brake switch signal is not sent to ECM for an extremely long time while the vehicle is driving.	● Harness or connectors (Stop lamp switch circuit is open or shorted.) ● Stop lamp switch

DTC Confirmation Procedure

EBS00H3I

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Fully depress the brake pedal for at least 5 seconds.
3. Erase the DTC with CONSULT-II.
4. Select “DATA MONITOR” mode with CONSULT-II.
5. If 1st trip DTC is detected, go to EC-1643, "Diagnostic Procedure" .

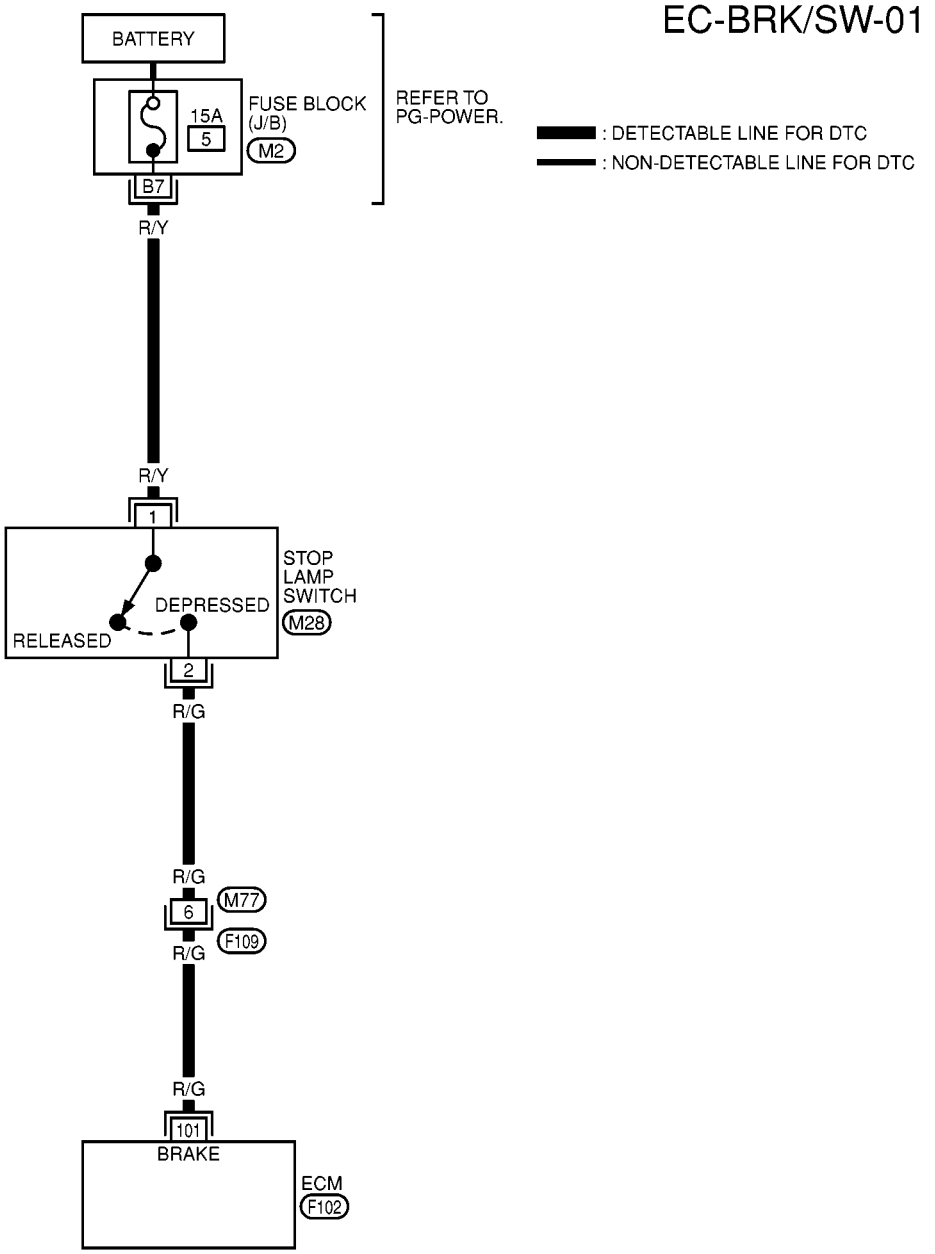


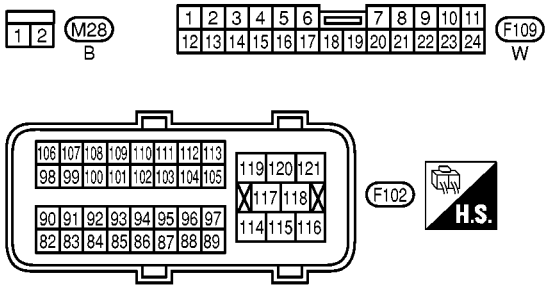
WITHOUT CONSULT-II

1. Turn ignition switch “ON”.
2. Fully depress the brake pedal at least 5 seconds.
3. Erase the “Diagnostic Test Mode II (Self-diagnostic results)” memory. Refer to EC-1450, "How to Erase Diagnostic Test Mode II (Self-diagnostic Results)" .
4. Turn ignition switch “OFF”, wait at least 10 seconds and then turn “ON”.
5. Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
6. If 1st trip DTC is detected, go to EC-1643, "Diagnostic Procedure" .

Wiring Diagram

EBS00H3J





REFER TO THE FOLLOWING.
M2 -FUSE BLOCK-
JUNCTION BOX (J/B)

MBWA0034E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
101	R/G	Stop lamp switch	**[Engine is running]** ● Brake pedal fully released	Approximately 0V
			[Engine is running] ● Brake pedal depressed	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

EBS00H3K

1. CHECK STOP LAMP SWITCH CIRCUIT

1. Turn ignition switch “OFF”.
2. Check the stop lamp when depressing and releasing the brake pedal.

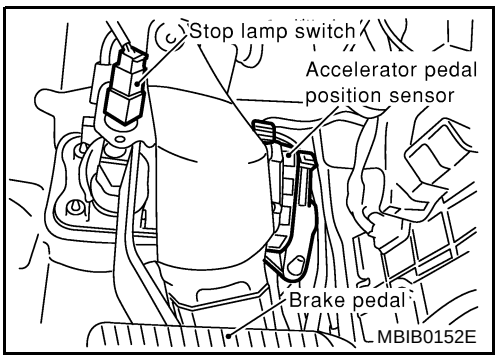
Brake pedal	Stop lamp
Fully released	Not illuminated
Depressed	Illuminated

OK or NG

OK >> GO TO 4.
NG >> GO TO 2.

2. CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT

1. Disconnect stop lamp switch harness connector.

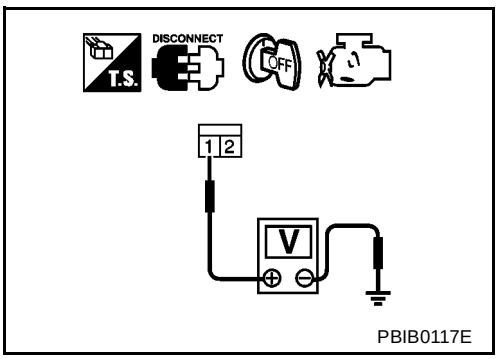


2. Check voltage between stop lamp switch terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 4.
NG >> GO TO 3.



3. DETECT MALFUNCTIONING PART

Check the following.

- 15A fuse
- Fuse block (J/B) connector M2
- Harness for open and short between stop lamp switch and battery

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK STOP LAMP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 101 and stop lamp switch terminal 2.
   Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M77, F109
- Harness for open or short between ECM and stop lamp switch

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK STOP LAMP SWITCH

Refer to EC-1644, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace stop lamp switch.

7. CHECK INTERMITTENT INCIDENT

Refer to EC-1498, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

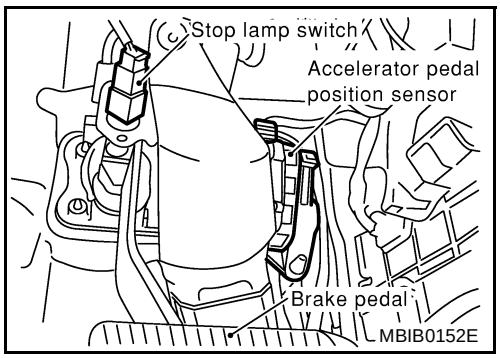
>> **INSPECTION END**

Component Inspection

EBS00H3L

STOP LAMP SWITCH

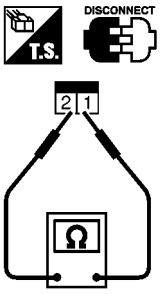
1. Disconnect stop lamp switch harness connector.



2. Check continuity between stop lamp switch terminals 1 and 2 under the following conditions.

Conditions	Continuity
Brake pedal fully released	Should not exist.
Brake pedal depressed	Should exist.

If NG, adjust brake pedal installation, refer to BR-6, "BRAKE PEDAL" , and perform step 2 again.



PBIB0118E

HO2S1 HEATER

PFP:22690

Description

EBS00H3M

SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM function	Actuator
Camshaft position sensor (PHASE) Crankshaft position sensor (POS)	Engine speed	Heated oxygen sensor 1 heater control	Heated oxygen sensor 1 heater
Engine coolant temperature sensor	Engine coolant temperature		

The ECM performs ON/OFF duty control of the heated oxygen sensor 1 heater corresponding to the engine speed and engine coolant temperature. The duty percent varies with engine coolant temperature when engine is started.

OPERATION

Engine speed rpm	Heated oxygen sensor 1 heater
Above 3,600	OFF
Below 3,600	ON

CONSULT-II Reference Value in Data Monitor Mode

EBS00H3N

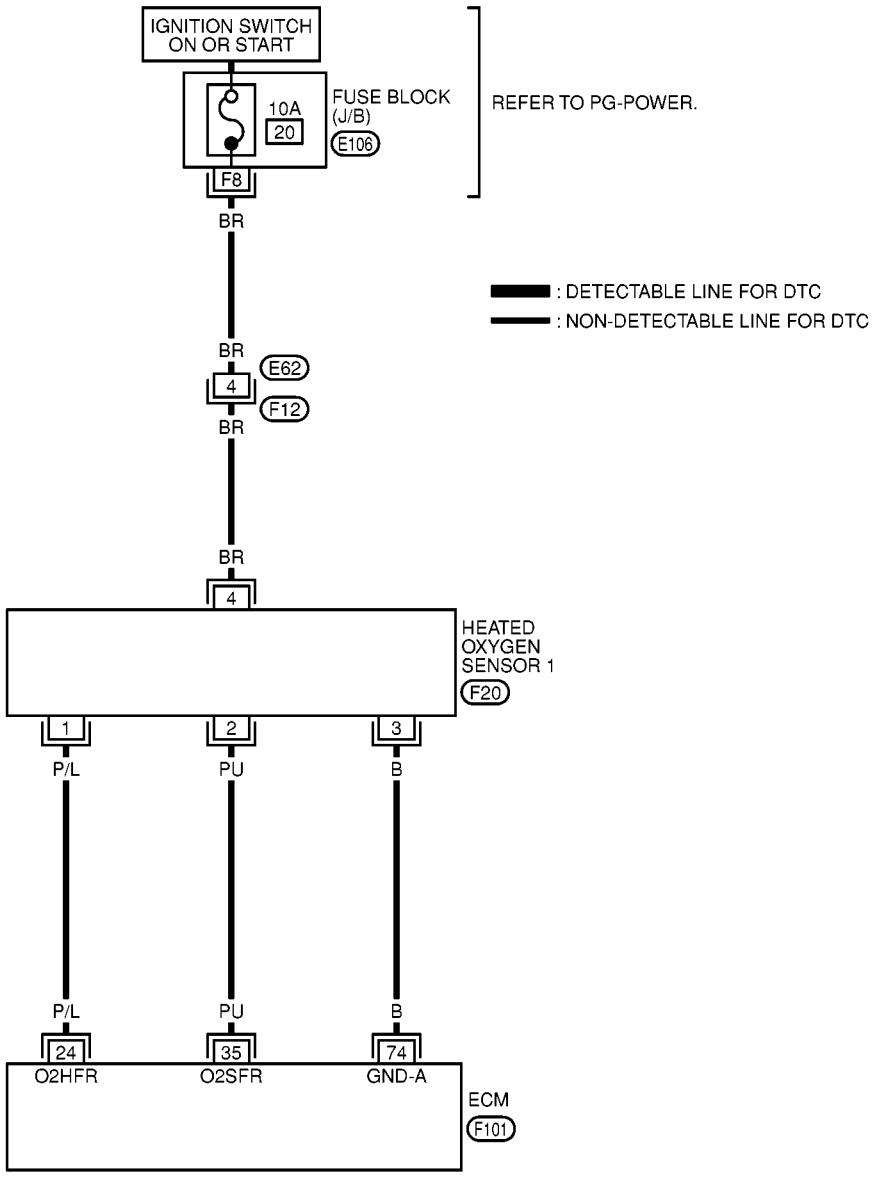
Specification data are reference values.

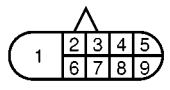
MONITOR ITEM	CONDITION	SPECIFICATION
HO2S1 HTR (B1)	● Engine: After warming up ● Engine speed: Below 3,600 rpm	ON
	● Engine speed: Above 3,600 rpm	OFF

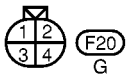
Wiring Diagram

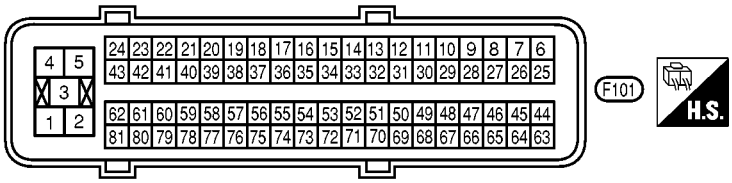
EBS00H3O

EC-FRO2-01









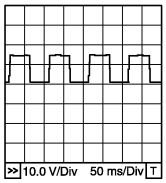
REFER TO THE FOLLOWING.
E106 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0021E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
24	P/L	Heated oxygen sensor 1 heater	**[Engine is running]** ● **Warm-up condition.** ● Engine speed is below 3,600 rpm.	Approximately 7.0V★  PBIB0519E
			[Engine is running] ● Engine speed is above 3,600 rpm.	BATTERY VOLTAGE (11 - 14V)

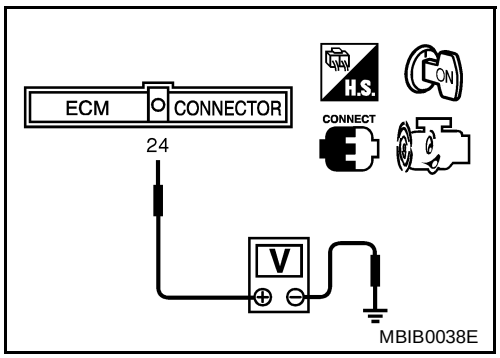
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnostic Procedure

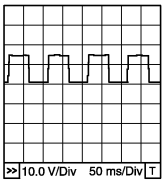
EBS00H3P

1. CHECK OVERALL FUNCTION

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Turn ignition switch “ON”.
4. Set tester prove between ECM terminal 24 (HO2S1 heater signal) and ground.
5. Start engine and let it idle.
6. Check the voltage under the following conditions.
   Verify that the oscilloscope screen shows the signal waves as shown below.



MBIB0038E

Conditions	Voltage
At idle	Approximately 7.0V★  PBIB0519E
Engine speed is above 3,600 rpm.	BATTERY VOLTAGE (11 - 14V)

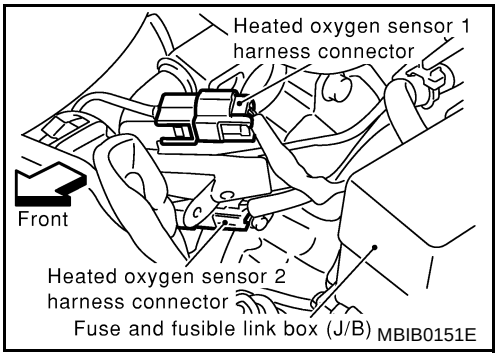
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 2.

2. CHECK HO2S1 POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 1 harness connector.
3. Turn ignition switch “ON”.

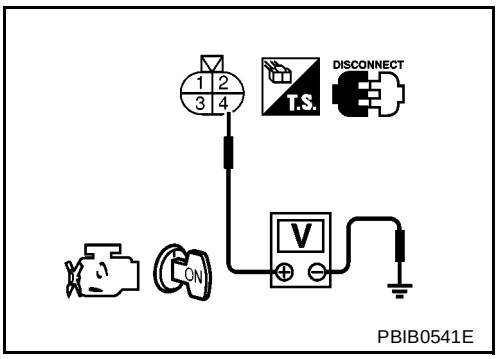


4. Check voltage between HO2S1 terminal 4 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 4.
NG >> GO TO 3.



3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E62, F12
- Fuse block (J/B) connector E106
- 10A fuse
- Harness for open or short between heated oxygen sensor 1 and fuse

>> Repair harness or connectors.

4. CHECK HO2S1 OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 24 and HO2S1 terminal 1. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK HEATED OXYGEN SENSOR 1 HEATER

Refer to EC-1650, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace heated oxygen sensor 1.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-1498, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

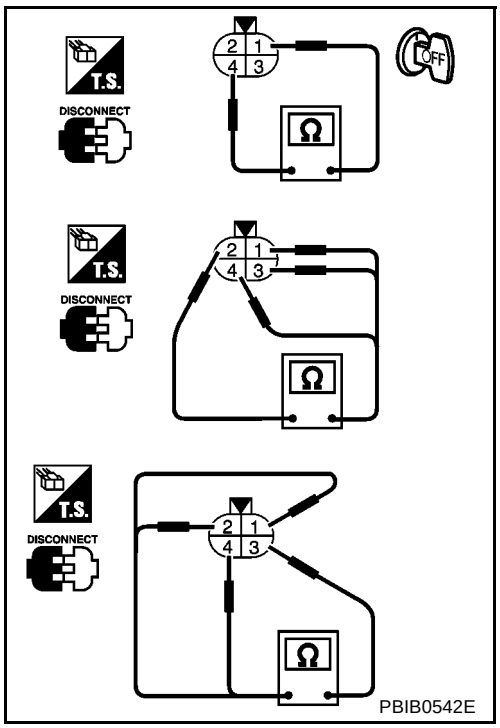
EBS00H3Q

HEATED OXYGEN SENSOR 1 HEATER

1. Check resistance between HO2S1 terminals as follows.

Terminal No.	Resistance
1 and 4	2.3 - 4.3 Ω at 25°C (77°F)
2 and 1, 3, 4	∞ Ω (Continuity should not exist)
3 and 1, 2, 4	

2. If NG, replace heated oxygen sensor 1.



CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

EBS00H3R

HEATED OXYGEN SENSOR 1

Refer to EM-121, "EXHAUST MANIFOLD AND THREE WAY CATALYST" .

HO2S2 HEATER

PFP:226A0

Description

EBS00H3S

SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM function	Actuator
Camshaft position sensor (PHASE)	Engine speed	Heated oxygen sensor 2 heater control	Heated oxygen sensor 2 heater
Crankshaft position sensor (POS)			

The ECM performs ON/OFF control of the heated oxygen sensor 2 heater corresponding to the engine speed.

OPERATION

Engine speed rpm	Heated oxygen sensor 2 heater
Above 3,800	OFF
Below 3,800	ON

CONSULT-II Reference Value in Data Monitor Mode

EBS00H3T

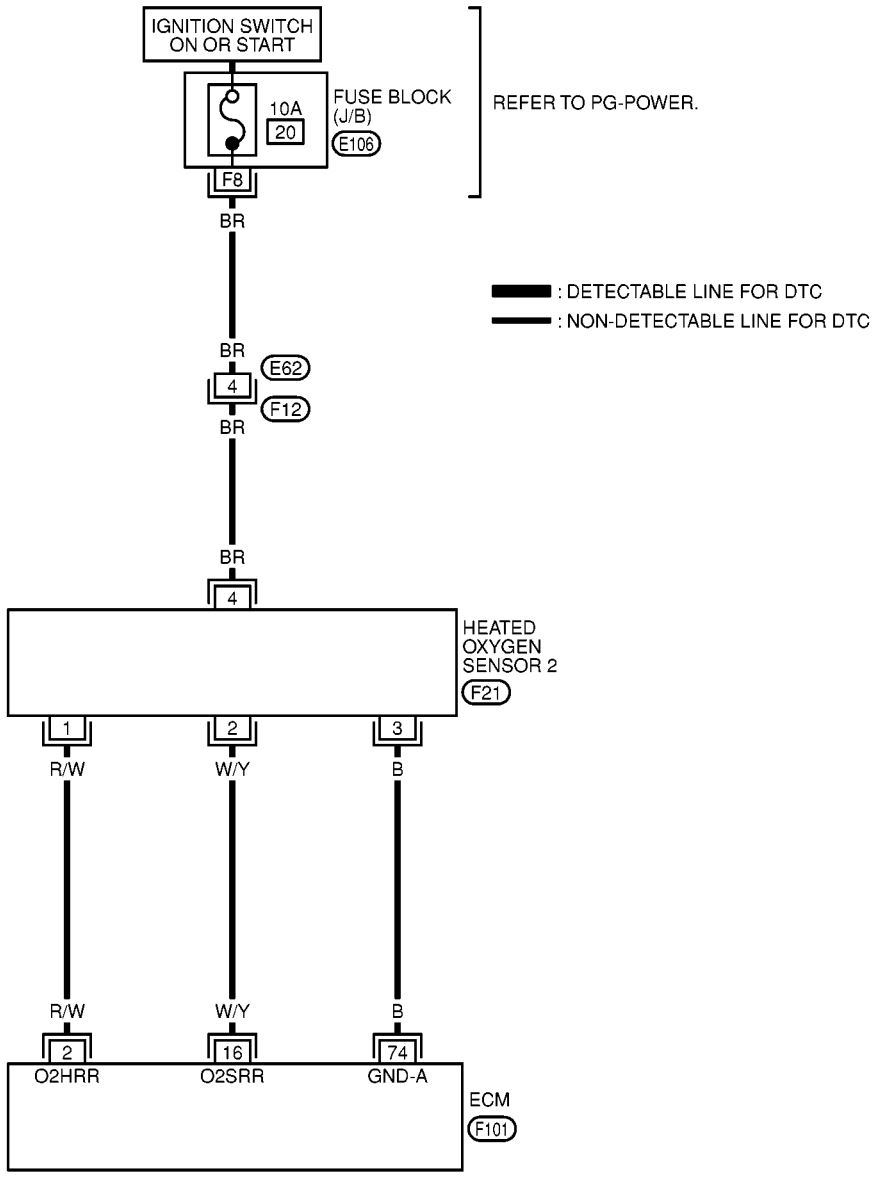
Specification data are reference values.

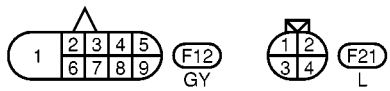
MONITOR ITEM	CONDITION	SPECIFICATION
HO2S2 HTR (B1)	● Engine speed: Below 3,800 rpm [After driving for 2 minutes at a speed of 70 km/h (43 MPH) or more]	ON
	● Engine speed: Above 3,800 rpm	OFF

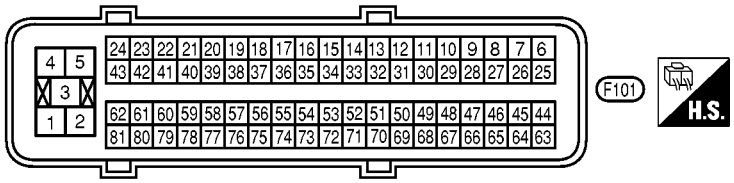
Wiring Diagram

EBS00H3U

EC-RRO2-01







REFER TO THE FOLLOWING.
E106 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0023E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
2	R/W	Heated oxygen sensor 2 heater	**[Engine is running]** ● Engine speed is below 3,800 rpm. ● After driving for 2 minutes at a speed of 70 km/h (43 MPH) or more.	0 - 1.0V
			[Ignition switch "ON"] ● Engine stopped **[Engine is running]** ● Engine speed is above 3,800 rpm.	BATTERY VOLTAGE (11 - 14V)

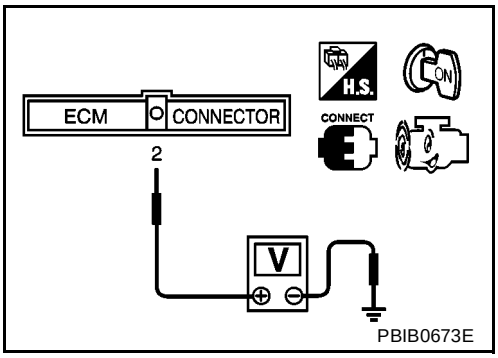
Diagnostic Procedure

EBS00H3V

1. CHECK OVERALL FUNCTION

1. Stop engine and drive the vehicle at over 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle and keep the engine running.
3. Set voltmeter proves between ECM terminal 2 (HO2S2 heater signal) and ground.
4. Check the voltage under the following conditions.

Conditions	Voltage
At idle	0 - 1V
Engine speed is above 3,600 rpm.	Battery voltage

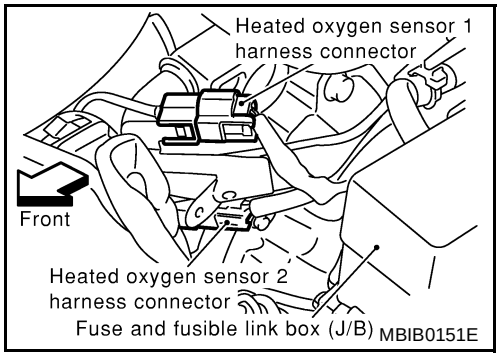


OK or NG

OK >> **INSPECTION END**
NG >> GO TO 2.

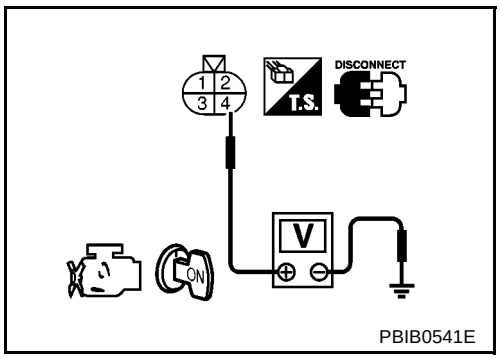
2. CHECK HO2S2 POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 2 harness connector.
3. Turn ignition switch “ON”.



4. Check voltage between HO2S2 terminal 4 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E62, F12
- Fuse block (J/B) connector E106
- 10A fuse
- Harness for open or short between heated oxygen sensor 2 and fuse

>> Repair harness or connectors.

4. CHECK HO2S2 OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 2 and HO2S2 terminal 1. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK HEATED OXYGEN SENSOR 2 HEATER

Refer to EC-1655, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace heated oxygen sensor 2.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-1498, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

EBS00H3W

HEATED OXYGEN SENSOR 2 HEATER

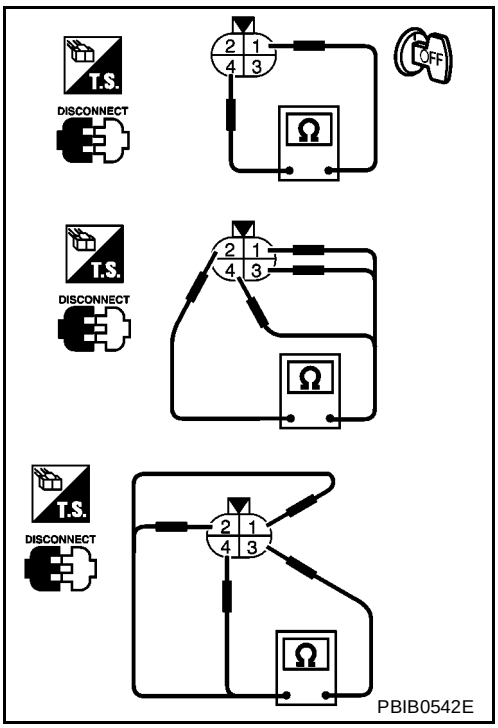
1. Check resistance between HO2S2 terminals as follows.

Terminal No.	Resistance
1 and 4	2.3 - 4.3 Ω at 25°C (77°F)
2 and 1, 3, 4	∞ Ω (Continuity should not exist)
3 and 1, 2, 4	

2. If NG, replace heated oxygen sensor 2.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**



PBIB0542E

Removal and Installation

EBS00H3X

HEATED OXYGEN SENSOR 2

Refer to EX-3, "EXHAUST SYSTEM" .

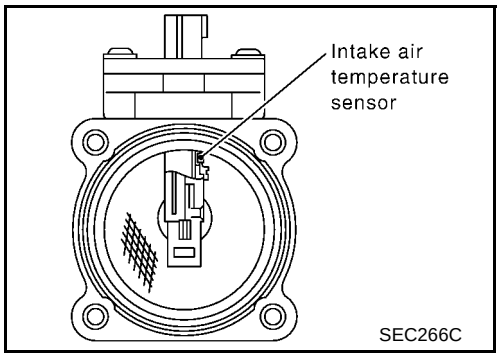
IAT SENSOR

PFP:22630

Component Description

EBS00H3Y

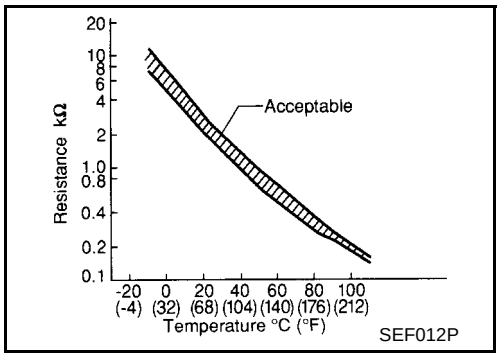
The intake air temperature sensor is built into mass air flow sensor. The sensor detects intake air temperature and transmits a signal to the ECM.
The temperature sensing unit uses a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the temperature rise.



<Reference data>

Intake air temperature °C (°F)	Voltage* V	Resistance kΩ
–10 (14)	4.43	7.9 - 9.3
25 (77)	3.32	1.9 - 2.1
80 (176)	1.23	0.31 - 0.37

*: These data are reference values and are measured between ECM terminal 34 (Intake air temperature sensor) and ground.

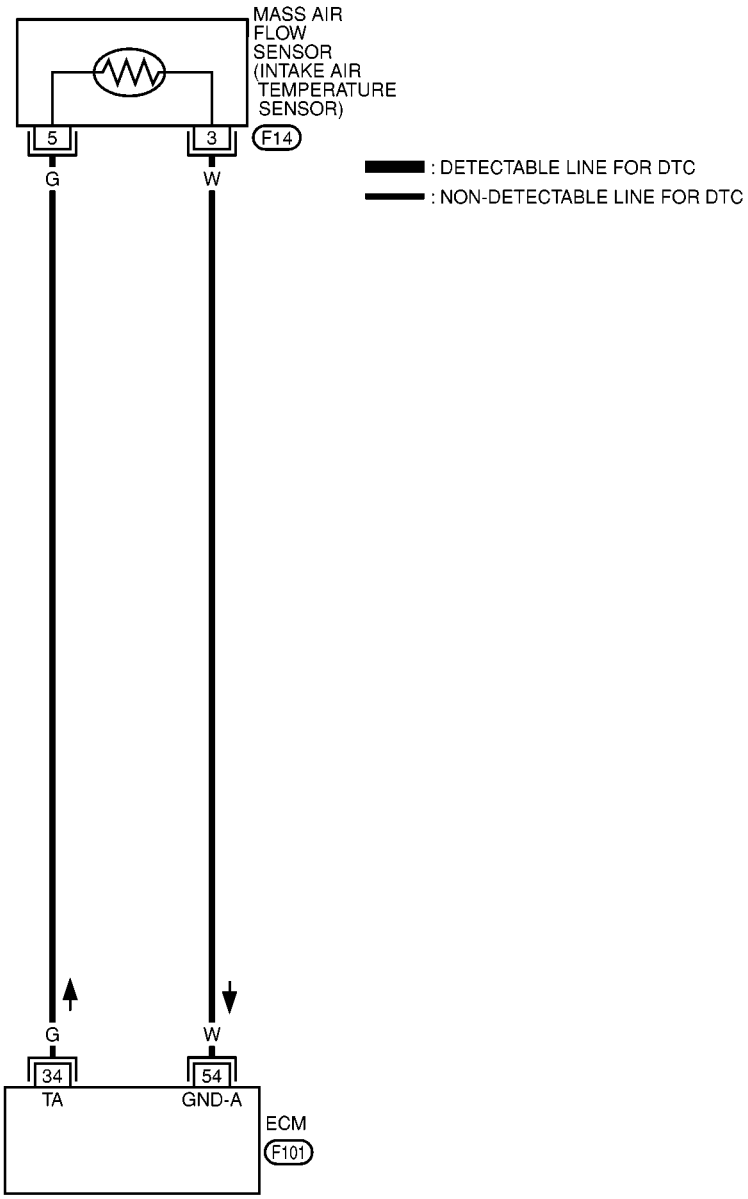


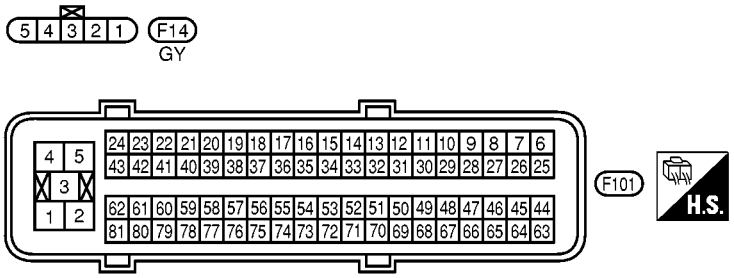
CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

Wiring Diagram

EBS00H3Z

EC-IATSEN-01





MBWA0020E

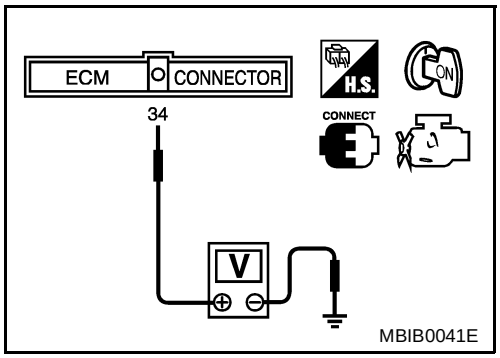
Diagnostic Procedure

EBS00H40

1. CHECK OVERALL FUNCTION

1. Turn ignition switch “ON”.
2. Check voltage between ECM terminal 34 and ground with CONSULT-II or tester.

Voltage: 0.04 - 4.84V

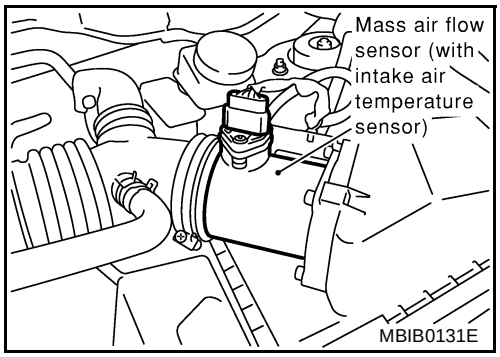


OK or NG

OK >> **INSPECTION END**
NG >> GO TO 2.

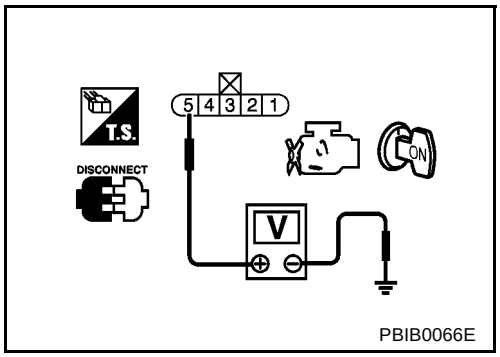
2. CHECK INTAKE AIR TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect mass air flow sensor (intake air temperature sensor is built-into) harness connector.
3. Turn ignition switch “ON”.



4. Check voltage between MAF sensor terminal 5 and ground.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 3.
NG >> Repair harness or connectors.

3. CHECK INTAKE AIR TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between MAF sensor terminal 3 and ECM terminal 54.
   Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair harness or connectors.

4. CHECK INTAKE AIR TEMPERATURE SENSOR

Refer to EC-1513, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace mass air flow sensor (with intake air temperature sensor).

5. CHECK INTERMITTENT INCIDENT

Refer to EC-1498, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

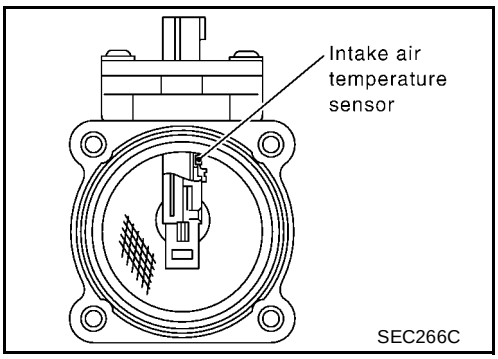
EBS00H41

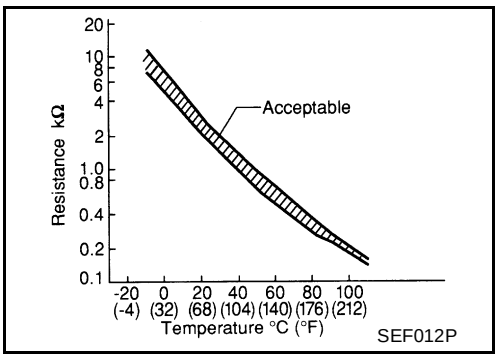
INTAKE AIR TEMPERATURE SENSOR

1. Check resistance between mass air flow sensor terminals 3 and 5 under the following conditions.

Intake air temperature °C (°F)	Resistance kΩ
25 (77)	1.9 - 2.1

2. If NG, replace mass air flow sensor (with intake air temperature sensor).





Removal and Installation

EBS00H42

MASS AIR FLOW SENSOR

Refer to EM-114, "AIR CLEANER AND AIR DUCT" .

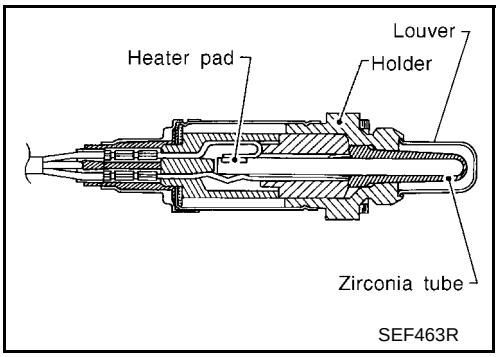
HO2S1

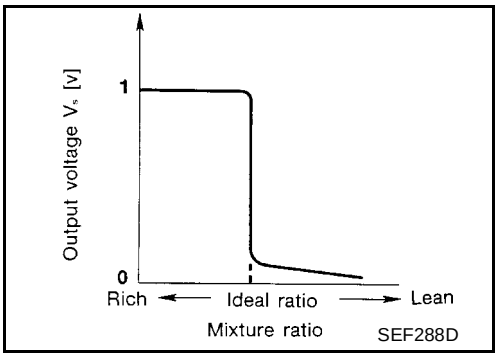
PFP:22690

Component Description

EBS00H43

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.





CONSULT-II Reference Value in Data Monitor Mode

EBS00H44

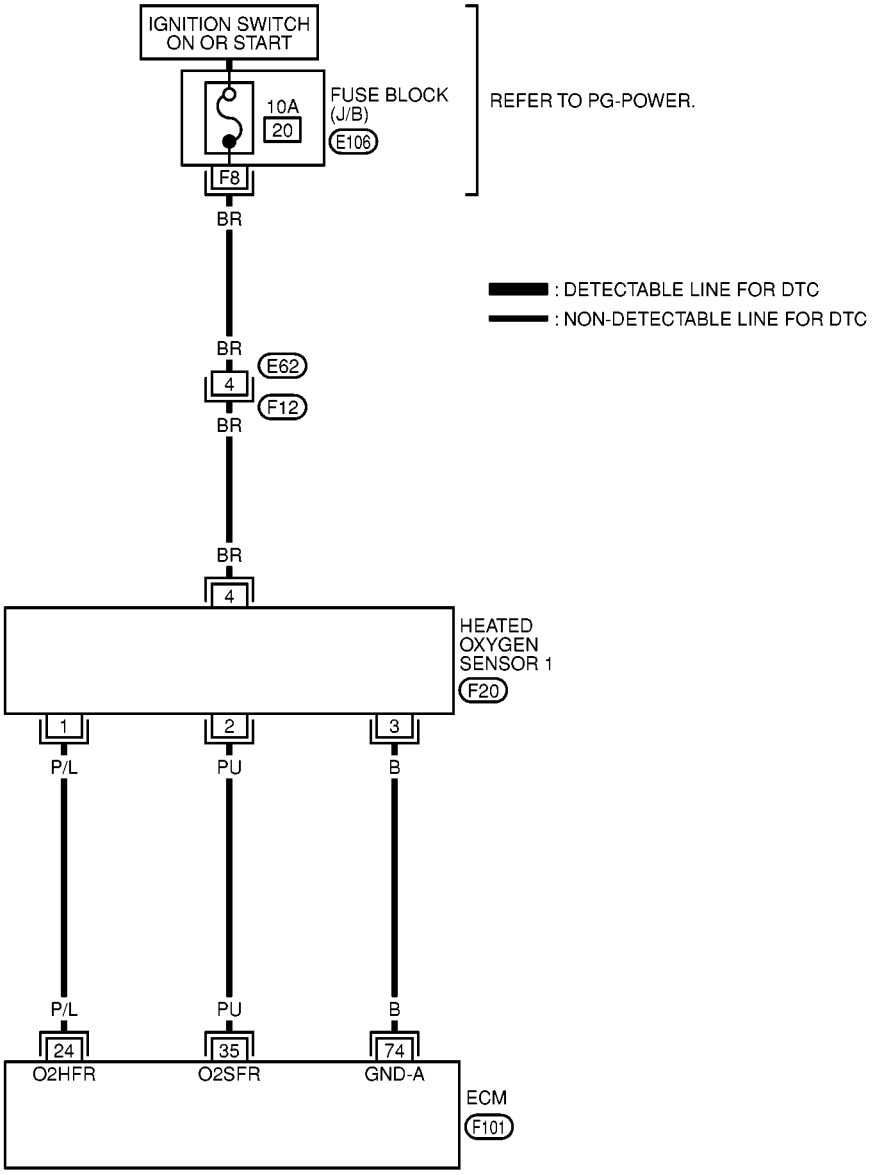
Specification data are reference values.

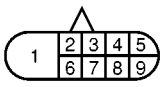
MONITOR ITEM	CONDITION		SPECIFICATION
HO2S1 (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S1 MNTR (B1)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	LEAN ←→ RICH Changes more than 5 times during 10 seconds.

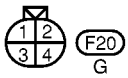
Wiring Diagram

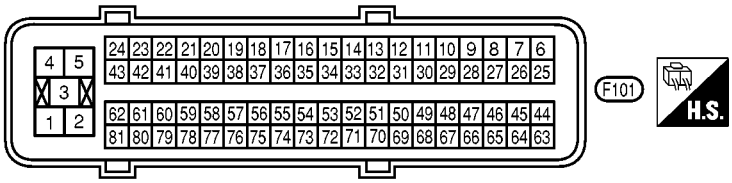
EBS00H45

EC-FRO2-01









REFER TO THE FOLLOWING.
E106 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0021E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
35	PU	Heated oxygen sensor 1	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V (Periodically change)
74	B	Sensors' ground	**[Engine is running]** ● Idle speed	Approximately 0V

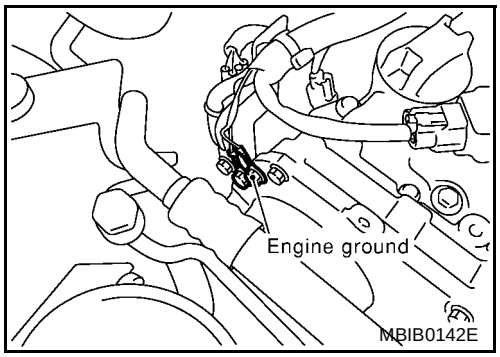
Diagnostic Procedure

EBS00H46

1. INSPECTION START

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

>> GO TO 2.



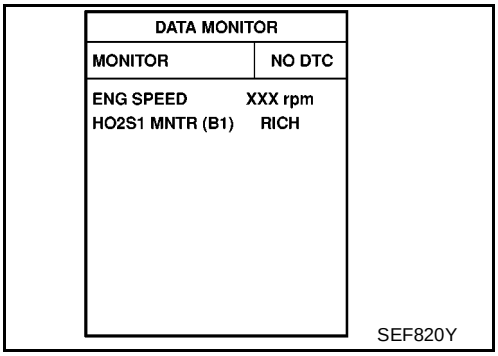
2. CHECK OVERALL FUNCTION

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select “HO2S1 MNTR (B1)” in “DATA MONITOR” mode with CONSULT-II.
3. Keep the engine speed at 2,000 rpm under no load, and make sure that the monitors fluctuates between LEAN and RICH more than five times in 10 seconds.

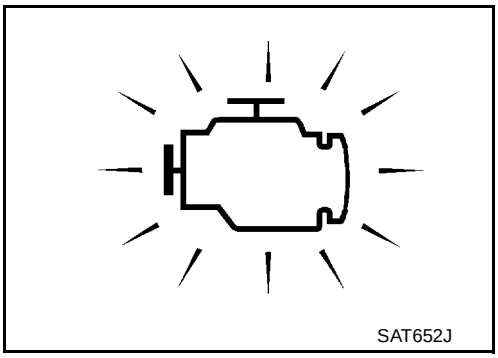
   1 time: RICH → LEAN → RICH

   2 times: RICH → LEAN → RICH → LEAN →RICH



Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Stop engine and wait at least 10 seconds.
3. Set ECM in “Diagnostic test mode - II (Heated oxygen sensor 1 monitor)”.
   Refer to EC-1449, "HOW TO SWITCH DIAGNOSTIC TEST MODE" .
4. Keep the engine speed at 2,000 rpm under no load, and make sure that the MI comes ON more than five times in 10 seconds.



OK or NG

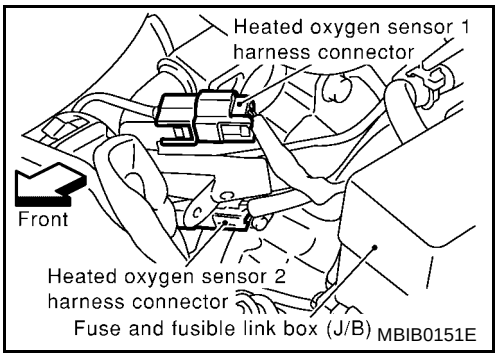
OK >> **INSPECTION END**
NG >> GO TO 3.

3. CHECK HO2S1 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 1 harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminal 74 and HO2S1 terminal 3.
   Refer to Wiring Diagram.

   Continuity should exist.

5. Also check harness for short to ground and short to power.



OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK HO2S1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 35 and HO2S1 terminal 2.
   Refer to Wiring Diagram.

   Continuity should exist.

2. Check harness continuity between ECM terminal 35 or HO2S1 terminal 2 and ground.
   Refer to Wiring Diagram.

   Continuity should not exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK HEATED OXYGEN SENSOR 1

Refer to EC-1664, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace heated oxygen sensor 1.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-1498, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

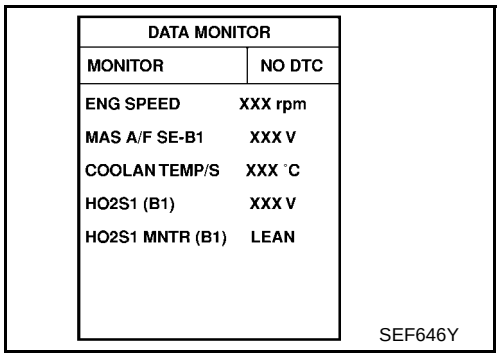
Component Inspection

EBS00H47

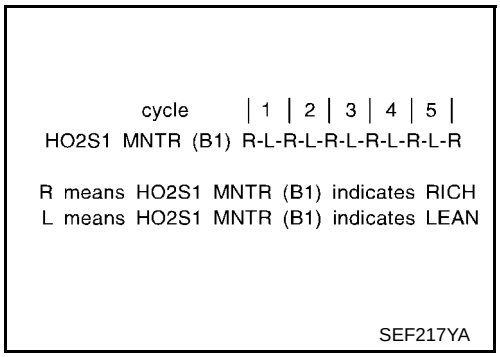
HEATED OXYGEN SENSOR 1

With CONSULT-II

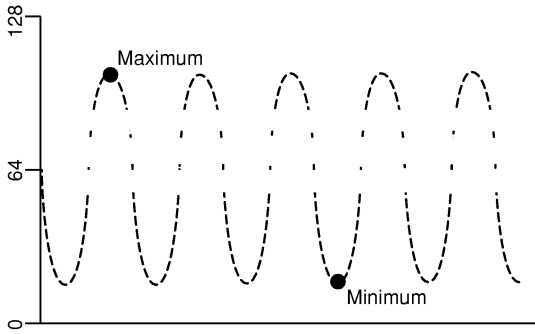
1. Start engine and warm it up to normal operating temperature.
2. Select “MANU TRIG” and adjust “TRIGGER POINT” to 100% in “DATA MONITOR” mode with CONSULT-II.
3. Select “HO2S1 (B1)” and “HO2S1 MNTR (B1)”.
4. Hold engine speed at 2,000 rpm under no load during the following steps.
5. Touch “RECORD” on CONSULT-II screen.



6. Check the following.
   - “HO2S1 MNTR (B1)” in “DATA MONITOR” mode changes from “RICH” to “LEAN” to “RICH” 5 times in 10 seconds.
     5 times (cycles) are counted as shown at right.
   - “HO2S1 (B1)” voltage goes above 0.6V at least once.
   - “HO2S1 (B1)” voltage goes below 0.3V at least once.
   - “HO2S1 (B1)” voltage never exceeds 1.0V.



Trigger	ENG SPEED	HO2S1 (B1)
	rpm	V
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX
XXX	XXX	XXX



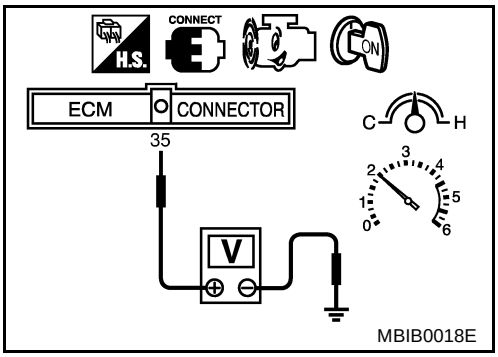
CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 35 [HO2S1 (B1) signal] and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no load.
   - The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds.
   - The maximum voltage is over 0.6V at least one time.
   - The minimum voltage is below 0.3V at least one time.
   - The voltage never exceeds 1.0V.

   1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V
   2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V



CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

EBS00H48

HEATED OXYGEN SENSOR 1

Refer to EM-121, "EXHAUST MANIFOLD AND THREE WAY CATALYST" .

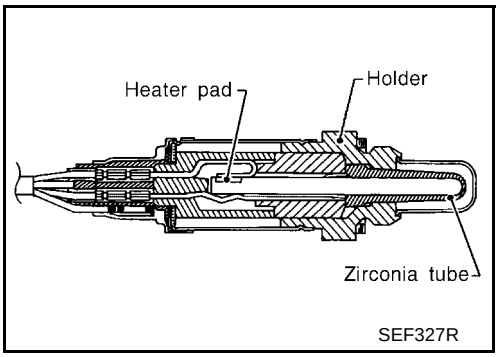
HO2S2

PFP:226A0

Component Description

EBS00H49

The heated oxygen sensor 2, after three way catalyst (manifold), monitors the oxygen level in the exhaust gas on each bank.
Even if switching characteristics of the heated oxygen sensor 1 are shifted, the air fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.
This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.
Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.



CONSULT-II Reference Value in Data Monitor Mode

EBS00H4A

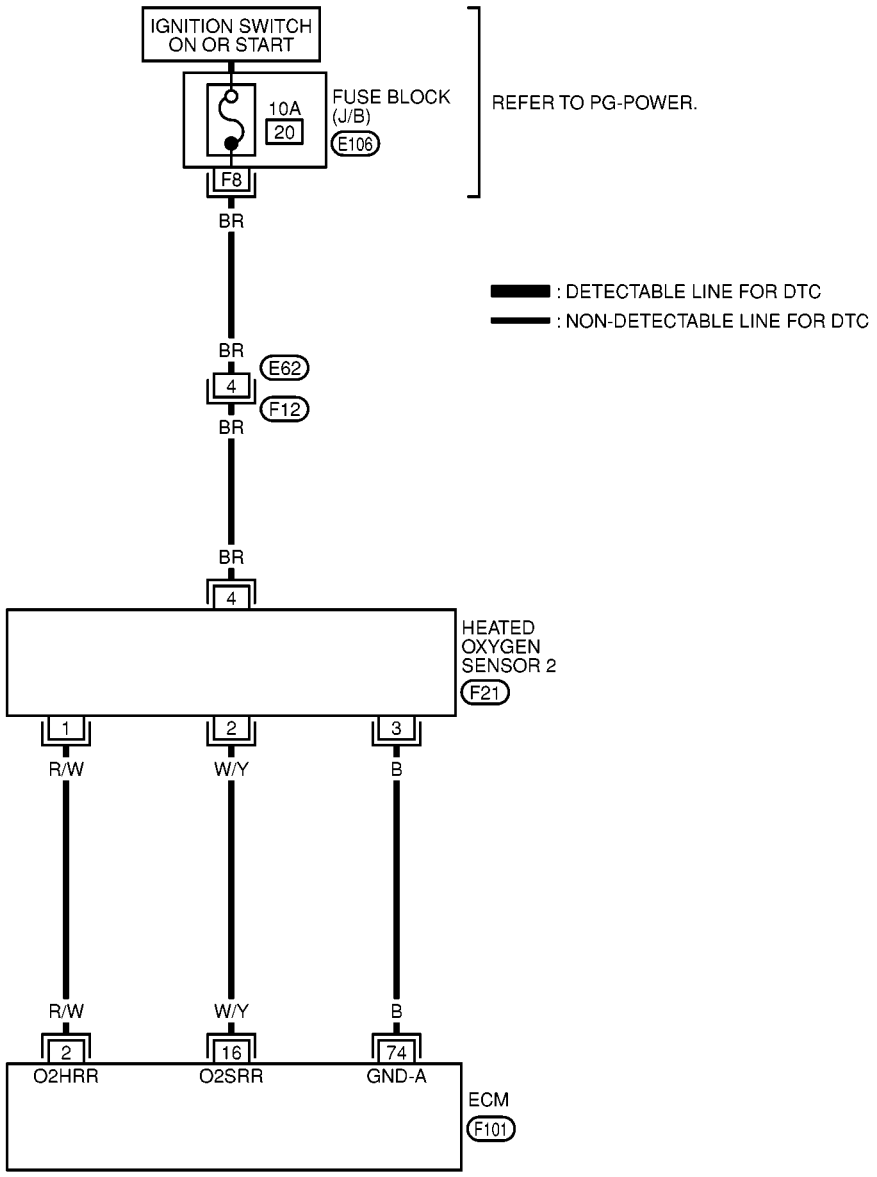
Specification data are reference values.

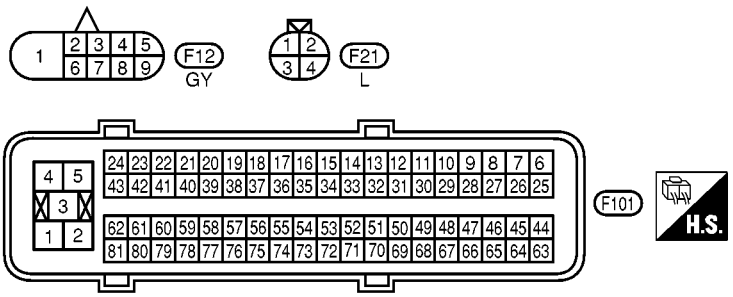
MONITOR ITEM	CONDITION		SPECIFICATION
HO2S2 (B1)	● Engine: After warming up	Revving engine from idle to 3,000 rpm quickly.	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S2 MNTR (B1)	● Engine: After warming up	Revving engine from idle to 3,000 rpm quickly.	LEAN ←→ RICH

Wiring Diagram

EBS00H4B

EC-RRO2-01





REFER TO THE FOLLOWING.
E106 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0023E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
16	W/Y	Heated oxygen sensor 2	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V
74	B	Sensors' ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V

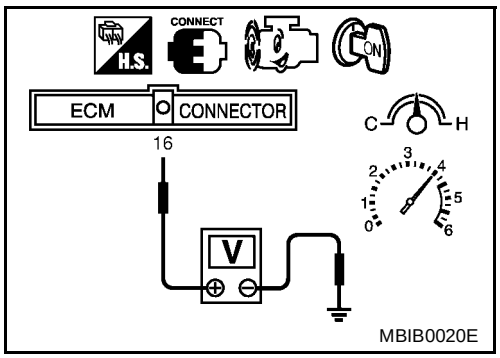
Diagnostic Procedure

EBS00H4C

1. CHECK OVERALL FUNCTION-I

1. Start engine and drive the vehicle at over 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle and keep the engine running.
3. Set voltmeter probes between ECM terminal 16 (HO2S2 signal) and ground.
4. Check the voltage while revving up to 4,000 rpm under no load at least 10 times. (Depress and release the accelerator pedal as quickly as possible.)

The voltage does not remain in the range of 0.2 -0.4V



OK or NG

OK >> **INSPECTION END**
NG >> GO TO 2.

2. CHECK OVERALL FUNCTION-II

Keep engine at idle for 10 minutes, then check the voltage between ECM terminal 16 and ground, or check voltage when coasting 80 km/h (50 MPH) in 3rd gear (M/T) or “D” position (CVT).

The voltage does not remain in the range of 0.2 -0.4V

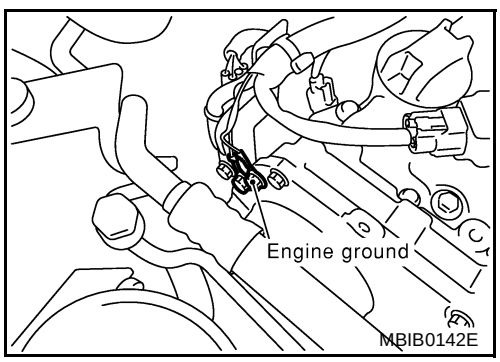
OK or NG

OK >> **INSPECTION END**
NG >> GO TO 3.

3. RETIGHTEN GROUND SCREWS

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

>> GO TO 4.



4. CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

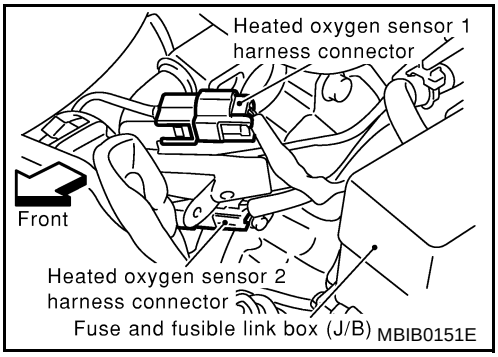
1. Turn ignition switch “OFF”.
2. Disconnect heated oxygen sensor 2 harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminal 74 and HO2S2 terminal 3.
   Refer to Wiring Diagram.

   Continuity should exist.

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.



5. CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 16 and HO2S2 terminal 2.
   Refer to Wiring Diagram.

   Continuity should exist.

2. Check harness continuity between ECM terminal 16 or HO2S2 terminal 2 and ground.
   Refer to Wiring Diagram.

   Continuity should not exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 6.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK HEATED OXYGEN SENSOR 2

Refer to EC-1669, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace heated oxygen sensor 2.

7. CHECK INTERMITTENT INCIDENT

Refer to EC-1498, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

EBS00H4D

HEATED OXYGEN SENSOR 2

With CONSULT-II

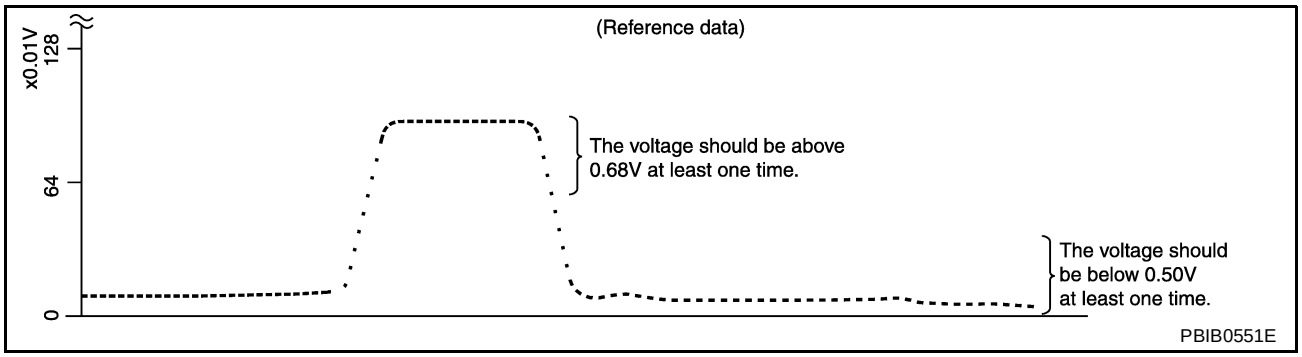
1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.

3. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)” as the monitor item with CONSULT-II.

ACTIVE TEST	
FUEL INJECTION	25 %
MONITOR	
ENG SPEED	XXX rpm
HO2S1 (B1)	XXX V
HO2S2 (B1)	XXX V
HO2S1 MNTR (B1)	RICH
HO2S2 MNTR (B1)	RICH

SEF662Y

4. Check “HO2S2 (B1)” at idle speed when adjusting “FUEL INJECTION” to ±25%.



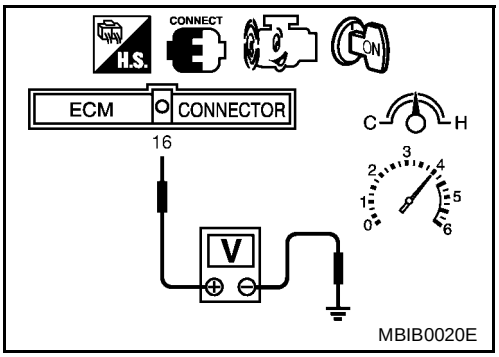
“HO2S2 (B1)” should be above 0.68V at least once when the “FUEL INJECTION” is +25%.
“HO2S2 (B1)” should be below 0.50V at least once when the “FUEL INJECTION” is –25%.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Without CONSULT-II

1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Set voltmeter probes between ECM terminal 16 [HO2S2 (B1) signal] and engine ground.
4. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be above 0.68V at least once during this procedure.
   If the voltage is above 0.68V at step 4, step 5 is not necessary.
5. Keep vehicle idling for 10 minutes, then check voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in “D” position (CVT), 3rd gear position (M/T).
   The voltage should be below 0.50V at least once during this procedure.
6. If NG, replace heated oxygen sensor 2.



CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

Removal and Installation

EBS00H4E

HEATED OXYGEN SENSOR 2

Refer to EX-3, "EXHAUST SYSTEM" .

IGNITION SIGNAL

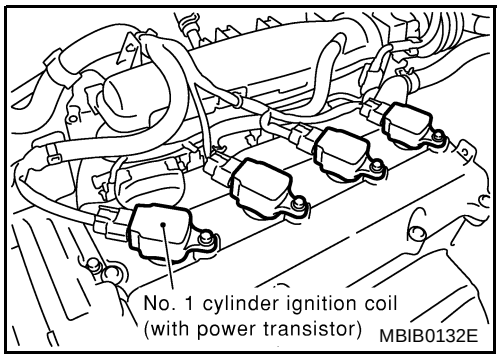
PFP:22448

Component Description

EBS00H4F

IGNITION COIL & POWER TRANSISTOR

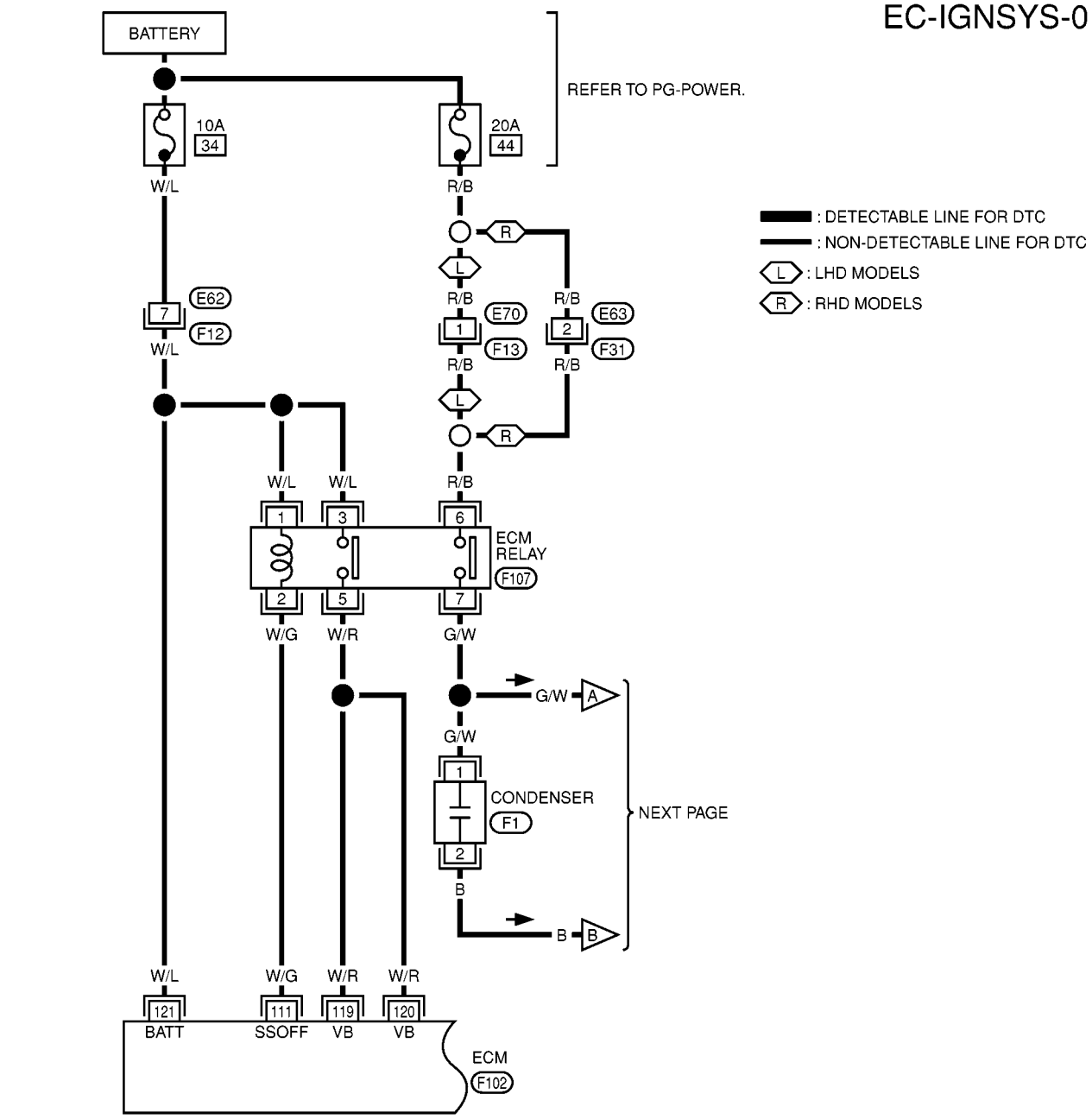
The ignition signal from the ECM is sent to and amplified by the power transistor. The power transistor turns on and off the ignition coil primary circuit. This on-off operation induces the proper high voltage in the coil secondary circuit.

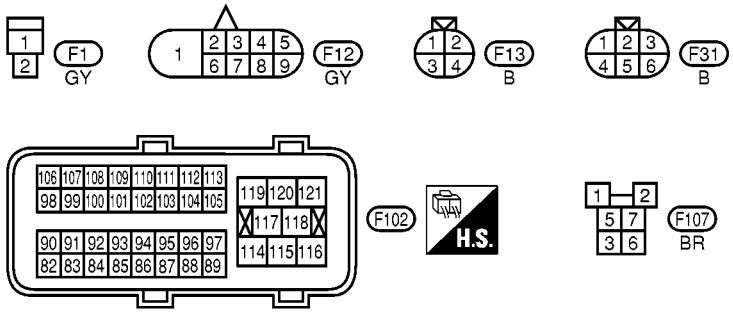


Wiring Diagram

EBS00H4G

EC-IGNSYS-01





MBWA0029E

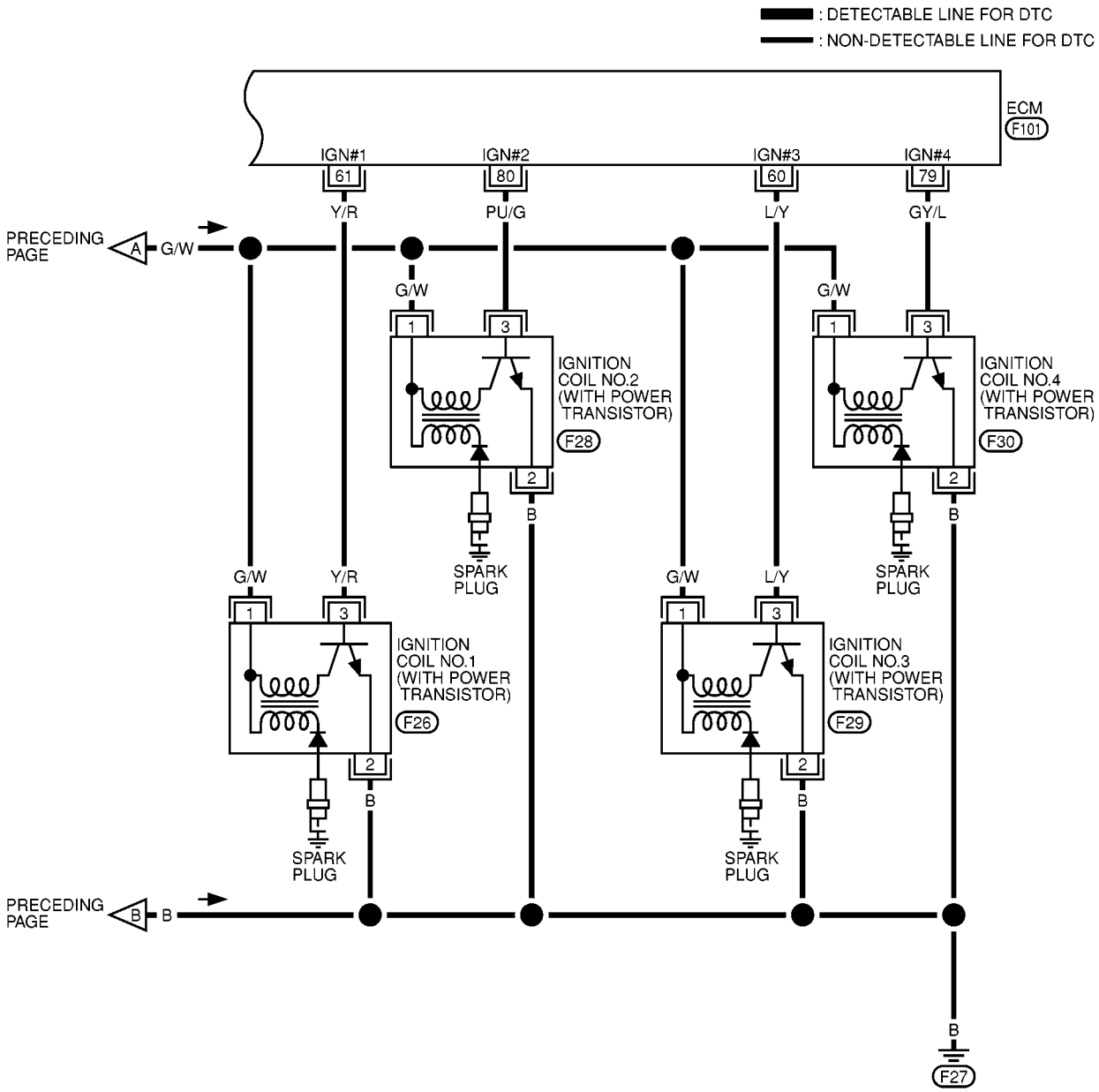
Specification data are reference values and are measured between each terminal and ground.

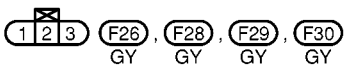
CAUTION:

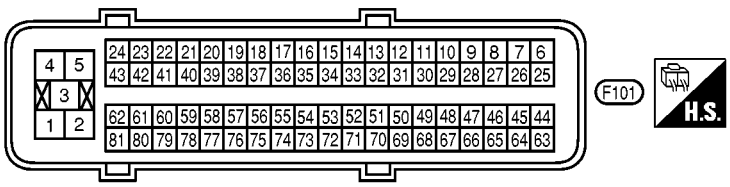
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
111	W/G	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch "OFF"]** ● For a few seconds after turning ignition switch "OFF"	0 - 1.0V
			[Ignition switch "OFF"] ● More than a few seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
119 120	W/R W/R	Power supply for ECM	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)
121	W/L	Power supply for ECM (Buck-up)	**[Ignition switch "OFF"]**	BATTERY VOLTAGE (11 - 14V)

EC-IGNSYS-02





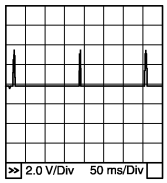
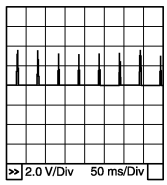


MBWA0030E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
60 61 79 80	L/Y Y/R GY/L PU/G	Ignition signal No. 3 Ignition signal No. 1 Ignition signal No. 4 Ignition signal No. 2	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0 - 0.1V★  PBIB0521E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - 0.2V★  PBIB0522E

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnostic Procedure

EBS00H4H

1. CHECK ENGINE START

Turn ignition switch “OFF”, and restart engine.

Is engine running?

Yes or No

Yes (With CONSULT-II)>>GO TO 2.
Yes (Without CONSULT-II)>>GO TO 3.
No >> GO TO 4.

2. CHECK OVERALL FUNCTION

With CONSULT-II

1. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT-II.
2. Make sure that each circuit produces a momentary engine speed drop.

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 12.

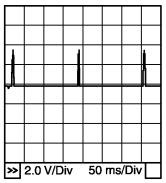
ACTIVE TEST	
POWER BALANCE	
MONITOR	
ENG SPEED	XXX rpm
MAS A/F SE-B1	XXX V

PBIB0133E

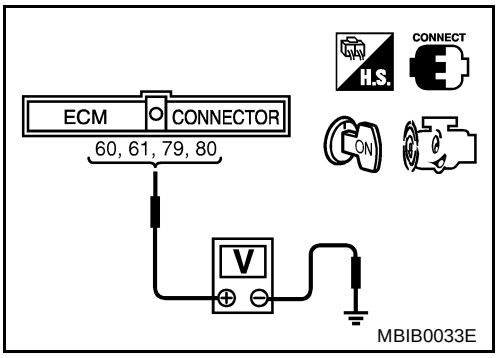
3. CHECK OVERALL FUNCTION

Without CONSULT-II

1. Let engine idle.
2. Read the voltage signal between ECM terminals 60, 61, 79, 80 and ground with an oscilloscope.
3. Verify that the oscilloscope screen shows the signal wave as shown below.



PBIB0521E



MBIB0033E

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 12.

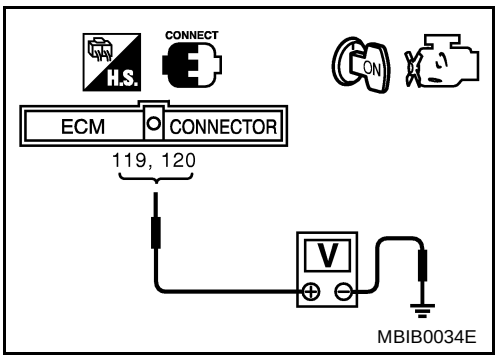
4. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-I

1. Turn ignition switch “ON”.
2. Check voltage between ECM terminals 119, 120 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 5.
NG >> Go to EC-1499, "POWER SUPPLY CIRCUIT FOR ECM" .



MBIB0034E

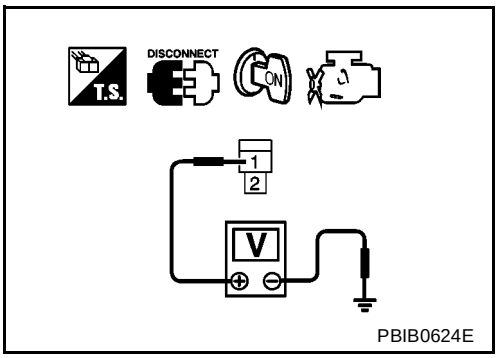
5. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-II

1. Turn ignition switch “OFF”.
2. Disconnect condenser harness connector.
3. Turn ignition switch “ON”.
4. Check voltage between condenser terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 10.
NG >> GO TO 6.



PBIB0624E

6. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-III

1. Turn ignition switch “OFF”.
2. Disconnect ECM relay.
3. Check harness continuity between ECM relay terminal 7 and condenser terminal 1.
   Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

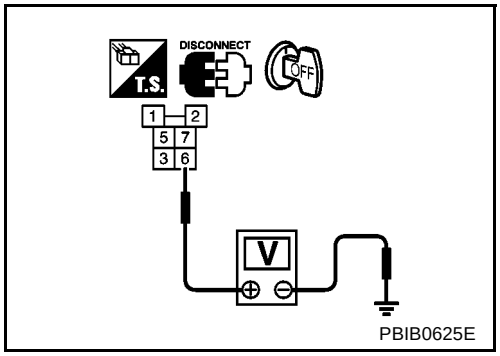
OK or NG

OK >> GO TO 7.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-IV

Check voltage between ECM relay terminal 6 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 9.
NG >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E70, F13 (LHD models)
- Harness connectors E63, F31 (RHD models)
- 20A fuse
- Harness for open or short between ECM relay and battery

>> Repair or replace harness or connectors.

9. CHECK ECM RELAY

Refer to EC-1680, "Component Inspection" .

OK or NG

OK >> GO TO 17.
NG >> Replace ECM relay.

10. CHECK CONDENSER GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect condenser harness connector.
3. Check harness continuity between condenser terminal 2 and ground.
   Refer to Wiring diagram.

Continuity should exist.

4. Also check harness for short to power.

OK or NG

OK >> GO TO 11.
NG >> Repair open circuit or short to power in harness or connector.

11. CHECK CONDENSER

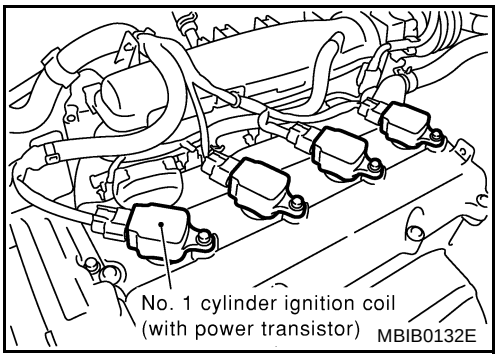
Refer to EC-1680, "Component Inspection" .

OK or NG

OK >> GO TO 12.
NG >> Replace condenser.

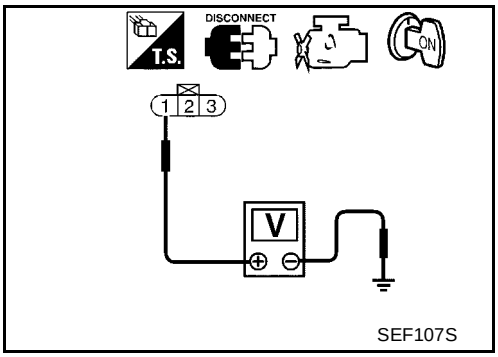
12. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-V

1. Turn ignition switch “OFF”.
2. Reconnect all harness connectors disconnected.
3. Disconnect ignition coil harness connector.
4. Turn ignition switch “ON”.



5. Check voltage between ignition coil terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 14.
NG >> GO TO 13.

13. DETECT MALFUNCTIONING PART

Check harness for open or short between ignition coil and ECM relay.

>> Repair or replace harness or connectors.

14. CHECK IGNITION COIL GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between ignition coil terminal 2 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 15.
NG >> Repair open circuit or short to power in harness or connectors.

15. CHECK IGNITION COIL OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminals 60, 61, 79, 80 and ignition coil terminal 3. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 16.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

16. CHECK IGNITION COIL WITH POWER TRANSISTOR

Refer to EC-1680, "Component Inspection" .

OK or NG

OK >> GO TO 17.
NG >> Replace ignition coil with power transistor.

17. CHECK INTERMITTENT INCIDENT

Refer to EC-1498, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

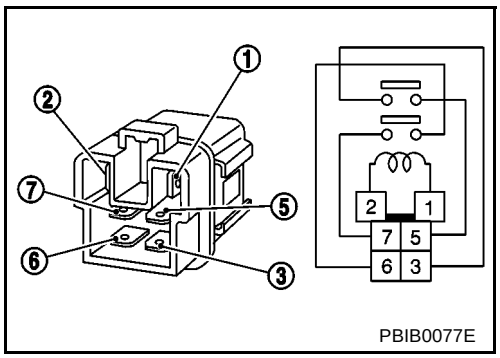
EBS00H4I

ECM RELAY

1. Apply 12V direct current between ECM relay terminals 1 and 2.
2. Check continuity between relay terminals 3 and 5, 6 and 7.

Condition	Continuity
12V direct current supply between terminals 1 and 2	Yes
OFF	No

3. If NG, replace ECM relay.

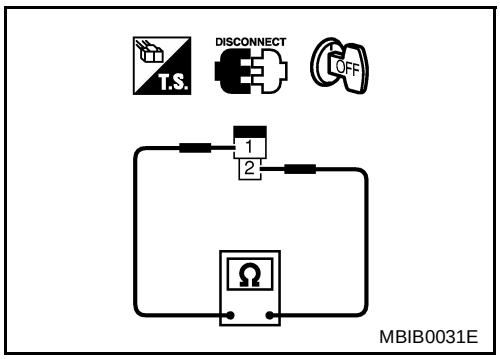


PBIB0077E

CONDENSER

1. Turn ignition switch “OFF”.
2. Disconnect condenser harness connector.
3. Check resistance between condenser terminals 1 and 2.

