

GENERAL DESCRIPTION

GD(H4SO U5)

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LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

GENERAL DESCRIPTION

1. List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Item	Index
P0030	HO2S Heater Control Circuit (Bank 1 Sensor 1)	<Ref. to GD(H4SO U5)-12, DTC P0030 — HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0031	HO2S Heater Control Circuit Low (Bank 1 Sensor 1)	<Ref. to GD(H4SO U5)-14, DTC P0031 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0032	HO2S Heater Control Circuit High (Bank 1 Sensor 1)	<Ref. to GD(H4SO U5)-16, DTC P0032 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0037	HO2S Heater Control Circuit Low (Bank 1 Sensor 2)	<Ref. to GD(H4SO U5)-18, DTC P0037 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0038	HO2S Heater Control Circuit High (Bank 1 Sensor 2)	<Ref. to GD(H4SO U5)-20, DTC P0038 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0043	HO2S Heater Control Circuit Low (Bank 1 Sensor 3)	<Ref. to GD(H4SO U5)-22, DTC P0043 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 3) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0044	HO2S Heater Control Circuit High (Bank 1 Sensor 3)	<Ref. to GD(H4SO U5)-24, DTC P0044 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 3) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0050	HO2S Heater Control Circuit (Bank 2 Sensor 1)	<Ref. to GD(H4SO U5)-26, DTC P0050 — HO2S HEATER CONTROL CIRCUIT (BANK 2 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0051	HO2S Heater Control Circuit Low (Bank 2 Sensor 1)	<Ref. to GD(H4SO U5)-26, DTC P0051 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 2 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0052	HO2S Heater Control Circuit High (Bank 2 Sensor 1)	<Ref. to GD(H4SO U5)-26, DTC P0052 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 2 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0057	HO2S Heater Control Circuit Low (Bank 2 Sensor 2)	<Ref. to GD(H4SO U5)-26, DTC P0057 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 2 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0058	HO2S Heater Control Circuit High (Bank 2 Sensor 2)	<Ref. to GD(H4SO U5)-26, DTC P0058 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 2 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0068	Manifold Absolute Pressure/Barometric Pressure Circuit Range/Performance	<Ref. to GD(H4SO U5)-28, DTC P0068 — MANIFOLD PRESSURE SENSOR RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0101	Mass or Volume Air Flow Circuit Range/Performance	<Ref. to GD(H4SO U5)-30, DTC P0101 — MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0102	Mass or Volume Air Flow Circuit Low Input	<Ref. to GD(H4SO U5)-34, DTC P0102 — MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0103	Mass or Volume Air Flow Circuit High Input	<Ref. to GD(H4SO U5)-36, DTC P0103 — MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0107	Manifold Absolute Pressure/Barometric Pressure Circuit Low Input	<Ref. to GD(H4SO U5)-38, DTC P0107 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0108	Manifold Absolute Pressure/Barometric Pressure Circuit High Input	<Ref. to GD(H4SO U5)-40, DTC P0108 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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P0111	Intake Air Temperature Circuit Range/Performance	<Ref. to GD(H4SO U5)-42, DTC P0111 — INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0112	Intake Air Temperature Circuit Low Input	<Ref. to GD(H4SO U5)-44, DTC P0112 — INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0113	Intake Air Temperature Circuit High Input	<Ref. to GD(H4SO U5)-46, DTC P0113 — INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0117	Engine Coolant Temperature Circuit Low Input	<Ref. to GD(H4SO U5)-48, DTC P0117 — ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0118	Engine Coolant Temperature Circuit High Input	<Ref. to GD(H4SO U5)-50, DTC P0118 — ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0122	Throttle/Pedal Position Sensor/Switch "A" Circuit Low Input	<Ref. to GD(H4SO U5)-52, DTC P0122 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0123	Throttle/Pedal Position Sensor/Switch "A" Circuit High Input	<Ref. to GD(H4SO U5)-54, DTC P0123 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0125	Insufficient Coolant Temperature for Closed Loop Fuel Control	<Ref. to GD(H4SO U5)-56, DTC P0125 — INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0128	Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature)	<Ref. to GD(H4SO U5)-58, DTC P0128 — COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0129	Atmospheric Pressure Sensor Circuit Range/Performance	<Ref. to GD(H4SO U5)-60, DTC P0129 — BAROMETRIC PRESSURE TOO LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0131	O ₂ Sensor Circuit Low Voltage (Bank 1 Sensor 1)	<Ref. to GD(H4SO U5)-62, DTC P0131 — O ₂ SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0132	O ₂ Sensor Circuit High Voltage (Bank 1 Sensor 1)	<Ref. to GD(H4SO U5)-64, DTC P0132 — O ₂ SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0133	O ₂ Sensor Circuit Slow Response (Bank 1 Sensor 1)	<Ref. to GD(H4SO U5)-66, DTC P0133 — O ₂ SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0134	O ₂ Sensor Circuit No Activity Detected (Bank 1 Sensor 1)	<Ref. to GD(H4SO U5)-70, DTC P0134 — O ₂ SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0137	O ₂ Sensor Circuit Low Voltage (Bank 1 Sensor 2)	<Ref. to GD(H4SO U5)-72, DTC P0137 — O ₂ SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0138	O ₂ Sensor Circuit High Voltage (Bank 1 Sensor 2)	<Ref. to GD(H4SO U5)-74, DTC P0138 — O ₂ SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0139	O ₂ Sensor Circuit Slow Response (Bank 1 Sensor 2)	<Ref. to GD(H4SO U5)-76, DTC P0139 — O ₂ SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0143	O ₂ Sensor Circuit Low Voltage (Bank 1 Sensor 3)	<Ref. to GD(H4SO U5)-82, DTC P0143 — O ₂ SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 3) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0144	O ₂ Sensor Circuit High Voltage (Bank 1 Sensor 3)	<Ref. to GD(H4SO U5)-84, DTC P0144 — O ₂ SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 3) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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P0151	O ₂ Sensor Circuit Low Voltage (Bank 2 Sensor 1)	<Ref. to GD(H4SO U5)-86, DTC P0151 — O ₂ SENSOR CIRCUIT LOW VOLTAGE (BANK 2 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0152	O ₂ Sensor Circuit High Voltage (Bank 2 Sensor 1)	<Ref. to GD(H4SO U5)-86, DTC P0152 — O ₂ SENSOR CIRCUIT HIGH VOLTAGE (BANK 2 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0153	O ₂ Sensor Circuit Slow Response (Bank 2 Sensor 1)	<Ref. to GD(H4SO U5)-86, DTC P0153 — O ₂ SENSOR CIRCUIT SLOW RESPONSE (BANK 2 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0154	O ₂ Sensor Circuit No Activity Detected (Bank 2 Sensor 1)	<Ref. to GD(H4SO U5)-86, DTC P0154 — O ₂ SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 2 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0157	O ₂ Sensor Circuit Low Voltage (Bank 2 Sensor 2)	<Ref. to GD(H4SO U5)-86, DTC P0157 — O ₂ SENSOR CIRCUIT LOW VOLTAGE (BANK 2 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0158	O ₂ Sensor Circuit High Voltage (Bank 2 Sensor 2)	<Ref. to GD(H4SO U5)-86, DTC P0158 — O ₂ SENSOR CIRCUIT HIGH VOLTAGE (BANK 2 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0159	O ₂ Sensor Circuit Slow Response (Bank 2 Sensor 2)	<Ref. to GD(H4SO U5)-86, DTC P0159 — O ₂ SENSOR CIRCUIT SLOW RESPONSE (BANK 2 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0171	System too Lean (Bank 1)	<Ref. to GD(H4SO U5)-88, DTC P0171 — SYSTEM TOO LEAN (BANK 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0172	System too Rich (Bank 1)	<Ref. to GD(H4SO U5)-92, DTC P0172 — SYSTEM TOO RICH (BANK 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0174	System too Lean (Bank 2)	<Ref. to GD(H4SO U5)-95, DTC P0174 — SYSTEM TOO LEAN (BANK 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0175	System too Rich (Bank 2)	<Ref. to GD(H4SO U5)-95, DTC P0175 — SYSTEM TOO RICH (BANK 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0181	Fuel Temperature Sensor "A" Circuit Range/Performance	<Ref. to GD(H4SO U5)-96, DTC P0181 — FUEL TEMPERATURE SENSOR "A" CIRCUIT RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0182	Fuel Temperature Sensor "A" Circuit Low Input	<Ref. to GD(H4SO U5)-100, DTC P0182 — FUEL TEMPERATURE SENSOR "A" CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0183	Fuel Temperature Sensor "A" Circuit High Input	<Ref. to GD(H4SO U5)-102, DTC P0183 — FUEL TEMPERATURE SENSOR "A" CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0222	Throttle/Pedal Position Sensor/Switch "B" Circuit Low Input	<Ref. to GD(H4SO U5)-104, DTC P0222 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "B" CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0223	Throttle/Pedal Position Sensor/Switch "B" Circuit High Input	<Ref. to GD(H4SO U5)-106, DTC P0223 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "B" CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0301	