Resistance: Above 1 MΩ at 25°C (77°F)



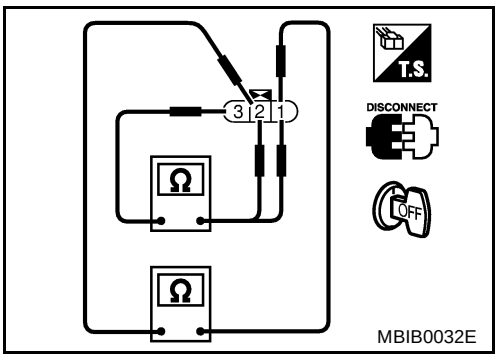
MBIB0031E

IGNITION COIL WITH POWER TRANSISTOR

1. Turn ignition switch “OFF”.
2. Disconnect ignition coil harness connector.

3. Check resistance between ignition coil terminals as follows.

Terminal No.	Resistance Ω [at 25°C (77°F)]
2 and 3	Except 0 or ∞
1 and 2	Except 0
1 and 3	



EBS00H4J

Removal and Installation

IGNITION COIL WITH POWER TRANSISTOR

Refer to EM-126, "IGNITION COIL" .

EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

PFP:14920

Description

EBS00H4K

SYSTEM DESCRIPTION

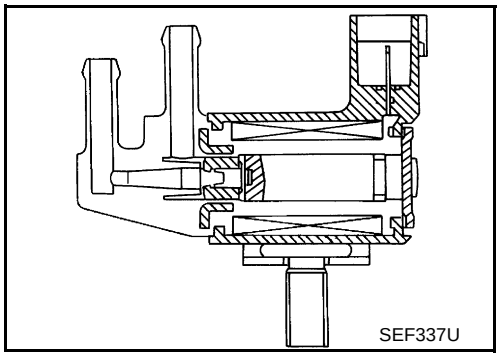
Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*1	EVAP canister purge flow control	EVAP canister purge volume control solenoid valve
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Battery	Battery voltage*1		
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Closed throttle position		
Heated oxygen sensors 1	Density of oxygen in exhaust gas (Mixture ratio feedback signal)		
Vehicle speed signal*2	Vehicle speed		

*1: ECM determines the start signal status by the signals of engine speed and battery voltage.
*2: This signal is sent to the ECM through CAN communication line.

This system controls flow rate of fuel vapor from the EVAP canister. The opening of the vapor by-pass passage in the EVAP canister purge volume control solenoid valve changes to control the flow rate. The EVAP canister purge volume control solenoid valve repeats ON/OFF operation according to the signal sent from the ECM. The opening of the valve varies for optimum engine control. The optimum value stored in the ECM is determined by considering various engine conditions. When the engine is operating, the flow rate of fuel vapor from the EVAP canister is regulated as the air flow changes.

COMPONENT DESCRIPTION

The EVAP canister purge volume control solenoid valve uses a ON/OFF duty to control the flow rate of fuel vapor from the EVAP canister. The EVAP canister purge volume control solenoid valve is moved by ON/OFF pulses from the ECM. The longer the ON pulse, the greater the amount of fuel vapor that will flow through the valve.



CONSULT-II Reference Value in Data Monitor Mode

EBS00H4L

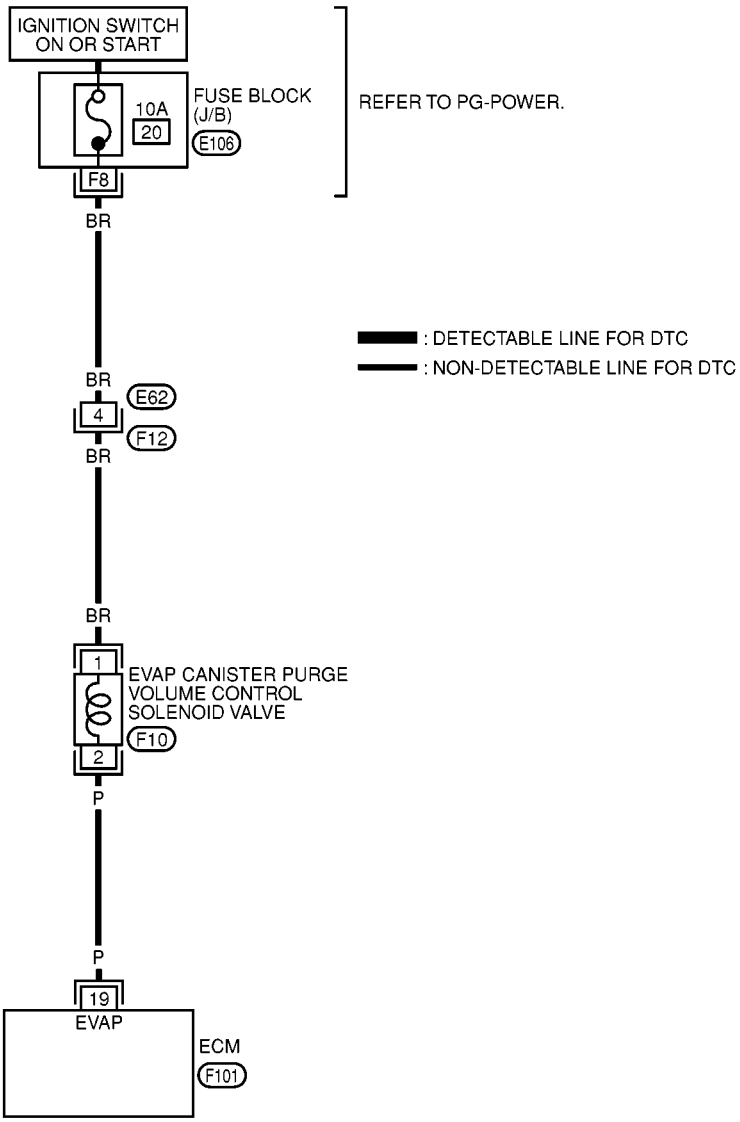
Specification data are reference values.

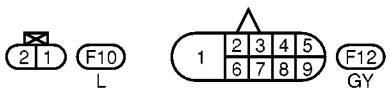
MONITOR ITEM	CONDITION		SPECIFICATION
PURG VOL C/V	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	0%
		2,000 rpm	20 - 30%

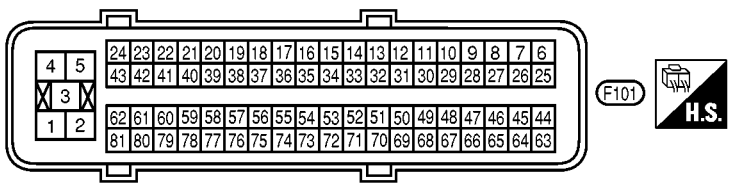
Wiring Diagram

EBS00H4M

EC-PRGVLV-01







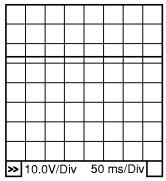
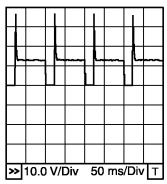
REFER TO THE FOLLOWING.
E106 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0025E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
19	P	EVAP canister purge volume control solenoid valve	**[Engine is running]** ● Idle speed	BATTERY VOLTAGE (11 - 14V)★  PBIB0050E
			[Engine is running] ● Engine speed is about 2,000 rpm (More than 100 seconds after starting engine)	Approximately 10V★  PBIB0520E

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnostic Procedure

EBS00H4N

1. CHECK OVERALL FUNCTION

With CONSULT-II

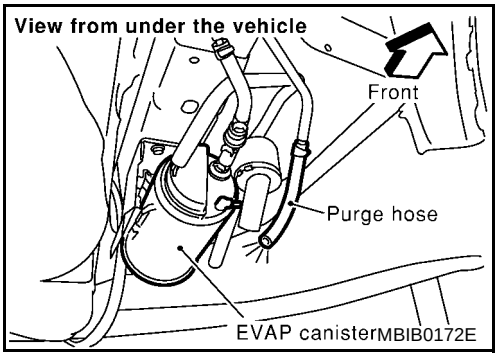
1. Turn ignition switch “OFF”.
2. Disconnect the EVAP purge hose connected to the EVAP canister.
3. Turn ignition switch “ON”, and select “PURG VOL CONT/V” in “ACTIVE TEST” mode with CONSULT-II.
4. Start engine and let it idle.

ACTIVE TEST	
PURG VOL CONT/V	XXX %
MONITOR	
ENG SPEED	XXX rpm
A/F ALPHA-B1	XXX %
HO2S1 MNTR (B1)	LEAN

PBIB0569E

5. Change the valve opening percentage with touching “Qu” or “Qd” on CONSULT-II screen, and check for vacuum existence at the EVAP purge hose under the following conditions.

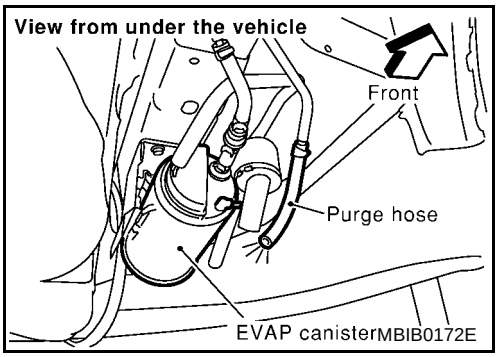
Conditions	Vacuum
At idle	Should not exist.
Engine speed is about 2,000 rpm.	Should exist.



Without CONSULT-II

1. Turn ignition switch “OFF”.
2. Disconnect the EVAP purge hose connected to the EVAP canister.
3. Start engine and let it idle for at least 80 seconds.
4. Check for vacuum existence at the EVAP purge hose under the following conditions.

Conditions	Vacuum
At idle	Should not exist.
Engine speed is about 2,000 rpm.	Should exist.



OK or NG

OK >> GO TO 2.
NG >> GO TO 3.

2. CHECK EVAP CANISTER

Refer to EC-1688, "Component Inspection" .

OK or NG

OK >> **INSPECTION END**
NG >> Replace EVAP canister.

3. CHECK EVAP PURGE LINE

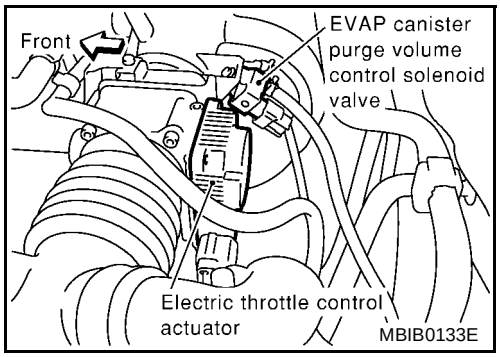
Check EVAP purge line (pipe, rubber tube, fuel tank and EVAP canister) for cracks or improper connection. Refer to EC-1724, "EVAPORATIVE EMISSION LINE DRAWING" .

OK or NG

OK >> GO TO 4.
NG >> Repair or reconnect the hose.

4. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect EVAP canister purge volume control solenoid valve harness connector.
3. Turn ignition switch “ON”.

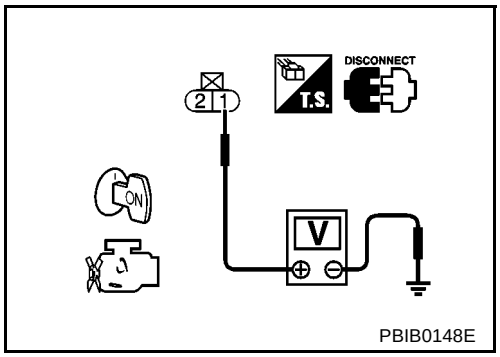


4. Check voltage between EVAP canister purge volume control solenoid valve terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.



5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E62, F12
- Harness for open or short between EVAP canister purge volume control solenoid valve and ECM

>> Repair harness or connectors.

6. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 19 and EVAP canister purge volume control solenoid valve terminal 2. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK (With CONSULT-II)>>GO TO 7.
OK (Without CONSULT-II)>>GO TO 8.
NG >> Repair open circuit or short to ground and short to power in harness or connectors.

7. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

With CONSULT-II

1. Reconnect all harness connectors disconnected.
2. Start engine.
3. Perform “PURG VOL CONT/V” in “ACTIVE TEST” mode with CONSULT-II. Check that engine speed varies according to the valve opening.

OK or NG

OK >> GO TO 9.
NG >> GO TO 8.

ACTIVE TEST	
PURG VOL CONT/V	XXX %
MONITOR	
ENG SPEED	XXX rpm
A/F ALPHA-B1	XXX %
HO2S1 MNTR (B1)	LEAN

PBIB0569E

8. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-1688, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> Replace EVAP canister purge volume control solenoid valve.

9. CHECK INTERMITTENT INCIDENT

Refer to EC-1498, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

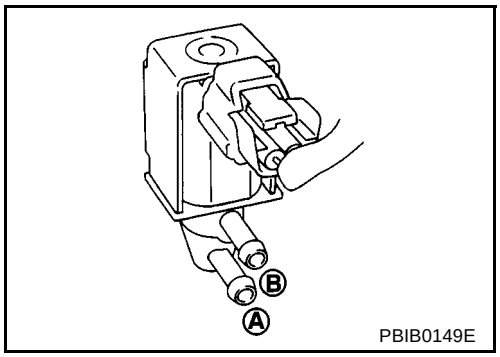
EBS00H4O

EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT-II

Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

Condition (PURG VOL CONT/V value)	Air passage continuity between A and B
100.0%	Yes
0.0%	No

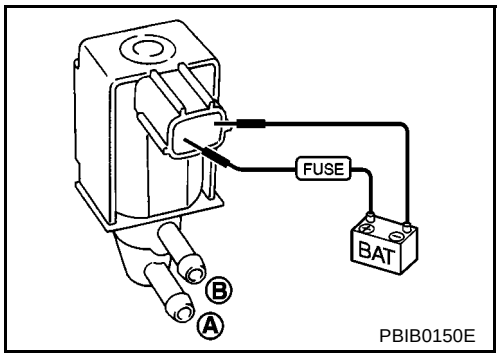


PBIB0149E

Without CONSULT-II

Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

Condition	Air passage continuity between A and B
12V direct current supply between terminals 1 and 2	Yes
No supply	No



PBIB0150E

Removal and Installation

EBS00H4P

EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EM-116, "INTAKE MANIFOLD" .

IVT CONTROL SOLENOID VALVE

PFP:23796

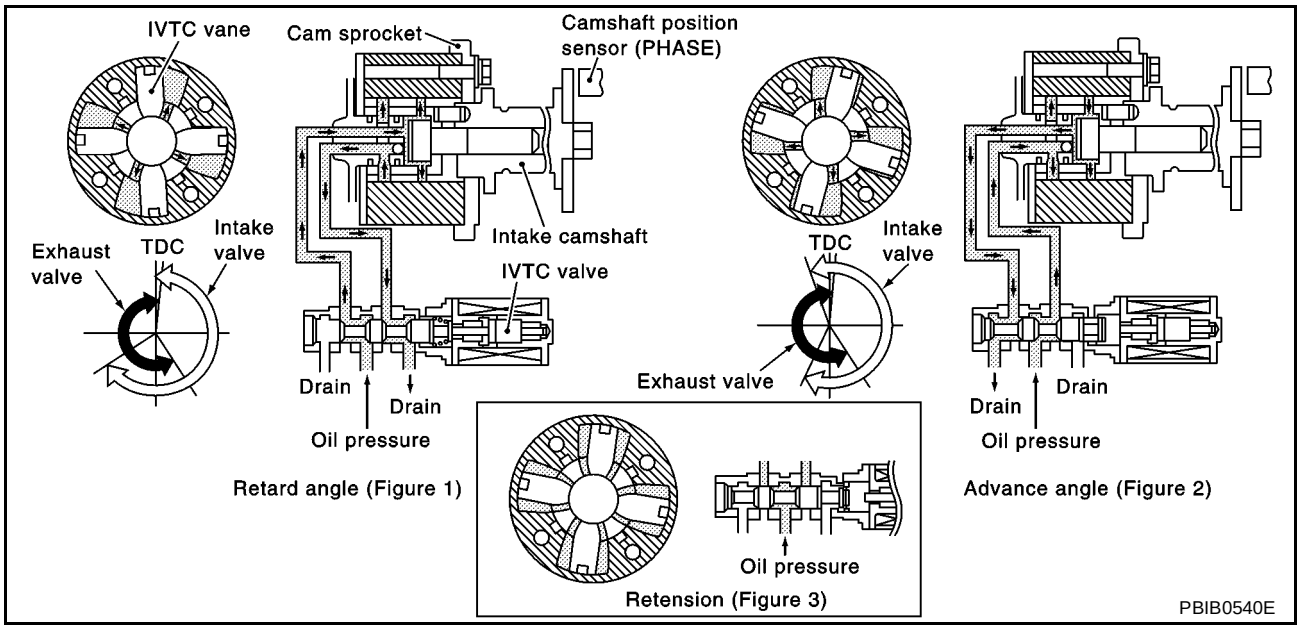
Description

EBS00H9N

SYSTEM DESCRIPTION

Sensor	Input signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed	Intake valve timing control	Intake valve timing control solenoid valve
Camshaft position sensor (PHASE)			
Engine coolant temperature sensor	Engine coolant temperature		
Vehicle speed signal*	Vehicle speed		

*: This signal is sent to the ECM through CAN communication line.



This mechanism hydraulically controls cam phases continuously with the fixed operating angle of the intake valve.

The ECM receives signals such as crankshaft position, camshaft position, engine speed, and engine coolant temperature. Then, the ECM sends ON/OFF pulse duty signals to the intake valve timing control solenoid valve depending on driving status. This makes it possible to control the shut/open timing of the intake valve to increase engine torque in low/mid speed range and output in high-speed range.

COMPONENT DESCRIPTION

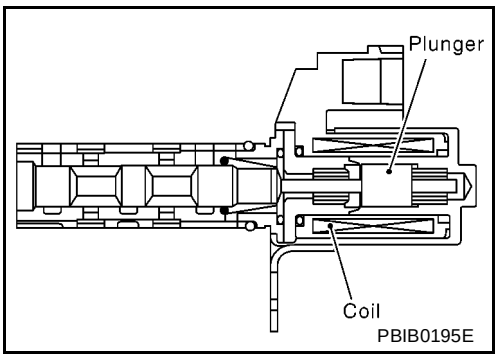
Intake valve timing control solenoid valve is activated by ON/OFF pulse duty (ratio) signals from the ECM.

The intake valve timing control solenoid valve changes the oil amount and direction of flow through intake valve timing control unit or stops oil flow.

The longer pulse width advances valve angle.

The shorter pulse width retards valve angle.

When ON and OFF pulse widths become equal, the solenoid valve stops oil pressure flow to fix the intake valve angle at the control position.



CONSULT-II Reference Value in Data Monitor Mode

EBS00H4R

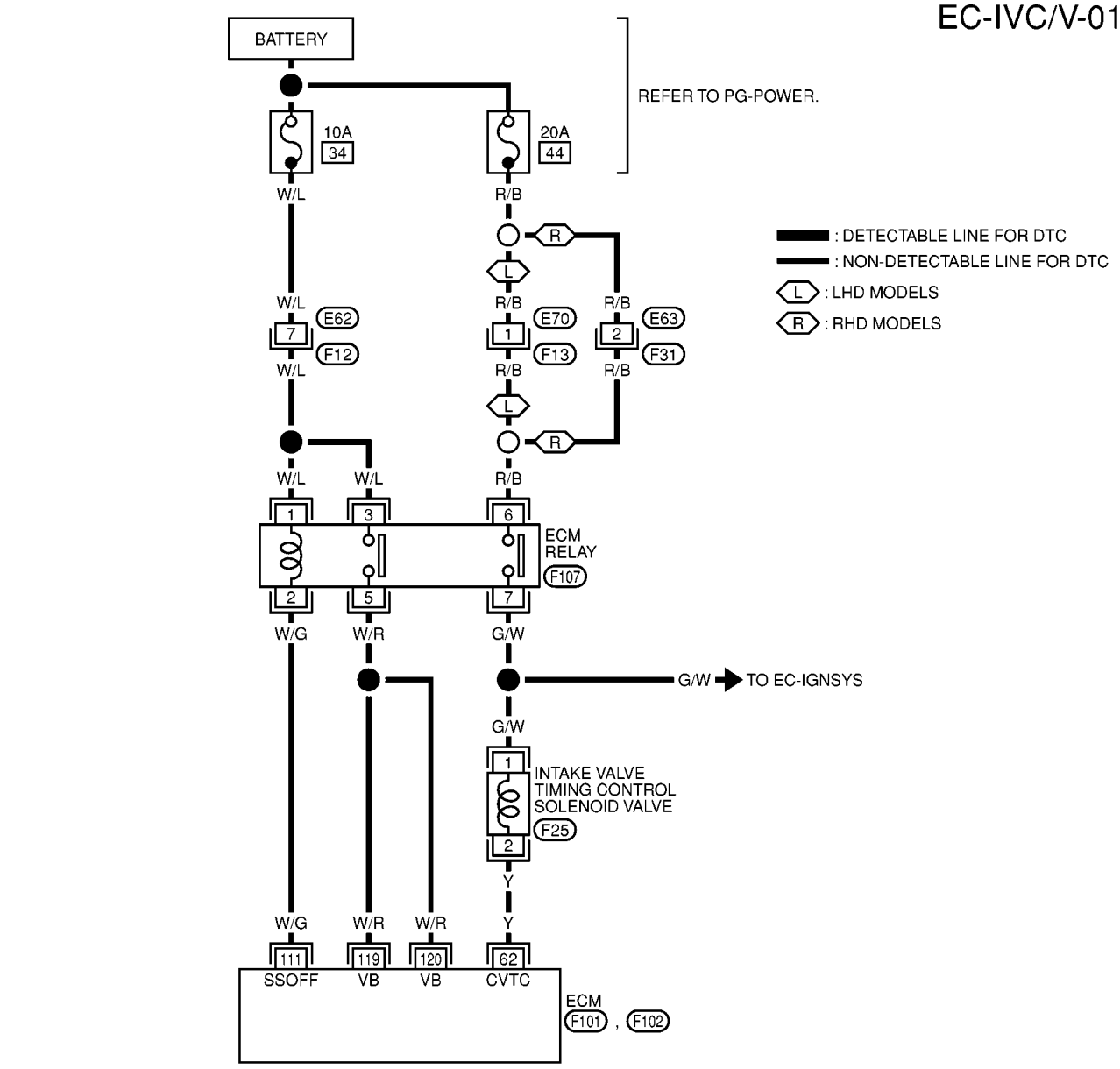
Specification data are reference values.

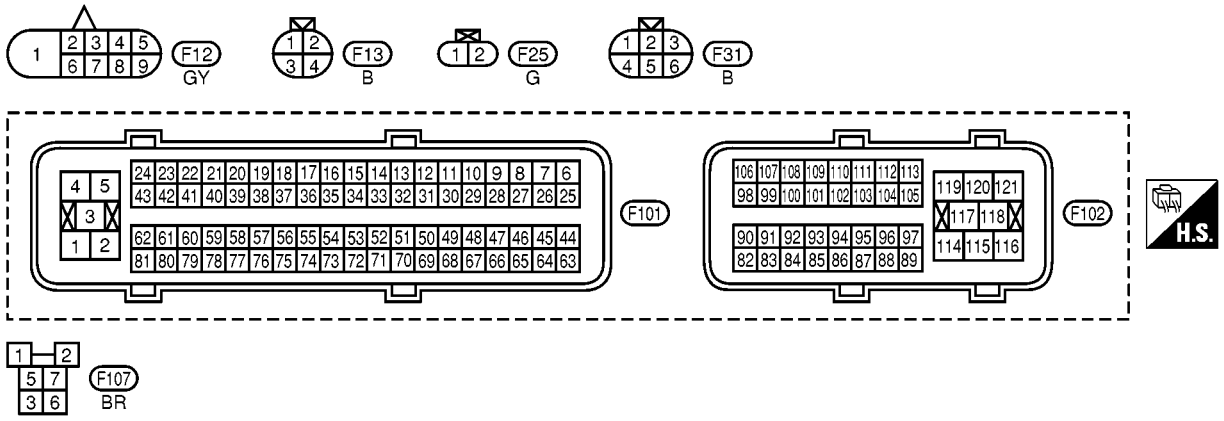
MONITOR ITEM	CONDITION		SPECIFICATION
INT/V SOL (B1)	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	0% - 2%
		When revving engine up to 2,000 rpm quickly	Approx. 0% - 50%

Wiring Diagram

EBS00H4S

EC-IVC/V-01



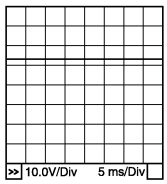
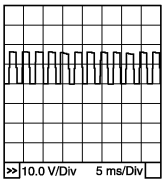


MBWA0026E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
62	Y	Intake valve timing control solenoid valve	**[Engine is running]** ● **Warm-up condition** ● Idle speed	BATTERY VOLTAGE (11 - 14V)  MBIB0052E
			[Engine is running] ● **Warm-up condition** ● When revving engine up to 2,000 rpm quickly	Approximately 4V - BATTERY VOLTAGE (11 - 14V)★  PBIB0532E

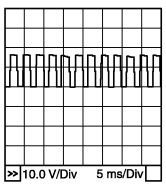
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

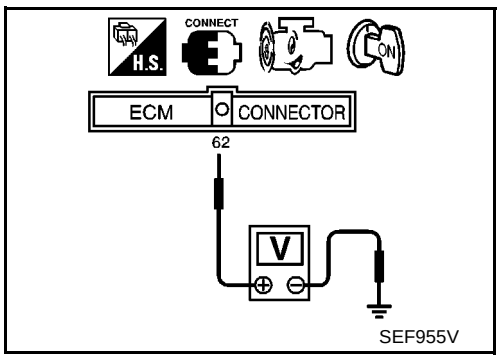
Diagnostic Procedure

EBS00H4T

1. CHECK OVERALL FUNCTION CHECK

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch "OFF" and wait at least 10 seconds.
3. Turn ignition switch "ON".
4. Set the tester probe between ECM terminals 62 (IVT control solenoid valve signal) and ground.
5. Start engine and let it idle.
6. Check the voltage under the following conditions.
   Verify that the oscilloscope screen shows the signal wave as shown below.

Conditions	Voltage
At idle	BATTERY VOLTAGE (11 - 14V)
When revving engine up to 2,000 rpm quickly	Approximately 4V - BATTERY VOLTAGE (11 - 14V)★  PBIB0532E



SEF955V

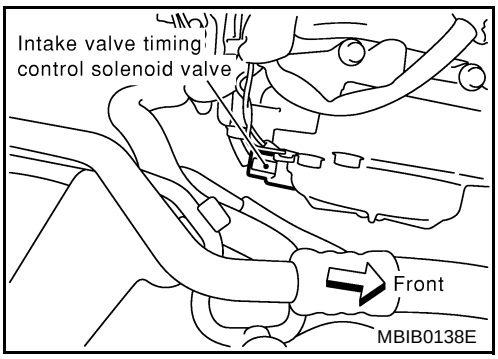
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 2.

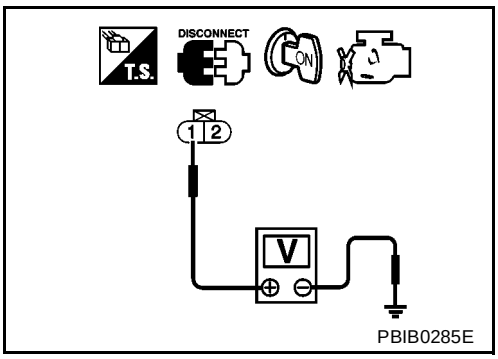
2. CHECK POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect intake valve timing control solenoid valve harness connector.
3. Turn ignition switch “ON”.



4. Check voltage between intake valve timing control solenoid valve terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTION PART

Check harness for open or short between intake valve timing control solenoid valve and ECM relay.

>> Repair or replace harness or connectors.

4. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 62 and intake valve timing control solenoid valve terminal 2. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE

Refer to EC-1694, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace intake valve timing control solenoid valve.

6. CHECK CRANKSHAFT POSITION SENSOR (POS)

Refer to EC-1560, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace crankshaft position sensor (POS).

7. CHECK CAMSHAFT POSITION SENSOR (PHASE)

Refer to EC-1567, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> Replace camshaft position sensor (PHASE).

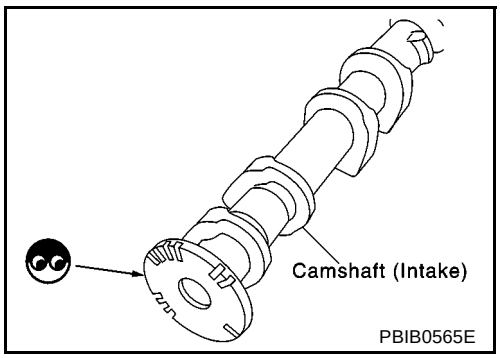
8. CHECK CAMSHAFT (INTAKE)

Check the following.

- Accumulation of debris to the signal plate of camshaft rear end
- Chipping signal plate of camshaft rear end

OK or NG

OK >> GO TO 9.
NG >> Remove debris and clean the signal plate of camshaft rear end or replace camshaft.



9. CHECK INTERMITTENT INCIDENT

Refer to EC-1498, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

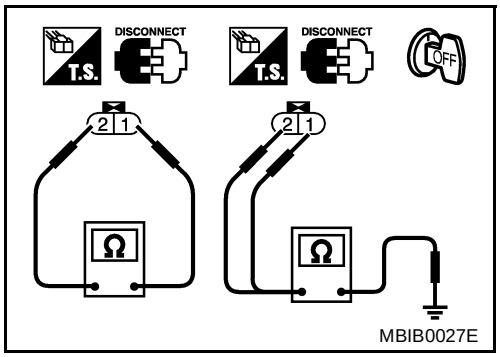
Component Inspection

EBS00H4U

INTAKE VALVE TIMING CONTROL SOLENOID VALVE

1. Disconnect intake valve timing control solenoid valve harness connector.
2. Check resistance between intake valve timing control solenoid valve terminals 1 and 2 under the following conditions.

Terminals	Resistance
1 and 2	Approximately 8Ω at 20°C (68°F)
1 or 2 and ground	∞Ω (Continuity should not exist)



Removal and Installation

EBS00H4V

INTAKE VALVE TIMING CONTROL SOLENOID VALVE

Refer to EM-143, "TIMING CHAIN" .

PNP SWITCH

PFP:32006

Component Description

EBS00H4W

When the shift lever position is “P” (CVT models only) or “N”, park/neutral position (PNP) switch is “ON”.
ECM detects the position because the continuity of the line (the “ON” signal) exists.

CONSULT-II Reference Value in Data Monitor Mode

EBS00H4X

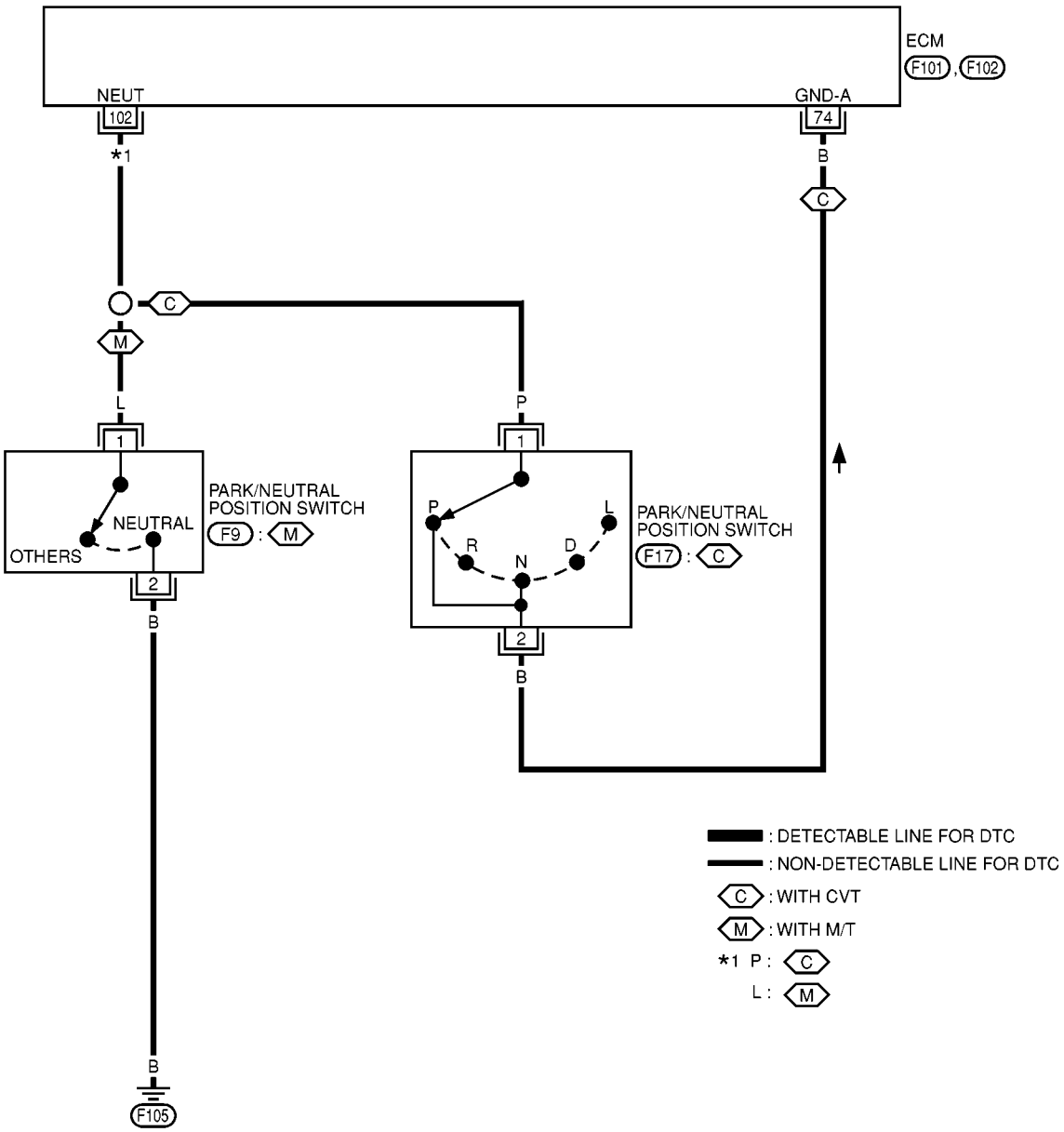
Specification data are reference values.

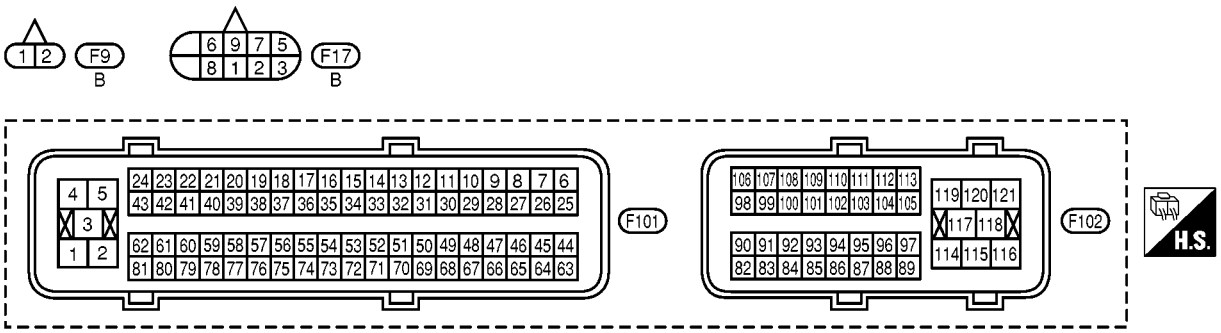
MONITOR ITEM	CONDITION		SPECIFICATION
P/N POSI SW	● Ignition switch: ON	Shift lever: P or N (CVT model) Neutral (M/T model)	ON
		Shift lever: Except above	OFF

Wiring Diagram

EBS00H4Y

EC-PNPSW1-01





MBWA0027E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
74 (CVT models)	B	Sensors' ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
102	P (CVT) L (M/T)	PNP switch	**[Ignition switch "ON"]** ● Shift lever position is "P" (CVT models) or "N", "Neutral" (M/T models).	Approximately 0V
			[Ignition switch "ON"] ● Except the above gear position	**CVT models** BATTERY VOLTAGE (11 - 14V) **M/T models** Approximately 5V

Diagnostic Procedure

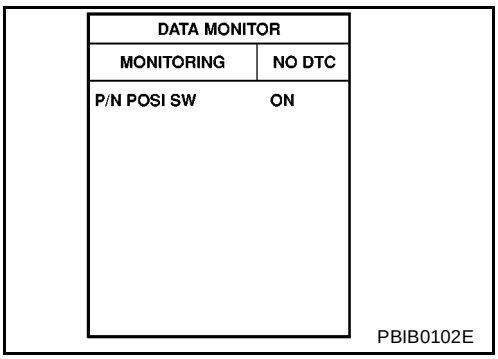
EBS00H4Z

1. CHECK OVERALL FUNCTION

With CONSULT-II

1. Turn ignition switch "ON".
2. Select "P/N POSI SW" in "DATA MONITOR" mode with CONSULT-II.
3. Check the "P/N POSI SW" signal under the following conditions.

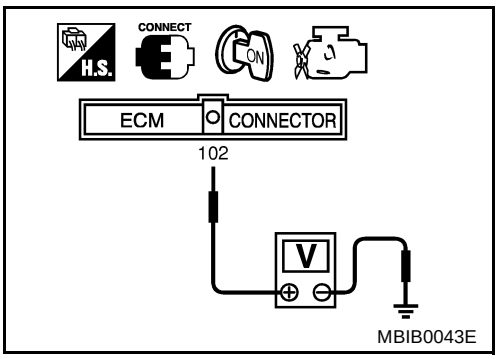
Selector lever position	P/N POSI SW signal
"P" and "N" position	ON
Except the above position	OFF



Without CONSULT-II

1. Turn ignition switch "ON".
2. Check voltage between ECM terminal 102 and ground under the following conditions.

Selector lever position	Voltage
"P" and "N" position	Approximately 0V
Except the above position	CVT models: Battery voltage M/T models: Approximately 5V



OK or NG

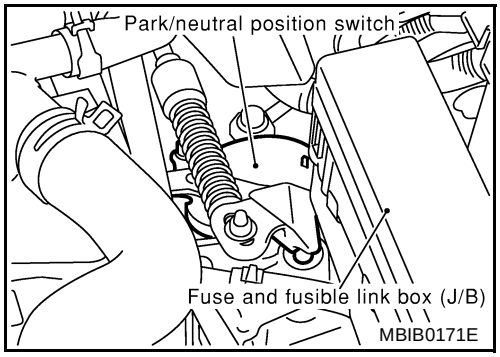
OK >> **INSPECTION END**
NG >> GO TO 2.

2. CHECK GROUND CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect PNP switch harness connector.
3. Check harness continuity between PNP switch terminal 2 and ground.
   Refer to Wiring Diagram.

   Continuity should exist.

4. Also check harness for short to power.



OK or NG

OK >> GO TO 3.
NG >> GO TO 4.

3. DETECT MALFUNCTIONING PART

Check the foloowing.

- Harness for open and short between PNP switch and ECM (CVT models)
- Harness for open and short between PNP switch and gound (M/T models)

>> Repair open circuit or short to power in harness or connectors.

4. CHECK INPUT SIGNAL CIRCUIT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 102 and PNP switch terminal 1.
   Refer to Wiring Diagram.

   Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to power in harness or connectors.

5. CHECK PNP SWITCH

Refer to CVT-204, "PNP Switch, Stop Lamp Switch and Throttle Position Switch" (CVT models) or MT-126, "PARK/NEUTRAL POSITION SWITCH" (M/T models).

OK or NG

OK >> GO TO 6.
NG >> Replace PNP switch.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-1498, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

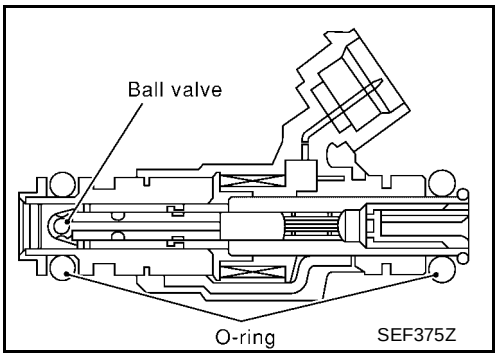
INJECTOR CIRCUIT

PFP:16600

Component Description

EBS00H50

The fuel injector is a small, precise solenoid valve. When the ECM supplies a ground to the injector circuit, the coil in the injector is energized. The energized coil pulls the needle valve back and allows fuel to flow through the injector into the intake manifold. The amount of fuel injected depends upon the injection pulse duration. Pulse duration is the length of time the injector remains open. The ECM controls the injection pulse duration based on engine fuel needs.



CONSULT-II Reference Value in Data Monitor Mode

EBS00H51

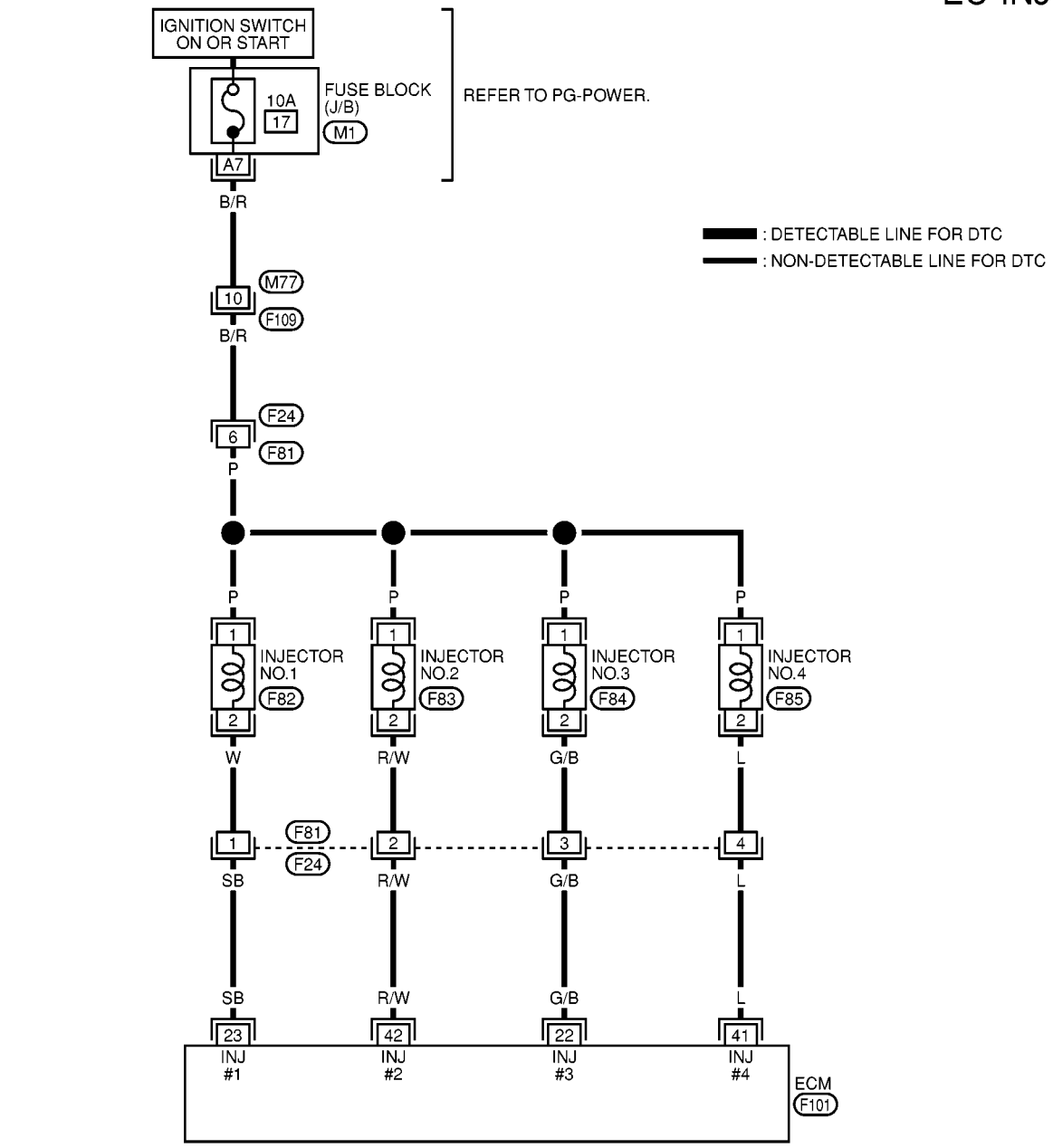
Specification data are reference values.

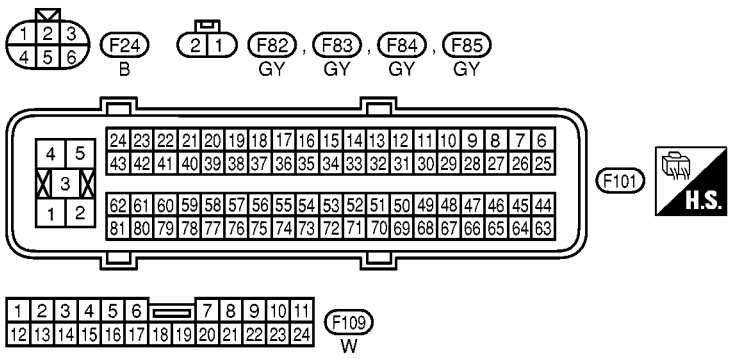
MONITOR ITEM	CONDITION		SPECIFICATION
B/FUEL SCHDL	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	2.5 - 3.5 msec
		2,000 rpm	2.5 - 3.5 msec
INJ PULSE-B1	● Engine: After warming up ● Shift lever: N ● Air conditioner switch: OFF ● No-load	Idle	2.0 - 3.0 msec
		2,000 rpm	1.9 - 2.9 msec

Wiring Diagram

EBS00H52

EC-INJECT-01



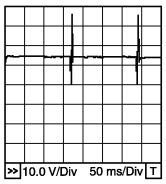
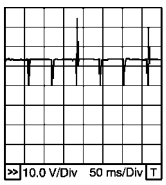


REFER TO THE FOLLOWING.
M1 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0028E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
22 23 41 42	G/B SB L R/W	Injector No. 3 Injector No. 1 Injector No. 4 Injector No. 2	**[Engine is running]** ● **Warm-up condition** ● Idle speed	BATTERY VOLTAGE (11 - 14V)★  PBIB0529E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	BATTERY VOLTAGE (11 - 14V)★  PBIB0530E

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnostic Procedure

EBS00H53

1. INSPECTION START

Turn ignition switch to “START”.
Is any cylinder ignited?

Yes or No

Yes >> GO TO 2.
No >> GO TO 3.

2. CHECK OVERALL FUNCTION

With CONSULT-II

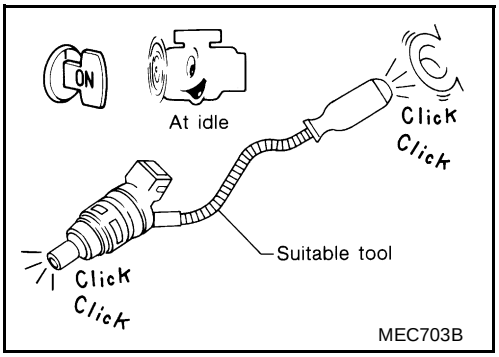
1. Start engine.
2. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT-II.
3. Make sure that each circuit produces a momentary engine speed drop.

ACTIVE TEST	
POWER BALANCE	
MONITOR	
ENG SPEED	XXX rpm
MAS A/F SE-B1	XXX V

PBIB0133E

Without CONSULT-II

1. Start engine.
2. Listen to each injector operating sound.
   Clicking noise should be heard.



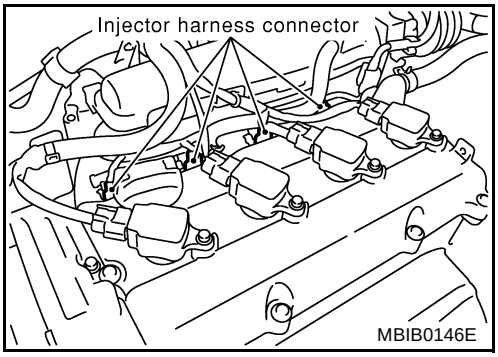
MEC703B

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 3.

3. CHECK INJECTOR POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect injector harness connector.
3. Turn ignition switch “ON”.

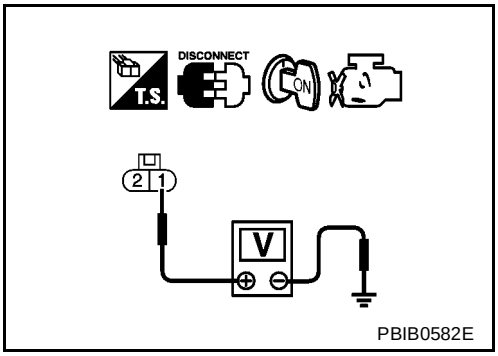


4. Check voltage between injector terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.



4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M77, F109
- Harness connectors F24, F81
- Fuse block (J/B) connector M1
- 10A fuse
- Harness for open or short between injector and fuse

>> Repair harness or connectors.

5. CHECK INJECTOR OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between injector terminal 2 and ECM terminals 22, 23, 41, 42. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFONCTIONING PART

Check the following.

- Harness connectors F81, F24
- Harness for open or short between injector and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK INJECTOR

Refer to EC-1704, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> Replace injector.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-1498, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

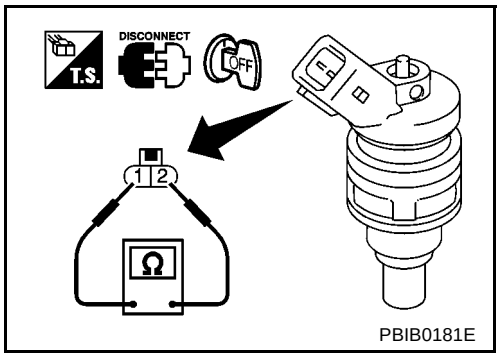
Component Inspection

EBS00H54

INJECTOR

1. Disconnect injector harness connector.
2. Check resistance between terminals as shown in the figure.

Resistance: 12.1 - 12.9Ω [at 20°C (68°F)]



Removal and Installation

EBS00H55

INJECTOR

Refer to EM-128, "FUEL INJECTOR AND FUEL TUBE" .

FUEL PUMP CIRCUIT

PFP:17042

Description

EBS00H56

SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM Function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*	Fuel pump control	Fuel pump relay
Battery	Battery voltage*		

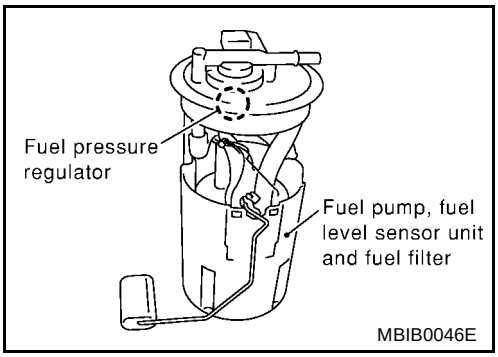
*: ECM determines the start signal status by the signals of engine speed and battery voltage.

The ECM activates the fuel pump for several seconds after the ignition switch is turned on to improve engine startability. If the ECM receives a engine speed signal from the crankshaft position sensor (POS) and camshaft position sensor (PHASE), it knows that the engine is rotating, and causes the pump to operate. If the engine speed signal is not received when the ignition switch is ON, the engine stalls. The ECM stops pump operation and prevents battery discharging, thereby improving safety. The ECM does not directly drive the fuel pump. It controls the ON/OFF fuel pump relay, which in turn controls the fuel pump.

Condition	Fuel pump operation
Ignition switch is turned to ON.	Operates for 1 second.
Engine running and cranking	Operates.
When engine is stopped	Stops in 1.5 seconds.
Except as shown above	Stops.

COMPONENT DESCRIPTION

A turbine type design fuel pump is used in the fuel tank.



CONSULT-II Reference Value in Data Monitor Mode

EBS00H57

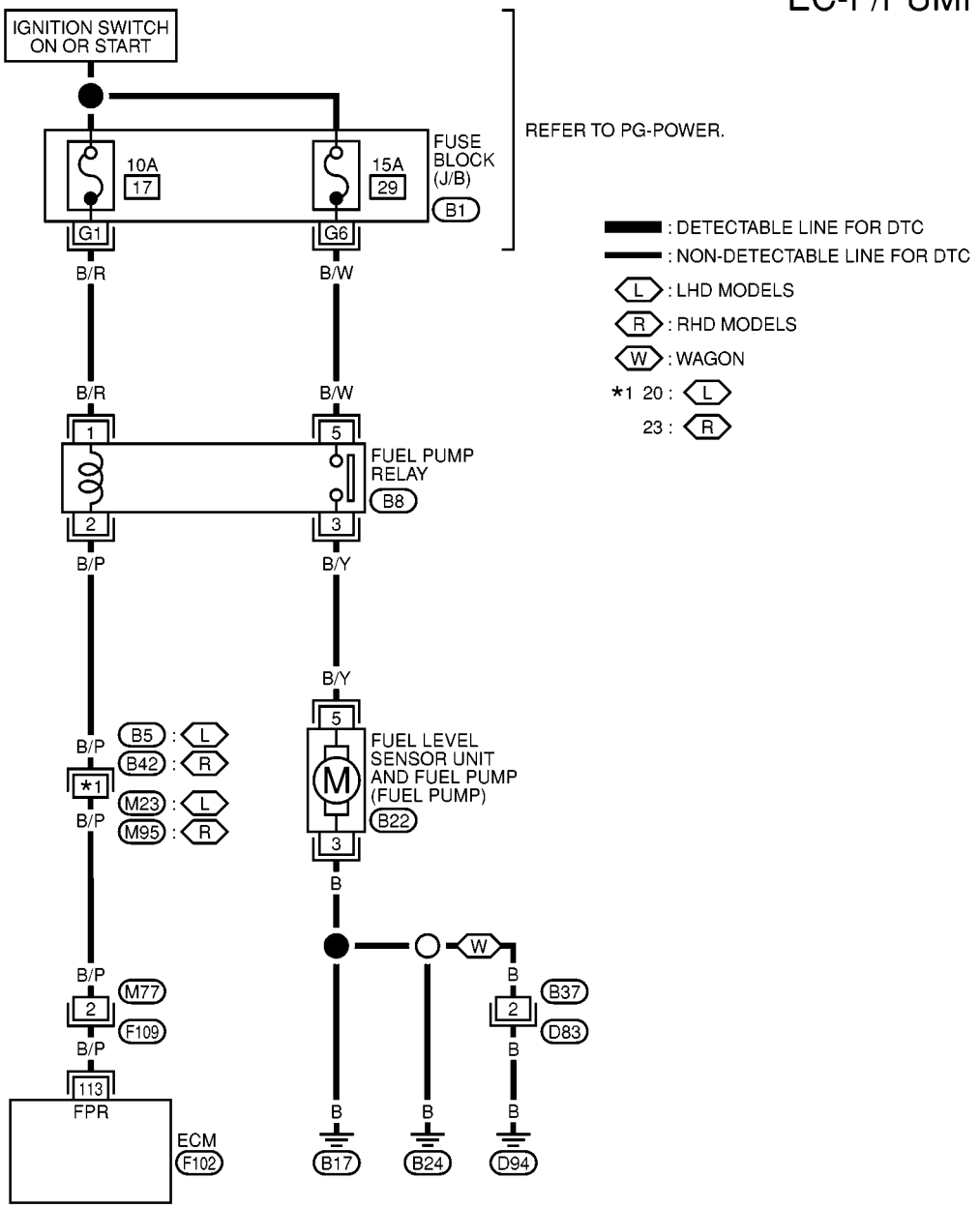
Specification data are reference values.

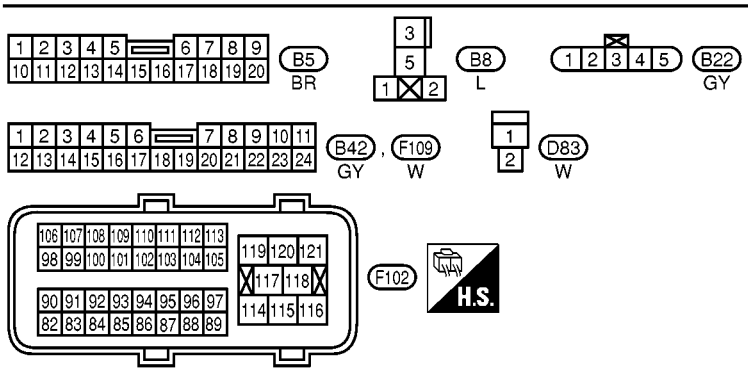
MONITOR ITEM	CONDITION	SPECIFICATION
FUEL PUMP RLY	● For 1 seconds after turning ignition switch ON ● Engine running or cranking	ON
	● Except above conditions	OFF

Wiring Diagram

EBS00H58

EC-F/PUMP-01





REFER TO THE FOLLOWING.
B1 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0031E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

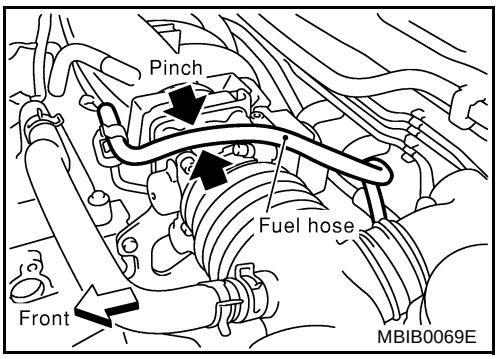
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
113	B/P	Fuel pump relay	**[Ignition switch "ON"]** ● For 1 seconds after turning ignition switch "ON" **[Engine is running]**	0 - 1.0V
			[Ignition switch "ON"] ● More than 1 seconds after turning ignition switch "ON".	BATTERY VOLTAGE (11 - 14V)

Diagnostic Procedure

EBS00H59

1. CHECK OVERALL FUNCTION

1. Turn ignition switch "ON".
2. Pinch fuel feed hose with two fingers.
   Fuel pressure pulsation should be felt on the fuel hose for 1 second after ignition switch is turned "ON".

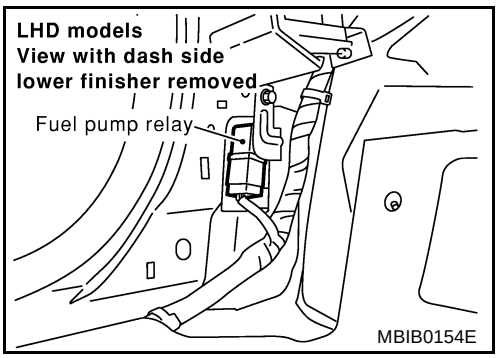


OK or NG

OK >> **INSPECTION END**
NG >> GO TO 2.

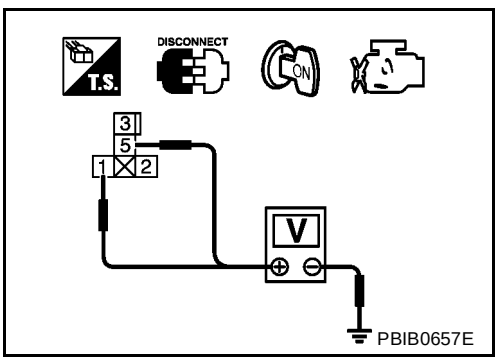
2. CHECK FUEL PUMP RELAY POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect fuel pump relay.
3. Turn ignition switch "ON".



4. Check voltage between fuel pump relay terminals 1, 5 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector B1
- 10A fuse
- 15A fuse
- Harness for open or short between fuel pump relay and fuse

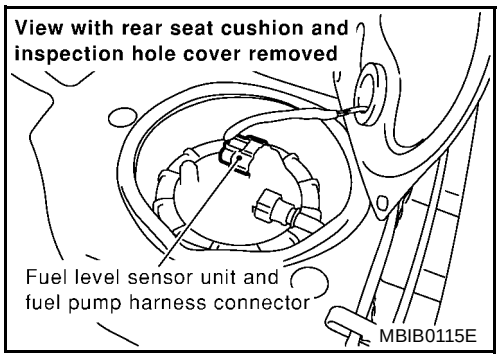
>> Repair harness or connectors.

4. CHECK FUEL PUMP POWER SUPPLY AND GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect fuel level sensor unit and fuel pump harness connector.
3. Check harness continuity between fuel pump relay terminal 3 and fuel level sensor unit and fuel pump terminal 5, fuel level sensor unit and fuel pump terminal 3 and body ground.
   Refer to Wiring Diagram.

   Continuity should exist.

4. Also check harness for short to ground and short to power.



OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors B37, D83 (Wagon)
- Harness for open or short between fuel level sensor unit and fuel pump and fuel pump relay
- Harness for open or short between fuel level sensor unit and fuel pump and body ground

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK FUEL PUMP RELAY OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 113 and fuel pump relay terminal 2.
   Refer to Wiring Diagram.

   Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M77, F109
- Harness connectors B5, M23 (LHD models)
- Harness connectors B42, M95 (RHD models)
- Harness for open or short between ECM and fuel pump relay

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK FUEL PUMP RELAY

Refer to EC-1709, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> Replace fuel pump relay.

9. CHECK FUEL PUMP

Refer to EC-1709, "Component Inspection" .

OK or NG

OK >> GO TO 10.
NG >> Replace fuel pump.

10. CHECK INTERMITTENT INCIDENT

Refer to EC-1498, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

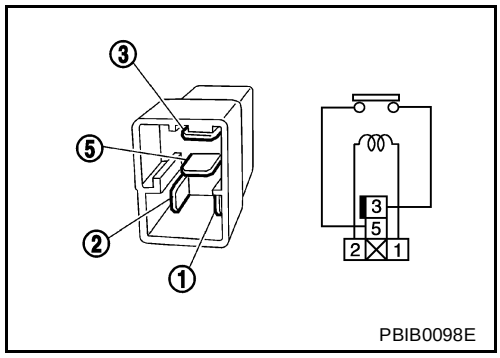
Component Inspection

EBS00H5A

FUEL PUMP RELAY

Check continuity between terminals 3 and 5 under the following conditions.

Conditions	Continuity
12V direct current supply between terminals 1 and 2	Yes
No current supply	No

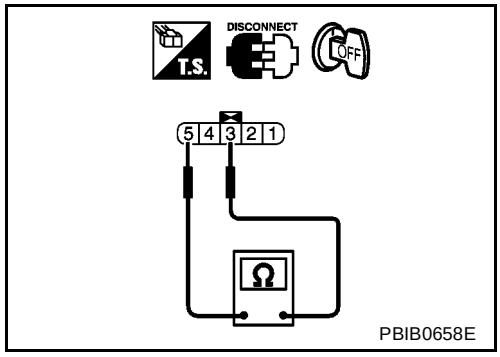


PBIB0098E

FUEL PUMP

1. Disconnect fuel level sensor unit and fuel pump harness connector.
2. Check resistance between fuel level sensor unit and fuel pump terminals 3 and 5.

Resistance: Approximately 1.0Ω [at 25°C (77°F)]



PBIB0658E

Removal and Installation

EBS00H5B

FUEL PUMP

Refer to FL-6, "FUEL LEVEL SENSOR UNIT, FUEL FILTER AND FUEL PUMP ASSEMBLY (EXCEPT YD22DDTi)" .

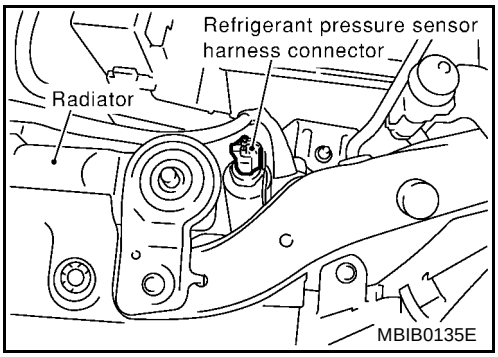
REFRIGERANT PRESSURE SENSOR

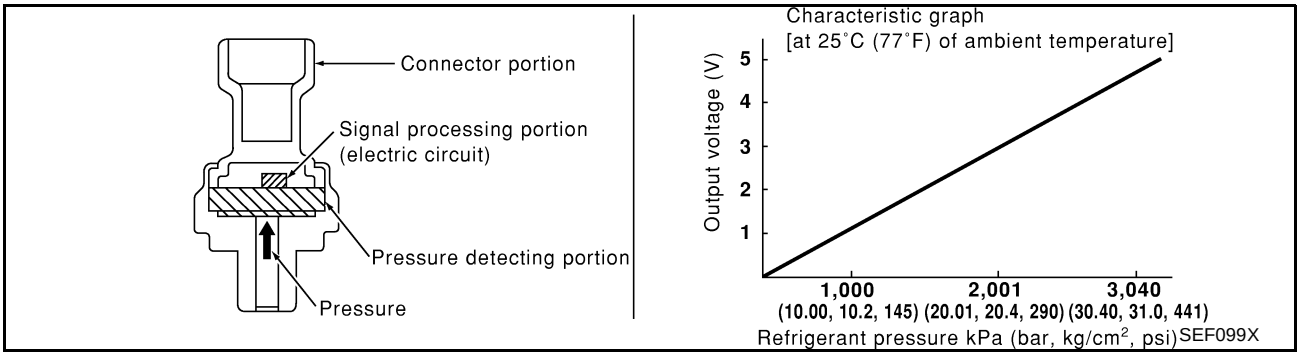
PFP:92136

Component Description

EBS00H5C

The refrigerant pressure sensor is installed at the liquid tank of the air conditioner system. The sensor uses an electrostatic volume pressure transducer to convert refrigerant pressure to voltage. The voltage signal is sent to ECM, and ECM controls cooling fan system.

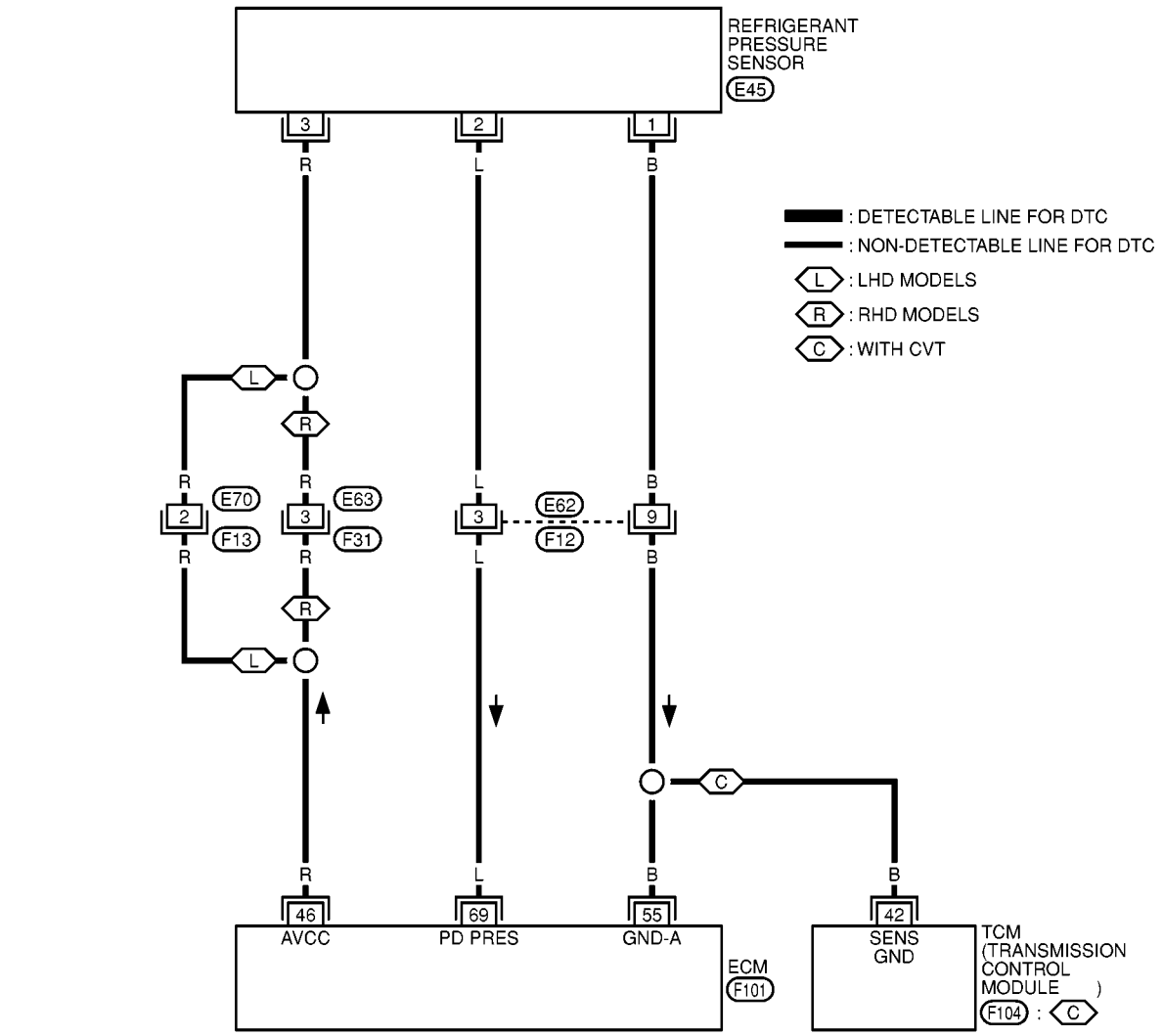


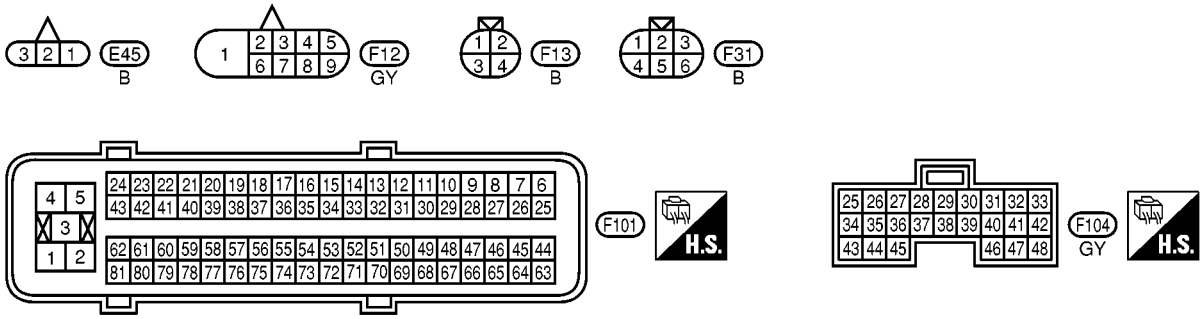


Wiring Diagram

EBS00H5D

EC-RP/SEN-01





MBWA0033E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
55	B	Sensor's ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
46	R	Sensor's power supply (Refrigerant pressure sensor)	**[Ignition switch "ON"]**	Approximately 5V
69	L	Refrigerant pressure sensor	**[Engine is running]** ● **Warm-up condition** ● Both A/C switch and blower switch are "ON". (Compressor operates.)	1.0 - 4.0V

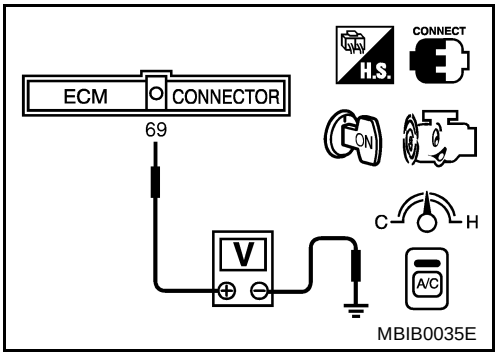
Diagnostic Procedure

EBS00H5E

1. CHECK REFRIGERANT PRESSURE SENSOR OVERALL FUNCTION

1. Start engine and warm it up to normal operating temperature.
2. Turn A/C switch and blower switch "ON".
3. Check voltage between ECM terminal 69 and ground with CONSULT-II or tester.

Voltage: 1.0 - 4.0V

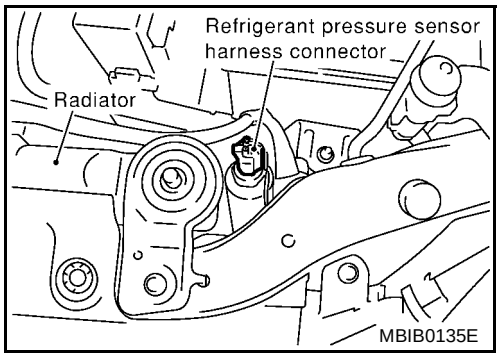


OK or NG

OK >> **INSPECTION END**
NG >> GO TO 2.

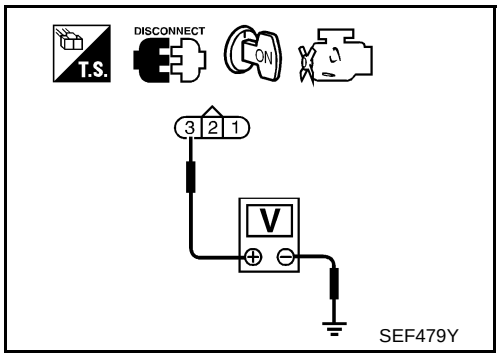
2. CHECK REFRIGERANT PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Turn A/C switch and blower switch “OFF”.
2. Stop engine.
3. Disconnect refrigerant pressure sensor harness connector.
4. Turn ignition switch “ON”.



5. Check voltage between refrigerant pressure sensor terminal 3 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E70, F13 (LHD models)
- Harness connectors E63, F31 (RHD models)
- Harness for open or short between ECM and refrigerant pressure sensor

>> Repair harness or connectors.

4. CHECK REFRIGERANT PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 55 and refrigerant pressure sensor terminal 1. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E62, F12
- Harness for open or short between ECM and refrigerant pressure sensor
- Harness for open or short between TCM and refrigerant pressure sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK REFRIGERANT PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 69 and refrigerant pressure sensor terminal 2. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E62, F12
- Harness for open or short between ECM and refrigerant pressure sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-1498, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

OK or NG

OK >> Replace refrigerant pressure sensor.
NG >> Repair or replace.

Removal and Installation

EBS00H5F

REFRIGERANT PRESSURE SENSOR

Refer to ATC-127, "REFRIGERANT LINES" .

ELECTRICAL LOAD SIGNAL

PFP:25350

Description

EBS00H5G

The electrical load signals except headlamp switch signal are transferred through the CAN communication line.

CONSULT-II Reference Value in Data Monitor Mode

EBS00H5H

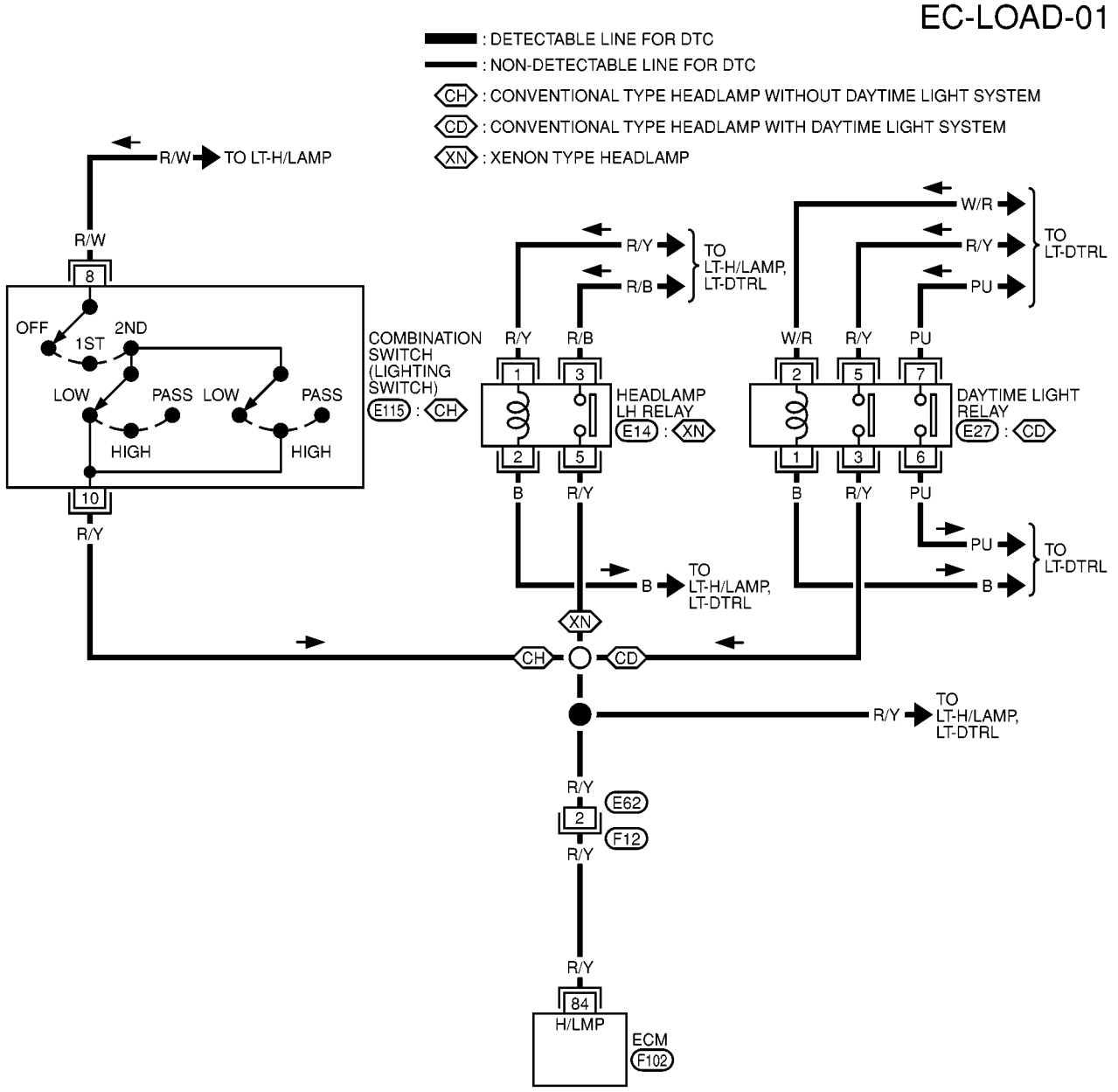
Specification data are reference values.

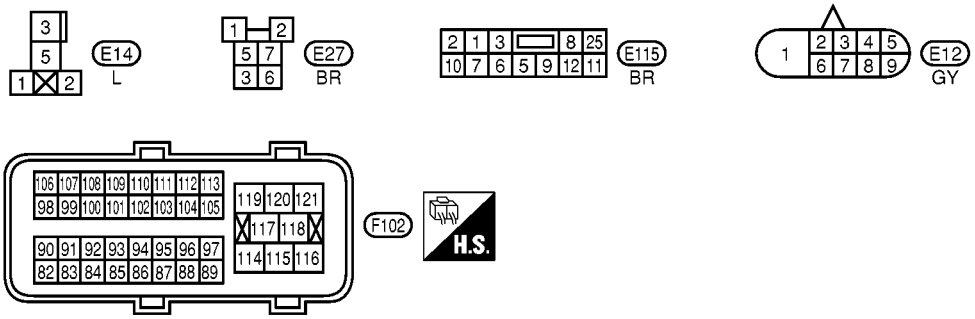
MONITOR ITEM	CONDITION		SPECIFICATION
LOAD SIGNAL	● Ignition switch: ON	Rear window defogger switch is ON and/or lighting switch is 2nd.	ON
		Rear window defogger switch is OFF and lighting switch is OFF.	OFF

Wiring Diagram

EBS00H5I

EC-LOAD-01





MBWA0147E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
84	R/Y	Electrical load signal (Headlamp signal)	**[Ignition switch "ON"]** ● Lighting switch is "2ND" position	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"] ● Lighting switch is "OFF"	Approximately 0V

Diagnostic Procedure

EBS00H5J

1. INSPECTION START

Do you have CONSULT-II?

Yes or No

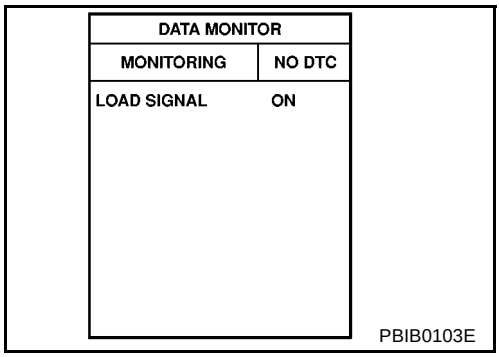
Yes >> GO TO 2.
No >> GO TO 3.

2. CHECK LOAD SIGNAL CIRCUIT OVERALL FUNCTION-I

With CONSULT-II

1. Turn ignition switch "ON".
2. Connect CONSULT-II and select "DATA MONITOR" mode.
3. Select "LOAD SIGNAL" and check indication under the following conditions.

Condition	Indication
Rear window defogger switch "ON"	ON
Rear window defogger switch "OFF"	OFF



OK or NG

OK >> GO TO 4.
NG >> GO TO 6.

3. CHECK LOAD SIGNAL CIRCUIT OVERALL FUNCTION-I

Without CONSULT-II

1. Turn ignition switch "ON".
2. Turn rear window defogger switch "ON".
3. Make sure that rear window defogger system operates normally.

OK or NG

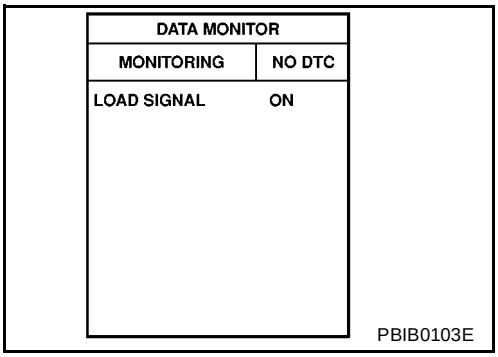
OK >> GO TO 5.
NG >> GO TO 6.

4. CHECK LOAD SIGNAL CIRCUIT OVERALL FUNCTION-II

With CONSULT-II

Check "LOAD SIGNAL" indication under the following conditions.

Condition	Indication
Lighting switch "ON" at 2nd position	ON
Lighting switch "OFF"	OFF



OK or NG

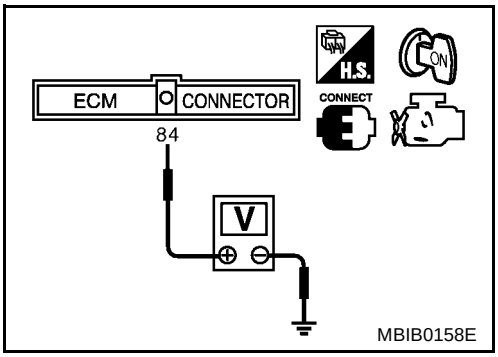
OK >> **INSPECTION END**
NG >> GO TO 7.

5. CHECK LOAD SIGNAL CIRCUIT OVERALL FUNCTION-II

Without CONSULT-II

Check voltage between ECM terminal 84 and ground under the following conditions.

Condition	Voltage
Lighting switch "ON" at 2nd position	Battery voltage
Lighting switch "OFF"	Approximately 0V



OK or NG

OK >> **INSPECTION END**
NG >> GO TO 7.

6. CHECK REAR WINDOW DEFOGGER SYSTEM

Refer to GW-40, "REAR WINDOW DEFOGGER" .

>> **INSPECTION END**

7. CHECK HEADLAMP FUNCTION

1. Turn lighting switch “ON” at 2nd position.
2. Check that headlamps are illuminated.

OK or NG

OK >> GO TO 8.
NG >> Refer to LT-5, "HEADLAMP -CONVENTIONAL TYPE-" , LT-10, "HEADLAMP - XENON TYPE -" , LT-18, "HEADLAMP (WITH DAYTIME) - CONVENTIONAL TYPE -" or LT-25, "HEADLAMP (WITH DAYTIME) - XENON TYPE -" .

8. CHECK HEADLAMP INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

CONVENTIONAL TYPE HEADLAMP WITHOUT DAYTIME LIGHT SYSTEM

1. Turn ignition switch “OFF”.
2. Disconnect ECM hraness connector.
3. Disconnect lighting switch harness connector .
4. Check harness continuity between ECM terminal 84 and lighting switch terminal 10.
   Refer to Wiring Diagram.

   Continuity should exist.

5. Also check harness for short to ground and short to power.

CONVENTIONAL TYPE HEADLAMP WITH DAYTIME LIGHT SYSTEM

1. Turn ignition switch “OFF”.
2. Disconnect ECM hraness connector.
3. Disconnect daytime light relay.
4. Check harness continuity between ECM terminal 84 and daytime light relay terminal 3.
   Refer to Wiring Diagram.

   Continuity should exist.

5. Also check harness for short to ground and short to power.

XENON TYPE HEADLAMP

1. Turn ignition switch “OFF”.
2. Disconnect ECM hraness connector.
3. Disconnect headlamp LH relay.
4. Check harness continuity between ECM terminal 84 and headlamp LH relay terminal 5.
   Refer to Wiring Diagram.

   Continuity should exist.

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 10.
NG >> GO TO 9.

9. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E62, F12
- harness for open and short between ECM and lighting switch
- harness for open and short between ECM and daytime light relay
- harness for open and short between ECM and headlamp LH relay

>> Repair open circuit or short to ground or short to power in harness or connectors.

10. CHECK INTERMITTENT INCIDENT

Refer to EC-1498, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

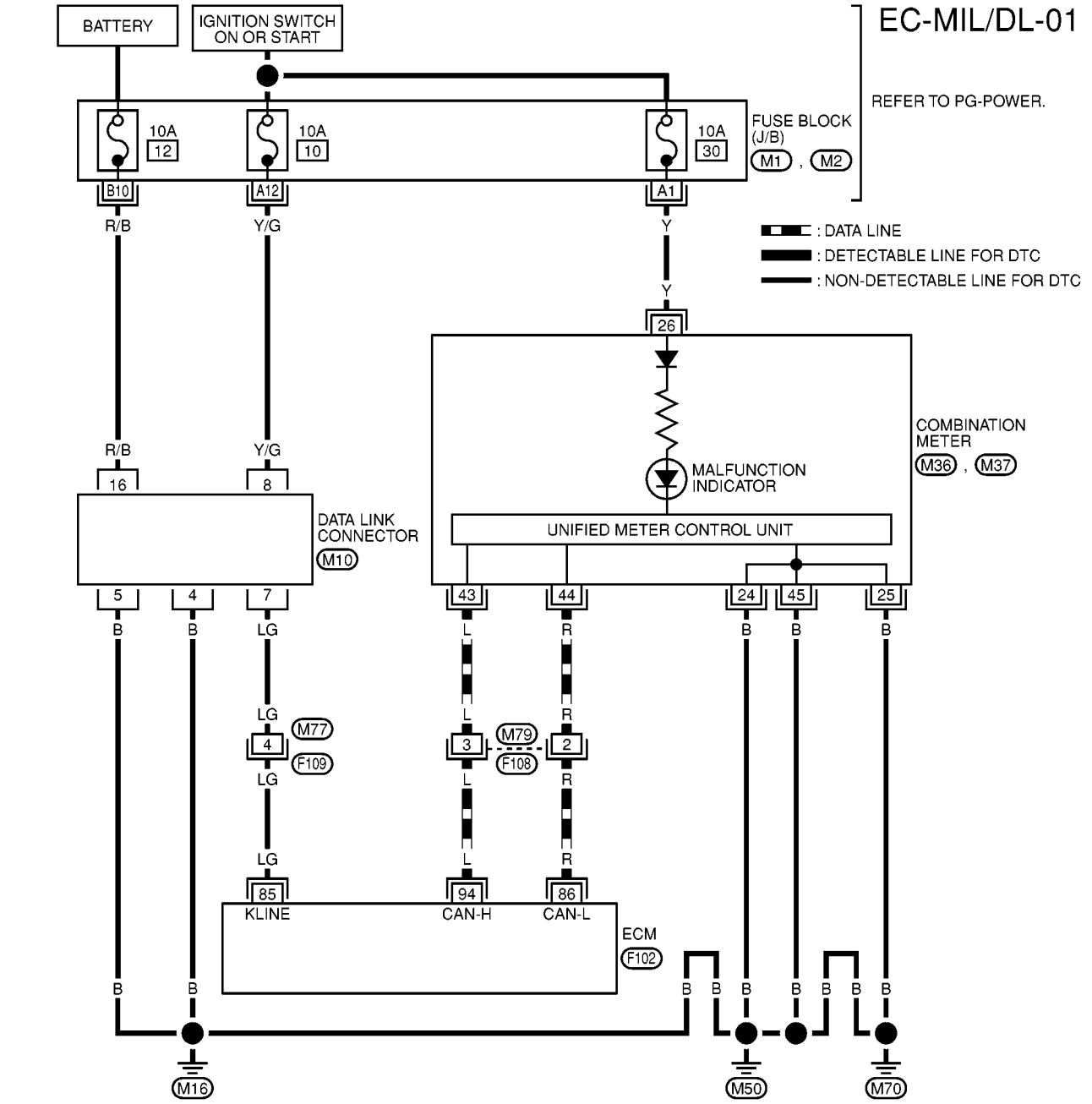
>> **INSPECTION END**

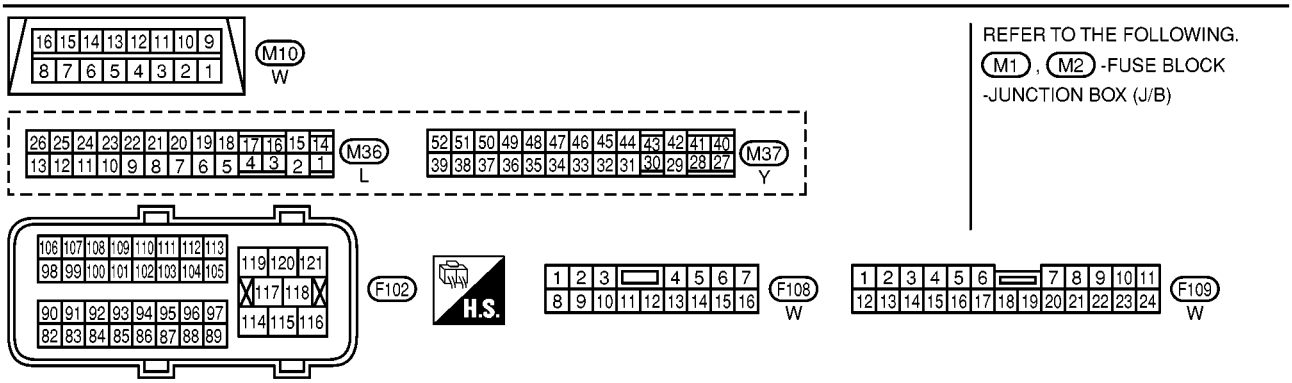
MI & DATA LINK CONNECTORS

PFP:24814

Wiring Diagram (LHD Models)

EBS00H5K

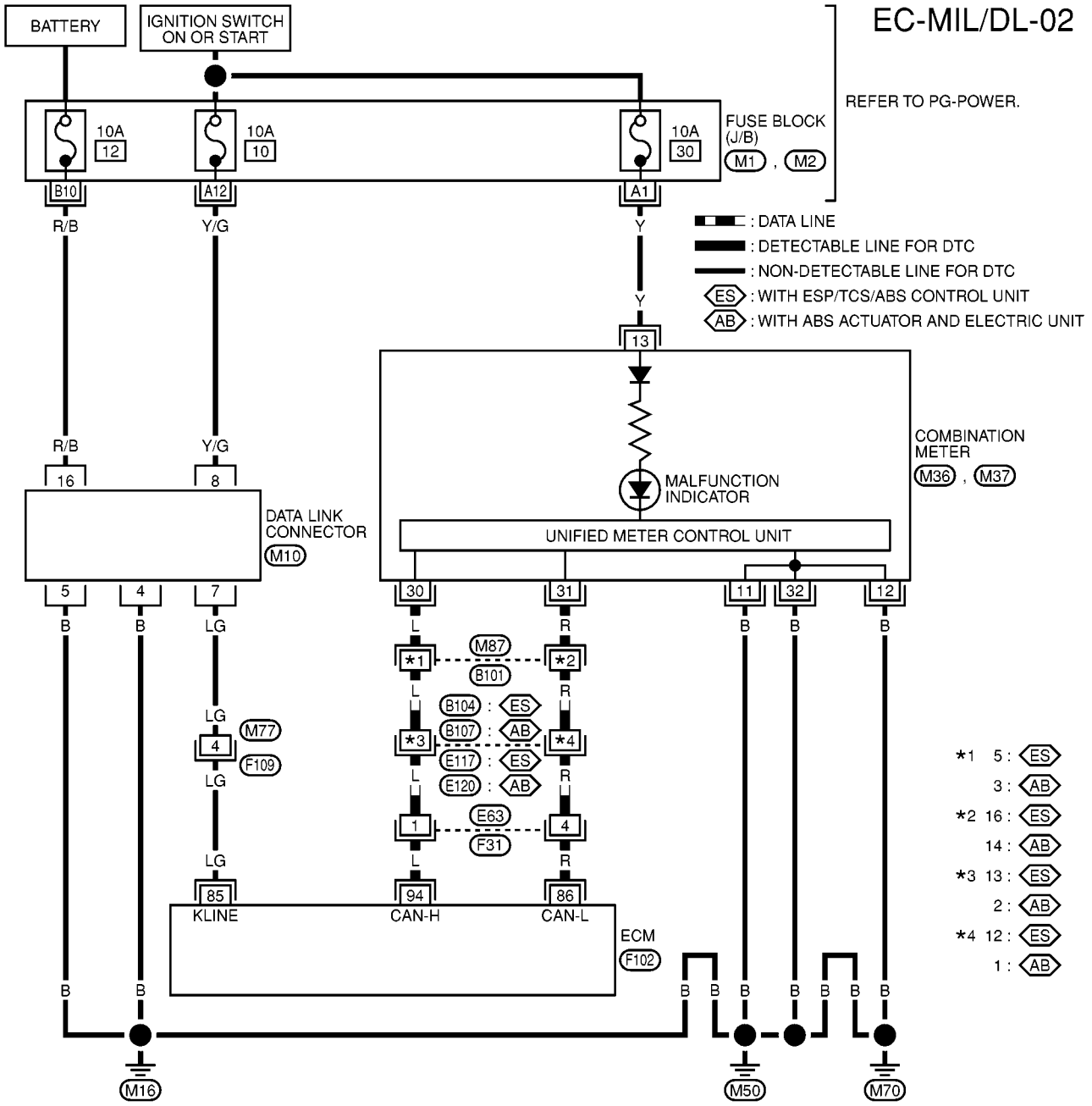


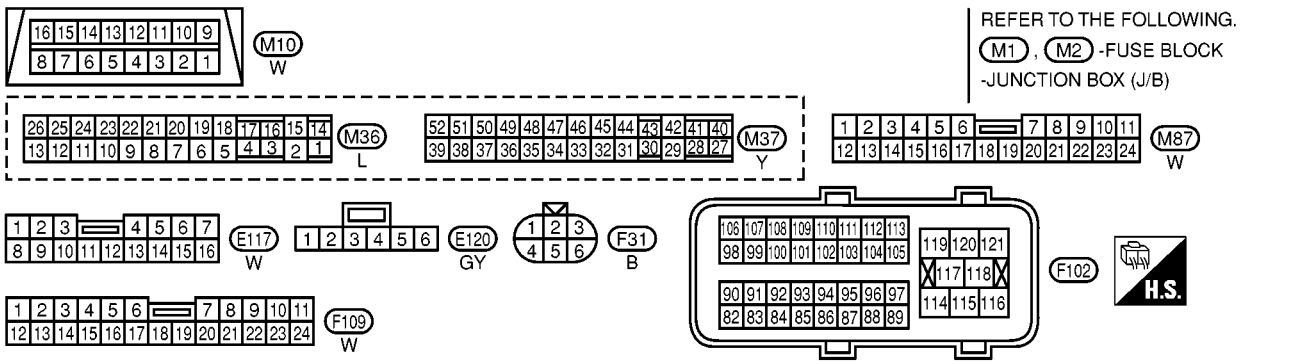


MBWA0039E

Wiring Diagram (RHD Models)

EBS00H5L





MBWA0148E

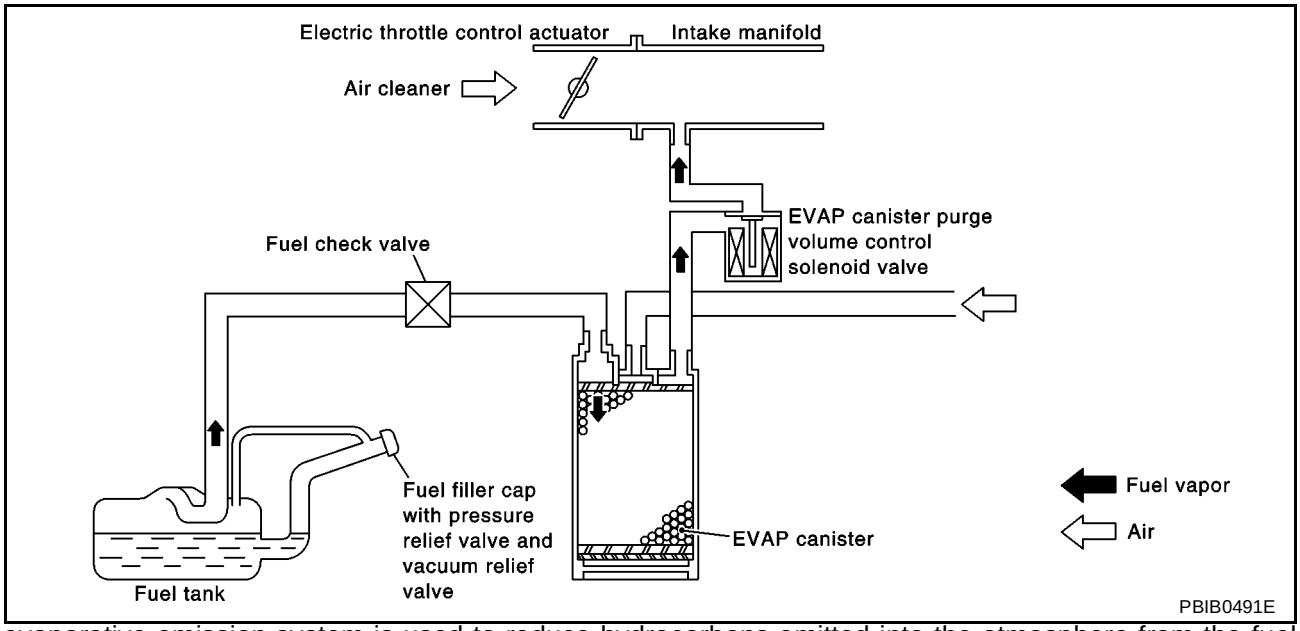
EVAPORATIVE EMISSION SYSTEM

PFP:14950

Description

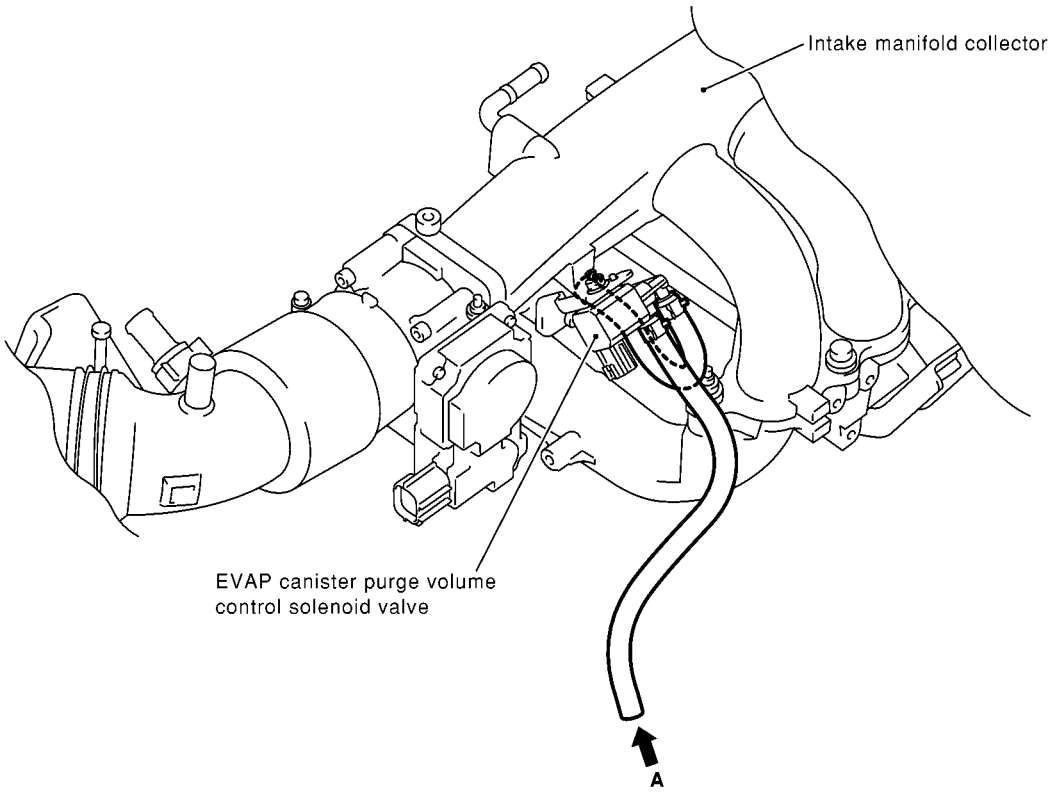
EBS00H5M

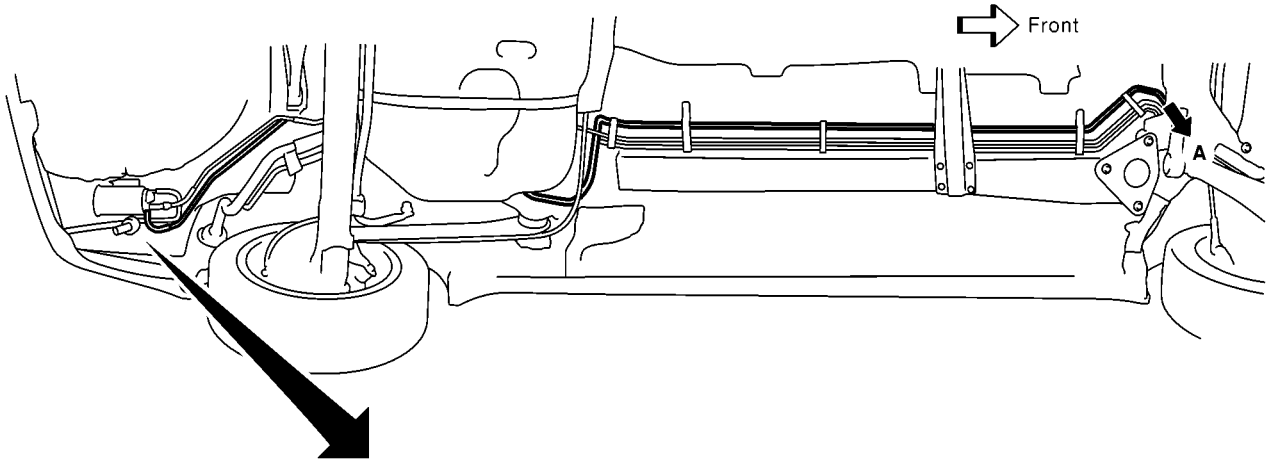
SYSTEM DESCRIPTION



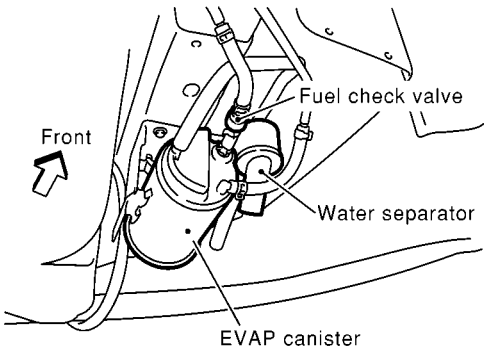
The evaporative emission system is used to reduce hydrocarbons emitted into the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the EVAP canister.
The fuel vapor in the sealed fuel tank is led into the EVAP canister which contains activated carbon and the vapor is stored there when the engine is not operating or when refueling to the fuel tank.
The vapor in the EVAP canister is purged by the air through the purge line to the intake manifold when the engine is operating. EVAP canister purge volume control solenoid valve is controlled by ECM. When the engine operates, the flow rate of vapor controlled by EVAP canister purge volume control solenoid valve is proportionally regulated as the air flow increases.
EVAP canister purge volume control solenoid valve also shuts off the vapor purge line during decelerating and idling.

EVAPORATIVE EMISSION LINE DRAWING





View from under the vehicle



NOTE:
Do not use soapy water or any type of solvent while installing vacuum hose or purge hoses.

MBIB0144E

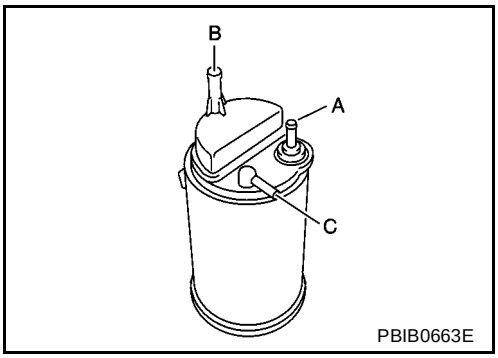
Component Inspection

EBS00H5N

EVAP CANISTER

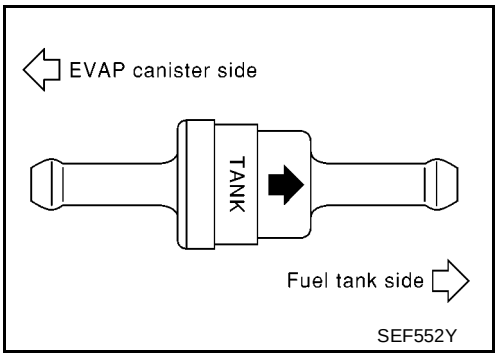
Check EVAP canister as follows:

1. Block port **B** . Orally blow air through port **A** . Check that air flows freely through port **C** .
2. Block port **A** . Orally blow air through port **B** . Check that air flows freely through port **C** .



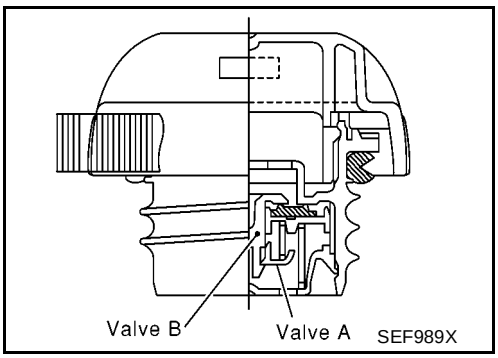
FUEL CHECK VALVE

1. Blow air through connector on fuel tank side. A considerable resistance should be felt and a portion of air flow should be directed toward the EVAP canister side.
2. Blow air through connector on EVAP canister side. Air flow should be smoothly directed toward fuel tank side.
3. If fuel check valve is suspected of not properly functioning in steps 1 and 2 above, replace it.



FUEL TANK VACUUM RELIEF VALVE (BUILT INTO FUEL FILLER CAP)

1. Wipe clean valve housing.

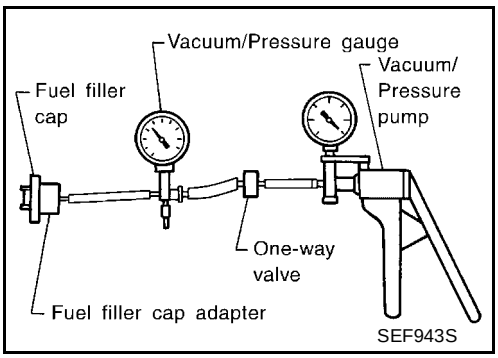


2. Check valve opening pressure and vacuum.

Pressure: 15.3 - 20.0 kPa (0.153 - 0.200 bar, 0.156 - 0.204 kg/cm^2 , 2.22 - 2.90 psi)

Vacuum: −6.0 to −3.4 kPa (−0.060 to −0.034 bar, −0.061 to −0.035 kg/cm^2 , −0.87 to −0.49 psi)

3. If out of specification, replace fuel filler cap as an assembly.



EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-1688, "Component Inspection" .

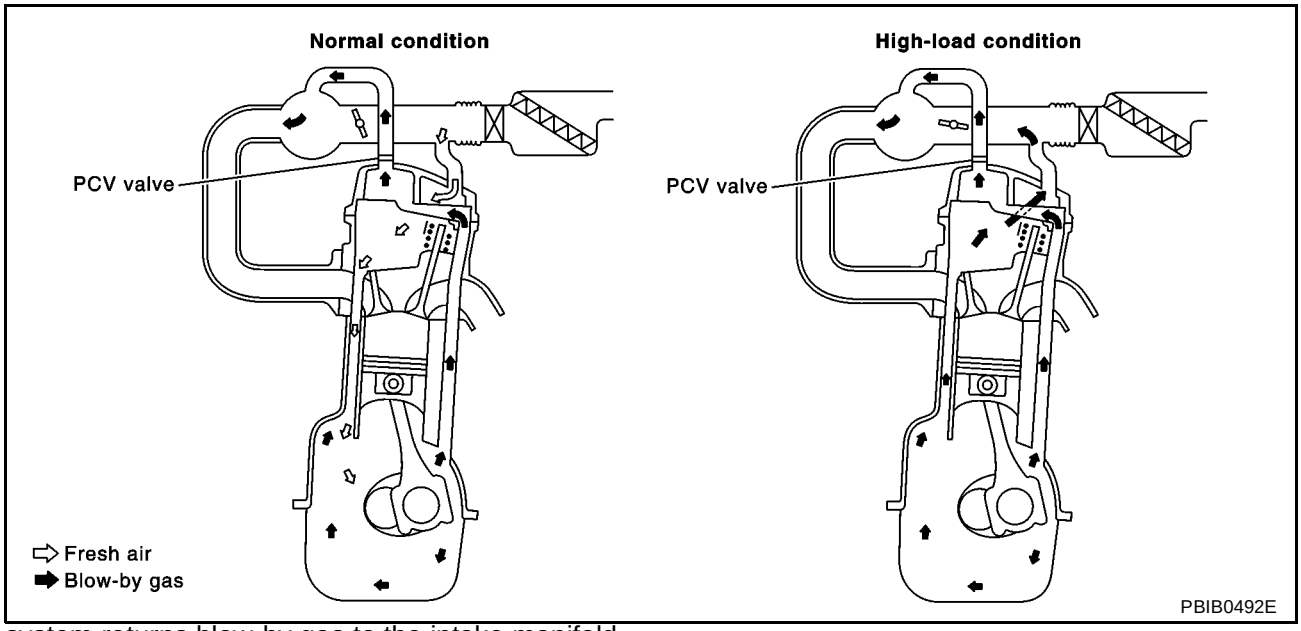
POSITIVE CRANKCASE VENTILATION

PFP:11810

Description

EBS00H5O

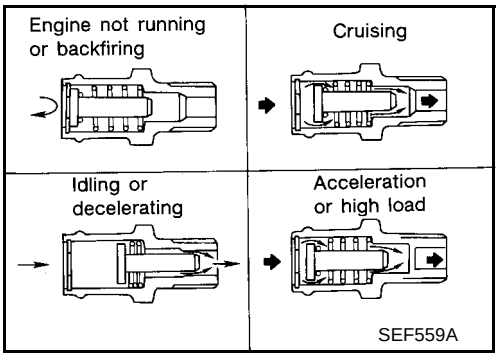
SYSTEM DESCRIPTION



This system returns blow-by gas to the intake manifold.

The positive crankcase ventilation (PCV) valve is provided to conduct crankcase blow-by gas to the intake manifold. During partial throttle operation of the engine, the intake manifold sucks the blow-by gas through the PCV valve. Normally, the capacity of the valve is sufficient to handle any blow-by and a small amount of ventilating air. The ventilating air is then drawn from the air inlet tubes into the crankcase. In this process the air passes through the hose connecting air inlet tubes to rocker cover. Under full-throttle condition, the manifold vacuum is insufficient to draw the blow-by flow through the valve. The flow goes through the hose connection in the reverse direction.

On vehicles with an excessively high blow-by, the valve does not meet the requirement. This is because some of the flow will go through the hose connection to the air inlet tubes under all conditions.

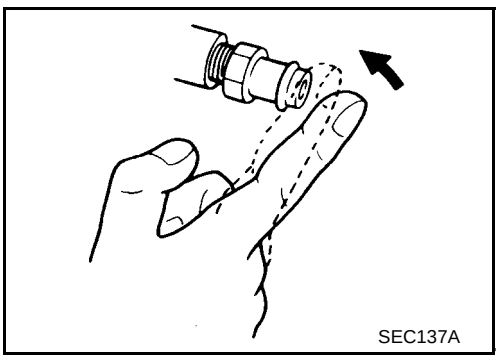


Component Inspection

EBS00H5P

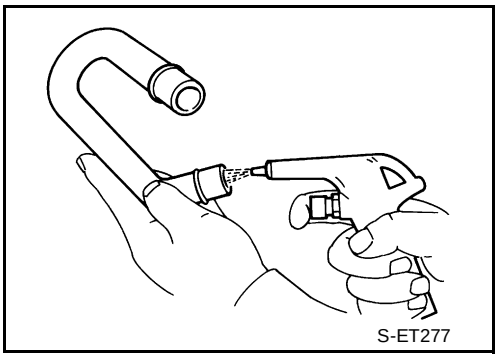
PCV (POSITIVE CRANKCASE VENTILATION) VALVE

With engine running at idle, remove PCV valve from rocker cover. A properly working valve makes a hissing noise as air passes through it. A strong vacuum should be felt immediately when a finger is placed over valve inlet.



PCV VALVE VENTILATION HOSE

1. Check hoses and hose connections for leaks.
2. Disconnect all hoses and clean with compressed air. If any hose cannot be freed of obstructions, replace.



SERVICE DATA AND SPECIFICATIONS (SDS)

PFP:00030

Fuel Pressure

EBS00H5Q

Fuel pressure at idle	Approximately 350 kPa (3.7kg/cm^2 , 51psi)

Idle Speed and Ignition Timing

EBS00H5R

Target idle speed	No-load*1 (in “P” or N” position)	M/T: 600±50 rpm CVT: 650±50 rpm
Air conditioner: ON	In “P” or N” position	725 rpm or more
Ignition timing	In “P” or N” position	M/T: 14°±5° BTDC CVT:15°±5° BTDC

*1: Under the following conditions:

- Air conditioner switch: OFF
- Electric load: OFF (Lights, heater fan & rear window defogger)
- Steering wheel: Kept in straight-ahead position

Calculated Load Value

EBS00H5S

	Calculated load value % (Using CONSULT-II or GST)
At idle	10 - 35
At 2,500 rpm	10 - 35

Mass Air Flow Sensor

EBS00H5T

Supply voltage	Battery voltage (11 - 14V)
Output voltage at idle	1.1 - 1.5*V
Mass air flow (Using CONSULT-II)	1.4 - 4.0 g·m/sec at idle* 4.0 - 10.0 g·m/sec at 2,500 rpm*

*: Engine is warmed up to normal operating temperature and running under no-load.

Intake Air Temperature Sensor

EBS00H5U

Temperature °C (°F)	Resistance kΩ
25 (77)	1.9 - 2.1
80 (176)	0.31 - 0.37

Engine Coolant Temperature Sensor

EBS00H5V

Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.00
90 (194)	0.236 - 0.260

Heated Oxygen Sensor 1 Heater

EBS00H5W

Resistance [at 25°C (77°F)]	2.3 - 4.3Ω

Heated Oxygen sensor 2 Heater

EBS00H5X

Resistance [at 25°C (77°F)]	2.3 - 4.3Ω

Crankshaft Position Sensor (POS)

EBS00H5Y

Refer to EC-1560, "Component Inspection" .

Camshaft Position Sensor (PHASE)

EBS00H5Z

Refer to EC-1567, "Component Inspection" .

Throttle Control Motor

EBS00H60

Resistance [at 25°C (77°F)]	Approximately 1 - 15Ω

Injector

EBS00H61

Resistance [at 20°C (68°F)]	13.5 - 17.5Ω

Fuel Pump

EBS00H62

Resistance [at 25°C (77°F)]	Approximately 1.0Ω

INDEX FOR DTC

PFP:00024

Alphabetical Index

EBS00DY1

X: Applicable —: Not applicable

Items (CONSULT-II screen terms)	DTC	MI illumination	Reference page
ACCEL POS SENSOR	P0120	×	EC-1802
ACCEL POS SW (F/C)	P1510	×	EC-1876
BATTERY VOLTAGE	P1660	×	EC-1887
CAM POS SEN/CIR	P0340	×	EC-1832
CAN COMM CIRCUIT	U1000	×	EC-1790
COOLANT TEMP SEN	P0115	×	EC-1798
CR PRES SEN	P0190	×	EC-1810
CRANK POS SEN (TDC)	P0335	×	EC-1827
CYL1 INJECTOR	P0201	×	EC-1814
CYL2 INJECTOR	P0202	×	EC-1814
CYL3 INJECTOR	P0203	×	EC-1814
CYL4 INJECTOR	P0204	×	EC-1814
ECM 1	P1606	×	EC-1881
ECM 10	P1107	×	EC-1838
ECM 15	P1621	—	EC-1883
FUEL LEAK FNCTN	P1305	×	EC-1874
INJ DRIVE UNIT	P1216	×	EC-1843
INJ1 CORREC R	P1301	—	EC-1870
INJ2 CORREC R	P1302	—	EC-1870
INJ3 CORREC R	P1303	—	EC-1870
INJ4 CORREC R	P1304	—	EC-1870
MAS AIR FLOW SEN	P0100	×	EC-1793
NATS MALFUNCTION	P1610 - P1617	—	EC-1748
NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	**P0000**	—	—
OVER HEAT	P1217	×	EC-1850
P9·FUEL TEMP SEN	P1180	×	EC-1840
SUCTION CONT/V1	P1233	×	EC-1865
SUCTION CONT/V2	P1234	×	EC-1865
TURBO PRESSURE	P0235	×	EC-1821
VEHICLE SPEED SEN	P0500	×	EC-1837

DTC No. Index

EBS00DY2

X: Applicable —: Not applicable

DTC	Items (CONSULT-II screen item)	MI illumination	Reference page
U1000	CAN COMM CIRCUIT	×	EC-1790
P0000	**NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.**	—	—
P0100	MASS AIR FLOW SEN	×	EC-1793
P0115	COOLANT TEMP SEN	×	EC-1798
P0120	ACCEL POS SENSOR	×	EC-1802

DTC	Items (CONSULT-II screen item)	MI illumination	Reference page
P0190	CR PRES SEN	×	EC-1810
P0201	CYL1 INJECTOR	×	EC-1814
P0202	CYL2 INJECTOR	×	EC-1814
P0203	CYL3 INJECTOR	×	EC-1814
P0204	CYL4 INJECTOR	×	EC-1814
P0235	TURBO PRESSURE	×	EC-1821
P0335	CRANK POS SEN (TDC)	×	EC-1827
P0340	CAM POS SEN/CIR	×	EC-1832
P0500	VEHICLE SPEED SEN	×	EC-1837
P1107	ECM 10	×	EC-1838
P1180	P9·FUEL TEMP SEN	×	EC-1840
P1216	INJ DRIVE UNIT	×	EC-1843
P1217	OVER HEAT	×	EC-1850
P1233	SUCTION CONT/V1	×	EC-1865
P1234	SUCTION CONT/V2	×	EC-1865
P1301	INJ1 CORREC R	—	EC-1870
P1302	INJ2 CORREC R	—	EC-1870
P1303	INJ3 CORREC R	—	EC-1870
P1304	INJ4 CORREC R	—	EC-1870
P1305	FUEL LEAK FNCTN	×	EC-1874
P1510	ACCEL POS SW (F/C)	×	EC-1876
P1606	ECM 1	×	EC-1881
P1610 - P1617	NATS MALFUNTION	—	EC-1748
P1621	ECM 15	—	EC-1883
P1660	BATTERY VOLTAGE	×	EC-1887

PRECAUTIONS

PFP:00001

Precautions for Supplemental Restraint System (SRS) “AIR BAG” and “SEAT BELT PRE-TENSIONER”

EBS00DY3

The Supplemental Restraint System such as "AIR BAG" and "SEAT BELT PRE-TENSIONER", used along with a front seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. Information necessary to service the system safely is included in the SRS and SB section of this Service Manual.

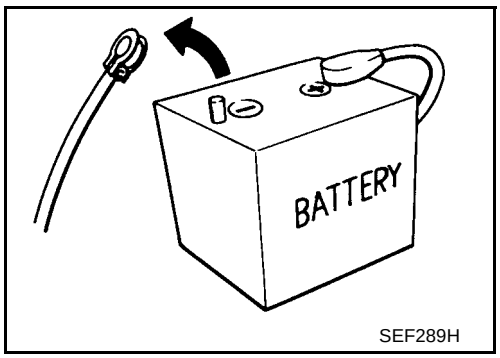
WARNING:

- **To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance must be performed by an authorized NISSAN/INFINITI dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system. For removal of Spiral Cable and Air Bag Module, see the SRS section.**
- **Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses can be identified by yellow and/or orange harness connectors.**

Precautions

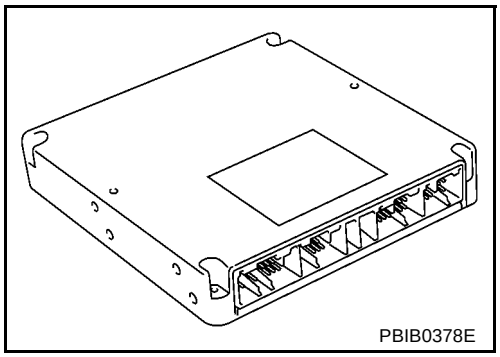
EBS00DY4

- **Before connecting or disconnecting the ECM harness connector, turn ignition switch OFF and disconnect negative battery terminal. Failure to do so may damage the ECM because battery voltage is applied to ECM even if ignition switch is turned off.**

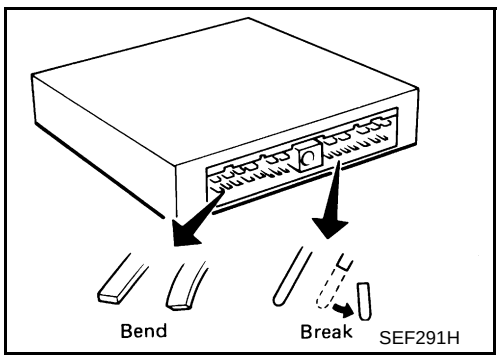


SEF289H

- **Do not disassemble ECM.**


PBIB0378E

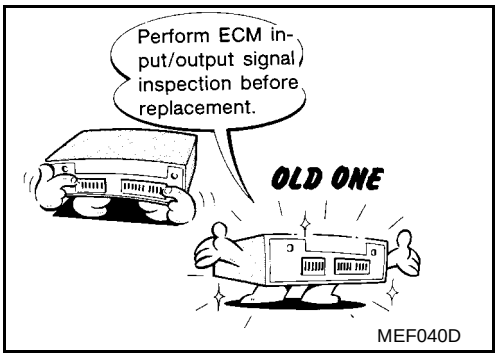
- **When connecting or disconnecting pin connectors into or from ECM, take care not to damage pin terminals (bend or break).**
  Make sure that there are not any bends or breaks on ECM pin terminal, when connecting pin connectors.
- **Securely connect ECM harness connectors.**
  A poor connection can cause an extremely high (surge) voltage to develop in coil and condenser, thus resulting in damage to IC’s.
- **Keep engine control system harness at least 10cm (4 in) away from adjacent harness, to prevent engine control system malfunctions due to receiving external noise, degraded operation of IC’s, etc.**



SEF291H

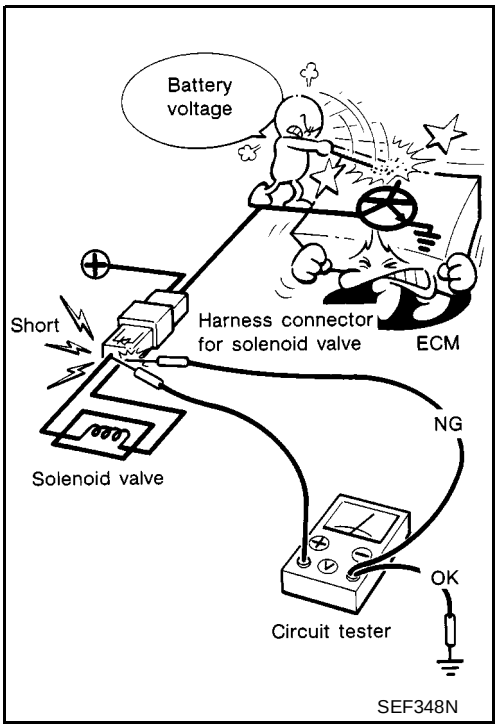
- Keep engine control system parts and harness dry.

- Before replacing ECM, perform Terminals and Reference Value inspection and make sure ECM functions properly. Refer to EC-1767 .
- After performing each TROUBLE DIAGNOSIS, perform “DTC Confirmation Procedure” or “Overall Function Check”.
  The DTC should not be displayed in the “ DTC Confirmation Procedure” if the repair is completed. The “Overall Function Check” should be a good result if the repair is completed.



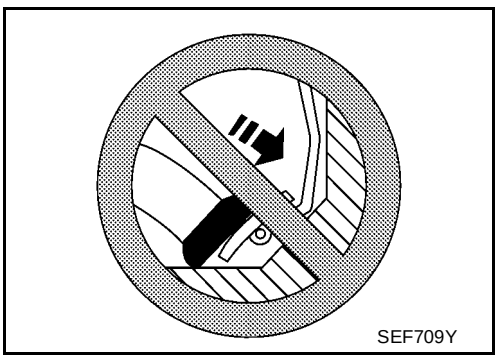
MEF040D

- When measuring ECM signals with a circuit tester, never allow the two tester probes to contact.
  Accidental contact of probes will cause a short circuit and damage the ECM power transistor.
- Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.
- Do not disconnect fuel supply pump harness connector with engine running.
- Do not disassemble fuel supply pump.
  If NG, take proper action.
- Do not disassemble fuel injector.
  If NG, replace fuel injector.
- Even a slight leak in the air intake system can cause serious problems.
- Do not shock or jar the crankshaft position sensor (TDC) and the camshaft position sensor.

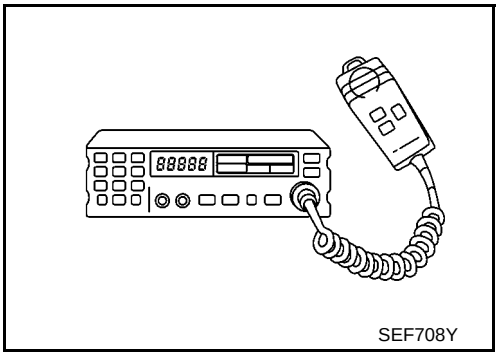


SEF348N

- Do not depress accelerator pedal when staring.
- Immediately after staring, do not rev up engine unnecessarily.
- Do not rev up engine just prior to shutdown.


SEF709Y

- **When installing C.B. ham radio or a mobile phone, be sure to observe the following as it may adversely affect electronic control systems depending on installation location.**
  - **Keep the antenna as far as possible from the electronic control units.**
  - **Keep the antenna feeder line more than 20 cm (8 in) away from the harness of electronic controls.**
    Do not let them run parallel for a long distance.
  - **Adjust the antenna and feeder line so that the standingwave radio can be kept smaller.**
  - **Be sure to ground the radio to vehicle body.**



Wiring Diagrams and Trouble Diagnosis

EBS00DY5

When you read Wiring diagrams, refer to the following:

- GI-14, "How to Read Wiring Diagrams".
- PG-3, "POWER SUPPLY ROUTING" for power distribution circuit

When you perform trouble diagnosis, refer to the following:

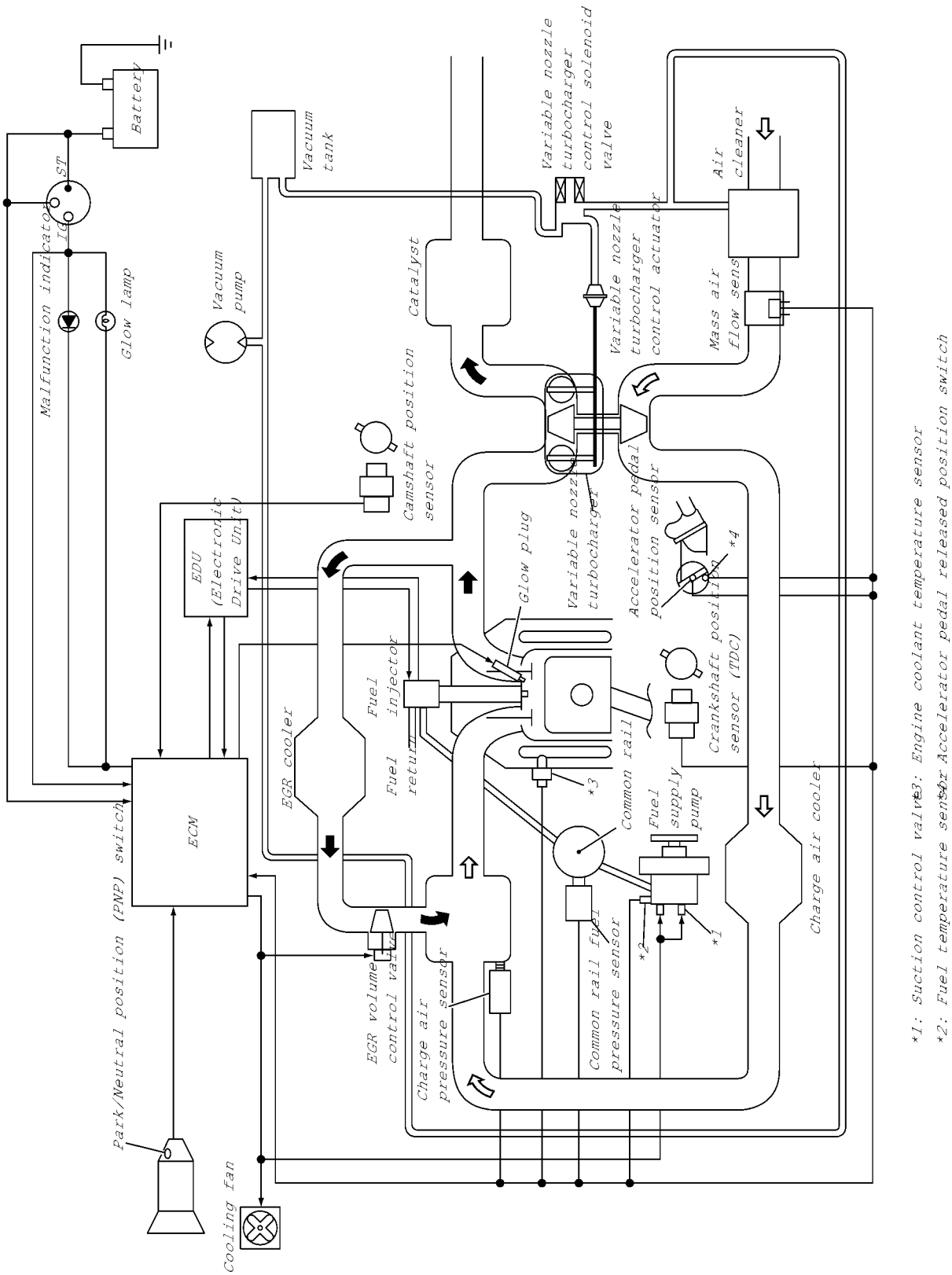
- GI-11, "HOW TO FOLLOW TEST GROUPS IN TROUBLE DIAGNOSES".
- GI-24, "How to Perform Efficient Diagnosis for an Electrical Incident".

ENGINE CONTROL SYSTEM

PFP:23710

System Diagram

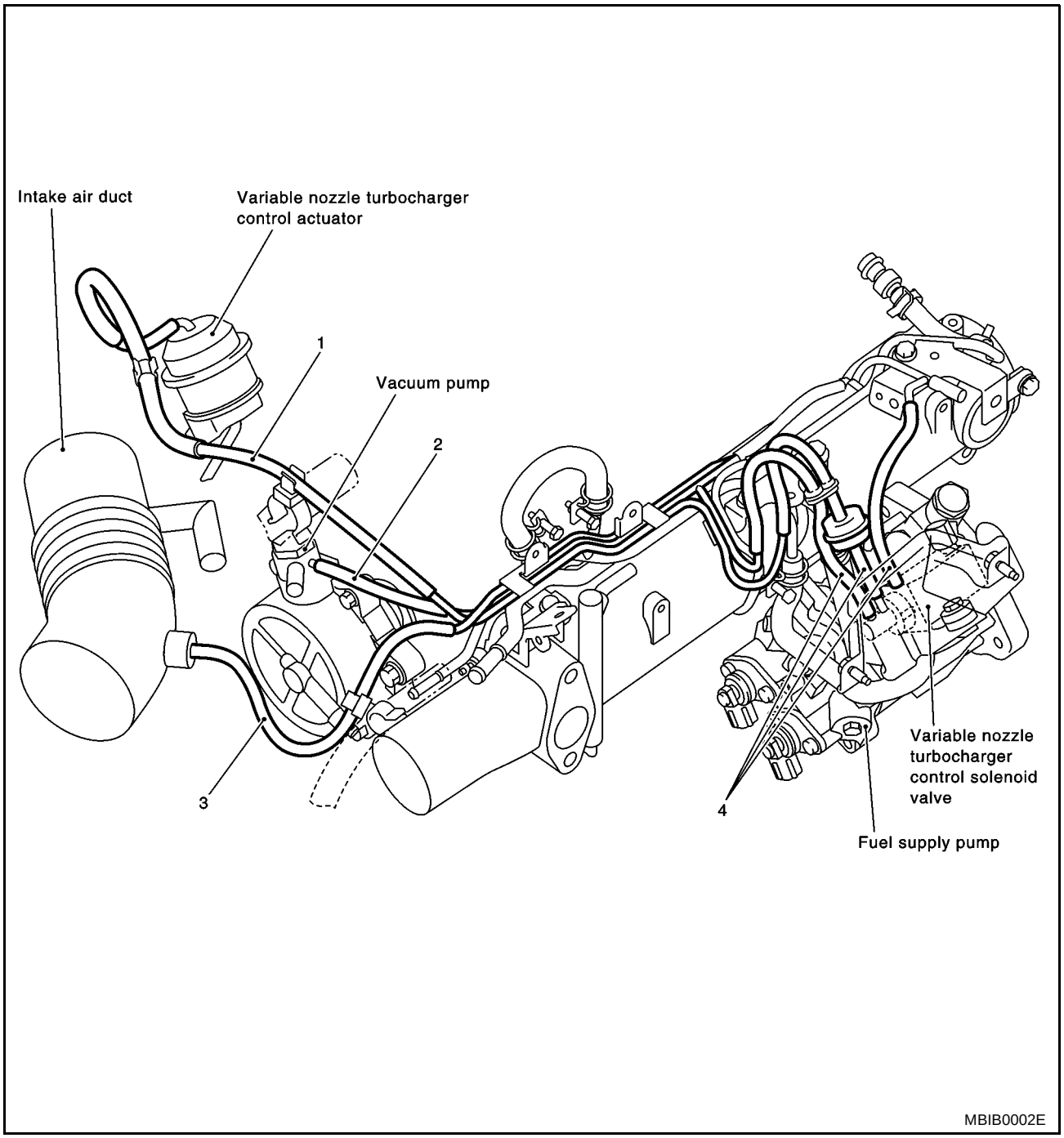
EBS00DY6



MBIB0008E

Vacuum Hose Drawing

EBS00GNW



1. Variable nozzle turbocharger control actuator to vacuum gallery
2. Vacuum pump to vacuum gallery
3. Intake air duct to vacuum gallery
4. Variable nozzle turbocharger control solenoid valve to vacuum gallery

Refer to EC-1735, "System Diagram" for vacuum control system.

System Chart

EBS00DY7

Input (Sensor)	ECM Function	Output (Actuator)
● Accelerator pedal position sensor ● Accelerator pedal released position switch ● Common rail fuel pressure sensor ● Fuel temperature sensor ● Engine coolant temperature sensor ● Crankshaft position sensor (TDC) ● Camshaft position sensor ● Vehicle speed sensor*1 ● Ignition switch ● Stop Lamp switch ● Air conditioner switch*1 ● Mass air flow sensor ● Charge air pressure sensor ● Park/neutral position switch ● Battery voltage ● Power steering oil pressure switch	Fuel injection control	EDU, Fuel injectors and Suction control valve
	Fuel injection timing control	EDU, Fuel injectors and Suction control valve
	Fuel cut control	EDU, Fuel injectors and Suction control valve
	Glow control system	● Glow relay ● Glow indicator lamp*2
	On board diagnostic system	Malfunction indicator (MI)*2
	EGR volume control	EGR volume control valve
	Cooling fan control	Cooling fan relay*2
	Air conditioning cut control	Air conditioner relay*2
	Variable nozzle turbocharger control	Variable nozzle turbocharger control solenoid valve

*1: The input signals are sent to the ECM through CAN communication line.
*2: The output signals are sent from the ECM through CAN communication line.

Fuel Injection Control System

EBS00DY8

SYSTEM DESCRIPTION

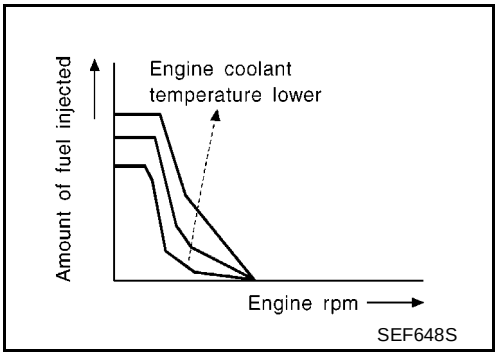
Three types of fuel injection control are provided to accommodate engine operating conditions; normal control, idle control and start control. The ECM determines the appropriate fuel injection control. Under each control, the amount of fuel injected is adjusted to improve engine performance.
Pulse signals are exchanged between ECM and Electronic Drive Unit (EDU). EDU controls fuel injectors according to the input signals to adjust the amount of fuel injected to the preset value.

START CONTROL

Input/Output Signal Chart

Sensor	Input Signal to ECM	ECM Function	Actuator
Engine coolant temperature sensor	Engine coolant temperature	Fuel injection control (start control)	EDU Fuel injectors Suction control valve
Crankshaft position sensor (TDC)	Engine speed		
Camshaft position sensor	Piston position		
Ignition switch	Start signal		
Common rail fuel pressure sensor	Common rail fuel pressure		

When the ECM receives a start signal from the ignition switch, the ECM adapts the fuel injection system for the start control. The amount of fuel injected at engine starting is a preset program value in the ECM. The program is determined by the engine speed, engine coolant temperature and common rail fuel pressure.
For better startability under cool engine conditions, the lower the coolant temperature becomes, the greater the amount of fuel injected. The ECM ends the start control when the engine speed reaches the specific value, and shifts the control to the normal or idle control.



IDLE CONTROL

Input/Output Signal Chart

Sensor	Input Signal to ECM	ECM Function	Actuator
Engine coolant temperature sensor	Engine coolant temperature	Fuel injection control (Idle control)	EDU Fuel injectors Suction control valve
Crankshaft position sensor (TDC)	Engine speed		
Battery	Battery voltage		
Accelerator pedal position sensor	Accelerator pedal position		
Accelerator pedal released position switch	Accelerator pedal released position		
Vehicle speed sensor*1	Vehicle speed		
Air conditioner switch*1	Air conditioner signal		
Common rail fuel pressure sensor	Common rail fuel pressure		

*1: These signals are sent to the ECM through CAN communication line.

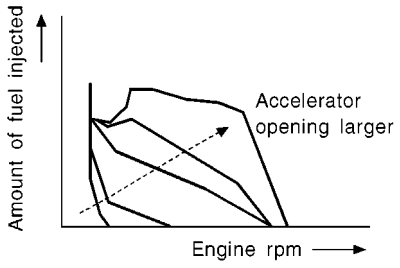
When the ECM determines that the engine speed is at idle, the fuel injection system is adapted for the idle control. The ECM regulates the amount of fuel injected corresponding to changes in load applied to the engine to keep engine speed constant. The ECM also provides the system with a fast idle control in response to the engine coolant temperature signal.

NORMAL CONTROL

Input/Output Signal Chart

Sensor	Input Signal to ECM	ECM Function	Actuator
Crankshaft position sensor (TDC)	Engine speed	Fuel injection control (Normal control)	EDU Fuel injectors Suction control valve
Accelerator pedal position sensor	Accelerator position		
Common rail fuel pressure sensor	Common rail fuel pressure		

The amount of fuel injected under normal driving conditions is determined according to sensor signals. The crankshaft position sensor (TDC) detects engine speed, the accelerator pedal position sensor detects accelerator pedal position and common rail fuel pressure sensor detects common rail fuel pressure. These sensors send signals to the ECM.
The fuel injection data, predetermined by correlation between various engine speeds, accelerator pedal positions and common rail fuel pressure are stored in the ECM memory, forming a map. The ECM determines the optimal amount of fuel to be injected using the sensor signals in comparison with the map.



SEF649S

MAXIMUM AMOUNT CONTROL

Input/Output Signal Chart

Sensor	Input Signal to ECM	ECM Function	Actuator
Mass air flow sensor	Amount of intake air	Fuel injection control (Maximum amount control)	EDU Fuel Injectors Suction control valve
Engine coolant temperature sensor	Engine coolant temperature		
Crankshaft position sensor (TDC)	Engine speed		
Accelerator pedal position sensor	Accelerator position		

The maximum injection amount is controlled to an optimum by the engine speed, intake air amount, engine coolant temperature, and accelerator opening in accordance with the driving conditions.
This prevents the oversupply of the injection amount caused by decreased air density at a high altitude or during a system failure.

DECELERATION CONTROL

Input/Output Signal Chart

Sensor	Input Signal to ECM	ECM Function	Actuator
Accelerator pedal released position switch	Accelerator pedal position	Fuel injection control (Deceleration control)	EDU Fuel injectors Suction control valve
Crankshaft position sensor (TDC)	Engine speed		

The ECM sends a fuel cut signal to the fuel injector and suction control valve during deceleration for better fuel efficiency. The ECM determines the time of deceleration according to signals from the accelerator pedal released position switch and crankshaft position sensor (TDC).

Fuel Injection Timing Control System

EBS00DY9

DESCRIPTION

The target fuel injection timing in accordance with the engine speed and the fuel injection amount are recorded as a map in the ECM beforehand. The ECM determines the optimum injection timing using sensor signals accordance with the map.

Air Conditioning Cut Control

EBS00DYA

INPUT / OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM Function	Actuator
Air conditioner switch*1	Air conditioner “ON” signal	Air conditioner cut control	Air conditioner relay
Accelerator pedal position sensor	Accelerator pedal opening angle		
Vehicle speed sensor*1	Vehicle speed		
Engine coolant temperature sensor	Engine coolant temperature		

*1: These signals are sent to the ECM through CAN communication line.

SYSTEM DESCRIPTION

This system improves acceleration when the air conditioner is used.
When the accelerator pedal is fully depressed, the air conditioner is turned off for a few seconds.
When engine coolant temperature becomes excessively high, the air conditioner is turned off. This continues until the engine coolant temperature returns to normal.

Fuel Cut Control (At No Load & High Engine Speed)

EBS00DYB

INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM Function	Actuator
Vehicle speed sensor*1	Vehicle speed	Fuel cut control	EDU Fuel injectors Suction control valve
Accelerator pedal released position switch	Accelerator position		
Crankshaft position sensor (TDC)	Engine speed		

*1: These signals are sent to the ECM through CAN communication line.

If the engine speed is above 2,800 rpm with no load (for example, in neutral and engine speed over 2,800 rpm) fuel will be cut off after some time. The exact time when the fuel is cut off varies based on engine speed. Fuel cut will operate until the engine speed reaches 1,500 rpm, then fuel cut is cancelled.

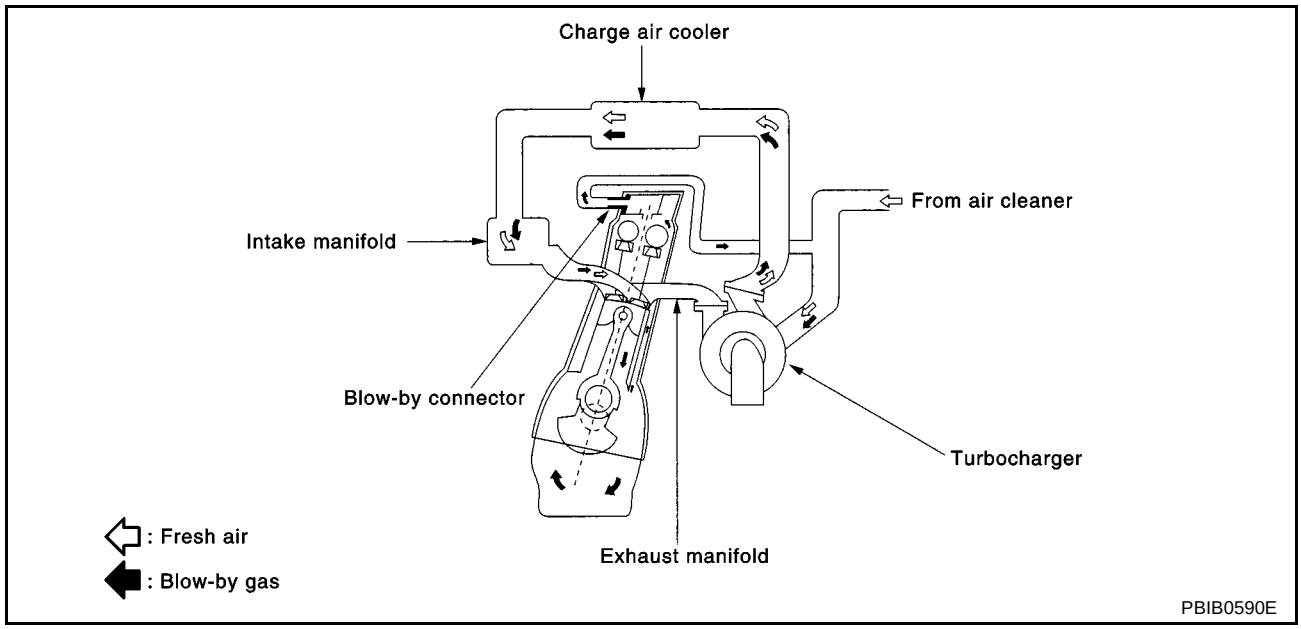
NOTE:
This function is different from deceleration control listed under EC-1737, "Fuel Injection Control System" .

Crankcase Ventilation System

EBS00DYC

DESCRIPTION

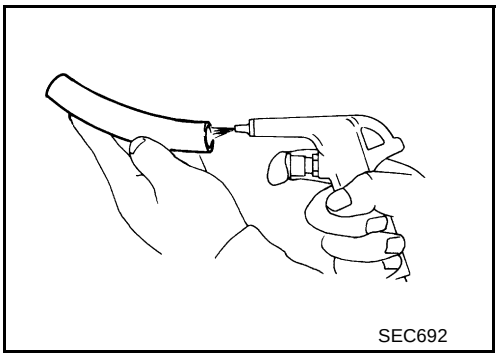
In this system, blow-by gas is sucked into the air duct after oil separation by oil separator in the rocker cover.



INSPECTION

Ventilation Hose

1. Check hoses and hose connections for leaks.
2. Disconnect all hoses and clean with compressed air. If any hose cannot be freed of obstructions, replace.



CAN communication

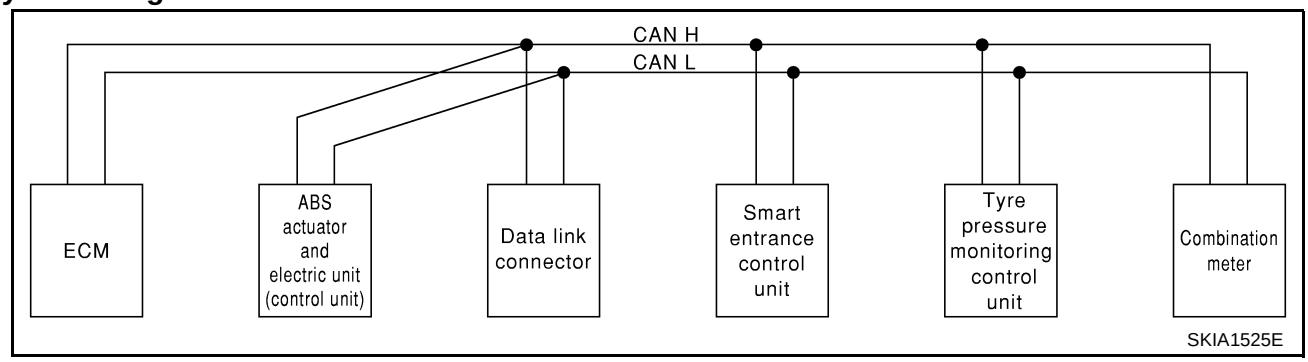
EBS00HBY

SYSTEM DESCRIPTION

CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent error detection ability. Many electronic control units are equipped onto a vehicle, and each control unit shares information and links with other control units during operation (not independent). In CAN communication, control units are connected with 2 communication lines (CAN H line, CAN L line) allowing a high rate of information transmission with less wiring. Each control unit transmits/receives data but selectively reads required data only.

LHD MODELS WITH TYRE PRESSURE MONITORING SYSTEM

System Diagram



Input/Output Signal Chart

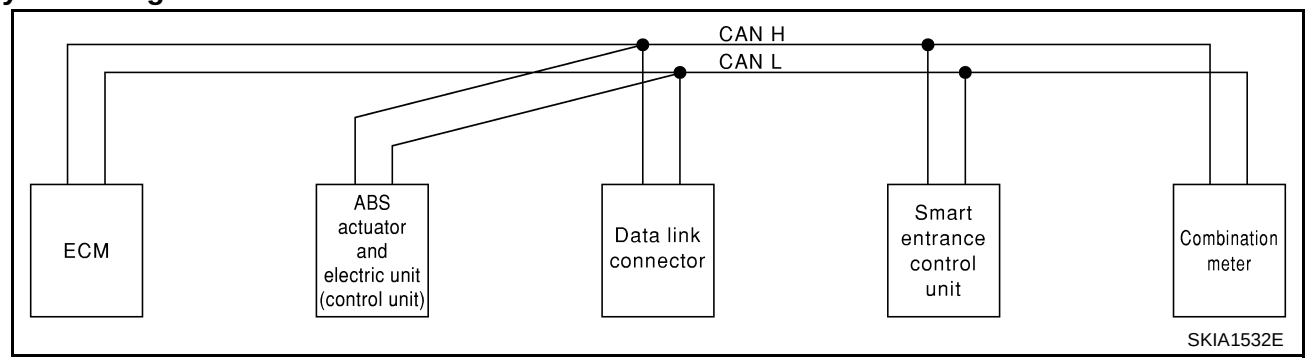
T: Transmit R: Receive

Signals	ECM	ABS actuator and electric unit (control unit)	Smart entrance control unit	Tyre pressure monitoring control unit	Combination meter
Engine speed signal	T				R
Rear window defogger signal	R*1		T		
Heater fan switch signal	R*1				T
Air conditioner switch signal	R				T
MI signal	T				R
Glow lamp signal*2	T				R
Engine coolant temperature signal	T				R
Fuel consumption signal	T				R
Vehicle speed signal		T			R
	R				T
Seat belt reminder signal			R		T
Headlamp switch signal			T		R
Flashing indicator signal			T		R
Engine cooling fan speed signal	T		R		
Child lock indicator signal			T		R
Door switches state signal			T		R
Key ID signal	R		T		
	T		R		
A/C compressor signal	T		R		
Tire pressure signal				T	R

*1: Except YD22DDTi engine model
*2: YD22DDTi engine model only

LHD MODELS WITHOUT TYRE PRESSURE MONITORING SYSTEM

System Diagram



Input/Output Signal Chart

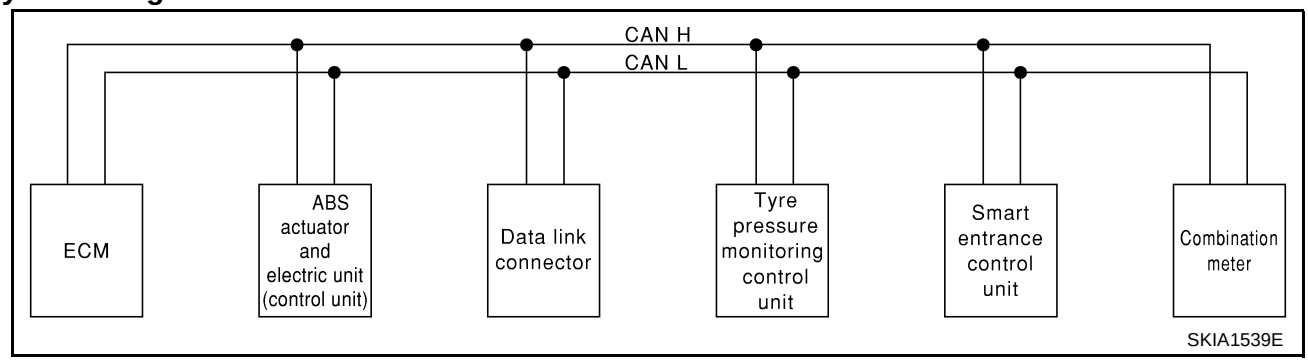
T: Transmit R: Receive

Signals	ECM	ABS actuator and electric unit (control unit)	Smart entrance control unit	Combination meter
Engine speed signal	T			R
Rear window defogger signal	R*1		T	
Heater fan switch signal	R*1			T
Air conditioner switch signal	R			T
MI signal	T			R
Glow lamp signal*2	T			R
Engine coolant temperature signal	T			R
Fuel consumption signal	T			R
Vehicle speed signal		T		R
	R			T
Seat belt reminder signal			R	T
Headlamp switch signal			T	R
Flashing indicator signal			T	R
Engine cooling fan speed signal	T		R	
Child lock indicator signal			T	R
Door switches state signal			T	R
Key ID signal	R		T	
	T		R	
A/C compressor signal	T		R	

*1: Except YD22DDTi engine model
*2:YD22DDTi engine model only

RHD MODELS WITH TYRE PRESSURE MONITORING SYSTEM

System Diagram



Input/Output Signal Chart

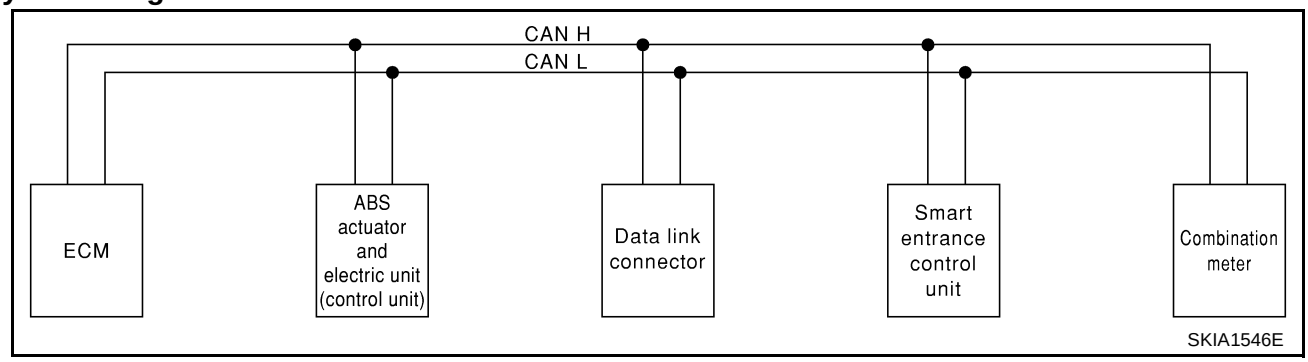
T: Transmit R: Receive

Signals	ECM	ABS actuator and electric unit (control unit)	Tyre pressure monitoring control unit	Smart entrance control unit	Combination meter
Engine speed signal	T				R
Rear window defogger signal	R*1			T	
Heater fan switch signal	R*1				T
Air conditioner switch signal	R				T
MI signal	T				R
Glow lamp signal*2	T				R
Engine coolant temperature signal	T				R
Fuel consumption signal	T				R
Vehicle speed signal		T			R
	R				T
Seat belt reminder signal				R	T
Headlamp switch signal				T	R
Flashing indicator signal				T	R
Engine cooling fan speed signal	T			R	
Child lock indicator signal				T	R
Door switches state signal				T	R
Key ID signal	R			T	
	T			R	
A/C compressor signal	T			R	
Tire pressure signal			T		R

*1: Except YD22DDTi engine model
*2: YD22DDTi engine model only

RHD MODELS WITHOUT TYRE PRESSURE MONITORING SYSTEM

System Diagram



Input/Output Signal Chart

T: Transmit R: Receive

Signals	ECM	ABS actuator and electric unit (control unit)	Smart entrance control unit	Combination meter
Engine speed signal	T			R
Rear window defogger signal	R*1		T	
Heater fan switch signal	R*1			T
Air conditioner switch signal	R			T
MI signal	T			R
Glow lamp signal*2	T			R
Engine coolant temperature signal	T			R
Fuel consumption signal	T			R
Vehicle speed signal		T		R
	R			T
Seat belt reminder signal			R	T
Headlamp switch signal			T	R
Flashing indicator signal			T	R
Engine cooling fan speed signal	T		R	
Child lock indicator signal			T	R
Door switches state signal			T	R
Key ID signal	R		T	
	T		R	
A/C compressor signal	T		R	

*1: Except YD22DDTi engine model
*2: YD22DDTi engine model only

BASIC SERVICE PROCEDURE

PFP:00018

Fuel Filter

EBS00DYD

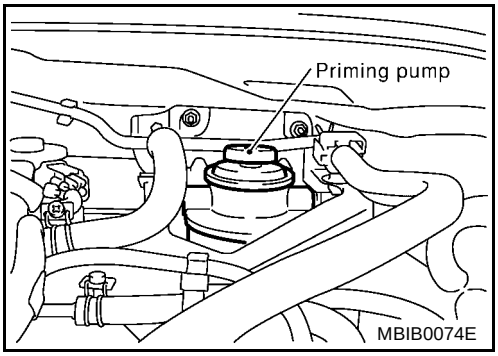
DESCRIPTION

A water draining cock is on the lower side and a priming pump for bleeding air is on the upper side.

AIR BLEEDING

Pump the priming pump to bleed air.

- When air is bled completely, the pumping of the priming pump suddenly becomes heavy. Stop the operation at that time.
- If it is difficult to bleed air by the pumping of the priming pump (the pumping of the priming pump does not become heavy), disconnect the fuel supply hose between the fuel filter and the fuel gallery. Then, perform the operation described above, and make sure that fuel comes out. (Use a pan, etc. so as not to spill fuel. Do not let fuel get on engine and other parts.) After that, connect the hose, then bleed air again.
- Start engine and let it idle for at least one minute after performing air bleeding.



WATER DRAINING

1. Remove the fuel filter, filter bracket, protector assembly from the dash panel as follows.

a. Remove the air cleaner case (upper), air duct assembly, and vacuum hose for brake booster (between the vacuum pump and vacuum pipe).

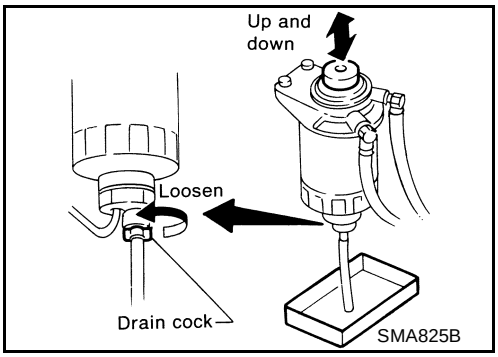
CAUTION:
After the duct is removed, cover the opening with gum tape, etc. to prevent foreign object from getting into the engine during the operation.

b. Remove the mounting nuts on the dash panel, then remove the fuel filter, filter bracket, and protector assembly from the dash panel.

- It is not necessary to disconnect the fuel hose.

2. Using a tool such as a pliers, loosen the water draining cock at the bottom of the fuel filter.
Loosening drain cock four to five turns causes water to start draining.
Do not remove drain cock by loosening it excessively.
If water dose not drain properly, move the priming up and down.

CAUTION:
When the water is drained, the fuel is also drained. Use a pan, etc. to avoid fuel adherence to the rubber parts such as the engine mount insulator.
Do not over-tighten the water draining cock. This will damage the cock thread, resulting in water or fuel leak.



3. Bleed air of the fuel filter. Refer to EC-1745, "AIR BLEEDING" .
4. Start the engine, then check that the MI goes off.

Accelerator Pedal Released Position Learning

EBS00DYE

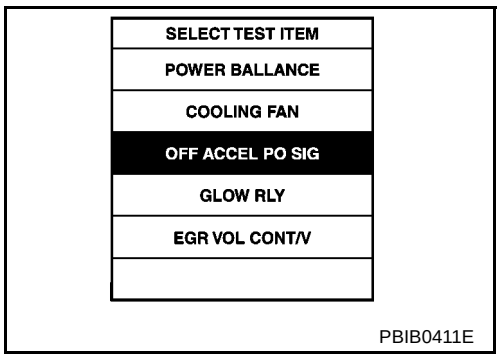
DESCRIPTION

“Accelerator Pedal Released Position Learning” is an operating to learn the fully released position of the accelerator pedal by monitoring the accelerator pedal position sensor output signal. It must be performed when accelerator work unit or ECM is replaced.

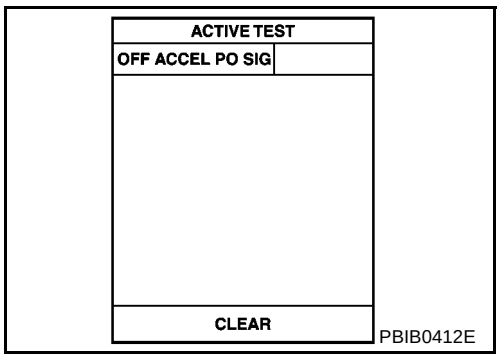
OPERATION PROCEDURE

1. Turn ignition switch “ON”.

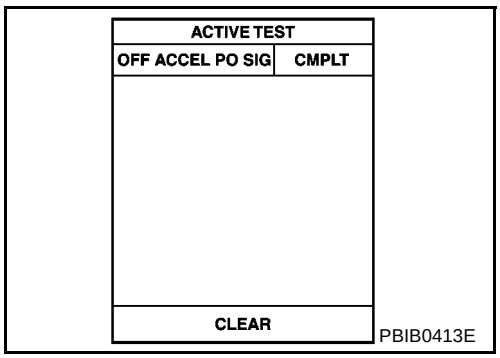
2. Select “OFF ACCEL PO SIG” in “ACTIVE TEST” mode with CONSULT-II
3. Make sure that accelerator pedal is released.



4. Touch “CLEAR” and wait a few seconds.



5. Make sure that “CMPLT” is displayed on CONSULT-II screen.



Fuel Pressure Relief Valve

EBS00DYF

DESCRIPTION

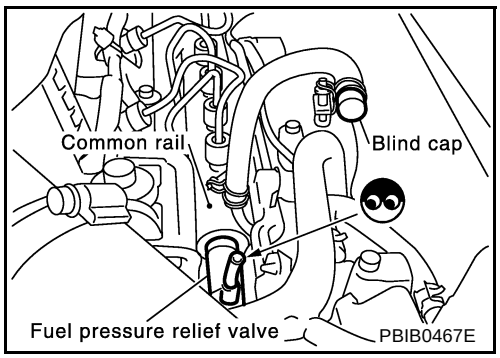
When the fuel pressure in common rail increases to excessively high, fuel pressure relief valve opens to carry excess fuel to the return hose.

FUEL PRESSURE RELIEF VALVE CHECK

WARNING:

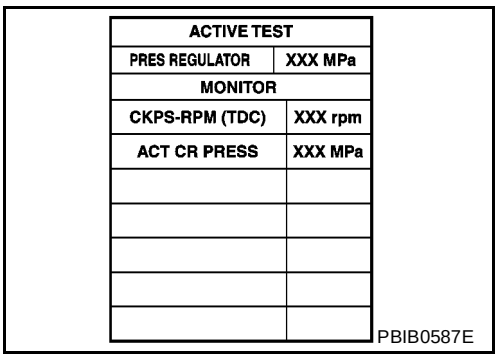
Confirm that the engine is cooled down and there are no fire hazards near the vehicle.

1. Turn ignition switch “OFF”.
2. Remove fuel hose from fuel pressure relief valve.
3. Attach a blind cap or plug to removed hose.
4. Turn ignition switch “ON”.



5. Select “PRES REGULATOR” in “ACTIVE TEST MODE” with CONSULT-II.
6. Start engine and keep engine speed 2,000 rpm.
7. Raise fuel pressure to 135 MPa with touching “UP” or “Qu” on the CONSULT-II screen.
8. Confirm that the fuel does not come out from the fuel pressure relief valve.

   WARNING:
   If the fuel comes out, stop the engine immediately.
9. If NG, replace common rail assembly.



ON BOARD DIAGNOSTIC (OBD) SYSTEM

PFP:00028

DTC and MI Detection Logic

EBS00DYG

When a malfunction is detected, the malfunction (DTC) is stored in the ECM memory.
The MI will light up each time the ECM detects malfunction. For diagnostic items causing the MI to light up, refer to EC-1730, "INDEX FOR DTC" .

Diagnostic Trouble Code (DTC)

EBS00DYH

HOW TO READ DTC

The DTC can be read by CONSULT-II only.

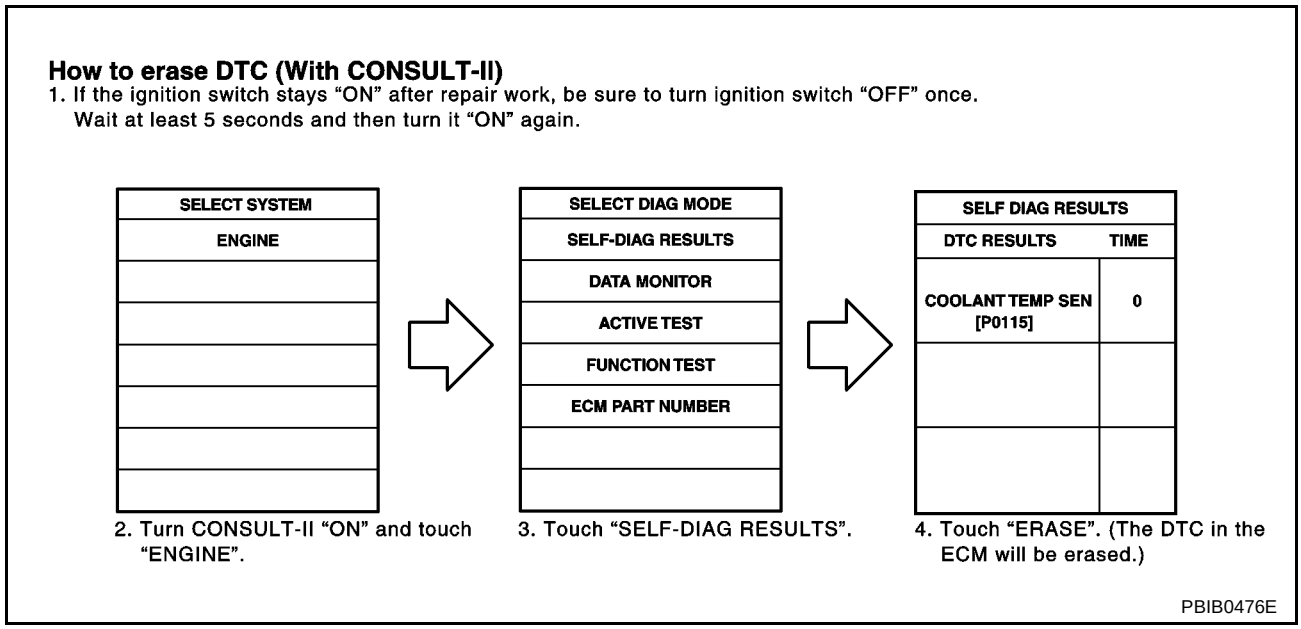
With CONSULT-II

CONSULT-II displays the DTC in “SELF-DIAG RESULTS” mode. Example: P0115, P0335, P1233, etc. These DTCs are prescribed by ISO15031-5.
(CONSULT-II also displays the malfunctioning component or system.)

HOW TO ERASE DTC

How to Erase DTC (With CONSULT-II)

1. If the ignition switch stays “ON” after repair work, be sure to turn ignition switch “OFF” once. Wait at least 5 seconds and then turn it “ON” (engine stopped) again.
2. Touch “ENGINE”.
3. Touch “SELF-DIAG RESULTS”.
4. Touch “ERASE”. (The DTC in the ECM will be erased.)

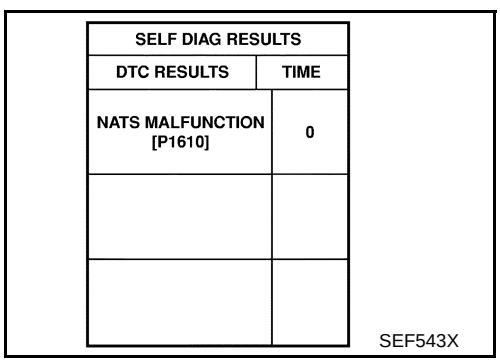


The emission related diagnostic information in the ECM can be erased by selecting “ERASE” in the “SELF-DIAG RESULTS” mode with CONSULT-II.

NATS (Nissan Anti-theft System)

EBS00DYI

- **If the security indicator lights up with the ignition switch in the “ON” position or “NATS MALFUNCTION” is displayed on “SELF-DIAG RESULTS” screen, perform self-diagnostic results mode with CONSULT-II using NATS program card. Refer to NATS (Nissan Anti-Theft System) in BL section.**
- **Confirm no self-diagnostic results of NATS is displayed before touching “ERASE” in “SELF-DAIG RESULTS” mode with CONSULT-II.**
- **When replacing ECM, initialization of NATS system and registration of all NATS ignition key IDs must be carried out with CONSULT-II using NATS program card.**



Therefore, be sure to receive all keys from vehicle owner. Regarding the procedure of NATS initialization and NATS ignition key ID registration, refer to CONSULT-II operation manual, NATS.

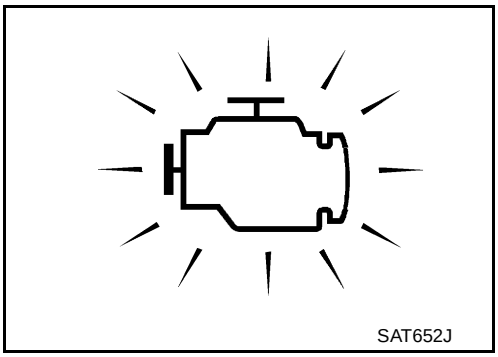
Malfunction Indicator (MI)

EBS00DYJ

DESCRIPTION

The MI is located on the instrument panel.

1. The MI will light up when the ignition switch is turned ON without the engine running. This is a bulb check.
   - If the MI does not light up, refer to DI-95, "WARNING LAMPS" or see EC-1922 .
2. When the engine is started, the MI should go off.
   If the MI remains on, the on board diagnostic system has detected an engine system malfunction.


SAT652J

On Board Diagnostic System Function

The on board diagnostic system has the following two functions.

Diagnostic Test Mode	KEY and ENG. Status	Function	Explanation of Function
Mode I	Ignition switch in ON position  Engine stopped 	BULB CHECK	This function checks the MI bulb for damage (blown, open circuit, etc.). If the MI does not come on, check MI circuit. (See EC-1922, "MI & DATA LINK CONNECTORS" .)
	Engine running 	MALFUNCTION WARNING	This is a usual driving condition. When ECM detects a malfunction, the MI will light up to inform the driver that a malfunction has been detected.

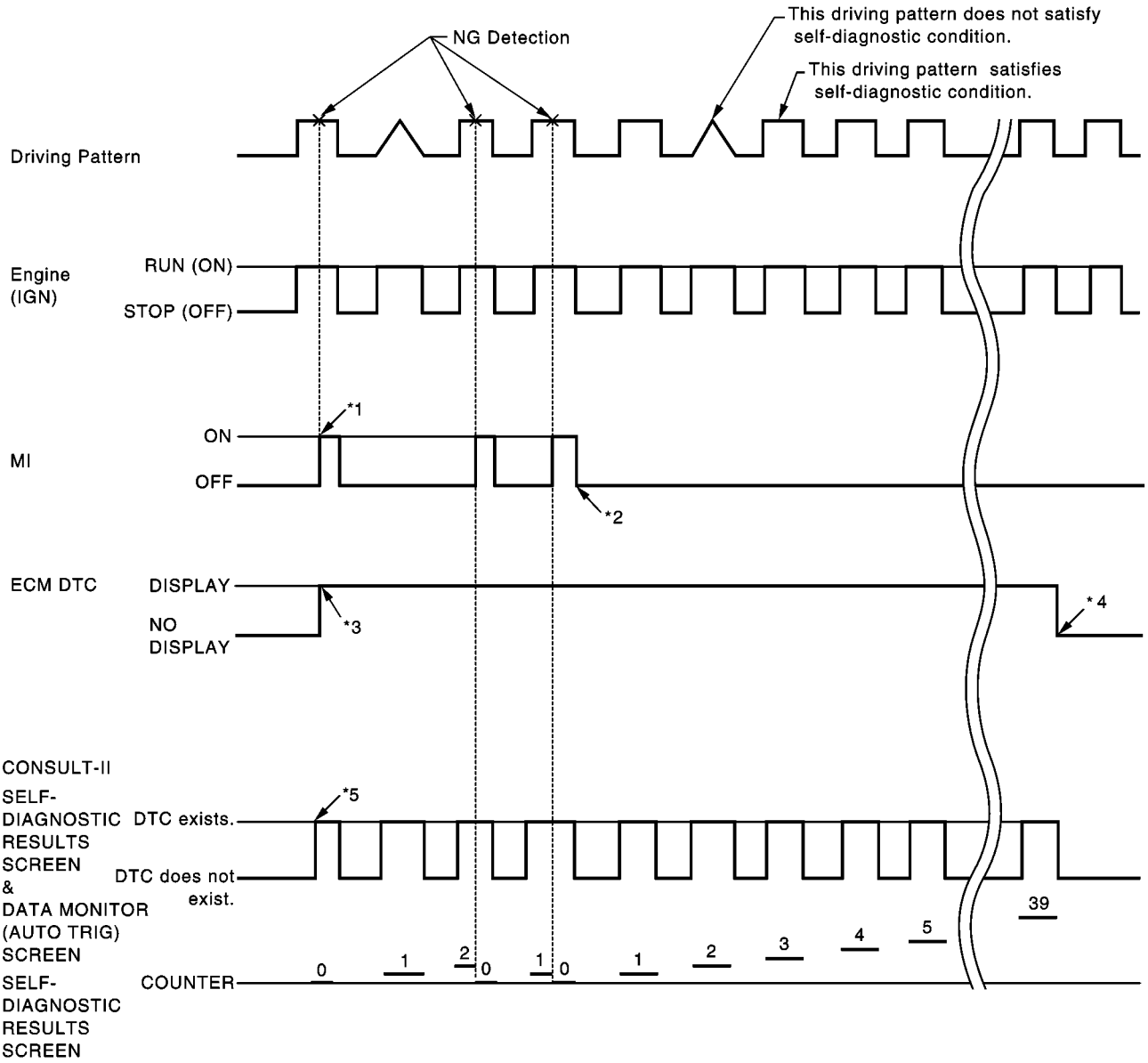
Diagnostic Test Mode I - Bulb Check

In this mode, the MI on the instrument panel should stay ON. If it remains OFF, check the bulb. Refer to DI-95, "WARNING LAMPS" or see EC-1922 .

Diagnostic Test Mode I - Malfunction Warning

MI	Condition
ON	When the malfunction is detected or the ECM's CPU is malfunctioning.
OFF	No malfunction.

Relationship Between MI, DTC, CONSULT-II and Driving Patterns



PBIB0589E

*1: When a malfunction is detected, MI will light up.

*2: MI will not light up after ignition switch is turned OFF.

*3: When a malfunction is detected for the first time, the DTC will be stored in ECM.

*4: The DTC will not be displayed any longer after vehicle is driven 40 times without the same malfunction. (The DTC still remain in ECM.)

*5: Other screens except SELF-DIAGNOSTIC RESULTS & DATA MONITOR (AUTO TRIG) cannot display the malfunction. DATA MONITOR (AUTO TRIG) can display the malfunction at the moment it is detected.

TROUBLE DIAGNOSIS

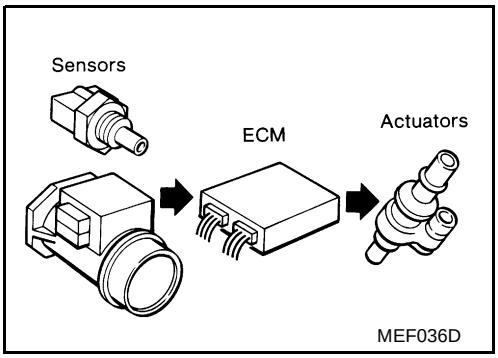
PFP:00004

Trouble Diagnosis Introduction

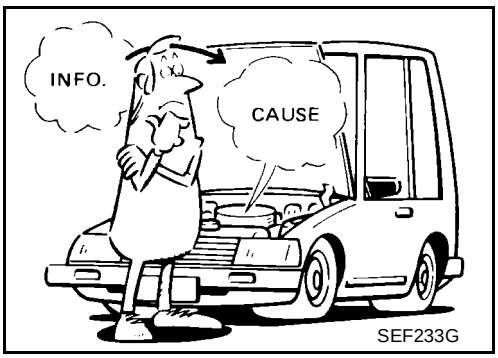
EBS00DYK

INTRODUCTION

The engine has an ECM to control major systems such as fuel injection control, fuel injection timing control, glow control system, etc. The ECM accepts input signals from sensors and instantly actuators. It is essential that both input and output signals are proper and stable. At the same time, it is important that there are no problems such as vacuum leaks, or other problems with the engine.



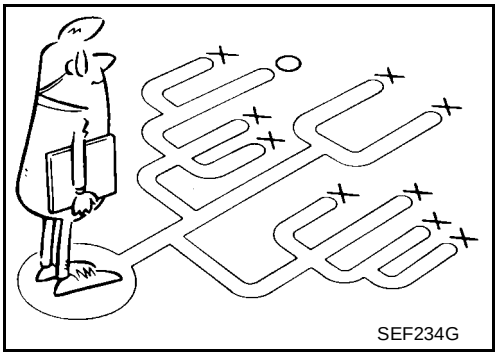
It is much more difficult to diagnose a problem that occurs intermittently rather than continuously. Most intermittent problems are caused by poor electric connections or improper wiring. In this case, careful checking of suspected circuits may help prevent the replacement of good parts.



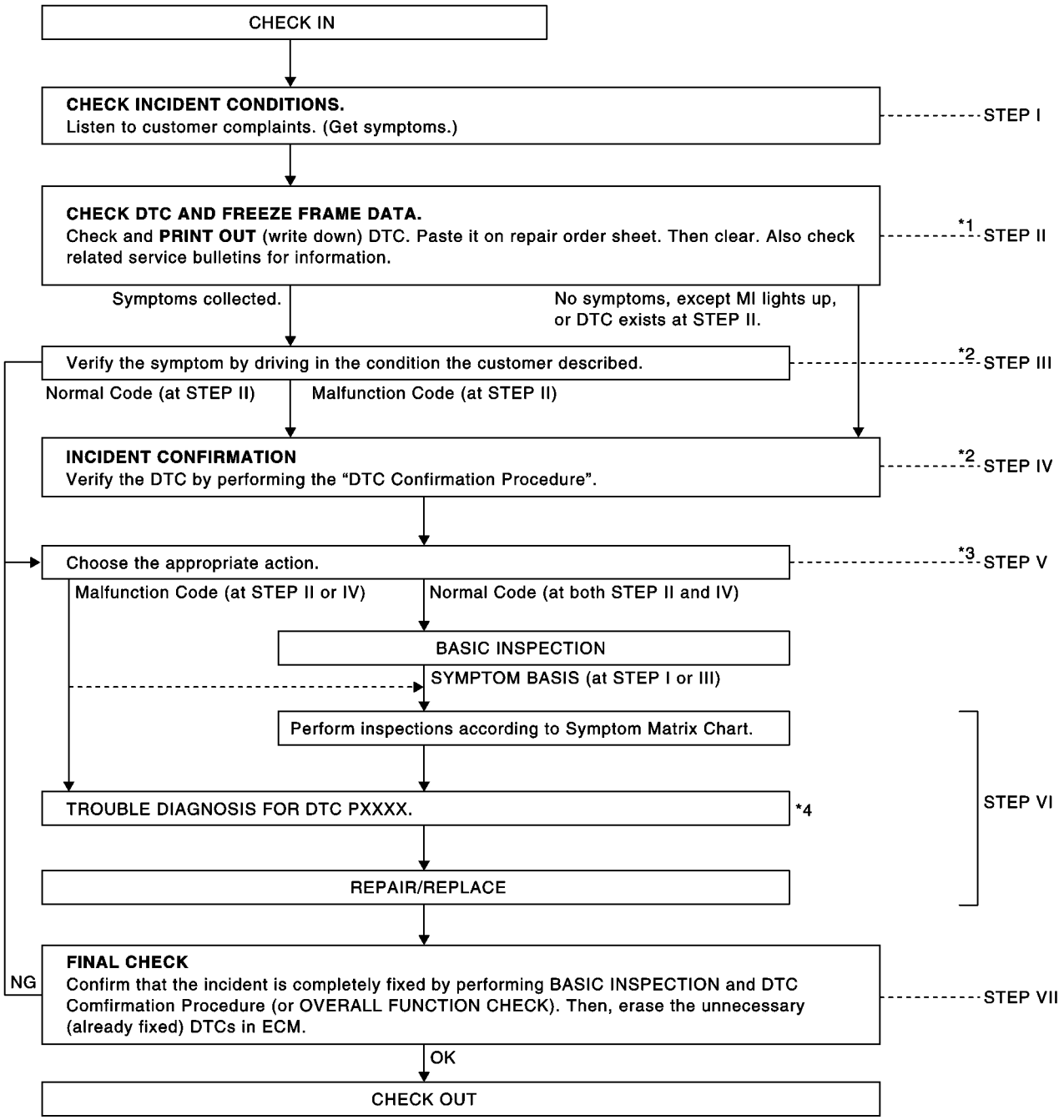
A visual check only may not find the cause of the problems. A road test with CONSULT-II or a circuit tester connected should be performed. Follow the EC-1752, "WORK FLOW" .

Before undertaking actual checks, take a few minutes to talk with a customer who approaches with a driveability complaint. The customer can supply good information about such problems, especially intermittent ones. Find out what symptoms are present and under what conditions they occur. A “Diagnostic Worksheet” like the example on EC-1753, "DIAGNOSTIC WORK SHEET" should be used.

Start your diagnosis by looking for “conventional” problems first. This will help troubleshoot driveability problems on an electronically controlled engine vehicle.



WORK FLOW



PBIB0477E

*1 If time data of "SELF-DIAG RESULTS" is other than "0", perform EC-1783, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

*2 If the incident cannot be verified, perform EC-1783, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

*3 If the on board diagnostic system cannot be performed, check main power supply and ground circuit. Refer to EC-1784, "POWER SUPPLY CIRCUIT FOR ECM" .

*4 If malfunctioning part cannot be detected, perform EC-1783, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

Description for Work Flow

STEP	DESCRIPTION
STEP I	Get detailed information about the conditions and the environment when the incident/symptom occurred using the EC-1753, "DIAGNOSTIC WORK SHEET" .
STEP II	Before confirming the concern, check and write down (print out using CONSULT-II) the DTC, then erase the DTC. Refer to EC-1748 . If the incident cannot be verified, perform EC-1783, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" . Study the relationship between the cause, specified by DTC, and the symptom described by the customer. (The “Symptom Matrix Chart” will be useful. Refer to EC-1758 .) Also check related service bulletins for information.
STEP III	Try to confirm the symptom and under what conditions the incident occurs. The “DIAGNOSTIC WORK SHEET” is useful to verify the incident. Connect CONSULT-II to the vehicle in DATA MONITOR (AUTO TRIG) mode and check real time diagnosis results. If the incident cannot be verified, perform EC-1783, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" . If the malfunction code is detected, skip STEP IV and perform STEP V.
STEP IV	Try to detect the DTC by driving in (or performing) the “DTC Confirmation Procedure”. Check and read the DTC by using CONSULT-II. During the DTC verification, be sure to connect CONSULT-II to the vehicle in DATA MONITOR (AUTO TRIG) mode and check real time diagnosis results. If the incident cannot be verified, perform EC-1783, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" . In case the “DTC Confirmation Procedure” is not available, perform the “Overall Function Check” instead. The DTC cannot be displayed by this check, however, this simplified “check” is an effective alternative. The “NG” result of the “Overall Function Check” is the same as the DTC detection.
STEP V	Take the appropriate action based on the results of STEP I through IV. If the malfunction code is indicated, proceed to Trouble Diagnosis for DTC PXXXX. If the normal code is indicated, proceed to the Basic Inspection, EC-1754 . Then perform inspections according to the Symptom Matrix Chart. Refer to EC-1758 .
STEP VI	Identify where to begin diagnosis based on the relationship study between symptom and possible causes. Inspect the system for mechanical binding, loose connectors or wiring damage using (tracing) “Harness Layouts”. Gently shake the related connectors, components or wiring harness with CONSULT-II set in “DATA MONITOR (AUTO TRIG)” mode. Check the voltage of the related ECM terminals or monitor the output data from the related sensors with CONSULT-II. Refer to EC-1767 or EC-1779 . The “Diagnostic Procedure” in EC section contains a description based on open circuit inspection. A short circuit inspection is also required for the circuit check in the Diagnostic Procedure. For details, refer to GI-24, "How to Perform Efficient Diagnosis for an Electrical Incident" , “Circuit Inspection”. Repair or replace the malfunction parts. If the malfunctioning part cannot be detected, perform EC-1783, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .
STEP VII	Once you have repaired the circuit or replaced a component, you need to run the engine in the same conditions and circumstances which resulted in the customer's initial complaint. Perform the “DTC Confirmation Procedure” and confirm the normal code (DTC P0000) is detected. If the incident is still detected in the final check, perform STEP VI by using a different method from the previous one. Before returning the vehicle to the customer, be sure to erase the unnecessary (already fixed) DTC in ECM. (Refer to EC-1748 .)

DIAGNOSTIC WORK SHEET

There are many operating conditions that lead to the malfunction of engine components. A good grasp of such conditions can make troubleshooting faster and more accurate.

In general, each customer feels differently about a problem. It is important to fully understand the symptoms or conditions for a customer complaint.

Utilize a diagnostic worksheet like the one shown below in order to organize all the information for troubleshooting.

KEY POINTS

WHAT ..... Vehicle & engine model
WHEN ..... Date, Frequencies
WHERE..... Road conditions
HOW ..... Operating conditions, Weather conditions, Symptoms

SEF907L

Worksheet Sample

Customer name MR/MS		Model & Year	VIN
Engine #		Trans.	Mileage
Incident Date		Manuf. Date	In Service Date
Symptoms	☐ Startability	☐ Impossible to start ☐ No combustion ☐ Partial combustion ☐ Partial combustion affected by throttle position ☐ Partial combustion when engine is cool ☐ Possible but hard to start ☐ Others [ ]	
	☐ Idling	☐ No fast idle ☐ Unstable ☐ High idle ☐ Low idle ☐ Others [ ]	
	☐ Driveability	☐ Stumble ☐ Surge ☐ Knock ☐ Lack of power ☐ Others [ ]	
	☐ Engine stall	☐ At the time of start ☐ While idling ☐ While accelerating ☐ While decelerating ☐ Just after stopping ☐ While loading	
Incident occurrence		☐ Just after delivery ☐ Recently ☐ In the morning ☐ At night ☐ In the daytime	
Frequency		☐ All the time ☐ Under certain conditions ☐ Sometimes	
Weather conditions		☐ Not affected	
	Weather	☐ Fine ☐ Raining ☐ Snowing ☐ Others [ ]	
	Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold ☐ Humid °F	
Engine conditions		☐ Cold ☐ During warm-up ☐ After warm-up Engine speed 0 2,000 4,000 6,000 8,000 rpm	
Road conditions		☐ In town ☐ In suburbs ☐ Highway ☐ Off road (up/down)	
Driving conditions		☐ Not affected ☐ At starting ☐ While idling ☐ At racing ☐ While accelerating ☐ While cruising ☐ While decelerating ☐ While turning (RH/LH) Vehicle speed 0 10 20 30 40 50 60 MPH	
Malfunction indicator		☐ Turned on ☐ Not turned on	

MTBL0533

Basic Inspection

EBS00DYL

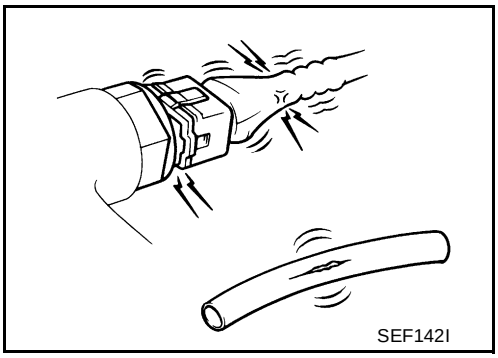
Precaution:
Perform Basic Inspection without electrical or mechanical loads applied;

- **Headlamp switch is OFF.**
- **On vehicles equipped with daytime light systems, set lighting switch to the 1st position to light only small lamps.**
- **Air conditioner switch is OFF.**
- **Rear defogger switch is OFF.**
- **Steering wheel is in the straight-ahead position, etc.**

1. INSPECTION START

1. Check service records for any recent repairs that may indicate a related problem.
2. Check the current need for scheduled maintenance, especially for fuel filter and air cleaner filter. Refer to MA-7, "PERIODIC MAINTENANCE" .
3. Open engine hood and check the following:
- Harness connectors for improper connections
- Vacuum hoses for splits, kinks, or improper connections
- Wiring for improper connections, pinches, or cuts
4. Start engine and warm it up to the normal operating temperature.

>> GO TO 2.


SEF142I

2. PREPARATION FOR CHECKING IDLE SPEED

With CONSULT-II

Connect CONSULT-II to the data link connector.

>> GO TO 3.

3. CHECK IDLE SPEED

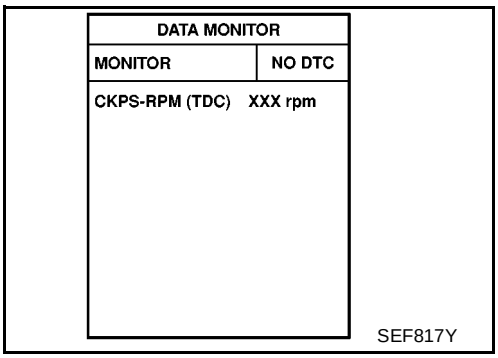
With CONSULT-II

1. Select “CKPS·RPM (TDC)” in “DATA MONITOR” mode with CONSULT-II.
2. Read idle speed.

725±25 rpm

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 4.



SEF817Y

4. CHECK FOR INTAKE AIR LEAK

Listen for an intake air leak after the mass air flow sensor.

OK or NG

OK >> GO TO 5.
NG >> Repair or replace.

5. BLEED AIR FROM FUEL SYSTEM

1. Stop engine.
2. Use priming pump to bleed air from fuel system. Refer to EC-1745, "AIR BLEEDING" .

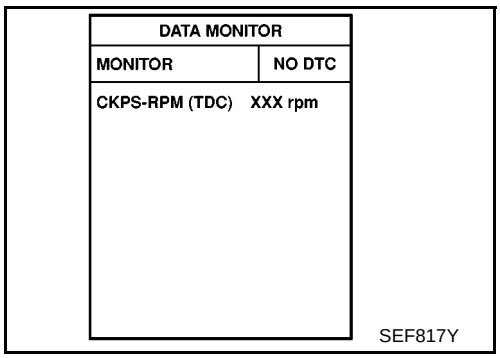
>> GO TO 6.

6. CHECK IDLE SPEED AGAIN

With CONSULT-II

1. Start engine and let it idle.
2. Select “CKPS·RPM (TDC)” in “DATA MONITOR” mode with CONSULT-II.
3. Read idle speed.

725±25 rpm



OK or NG

OK >> **INSPECTION END**
NG >> GO TO 7.

7. DRAIN WATER FROM FUEL FILTER

Drain water from fuel filter. Refer to EC-1745, "WATER DRAINING" .

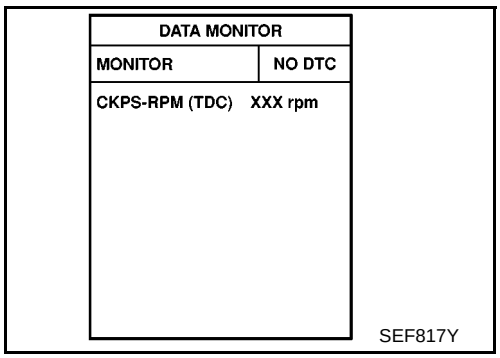
>> GO TO 8.

8. CHECK IDLE SPEED AGAIN

With CONSULT-II

1. Start engine and let it idle.
2. Select “CKPS·RPM (TDC)” in “DATA MONITOR” mode with CONSULT-II.
3. Read idle speed.

725±25 rpm



OK or NG

OK >> **INSPECTION END**
NG >> GO TO 9.

9. CHECK AIR CLEANER FILTER

Check air cleaner filter for clogging or breaks.

OK or NG

OK >> GO TO 10.
NG >> Replace air cleaner filter.

10. CHECK BATTERY VOLTAGE

Check battery voltage.

Voltage: More than 12.13V

OK or NG

OK >> GO TO 12.
NG >> GO TO 11.

11. CHECK BATTERY

Refer to SC-3, "BATTERY" .

OK or NG

OK >> Check charging system. Refer to SC-12, "CHARGING SYSTEM" .
NG >> Repair or replace.

12. CHECK COMPRESSION PRESSURE

Check compression pressure. Refer to EM-274, "CHECKING COMPRESSION PRESSURE" .

OK or NG

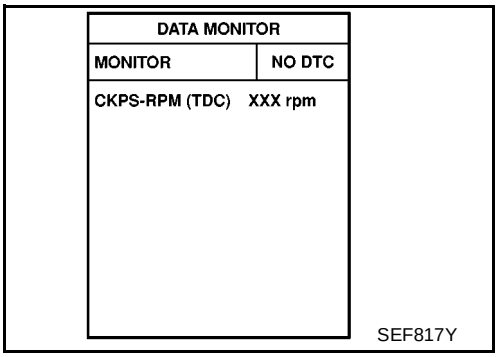
OK >> GO TO 11.
NG >> Follow the instruction of “CHECKING COMPRESSION PRESSURE”.

13. CHECK IDLE SPEED AGAIN

With CONSULT-II

1. Start engine and let it idle.
2. Select “CKPS·RPM (TDC)” in “DATA MONITOR” mode with CONSULT-II.
3. Read idle speed.

725±25 rpm



OK or NG

OK >> **INSPECTION END**
NG >> 1. Replace fuel injector.
2. GO TO 3.

Symptom Matrix Chart

EBS00DYM

SYSTEM — Basic engine control system		SYMPTOM													Reference page
		HARD/NO START/RESTART (EXCP. HA)				ENGINE STALL			HESITATION/SURGING/FLAT SPOT	KNOCK/DETONATION	LACK OF POWER	POOR ACCELERATION	HI IDLE	LOW IDLE	
		NO START (with first firing)	NO START (without first firing)	HARD TO START WHEN ENGINE IS COLD	HARD TO START WHEN ENGINE IS HOT	AT IDLE	DURING DRIVING	WHEN DECELERATING							
Warranty symptom code		AA				AB			AC	AD	AE		AF		
Fuel supply pump		5	5	5	5	5	5	5	5		5	5		5	—
Fuel injector		3	3	3	3	3	3	3	3	3	4	4	3	3	EC-1814
EDU (Electronic drive unit)		4	4	4	4	4	4	4	4	4	5	5	4	4	EC-1843
Glow control system		1	1	1	1					1					EC-1889
Engine body		3	3	3	3	3	3	3		3	4	4		3	EM-285
EGR system											3	3			EC-1896
Air cleaner and duct											3	3			MA-7
Fuel pressure relief valve															EC-1746
ENGINE CONTROL	Suction control valve circuit	4	4	4	4	4	4	4	4		4	4		4	EC-1865
	Fuel injector circuit	1	1	1	1	1	1	1	1	1	1	1	1	1	EC-1814
	EDU circuit	2	2	2	2	2	2	2	2	2	2	2	2	2	EC-1843
	Mass air flow sensor circuit								1		1	1			EC-1793
	Engine coolant temperature circuit			1		1		1						1	EC-1798
	Vehicle speed signal circuit											1			EC-1837
	Accelerator pedal position sensor circuit								1		1	1			EC-1802
	Accelerator pedal released position switch circuit					1		1	1		1	1		1	EC-1876
	Common rail fuel pressure sensor circuit														EC-1810

SYSTEM — Basic engine control system		SYMPTOM													Reference page
		HARD/NO START/RESTART (EXCP. HA)				ENGINE STALL			HESITATION/SURGING/FLAT SPOT	KNOCK/DETONATION	LACK OF POWER	POOR ACCELERATION	HI IDLE	LOW IDLE	
		NO START (with first firing)	NO START (without first firing)	HARD TO START WHEN ENGINE IS COLD	HARD TO START WHEN ENGINE IS HOT	AT IDLE	DURING DRIVING	WHEN DECELERATING							
Warranty symptom code		AA				AB			AC	AD	AE		AF		
ENGINE CONTROL	Crankshaft position sensor (TDC) circuit		1	1	1	1	1	1	1	1	1	1			EC-1827
	Camshaft position sensor circuit			3	3										EC-1832
	Charge air pressure sensor circuit								1		1	1			EC-1821
	Variable nozzle turbocharger control solenoid valve circuit								1		1	1			EC-1903
	Start signal circuit	1	1	1	1	1		1	1		1	1			EC-1916
	Ignition switch circuit		1			1	1	1							EC-1784
	Power supply for ECM circuit		1			1	1	1							EC-1784
	Cooling fan relay circuit														EC-1850
	EGR volume control valve circuit								1		1	1			EC-1896
	Glow relay circuit	1	1	1	1										EC-1889
	ECM relay (Self-shutoff) circuit		1				1	1	1						EC-1883
	ECM, connector circuit	2	2	2	2	2	2	2	2	2	2	2	2	2	EC-1838, EC-1881
NATS (Nissan Anti-theft System)			1												EC-1748

1 - 5: The numbers refer to the order of inspection.

(continued on next page)

SYSTEM — Basic engine control system		SYMPTOM											Reference page
		ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEAT/HIGH ENGINE COOLANT TEMPERATURE	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	ABNORMAL SMOKE COLOR		DEAD BATTERY (UNDER CHARGE)	Malfunction indicator illuminates.	Can be detected by CONSULT-II?	
								BLACK SMOKE	WHITE SMOKE				
Warranty symptom code		AG	AH	AJ	AK	AL	AM	AP		HA			
Fuel supply pump		5	5	5		5					1	1	—
Fuel injector		3	3	3		4		4	4		1	1	EC-1814
EDU (Electronic drive unit)		4	4	4		5		5	5		1	1	EC-1843
Glow system									1				EC-1889
Engine body			3	3	3	3	1		3				EM-285
EGR system								3					EC-1896
Air cleaner and duct								3					MA-7
Fuel pressure relief valve													EC-1746
ENGINE CONTROL	Suction control valve circuit	4	4	4		4					1	1	EC-1865
	Fuel injector circuit	1	1	1		1		1	1		1	1	EC-1814
	EDU circuit	2	2	2		2		2	2		1	1	EC-1843
	Mass air flow sensor circuit							1			1	1	EC-1793
	Engine coolant temperature circuit	1	1		1						1	1	EC-1798
	Vehicle speed signal circuit										1	1	EC-1837
	Accelerator pedal position sensor circuit			1							1	1	EC-1802
	Accelerator pedal released position switch circuit										1	1	EC-1876
	Common rail fuel pressure sensor circuit										1	1	EC-1810
	Crankshaft position sensor (TDC) circuit	1	1								1	1	EC-1827

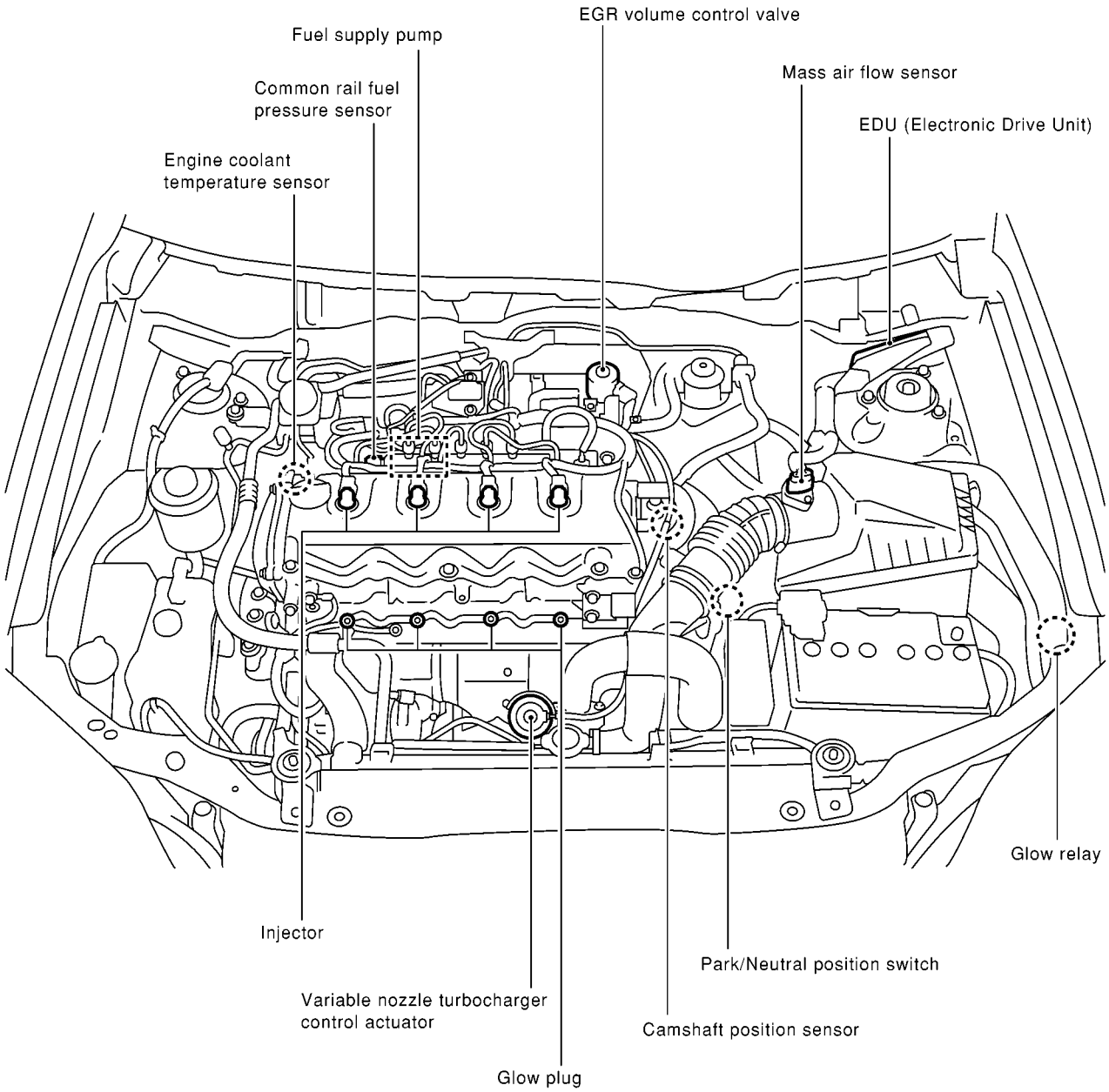
SYSTEM — Basic engine control system		SYMPTOM											Reference page
		ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEAT/HIGH ENGINE COOLANT TEMPERATURE	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	ABNORMAL SMOKE COLOR		DEAD BATTERY (UNDER CHARGE)	Malfunction indicator illuminates.	Can be detected by CONSULT-II?	
								BLACK SMOKE	WHITE SMOKE				
Warranty symptom code		AG	AH	AJ	AK	AL	AM	AP		HA			
ENGINE CONTROL	Camshaft position sensor circuit										1	1	EC-1832
	Charge air pressure sensor circuit										1	1	EC-1821
	Variable nozzle turbocharger control solenoid valve circuit							1	1				EC-1903
	Start signal circuit												EC-1916
	Ignition switch circuit												EC-1784
	Power supply for ECM circuit										1	1	EC-1784
	Cooling fan relay circuit				2								EC-1850
	EGR volume control valve circuit							1					EC-1896
	Glow relay circuit								1				EC-1889
	ECM relay (Self-shutoff) circuit											1	EC-1883
	ECM, connector circuit	2	2	2	2	2	2	2	2	2	2	2	EC-1838,EC-1881
NATS (Nissan Anti-theft System)												1	EC-1748

1 - 5: The numbers refer to the order of inspection.

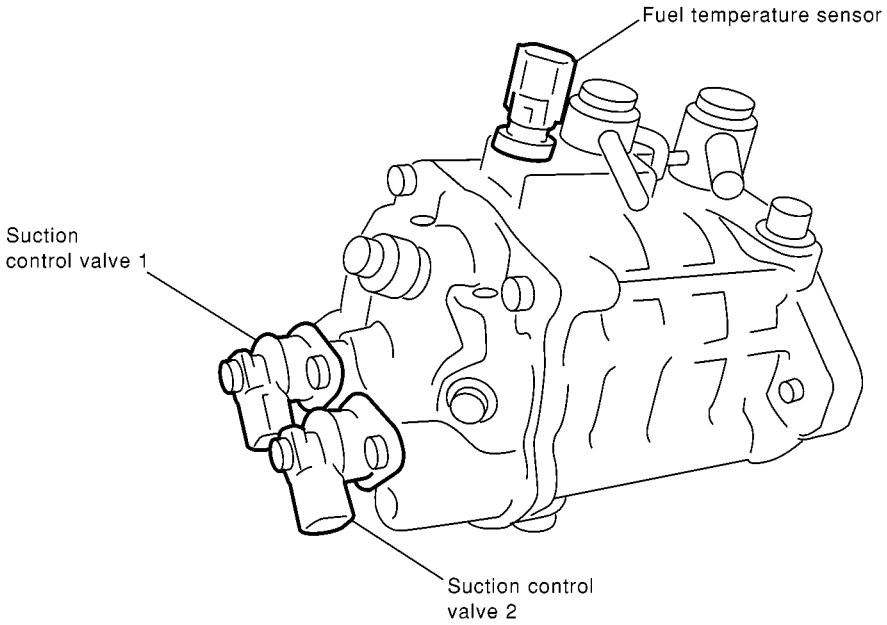
(continued on next page)

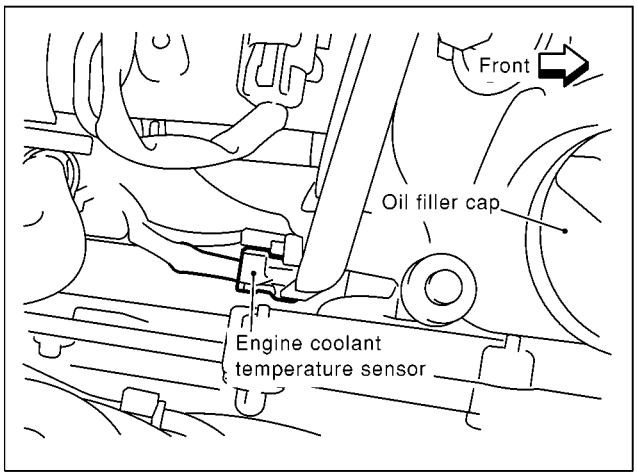
Engine Control Component Parts Location

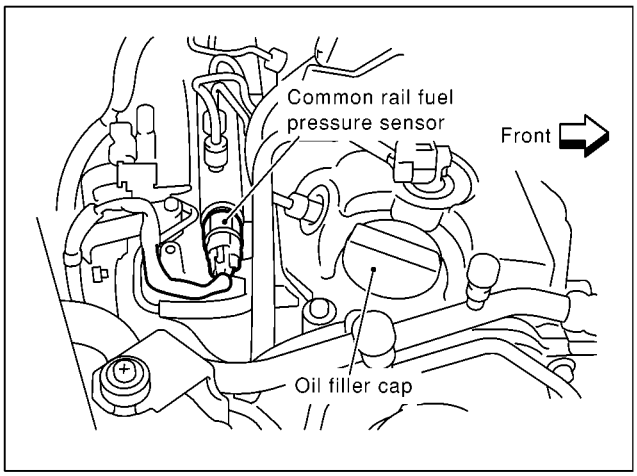
EBS00DYN

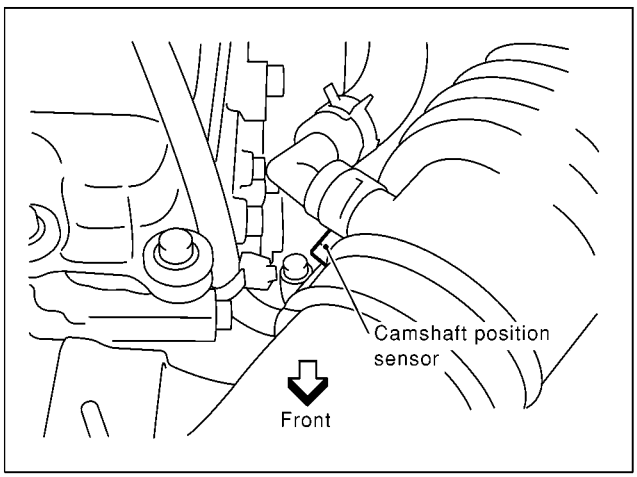


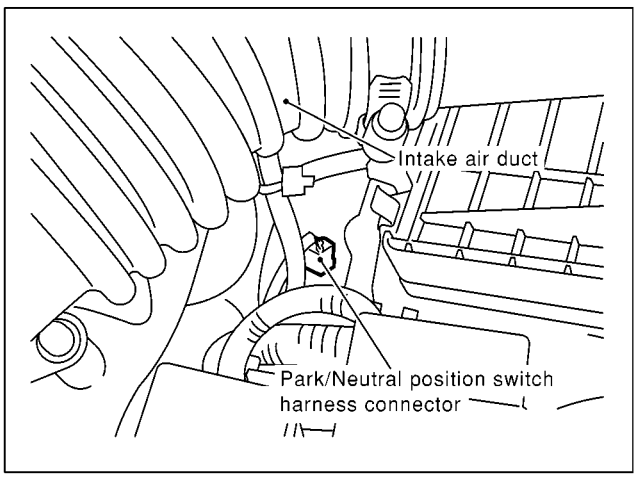
MBIB0164E


Fuel temperature sensor
Suction
control valve 1
Suction control
valve 2

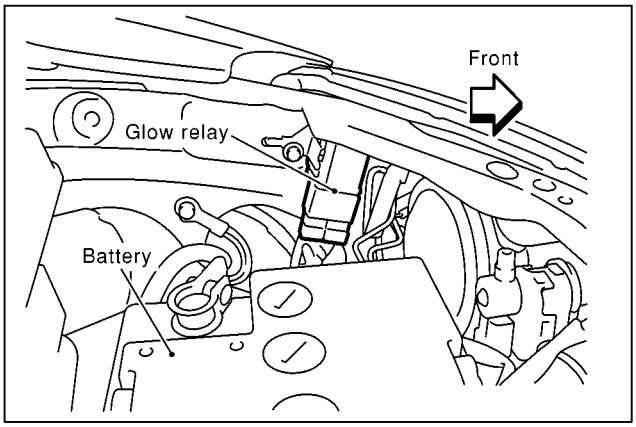

Front
Oil filler cap
Engine coolant
temperature sensor

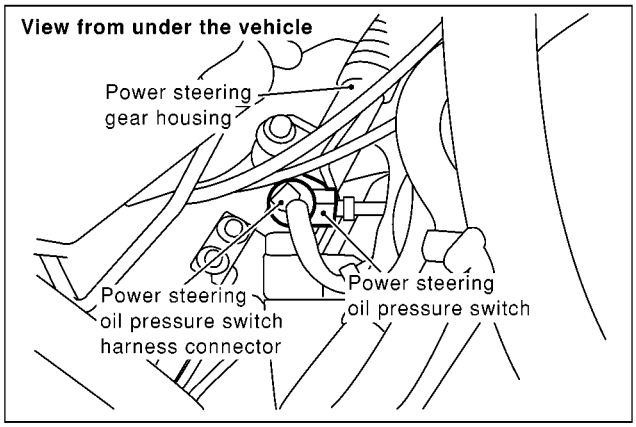

Common rail fuel
pressure sensor
Front
Oil filler cap

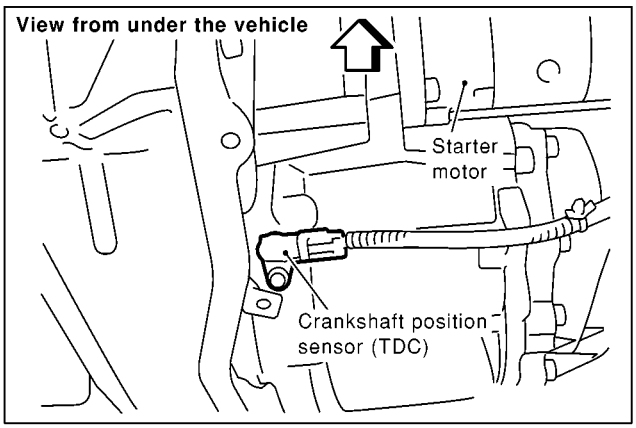

Camshaft position
sensor
Front

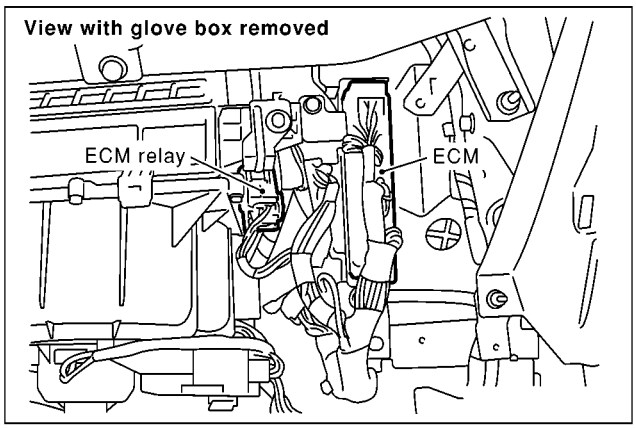

Intake air duct
Park/Neutral position switch
harness connector

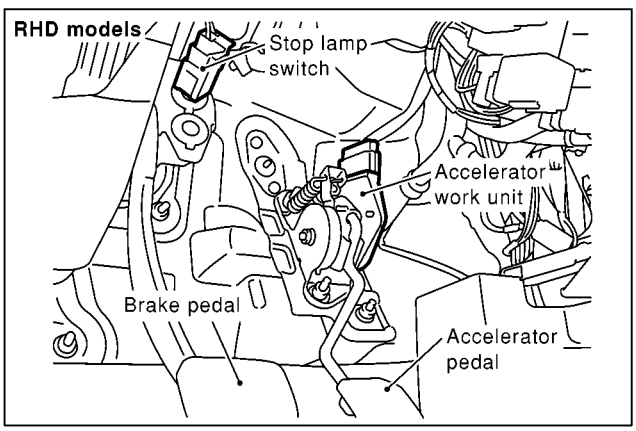
MBIB0168E

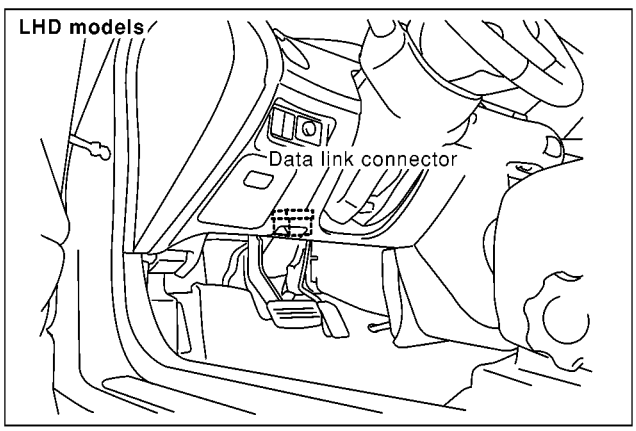

Front
Glow relay
Battery

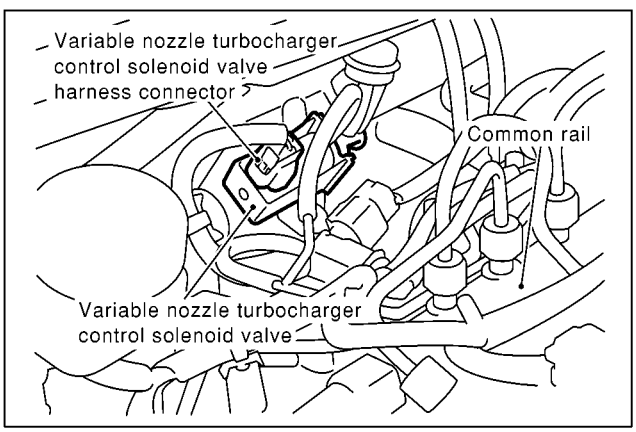

View from under the vehicle
Power steering gear housing
Power steering oil pressure switch harness connector
Power steering oil pressure switch


View from under the vehicle
Starter motor
Crankshaft position sensor (TDC)


View with glove box removed
ECM relay
ECM


RHD models
Stop lamp switch
Accelerator work unit
Brake pedal
Accelerator pedal

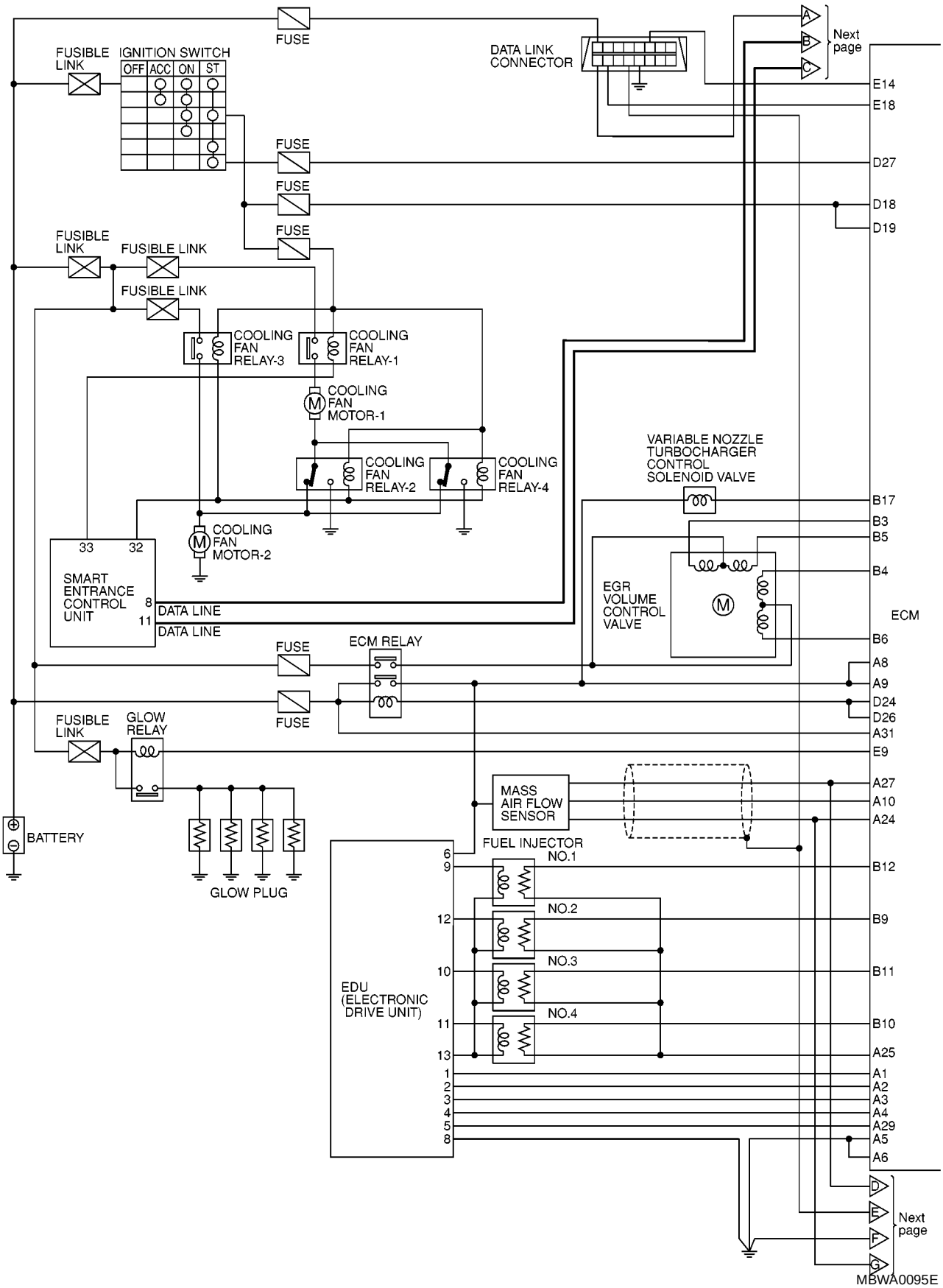

LHD models
Data link connector

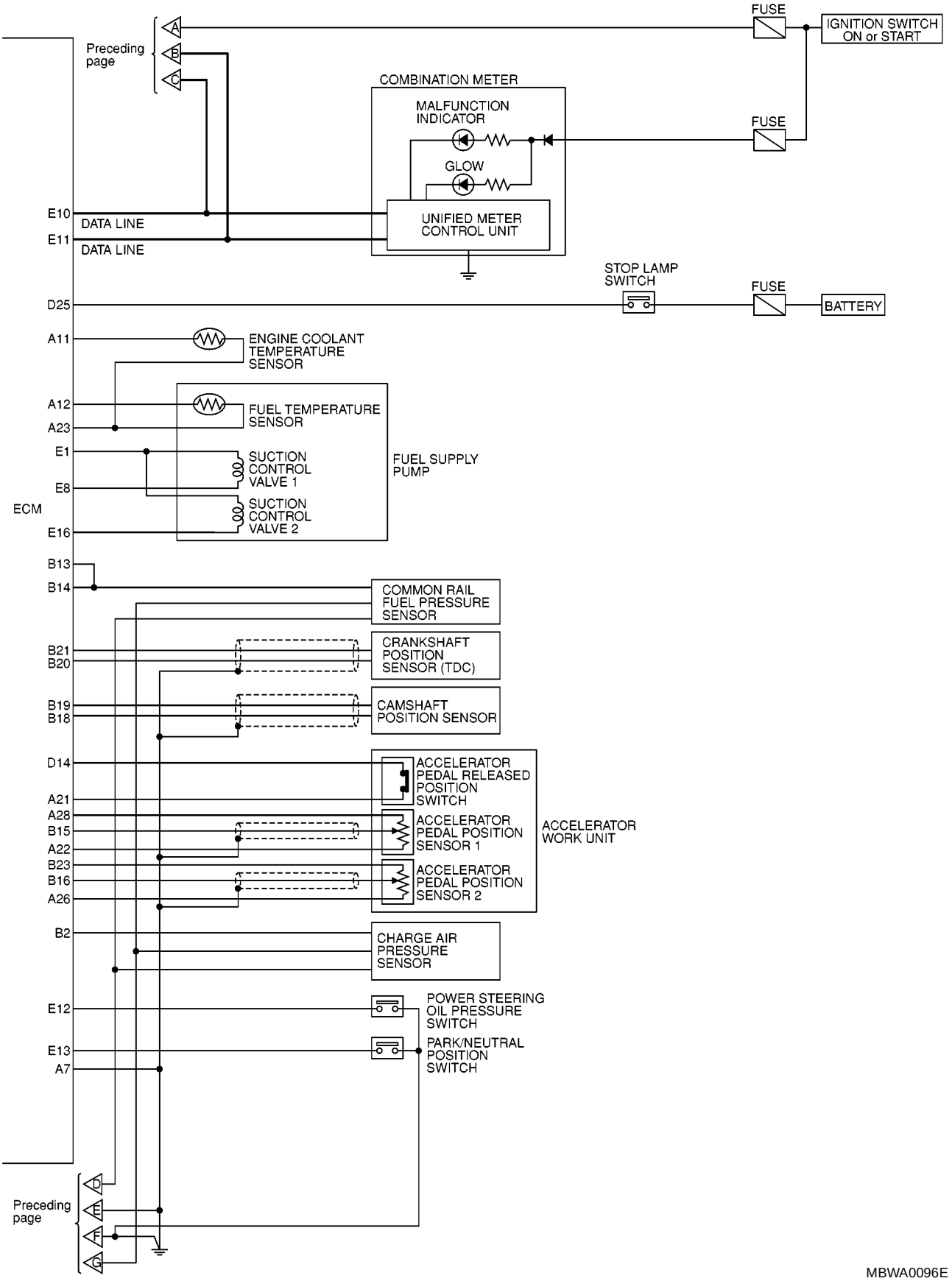

Variable nozzle turbocharger control solenoid valve harness connector
Common rail
Variable nozzle turbocharger control solenoid valve

MBIB0169E

Circuit Diagram

EBS00DYO

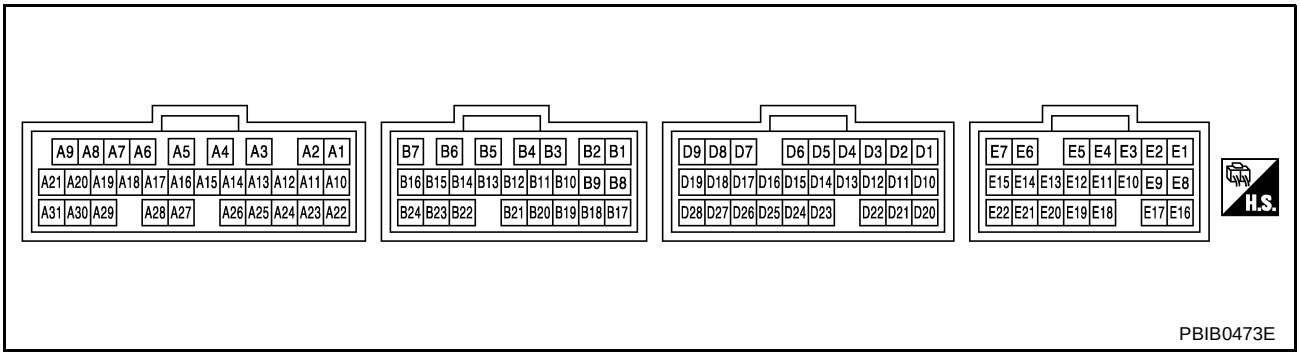



Preceding page
A
B
C
FUSE
IGNITION SWITCH ON or START
COMBINATION METER
MALFUNCTION INDICATOR
FUSE
GLOW
E10
DATA LINE
E11
DATA LINE
UNIFIED METER CONTROL UNIT
STOP LAMP SWITCH
FUSE
D25
BATTERY
A11
ENGINE COOLANT TEMPERATURE SENSOR
A12
A23
FUEL TEMPERATURE SENSOR
E1
SUCTION CONTROL VALVE 1
FUEL SUPPLY PUMP
E8
ECM
SUCTION CONTROL VALVE 2
E16
B13
B14
COMMON RAIL FUEL PRESSURE SENSOR
B21
B20
CRANKSHAFT POSITION SENSOR (TDC)
B19
B18
CAMSHAFT POSITION SENSOR
D14
ACCELERATOR PEDAL RELEASED POSITION SWITCH
A21
A28
B15
ACCELERATOR PEDAL POSITION SENSOR 1
ACCELERATOR WORK UNIT
A22
B23
B16
ACCELERATOR PEDAL POSITION SENSOR 2
A26
B2
CHARGE AIR PRESSURE SENSOR
E12
POWER STEERING OIL PRESSURE SWITCH
E13
PARK/NEUTRAL POSITION SWITCH
A7
Preceding page
D
E
F
G

MBWA0096E

ECM Harness Connector Terminal Layout

EBS00DYP

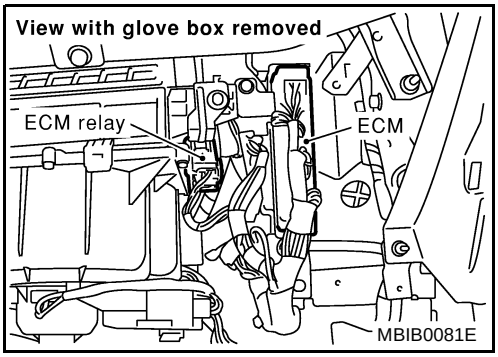


ECM Terminals And Reference Value

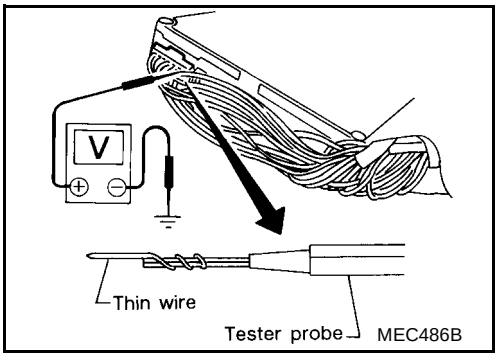
EBS00DYQ

PREPARATION

1. ECM is located behind the glove box. For this inspection, remove glove box.



2. Perform all voltage measurements with the connector connected. Extend tester probe as shown to perform tests easily.
   - Open harness securing clip to make testing easier.
   - Use extreme care not to touch 2 pins at one time.
   - Data is for comparison and may not be exact.

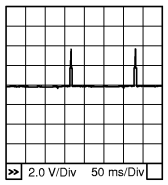
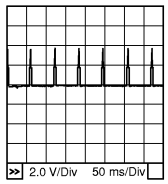
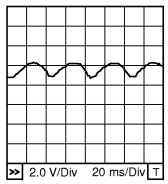
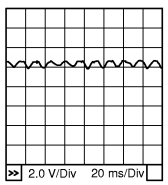


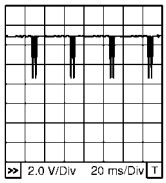
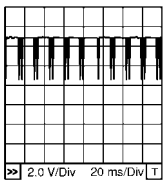
ECM INSPECTION TABLE

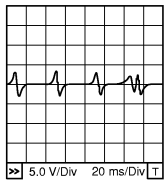
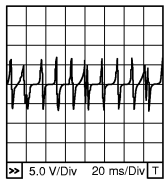
Remarks: Specification data are reference values and are measured between each terminal and ground.

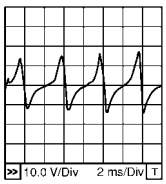
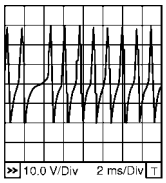
CAUTION:

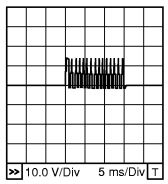
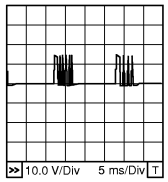
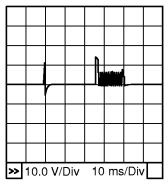
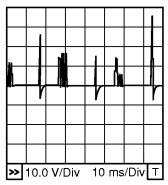
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

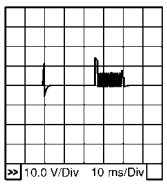
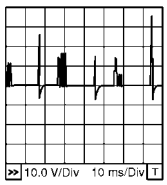
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
A1 A2 A3 A4	L/W Y/PU PU Y	EDU drive No. 2 EDU drive No. 4 EDU drive No. 3 EDU drive No. 1	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0 - 4V ★  PBIB0387E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	0 - 4V ★  PBIB0388E
A5 A6 A7	B B B	ECM ground	**[Engine is running]** ● Idle speed	Approximately 0V
A8 A9	R R	Power supply for ECM	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)
A10	R	Mass air flow sensor	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0.5 - 2.5V ★  PBIB0389E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	1.5 - 3.5V ★  PBIB0390E
A11	L/OR	Engine coolant temperature sensor	**[Engine is running]** ● **Warm-up condition**	Approximately 0 - 4.8V Output voltage varies with engine coolant temperature
A12	PU	Fuel temperature sensor	**[Engine is running]** ● **Warm-up condition**	Approximately 0 - 4.8V Output voltage varies with fuel temperature
A21	B	Accelerator pedal released position switch ground	**[Ignition switch "ON"]**	Approximately 0V
A22	LG	Accelerator pedal position sensor 1 ground	**[Ignition switch "ON"]**	Approximately 0V
A23	B	Sensor's ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
A24	B	Mass air flow sensor ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
A25	PU/W	Injector's ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
A26	LG/R	Accelerator pedal position sensor 2 ground	**[Ignition switch "ON"]**	Approximately 0V
A27	W	Sensor's power supply	**[Ignition switch "ON"]**	Approximately 5V
A28	PU/R	Accelerator pedal position sensor 1 power supply	**[Ignition switch "ON"]**	Approximately 5V
A29	W/PU	EDU injector check signal	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1 - 5V ★  PBIB0391E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	1 - 5V ★  PBIB0392E
A31	W/L	Power supply for ECM	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)
B2	Y	Charge air pressure sensor	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 2.0V
B3 B4 B5 B6	GY/B OR/B W/L GY	EGR volume control valve	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0.1 - 14V (Voltage signals of each ECM terminals differ according to the control position of EGR volume control valve.)
B9	Y/B	Fuel injector adjustment resistor No.2	**[Ignition switch "ON"]**	0.2 - 4.8V (There are individual differences between fuel injector adjustment resistors.)
B10	R/B	Fuel injector adjustment resistor No.4		
B11	G/B	Fuel injector adjustment resistor No.3		
B12	W/B	Fuel injector adjustment resistor No.1		
B13 B14	Y/R Y/R	Common rail fuel pressure sensor	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.6 - 1.8V
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	1.8 - 2.0V

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
B15	W	Accelerator pedal position sensor 1	**[Ignition switch "ON"]** ● Accelerator pedal fully released	0.8 - 1.3V
			[Ignition switch "ON"] ● Accelerator pedal fully depressed	More than 3.5V
B16	L	Accelerator pedal position sensor 2	**[Ignition switch "ON"]** ● Accelerator pedal fully released	0.3 - 1.8V
			[Ignition switch "ON"] ● Accelerator pedal fully depressed	More than 3.0V
B17	L	Variable nozzle turbocharger control solenoid valve	**[Engine is running]** ● **Warm-up condition** ● Idle speed	4.5 - 6.5V
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,500 rpm	7 - 9V
B18	G	Camshaft position sensor ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
B19	R	Camshaft position sensor	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0 - 3V ★  PBIB0393E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	0 - 8V ★  PBIB0394E
B20	L/R	Crankshaft position sensor (TDC) ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
B21	L/G	Crankshaft position sensor (TDC)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0 - 12.5V ★  PBIB0395E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	0 - 30.0V ★  PBIB0396E
B23	GY/L	Accelerator pedal position sensor 2 power supply	**[Ignition switch "ON"]**	Approximately 5V
D14	G/Y	Accelerator pedal released position switch	**[Ignition switch "ON"]** ● Accelerator pedal slightly depressed	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"] ● Accelerator pedal fully released	Approximately 0V
D18 D19	W/R W/R	Ignition switch	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)
D24 D26	G G	ECM relay (self-shutoff)	**[Ignition switch "ON"]** **[Ignition switch "OFF"]** ● For a few seconds after turning ignition switch "OFF"	Approximately 0V
			[Ignition switch "OFF"] ● A few seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
D25	R/G	Stop lamp switch	**[Ignition switch "ON"]** ● Brake pedal fully released	Approximately 0V
			[Ignition switch "ON"] ● Brake pedal depressed	BATTERY VOLTAGE (11 - 14V)
D27	B/Y	Start signal	**[Ignition switch "ON"]**	Approximately 0V
			[Ignition switch "START"]	BATTERY VOLTAGE (11 - 14V)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
E1	L	Suction control valve power supply	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0 - 12.5V ★  PBIB0399E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	0 - 12.5V ★  PBIB0400E
E8	Y/L	Suction control valve 1	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0 - 12.5V ★  PBIB0401E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	0 - 12.5V ★  PBIB0402E
E9	W/R	Glow relay	Refer to EC-1889, "GLOW CONTROL SYSTEM" .	
E10	R	CAN communication line	**[Ignition switch “ON”]**	Approximately 1.7 - 2.3V Output voltage varies with the communication status.
E11	L	CAN communication line	**[Ignition switch “ON”]**	Approximately 2.6 - 3.2V Output voltage varies with the communication status.
E12	P/B	Power steering oil pressure switch	**[Engine is running]** ● Steering wheel is being turned	Approximately 0V
			[Engine is running] ● Steering wheel is not being turned	BATTERY VOLTAGE (11 - 14V)
E13	G/OR	Park/Neutral position switch	**[Ignition switch “ON”]** ● Gear position is “Neutral”	Approximately 0V
			[Ignition switch “ON”] ● Except the above gear position	BATTERY VOLTAGE (11 - 14V)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
E16	G/W	Suction control valve 2	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0 - 12.5V ★  PBIB0401E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	0 - 12.5V ★  PBIB0402E
E18	LG/W	Data Link connector	**[Ignition switch "ON"]** CONSULT-II or GST is disconnected	BATTERY VOLTAGE (11 - 14V)

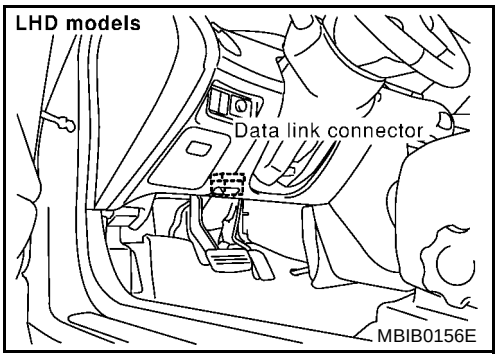
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

CONSULT-II Function

EBS00DYR

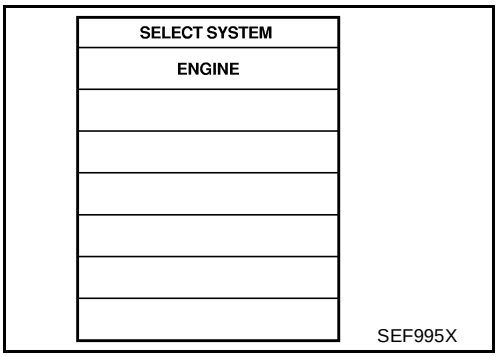
CONSULT-II INSPECTION PROCEDURE

1. Turn ignition switch OFF.
2. Connect CONSULT-II to data link connector, which is located under the driver side dash panel.



MBIB0156E

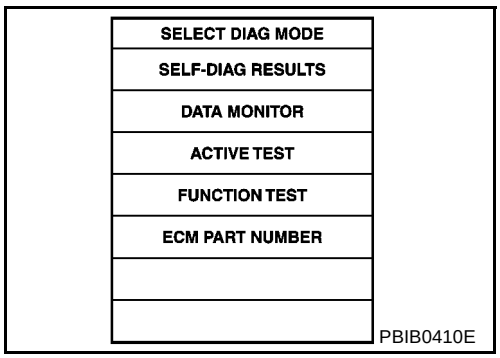
3. Turn ignition switch ON.
4. Touch "START".
5. Touch "ENGINE".



SEF995X

6. Perform each diagnostic test mode according to each service procedure.

For further information, see the CONSULT-II Operation Manual.



ENGINE CONTROL COMPONENT PARTS/CONTROL SYSTEMS APPLICATION

	Item		DIAGNOSTIC TEST MODE		
			SELF-DIAG RESULTS	DATA MONITOR	ACTIVE TEST
ENGINE CONTROL COMPONENT PARTS	INPUT	Crankshaft position sensor (TDC)	×	×	
		Camshaft position sensor	×		
		Engine coolant temperature sensor	×	×	
		Vehicle speed signal	×	×	
		Fuel temperature sensor	×	×	
		Accelerator pedal position sensor 1	×	×	
		Accelerator pedal position sensor 2	×	×	
		Accelerator pedal released position switch	×	×	
		Common rail fuel pressure sensor	×	×	
		Park/neutral position (PNP) switch		×	
		Mass air flow sensor	×	×	
		Battery voltage	×	×	
		Power steering oil pressure switch		×	
		Stop lamp switch		×	
		Absolute pressure sensor	×	×	
		Fuel injector adjustment resistor	×		
		Charge air pressure sensor	×	×	
	OUTPUT	Suction control valve	×	×	×
		Fuel injector	×	×	×
		Glow relay		×	×
		Cooling fan relay	×	×	×
		EGR volume control valve		×	×
		Variable nozzle turbocharger control solenoid valve			

X: Applicable

SELF-DIAGNOSTIC MODE

Regarding items detected in “SELF-DIAG RESULTS” mode, refer to — EC-1730, "INDEX FOR DTC" .

DATA MONITOR MODE

MONITOR ITEM	ECM IPUT SIG-NAL	MAIN SIG-NALS	CAN DIAG SUP-PORT MNTR	CONDITION	SPECIFICATION
CKPS·RPM (TDC) [rpm]	×	×		● The engine speed computed from the crankshaft position sensor (TDC) signal is displayed.	
COOLAN TEMP/S [°C] or [°F]	×	×		● The engine coolant temperature (determined by the signal voltage of the engine coolant temperature sensor) is displayed.	When the engine coolant temperature circuit is open or short, ECM enters fail-safe mode. The engine coolant temperature determined by the ECM is displayed.
VHCL SPEED SE [km/h] or [mph]	×	×		● The vehicle speed computed form the vehicle speed signal is displayed.	
FUEL TEMP SEN [°C] or [°F]	×	×		● The fuel temperature (determined by the signal voltage of the fuel temperature sensor) is displayed.	
ACCEL POS SEN [V]	×	×		● The accelerator pedal position sensor 1 signal voltage is displayed.	
ACCEL SEN 2 [V]	×	×		● The accelerator pedal position sensor 2 signal voltage is displayed.	
OFF ACCEL SW [ON/OFF]	×	×		● indicates [ON/OFF] condition from the accelerator pedal released position switch signal.	
ACT CR PRESS [MPa]	×	×		● The common rail fuel pressure (determined by the signal voltage of the common rail fuel pressure sensor) is displayed.	
BATTERY VOLT [V]	×	×		● The power supply voltage of ECM is displayed.	
P/N POSI SW [ON/OFF]	×	×		● Indicates [ON/OFF] condition from the park/neutral position switch signal.	
START SIGNAL [ON/OFF]	×	×		● indicates [ON/OFF] condition from the starter signal.	
PW/ST SIGNAL [ON/OFF]	×			● indicates [ON/OFF] condition from the power steering oil pressure switch signal.	
BRAKE SW [ON/OFF]	×	×		● indicates [ON/OFF] condition from the stop lamp switch signal.	
IGN SW [ON/OFF]	×	×		● Indicates [ON/OFF] condition from ignition switch signal.	
MAS AIR/FL SE [V]	×	×		● The signal voltage of the mass air flow sensor is displayed.	
SUCTION CV [°CA]		×		● Indicates [°CA] of suction control valve operating angle.	
MAIN INJ WID [msec]		×		● Indicates the actual fuel injection pulse width compensated by ECM according to the input signals.	

MONITOR ITEM	ECM IPUT SIG-NAL	MAIN SIG-NALS	CAN DIAG SUP-PORT MNTR	CONDITION	SPECIFICATION
GLOW RLY [ON/OFF]		×		● The glow relay control condition (determined by ECM according to the input signal) is displayed.	
COOLING FAN [LOW/HI/OFF]		×		● Indicates the control condition of the cooling fans (determined by ECM according to the input signal). LOW ... Operates at low speed. HI ... Operates at high speed. OFF ... Stopped	
EGR VOL CON/V [step]		×		● Indicates the EGR volume control value computed by the ECM according to the input signals. ● The opening becomes larger as the value increases.	
INT/A VOLUME [mg/]				● The intake air volume computed from the mass air flow sensor signal is displayed.	
BARO SEN [kPa]	×	×		● The barometric pressure (determined by the signal voltage from the absolute pressure sensor built into the ECM) is displayed.	
CYL COUNT [0/1/2/3]				● The cylinder being injected is displayed. 0 ... Cylinder No.1 is injected. 1 ... Cylinder No.3 is injected. 2 ... Cylinder No.4 is injected. 3 ... Cylinder No.2 is injected.	
TURBO BST SEN				● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: Neutral position ● No-load	
Voltage [V]				Voltage, frequency, duty cycle or pulse width measured by the probe.	Only “#” is displayed if item is unable to be measured. Figures with “#”s are temporary ones. They are the same figures as an actual piece of data which was just previously measured. [Hz] or [%]
Frequency [msec], [Hz] or [%]					
DUTY-HI					
DUTY-LOW					
PLS WIDTH-HI					
PLS WIDTH-LOW					

MONITOR ITEM	ECM IPUT SIG-NAL	MAIN SIG-NALS	CAN DIAG SUP-PORT MNTR	CONDITION	SPECIFICATION
CAN COMM [OK/NG]			×	● Indicates the communication condition of CAN communication line.	● These items are not displayed in “SELECTION FROM MENU” mode.
CAN CIRC 1 [OK/UNKWN]			×		
CAN CIRC 2 [OK/UNKWN]			×		
CAN CIRC 3 [OK/UNKWN]			×		
CAN CIRC 4 [OK/UNKWN]			×		
CAN CIRC 5 [OK/UNKWN]			×		
CAN CIRC 6 [OK/UNKWN]			×		
CAN CIRC 7 [OK/UNKWN]			×		

NOTE:
Any monitored item that does not match the vehicle being diagnosed is deleted from the display automatically.

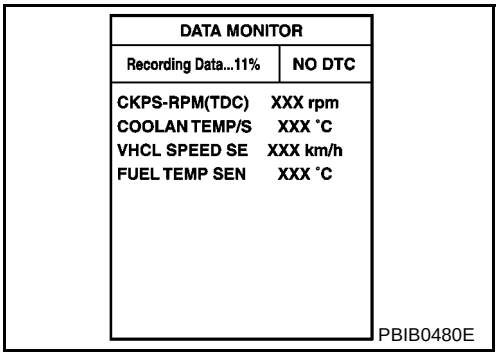
ACTIVE TEST MODE

TEST ITEM	CONDITION	JUDGEMENT	CHECK ITEM (REMEDY)
POWER BAL-ANCE	● Engine: After warming up, idle the engine. ● A/C switch “OFF” ● Shift lever “N” ● Cut off each injector signal one at a time using CONSULT-II	Engine runs rough or dies.	● Harness and connectors ● Compression ● Fuel injectors
COOLING FAN	● Ignition switch: ON ● Operate the cooling fan at “LOW”, “HI” speed and turn “OFF” using CONSULT-II.	Cooling fan moves at “LOW”, “HI” speed and stops.	● Harness and connector ● Cooling fan motor ● Cooling fan relay
OFF ACCEL PO SIG	● This mode is used for ECM to learn accelerator pedal released positions.		
GLOW RELAY	● Ignition switch: ON (Engine stopped) ● Turn the glow relay “ON” and “OFF” using CONSULT-II and listen to operating sound.	Glow relay makes the operating sound.	● Harness and connector ● Glow relay
EGR VOL CONT/V	● Ignition switch: ON ● Change EGR volume control valve opening step using CONSULT-II.	EGR volume control valve makes an operating sound.	● Harness and connector ● EGR volume control valve
PRES REGULA-TOR	● Ignition switch: ON ● Change fuel pressure in common rail using CONSULT-II	Fuel leaks.	● Fuel line ● Fuel pressure relief valve

REAL TIME DIAGNOSIS IN DATA MONITOR MODE

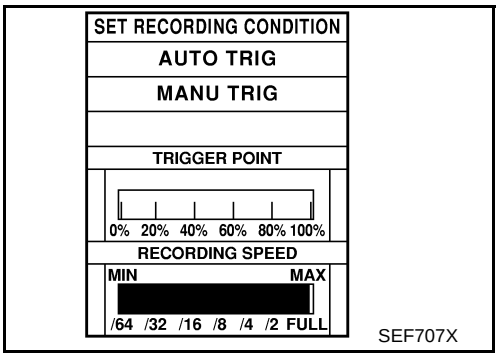
CONSULT-II has two kinds of triggers and they can be selected by touching “SETTING” in “DATA MONITOR” mode.

1. “AUTO TRIG” (Automatic trigger):



- The malfunction will be identified on the CONSULT-II screen in real time.
  In other words, DTC will be displayed if the malfunction is detected by ECM.
  At the moment a malfunction is detected by ECM, “MONITOR” in “DATA MONITOR” screen is changed to “Recording Data ... xx%” as shown in the figure, and the data after the malfunction detection is recorded. Then when the percentage reached 100%, “REAL-TIME DIAG” screen is displayed. If “STOP” is touched on the screen during “ Recording Data ... xx%”, “REAL-TIME DIAG” screen is also displayed.
  The recording time after the malfunction detection and the recording speed can be changed by “TRIGGER POINT” and “Recording Speed”. Refer to CONSULT-II OPERATION MANUAL.

2. “MANU TRIG” (Manual trigger):



- DTC will not be displayed automatically on CONSULT-II screen even though a malfunction is detected by ECM.
  DATA MONITOR can be performed continuously even though a malfunction is detected.

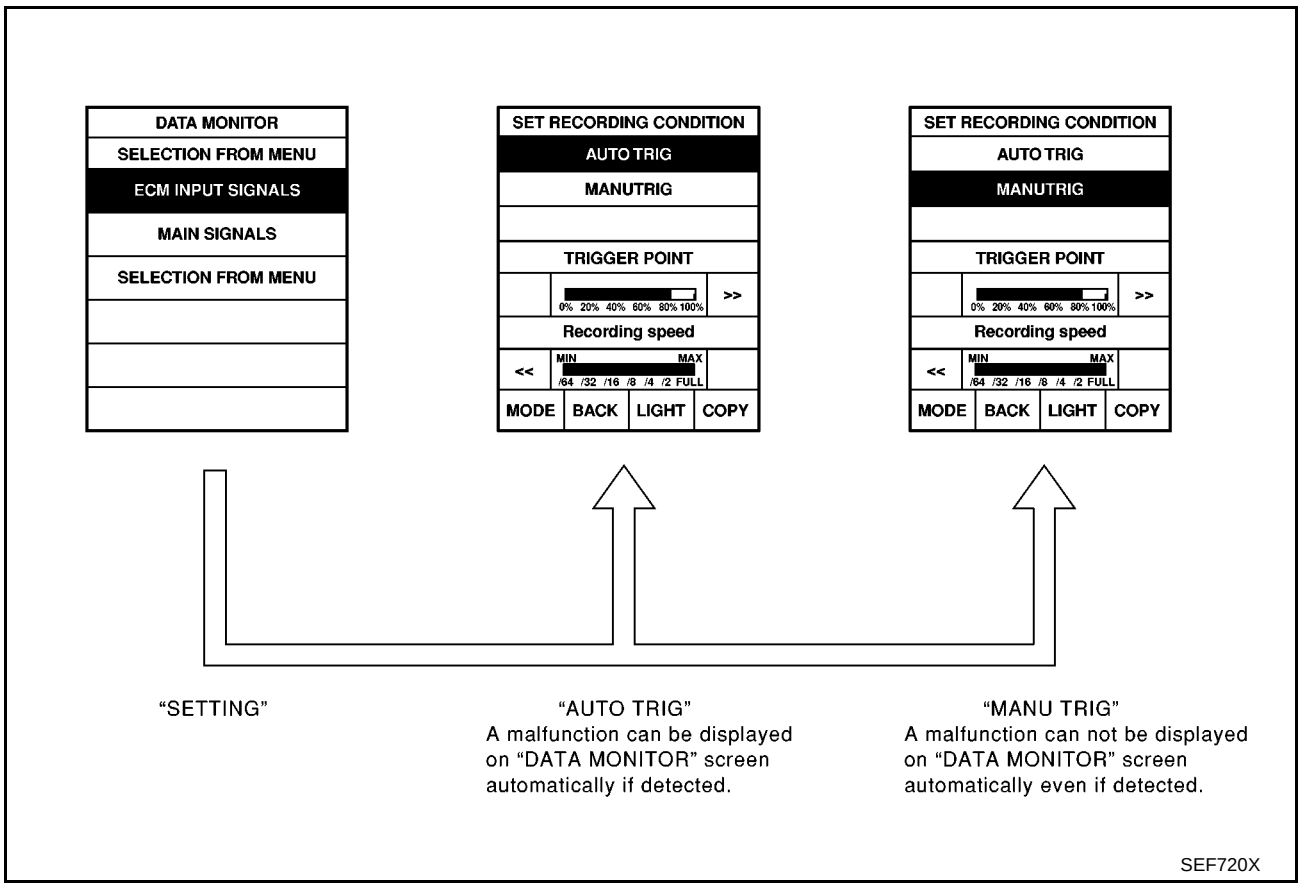
Use these triggers as follows:

1. “AUTO TRIG”

- While trying to detect the DTC by performing the “DTC Confirmation Procedure”, be sure to select to “DATA MONITOR (AUTO TRIG)” mode. You can confirm the malfunction at the moment it is detected.
- While narrowing down the possible causes, CONSULT-II should be set in “DATA MONITOR (AUTO TRIG)” mode, especially in case the incident is intermittent.
  When you are inspecting the circuit by gently shaking (or twisting) the suspicious connectors, components and harness in the “DTC Confirmation Procedure”, the moment a malfunction is found the DTC will be displayed. Refer to GI-24, "How to Perform Efficient Diagnosis for an Electrical Incident" , “INCIDENT SIMULATION TESTS”.

2. “MANU TRIG”

– If the malfunction is displayed as soon as “DATA MONITOR” is selected, reset CONSULT-II to “MANU TRIG”. By selecting “MANU TRIG” you can monitor and store the data. The data can be utilized for further diagnosis, such as a comparison with the value for the normal operating condition.



FUNCTION TEST

This mode is used to inform customers of their vehicle condition of periodic maintenance.

CONSULT-II Reference Value in Data Monitor Mode

EBS00DYS

Remarks:
- Specification data are reference values.
- Specification data are output/input values which are detected or supplied by the ECM at the connector.

* Specification data may not be directly related to their components signals/values/operations.

MONITOR ITEM	CONDITION		SPECIFICATION
CKPS-RPM (TDC)	● Tachometer: Connect ● Run engine and compare tachometer indication with the CONSULT-II value		Almost the same speed as the CONSULT-II value
COOLAN TEMP/S	● Engine: After warming up		More than 70°C (158°F)
VHCL SPEED SE	● Turn drive wheels and compare speedometer indication with the CONSULT-II value		Almost the same speed as the CONSUT-II value
FUEL TEMP SEN	● Engine: After warming up		More than 40°C (104°F)
ACCEL POS SEN	● Ignition switch: ON (Engine stopped)	Accelerator pedal: fully released	0.8 - 1.3V
		Accelerator pedal: fully depressed	More than 3.5V
ACCEL SEN 2	● Ignition switch: ON (Engine stopped)	Accelerator pedal: fully released	0.3 - 1.8V
		Accelerator pedal: fully depressed	More than 3.0V
OFF ACCEL SW	● Ignition switch: ON (Engine stopped)	Accelerator pedal: fully released	ON
		Accelerator pedal: slightly depressed	OFF

MONITOR ITEM	CONDITION		SPECIFICATION
MAS AIR/FL SE	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: Neutral position ● No-load	Idle	1.0 - 2.5V
		2,000 rpm	2.1 - 2.7V
BATTERY VOLT	● Ignition switch: ON (Engine stopped)		11 - 14V
P/N POSI SW	● Ignition switch: ON	Shift lever: Neutral position	ON
		Except above	OFF
START SIGNAL	● Ignition switch: ON → START → ON		OFF → ON → OFF
PW/ST SIGNAL	● Engine: After warming up, idle the engine	Steering wheel is in neutral position. (Forward direction)	OFF
		Steering wheel is turned.	ON
BRAKE SW	● Ignition switch: ON	Brake pedal: Fully released	OFF
		Brake pedal: Slightly depressed	ON
IGN SW	● Ignition switch: ON → OFF		ON → OFF
ACT CR PRESS	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: Neutral position ● No-load	Idle	30 - 40 MPa
		2,000 rpm	40 - 50 MPa
SUCTION CV	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: Neutral position ● No-load	Idle	70.0 - 71.5°CA
		2,000 rpm	73.5 - 75.0°CA
MAIN INJ WID	● Engine: After warming up ● Shift lever: Neutral position ● Idle speed	No-load	0.68 - 0.78 msec
		Air conditioner switch: ON Rear window defogger switch: ON	0.78 - 0.88 msec
GLOW RLY	Refer to EC-1889, "GLOW CONTROL SYSTEM" .		
COOLING FAN	● When cooling fan is stopped.		OFF
	● When cooling fans operate at low speed.		LOW
	● When cooling fans operate at high speed.		HIGH
EGR VOL CON/V	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: Neutral position ● No-load	After one minute at idle	More than 10 steps
		Revving engine from idle to 3,600 rpm	0 step
INT/A VOLUME	● Engine: After warming up, idle the engine		150 - 450 mg/st
BARO SEN	● Ignition switch: ON		Altitude Approx. 0m: Approx. 100.62 kPa (1.0062 bar, 1.026 kg/cm^2 , 14.59 psi) Approx. 1,000 m: Approx. 88.95 kPa (0.8895 bar, 0.907 kg/cm^2 , 12.90 psi) Approx. 1,500 m: Approx. 83.16 kPa (0.8316 bar, 0.848 kg/cm^2 , 12.06 psi) Approx. 2,000 m: Approx. 78.36 kPa (0.7836 bar, 0.799 kg/cm^2 , 11.36 psi)
CYL COUNT	● Engine is running		0 → 1 → 2 → 3

MONITOR ITEM	CONDITION		SPECIFICATION
TURBO BST SEN	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: Neutral position ● No-load	Idle	Approx. 100kPa
		2,500 rpm	Approx. 114 kPa
		3,000 rpm	Approx. 100 - 104 kPa

NOTE:
Any monitored item that does not match the vehicle being diagnosed is deleted from the display automatically.

Major Sensor Reference Graph in Data Monitor Mode

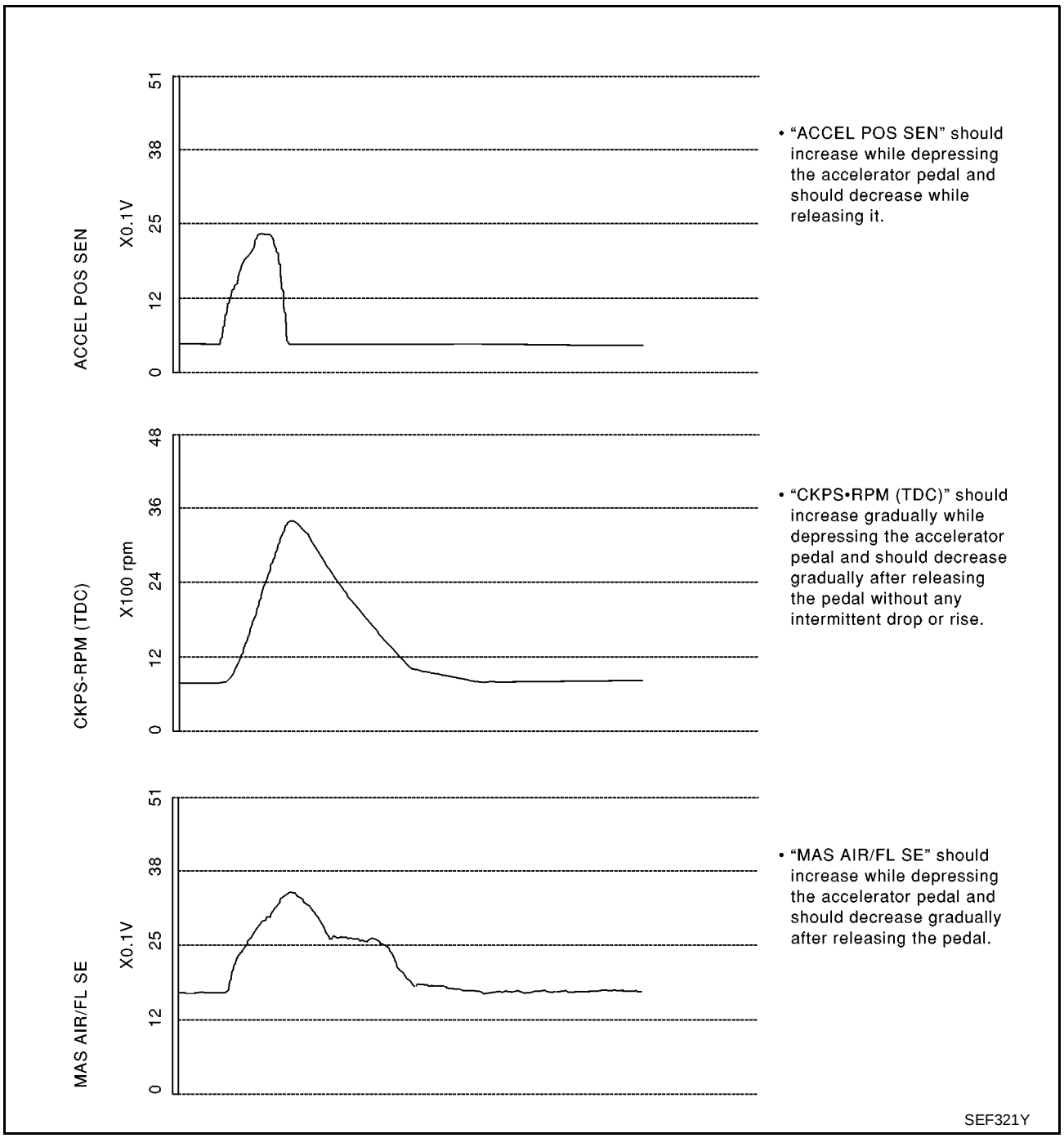
EBS00DYT

The following are the major sensor reference graphs in “DATA MONITOR” mode.

ACCEL POS SEN, “CKPS·RPM (TDC)”, “MAS AIR/FL SE”

Below is the data for “ACCEL POS SEN”, “CKPS·RPM (TDC)” and “MAS AIR/FL SE” when revving engine quickly up to 3,000 rpm under no load after warming up engine to the normal operating temperature.

Each value is for reference, the exact value may vary.



TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT

PFP:00006

Description

EBS00DYU

Intermittent incidents (I/I) may occur. In many cases, the problem resolves itself (the part or circuit function returns to normal without intervention). It is important to realize that the symptoms described in the customer's complaint often do not recur on DTC visits. Realize also that the most frequent cause of I/I occurrences is poor electrical connections. Because of this, the conditions under which the incident occurred may not be clear. Therefore, circuit checks made as part of the standard diagnostic procedure may not indicate the specific problem area.

COMMON I/I REPORT SITUATIONS

STEP in Work Flow	Situation
II	The CONSULT-II is used. The SELF-DIAG RESULTS screen shows time data other than “0”.
III	The symptom described by the customer does not recur.
IV	DTC does not appear during the DTC Confirmation Procedure.
VI	The Diagnostic Procedure for XXXX does not indicate the problem area.

Diagnostic Procedure

EBS00DYV

1. INSPECTION START

Erase DTCs. Refer to EC-1748, "HOW TO ERASE DTC" .

>> GO TO 2.

2. CHECK GROUND TERMINALS

Check ground terminals for corroding or loose connection.
Refer to GI-24, "How to Perform Efficient Diagnosis for an Electrical Incident" , “CIRCUIT INSPECTION”, “Ground Inspection”.

OK or NG

OK >> GO TO 3.
NG >> Repair or replace.

3. SEARCH FOR ELECTRICAL INCIDENT

Perform GI-24, "How to Perform Efficient Diagnosis for an Electrical Incident" , “INCIDENT SIMULATION TESTS”.

OK or NG

OK >> **INSPECTION END**
NG >> Repair or replace.

POWER SUPPLY CIRCUIT FOR ECM

PFP:24110

ECM Terminals and Reference Value

EBS00DYW

Remarks: Specification data are reference values and are measured between each terminal and ground.

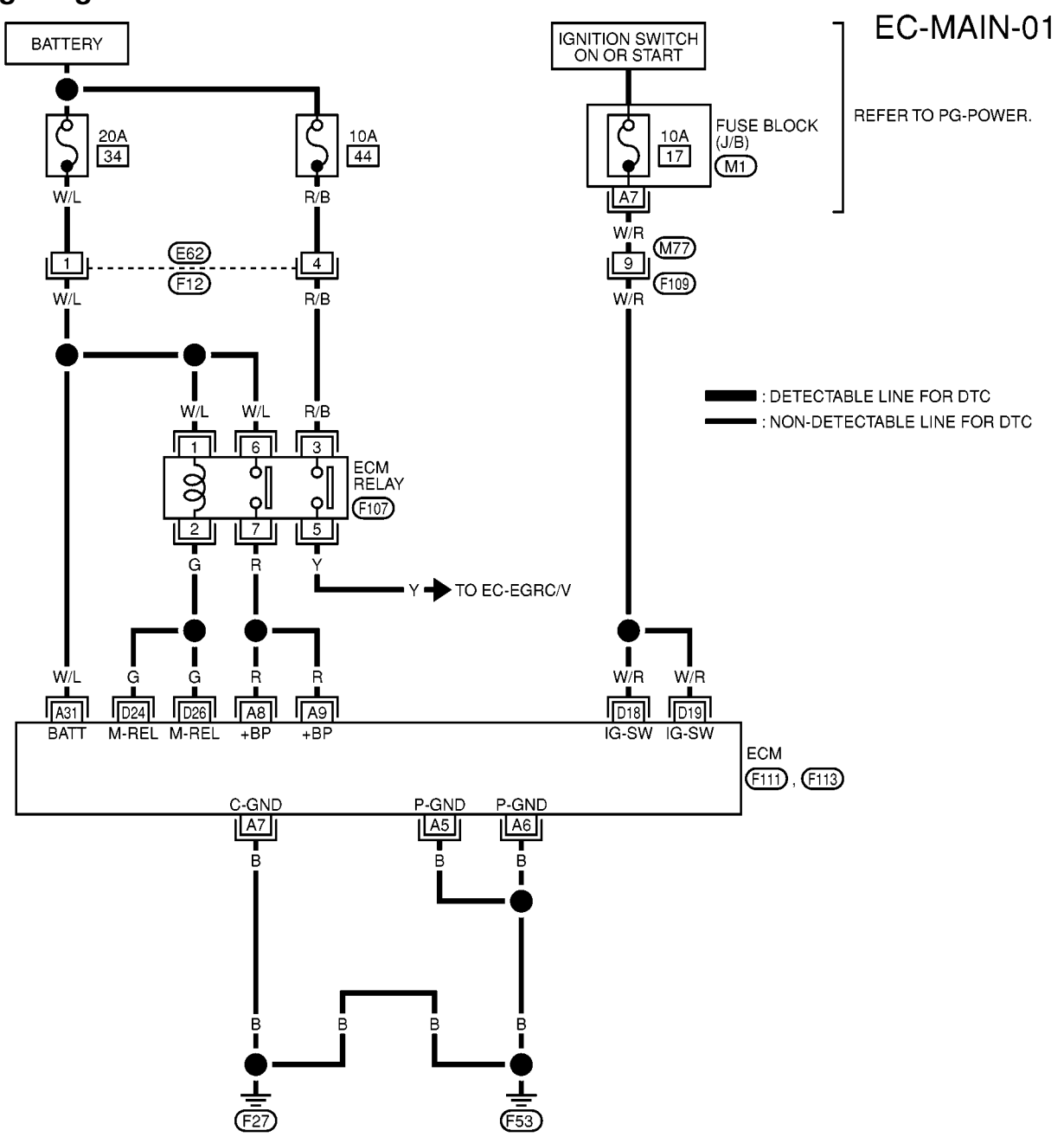
CAUTION:

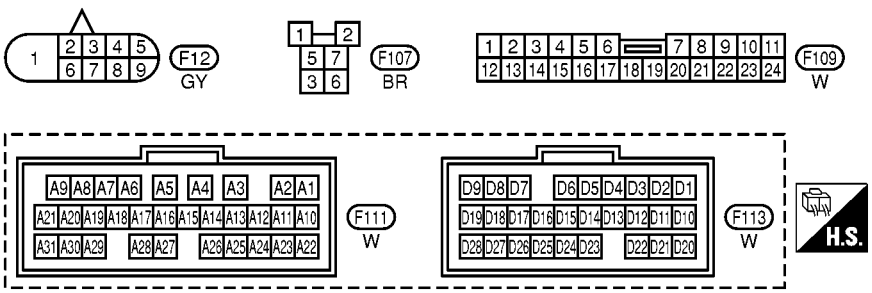
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
A5 A6 A7	B B B	ECM ground	**[Engine is running]** ● Idle speed	Approximately 0V
A8 A9	R R	Power supply for ECM	**[Ignition switch “ON”]**	BATTERY VOLTAGE (11 - 14V)
A31	W/L	Power supply for ECM	**[Ignition switch “ON”]**	BATTERY VOLTAGE (11 - 14V)
D18 D19	W/R W/R	Ignition switch	**[Ignition switch “ON”]**	BATTERY VOLTAGE (11 - 14V)
D24 D26	G G	ECM relay (self-shutoff)	**[Ignition switch “ON”]** **[Ignition switch “OFF”]** ● For a few seconds after turning ignition switch “OFF”	Approximately 0V
			[Ignition switch “OFF”] ● A few seconds passed after turning ignition switch “OFF”	BATTERY VOLTAGE (11 - 14V)

Wiring Diagram

EBS00DYX





REFER TO THE FOLLOWING.

M1 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0097E

Diagnostic Procedure

EBS00DYY

1. INSPECTION START

Start engine.
Is engine running?

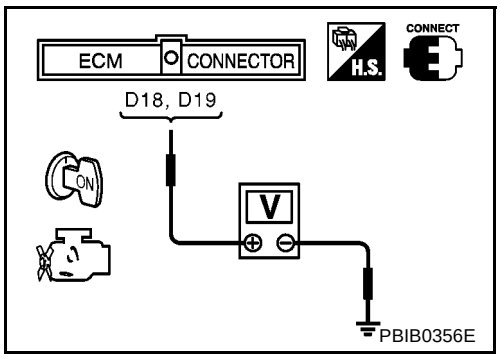
Yes or No

Yes >> GO TO 6.
No >> GO TO 2.

2. CHECK ECM POWER SUPPLY CIRCUIT-I

1. Turn ignition switch “ON”.
2. Check voltage between ECM terminals D18, D19 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M77, F109
- Fuse block (J/B) connector M1
- 10A fuse
- Harness for open or short between ECM and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK ECM GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminals A5, A6, A7 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to power.

OK or NG

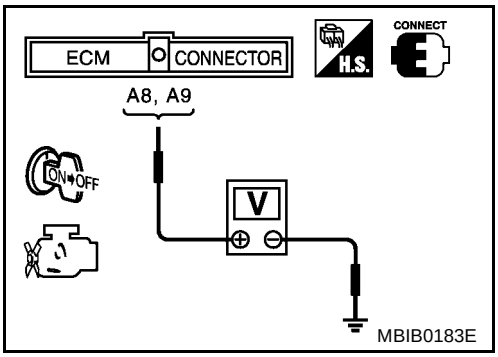
OK >> GO TO 5.
NG >> Repair open circuit or short to power in harness or connectors.

5. CHECK ECM POWER SUPPLY CIRCUIT-II

1. Reconnect ECM harness connector.
2. Turn ignition switch “ON” and then “OFF”.
3. Check voltage between ECM terminals A8, A9 and ground with CONSULT-II or tester.

Voltage:

After turning ignition switch “OFF”, battery voltage will exist for a few seconds, then drop to approximately 0V.



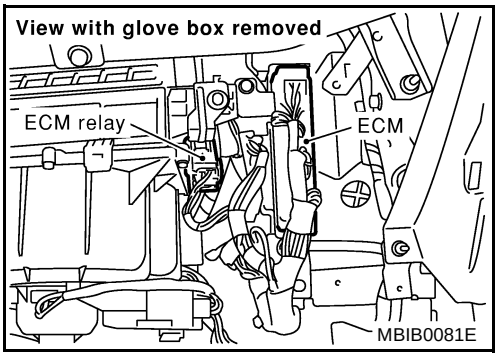
OK or NG

OK >> Check EDU power supply circuit. Refer to EC-1847, "Diagnostic Procedure" .

NG >> GO TO 6.

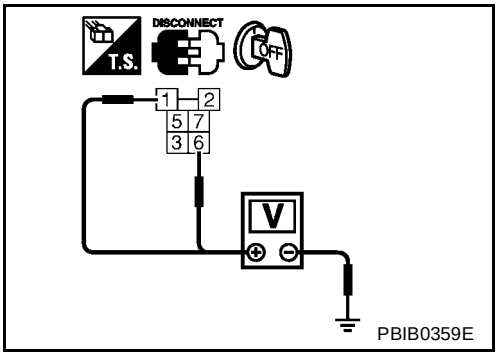
6. CHECK ECM POWER SUPPLY CIRCUIT-III

1. Disconnect ECM relay.



2. Check voltage between relay terminals 1, 6 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 8.

NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E62, F12
- 20A fuse
- Harness for open or short between ECM relay and battery

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminals D24, D26 and ECM relay terminal 2. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 9.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK ECM POWER SUPPLY CIRCUIT-IV

1. Check harness continuity between ECM terminals A8, A9 and ECM relay terminal 7. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 10.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

10. CHECK ECM RELAY

Refer to EC-1789, "Component Inspection" .

OK or NG

OK >> GO TO 11.
NG >> Replace ECM relay.

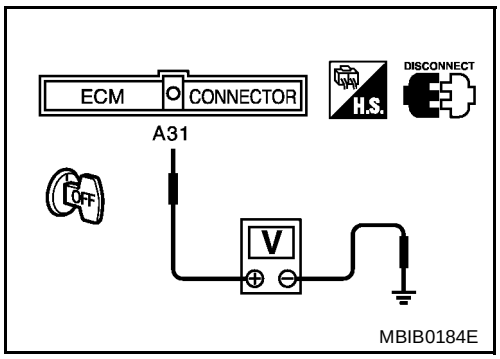
11. CHECK ECM POWER SUPPLY CIRCUIT-V

1. Turn ignition switch “OFF”.
2. Check voltage between ECM terminal A31 and ground.

Voltage: Battery voltage

OK or NG

OK >> GO TO 13.
NG >> GO TO 12.



12. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E62, F12
- 20A fuse
- Harness for open or short between ECM and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

13. CHECK ECM GROUND CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminals A5, A6, A7 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to power.

OK or NG

OK >> GO TO 14.
NG >> Repair open circuit or short to power in harness or connectors.

14. CHECK INTERMITTENT INCIDENT

Refer to EC-1783, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

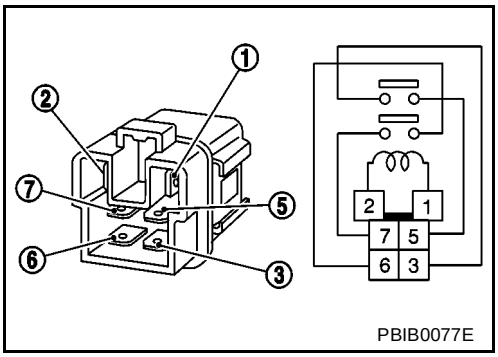
EBS00DYZ

ECM RELAY

1. Apply 12V direct current between ECM relay terminals 1 and 2.
2. Check continuity between relay terminals 3 and 5, 6 and 7.

Condition	Continuity
12V direct current supply between terminals 1 and 2	Yes
OFF	No

3. If NG, replace ECM relay.



DTC U1000 CAN COMMUNICATION LINE

PFP:23710

Description

EBS00G9W

CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent error detection ability. Many electronic control units are equipped onto a vehicle, and each control unit shares information and links with other control units during operation (not independent). In CAN communication, control units are connected with 2 communication lines (CAN H line, CAN L line) allowing a high rate of information transmission with less wiring. Each control unit transmits/receives data but selectively reads required data only.

On Board Diagnosis Logic

EBS00G9X

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
U1000 1000	CAN communication line	● ECM can not communicate to other control unit. ● ECM can not communicate for more than the specified time.	● Harness or connectors (CAN communication line is open or shorted)

DTC Confirmation Procedure

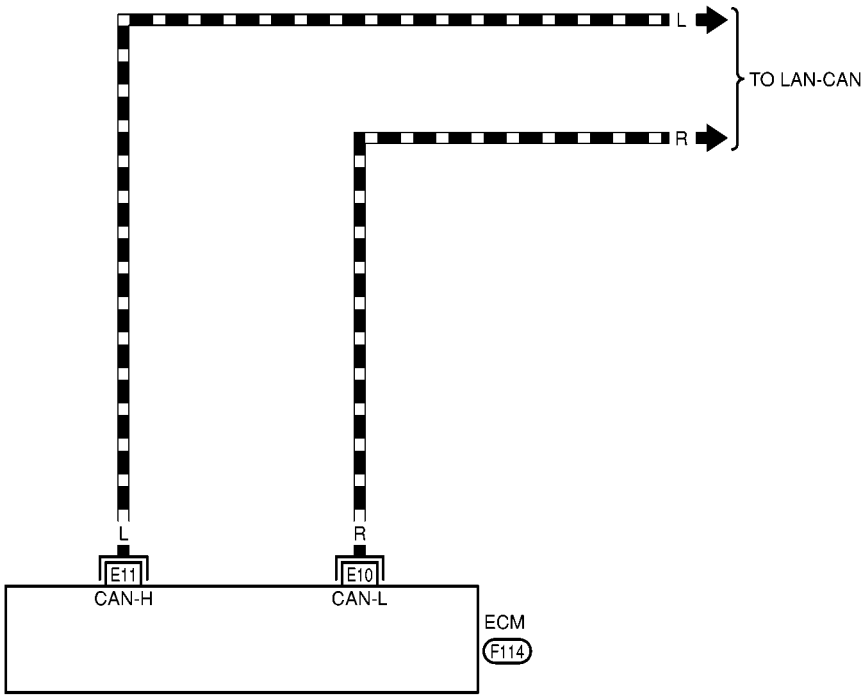
EBS00G9Y

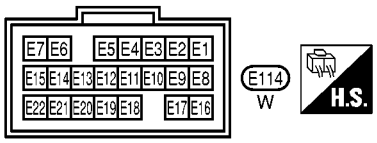
1. Turn ignition switch “ON” and wait at least 3 seconds.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. If 1st trip DTC is detected, go to EC-1792, "Diagnostic Procedure" .

Wiring Diagram

EBS00G9Z

EC-CAN-01





MBWA0124E

Diagnostic Procedure

EBS00GA0

1. INSPECTION START

1. Turn ignition switch “ON”.
2. Select “CAN DIAG SUPPORT MNTR” in “DATA MONITOR” mode with CONSULT-II.
3. Print out the CONSULT-II screen.

OK data

DATA MONITOR	
MONITOR	
CAN COMM	OK
CAN CIRC 1	OK
CAN CIRC 2	UNKWN
CAN CIRC 3	UNKWN
CAN CIRC 4	OK
CAN CIRC 5	UNKWN
CAN CIRC 6	UNKWN
CAN CIRC 7	UNKWN

NG data

DATA MONITOR	
MONITOR	
CAN COMM	OK
CAN CIRC 1	UNKWN
CAN CIRC 2	UNKWN
CAN CIRC 3	UNKWN
CAN CIRC 4	UNKWN
CAN CIRC 5	UNKWN
CAN CIRC 6	UNKWN
CAN CIRC 7	UNKWN

MBIB0009E

>> Go to LAN-8, "CAN COMMUNICATION" .

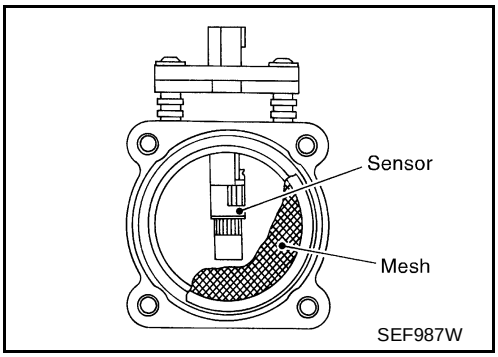
DTC P0100 MASS AIR FLOW SENSOR (MAFS)

PFP:22680

Component Description

EBS00DZ0

The mass air flow sensor (MAFS) is placed in the stream of intake air. It measures the intake air flow rate by measuring a part of the entire intake air flow. It consists of a hot film that is supplied with electric current from the ECM. The temperature of the hot film is controlled by the ECM a certain amount. The heat generated by the hot film is reduced as the intake air flows around it. The more air, the greater the heat loss.
Therefore, the ECM must supply more electric current to maintain the temperature of the hot film as air flow increases. The ECM detects the air flow by means of this current change.



CONSULT-II Reference Value in Data Monitor Mode

EBS00DZ1

Specification data are reference values.

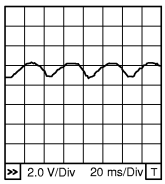
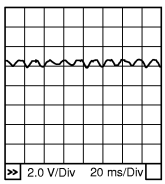
MONITOR ITEM	CONDITION		SPECIFICATION
MAS AIR/FL SE	● Engine: After warming up ● Air conditioner switch: “OFF” ● Shift lever: Neutral position ● No-load	Idle	1.0 - 2.5V
		2,000 rpm	2.1 - 2.7V

ECM Terminals and Reference Value

EBS00DZ2

Specification data are reference values, and are measured between each terminal and ground.

CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
A8 A9	R R	Power supply for ECM	**[Ignition switch “ON”]**	BATTERY VOLTAGE (11 - 14V)
A10	R	Mass air flow sensor	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0.5 - 2.5V ★  PBIB0389E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	1.5 - 3.5V ★  PBIB0390E
A24	B	Mass air flow sensor ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
A27	W	Sensor's power supply	**[Ignition switch “ON”]**	Approximately 5V

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
D24 D26	G G	ECM relay (self-shutoff)	**[Ignition switch “ON”]** **[Ignition switch “OFF”]** ● For a few seconds after turning ignition switch “OFF”	Approximately 0V
			[Ignition switch “OFF”] ● A few seconds passed after turning ignition switch “OFF”	BATTERY VOLTAGE (11 - 14V)

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

On Board Diagnosis Logic

EBS00DZ3

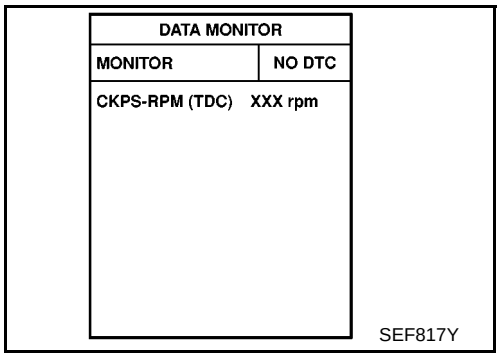
DTC	Malfunction is detected when ...	Check Items (Possible Cause)
P0100	● An excessively high or low voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Mass air flow sensor

DTC Confirmation Procedure

EBS00DZ4

WITH CONSULT-II

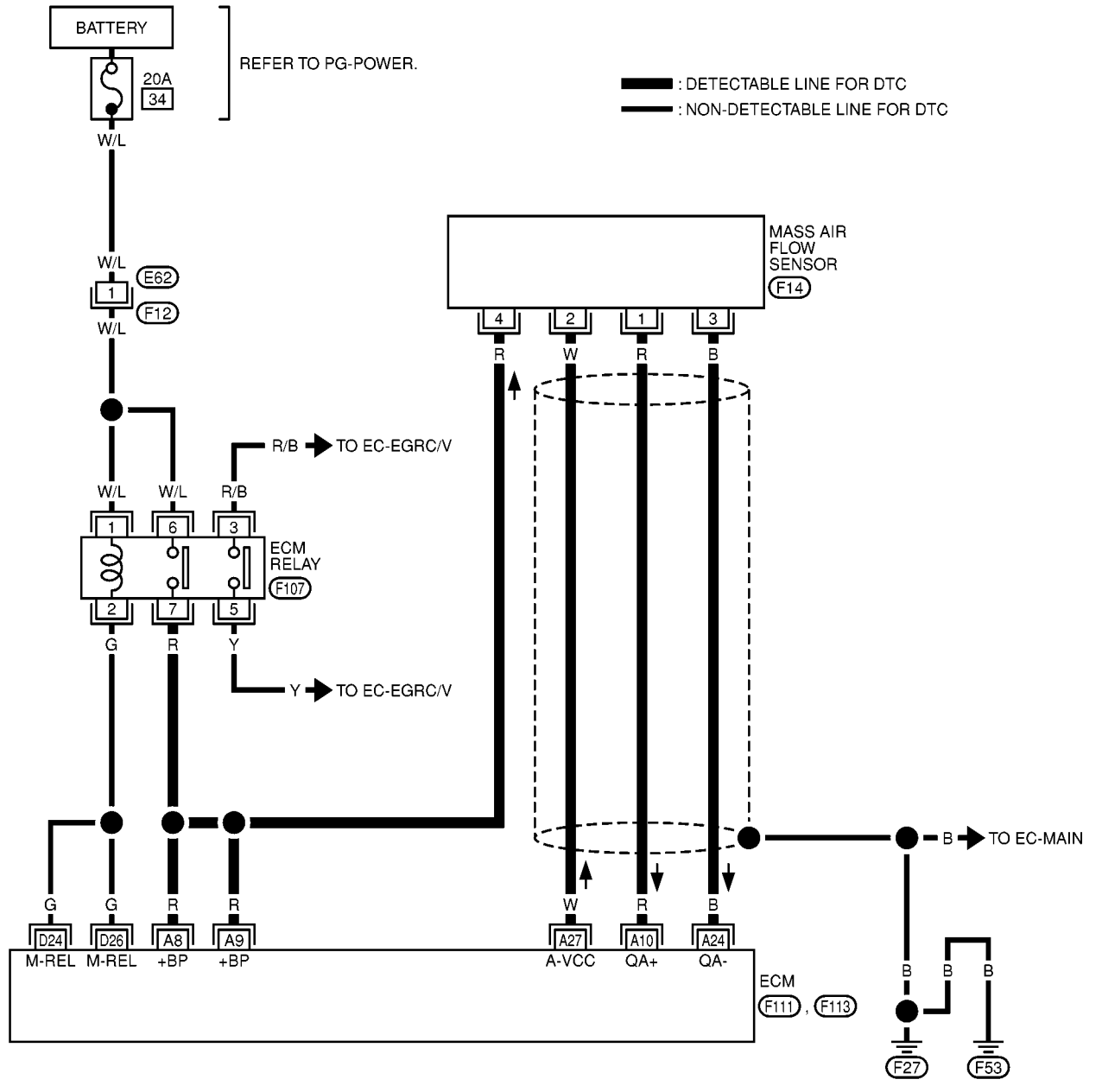
1. Turn ignition switch “ON”, and wait at least 6 seconds.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and wait at least 3 seconds.
4. If DTC is detected, go to EC-1796, "Diagnostic Procedure" .

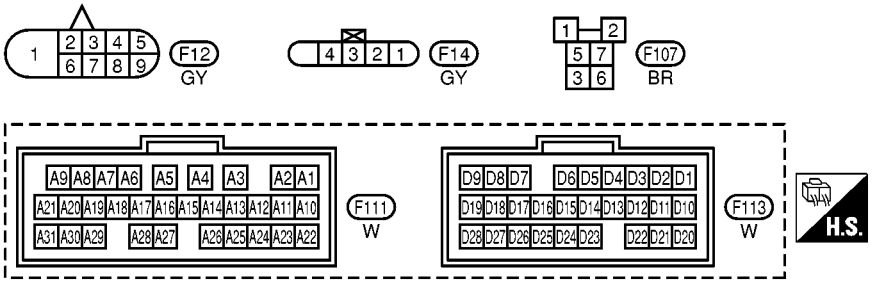


Wiring Diagram

EBS00DZ5

EC-MAFS-01





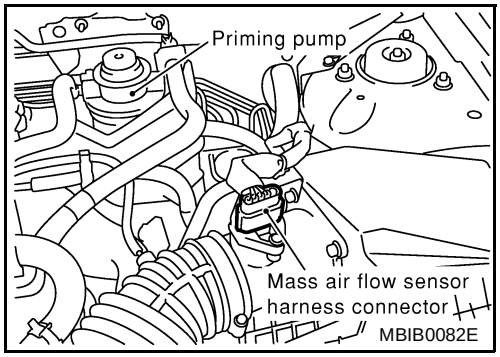
MBWA0098E

Diagnostic Procedure

EBS00DZ6

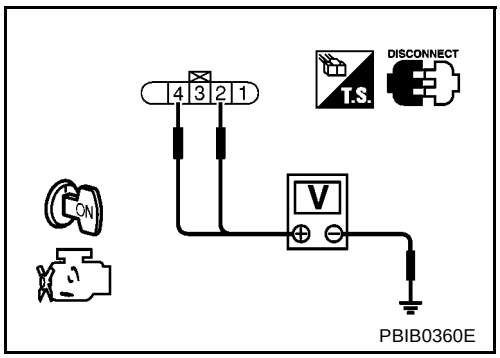
1. CHECK MAFS POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect mass air flow sensor harness connector.
3. Turn ignition switch “ON”.



4. Check voltage between mass air flow sensor terminals 2, 4 and ground with CONSULT-II or tester.

Terminal	Voltage
2	Approximately 5V
4	Battery voltage



OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between mass air flow sensor and ECM
- Harness for open or short between mass air flow sensor and ECM relay

>> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK MAFS GROUND CIRCUIT FOR OPEN AND SHORT

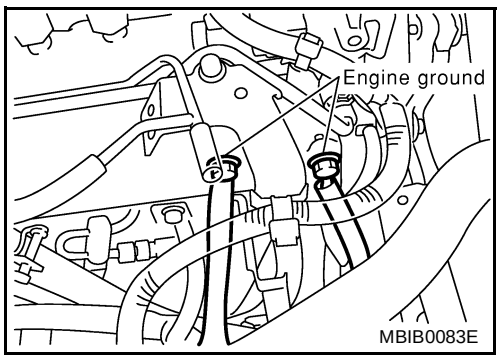
1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.
3. Check harness continuity between mass air flow sensor terminal 3 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.



4. DETECT MALFUNCTIONING PART

Check harness for open or short between mass air flow sensor and ECM.

>> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK MAFS INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between mass air flow sensor terminal 1 and ECM terminal A10. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK MASS AIR FLOW SENSOR

Refer to EC-1797, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace mass air flow sensor.

7. CHECK INTERMITTENT INCIDENT

Refer to EC-1783, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

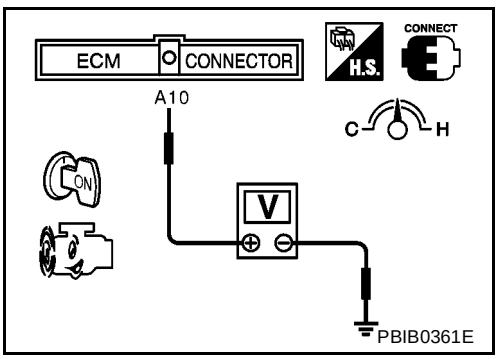
Component Inspection

EBS00DZ7

MASS AIR FLOW SENSOR

1. Reconnect harness connectors disconnected.
2. Start engine and warm it up to normal operating temperature.
3. Check voltage between ECM terminal A10 (Mass air flow sensor signal) and ground.

Condition	Voltage V
Ignition switch “ON” (Engine stopped.)	Approx. 1.0
Idle (Engine is warmed up to normal operating temperature.)	1.0 - 2.5
2,000 rpm (Engine is warmed up to normal operating temperature.)	2.1 - 2.7



4. If the voltage is out of specification, disconnect MAFS harness connector and connect it again.
Then repeat above check.

Removal and Installation

EBS00DZ8

MASS AIR FLOW SENSOR

Refer to EM-213, "AIR CLEANER AND AIR DUCT" .

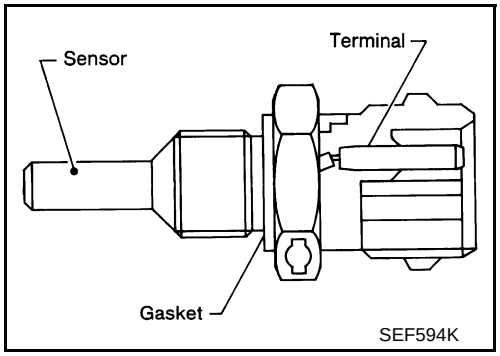
DTC P0115 ENGINE COOLANT TEMPERATURE (ECT) SENSOR (CIRCUIT)

PFP:22630

Description

EBS00DZ9

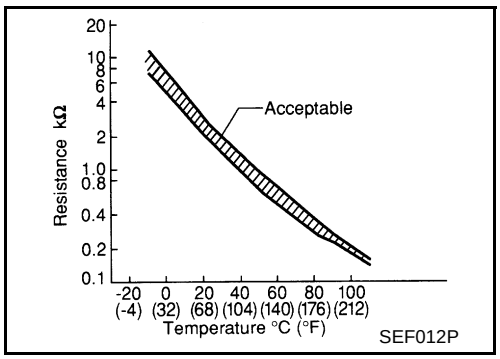
The engine coolant temperature sensor is used to detect the engine coolant temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine coolant temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.



<Reference data>

Engine coolant temperature °C (°F)	Voltage* (V)	Resistance (kΩ)
–10 (14)	4.4	7.0 - 11.4
20 (68)	3.5	2.1 - 2.9
50 (122)	2.3	0.68 - 1.00
90 (194)	1.0	0.236 - 0.260

*: These data are reference values and measured between ECM terminal A11 (Engine coolant temperature sensor) and ground.



CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

On Board Diagnosis Logic

EBS00DZA

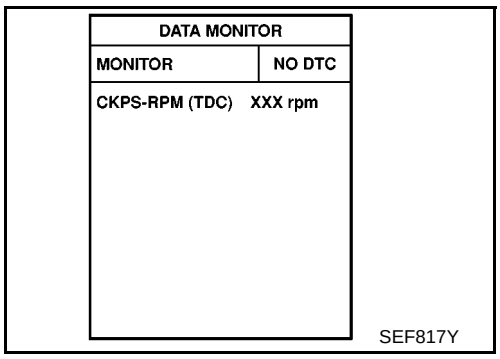
DTC	Malfunction is detected when ...	Check Items (Possible Cause)
P0115	● An excessively high or low voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Engine coolant temperature sensor

DTC Confirmation Procedure

EBS00DZB

WITH CONSULT-II

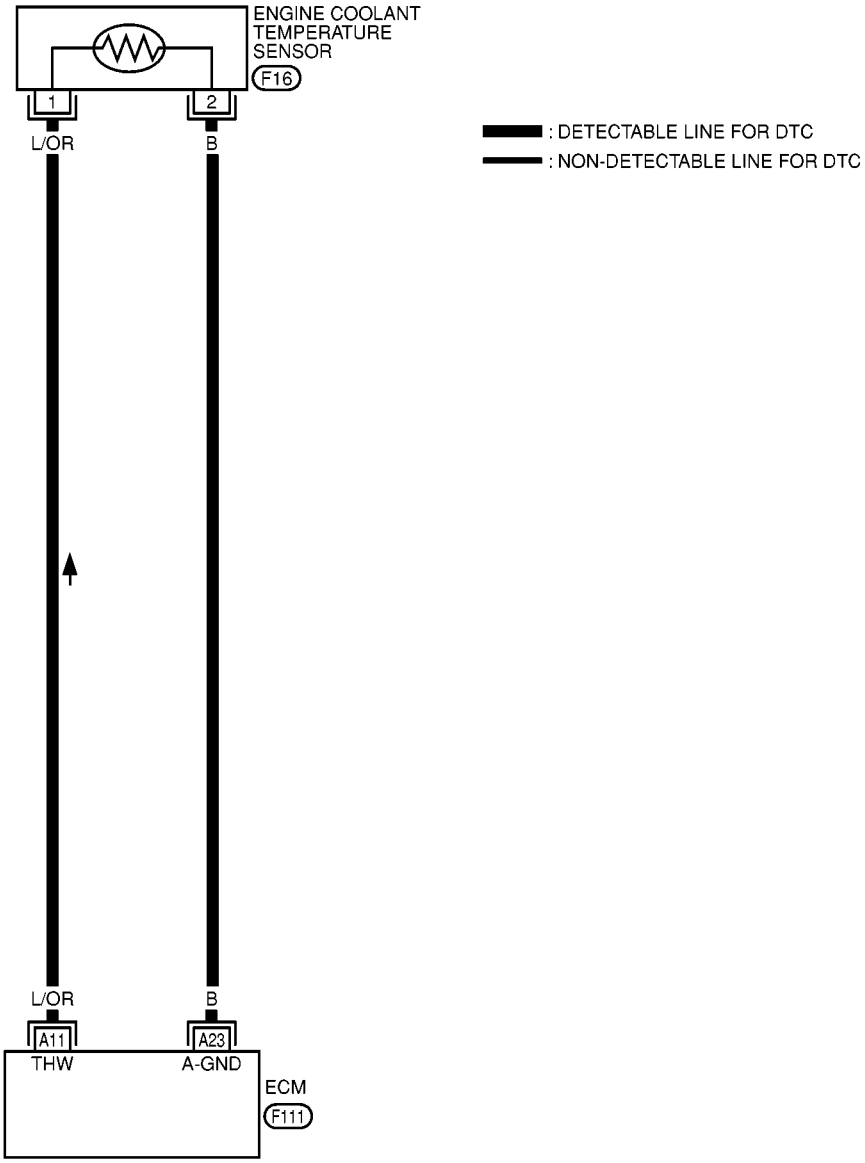
1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Wait at least 5 seconds.
4. If DTC is detected, go to EC-1800, "Diagnostic Procedure" .

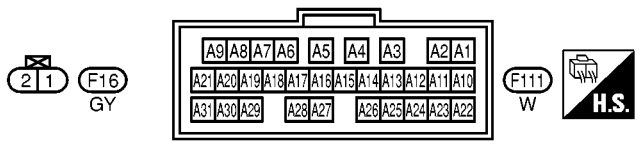


Wiring Diagram

EBS00DZC

EC-ECTS-01





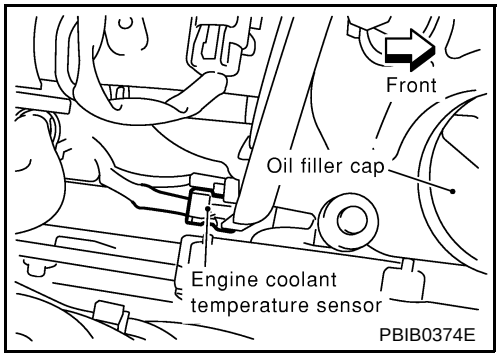
MBWA0099E

Diagnostic Procedure

EBS00DZD

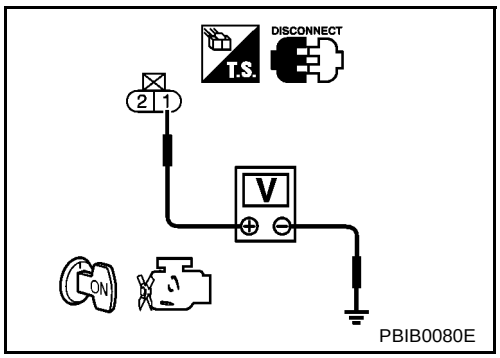
1. CHECK ECTS POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect engine coolant temperature sensor harness connector.
3. Turn ignition switch “ON”.



4. Check voltage between ECTS terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check harness for open or short between ECM and engine coolant temperature sensor.

>> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK ECTS GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between ECTS terminal 2 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check harness for open or short between ECM and engine coolant temperature sensor.

>> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-1801, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace engine coolant temperature sensor.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-1783, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

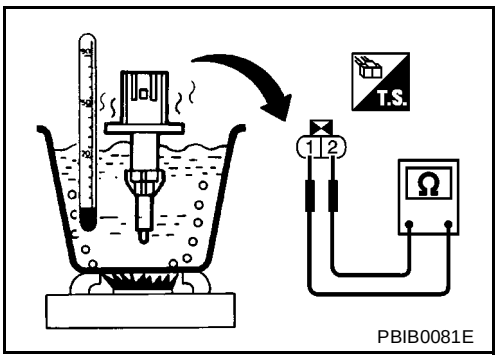
>> **INSPECTION END**

Component Inspection

EBS00DZE

ENGINE COOLANT TEMPERATURE SENSOR

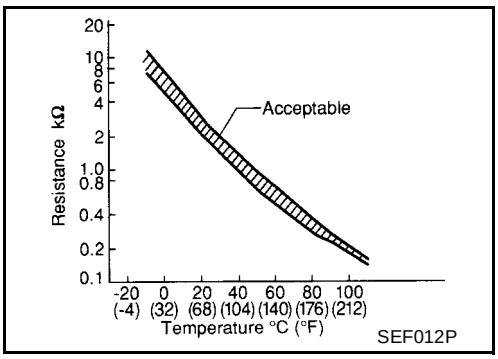
1. Check resistance between engine coolant temperature sensor terminals 1 and 2 as shown in the figure.



<Reference data>

Engine coolant temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.00
90 (194)	0.236 - 0.260

*: These data are measured between ECM terminal A11 (Engine coolant temperature sensor) and body ground.



2. If NG, replace engine coolant temperature sensor.

Removal and Installation

EBS00DZF

ENGINE COOLANT TEMPERATURE SENSOR

Refer to EM-274, "CYLINDER HEAD" .

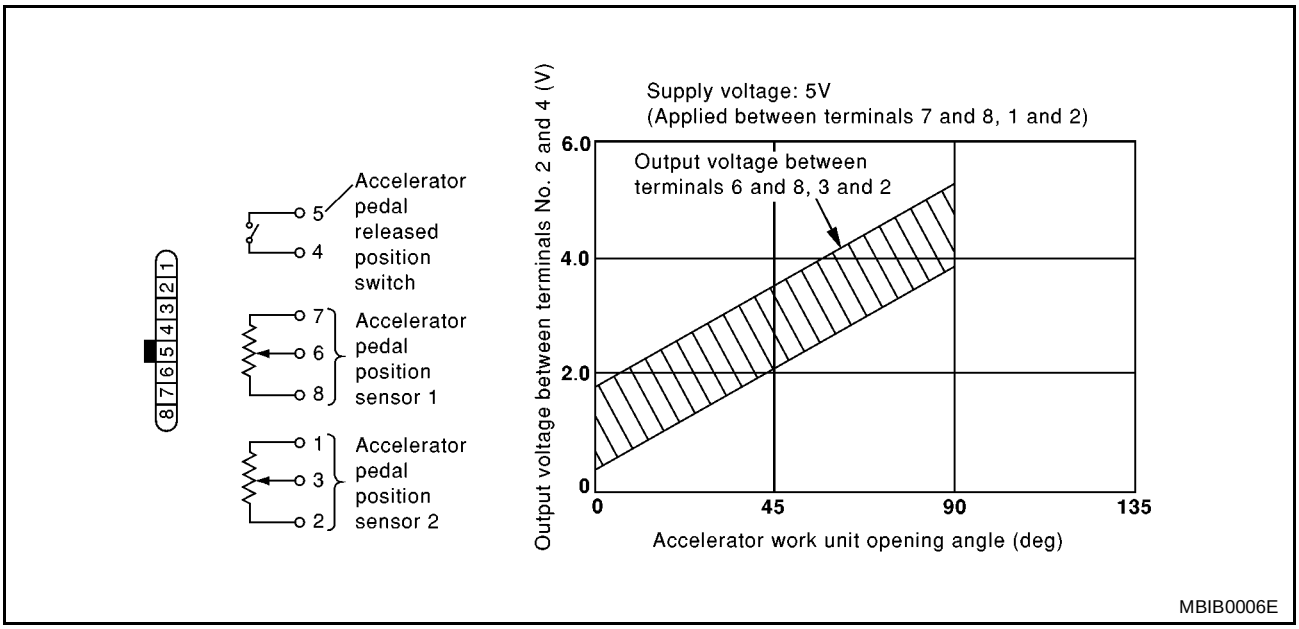
DTC P0120 ACCELERATOR PEDAL POSITION SENSOR

PFP:18002

Description

EBS00DZG

The accelerator work unit is installed on the upper end of the accelerator pedal assembly. The accelerator pedal position sensor 1, 2 and accelerator pedal released position switch are built into the accelerator work unit. The sensors detect the accelerator pedal position and sends a signal to the ECM. The ECM uses the signal to determine the amount of fuel to be injected.
The accelerator pedal released position switch detects accelerator pedal released position and sends the signal to the ECM. The ECM will then determine engine idle conditions. The signal is also used for diagnosing the accelerator pedal position sensor.



CONSULT-II Reference Value in Data Monitor Mode

EBS00DZH

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
ACCEL POS SEN	● Ignition switch: ON (Engine stopped)	Accelerator pedal: fully released	0.8 - 1.3V
		Accelerator pedal: fully depressed	More than 3.5V
ACCEL SEN 2	● Ignition switch: ON (Engine stopped)	Accelerator pedal: fully released	0.3 - 1.8V
		Accelerator pedal: fully depressed	More than 3.0V
OFF ACCEL SW	● Ignition switch: ON (Engine stopped)	Accelerator pedal: fully released	ON
		Accelerator pedal: slightly depressed	OFF

ECM Terminals and Reference Value

EBS00DZI

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
A21	B	Accelerator pedal released position switch ground	**[Ignition switch “ON”]**	Approximately 0V
A22	LG	Accelerator pedal position sensor 1 ground	**[Ignition switch “ON”]**	Approximately 0V

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
A26	LG/R	Accelerator pedal position sensor 2 ground	**[Ignition switch "ON"]**	Approximately 0V
A28	PU/R	Accelerator pedal position sensor 1 power supply	**[Ignition switch "ON"]**	Approximately 5V
B15	W	Accelerator pedal position sensor 1	**[Ignition switch "ON"]** ● Accelerator pedal fully released	0.8 - 1.3V
			[Ignition switch "ON"] ● Accelerator pedal fully depressed	More than 3.5V
B16	L	Accelerator pedal position sensor 2	**[Ignition switch "ON"]** ● Accelerator pedal fully released	0.3 - 1.8V
			[Ignition switch "ON"] ● Accelerator pedal fully depressed	More than 3.0V
B23	GY/L	Accelerator pedal position sensor 2 power supply	**[Ignition switch "ON"]**	Approximately 5V
D14	G/Y	Accelerator pedal released position switch	**[Ignition switch "ON"]** ● Accelerator pedal slightly depressed	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"] ● Accelerator pedal fully released	Approximately 0V

On Board Diagnosis Logic

EBS00DZJ

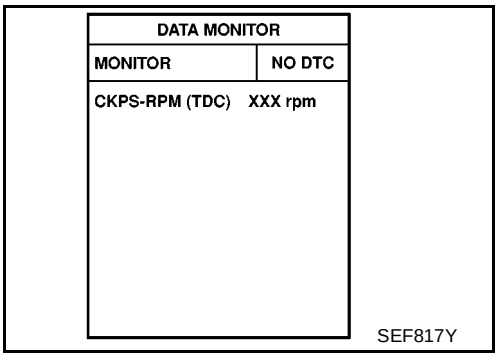
DTC	Malfunction is detected when ...	Check Items (Possible Cause)
P0120	● An improper voltage signal from accelerator pedal position sensor 1 and/or 2 is send to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Accelerator pedal position sensor 1 ● Accelerator pedal position sensor 2 ● Accelerator pedal released position switch

DTC Confirmation Procedure

EBS00DZK

WITH CONSULT-II

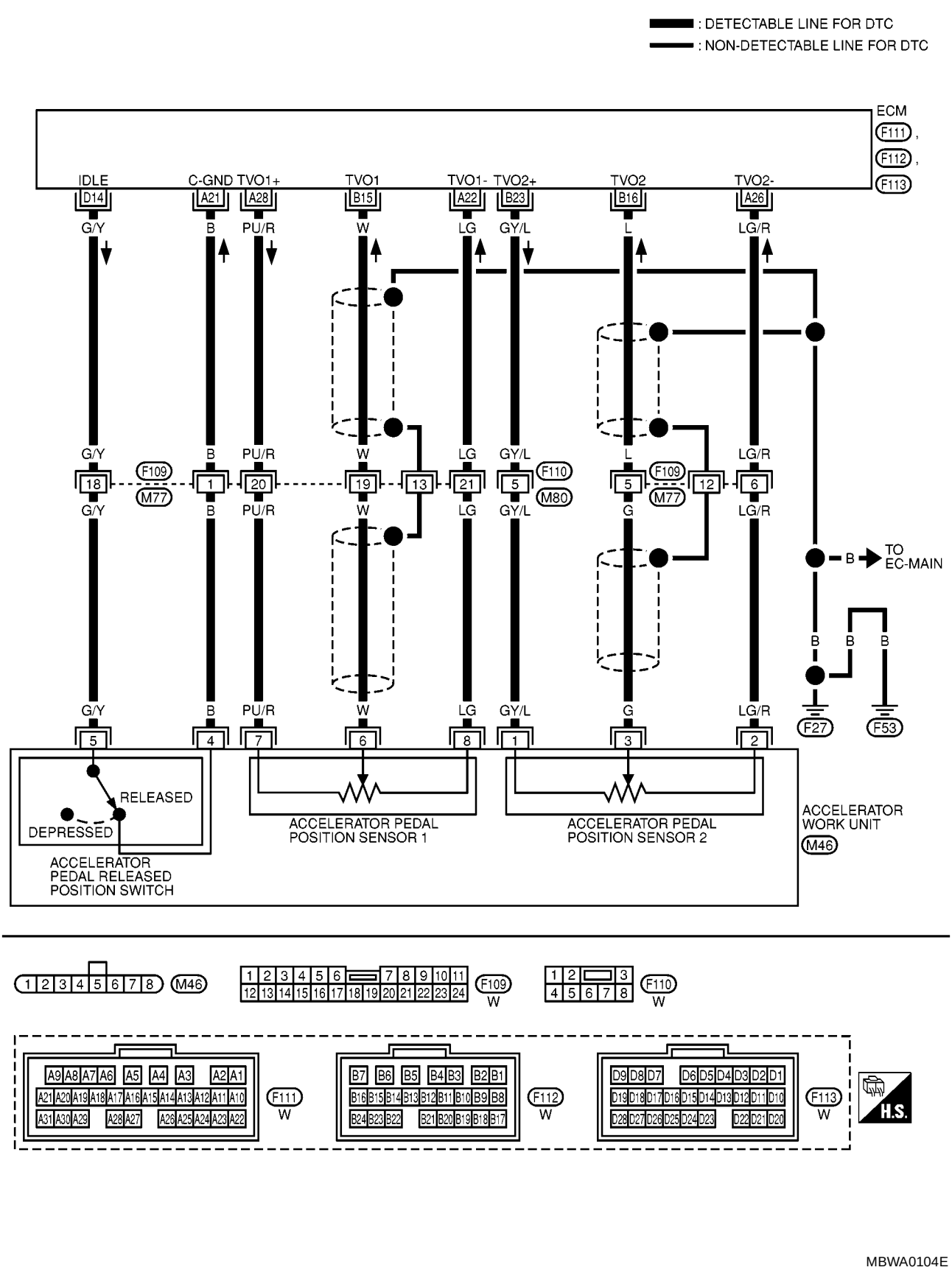
1. Turn ignition switch "ON".
2. Select "DATA MONITOR" mode with CONSULT-II.
3. Depress and release fully accelerator pedal slowly.
4. If DTC is detected, go to EC-1805, "Diagnostic Procedure" .



Wiring Diagram

EBS00DZL

EC-APPS-01



MBWA0104E

Diagnostic Procedure

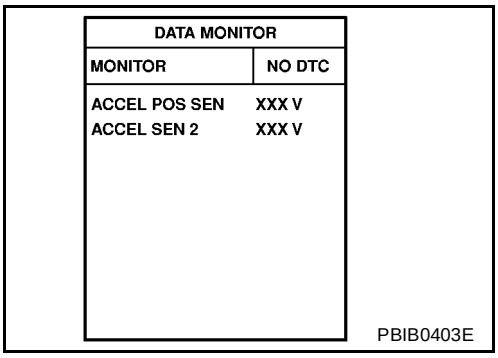
EBS00DZM

1. CHECK ACCELERATOR PEDAL POSITION SENSOR FUNCTION

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “ACCEL POS SEN” and “ACCEL SEN 2” in “DATA MONITOR” mode with CONSULT-II.
3. Check “ACCEL POS SEN” and “ACCEL SEN 2” signal under the following conditions.

Conditions	ACCEL POS SEN	ACCEL SEN 2
Accelerator pedal fully released	0.8 - 1.3V	0.3 - 1.8V
Accelerator pedal fully depressed	More than 3.5V	More than 3.0V



OK or NG

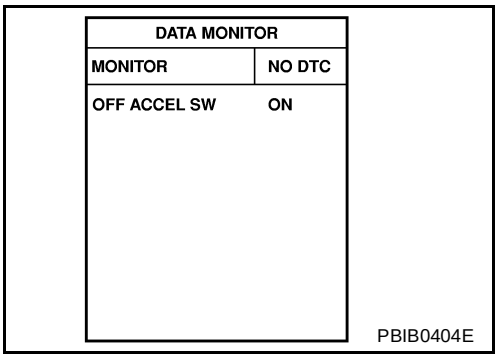
OK >> GO TO 2.
NG >> GO TO 3.

2. CHECK ACCELERATOR PEDAL RELEASED POSITION SWITCH FUNCTION

With CONSULT-II

1. Select “OFF ACCEL SW” in “DATA MONITOR” mode with CONSULT-II.
2. Check “OFF ACCEL SW” signal under the following conditions.

Conditions	OFF ACCEL SW
Accelerator pedal fully released	ON
Accelerator pedal depressed	OFF

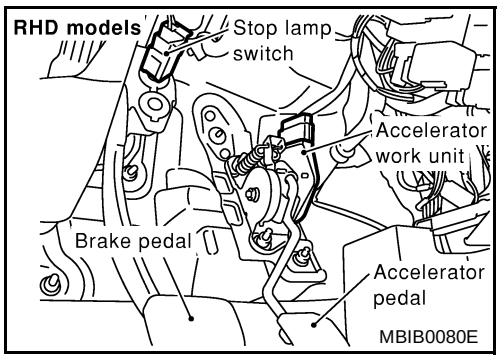


OK or NG

OK >> GO TO 16.
NG >> GO TO 10.

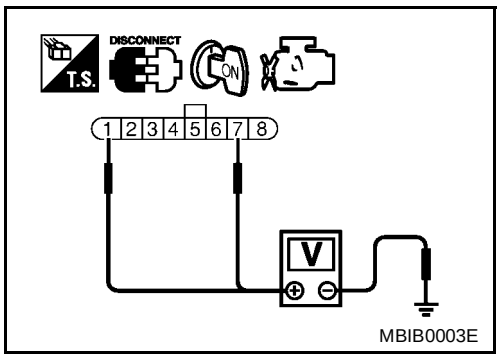
3. CHECK ACCELERATOR PEDAL POSITION SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect accelerator work unit harness connector.
3. Turn ignition switch “ON”.



4. Check voltage between accelerator work unit terminals 7, 1 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

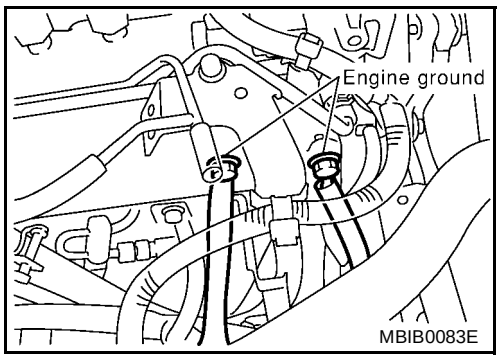
- Harness connectors F109, M77
- Harness connectors F110, M80
- Harness for open or short between ECM and accelerator work unit

>> Repair harness or connectors.

5. CHECK ACCELERATOR PEDAL POSITION SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screw.
3. Check harness continuity between accelerator work unit terminals 2, 8 and engine ground. Refer to Wiring Diagram.

Continuity should exist.



4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F109, M70
- Harness for open or short between ECM and accelerator work unit

>> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK ACCELERATOR PEDAL POSITION SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal B15 and accelerator work unit terminal 6, ECM terminal B16 and accelerator work unit terminal 3. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 9.
NG >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F109, M77
- Harness for open or short between ECM and accelerator work unit

>> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK ACCELERATOR PEDAL POSITION SENSOR

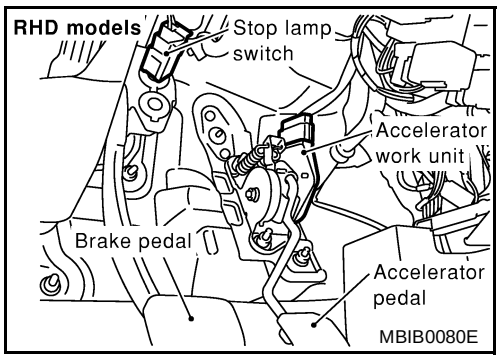
Refer to EC-1809, "Component Inspection" .

OK or NG

OK >> GO TO 16.
NG >> GO TO 15.

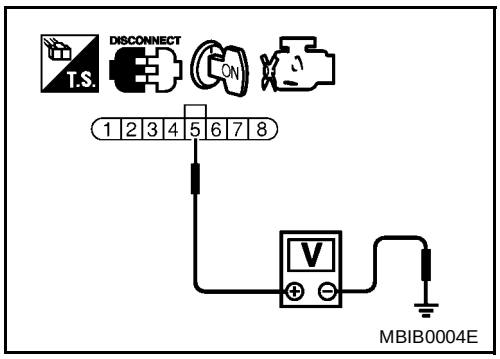
10. CHECK ACCELERATOR PEDAL RELEASED POSITION SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect accelerator work unit harness connector.
3. Turn ignition switch “ON”.



4. Check voltage between accelerator work unit terminal 5 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 12.
NG >> GO TO 11.

11. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F109, M77
- Harness for open or short between accelerator work unit and ECM

>> Repair harness or connectors.

12. CHECK ACCELERATOR PEDAL RELEASED POSITION SWITCH GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between accelerator work unit terminal 4 and ECM terminal A21. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 14.
NG >> GO TO 13.

13. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F109, M77
- Harness for open or short between ECM and accelerator work unit

>> Repair open circuit or short to ground or short to power in harness or connectors.

14. CHECK ACCELERATOR PEDAL RELEASED POSITION SWITCH

Refer to EC-1809, "Component Inspection" .

OK or NG

OK >> GO TO 16.
NG >> GO TO 15.

15. REPLEACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator work unit.
2. Perform EC-1745, "Accelerator Pedal Released Position Learning" .

>> **INSPECTION END**

16. CHECK INTERMITTENT INCIDENT

Refer to EC-1783, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

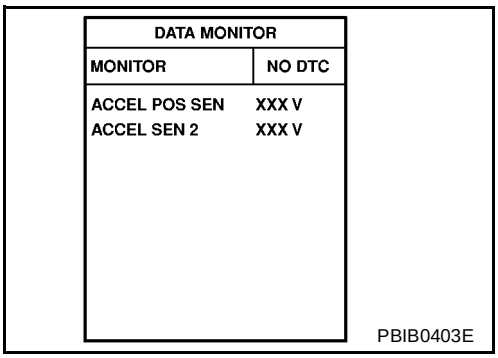
EBS00DZN

ACCELERATOR PEDAL POSITION SENSOR

With CONSULT-II

1. Reconnect all disconnected harness connectors.
2. Turn ignition switch “ON”.
3. Select “DATA MONITOR” mode with CONSULT-II.
4. Check the indication of “ACCEL POS SEN” and “ACCEL SEN 2” under the following conditions.

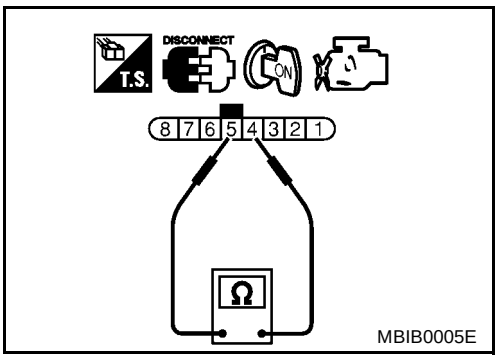
Conditions	ACCEL POS SEN	ACCEL SEN 2
Accelerator pedal fully released	0.8 - 1.3V	0.3 - 1.8V
Accelerator pedal fully depressed	More than 3.5V	More than 3.0V



ACCELERATOR PEDAL RELEASED POSITION SWITCH

Check continuity between accelerator position switch terminals 4 and 5 under the following conditions.

Conditions	Continuity
Accelerator pedal fully released	Should exist.
Accelerator pedal depressed	Should not exist.



Removal and Installation

EBS00DZO

ACCELERATOR WORK UNIT

Refer to ACC-2, "ACCELERATOR CONTROL SYSTEM" .

DTC P0190 COMMON RAIL FUEL PRESSURE SENSOR

PFP:16638

Description

EBS00DZP

The common rail fuel pressure sensor is placed to the common rail. It measures the fuel pressure in the common rail. The sensor sends voltage signal to the ECM. As the pressure increases, the voltage rises.
The ECM controls the fuel pressure in the common rail by the suction control valve. The ECM uses the signal from common rail fuel pressure sensor as a feedback signal.

CONSULT-II Reference Value in Data Monitor Mode

EBS00DZQ

Specification data are reference values.

MONITOR	CONDITION		SPECIFICATOIN
ACT CR PRESS	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: Neutral position ● No-load	Idle	30 - 40 MPa
		2,000 rpm	40 - 50 MPa

ECM Terminals and Reference Value

EBS00DZR

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
A24	B	Sensor's ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
A27	W	Sensor's power supply	**[Ignition switch “ON”]**	Approximately 5V
B13	Y/R	Common rail fuel pressure sensor	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.6 - 1.8V
B14	Y/R		**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm	1.8 - 2.0V

On Board Diagnosis Logic

EBS00DZS

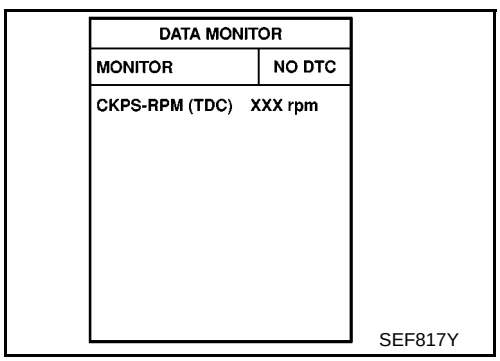
DTC	Malfunction is detected when ...	Check Items (Possible Cause)
P0190	● An excessively high or low voltage from the sensor is entered to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Common rail fuel pressure sensor

DTC Confirmation Procedure

EBS00DZT

WITH CONSULT-II

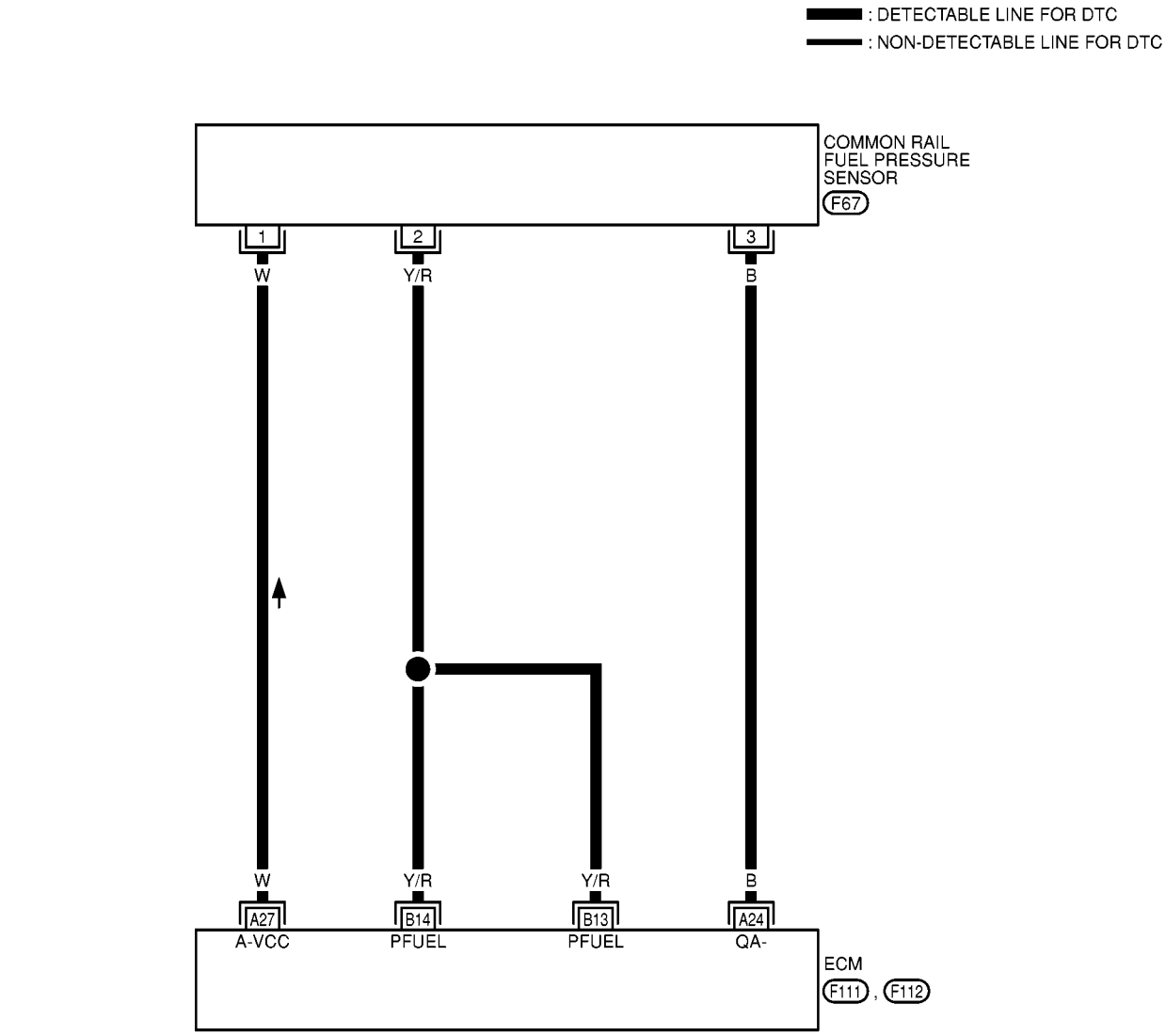
1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Wait at least 5 seconds.
4. If DTC is detected, go to EC-1812, "Diagnostic Procedure" .

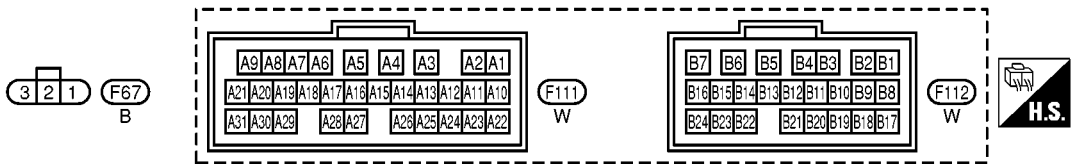


Wiring Diagram

EBS00DZU

EC-CRFPS-01





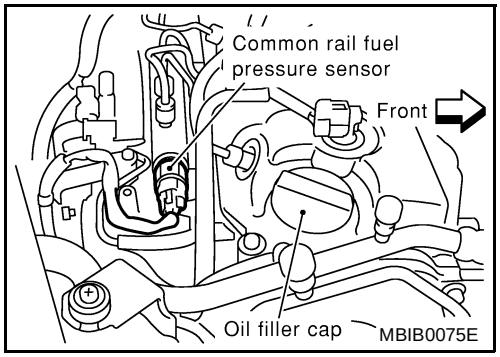
MBWA0114E

Diagnostic Procedure

EBS00DZV

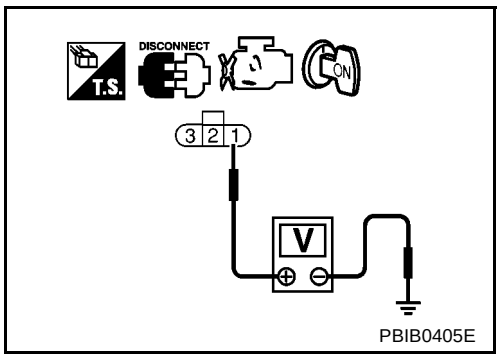
1. CHECK COMMON RAIL FUEL PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect common rail fuel pressure sensor harness connector.
3. Turn ignition switch “ON”.



4. Check voltage between common rail fuel pressure sensor terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 2.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

2. CHECK COMMON RAIL FUEL PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between common rail fuel pressure sensor terminal 3 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check harness for open or short between ECM and common rail fuel pressure sensor.

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK COMMON RAIL FUEL PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminals B13, B14 and common rail fuel pressure sensor terminal 2. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness connectors.

5. CHECK COMMON RAIL FUEL PRESSURE SENSOR

Refer to EC-1813, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace common rail assembly.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-1783, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

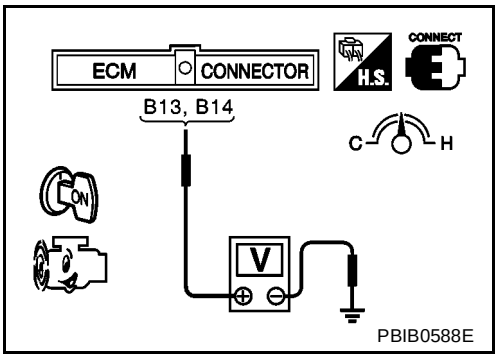
Component Inspection

EBS00DZW

COMMON RAIL FUEL PRESSURE SENSOR

1. Reconnect harness connector disconnected.
2. Start engine and warm it up to normal operating temperature.
3. Check voltage between ECM terminals B13, B14 (Common rail fuel pressure sensor signal) and ground under the following conditions.

Condition	Voltage V
Idle	1.6 - 1.8
2,000 rpm	1.8 - 2.0



4. If the voltage is out of specification, disconnect common rail fuel pressure sensor harness connector and connect it again. Then repeat above check.
5. If NG, replace common rail.

Removal and Installation

EBS00DZX

COMMON RAIL

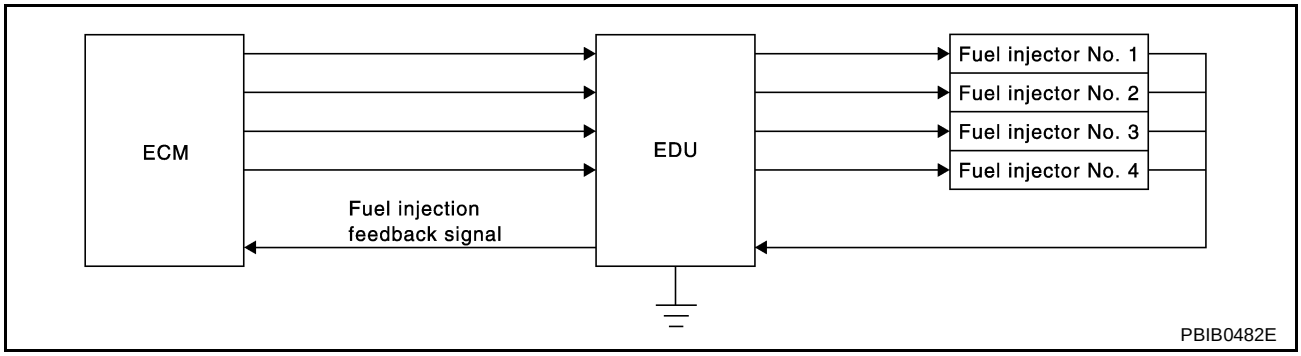
Refer to EM-236, "INJECTION TUBE AND FUEL INJECTOR" .

DTC P0201 - P0204 FUEL INJECTOR

PFP:16600

Description

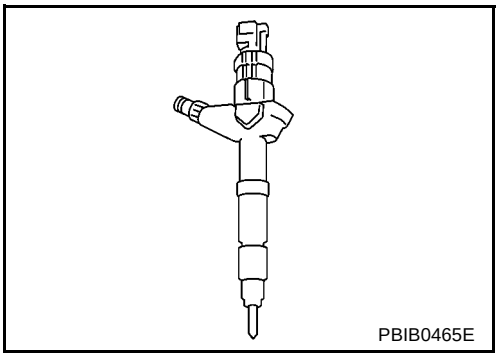
EBS00DZY



The ECM sends the fuel injection signal to EDU (Electronic Drive Unit). Then the EDU sends ON signals to fuel injectors to operate them.
The EDU monitors injector ground circuit and sends the feedback signal to the ECM.

COMPONENT DESCRIPTION

The fuel injector is a small, precise solenoid valve. When fuel injector receives ON signal from EDU, the coil in the fuel injector is energized. The energized coil pulls the needle valve back and allows fuel to flow through the fuel injector into the cylinder. The amount of fuel injected depends upon the injection pulse duration. Pulse duration is the length of time the fuel injector remains open. The ECM controls the injection pulse duration based on engine fuel needs.



CONSULT-II Reference Value in Data Monitor Mode

EBS00DZZ

Remarks: Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
MAIN INJ WID	● Engine: After warming up ● Shift lever: Neutral position ● Idle speed	No-load	0.68 - 0.78 msec
		Air conditioner switch: ON Rear window defogger switch: ON	0.78 - 0.88 msec

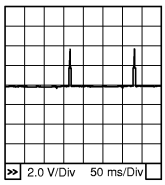
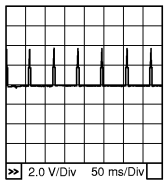
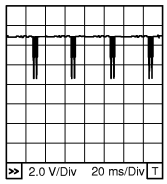
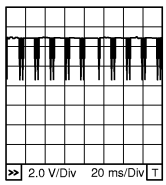
ECM Terminals and Reference Value

EBS00E00

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
A1 A2 A3 A4	L/W Y/PU PU Y	EDU drive No. 2 EDU drive No. 4 EDU drive No. 3 EDU drive No. 1	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0 - 4V ★  PBIB0387E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	0 - 4V ★  PBIB0388E
A8 A9	R R	Power supply for ECM	**[Ignition switch “ON”]**	BATTERY VOLTAGE (11 - 14V)
A29	W/PU	EDU injector check signal	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1 - 5V ★  PBIB0391E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	1 - 5V ★  PBIB0392E
D24 D26	G G	ECM relay (self-shutoff)	**[Ignition switch “ON”]** **[Ignition switch “OFF”]** ● For a few seconds after turning ignition switch “OFF”	Approximately 0V
			[Ignition switch “OFF”] ● A few seconds passed after turning ignition switch “OFF”	BATTERY VOLTAGE (11 - 14V)

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

On Board Diagnosis Logic

EBS00E01

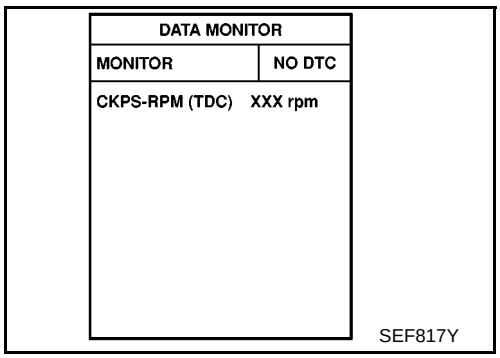
DTC	Malfunction is detected when	Check Items (Possible cause)
P0201	● Injector No.1 does not operate normally.	● Harness or connectors (Injector circuit is open or shorted.) ● Electronic drive unit ● Fuel injector
P0202	● Injector No.2 does not operate normally.	
P0203	● Injector No.3 does not operate normally.	
P0204	● Injector No.4 does not operate normally.	

DTC Confirmation Procedure

EBS00E02

WITH CONSULT-II

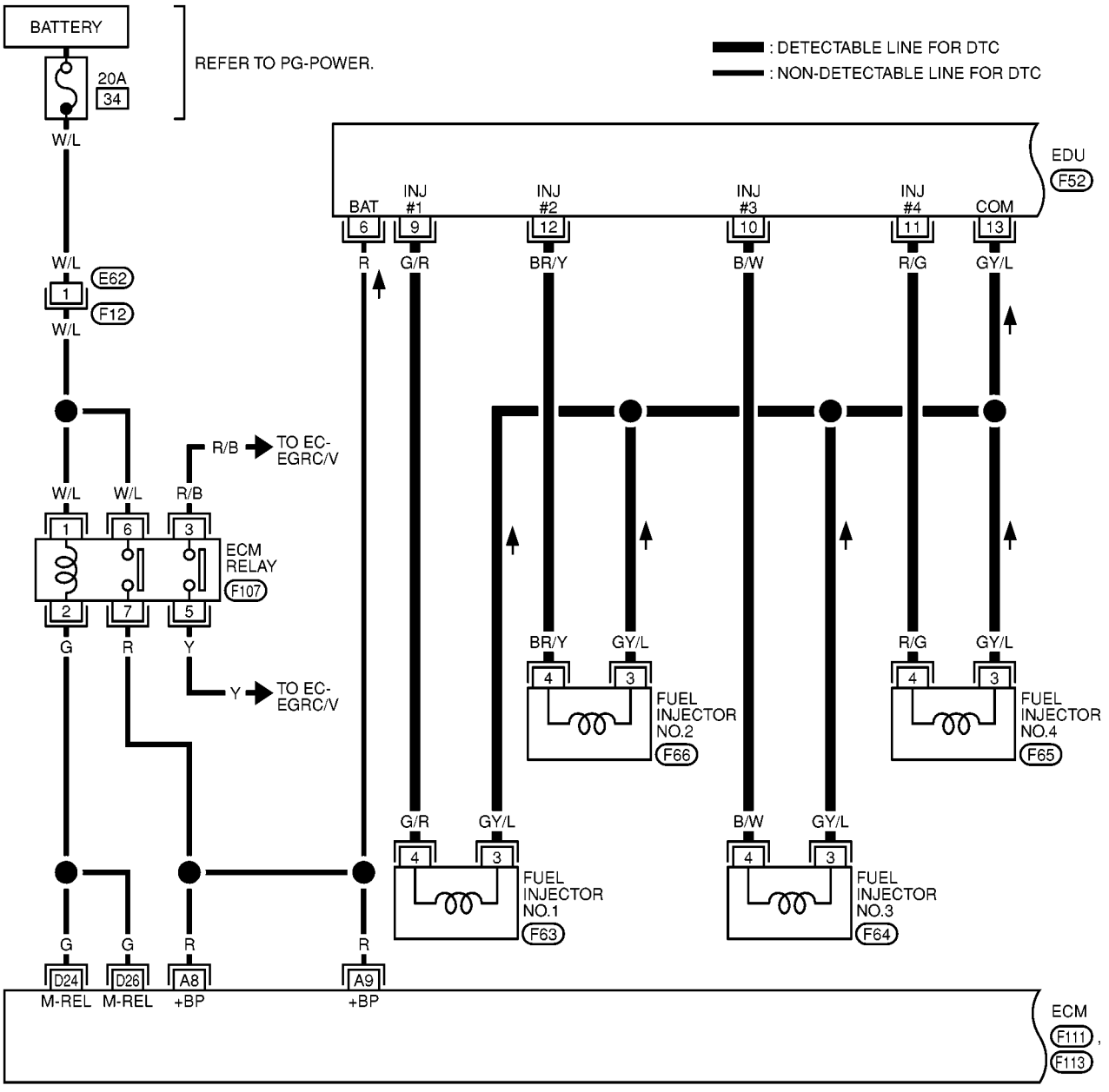
1. Turn ignition switch “ON” and wait at least 2 seconds.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and run it for at least 2 seconds at idle speed. (If engine does not run, turn ignition switch to “START” for at least 2 seconds.)
4. If DTC is detected, go to EC-1819, "Diagnostic Procedure" .

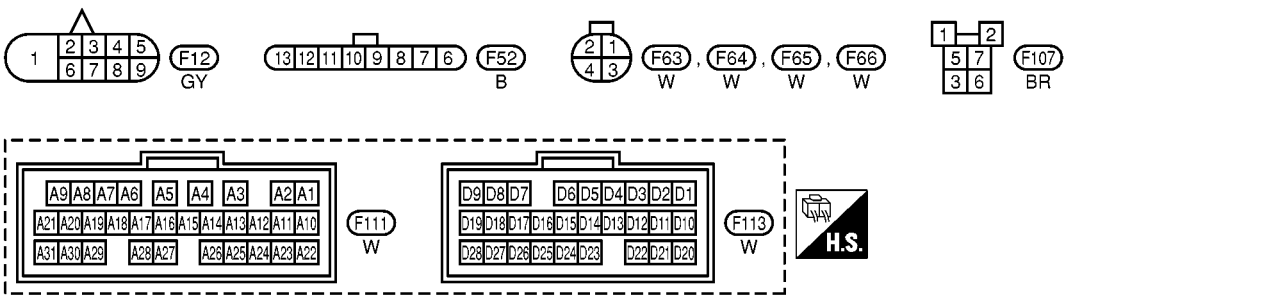


Wiring Diagram

EBS00E03

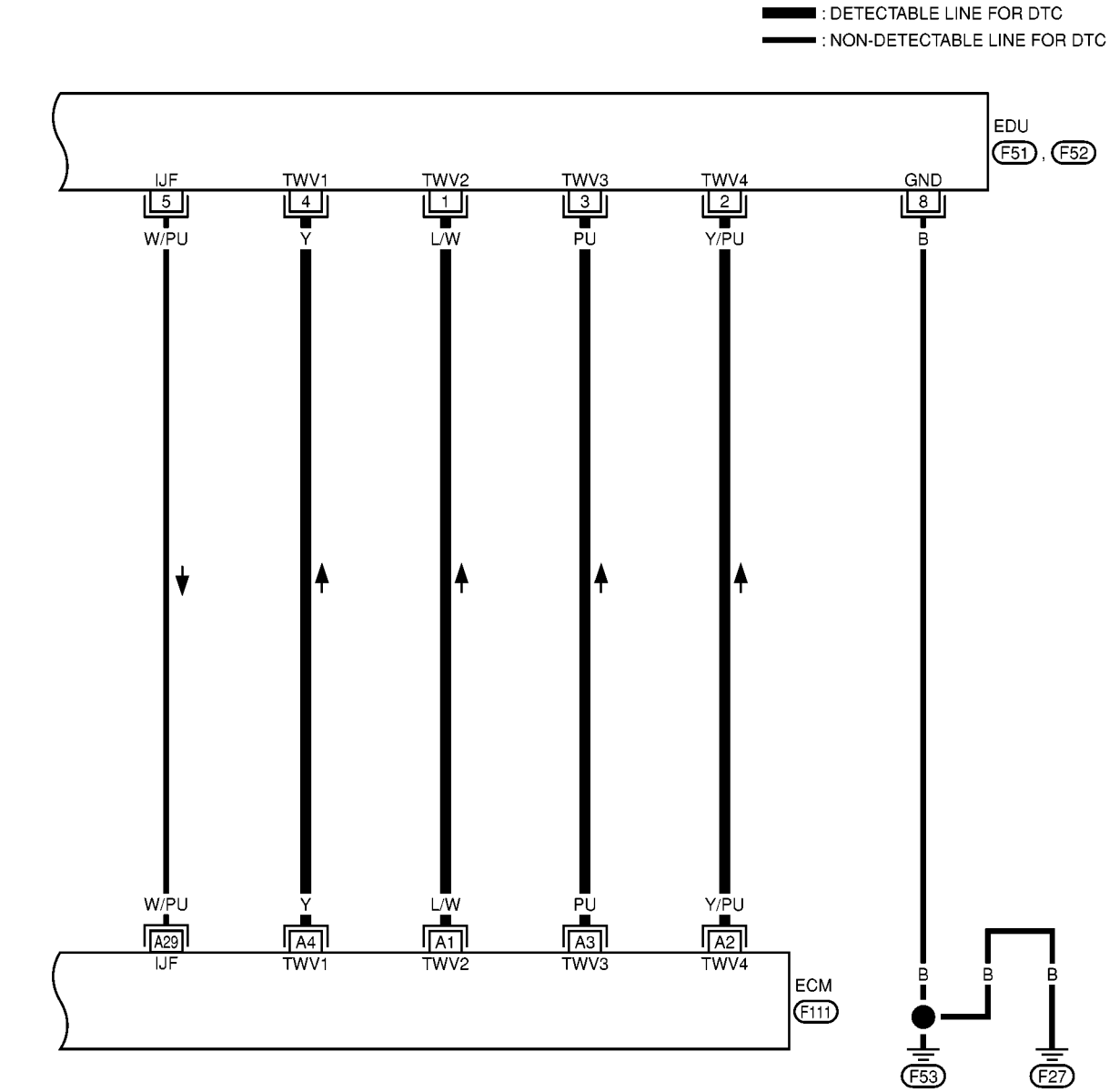
EC-INJECT-01

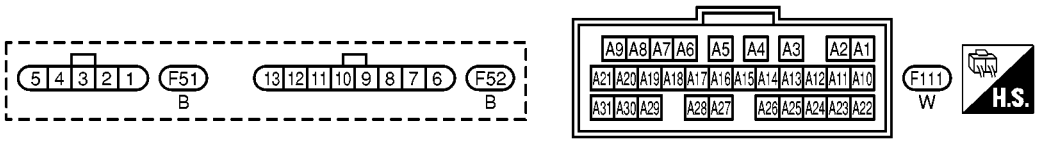




MBWA0117E

EC-INJECT-02





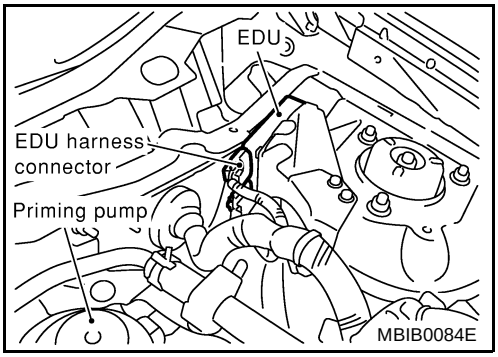
MBWA0118E

Diagnostic Procedure

EBS00E04

1. CHECK ECM OUTPUT SIGNAL CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector and EDU harness connetor.
3. Check harness continuity between the following terminals corresponding to the malfunctioning cylinder. Refer to Wiring Diagram.



DTC	Terminals		Cylinder
	ECM	EDU	
P0201	A4	4	No.1
P0202	A1	1	No.2
P0203	A3	3	No.3
P0204	A2	2	No.4

Continuity should exist.

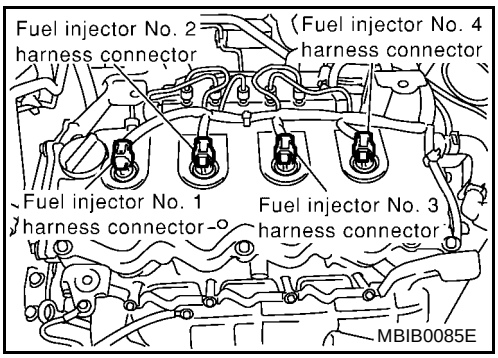
4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 2.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

2. CHECK EDU OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect fuel injector harness connector of malfunctioning cylinder.
2. Check harness continuity between the following terminals corresponding to the malfunctioning cylinder. Refer to Wiring Diagram.



DTC	Terminals		Cylinder
	EDU	Fuel injector	
P0201	9	4	No.1
P0202	12	4	No.2
P0203	10	4	No.3
P0204	11	4	No.4

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK FUEL INJECOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity fuel injector terminal 3 of malfunctioning cylinder and EDU terminal 13.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK FUEL INJECTOR-I

Refer to EC-1820, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace fuel injector.

5. CHECK FUEL INJECTOR-II

1. Remove two fuel injectors of malfunctioning cylinder and another cylinder.
2. Install fuel injectors to different cylinder.
3. Reconnect ECM harness connector, EDU harness connector and fuel injector harness connector.
4. Erase DTC. Refer to EC-1748, "HOW TO ERASE DTC" .
5. Select “DATA MONITOR” mode with CONSULT-II.
6. Start engine and warm it up to the normal operating temperature.
7. Check DTC.

Same DTC is detected. >>Replace EDU.
Another DTC is detected. >>Replace fuel injector of malfunctioning cylinder.
No DTC is detected. >>GO TO 6.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-1783, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

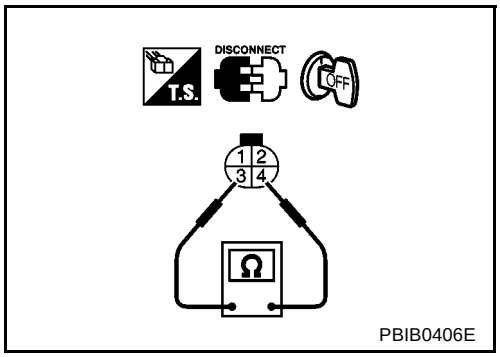
EBS00E05

FUEL INJECTOR

1. Disconnect fuel injector.
2. Check continuity between terminals as shown in the figure.

Continuity should exist.

3. If NG, replace fuel injector.



Removal and Installation

EBS00E06

FUEL INJECTOR

Refer to EM-236, "INJECTION TUBE AND FUEL INJECTOR" .

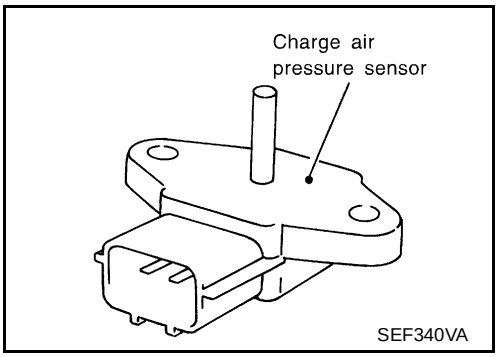
DTC P0235 CHARGE AIR PRESSURE SENSOR

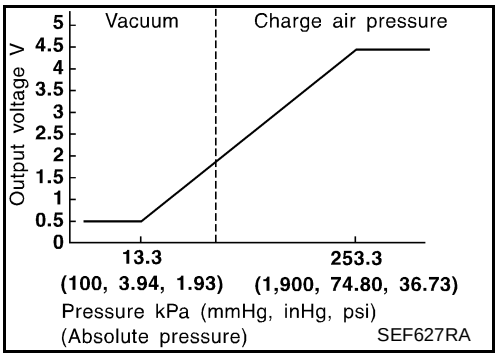
PFP:22365

Component Description

EBS00G9B

The charge air pressure sensor detects pressure in the exit side of the charge air cooler. The sensor output voltage to the ECM increases as pressure increases.





ECM Terminals and Reference Value

EBS00G9D

Specification data are reference values, and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may damage the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
46	L	Charge air pressure sensor	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 2.0V

On Board Diagnosis Logic

EBS00G9E

DTC		Malfunction is detected when ...	Check Items (Possible Cause)
P0235	A	● An excessively high or low voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Charge air pressure sensor
	B	● The ECM detects the variable nozzle turbocharger control actuator is stuck. **MI will not light up for this malfunction** .	● Harness or connectors (The solenoid valve circuit is shorted.) ● Variable nozzle turbocharger control actuator

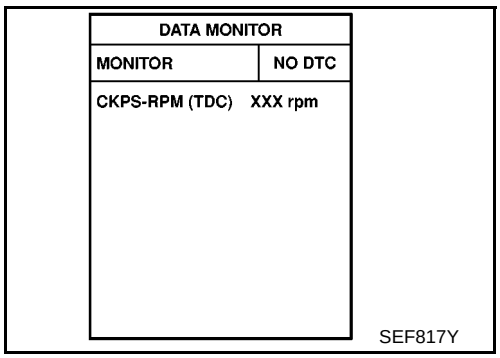
DTC Confirmation Procedure

EBS00G9F

PROCEDURE FOR MALFUNCTION A

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Wait at least 5 seconds.
4. If DTC is detected and MI lights up, go to EC-1821, "PROCEDURE FOR MALFUNCTION A" .



OVERALL FUNCTION CHECK FOR MALFUNCTION B

WITH CONSULT-II

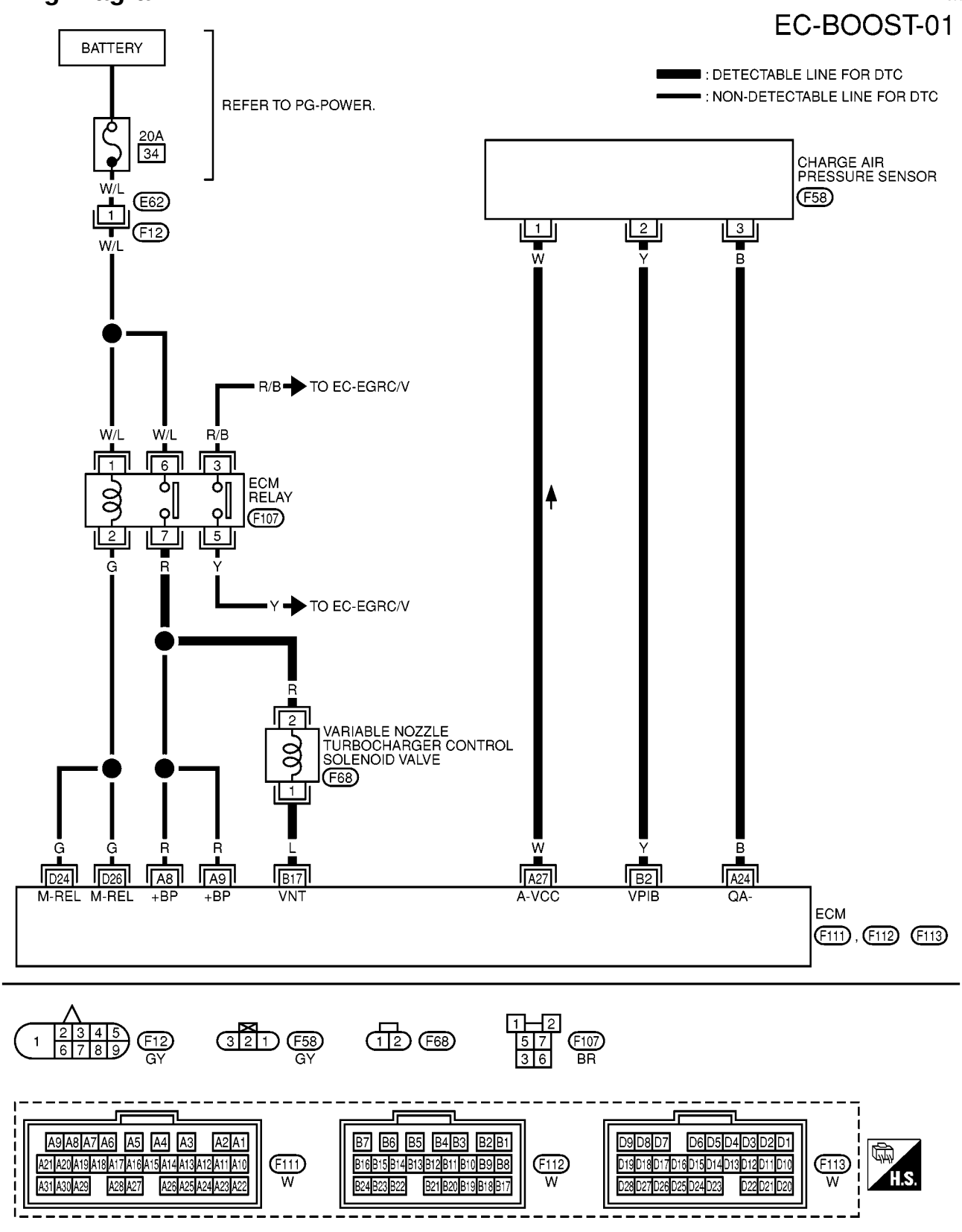
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF”.
3. Make sure that variable nozzle turbocharger control actuator rod moves while performing the following procedure.

a. Start engine and let it idle.
b. Turn ignition switch “OFF”.

4. If NG, go to EC-1822, "OVERALL FUNCTION CHECK FOR MALFUNCTION B" .

Wiring Diagram

EBS00G9G



MBWA0123E

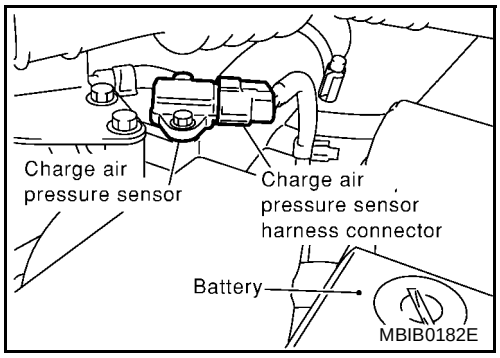
Diagnostic Procedure

EBS00G9H

PROCEDURE A

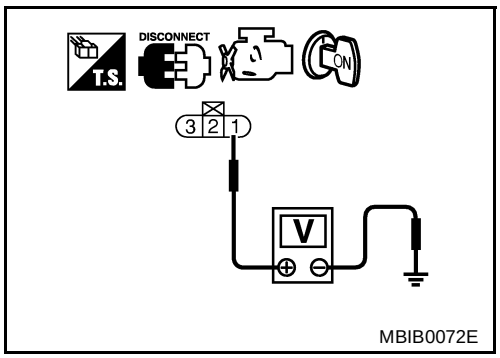
1. CHECK CHARGE AIR PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect charge air pressure sensor harness connector.
3. Turn ignition switch “ON”.



4. Check voltage between charge air pressure sensor terminal 1 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 2.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

2. CHECK CHARGE AIR PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between charge air pressure sensor terminal 3 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check harness for open or short between ECM and charge air pressure sensor.

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK CHARGE AIR PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminals B2 and charge air pressure sensor terminal 2. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness connectors.

5. CHECK CHARGE AIR PRESSURE SENSOR

Refer to EC-1826, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace charge air pressure sensor.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-1783, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

PROCEDURE B

1. CHECK VARIABLE NOZZLE TURBOCHARGER CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal B17 and variable nozzle turbocharger control solenoid valve terminal 1. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 2.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

2. CHECK CHARGE AIR PRESSURE SENSOR

Refer to EC-1826, "Component Inspection" .

OK or NG

OK >> GO TO 3.
NG >> Replace charge air pressure sensor.

3. CHECK VARIABLE NOZZLE TURBOCHARGER CONTROL ACTUATOR

Refer to EM-224, "VARIABLE NOZZLE TURBOCHARGER CONTROL ACTUATOR" .

OK or NG

OK >> GO TO 4.
NG >> Replace variable nozzle turbocharger.

4. CHECK INTERMITTENT INCIDENT

Refer to EC-1783, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

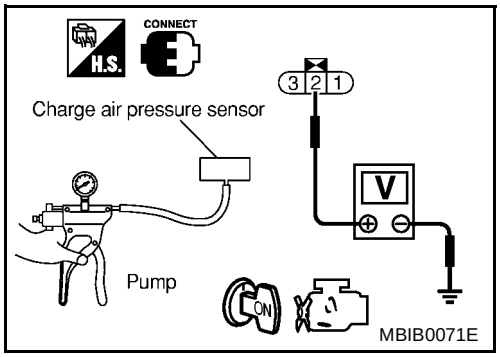
EBS00G9I

CHECK CHARGE AIR PRESSURE SENSOR

1. Remove charge air pressure sensor with its harness connected.
2. Turn ignition switch “ON”.
3. Use pump to apply pressure sensor as shown in the figure.

   CAUTION:
   - **Always calibrate the pressure pump gauge when using it.**
   - **Inspection should be done at room temperature [10-30°C (50-86°F)].**
4. Check the output voltage between charge air pressure sensor terminal 2 and engine ground.

Pressure (Relative to atmospheric pressure)	Voltage V
0 kPa (0 mbar, 0 mmHg, 0 inHg)	Approximately 2.0V
+40 kPa (400 mbar, 300mmHg, 11.81 inHg)	Approximately 2.6V



Removal and Installation

EBS00G9J

CHARGE AIR PRESSURE SENSOR

Refer to EM-220, "Removal and Installation" .

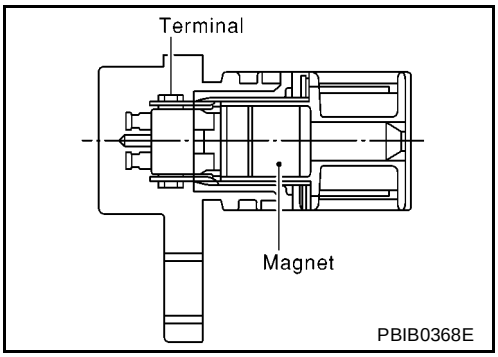
DTC P0335 CRANKSHAFT POSITION SENSOR (TDC)

PFP:23731

Description

EBS00E07

The crankshaft position sensor (TDC) monitors engine speed by means of signals from the sensing plate (with 23 protrusions) installed to the fly wheel. The datum signal output is detected 15° signal and sent to the ECM. The sensor signal is used for fuel injection control and fuel injection timing control.



CONSULT-II Reference Value in Data Monitor Mode

EBS00E08

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
CKPS·RPM (TDC)	● Tachometer: Connect ● Run engine and compare tachometer indication with the CONSULT-II value.	Almost the same speed as the CONSULT-II value.

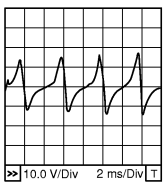
ECM Terminals and Reference Value

EBS00E09

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA(DC Voltage and Pulse Signal)
B20	L/R	Crankshaft position sensor (TDC) ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
B21	L/G	Crankshaft position sensor (TDC)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0 - 12.5V ★  PBIB0395E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	0 - 30V ★  PBIB0396E

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

On Board Diagnosis Logic

EBS00E0A

DTC	Malfunction is detected when ...	Check Items (Possible Cause)
P0335	● An improper voltage signal from the sensor is sent to ECM during running and cranking.	● Harness or connectors (The sensor circuit is open or shorted.) ● Crankshaft position sensor (TDC)

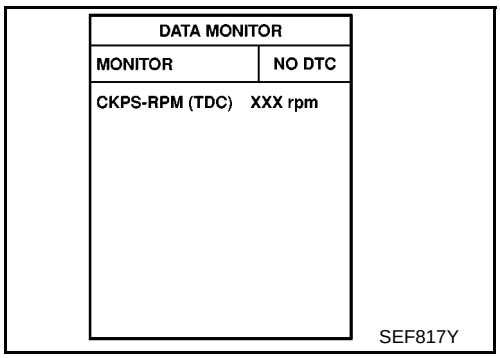
DTC Confirmation Procedure

EBS00E0B

Before performing the following procedure, confirm that battery voltage is more than 10V.

WITH CONSULT-II

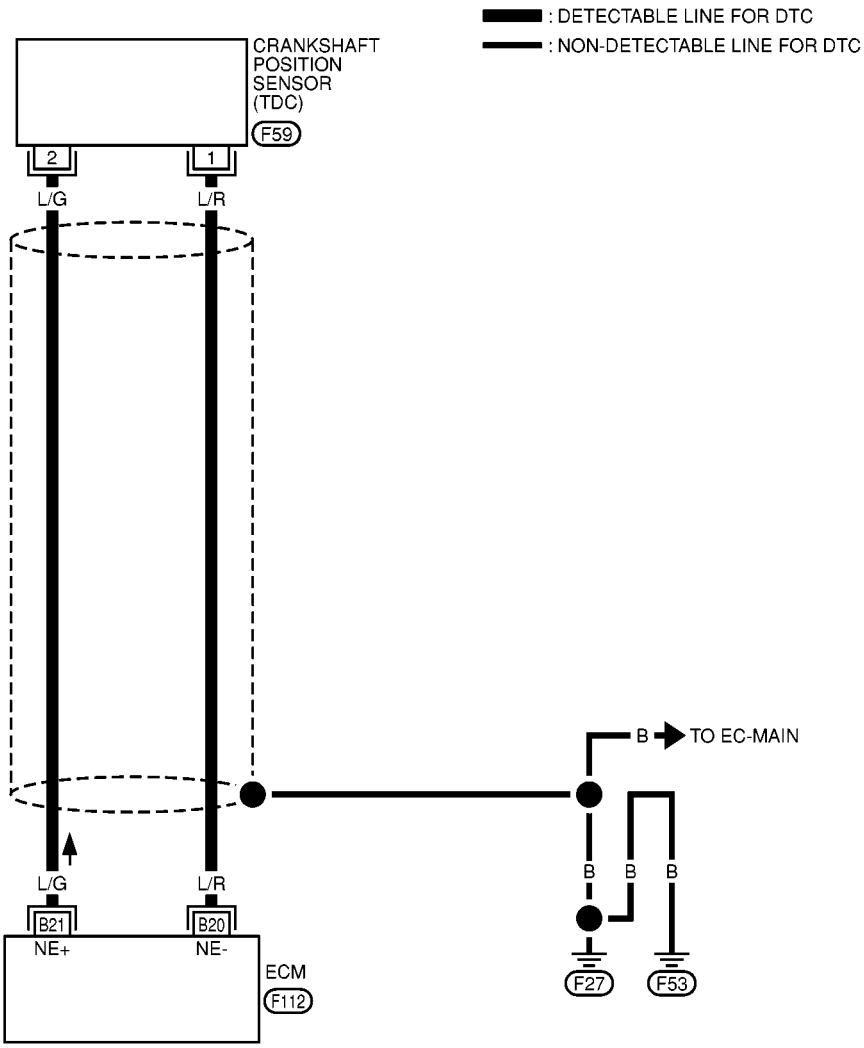
1. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2. Crank engine for at least 1 second.
3. Start engine and run it for at least 2 seconds at idle speed.
4. If DTC is detected, go to EC-1830, "Diagnostic Procedure" .

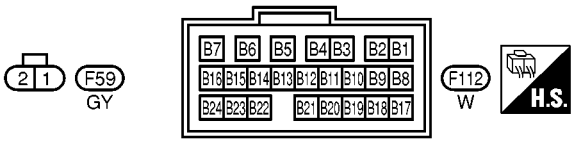


Wiring Diagram

EBS00E0C

EC-CKPS-01





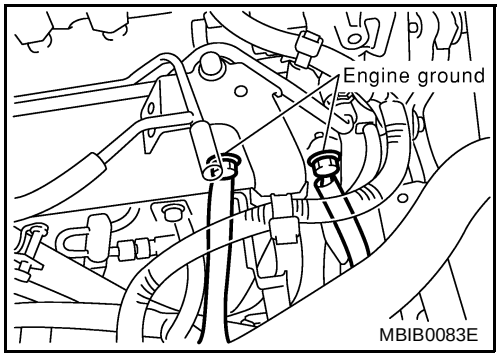
MBWA0112E

Diagnostic Procedure

EBS00E0D

1. CHECK CRANKSHAFT POSITION SENSOR (TDC) GROUND CIRCUIT FOR OPEN AND SHORT

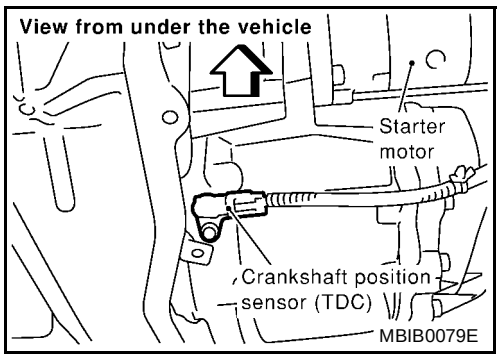
1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.



3. Disconnect crankshaft position sensor (TDC) harness connector and ECM harness connector.
4. Check harness continuity between ECM terminal B20 and crankshaft position sensor (TDC) terminal 1. Refer to Wiring Diagram.

Continuity should exist.

5. Also check harness for short to ground and short to power.



OK or NG

OK >> GO TO 2.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

2. CHECK CRANKSHAFT POSITION SENSOR (TDC) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between crankshaft position sensor (TDC) terminal 2 and ECM terminal B21. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK CRANKSHAFT POSITION SENSOR (TDC)

Refer to EC-1830, "Component Inspection" .

OK or NG

OK >> GO TO 4.
NG >> Replace crankshaft position sensor (TDC).

4. CHECK INTERMITTENT INCIDENT

Refer to EC-1783, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

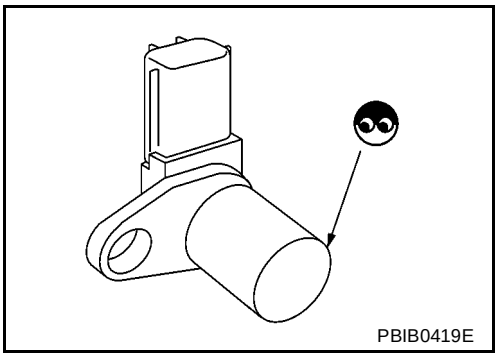
Component Inspection

EBS00E0E

CRANKSHAFT POSITION SENSOR (TDC)

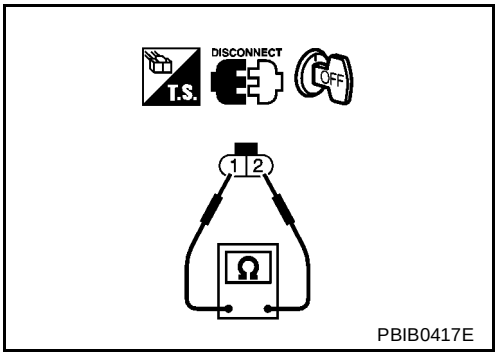
1. Loosen the fixing bolt of the sensor.

2. Disconnect crankshaft position sensor (TDC) harness connector.
3. Remove the sensor.
4. Visually check the sensor for chipping.


PBIB0419E

5. Check resistance as shown in the figure.

Resistance: 1,850 - 2,450 Ω



PBIB0417E

Removal and Installation

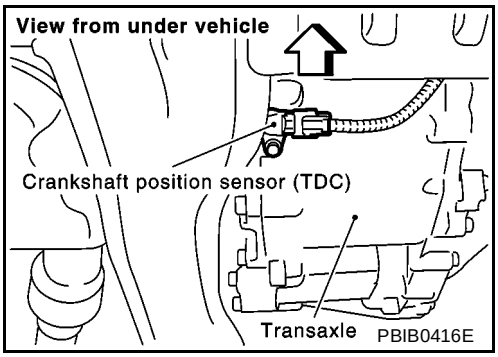
EBS00E0F

CRANKSHAFT POSITION SENSOR (TDC)

When installing crankshaft position sensor (TDC), tighten it with specific torque.

Tightening torque:

4.9 - 7.9 N·m (0.50 - 0.81 kg-m, 43 - 70 in-lb)



PBIB0416E

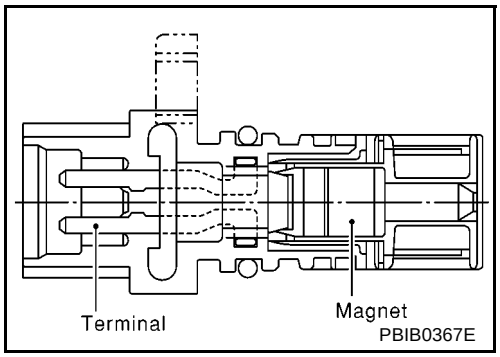
DTC P0340 CAMSHAFT POSITION SENSOR

PFP:23731

Description

EBS00E0G

The camshaft position sensor identifies a particular cylinder by means of signals from the sensing plate (with five protrusions) installed to the camshaft. The datum signal output is detected 90° signal and sent to the ECM. The sensor signal is used for fuel injection control and fuel injection timing control.



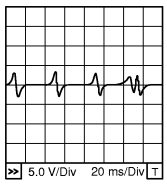
ECM Terminals and Reference Value

EBS00E0H

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA(DC Voltage and Pulse Signal)
B18	G	Camshaft position sensor ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
B19	R	Camshaft position sensor	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0 - 3V ★  PBIB0393E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	0 - 8V ★  PBIB0394E

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

On Board Diagnosis Logic

EBS00E0I

DTC	Malfunction is detected when ...	Check Items (Possible Cause)
P0340	● An improper voltage signal from the sensor is send to ECM during running and cranking.	● Harness or connectors (The sensor circuit is open or shorted.) ● Camshaft position sensor

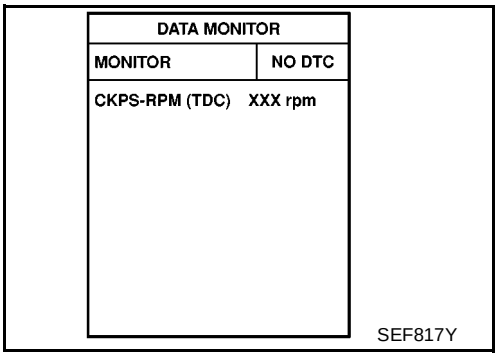
DTC Confirmation Procedure

EBS00E0J

Before performing the following procedure, confirm that battery voltage is more than 10V.

WITH CONSULT-II

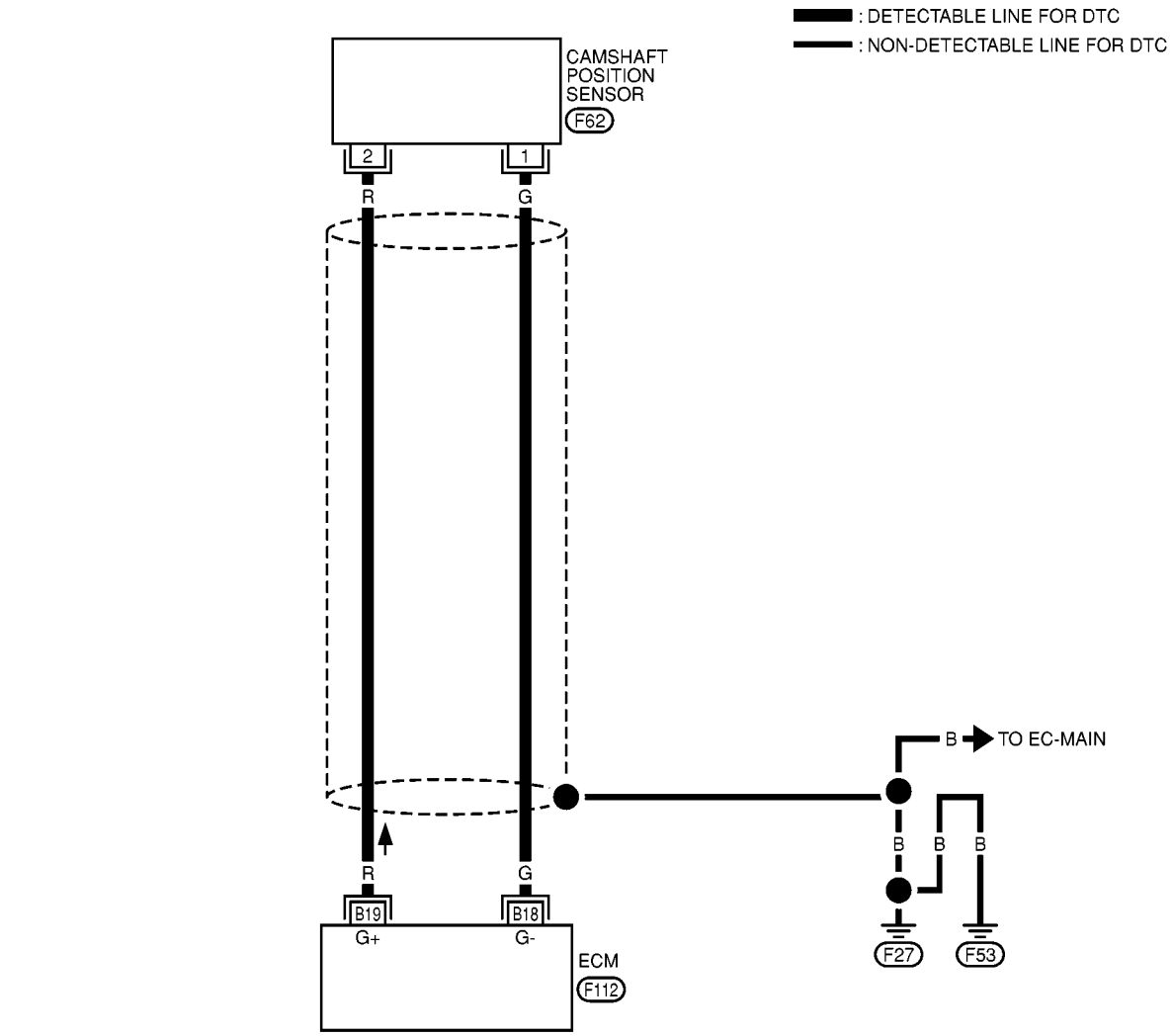
1. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2. Crank engine for at least 1 second.
3. Start engine and run it for at least 2 seconds at idle speed.
4. If DTC is detected, go to EC-1835, "Diagnostic Procedure" .

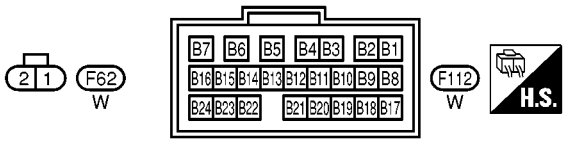


Wiring Diagram

EBS00E0K

EC-CMPS-01





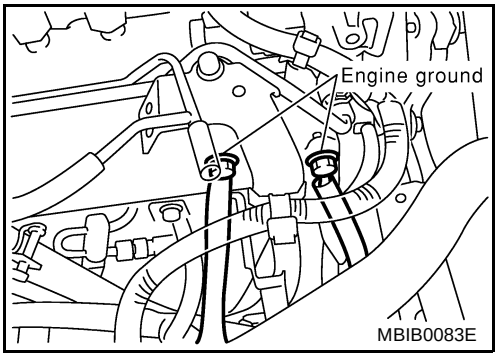
MBWA0113E

Diagnostic Procedure

EBS00E0L

1. CHECK CAMSHAFT POSITION SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

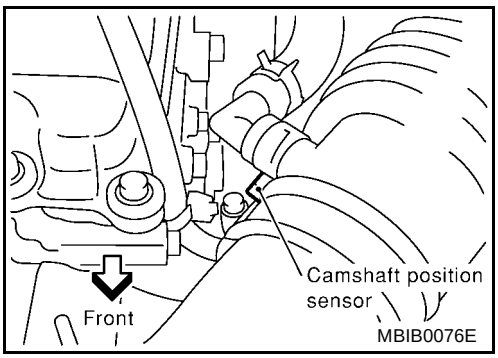
1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.



3. Disconnect camshaft position sensor harness connector and ECM harness connector.
4. Check harness continuity between ECM terminal B18 and camshaft position sensor terminal 1. Refer to Wiring Diagram.

Continuity should exist.

5. Also check harness for short to ground and short to power.



OK or NG

OK >> GO TO 2.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

2. CHECK CAMSHAFT POSITION SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between camshaft position sensor terminal 2 and ECM terminal B19. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK CAMSHAFT POSITION SENSOR

Refer to EC-1835, "Component Inspection" .

OK or NG

OK >> GO TO 4.
NG >> Replace camshaft position sensor.

4. CHECK INTERMITTENT INCIDENT

Refer to EC-1783, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

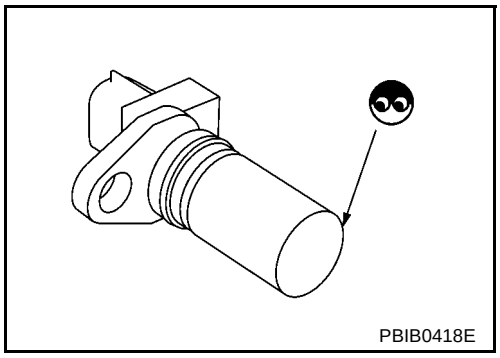
Component Inspection

EBS00E0M

CAMSHAFT POSITION SENSOR

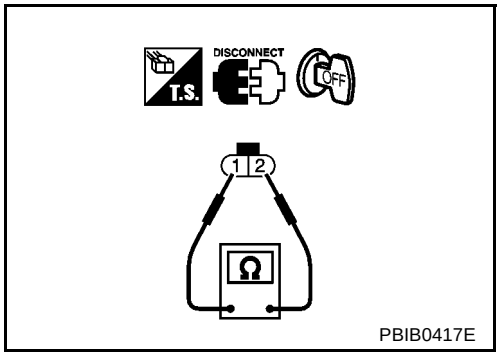
1. Loosen the fixing bolt of the sensor.

2. Disconnect camshaft position sensor harness connector.
3. Remove the sensor.
4. Visually check the sensor for chipping.


PBIB0418E

5. Check resistance as shown in the figure.

Resistance: 1,850 - 2,450 Ω



PBIB0417E

Removal and Installation

EBS00E0N

CAMSHAFT POSITION SENSOR

Refer to EM-232, "VACUUM PUMP" .

DTC P0500 VEHICLE SPEED SENSOR (VSS)

PFP:32702

Description

EBS00E0O

NOTE:
If DTC P0500 is displayed with DTC U1000, first perform the trouble diagnosis for DTC U1000. Refer to EC-1790, "DTC U1000 CAN COMMUNICATION LINE".
The vehicle speed signal is sent to the combination meter from the ABS actuator and electric unit (control unit) through CAN communication line. The combination meter then sends a signal to the ECM through CAN communication line.

On Board Diagnosis Logic

EBS00E0Q

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0500	Vehicle speed sensor	The almost 0 km/h (0 MPH) signal from vehicle speed sensor is sent to ECM even when vehicle is being driven.	● Harness or connectors (The CAN communication line is open or shorted.) ● Wheel sensor ● Combination meter ● ABS actuator and electric unit (control unit)

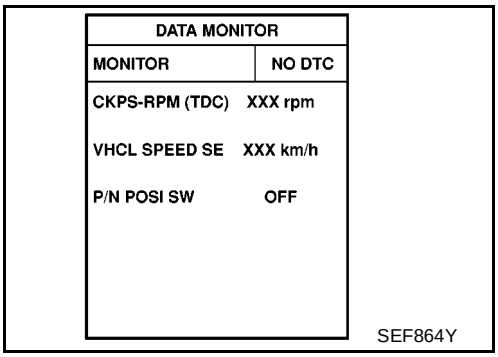
Overall Function Check

EBS00E0R

Use this procedure to check the overall function of the vehicle speed signal circuit. During this check, a DTC might not be confirmed.

WITH CONSULT-II

1. Lift up the vehicle.
2. Start engine.
3. Read “VHCL SPEED SE” in “DATA MONITOR” mode with CONSULT-II. The vehicle speed on CONSULT-II should exceed 10 km/h (6MPH) when rotating wheels with suitable gear position.
4. If NG, go to EC-1837, "Diagnostic Procedure" .



Diagnostic Procedure

EBS00E0T

1. CHECK DTC

Check DTC with ABS actuator and electric unit (control unit),
Refer to LAN-246, "ABS Actuator and Electric Unit (control unit) Circuit Check" .

OK or NG

OK >> GO TO 2.
NG >> Repair or replace.

2. CHECK COMBINATION METER

Check combination meter function.
Refer to LAN-247, "Combination Meter Circuit Check" .

>> **INSPECHION END**

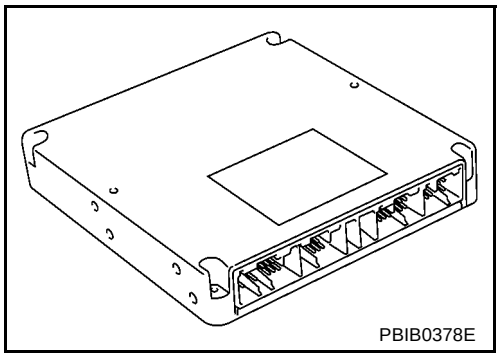
DTC P1107 ABSOLUTE PRESSURE SENSOR

PFP:23710

Description

EBS00E0U

The absolute pressure sensor is built into ECM. The sensor detects ambient barometric pressure and sends the voltage signal to the microcomputer.


PBIB0378E

On Board Diagnosis Logic

EBS00E0V

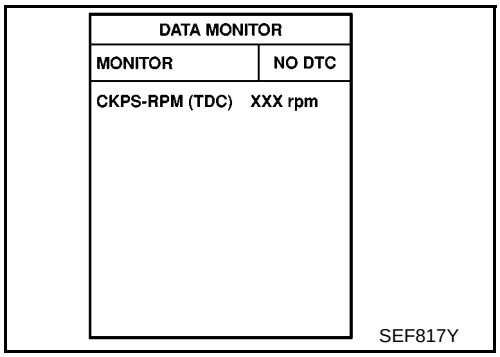
DTC	Malfunction is detected when ...	Check Items (Possible Cause)
P1107	● An excessively high or low voltage from the absolute pressure sensor (built-into ECM) is sent to ECM.	● ECM

DTC Confirmation Procedure

EBS00E0W

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and wait at least 2 seconds.
4. If DTC is detected, go to EC-1838, "Diagnostic Procedure" .



SEF817Y

Diagnostic Procedure

EBS00E0X

1. INSPECTION START

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “SELF DIAG RESULTS” mode with CONSULT-II.
3. Touch “ERASE”.
4. Perform EC-1838, "DTC Confirmation Procedure" , again.
5. Is the DTC P1107 displayed again?

Yes or No

Yes >> GO TO 2.
No >> **INSPECTION END**

2. REPLACE ECM

1. Replace ECM.
2. Perform initialization of NATS system and registration of all NATS ignition key IDs. Refer to EC-1748, "NATS (Nissan Anti-theft System)" .
3. Perform “Accelerator Pedal Released Position Learning”. Refer to EC-1745 .

>> **INSPECTION END**

DTC P1180 FUEL TEMPERATURE SENSOR

PFP:16700

Description

EBS00E0Y

Fuel temperature sensor is built in the fuel supply pump. The sensor detects the fuel temperature in the fuel supply pump and calibrates the fuel injection amount change by fuel temperature.

CONSULT-II Reference Value in Data Monitor Mode

EBS00E0Z

Remarks: Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
FUEL TEMP SEN	● Engine: After warming up	More than 40°C (104°F)

ECM Terminals and Reference Value

EBS00E10

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
A12	PU	Fuel temperature sensor	**[Engine is running]** ● **Warm-up condition**	Approximately 0 - 4.8V Output voltage varies with fuel temperature
A23	B	Sensor's ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V

On Board Diagnosis Logic

EBS00E11

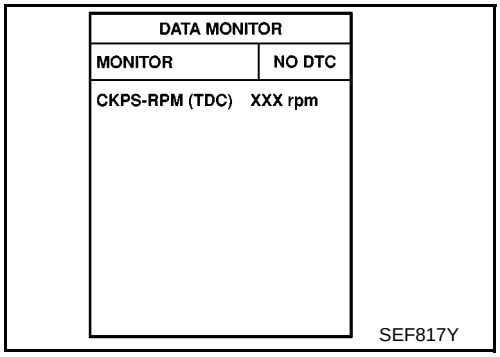
DTC	Malfunction is detected when	Check Items (Possible cause)
P1180	● An excessively high or low voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Fuel temperature sensor

DTC Confirmation Procedure

EBS00E12

WITH CONSULT-II

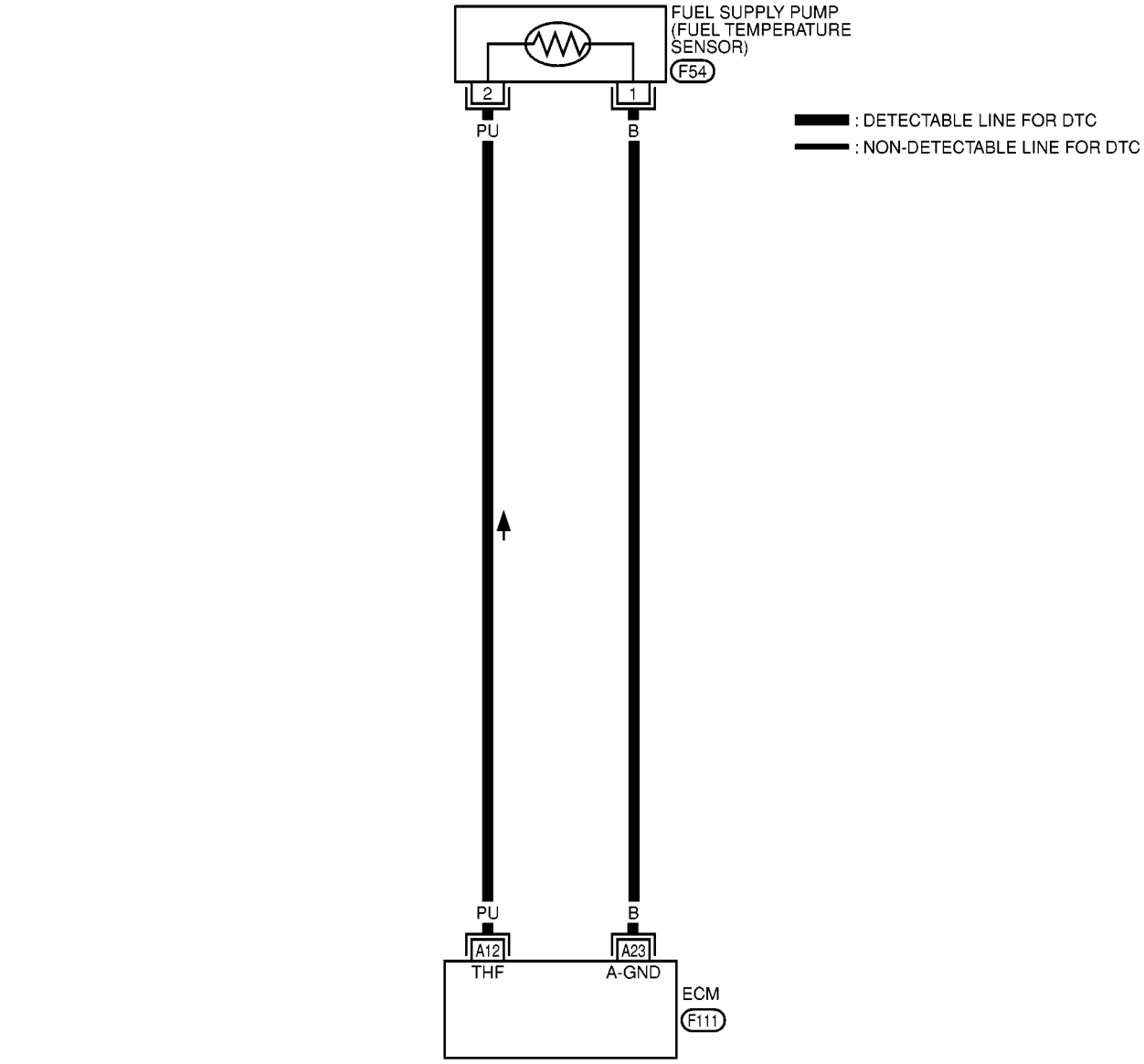
1. Turn ignition switch “ON” and wait at least 2 seconds.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and run it for at least 2 seconds at idle speed. (If engine does not run, turn ignition switch to “START” for at least 2 seconds.)
4. If DTC is detected, go to EC-1842, "Diagnostic Procedure" .

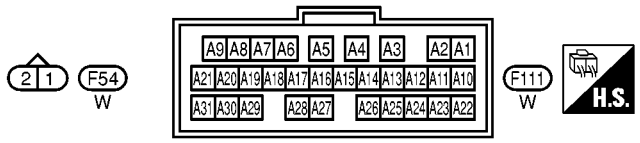


Wiring Diagram

EBS00E13

EC-FTS-01





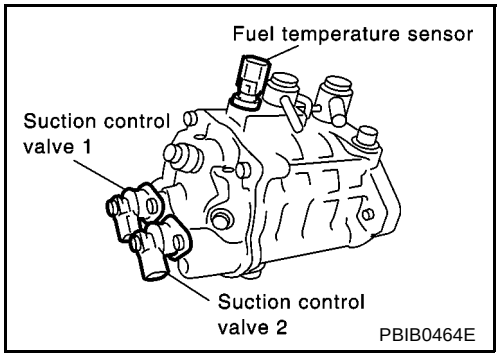
MBWA0107E

Diagnostic Procedure

EBS00E14

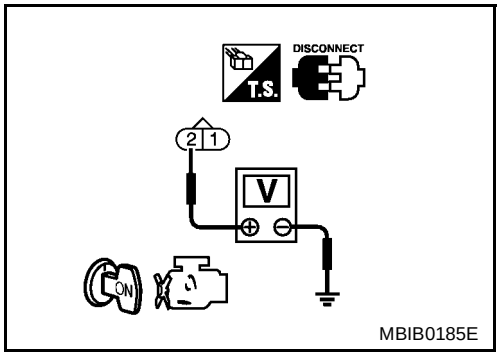
1. CHECK FUEL TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect fuel temperature sensor harness connector.
3. Turn ignition switch “ON”.



4. Check voltage between fuel temperature sensor terminal 2 and engine ground.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 2.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

2. CHECK FUEL TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “ON”.
2. Check harness continuity between fuel temperature sensor terminal 1 and ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check harness for open or short to between ECM and fuel temperature sensor.

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK INTERMITTENT INCIDENT

Refer to EC-1783, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

OK or NG

OK >> Replace fuel supply pump.
NG >> Repair or replace.

Removal and Installation

EBS00E15

FUEL SUPPLY PUMP

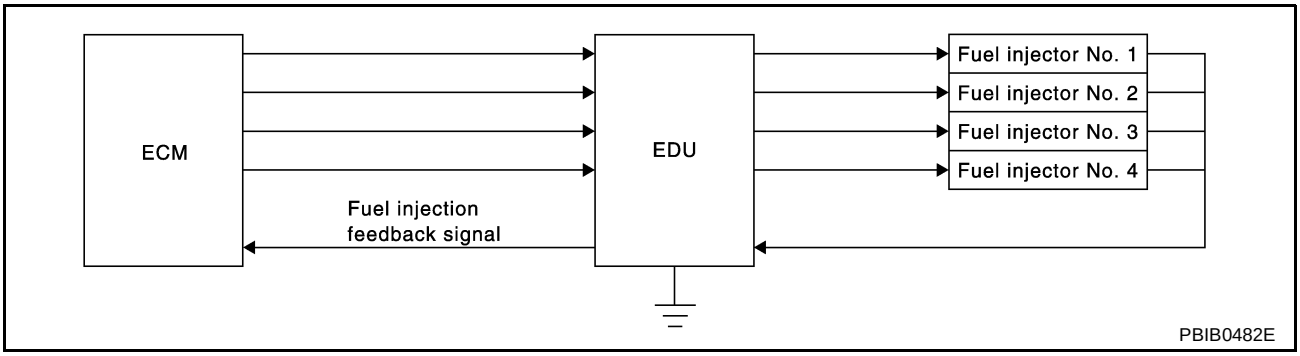
Refer to EM-239, "FUEL SUPPLY PUMP" .

DTC P1216 EDU

PFP:22710

Description

EBS00E16



The ECM sends the fuel injection signal to EDU (Electronic Drive Unit). Then the EDU sends ON signals to fuel injectors to operate them.
The EDU monitors injector ground circuit and sends the feed back signal to the ECM.

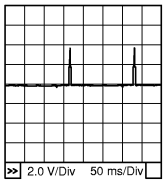
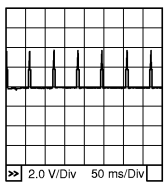
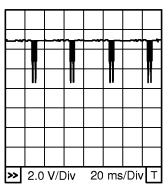
ECM Terminals and Reference Value

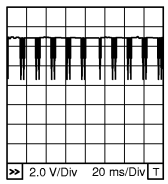
EBS00E17

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
A1 A2 A3 A4	L/W Y/PU PU Y	EDU drive No. 2 EDU drive No. 4 EDU drive No. 3 EDU drive No. 1	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0 - 4V ★  PBIB0387E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	0 - 4V ★  PBIB0388E
A8 A9	R R	Power supply for ECM	**[Ignition switch “ON”]**	BATTERY VOLTAGE (11 - 14V)
A29	W/PU	EDU injector check signal	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1 - 5V ★  PBIB0391E

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	1 - 5V ★  PBIB0392E
D24 D26	G G	ECM relay (self-shutoff)	**[Ignition switch “ON”]** **[Ignition switch “OFF”]** ● For a few seconds after turning ignition switch “OFF”	Approximately 0V
			[Ignition switch “OFF”] ● A few seconds passed after turning ignition switch “OFF”	BATTERY VOLTAGE (11 - 14V)

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

On Board Diagnosis Logic

EBS00E18

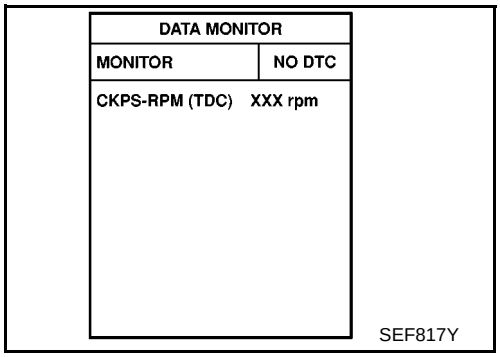
DTC	Malfunction is detected when	Check Items (Possible cause)
P1216	● EDU feed back signal is not normal pattern.	● Harness or connectors (Injector drive circuit is open or shorted.) ● Electronic drive unit ● Fuel injectors

DTC Confirmation Procedure

EBS00E19

WITH CONSULT-II

1. Turn ignition switch “ON” and wait at least 2 seconds.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and run it for at least 2 seconds at idle speed.
   (If engine does not run, turn ignition switch to “START” for at least 2 seconds.)
4. If DTC is detected, go to EC-1847, "Diagnostic Procedure" .

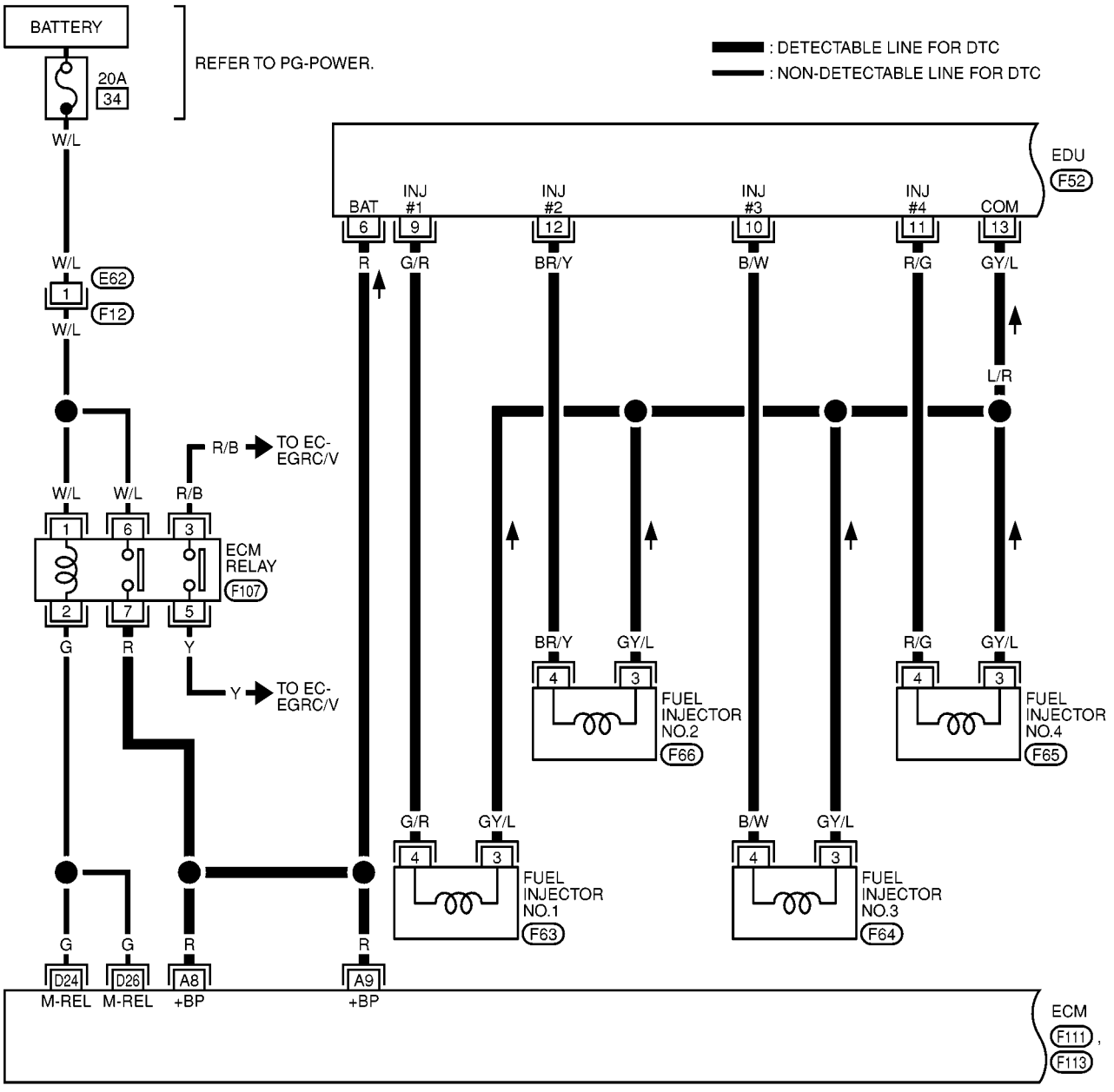


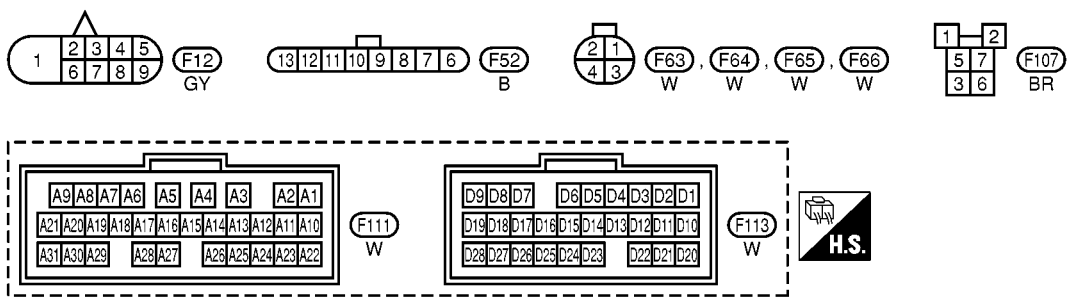
SEF817Y

Wiring Diagram

EBS00E1A

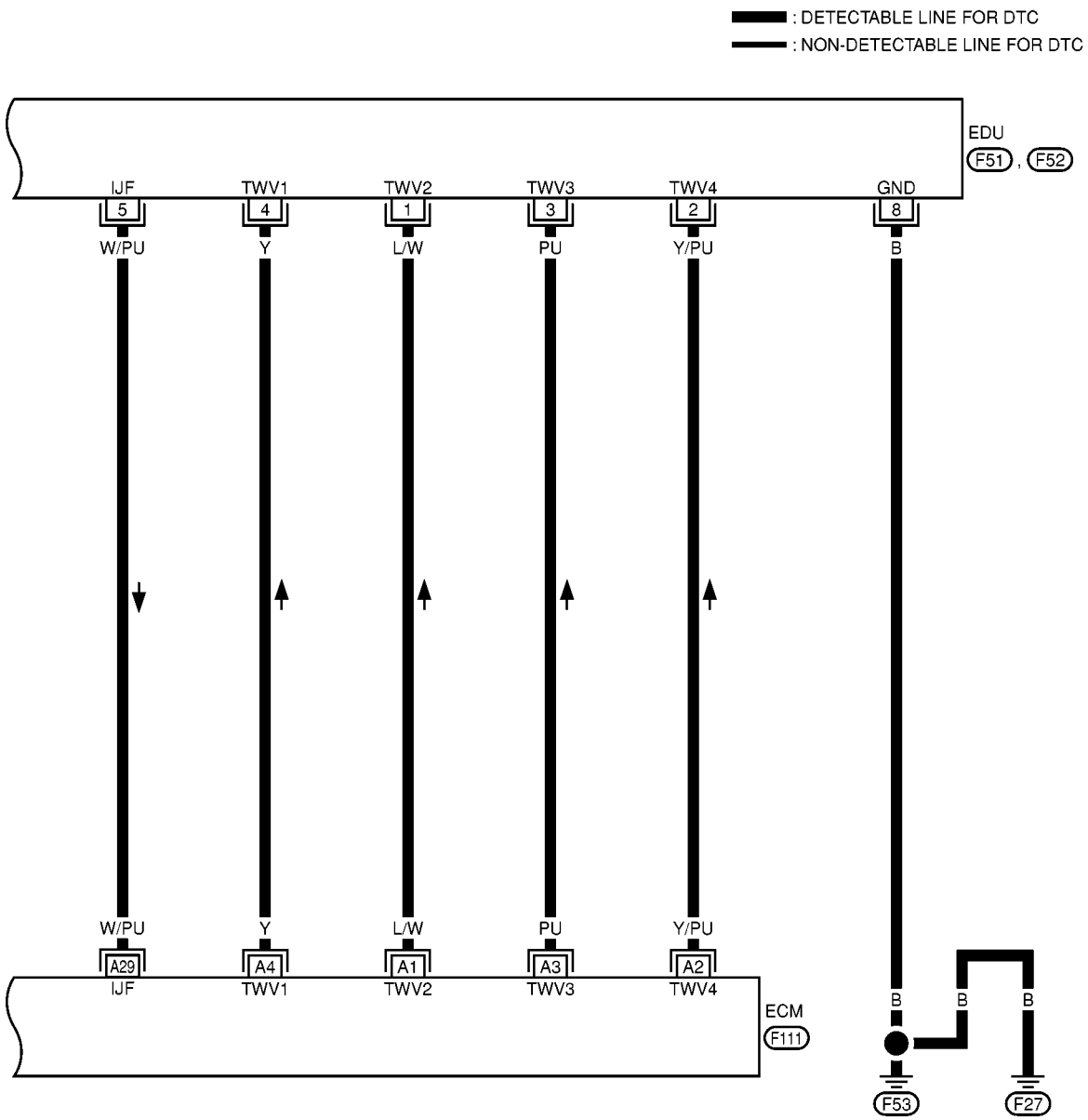
EC-EDU-01

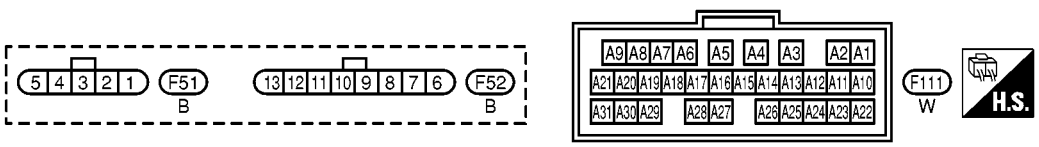




MBWA0108E

EC-EDU-02





MBWA0109E

Diagnostic Procedure

EBS00E1B

1. INSPECTION START

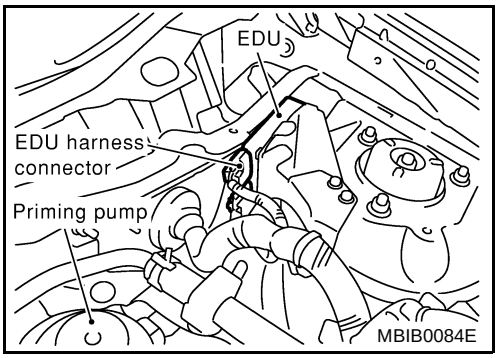
1. Turn ignition switch “START”.
2. Is any cylinder ignited?

OK or NG

OK >> GO TO 5.
NG >> GO TO 2.

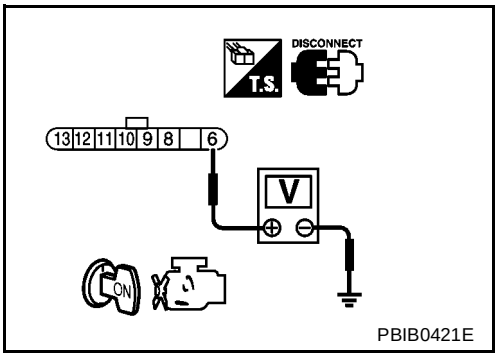
2. CHECK EDU POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect EDU harness connector.
3. Turn ignition switch “ON”.



4. Check voltage between EDU terminal 6 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between EDU and ECM
- Harness for open or short between EDU and ECM relay

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK EDU GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between EDU terminal 8 and ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to power in harness or connectors.

5. CHECK ECM OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between the following terminals. Refer to Wiring Diagram.

ECM terminal	EDU terminal
A4	4
A3	3
A2	2
A1	1

Continuity should exist

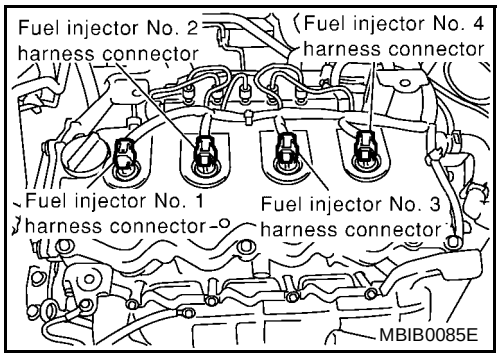
4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK EDU OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect fuel injector harness connectors.
2. Check harness continuity between the following terminals. Refer to Wiring Diagram.



EDU terminal	Fuel injector terminal
9	4
10	4
11	4
12	4

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK FUEL INJECTOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between fuel injector terminal 3 of each cylinder and EDU terminal 13. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK FUEL INJECTOR

Refer to EC-1820, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> Replace fuel injector.

9. CHECK ECM INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector and EDU harness connector.
3. Check continuity between ECM terminal A29 and EDU terminal 5. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 10.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

10. CHECK INTERMITTENT INCIDENT

Refer to EC-1783, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

OK or NG

OK >> Replace EDU.
NG >> Repair or replace.

Removal and Installation

EBS00E1C

FUEL INJECTOR

Refer to EM-236, "INJECTION TUBE AND FUEL INJECTOR" .

DTC P1217 OVERHEAT (COOLING SYSTEM)

PFP:00021

Description

EBS00E1D

SYSTEM DESCRIPTION

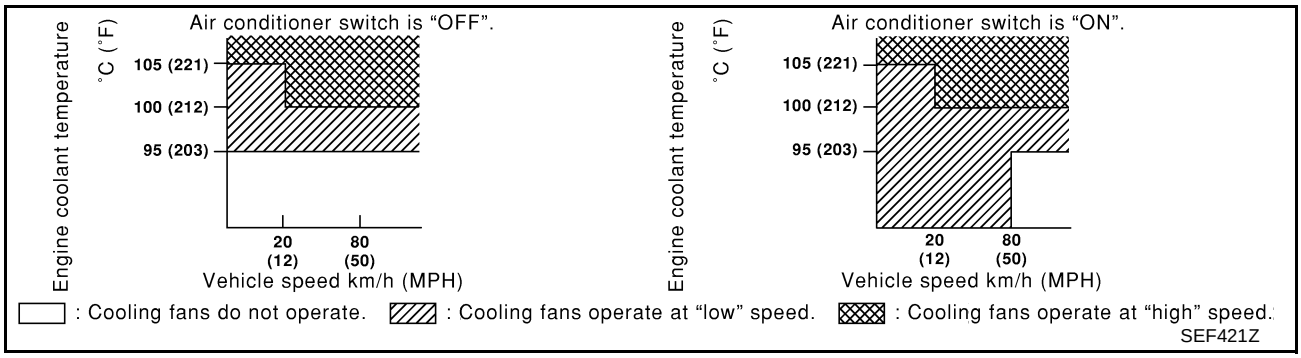
NOTE:
If DTC P1217 is displayed with DTC U1000, first perform the trouble diagnosis for DTC U1000. Refer to EC-1790, "DTC U1000 CAN COMMUNICATION LINE" .

COOLING FAN CONTROL

Sensor	Input signal to ECM	ECM function	Actuator
Vehicle speed signal	Vehicle speed	Cooling fan control	Cooling fan relay (s)
Engine coolant temperature sensor	Engine coolant temperature		
Air conditioner switch	Air conditioner “ON” signal		

The ECM controls the cooling fan corresponding to the vehicle speed, engine coolant temperature, air conditioner ON signal. The control system has 3-step control [HIGH/LOW/OFF].

OPERATION



CONSULT-II Reference Value in Data Monitor Mode

EBS00E1E

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
COOLING FAN	When cooling fan is stopped.	OFF
	When cooling fans operate at low speed.	LOW
	When cooling fans operate at high speed.	HIGH

ECM Terminals and Reference Value

EBS00E1F

Specification data are reference values and are measured between each terminal and ground.

CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
E2	LG	Cooling fan relay (Low)	**[Engine is running]** ● Cooling fan is not operating	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● Cooling fan is operating	Approximately 0.1V
E7	LG/B	Cooling fan relay (High)	**[Engine is running]** ● Cooling fan is not operating ● Cooling fan is operating at low speed	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● Cooling fan is operating at high speed	Approximately 0.1V

On Board Diagnosis Logic

EBS00E1G

This diagnosis continuously monitors the engine coolant temperature.
If the cooling fan or another component in the cooling system malfunctions, engine coolant temperature will rise.
When the engine coolant temperature reaches an abnormally high temperature condition, a malfunction is indicated.

DTC	Malfunction is detected when ...	Check Items (Possible Cause)
P1217	● Cooling fan does not operate properly (Overheat). ● Cooling fan system does not operate properly (Overheat). ● Engine coolant was not added to the system using the proper filling method.	● Harness or connectors (The cooling fan circuit is open or shorted.) ● Harness or connectors (The CAN communication line is open or shorted.) ● Cooling fan ● Radiator hose ● Radiator ● Radiator cap ● Water pump ● Thermostat ● Engine coolant temperature sensor For more information, refer to EC-1863, "Main 12 Causes of Overheating" .

CAUTION:
When a malfunction is indicated, be sure to replace the coolant following the procedure in the CO-49, "Changing Engine Coolant" . Also, replace the engine oil.

1. **Fill radiator with coolant up to specified level with a filling speed of 2 liters per minute. Be sure to use coolant with the proper mixture ratio. Refer to MA-18, "Engine Coolant Mixture Ratio" .**
2. **After refilling coolant, run engine to ensure that no water-flow noise is emitted.**

Overall Function Check

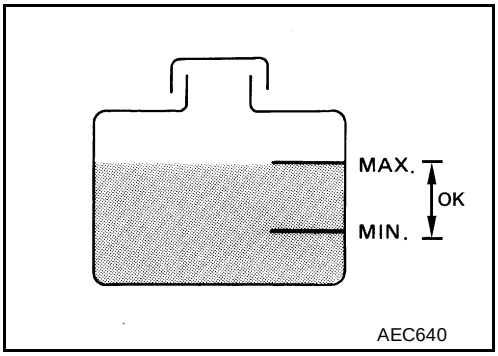
EBS00E1H

Use this procedure to check the overall function of the cooling fan. During this check, a DTC might not be confirmed.

WARNING:
Never remove the radiator cap when the engine is hot. Serious burns could be caused by high pressure fluid escaping from the radiator.
Wrap a thick cloth around the cap. Carefully remove the cap by turning it a quarter turn to allow built-up pressure to escape. Then turn the cap all the way off.

WITH CONSULT-II

1. Check the coolant level in the reservoir tank and radiator.
   Allow engine to cool before checking coolant level.
   If the coolant level in the reservoir tank and/or radiator is below the proper range, skip the following steps and go to EC-1855, "Diagnostic Procedure" .



2. Confirm whether customer filled the coolant or not. If customer filled the coolant, skip the following steps and go to EC-1855, "Diagnostic Procedure" .
3. Turn ignition switch “ON”.

4. Perform “COOLING FAN” in “ACTIVE TEST” mode with CONSULT-II and make sure that cooling fans operate when touching “HIGH” or “LOW”.
   If NG, go to EC-1855, "Diagnostic Procedure" .

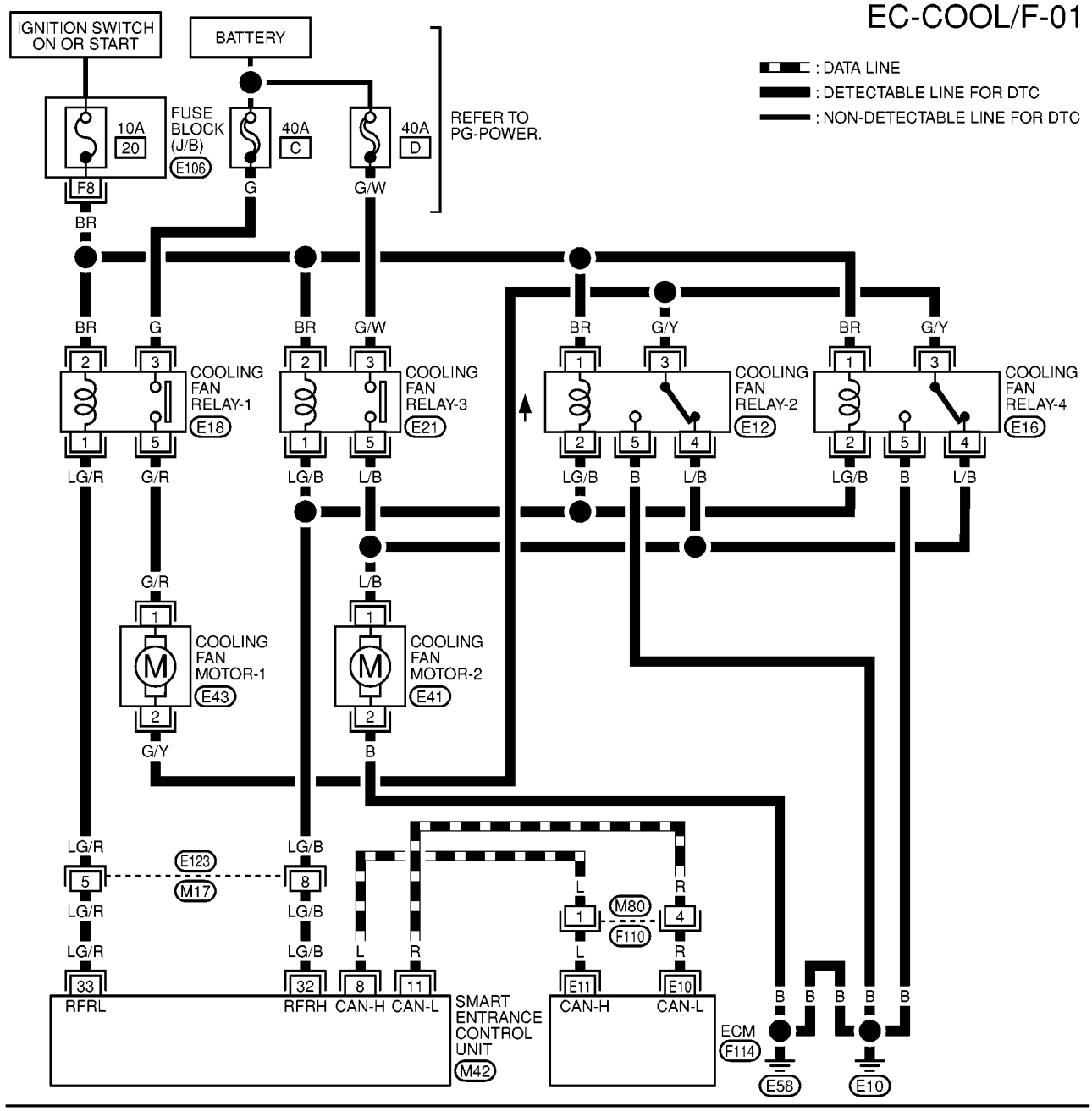
ACTIVE TEST	
COOLING FAN	OFF
MONITOR	
COOLAN TEMP/S	XXX °C

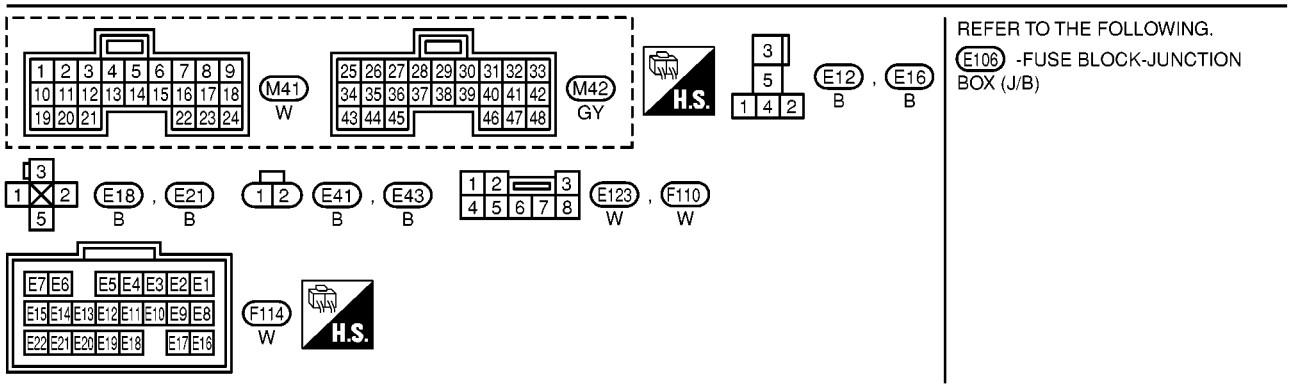
SEF111X

Wiring Diagram

EBS00E1I

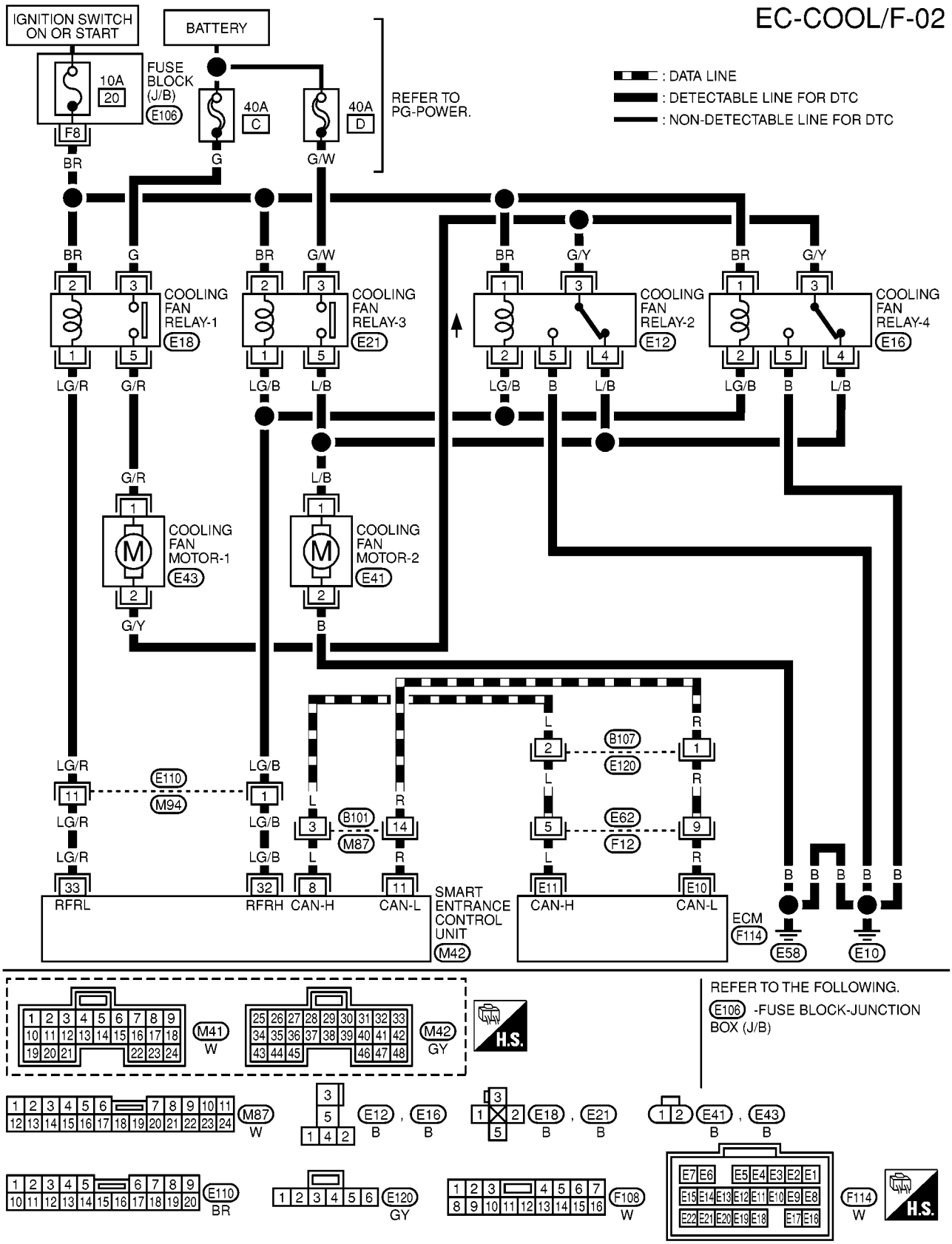
LHD MODELS





MBWA0149E

RHD MODELS



MBWA0150E

Diagnostic Procedure

EBS00E1J

1. CHECK COOLING FAN LOW SPEED OPERATION

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “COOLING FAN” in “ACTIVE TEST” mode with CONSULT-II.
3. Touch “LOW”.
4. Make sure that cooling fans-1 and -2 operate at low speed.

OK or NG

OK >> GO TO 2.
NG >> Check cooling fan low speed control circuit. (Go to EC-1857, "PROCEDURE A" .)

ACTIVE TEST	
COOLING FAN	LOW
MONITOR	
COOLAN TEMP/S	XXX °C

SEF784Z

2. CHECK COOLING FAN HIGH SPEED OPERATION-I

With CONSULT-II

1. Touch “HIGH”.
2. Make sure that cooling fan-1 operates at higher speed than low speed.

OK or NG

OK >> GO TO 3.
NG >> Check cooling fan high speed control circuit. (Go to EC-1859, "PROCEDURE B" .)

ACTIVE TEST	
COOLING FAN	HIGH
MONITOR	
COOLAN TEMP/S	XXX °C

SEF785Z

3. CHECK COOLING FAN HIGH SPEED OPERATION-II

With CONSULT-II

Make sure that cooling fan-2 operates at higher speed than low speed.

OK or NG

OK >> GO TO 4.
NG >> Check cooling fan high speed control circuit. (Go to EC-1861, "PROCEDURE C" .)

4. CHECK COOLING SYSTEM FOR LEAK

Apply pressure to the cooling system with a tester, and check if the pressure drops.

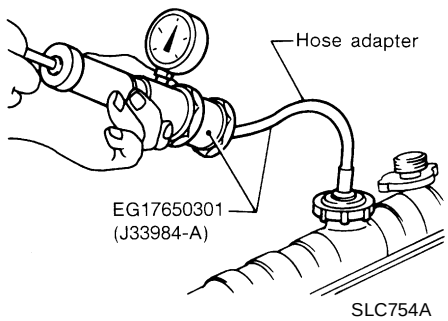
Testing pressure: 157 kPa (1.57 bar, 1.6 kg/cm^2 , 23psi)

CAUTION:
Higher than the specified pressure may cause radiator damage.

Pressure should not drop.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.



SLC754A

5. DETECT MALFUNCTIONING PART

Check the following for leak.

- Hose
- Radiator
- Water pump (Refer to CO-59, "WATER PUMP" .)

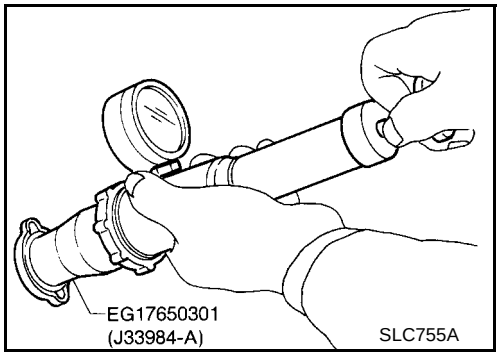
>> Repair or replace.

6. CHECK RADIATOR CAP

Apply pressure to cap with a tester and check radiator cap relief pressure.

Radiator cap relief pressure:

78 - 98 kPa (0.59 - 0.98 bar, 0.6 - 1.0 kg/cm^2 , 9 - 14 psi)



OK or NG

OK >> GO TO 7.
NG >> Replace radiator cap.

7. CHECK THERMOSTAT

1. Remove thermostat.
2. Check valve seating condition at normal room temperatures.
   It should seat tightly.
3. Check valve opening temperature and valve lift.

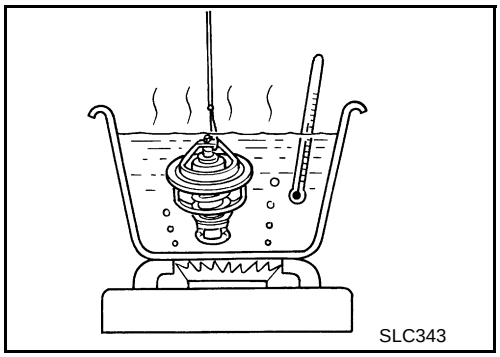
   Valve opening temperature:

   80.5 - 83.5 °C (177 - 182 °F)

   Valve lift:

   More than 8 mm/95 °C (0.31 in/203 °F)

4. Check if valve is closed at 5°C (9°F) below valve opening temperature. For details, refer to CO-61, "THERMOSTAT AND WATER PIPING" .



OK or NG

OK >> GO TO 8.
NG >> Replace thermostat.

8. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-1801, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> Replace engine coolant temperature sensor.

9. CHECK MAIN 12 CAUSES

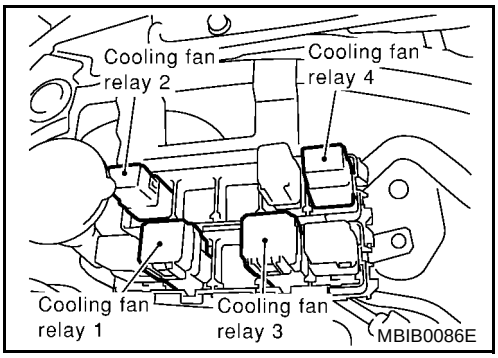
If the cause cannot be isolated, go to EC-1863, "Main 12 Causes of Overheating" .

>> **INSPECTION END**

PROCEDURE A

1. CHECK COOLING FAN POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect cooling fan relay-1.
3. Turn ignition switch “ON”.

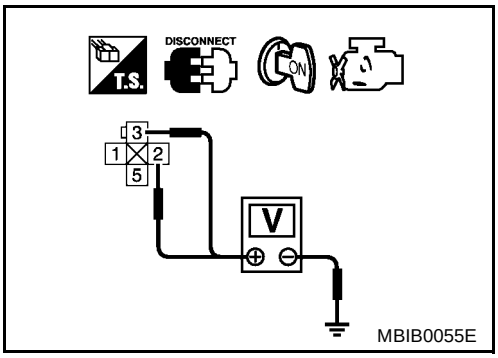


4. Check voltage between cooling fan relay-1 terminals 2, 3 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 3.
NG >> GO TO 2.



2. DETECT MALFUNCTIONING PART

Check the following.

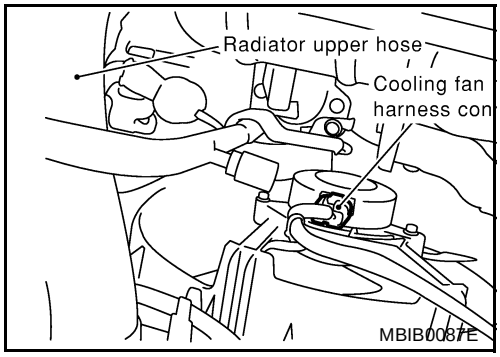
- Fuse block (J/B) connector E106
- 10A fuse
- 40A fusible link
- Harness for open or short between cooling fan relay-1 and fuse
- Harness for open or short between cooling fan relay-1 and battery

>> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK COOLING FAN MOTORS CONTROL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect cooling fan motor-1 harness connector and cooling fan motor-2 harness connector.
3. Disconnect cooling fan relay-2 and cooling fan relay-4.
4. Check harness continuity between the following.

- Cooling fan relay-1 terminal 5 and cooling fan motor-1 terminal 1
- Cooling fan motor-1 terminal 2 and cooling fan relay-2 terminal 3
- Cooling fan motor-1 terminal 2 and cooling fan relay-4 terminal 3
- Cooling fan relay-2 terminal 4 and cooling fan motor-2 terminal 1
- Cooling fan relay-4 terminal 4 and cooling fan motor-2 terminal 1
- Cooling fan motor-2 terminal 2 and ground
  Refer to Wiring Diagram.



Continuity should exist.

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK COOLING FAN MOTOR OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

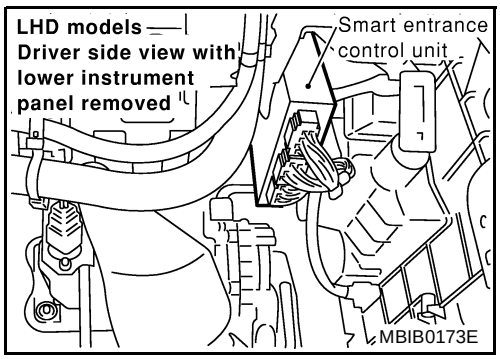
1. Disconnect smart entrance control unit harness connector.
2. Check harness continuity between cooling fan relay-1 terminal 1 and smart entrance control unit terminal 33. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.



5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E123, M17 (LHD models)
- Harness connectors E110, M94 (RHD models)
- Harness for open or short between cooling fan relay-1 and smart entrance control unit

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK COOLING FAN RELAY-1, -2 AND 4

Refer to EC-1864, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace cooling fan relay.

7. CHECK COOLING FAN MOTORS-1 AND -2

Refer to EC-1864, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> Replace cooling fan motors.

8. CHECK SMART ENTRANCE CONTROL UNIT

Refer to BCS-39, "Trouble Diagnoses" .

OK or NG

OK >> GO TO 9.
NG >> Replace smart entrance control unit.

9. CHECK INTERMITTENT INCIDENT

Perform EC-1783, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

PROCEDURE B

1. CHECK COOLING FAN RELAY GROUND CIRCUIT FOR OPEN AND SHORT

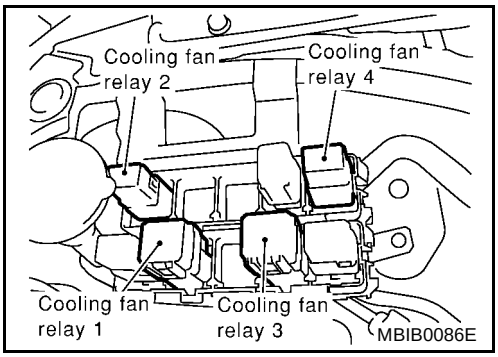
1. Turn ignition switch “OFF”.
2. Disconnect cooling fan relay-2 and cooling fan relay-4.
3. Check harness continuity between cooling fan relay-2 terminal 5 and ground, cooling fan relay-4 terminal 5 and ground. Refer to Wiring Diagram.

   Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 2.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.



2. CHECK COOLING FAN MOTOR OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

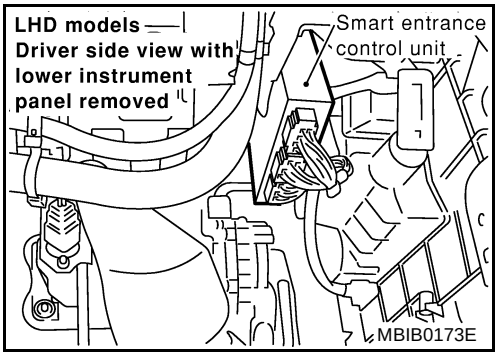
1. Disconnect smart entrance control unit harness connector.
2. Check harness continuity between cooling fan relay-2 terminal 2 and smart entrance control unit terminal 32, cooling fan relay-4 terminal 2 and smart entrance control unit terminal 32. Refer to Wiring Diagram.

   Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> GO TO 3.



3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E123, M17 (LHD models)
- Harness connectors E110, M94 (RHD models)
- Harness for open or short between cooling fan relay-2 and smart entrance control unit
- Harness for open or short between cooling fan relay-4 and smart entrance control unit

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK COOLING FAN RELAYS-2 AND -4

Refer to EC-1864, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace cooling fan relays.

5. CHECK SMART ENTRANCE CONTROL UNIT

Refer to BCS-39, "Trouble Diagnoses" .

OK or NG

OK >> GO TO 6.
NG >> Replace smart entrance control unit.

6. CHECK INTERMITTENT INCIDENT

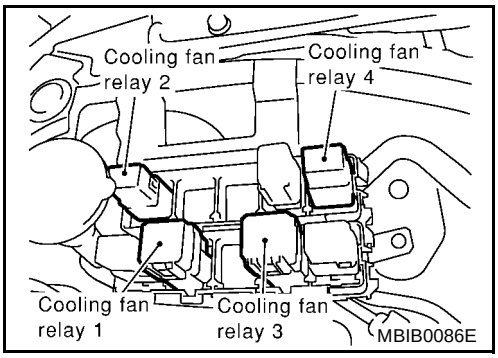
Perform EC-1783, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

PROCEDURE C

1. CHECK COOLING FAN MOTOR-2 POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect cooling fan relay-3.
3. Turn ignition switch “ON”.

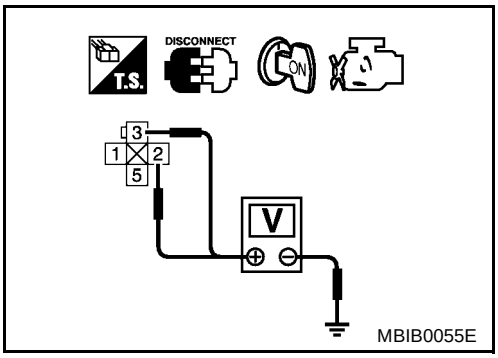


4. Check voltage between cooling fan relay-3 terminals 2, 3 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 3.
NG >> GO TO 2.



2. DETECT MALFUNCTIONING PART

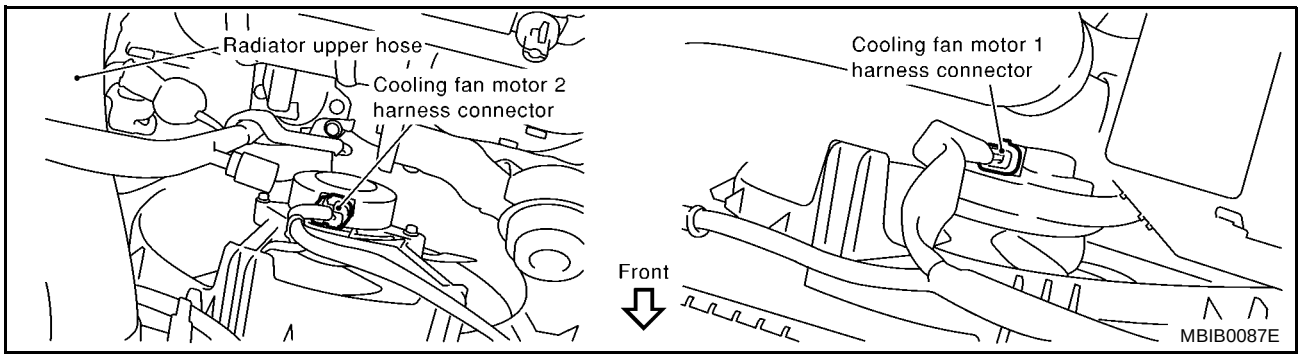
Check the following.

- Fuse block (J/B) connector E106
- 10A fuse
- 40A fusible link
- Harness for open or short between cooling fan relay-3 and fuse
- Harness for open or short between cooling fan relay-3 and battery

>> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK COOLING FAN MOTOR CONTROL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect cooling fan motor-2 harness connector.



3. Check harness continuity between cooling fan relay-3 terminal 5 and cooling fan motor-2 terminal 1. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to power in harness or connectors.

4. CHECK COOLING FAN MOTOR CONTROL CIRCUIT FOR SHORT TO GROUND

Check harness continuity between cooling fan relay-3 terminal 5 or cooling fan motor-2 terminal 1 and ground. Refer to Wiring Diagram.

Continuity should not exist.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Cooling fan relays-2 and -4 (Refer to EC-1864)
- Harness for short to ground between cooling fan relay-2 and cooling fan motor-2
- Harness for short to ground between cooling fan relay-3 and cooling fan motor-2
- Harness for short to ground between cooling fan relay-4 and cooling fan motor-2

>> Repair or replace.

6. CHECK COOLING FAN OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

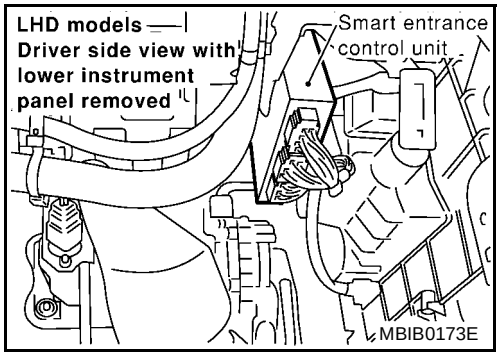
1. Disconnect smart entrance control unit harness connector.
2. Check harness continuity between cooling fan relay-3 terminal 1 and smart entrance control unit terminal 32. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> GO TO 7.



7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E123, M17 (LHD models)
- Harness connectors E110, M94 (RHD models)
- Harness for open or short between cooling fan relay-3 and smart entrance control unit

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK COOLING FAN RELAY-3

Refer to EC-1864, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> Replace cooling fan relay.

9. CHECK SMART ENTRANCE CONTROL UNIT

Refer to BCS-39, "Trouble Diagnoses" .

OK or NG

OK >> GO TO 10.
NG >> Replace smart entrance control unit.

10. CHECK INTERMITTENT INCIDENT

Perform EC-1783, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Main 12 Causes of Overheating

EBS00E1K

Engine	Step	Inspection item	Equipment	Condition	Reference page
OFF	1	● Blocked radiator ● Blocked radiator grille ● Blocked bumper	● Visual	No blocking	—
	2	● Coolant mixture	● Coolant tester	50 - 50% coolant mixture	See MA-16, "RECOMMENDED FLUIDS AND LUBRICANTS" .
	3	● Coolant level	● Visual	Coolant up to MAX level in reservoir tank and radiator filler neck	See CO-49, "Changing Engine Coolant" .
	4	● Radiator cap	● Pressure tester	78 - 98 kPa (0.78 - 0.98 bar, 0.8 - 1.0 kg/cm^2 , 11 - 14 psi)	See CO-53, "Checking Radiator Cap" .
ON*2	5	● Coolant leaks	● Visual	No leaks	See CO-49, "LEAK CHECK" .
ON*2	6	● Thermostat	● Touch the upper and lower radiator hoses	Both hoses should be hot	See CO-61, "THERMOSTAT AND WATER PIPING" .
ON*1	7	● Cooling fan	● CONSULT-II	Operating	See Trouble Diagnosis for DTC P1217, EC-1800 .
OFF	8	● Combustion gas leak	● Color checker chemical tester 4 Gas analyzer	Negative	—

Engine	Step	Inspection item	Equipment	Condition	Reference page
ON*3	9	● Coolant temperature gauge	● Visual	Gauge less than 3/4 when driving	—
		● Coolant overflow to reservoir tank	● Visual	No overflow during driving and idling	See CO-49, "Changing Engine Coolant" .
OFF*4	10	● Coolant return from reservoir tank to radiator	● Visual	Should be initial level in reservoir tank	See CO-50, "REFILLING ENGINE COOLANT" .
OFF	11	● Cylinder head	● Straight gauge feeler gauge	0.1mm (0.004 in) Maximum distortion (warping)	See EM-274, "CYLINDER HEAD" .
	12	● Cylinder block and pistons	● Visual	No scuffing on cylinder walls or piston	See EM-288, "CYLINDER BLOCK" .

*1: Turn the ignition switch ON.
*2: Engine running at 3,000 rpm for 10 minutes.
*3: Drive at 90 km/h (55 MPH) for 30 minutes and then let idle for 10 minutes.
*4: After 60 minutes of cool down time.
For more information, refer to CO-45, "OVERHEATING CAUSE ANALYSIS" .

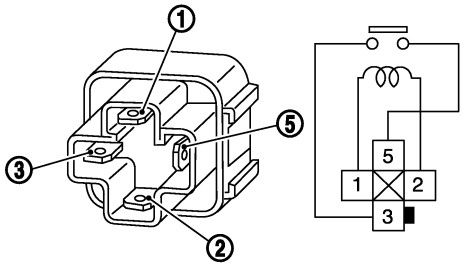
Component Inspection

EBS00E1L

COOLING FAN RELAY-1 AND -3

Check continuity between terminals 3 and 5 under the following conditions.

Conditions	Continuity
12V direct current supply between terminals 1 and 2	Yes
No current supply	No

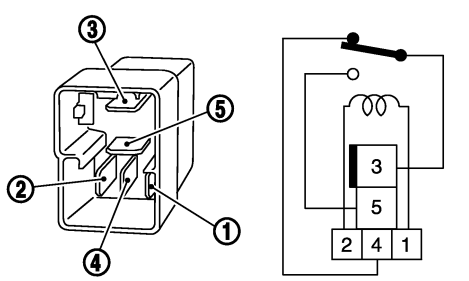


MBIB0057E

COOLING FAN RELAY-2 AND -4

Check continuity between terminals 3 and 5, 3 and 5 under the following conditions.

Conditions	Terminals	Continuity
12V direct current supply between terminals 1 and 2	3 and 4	No
	3 and 5	Yes
No current supply	3 and 4	Yes
	3 and 5	No

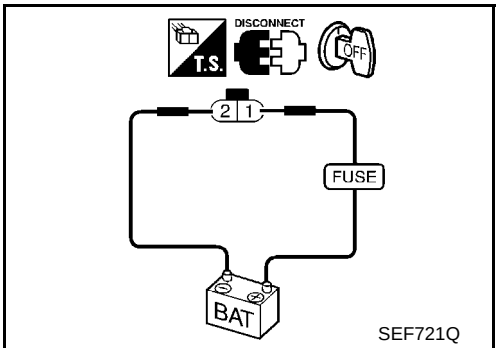


MBIB0056E

COOLING FAN MOTOR-1 AND -2

1. Disconnect cooling fan motor harness connectors.
2. Supply cooling fan motor terminals with battery voltage and check operation.

	Terminals	
	(+)	(-)
Cooling fan motor	1	2



SEF721Q

DTC P1233 - P1234 SUCTION CONTROL VALVE

PFP:16700

Description

EBS00E1M

To control the amount of the fuel inhalation of the fuel supply pump, a suction control valve is built into the fuel supply pump. When the amount of the fuel inhalation of fuel supply pump increases, the fuel supply pump raises the fuel exhalation pressure. As a result, the fuel injection pressure is raised. When the load of the engine increases, the ECM sends a signal to the suction control valve to raise the injection pressure.

CONSULT-II Reference Value in Data Monitor Mode

EBS00E1N

Remarks: Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
SUCTION CV	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: Neutral position ● No-load	Idle	70.0 - 71.5°CA
		2,000 rpm	73.5 - 75.0°CA

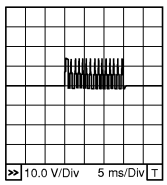
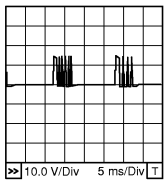
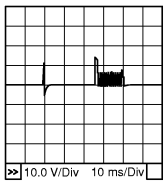
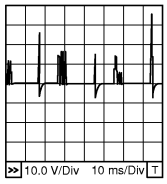
ECM Terminals and Reference Value

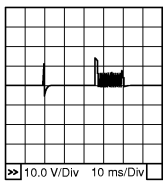
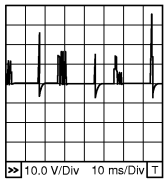
EBS00E1O

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
E1	L	Suction control valve power supply	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0 - 12.5V ★  PBIB0399E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	0 - 12.5V ★  PBIB0400E
E8	Y/G	Suction control valve 1 signal	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0 - 12.5V ★  PBIB0401E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	0 - 12.5V ★  PBIB0402E

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
E16	G/W	Suction control valve 2 signal	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0 - 12.5V ★  PBIB0401E
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	0 - 12.5V ★  PBIB0402E

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

On Board Diagnosis Logic

EBS00E1P

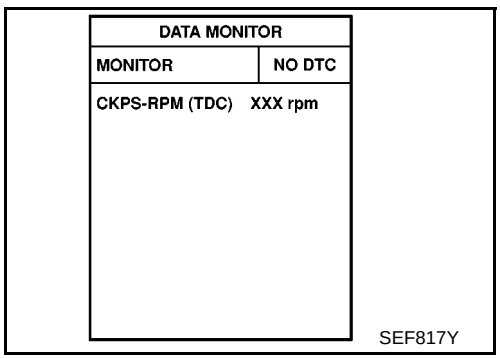
DTC	Malfunction is detected when	Check Items (Possible cause)
P1233 P1234	● Suction control valve 1 and/or 2 dose not operate normally.	● Harness or connectors (Fuel supply pump suction control valve circuit is open or shorted.) ● Suction control valve 1 ● Suction control valve 2

DTC Confirmation Procedure

EBS00E1Q

WITH CONSULT-II

1. Turn ignition switch “ON” and wait at least 2 seconds.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and run it for at least 2 seconds at idle speed. (If engine does not run, turn ignition switch to “START” for at least 2 seconds.)
4. If DTC is detected, go to EC-1868, "Diagnostic Procedure" .

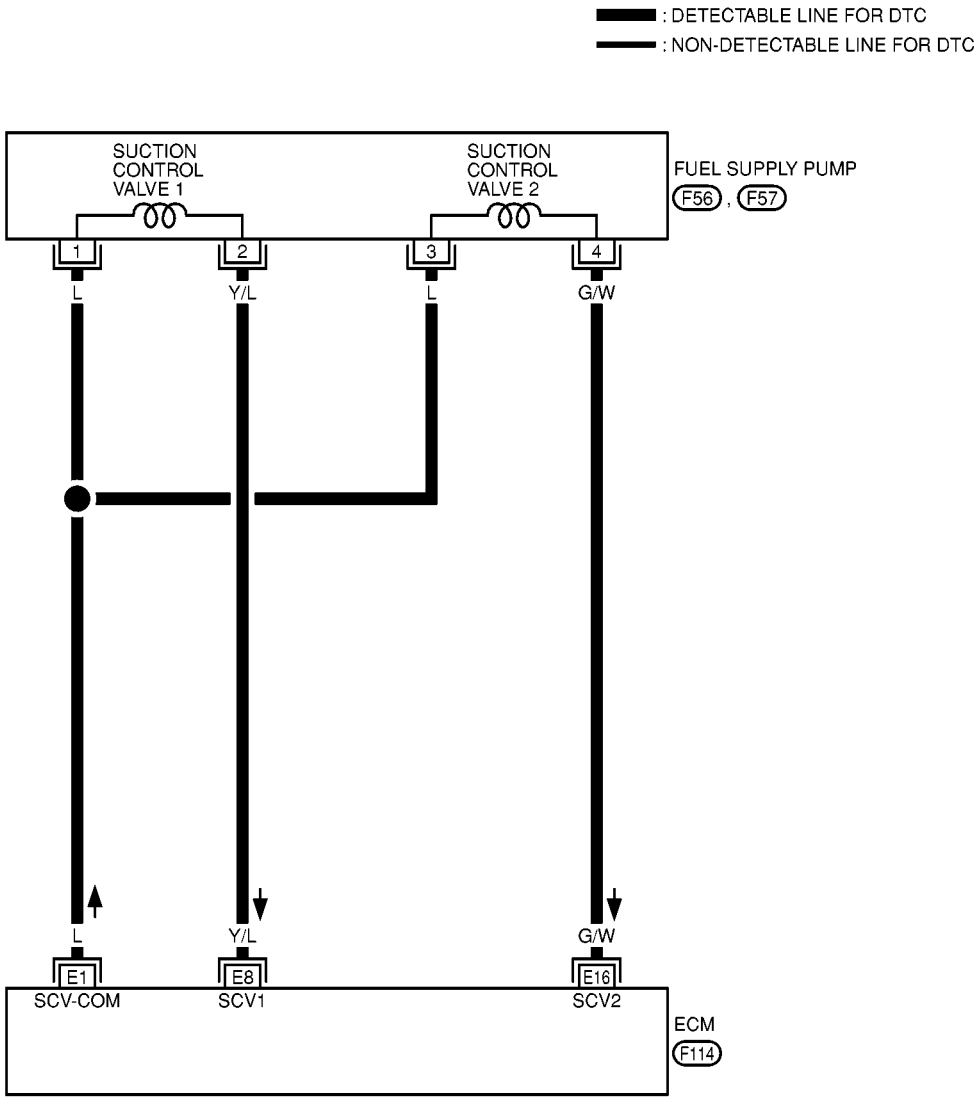


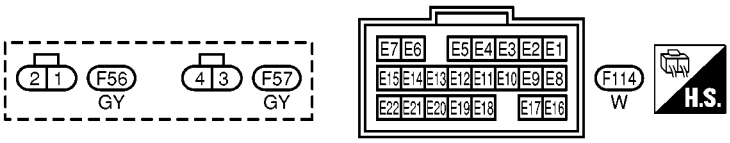
SEF817Y

Wiring Diagram

EBS00E1R

EC-SCTC/V-01





MBWA0111E

Diagnostic Procedure

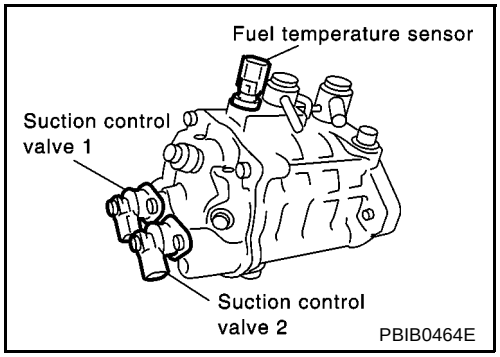
EBS00E1S

1. CHECK ECM OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector and fuel supply pump harness connectors.
3. Check continuity between ECM terminal E1 and fuel supply pump terminals 1, 3.
   Refer to Wiring Diagram.

   Continuity should exist.

4. Also check harness for short to ground and short to power.



OK or NG

OK >> GO TO 2.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

2. CHECK SUCTION CONTROL VALVE GROUND CIRCUIT FOR OPEN AND SHORT

1. Check continuity between ECM terminal E8 and fuel supply pump terminal 2, ECM terminal E16 and fuel supply pump terminal 4.
   Refer to Wiring Diagram.

   Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK SUCTION CONTROL VALVE

Refer to EC-1868, "Component Inspection" .

OK or NG

OK >> GO TO 4.
NG >> Replace fuel supply pump.

4. CHECK INTERMITTENT INCIDENT

Refer to EC-1783, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

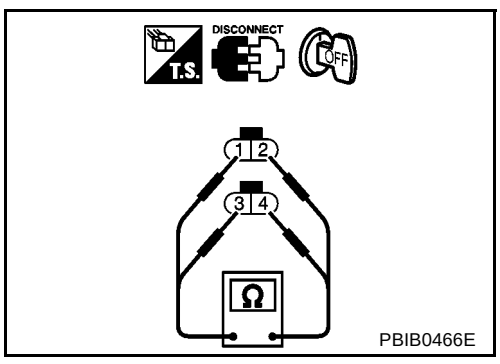
EBS00E1T

SUCTION CONTROL VALVE

1. Check continuity between fuel supply pump terminals 1 and 2, 3 and 4.

   Continuity should exist.

2. If NG, replace fuel supply pump.



Removal and Installation

EBS00E1U

FUEL SUPPLY PUMP

Refer to EM-239, "FUEL SUPPLY PUMP" .

DTC P1301 - P1304 FUEL INJECTOR ADJUSTMENT RESISTOR

PFP:16600

Description

EBS00E1V

The fuel injector adjustment resistor is built into the fuel injector. The resistance is constant and individual. ECM uses the individual resistance to determine the fuel injection pulse.

ECM Terminals and Reference Value

EBS00E1W

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
A25	PU/W	Fuel injector's ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
B9	Y/B	Fuel injector adjustment resistor No.2	**[Ignition switch “ON”]**	0.2 - 4.8V (There is an individual difference in fuel injector adjustment resistor.)
B10	R/B	Fuel injector adjustment resistor No.4		
B11	G/B	Fuel injector adjustment resistor No.3		
B12	W/B	Fuel injector adjustment resistor No.1		

On Board Diagnosis Logic

EBS00E1X

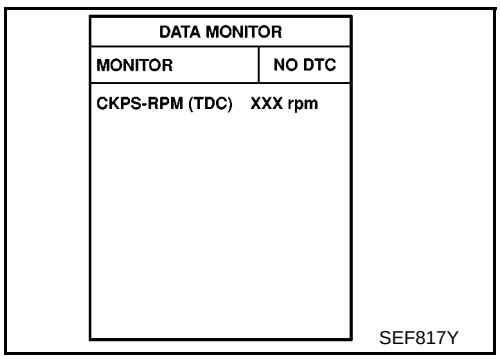
DTC	Malfunction is detected when	Check Items (Possible cause)
P1301	● An excessively high or low voltage from fuel injector No.1 adjustment resistor is sent to ECM	● Harness or connectors (Injector adjustment resister circuit is open or shorted.) ● Fuel injector adjustment resistor
P1302	● An excessively high or low voltage from fuel injector No.2 adjustment resistor is sent to ECM	
P1303	● An excessively high or low voltage from fuel injector No.3 adjustment resistor is sent to ECM	
P1304	● An excessively high or low voltage from fuel injector No.4 adjustment resistor is sent to ECM	

DTC Confirmation Procedure

EBS00E1Y

WITH CONSULT-II

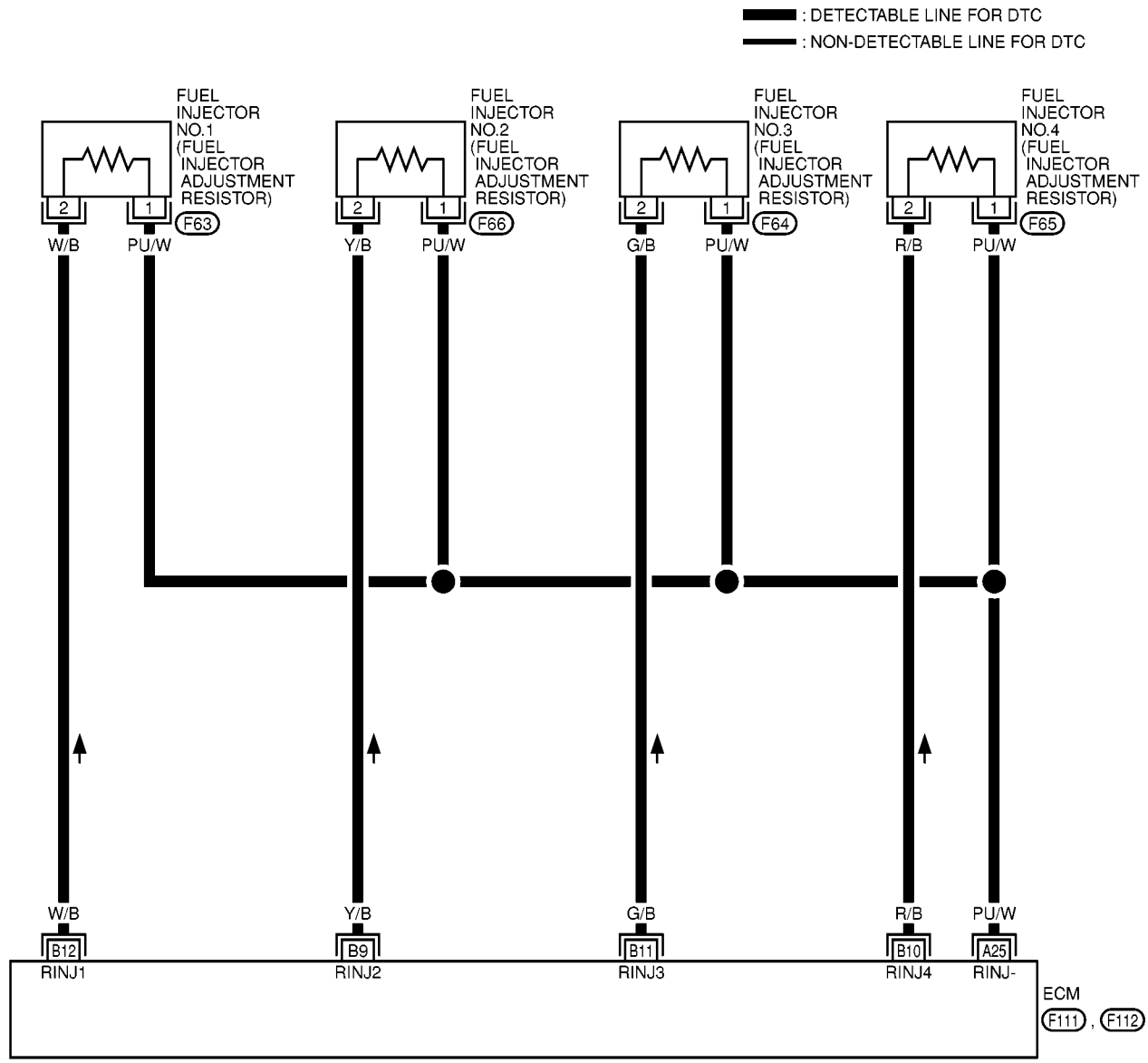
1. Turn ignition switch “ON” and wait at least 2 seconds.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and run it for at least 2 seconds at idle speed.
   (If engine does not run, turn ignition switch to “START” for at least 2 seconds.)
4. If DTC is detected, go to EC-1872, "Diagnostic Procedure" .

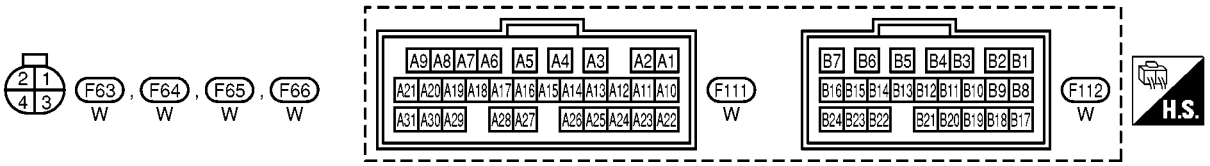


Wiring Diagram

EBS00E1Z

EC-FIAR-01





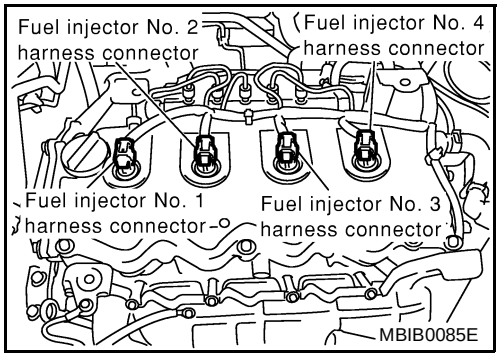
MBWA0115E

Diagnostic Procedure

EBS00E20

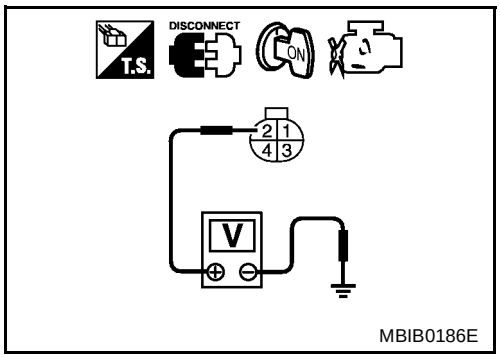
1. CHECK FUEL INJECTOR ADJUSTMENT RESISTOR POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect fuel injector harness connector of malfunctioning cylinder.
3. Turn ignition switch “ON”.



4. Check voltage between fuel injector terminal 2 and ground with CONSULT-II or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check harness continuity for open and short between ECM and fuel injector.

>> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK FUEL INJECTOR ADJUSTMENT RESISTOR GROUND CIRCUIT

1. Turn ignition switch “OFF”.
2. Check harness continuity between fuel injector terminal 1 and ECM terminal A25.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK FUEL INJECTOR ADJUSTMENT RESISTOR

Refer to EC-1873, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace fuel injector.

5. CHECK INTERMITTENT INCIDENT

Refer to EC-1783, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

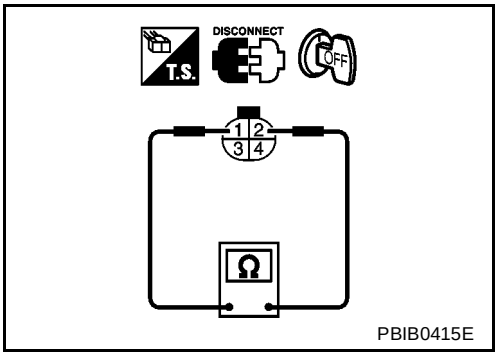
EBS00E21

FUEL INJECTOR ADJUSTMENT RESISTOR

1. Disconnect fuel injector harness connector.
2. Check continuity between terminals as shown in the figure.

Continuity should exist.

If NG, replace fuel injector.



PBIB0415E

Removal and Installation

EBS00E22

FUEL INJECTOR

Refer to EM-236, "INJECTION TUBE AND FUEL INJECTOR" .

DTC P1305 FUEL LEAK

PFP:17520

On Board Diagnosis Logic

EBS00E23

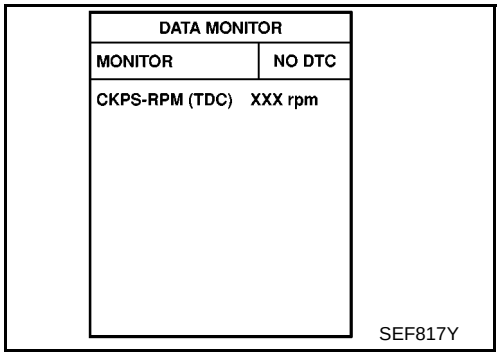
DTC	Malfunction is detected when	Check Items (Possible cause)
P1305	● The relation between the output signal to suction control valve and input signal from common rail fuel pressure sensor is not in normal range.	● Suction control valve ● Fuel tube ● Common rail ● Fuel pressure relief valve

DTC Confirmation Procedure

EBS00E24

WITH CONSULT-II

1. Turn ignition switch “ON” and wait at least 2 seconds.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Start engine and run it for at least 2 seconds at idle speed. (If engine does not run, turn ignition switch to “START” for at least 2 seconds.)
4. If DTC is detected, go to EC-1874, "Diagnostic Procedure" .



Diagnostic Procedure

EBS00E25

1. INSPECTION START

1. Start engine.
2. Visually check the following for fuel leak.
- Fuel tube from fuel supply pump to common rail
- Common rail
- Fuel tube from common rail to fuel injector
3. Also check for improper connection or pinches.

OK or NG

OK >> GO TO 2.
NG >> Repair malfunctioning part.

2. CEHCK FUEL PRESSURE RELIEF VALVE

Refer to EC-1746, "Fuel Pressure Relief Valve" .

OK or NG

OK >> GO TO 3.
NG >> Replace common rail.

3. CHECK INTERMITTENT INCIDENT

Refer to EC-1783, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

OK or NG

OK >> Replace fuel supply pump.
NG >> Repair or replace.

Removal and Installation

EBS00E26

COMMON RAIL

Refer to EM-236, "INJECTION TUBE AND FUEL INJECTOR" .

FUEL SUPPLY PUMP

Refer to EM-239, "FUEL SUPPLY PUMP" .

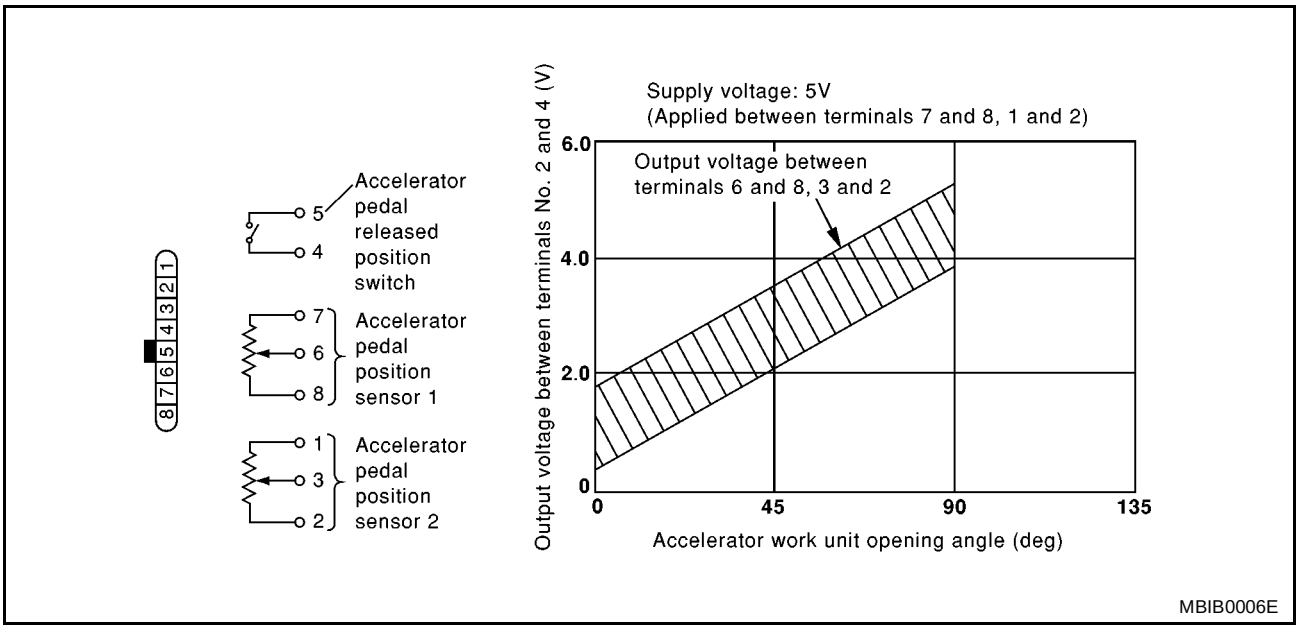
DTC P1510 ACCELERATOR PEDAL RELEASED POSITION SWITCH

PFP:18002

Description

EBS00E27

The accelerator work unit is installed on the upper end of the accelerator pedal assembly. The accelerator pedal position sensor 1, 2 and accelerator pedal released position switch are built into the accelerator work unit. The sensor detects the accelerator pedal position and sends a signal to the ECM. The ECM uses the signal to determine the amount of fuel to be injected.
The accelerator pedal released position switch detects accelerator pedal released position signal and sends this signal to the ECM. The ECM will then determine engine idle conditions. This signal is also used for diagnosing the accelerator pedal position sensor.



CONSULT-II Reference Value in Data Monitor Mode

EBS00E28

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
ACCEL POS SEN	● Ignition switch: ON (Engine stopped)	Accelerator pedal: fully released	0.8 - 1.3V
		Accelerator pedal: fully depressed	More than 3.5V
ACCEL SEN 2	● Ignition switch: ON (Engine stopped)	Accelerator pedal: fully released	0.3 - 1.8V
		Accelerator pedal: fully depressed	More than 3.0V
OFF ACCEL SW	● Ignition switch: ON (Engine stopped)	Accelerator pedal: fully released	ON
		Accelerator pedal: slightly depressed	OFF

ECM Terminals and Reference Value

EBS00E29

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
A21	B	Accelerator pedal released position switch ground	**[Ignition switch “ON”]**	Approximately 0V
A22	LG	Accelerator pedal position sensor 1 ground	**[Ignition switch “ON”]**	Approximately 0V

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
A26	LG/R	Accelerator pedal position sensor 2 ground	**[Ignition switch "ON"]**	Approximately 0V
A28	PU/R	Accelerator pedal position sensor 1 power supply	**[Ignition switch "ON"]**	Approximately 5V
B15	W	Accelerator pedal position sensor 1	**[Ignition switch "ON"]** ● Accelerator pedal fully released	0.8 - 1.3V
			[Ignition switch "ON"] ● Accelerator pedal fully depressed	More than 3.5V
B16	G	Accelerator pedal position sensor 2	**[Ignition switch "ON"]** ● Accelerator pedal fully released	0.3 - 1.8V
			[Ignition switch "ON"] ● Accelerator pedal fully depressed	More than 3.0V
B23	GY/L	Accelerator pedal position sensor 2 power supply	**[Ignition switch "ON"]**	Approximately 5V
D14	G/Y	Accelerator pedal released position switch	**[Ignition switch "ON"]** ● Accelerator pedal slightly depressed	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"] ● Accelerator pedal fully released	Approximately 0V

On Board Diagnosis Logic

EBS00E2A

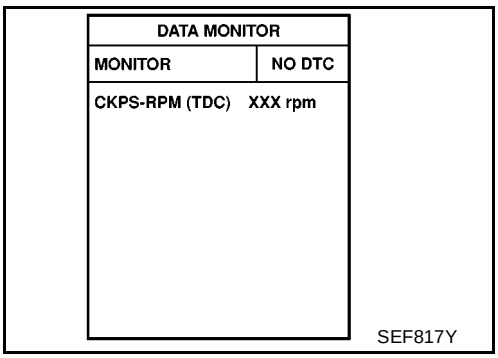
DTC	Malfunction is detected when ...	Check Items (Possible Cause)
P1510	● The relation between accelerator pedal position sensor 1, 2 signals and accelerator pedal position switch signal is not in the normal range during the specified accelerator pedal positions.	● Harness or connectors (Accelerator pedal released position switch circuit is open or shorted.) ● Accelerator pedal released position switch

DTC Confirmation Procedure

EBS00E2B

WITH CONSULT-II

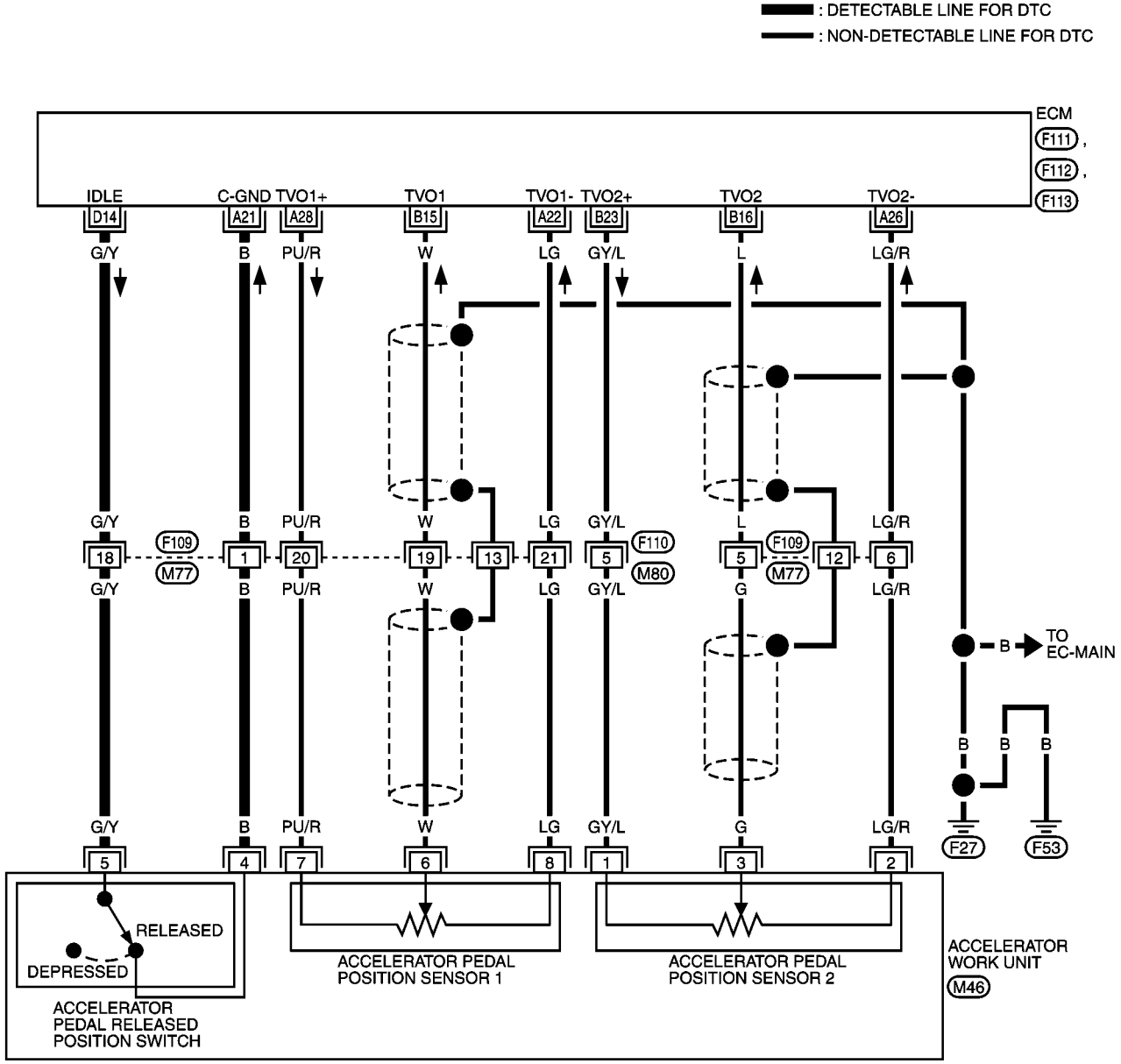
1. Turn ignition switch "ON".
2. Select "DATA MONITOR" mode with CONSULT-II.
3. Depress and release fully accelerator pedal slowly.
4. If DTC is detected, go to EC-1879, "Diagnostic Procedure" .

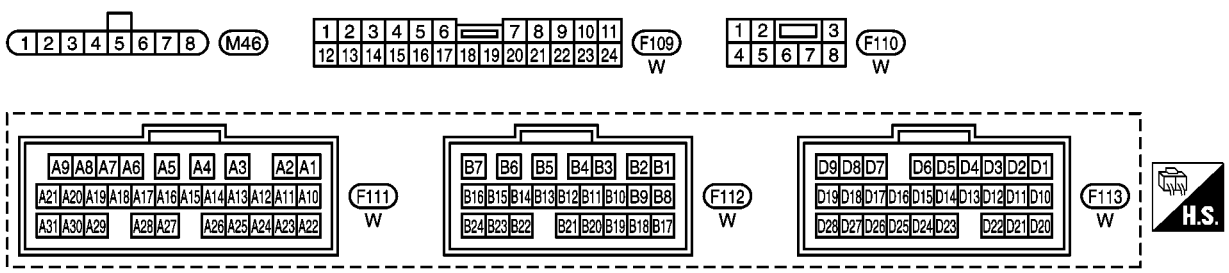


Wiring Diagram

EBS00E2C

EC-APRSW-01





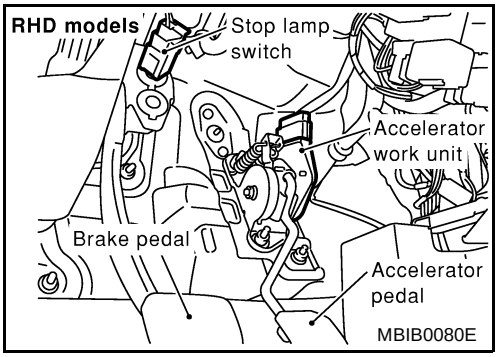
MBWA0116E

Diagnostic Procedure

EBS00E2D

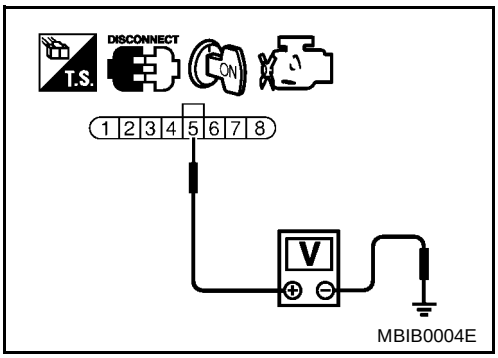
1. CHECK ACCELERATOR PEDAL RELEASED POSITION SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect accelerator work unit harness connector.
3. Turn ignition switch “ON”.



4. Check voltage between accelerator work unit terminal 5 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F109, M77
- Harness for open or short between accelerator work unit and ECM

>> Repair harness or connectors.

3. CHECK ACCELERATOR PEDAL RELEASED POSITION SWITCH GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between accelerator work unit terminal 4 and ECM terminal A21. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F109, M77
- Harness for open or short between ECM and accelerator work unit

>> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK ACCELERATOR PEDAL RELEASED POSITION SWITCH

Refer to EC-1880, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. REPLEACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly.
2. Perform EC-1745, "Accelerator Pedal Released Position Learning" .

>> **INSPECTION END**

7. CHECK INTERMITTENT INCIDENT

Refer to EC-1783, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

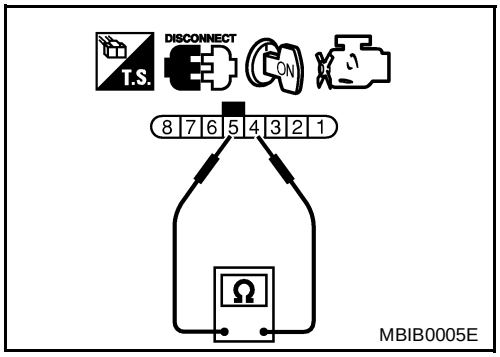
Component Inspection

EBS00E2E

ACCELERATOR PEDAL RELEASED POSITION SWITCH

Check continuity between accelerator position switch terminals 4 and 5 under the following conditions.

Conditions	Continuity
Accelerator pedal fully released	Should exist.
Accelerator pedal depressed	Should not exist.



Removal and Installation

EBS00E2F

ACCELERATOR WORK UNIT

Refer to ACC-2, "ACCELERATOR CONTROL SYSTEM" .

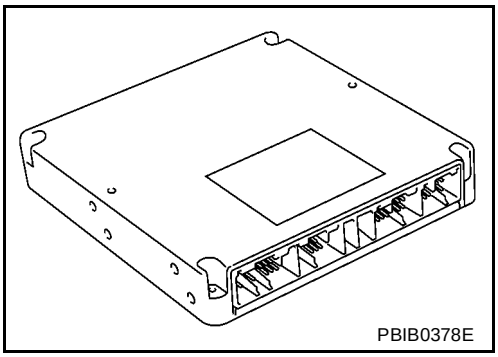
DTC P1606 ECM

PFP:23710

Description

EBS00E2G

The ECM consists of a microcomputer and connectors for signal input and output and for power supply. The ECM controls the engine.


PBIB0378E

On Board Diagnosis Logic

EBS00E2H

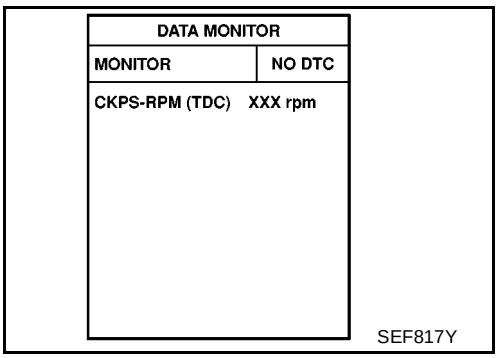
DTC	Malfunction is detected when ...	Check Items (Possible Cause)
P1606	● ECM calculation function is malfunctioning.	● ECM

DTC Confirmation Procedure

EBS00E2I

WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. If DTC is detected, go to EC-1881, "Diagnostic Procedure" .



SEF817Y

Diagnostic Procedure

EBS00E2J

1. INSPECTION START

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “SELF DIAG RESULTS” mode with CONSULT-II.
3. Touch “ERASE”.
4. Perform EC-1881, "DTC Confirmation Procedure" , again.
5. Is DTC P1606 displayed again?

Yes or No

Yes >> GO TO 2.
No >> **INSPECTION END**

2. REPLACE ECM

1. Replace ECM.
2. Perform initialization of NATS system and registration of all NATS ignition key IDs. Refer to EC-1748, "NATS (Nissan Anti-theft System)" .
3. Perform “Accelerator Pedal Released Position Learning”. Refer to EC-1745, "Accelerator Pedal Released Position Learning" .

>> **INSPECTION END**

DTC P1621 ECM RELAY

PFP:25230

ECM Terminals and Reference valve

EBS00E2K

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
A8 A9	R R	Power supply for ECM	**[Ignition switch “ON”]**	BATTERY VOLTAGE (11 - 14V)
D18 D19	W/R W/R	Ignition switch	**[Ignition switch “ON”]**	BATTERY VOLTAGE (11 - 14V)
D24 D26	G G	ECM relay (self-shutoff)	**[Ignition switch “ON”]** **[Ignition switch “OFF”]** ● For a few seconds after turning ignition switch “OFF”	Approximately 0V
			[Ignition switch “OFF”] ● A few seconds passed after turning ignition switch “OFF”	BATTERY VOLTAGE (11 - 14V)

On Board Diagnosis Logic

EBS00E2L

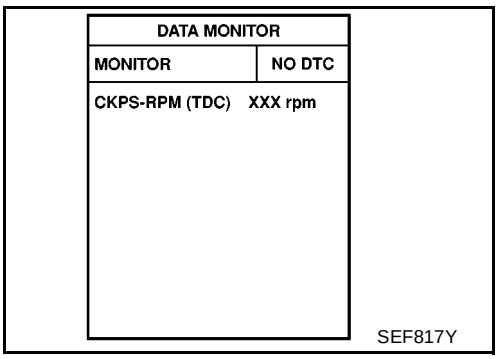
DTC	Malfunction is detected when ...	Check Items (Possible Cause)
P1621	● An irregular voltage signal from the ECM relay is sent to ECM.	● Harness or connectors (ECM relay circuit is open or shorted.) ● ECM relay

DTC Confirmation Procedure

EBS00E2M

WITH CONSULT-II

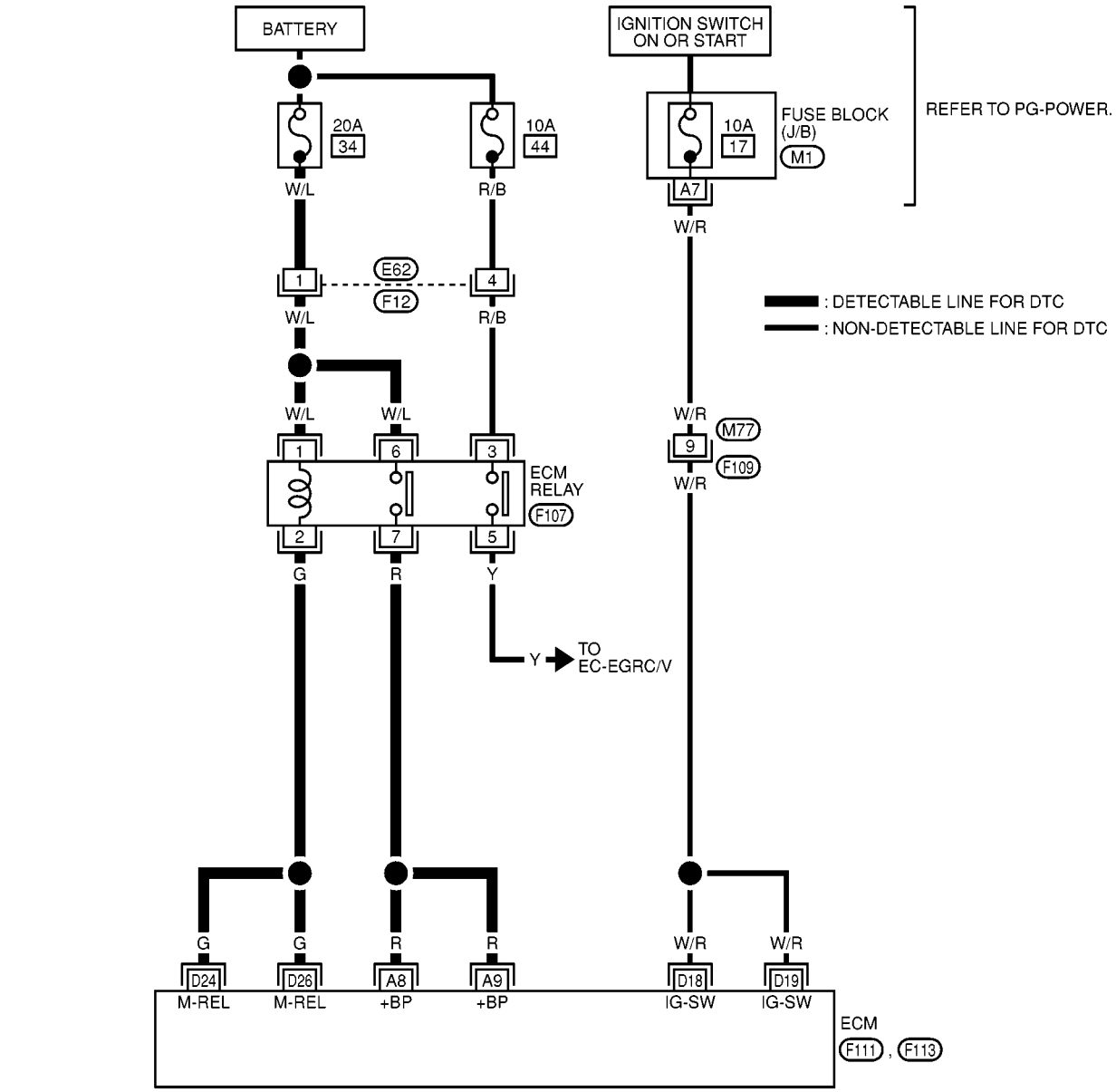
1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Turn ignition switch “OFF”, wait at least 20 seconds and then turn “ON”.
4. If DTC is detected, go to EC-1885, "Diagnostic Procedure" .

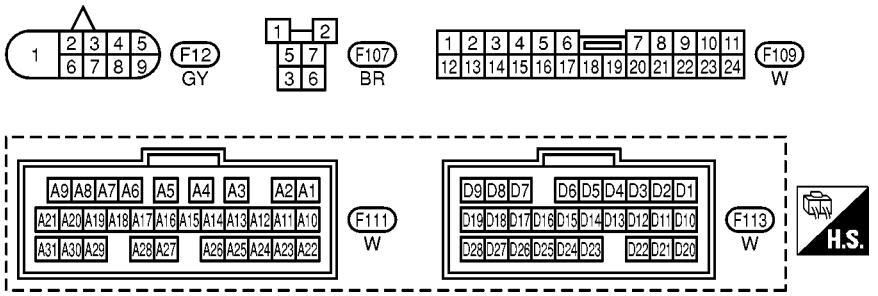


Wiring Diagram

EBS00E2N

EC-ECMRLY-01





REFER TO THE FOLLOWING.

M1 -FUSE BLOCK-JUNCTION BOX (J/B)

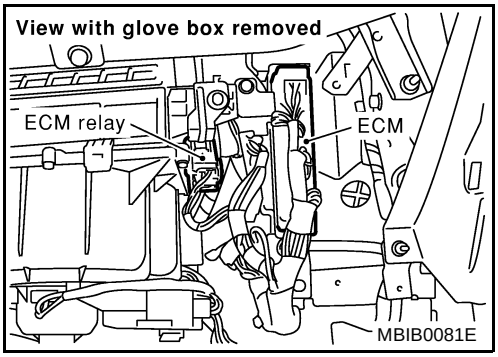
MBWA0110E

Diagnostic Procedure

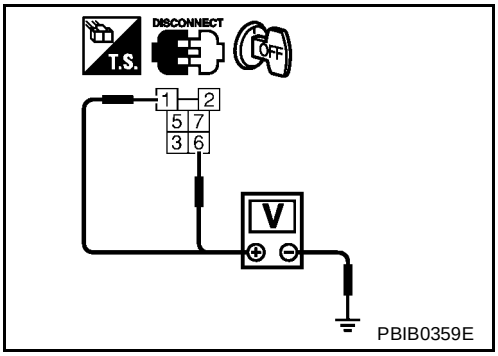
EBS00E2O

1. CHECK ECM POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect ECM relay.



3. Check voltage between ECM relay terminals 1, 6 and ground with CONSULT-II or tester.



OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E62, F12
- 20A fuse
- Harness for open and short between ECM relay and battery

>> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK ECM INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminals A8, A9 and ECM relay terminal 7. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK ECM OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminals D24, D26 and ECM relay terminal 2. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK ECM RELAY

Refer to EC-1886, "Component Inspection" .

OK or NG

OK >> GO TO 6.
NG >> Replace ECM relay.

6. CHECK INTERMITTENT INCIDET

Refer to EC-1783, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

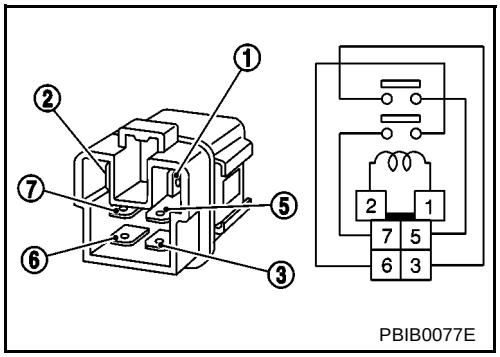
EBS00E2P

ECM RELAY

1. Apply 12V direct current between ECM relay terminals 1 and 2.
2. Check continuity between relay terminals 3 and 5, 6 and 7.

Condition	Continuity
12V direct current supply between terminals 1 and 2	Yes
OFF	No

3. If NG, replace ECM relay.



PBIB0077E

DTC P1660 BATTERY VOLTAGE

PFP:AYBGL

On Board Diagnosis Logic

EBS00E2Q

The ECM checks if battery voltage is within the tolerance range for the engine control system.

DTC	Malfunction is detected when ...	Check Items (Possible Cause)
P1660	● An abnormally high or low voltage from the battery is sent to ECM.	● Incorrect jump starting ● Battery ● Alternator ● ECM

DTC Confirmation Procedure

EBS00E2R

WITH CONSULT-II

1. Check the following.

– Jumper cables are connected for jump starting.

– Battery or alternator has been replaced.
If the result is “Yes” for one item or more, skip the following steps and go to EC-1887, "Diagnostic Procedure" .

2. Check that the positive battery terminal is connected to battery properly. If NG, reconnect it properly.
3. Check that the alternator functions properly. Refer to SC-12, "CHARGING SYSTEM" .
4. Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
5. Wait one minute.
6. If DTC is detected, go to EC-1887, "Diagnostic Procedure" .
If DTC is not detected, go to next step.
7. Start engine and wait one minute at idle.
8. If DTC is detected, go to EC-1887, "Diagnostic Procedure" .

Diagnostic Procedure

EBS00E2S

1. INSPECTION START

Are jumper cables connected for the jump starting?

Yes or No

Yes >> GO TO 3.
No >> GO TO 2.

2. CHECK BATTERY AND ALTERNATOR

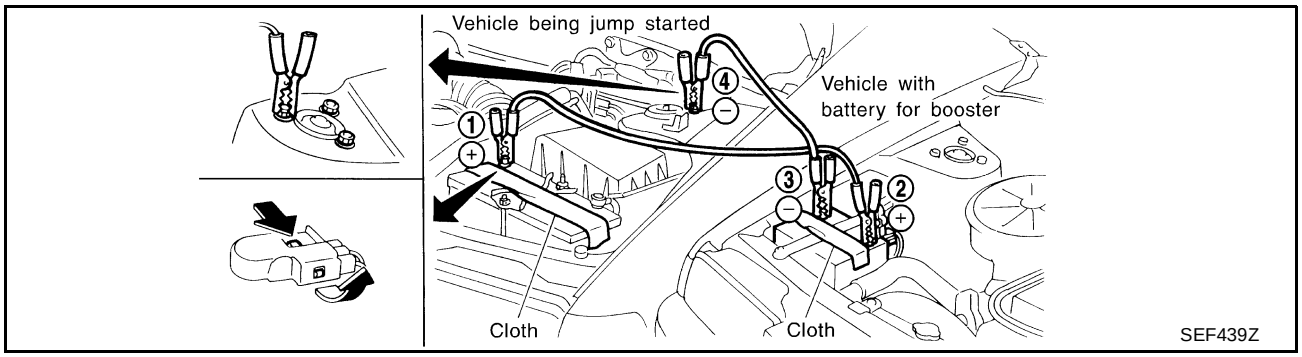
Check that the proper type of battery and alternator is installed.
Refer to SC-3, "BATTERY" , SC-12, "CHARGING SYSTEM" .

OK or NG

OK >> GO TO 5.
NG >> Replace with a proper one.

3. CHECK JUMPER CABLES INSTALLATION

Check that the jumper cables are connected in the correct sequence.



OK or NG

OK >> GO TO 4.
NG >> Reconnect jumper cables properly.

4. CHECK BATTERY FOR BOOSTER

Check that the battery for the booster is a 12V battery.

OK or NG

OK >> GO TO 5.
NG >> Change the vehicle for booster.

5. PERFORM DTC CONFIRMATION PROCEDURE AGAIN

Perform EC-1887, "DTC Confirmation Procedure" , again.

OK or NG

OK >> GO TO 6.
NG >> Replace ECM.

6. CHECK ELECTRICAL PARTS DAMAGE

Check the following for damage.

- Wiring harness and harness connectors for burn
- Fuses for short

OK or NG

OK >> **INSPECTION END**
NG >> Repair or replace malfunctioning part.

GLOW CONTROL SYSTEM

PFP:25230

Description

EBS00E2T

SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM Function	Actuator
Crankshaft position sensor (TDC)	Engine speed	Glow control	Glow lamp Glow relay Glow plugs
Engine coolant temperature sensor	Engine coolant temperature		

When engine coolant temperature is more than approximately 80°C (176°F), the glow relay turns off.
When coolant temperature is lower than approximately 80°C (176°F):

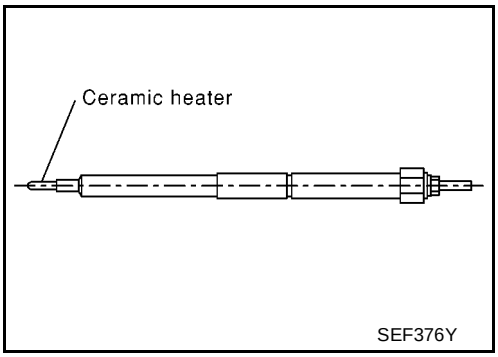
- Ignition switch ON
  After ignition switch has turned to ON, the glow relay turns ON for a certain period of time in relation to engine coolant temperature, allowing current to flow through glow plug.
- Cranking
  The glow relay turns ON, allowing current to flow through glow plug.
- Starting
  After engine has started, current continues to flow through glow plug (after-glow mode) for a certain period in relation to engine coolant temperature.

The glow indicator lamp turns ON for a certain period of time in relation to engine coolant temperature at the time glow relay is turned ON.
ECM controls glow indicator lamp through CAN communication line.

COMPONENT DESCRIPTION

Glow Plug

The glow plug is provided with a ceramic heating element to obtain a high-temperature resistance. It glows in response to a signal sent from the ECM, allowing current to flow through the glow plug via the glow relay.



ECM Terminals and Reference Value

EBS00E2U

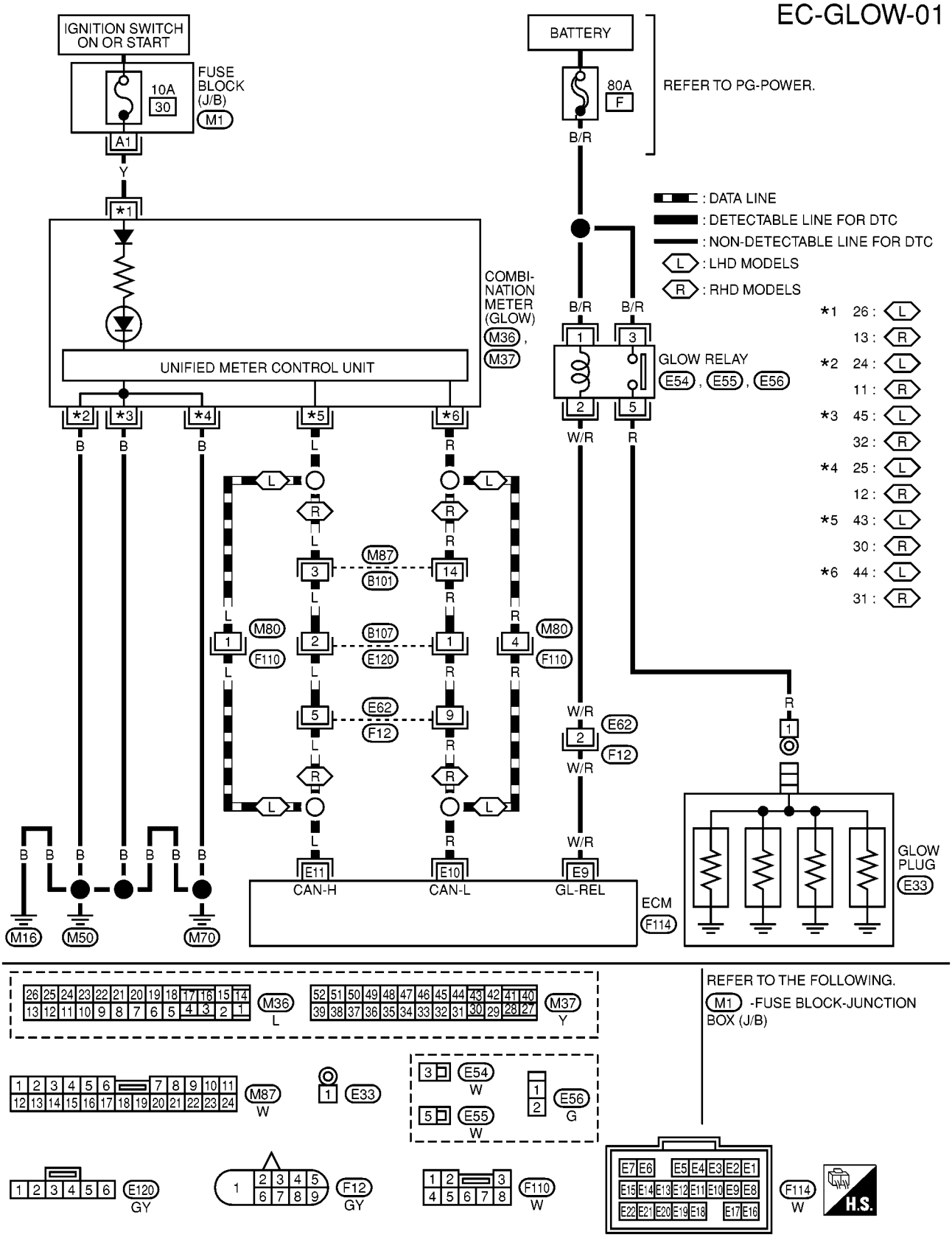
Specification data are reference values and are measured between each terminal and ground.

CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
E9	W/R	Glow relay	Refer to EC-1889, "SYSTEM DESCRIPTION"	

Wiring Diagram

EBS00E2V



MBWA0101E

Diagnostic Procedure

EBS00E2W

1. INSPECTION START

Check fuel level, fuel supplying system, starter motor, etc.

OK or NG

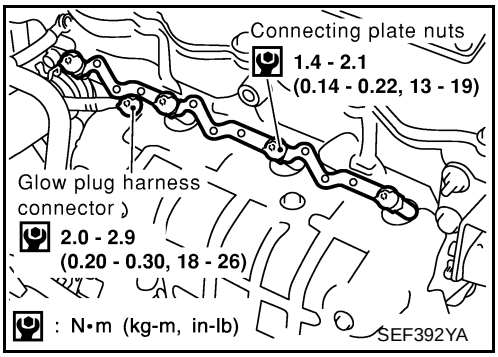
OK >> GO TO 2.
NG >> Correct.

2. CHECK INSTALLATION

Check that glow plug nut and all glow plug connecting plate nuts are installed properly.

OK or NG

OK >> GO TO 3.
NG >> Install properly.



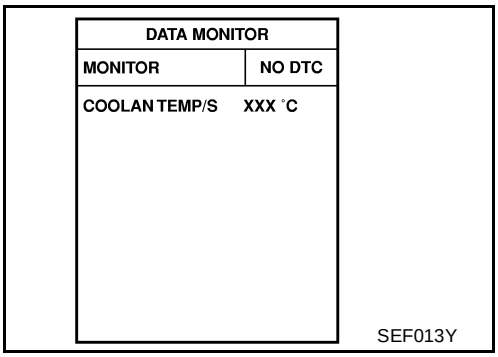
3. CHECK GLOW INDICATOR LAMP OPERATION

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “COOLAN TEMP/S” in “DATA MONITOR” mode with CONSULT-II.
3. Confirm that “COOLAN TEMP/S” indicates below 80°C (176°F). If it indicates above 80°C (176°F), cool down engine.
4. Turn ignition switch “OFF”, wait at least 5 seconds and then turn “ON”.
5. Make sure that glow indicator lamp is turned “ON” for 1.5 seconds or more after turning ignition switch “ON”, and then glow indicator lamp turned “OFF”.

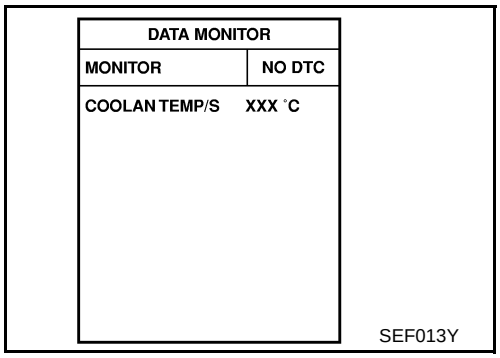
OK or NG

OK >> GO TO 4.
NG >> GO TO 5.



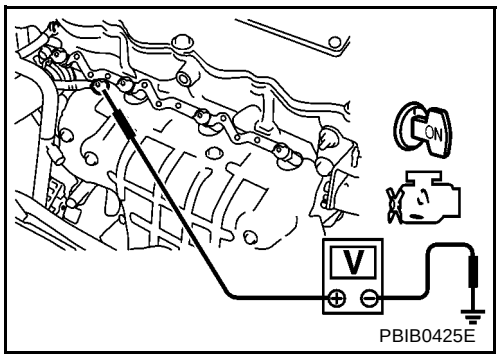
4. CHECK GLOW CONTROL SYSTEM OVERALL FUNCTION

1. Select “COOLAN TEMP/S” in “DATA MONITOR” mode with CONSULT-II.
2. Confirm that “COOLAN TEMP/S” indicates approximately 25°C (77°F). If NG, cool down engine.
3. Turn ignition switch “OFF”.
4. Set voltmeter probe between glow plug and engine body.
5. Turn ignition switch “ON”.



6. Check the voltage between glow plug and engine body under the following conditions.

Conditions	Voltage
For 20 seconds after turning ignition switch “ON”	Battery voltage
More than 20 seconds after turning ignition switch “ON”	Approx. 0V



OK or NG

OK >> **INSPECTION END**
NG >> GO TO 7.

5. CHECK DTC

Check that DTC U1000 is not displayed.

Yes or No

Yes >> Perform trouble diagnoses for DTC U1000, refer to EC-1790, "DTC U1000 CAN COMMUNICATION LINE" .
No >> GO TO 6.

6. CHECK COMBINATON METER OPERATION

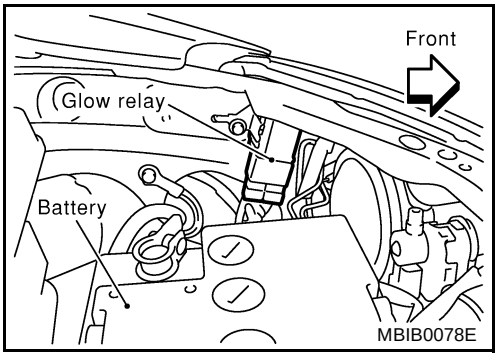
Does combination meter operate normally?

Yes or No

Yes >> GO TO 14.
No >> Check combination meter circuit. Refer to DI-5, "COMBINATION METERS (LHD MODELS)" or DI-34, "COMBINATION METERS (RHD MODELS)" .

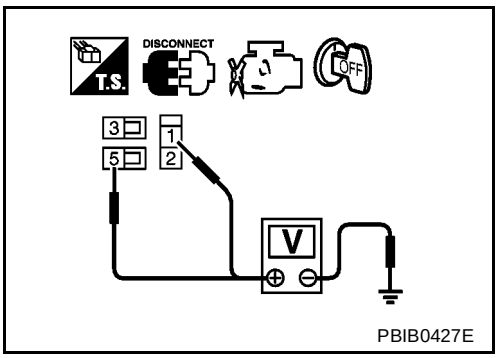
7. CHECK GLOW RELAY POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect glow relay.



3. Check voltage between glow relay terminals 1, 3 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 9.
NG >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the following.

- 60A fusible link
- Harness for open or short between glow relay and battery

>> Repair harness or connectors.

9. CHECK GLOW RELAY OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal E9 and glow relay terminal 2. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 11.
NG >> GO TO 10.

10. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E62, F12
- Harness for open or short between glow relay and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

11. CHECK HARNESS CONTINUITY BETWEEN GLOW RELAY AND GLOW PLUG FOR OPEN AND SHORT

1. Disconnect glow plug harness connector.
2. Check harness continuity between glow relay terminal 5 and glow plug harness connector. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 12.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

12. CHECK GLOW RELAY

Refer to EC-1894, "Component Inspection" .

OK or NG

OK >> GO TO 13.
NG >> Replace glow relay.

13. CHECK GLOW PLUG

Refer to EC-1894, "Component Inspection" .

OK or NG

OK >> GO TO 14.
NG >> Replace glow plug.

14. CHECK INTERMITTENT INCIDENT

Refer to EC-1783, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

Component Inspection

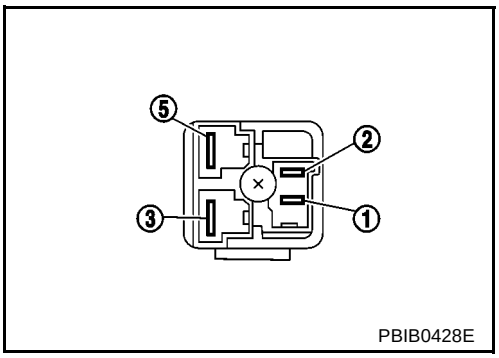
EBS00E2X

GLOW RELAY

Check continuity between glow relay terminals 3 and 5 under the following conditions.

Conditions	Continuity
12V direct current supply between terminals 1 and 2	Yes
No current supply	No

Operation takes less than 1 second.



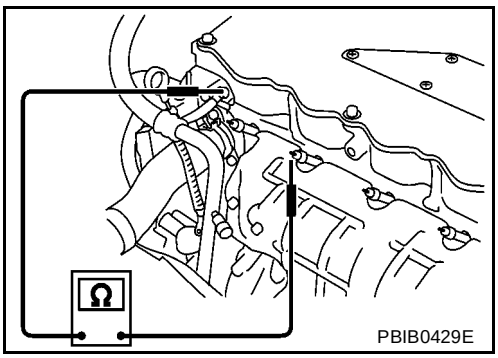
PBIB0428E

GLOW PLUG

1. Remove glow plug connecting plate.

2. Check glow plug resistance.

Resistance: Approximately 0.8 Ω [at 25°C (77°F)]



NOTE:

- **Do not bump glow plug heating element. If it is bumped, replace glow plug with a new one.**
- **If glow plug is dropped from a height of 10 cm (3.94 in) or higher, replace with a new one.**
- **If glow plug installation hole is contaminated with carbon, remove it with a reamer or suitable tool.**
- **Hand-tighten glow plug by turning it two or three times, then tighten using a tool to specified torque.**

: 17.7 - 22.5 N-m (1.8 - 2.3 kg-m, 13 - 16 ft-lb)

Removal and Installation

EBS00E2Y

GLOW PLUG

Refer to EM-231, "GLOW PLUG" .

EGR VOLUME CONTROL SYSTEM

PFP:14710

Description

EBS00E2Z

SYSTEM DESCRIPTION

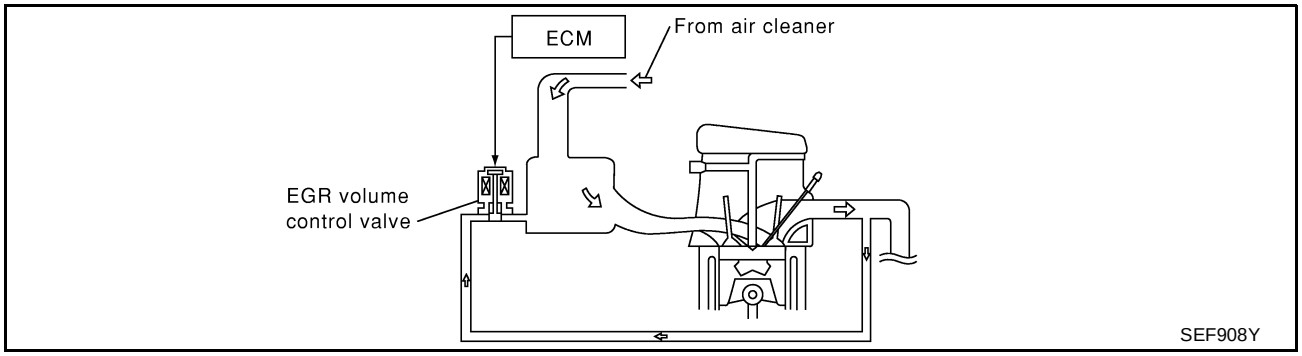
Sensor	Input Signal to ECM	ECM Function	Actuator
Crankshaft position sensor (TDC)	Engine speed	EGR volume control	EGR volume control valve
Vehicle speed signal*	Vehicle speed		
Engine coolant temperature sensor	Engine coolant temperature		
Ignition switch	Start signal		
Accelerator pedal position sensor	Accelerator pedal position		
Mass air flow sensor	Amount of intake air		
Air conditioner switch *	Air conditioner operation		

*: These signals are sent to the ECM through CAN communication line.

This system controls flow rate of EGR led from exhaust manifold to intake manifold. The opening of the EGR by-pass passage in the EGR volume control valve changes to control the flow rate. A built-in step motor moves the valve in steps corresponding to the ECM output pulses. The opening of the valve varies for optimum engine control. The optimum value stored in the ECM is determined by considering various engine conditions.

The EGR volume control valve remains close under the following conditions.

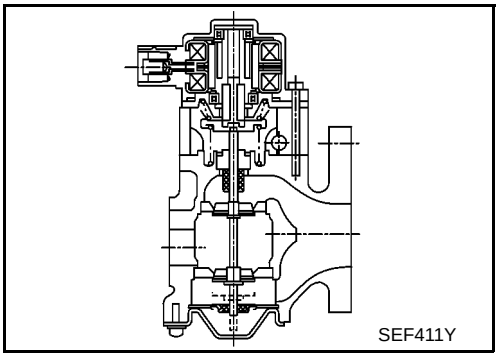
- Engine stopped
- Engine starting
- Low engine coolant temperature
- Excessively high engine coolant temperature
- High engine speed
- Wide open throttle



COMPONENT DESCRIPTION

EGR Volume Control Valve

The EGR volume control valve uses a step motor to control the flow rate of EGR from exhaust manifold. This motor has four winding phases. It operates according to the output pulse signal of the ECM. Two windings are turned ON and OFF in sequence. Each time an ON pulse is issued, the valve opens or closes, changing the flow rate. When no change in the flow rate is needed, the ECM does not issue the pulse signal. A certain voltage signal is issued so that the valve remains at that particular opening.



CONSULT-II Reference Value in Data Monitor Mode

EBS00E30

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
EGR VOL CON/V	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: Neutral position ● No-load	After one minute at idle	More than 10 steps
		Revving engine from idle to 3,600 rpm	0 step

ECM Terminals and Reference Value

EBS00E31

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

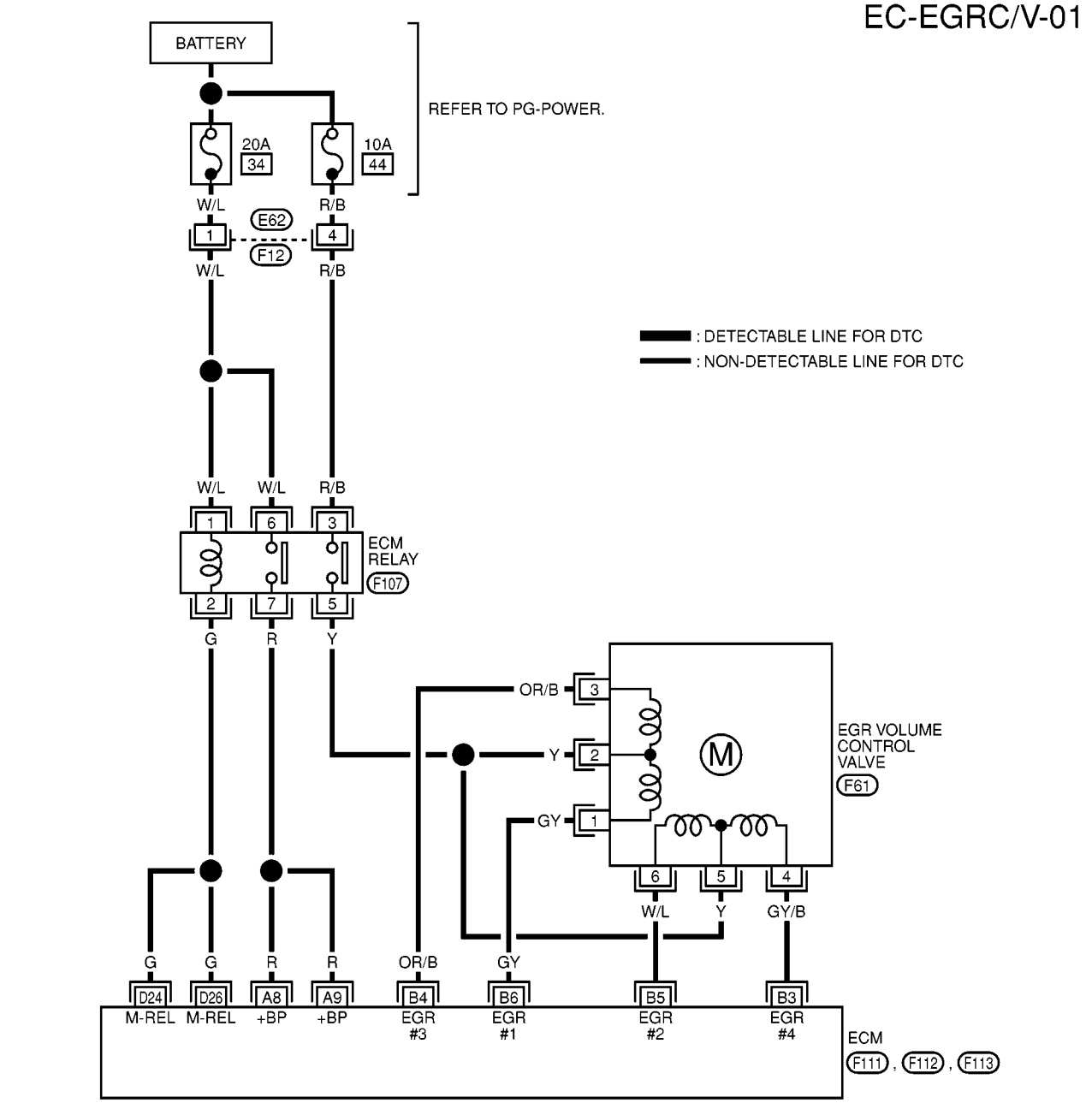
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

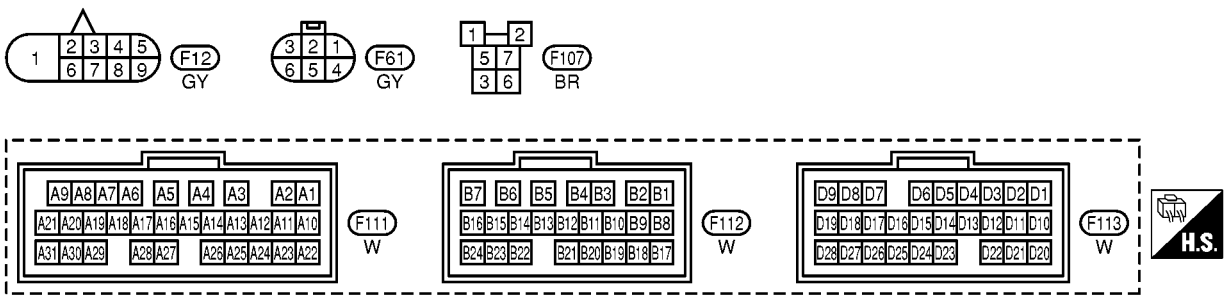
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
A8 A9	R R	Power supply for ECM	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)
B3 B4 B5 B6	GY/B OR/B W/L GY	EGR volume control valve	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0.1 - 14V (Voltage signals of each ECM terminals differ according to the control position of EGR volume control valve.)
D24 D26	G G	ECM relay (self-shutoff)	**[Ignition switch "ON"]** **[Ignition switch "OFF"]** ● For a few seconds after turning ignition switch "OFF"	Approximately 0V
			[Ignition switch "OFF"] ● A few seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)

Wiring Diagram

EBS00E32

EC-EGRC/V-01





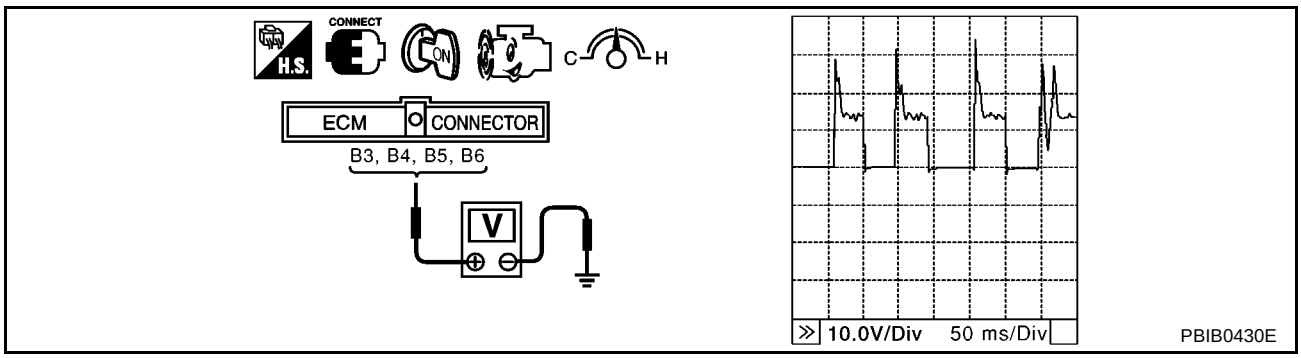
MBWA0102E

Diagnostic Procedure

EBS00E33

1. CHECK EGR VOLUME CONTROL SYSTEM OVERALL FUNCTION

1. Turn ignition switch “OFF”.
2. Set the oscilloscope probe between ECM terminals B3, B4, B5, B6 and ground.
3. Start engine and let it idle.
4. Check the oscilloscope screen when revving engine up to 3,200 rpm and return to idle.



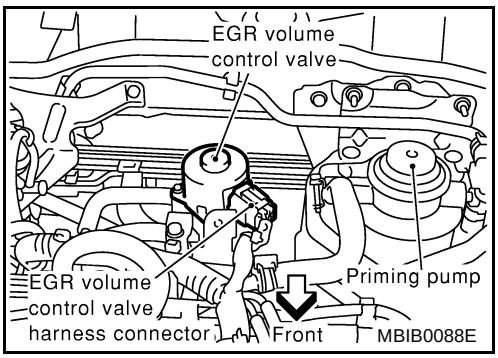
The pulse signal as shown in the figure should appear.

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 2.

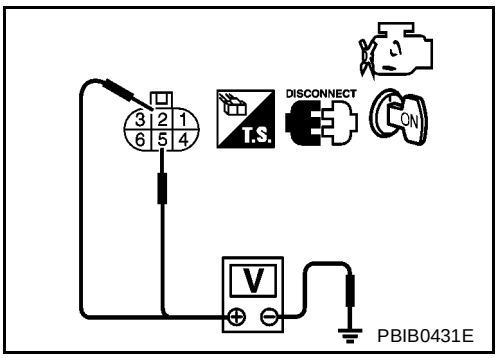
2. CHECK EGR VOLUME CONTROL VALVE POWER SUPPLY CIRCUIT-I

1. Turn ignition switch “OFF”.
2. Disconnect EGR volume control valve harness connector.
3. Turn ignition switch “ON”.



4. Check voltage between EGR volume control valve terminals 2, 5 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 7.
NG >> GO TO 3.

3. CHECK EGR VOLUME CONTROL VALVE POWER SUPPLY CIRCUIT-II

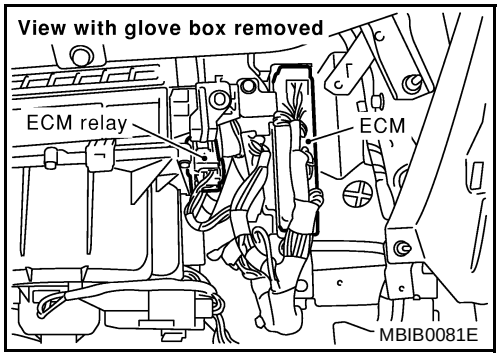
1. Turn ignition switch “OFF”.
2. Disconnect ECM relay.
3. Check harness continuity between ECM relay terminal 5 and EGR volume control valve terminals 2, 5.
   Refer to Wiring Diagram.

   Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.



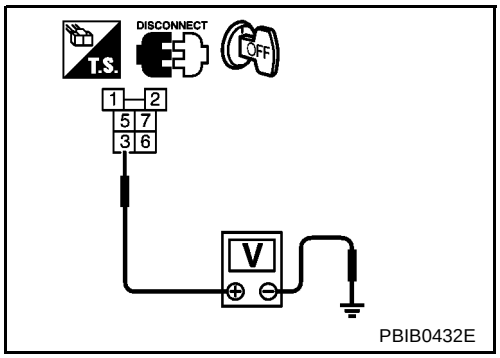
4. CHECK EGR VOLUME CONTROL VALVE POWER SUPPLY CIRCUIT-III

Check voltage between ECM relay terminal 3 and ground with CONSULT-II or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.



5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E62, F12
- 10A fuse
- Harness for open or short between ECM relay and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK ECM RELAY

Refer to EC-1789, "Component Inspection" .

OK or NG

OK >> GO TO 7.
NG >> Replace ECM relay.

7. CHECK EGR VOLUME CONTROL VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminals and EGR volume control valve terminals as follows. Refer to Wiring Diagram.

ECM terminal	EGR volume control valve terminal
B3	4
B4	3
B5	6
B6	1

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK EGR VOLUME CONTROL VALVE

Refer to EC-1901, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> Replace EGR volume control valve.

9. CHECK INTERMITTENT INCIDENT

Refer to EC-1783, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

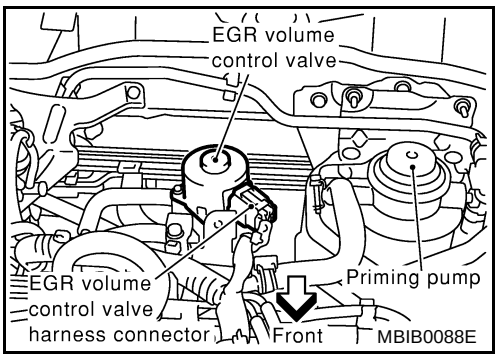
Component Inspection

EBS00E34

EGR VOLUME CONTROL VALVE

With CONSULT-II

1. Disconnect EGR volume control valve harness connector.

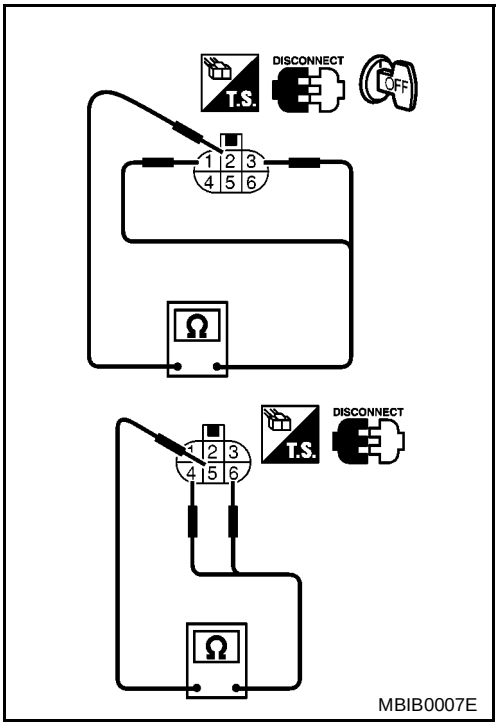


2. Check resistance between the following terminals.
   - terminal 2 and terminals 1, 3
   - terminal 5 and terminals 4, 6

Temperature °C (°F)	Resistance Ω
20 (68)	13 - 17

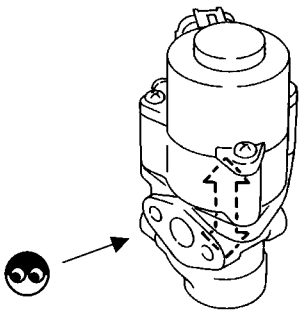
If NG, replace EGR volume control valve.
If OK, go to next step.

3. Reconnect EGR volume control valve harness connector.
4. Remove EGR volume control valve from cylinder head.
   (The EGR volume control valve harness connector should remain connected.)
5. Turn ignition switch “ON”.



6. Perform “EGR VOL CONT/V” in “ACTIVE TEST” mode with CONSULT-II. Check that EGR volume control valve shaft moves smoothly forward and backward according to the valve opening.

ACTIVE TEST	
EGR VOL CONT/V	20 step
MONITOR	
CKPS-RPM (TDC)	XXX rpm



If NG, replace the EGR volume control valve.

Removal and Installation

EBS00E35

EGR VOLUME CONTROL VALVE

Refer to EM-220, "EXHAUST MANIFOLD AND TURBOCHARGER" .

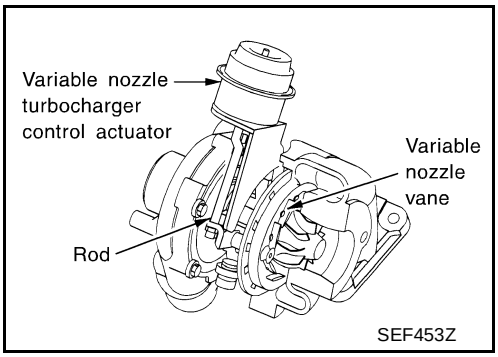
VARIABLE NOZZLE TURBOCHARGER CONTROL SOLENOID VALVE

PFP:14956

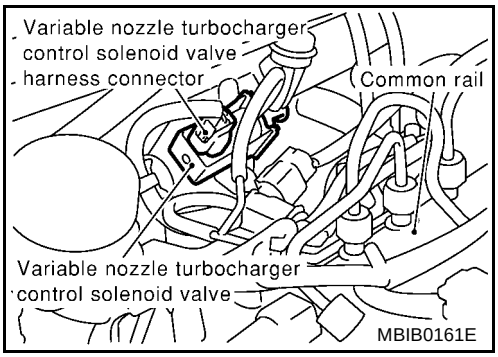
Description

EBS00G9Q

The load from the variable nozzle turbocharger control solenoid valve controls the actuator. By changing the variable nozzle vane opening through the rods, the intake air volume is adjusted.



The variable nozzle turbocharger control solenoid valve is moved by ON/OFF pulse from the ECM. The longer the ON pulse, the charge air pressure rises.



ECM Terminals and Reference Value

EBS00G9R

Specification data are reference valves, and are measured between each terminal and ground.

CAUTION:

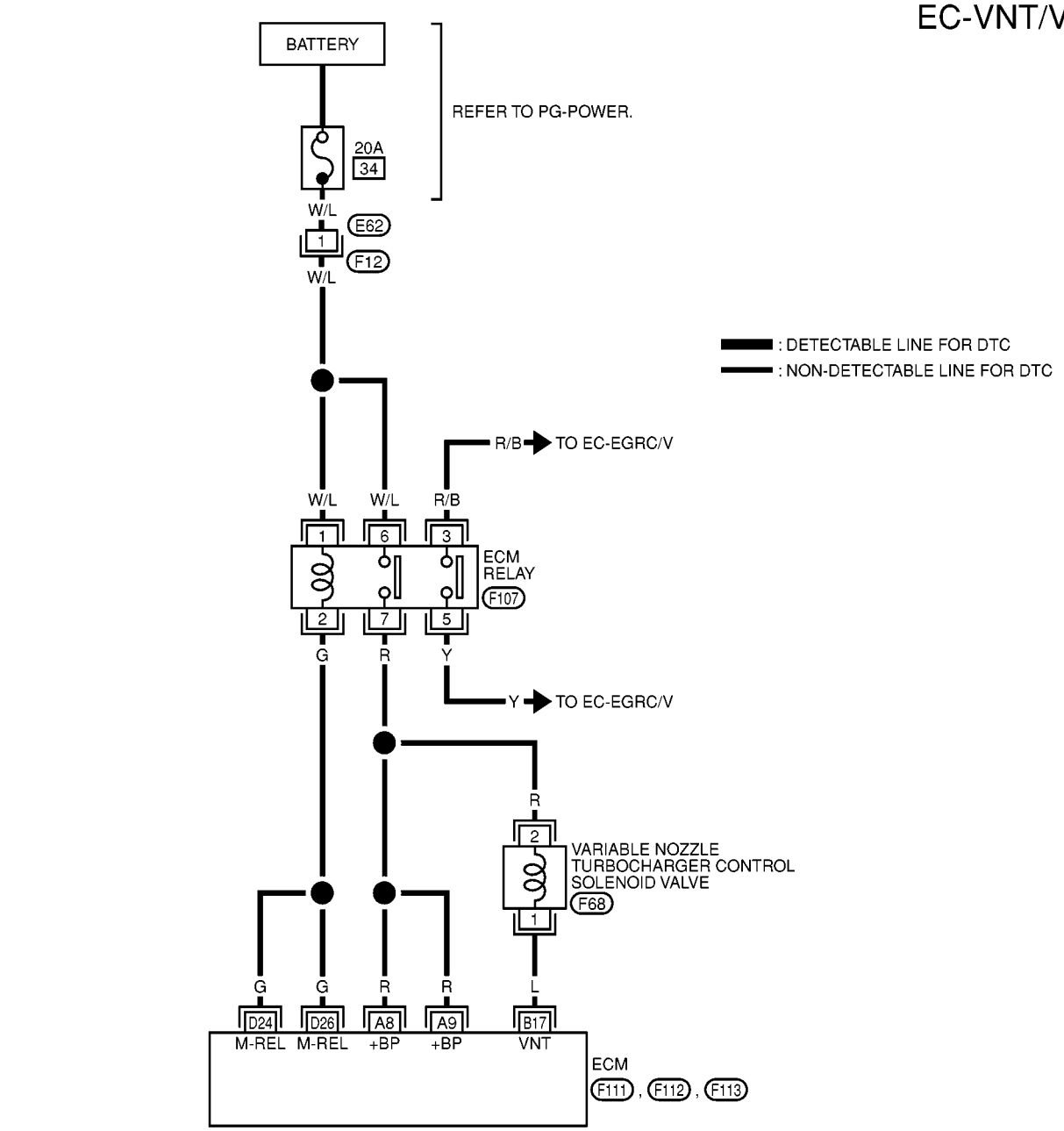
Do not use ECM ground terminals when measuring input/output voltage. Doing so may damage the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

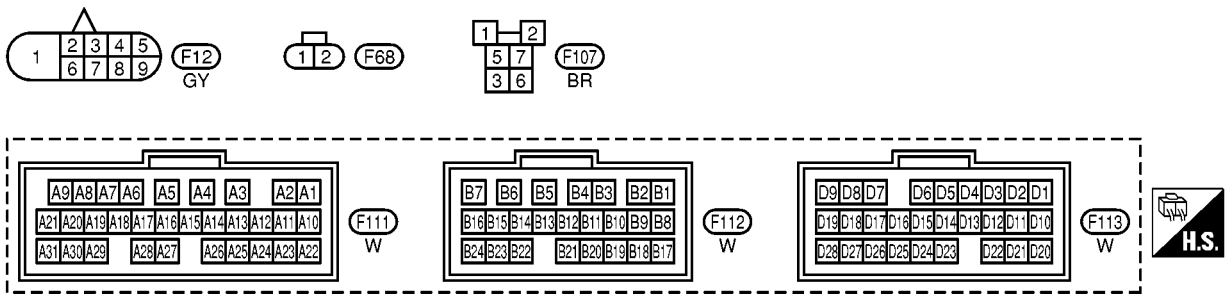
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
B17	L	Variable nozzle turbocharger control solenoid valve	**[Engine is running]** ● **Warm-up condition** ● Idle speed	4.5 - 6.5V
			[Engine is running] ● **Warm-up condition** ● Engine sped is 2,500 rpm	7 - 9V

Wiring Diagram

EBS00G9S

EC-VNT/V-01





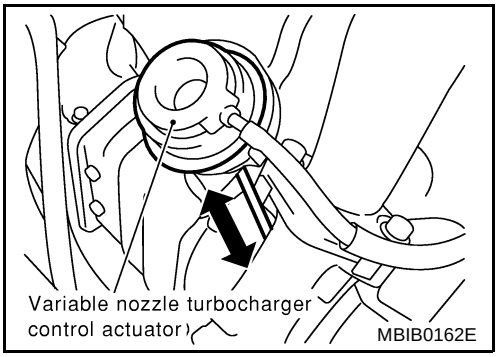
MBWA0121E

Diagnostic Procedure

EBS00G9U

1. CHECK OVERALL FUNCTION

1. Start engine and let it idle.
2. Make sure that variable nozzle turbocharger control actuator rod moves when revving engine up to 3,000 rpm and returning to idle.



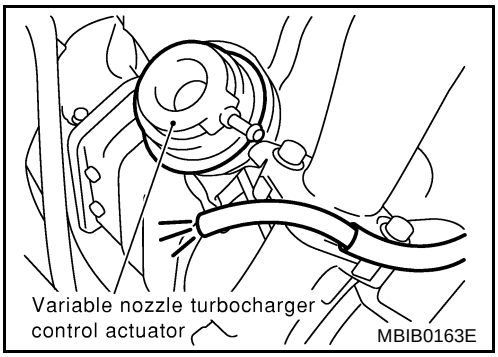
OK or NG

OK >> **INSPECTION END**
NG >> GO TO 2.

2. CHECK VACUUM SOURCE

1. Turn ignition switch “OFF”.
2. Disconnect vacuum hose connected to variable nozzle turbocharger control actuator.
3. Start engine and let it idle.
4. Check vacuum hose for vacuum existence.

Vacuum should exist.

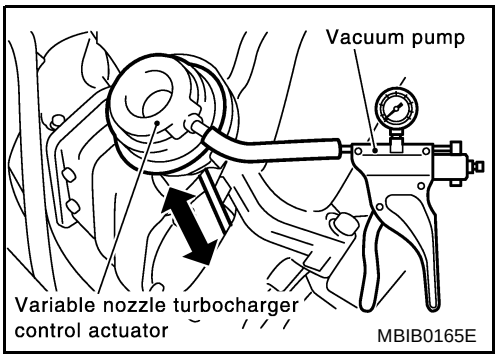


OK or NG

OK >> GO TO 3.
NG >> GO TO 4.

3. CHECK VARIABLE NOZZLE TURBOCHARGER CONTROL ACTUATOR

1. Turn ignition switch “OFF”.
2. Install a vacuum pump to variable nozzle turbocharger control actuator.
3. Make sure that the variable nozzle turbocharger control actuator rod moves smoothly when applying vacuum of -53.3kPa (-533mbar, -400mmHg, -15.75inHg) and releasing it.

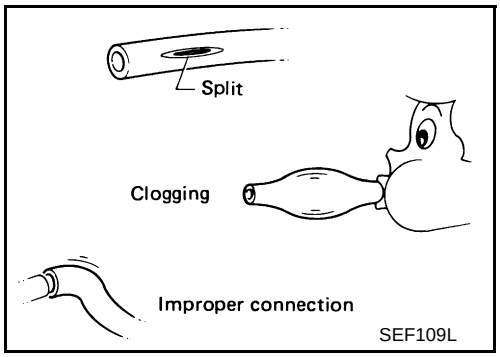


OK or NG

OK >> GO TO 9.
NG >> Replace turbocharger assembly.

4. CHECK VACUUM HOSES AND VACUUM GALLERY

1. Turn ignition switch “OFF”.
2. Check vacuum hoses and vacuum gallery for clogging, cracks or improper connection. Refer to Vacuum Hose Drawing.

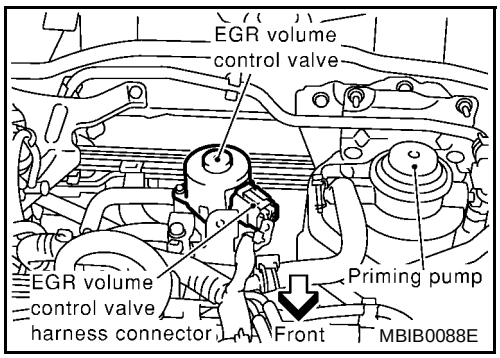


OK or NG

OK >> GO TO 5.
NG >> Repair or replace vacuum hoses and vacuum gallery.

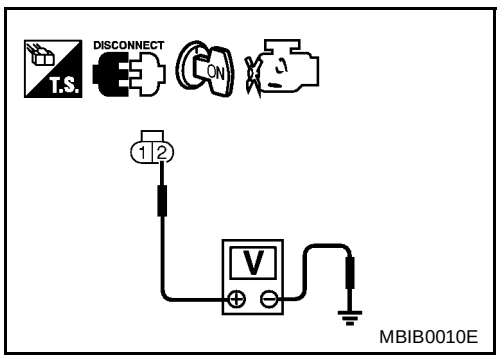
5. CHECK VARIABLE NOZZLE TURBOCHARGER CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect variable nozzle turbocharger control solenoid valve harness connector.
3. Turn ignition switch “ON”.



4. Check voltage between variable nozzle turbocharger control solenoid valve terminals 2 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between ECM relay and variable nozzle turbocharger control solenoid valve
- Harness for open or short between variable turbocharger control solenoid valve

>> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK VARIABLE NOZZLE TURBOCHARGER CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminals B17 and variable nozzle turbocharger control solenoid valve terminals 1. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK VARIABLE NOZZLE TURBOCHARGER CONTROL SOLENOID VALVE

Refer to EC-1901, "Component Inspection" .

OK or NG

OK >> GO TO 9.
NG >> Replace variable nozzle turbocharger control solenoid valve.

9. CHECK INTERMITTENT INCIDENT

Refer to EC-1783, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

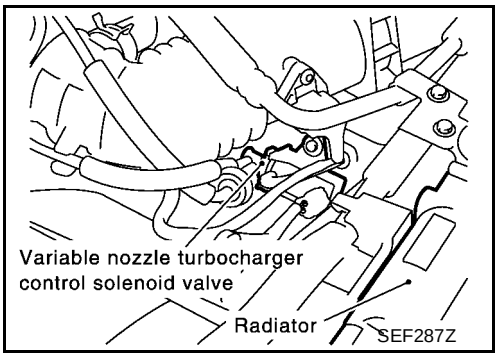
>> **INSPECTION END**

Component Inspection

EBS00G9V

VARIABLE NOZZLE TURBOCHARGER CONTROL SOLENOID VALVE

1. Disconnect variable nozzle turbocharger control solenoid valve harness connector.

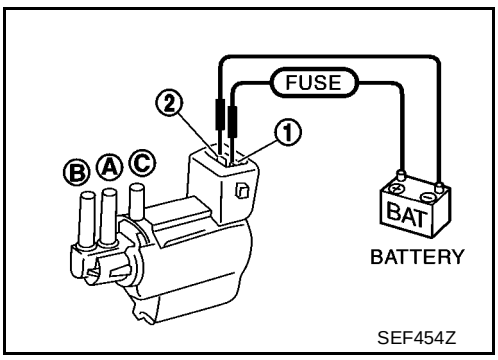


2. Apply 12V direct current between variable nozzle turbocharger control solenoid valve terminals.
3. Check air passage continuity of variable nozzle turbocharger control solenoid valve under the following conditions.

CONDITIONS	Air passage continuity between **A** and **B**	Air passage continuity between **A** and **C**
12V direct current supply between terminals **1** and **2**	Yes	No
No supply	No	Yes

Operation takes less than 1 second.

If NG, replace variable nozzle turbocharger control solenoid valve.



Removal and Installation

EBS00GNU

VARIABLE NOZZLE TURBOCHARGER CONTROL SOLENOID VALVE

Refer to EM-220, "Removal and Installation" .

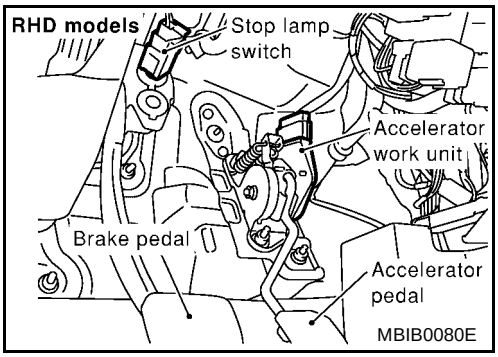
BRAKE SWITCH

PFP:25230

Description

EBS00E36

The stop lamp switch is installed to brake pedal bracket. The switch senses brake pedal position and sends an ON-OFF signal to the ECM. The ECM uses the signal to control the fuel injection control system.



ECM Terminals and Reference Value

EBS00E37

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

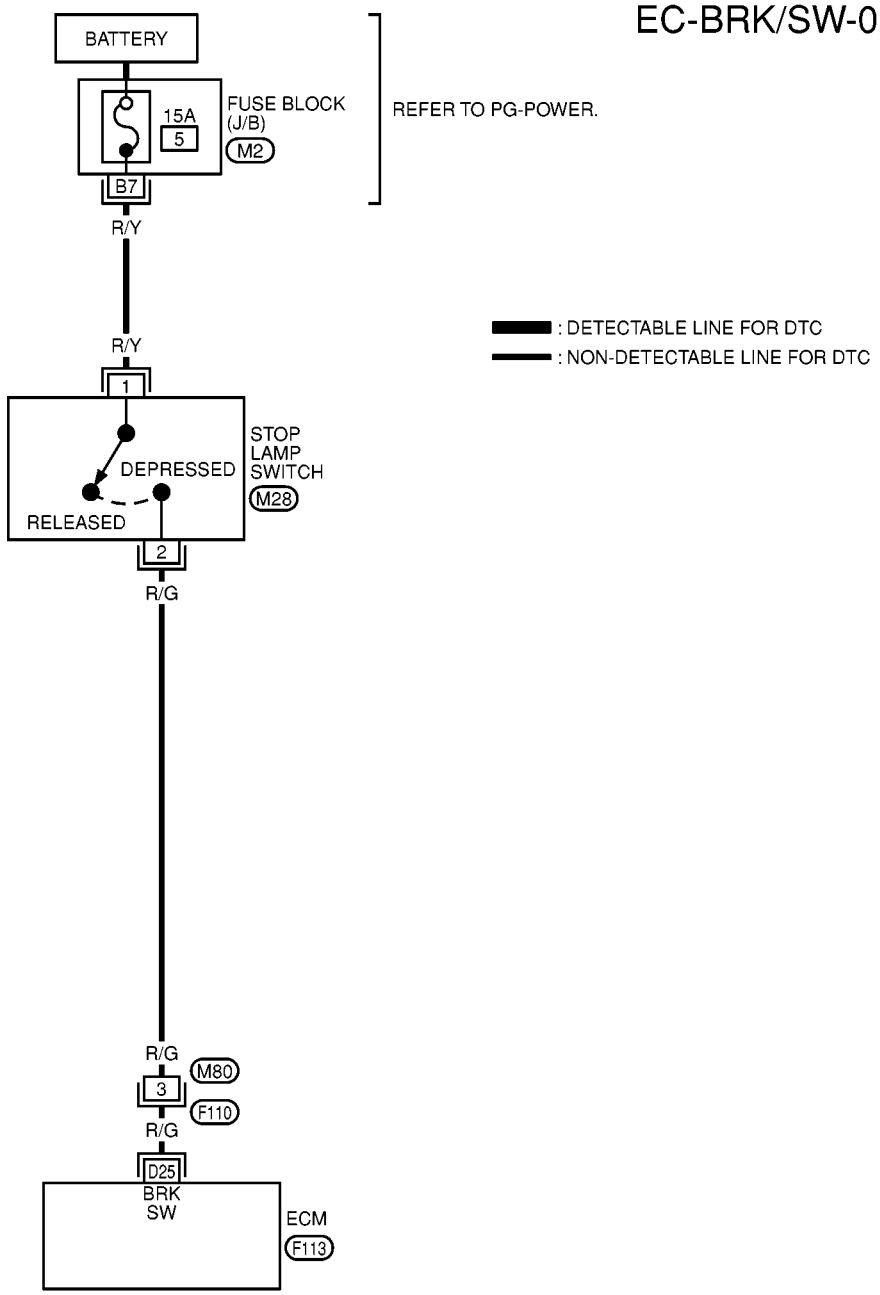
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
D25	R/G	Stop lamp switch	**[Ignition switch "ON"]** ● Brake pedal fully released	Approximately 0V
			[Ignition switch "ON"] ● Brake pedal depressed	BATTERY VOLTAGE (11 - 14V)

Wiring Diagram

EBS00E38

EC-BRK/SW-01



REFER TO THE FOLLOWING.

M2 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0100E

Diagnostic Procedure

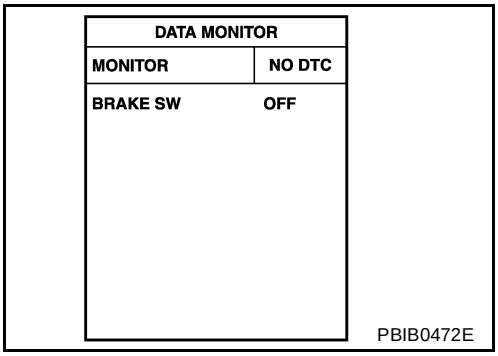
EBS00E39

1. CHECK OVERALL FUNCTION

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “BRAKE SW” in “DATA MONITOR” mode with CONSULT-II.
3. Check “BRAKE SW” signal under the following conditions.

Conditions	BRAKE SW
Brake pedal released	OFF
Brake pedal slightly depressed	ON

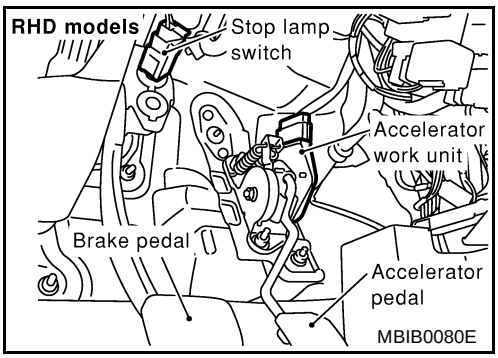


OK or NG

OK >> **INSPECTION END**
NG >> GO TO 2.

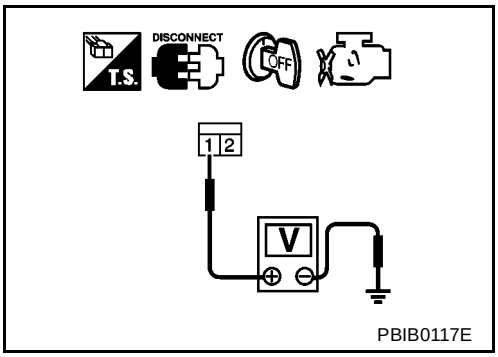
2. CHECK STOP LAMP SWITCH POWER SUPPLY CIRUIT

1. Turn ignition switch “OFF”.
2. Disconnect stop lamp switch harness connector.



3. Check voltage between stop lamp switch terminal 1 and ground with CONSULT-II or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTION PART

Check the following

- 15A fuse
- Fuse block (J/B) connector M2
- Harness for open and short between stop lamp switch and battery

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK STOP LAMP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal D25 and stop lamp switch terminal 2. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following

- Harness connectors F110, M80
- Harness for open and short between stop lamp switch and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK STOP LAMP SWITCH

Refer to EC-1912, "Component Inspection" .

OK or NG

OK >> GO TO 8.
NG >> Replace stop lamp switch.

7. CHECK INTERMITTENT INCIDENT

Refer to EC-1783, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

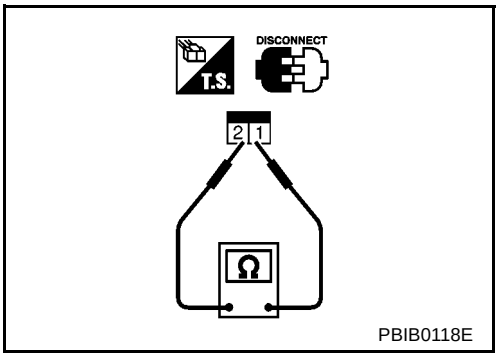
Component Inspection

EBS00E3A

STOP LAMP SWITCH

Check continuity between stop lamp switch terminals 1 and 2 under the following conditions.

Conditions	Continuity
Brake pedal fully released	Should not exist.
Brake pedal depressed	Should exist.



PBIB0118E

PARK/NEUTRAL POSITION (PNP) SWITCH

PFP:31918

Description

EBS00E3B

When the gear position is in “Neutral”, neutral position is “ON”. ECM detects the position because the continuity of the line (the “ON” signal) exists.

CONSULT-II Reference Value in Data Monitor Mode

EBS00E3C

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
P/N POSI SW	● Ignition switch: ON	Shift lever: Neutral	ON
		Except above	OFF

ECM Terminals and Reference Value

EBS00E3D

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

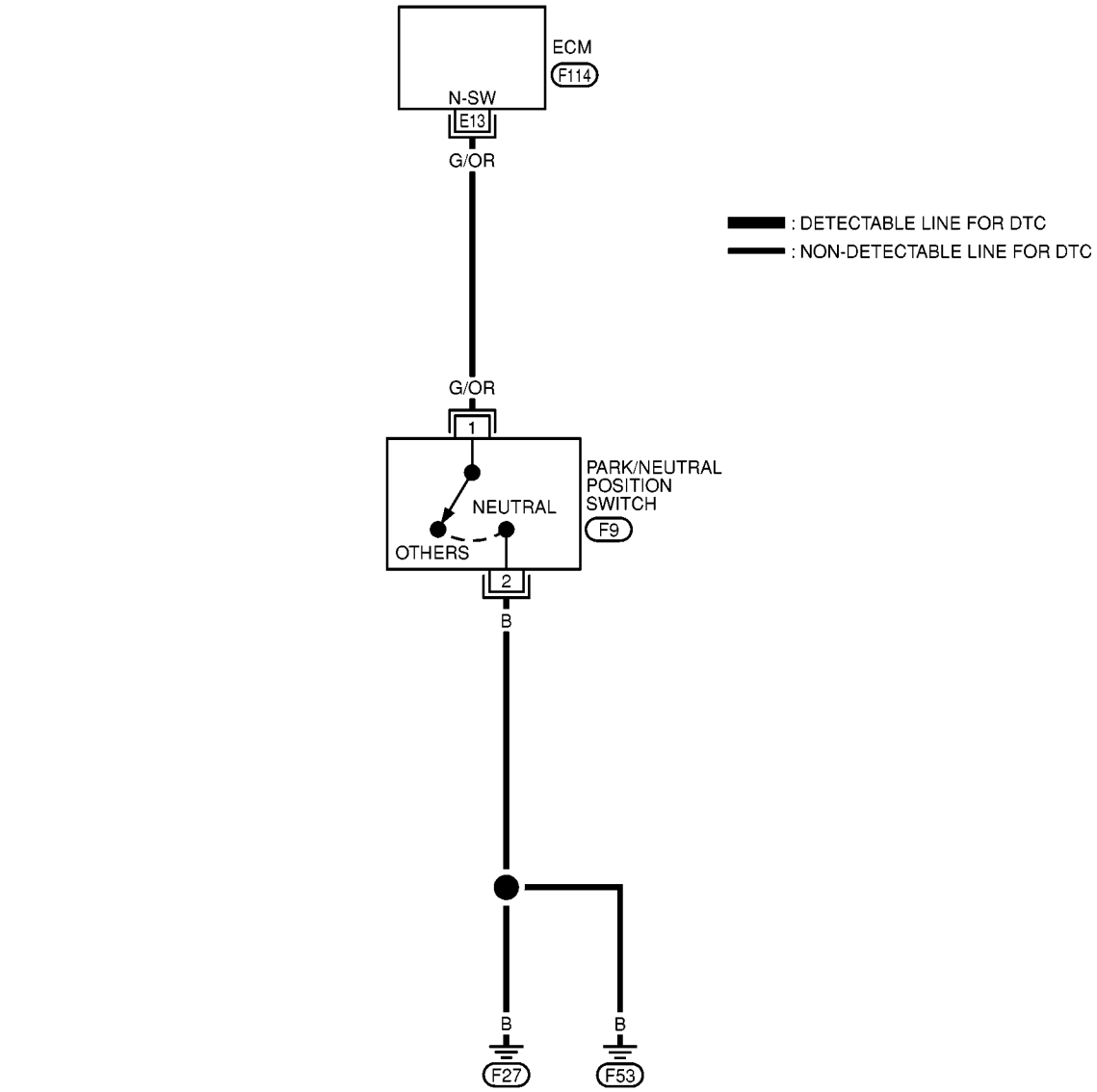
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

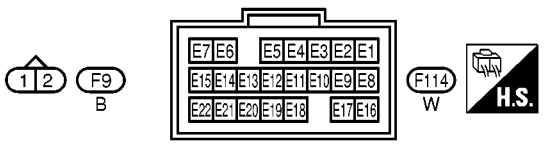
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
E13	G/OR	Park/Neutral position switch	**[Ignition switch “ON”]** ● Gear position is “Neutral”	Approximately 0V
			[Ignition switch “ON”] ● Except the above gear position	BATTERY VOLTAGE (11 - 14V)

Wiring Diagram

EBS00E3E

EC-PNP/SW-01





MBWA0105E

Diagnostic Procedure

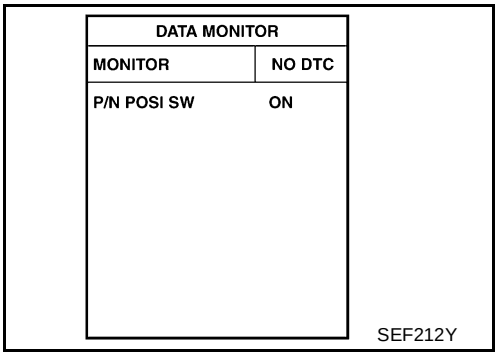
EBS00E3F

1. CHECK OVERALL FUNCTION

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “P/N POSI SW” in “DATA MONITOR” mode with CONSULT-II.
3. Check “P/N POSI SW” signal under the following conditions.

Shift lever position	P/N POSI SW
Neutral position	ON
Except the above position	OFF



OK or NG

OK >> **INSPECTION END**
NG >> GO TO 2.

2. CHECK PNP SWITCH GROUND CIRCUIT FOR OPEN AND SHORT

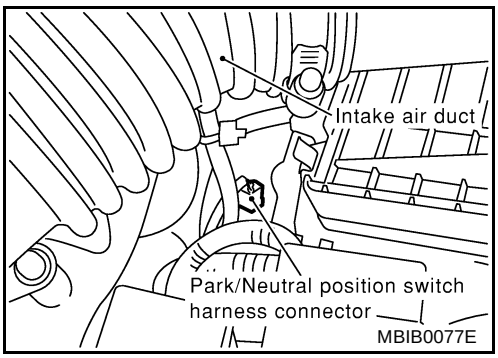
1. Turn ignition switch “OFF”.
2. Disconnect park/neutral position (PNP) switch harness connector.
3. Check harness continuity between PNP switch terminal 2 and body ground. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to power.

OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to power in harness or connectors.



3. CHECK PNP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal E13 and PNP switch terminal 1. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK PARK/NEUTRAL POSITION SWITCH

Refer to MT-126, "POSITION SWITCH" .

OK or NG

OK >> GO TO 5.
NG >> Replace park/neutral position switch.

5. CHECK INTERMITTENT INCIDENT

Refer to EC-1783, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

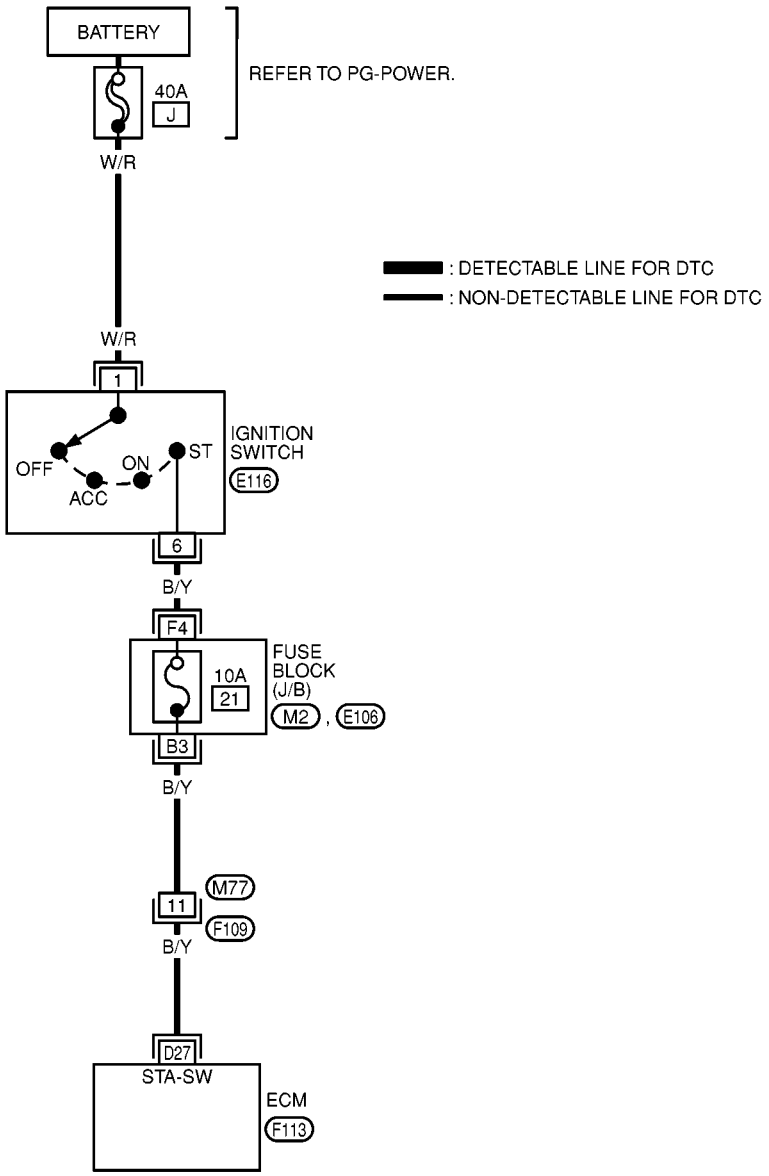
START SIGNAL

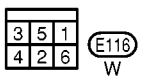
PFP:48750

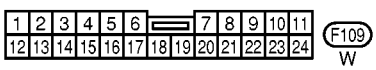
Wiring Diagram

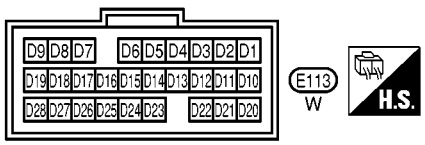
EBS00E3G

EC-S/SIG-01









REFER TO THE FOLLOWING.
M2 , E106 -FUSE BLOCK-JUNCTION BOX (J/B)

MBWA0103E

Diagnostic Procedure

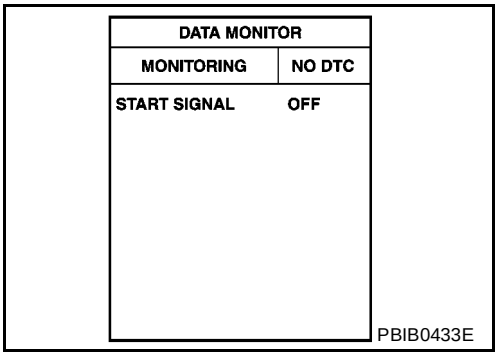
EBS00E3H

1. CHECK START SIGNAL OVERALL FUNCTION

With CONSULT-II

1. Turn ignition switch “ON”.
2. Check “START SIGNAL” in “DATA MONITOR” mode with CONSULT-II under the following conditions.

Condition	“START SIGNAL”
Ignition switch “ON”	OFF
Ignition switch “START”	ON



OK or NG

OK >> **INSPECTION END**
NG >> GO TO 2.

2. CHECK START SIGNAL INPUT SIGNAL CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector and ignition switch harness connector.
3. Check harness continuity between ECM terminal D27 and ignition switch terminal 6. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M77, F109
- 10A fuse
- Fuse block (J/B) connectors M2, E106
- Harness for open or short between ECM and ignition switch

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK INTERMITTENT INCIDENT

Refer to EC-1783, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

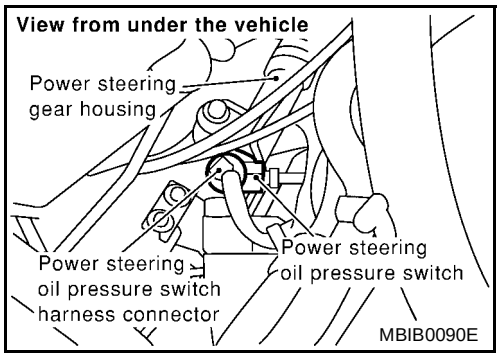
POWER STEERING OIL PRESSURE SWITCH

PFP:49761

Component Description

EBS00E3I

The power steering oil pressure switch is attached to the power steering high-pressure tube and detects a power steering load.
When a power steering load is detected, it signals the ECM. The ECM adjusts the fuel injector pulse width to increase the idle speed and adjust for the increased load.



CONSULT-II Reference Value in Data Monitor Mode

EBS00E3J

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
PW/ST SIGNAL	● Engine: After warming up, idle the engine	Steering wheel is in neutral position. (Forward direction)	OFF
		Steering wheel is turned.	ON

ECM Terminals and Reference Value

EBS00E3K

Specification data are reference values, and are measured between each terminal and ground.

CAUTION:

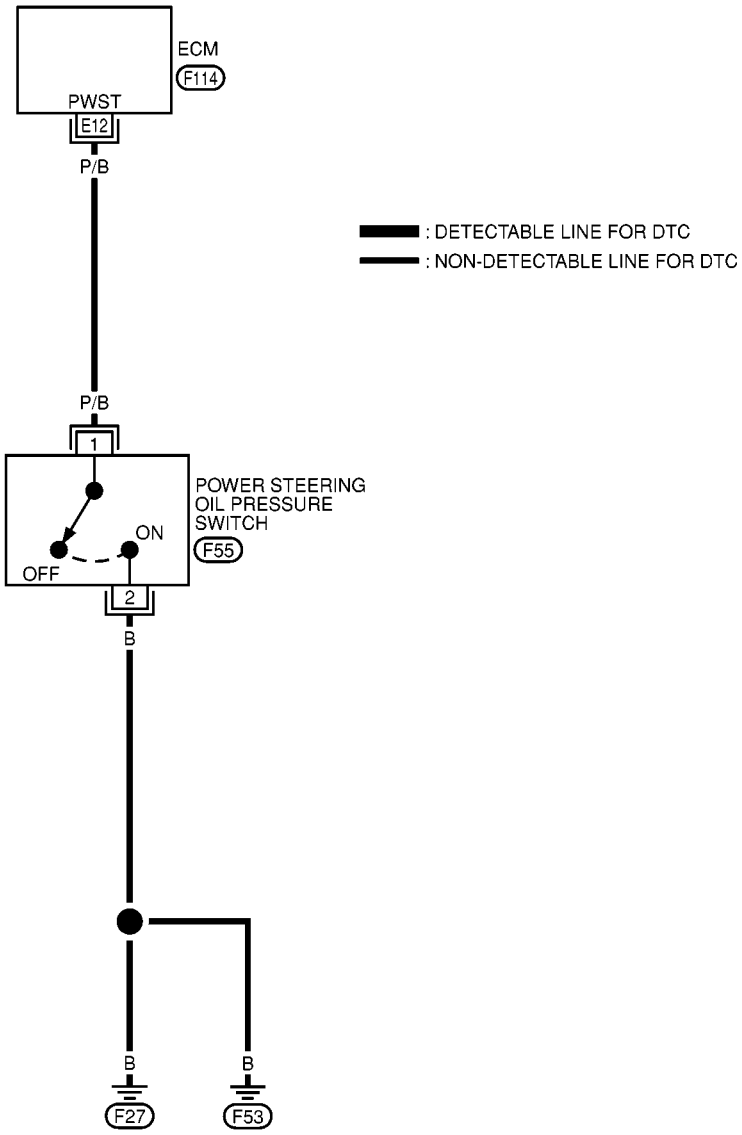
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

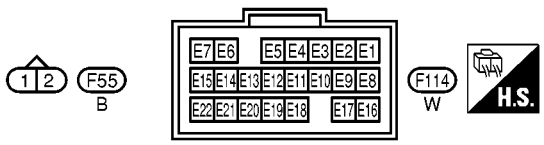
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
E12	P/B	Power steering oil pressure switch	**[Engine is running]** ● Steering wheel is being turned	Approximately 0V
			[Engine is running] ● Steering wheel is not being turned	BATTERY VOLTAGE (11 - 14V)

Wiring Diagram

EBS00E3L

EC-PST/SW-01





MBWA0106E

Diagnostic Procedure

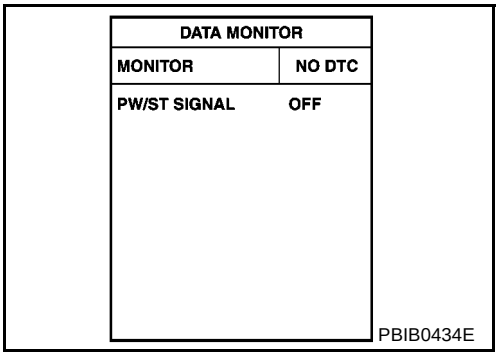
EBS00E3M

1. CHECK OVERALL FUNCTION

With CONSULT-II

1. Start engine.
2. Check “PW/ST SIGNAL” in “DATA MONITOR” mode with CONSULT-II under the following conditions.

Conditions	PW/ST SIGNAL
Steering in neutral position	OFF
Steering is turned	ON



OK or NG

OK >> **INSPECTION END**
NG >> GO TO 2.

2. CHECK POWER STEERING OIL PRESSURE SWITCH GROUND CIRCUIT FOR OPEN AND SHORT

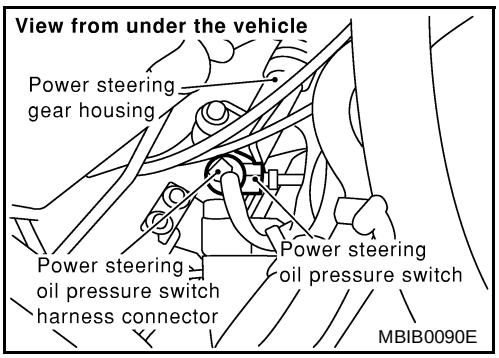
1. Turn ignition switch “OFF”.
2. Disconnect power steering oil pressure switch harness connector.
3. Check harness continuity between power steering oil pressure switch terminal 2 and engine ground. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to power.

OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to power in harness or connectors.



3. CHECK POWER STEERING OIL PRESSURE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal E12 and power steering oil pressure switch terminal 1. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK POWER STEERING OIL PRESSURE SWITCH

Refer to EC-1921, "Component Inspection" .

OK or NG

OK >> GO TO 5.
NG >> Replace power steering oil pressure switch.

5. CHECK INTERMITTENT INCIDENT

Refer to EC-1783, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" .

>> **INSPECTION END**

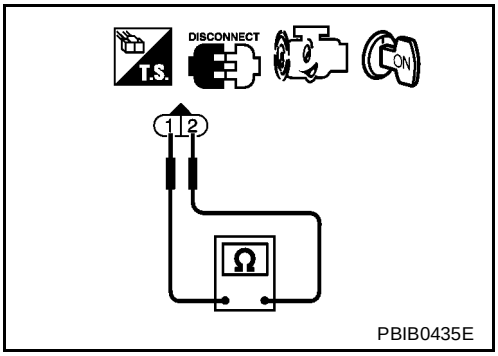
Component Inspection

EBS00E3N

POWER STEERING OIL PRESSURE SWITCH

1. Disconnect power steering oil pressure switch harness connector and then start engine.
2. Check continuity between power steering oil pressure switch terminal 1 and 2 under the following conditions.

Conditions	Continuity
Steering wheel is being fully turned.	Yes
Steering wheel is not being turned.	No



PBIB0435E

Removal and Installation

EBS00E3O

POWER STEERING OIL PRESSURE SWITCH

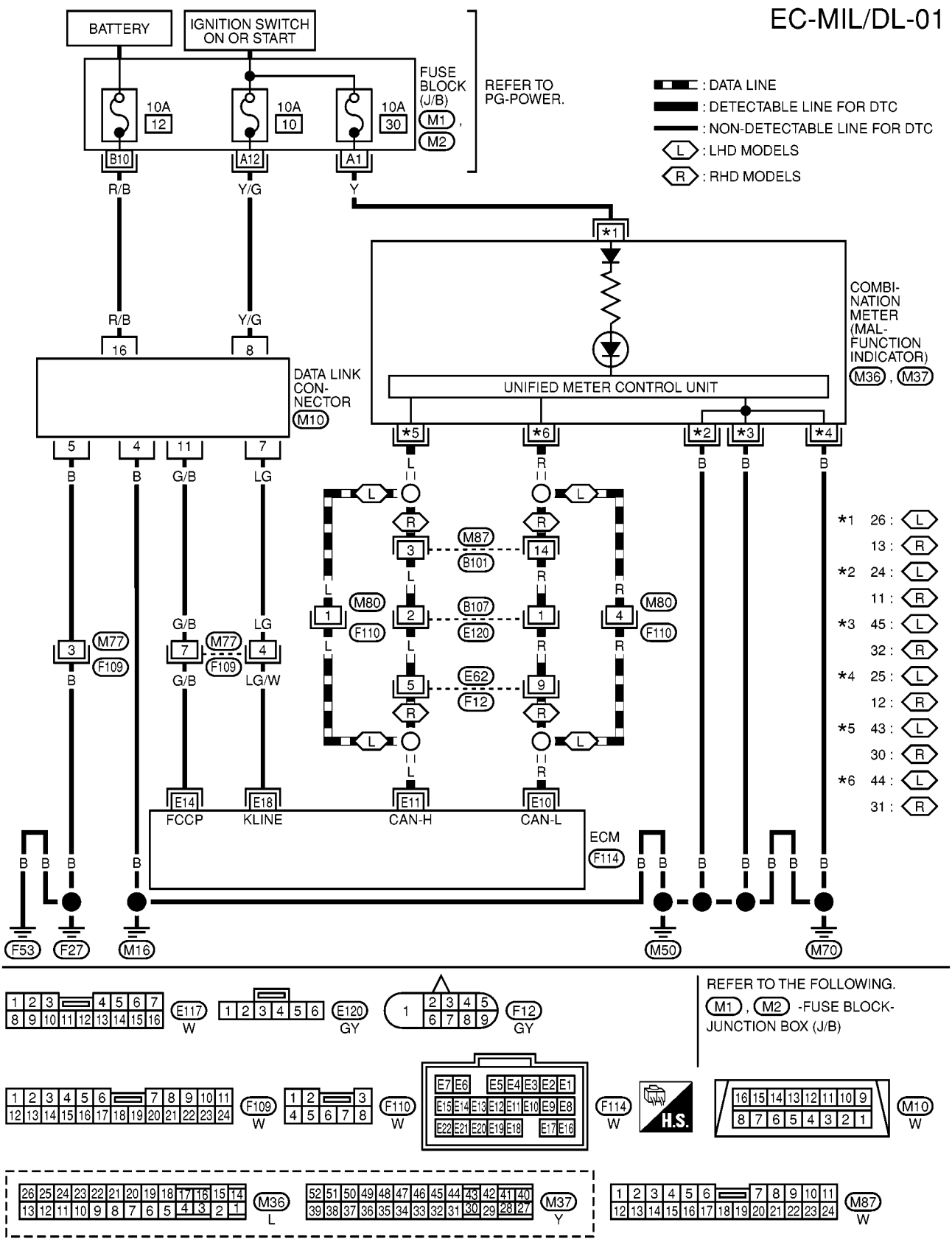
Refer to PS-24, "HYDRAULIC LINE" .

MI & DATA LINK CONNECTORS

PFP:24814

Wiring Diagram

EBS00E3Q



MBWA0119E

SERVICE DATA AND SPECIFICATIONS (SDS)

PFP:00100

General Specifications

EBS00E3R

Engine	YD22DDTi
Idle speed	725 ± 25 rpm
Maximum engine speed	4,900 rpm

Mass Air Flow Sensor

EBS00E3S

Supply voltage	5V
Ignition switch "ON" (Engine stopped.)	Approx. 1.0V
Idle (Engine is warmed up to normal operating temperature.)	1.0 - 2.5V
2,000 rpm (Engine is warmed up to normal operating temperature.)	2.1 - 2.7V

Engine Coolant Temperature Sensor

EBS00E3T

Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.00
90 (194)	0.236 - 0.260

Common Rail Fuel Pressure Sensor

EBS00E3U

Supply voltage	Approximately 5V
Idle (Engine is warmed up to normal operating temperature.)	1.6 - 1.8V
2,000 rpm (Engine is warmed up to normal operating temperature.)	1.8 - 2.0V

Crankshaft Position Sensor (TDC)

EBS00E3V

Resistance [at 20°C (68°F)] Ω	1,850 - 2,450

Camshaft Position Sensor

EBS00E3W

Resistance [at 20°C (68°F)] Ω	1,850 - 2,450

Glow Plug

EBS00E3X

Resistance [at 25°C (77°F)] Ω	Approximately 0.8

EGR Volume Control Valve

EBS00E3Y

Resistance [at 25°C (77°F)] Ω	13 - 17