Cylinder 1 misfire detected	<Ref. to GD(H4SO U5)-108, DTC P0301 — CYLINDER 1 MISFIRE DETECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0302	Cylinder 2 misfire detected	<Ref. to GD(H4SO U5)-113, DTC P0302 — CYLINDER 2 MISFIRE DETECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0303	Cylinder 3 misfire detected	<Ref. to GD(H4SO U5)-113, DTC P0303 — CYLINDER 3 MISFIRE DETECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0304	Cylinder 4 misfire detected	<Ref. to GD(H4SO U5)-113, DTC P0304 — CYLINDER 4 MISFIRE DETECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0327	Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)	<Ref. to GD(H4SO U5)-114, DTC P0327 — KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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P0328	Knock Sensor 1 Circuit High Input (Bank 1 or Single Sensor)	<Ref. to GD(H4SO U5)-116, DTC P0328 — KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0335	Crankshaft Position Sensor “A” Circuit	<Ref. to GD(H4SO U5)-118, DTC P0335 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0336	Crankshaft Position Sensor “A” Circuit Range/Performance	<Ref. to GD(H4SO U5)-120, DTC P0336 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0340	Camshaft Position Sensor “A” Circuit (Bank 1 or Single Sensor)	<Ref. to GD(H4SO U5)-122, DTC P0340 — CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0341	Camshaft Position Sensor “A” Circuit Range/Performance (Bank 1 or Single Sensor)	<Ref. to GD(H4SO U5)-124, DTC P0341 — CAMSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE (BANK 1 OR SINGLE SENSOR) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0400	Exhaust Gas Recirculation Flow	<Ref. to GD(H4SO U5)-126, DTC P0400 — EXHAUST GAS RECIRCULATION FLOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0420	Catalyst System Efficiency Below Threshold (Bank 1)	<Ref. to GD(H4SO U5)-130, DTC P0420 — CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0442	Evaporative Emission Control System Leak Detected (small leak)	<Ref. to GD(H4SO U5)-134, DTC P0442 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0447	Evaporative Emission Control System Vent Control Circuit Open	<Ref. to GD(H4SO U5)-156, DTC P0447 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0448	Evaporative Emission Control System Vent Control Circuit Shorted	<Ref. to GD(H4SO U5)-158, DTC P0448 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0451	Evaporative Emission Control System Pressure Sensor Range/Performance	<Ref. to GD(H4SO U5)-160, DTC P0451 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0452	Evaporative Emission Control System Pressure Sensor Low Input	<Ref. to GD(H4SO U5)-162, DTC P0452 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0453	Evaporative Emission Control System Pressure Sensor High Input	<Ref. to GD(H4SO U5)-164, DTC P0453 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0456	Evaporative Emission Control System Leak Detected (very small leak)	<Ref. to GD(H4SO U5)-166, DTC P0456 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0457	Evaporative Emission Control System Leak Detected (fuel cap loose/off)	<Ref. to GD(H4SO U5)-166, DTC P0457 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0458	Evaporative Emission Control System Purge Control Valve Circuit Low	<Ref. to GD(H4SO U5)-168, DTC P0458 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0459	Evaporative Emission Control System Purge Control Valve Circuit High	<Ref. to GD(H4SO U5)-170, DTC P0459 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0461	Fuel Level Sensor Circuit Range/Performance	<Ref. to GD(H4SO U5)-172, DTC P0461 — FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0462	Fuel Level Sensor Circuit Low Input	<Ref. to GD(H4SO U5)-174, DTC P0462 — FUEL LEVEL SENSOR CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0463	Fuel Level Sensor Circuit High Input	<Ref. to GD(H4SO U5)-176, DTC P0463 — FUEL LEVEL SENSOR CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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P0464	Fuel Level Sensor Circuit Intermittent	<Ref. to GD(H4SO U5)-178, DTC P0464 — FUEL LEVEL SENSOR CIRCUIT INTERMITTENT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0483	Cooling Fan Rationality Check	<Ref. to GD(H4SO U5)-181, DTC P0483 — COOLING FAN RATIONALITY CHECK —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0502	Vehicle Speed Sensor Circuit Low Input	<Ref. to GD(H4SO U5)-182, DTC P0502 — VEHICLE SPEED SENSOR CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0503	Vehicle Speed Sensor Intermittent/Erratic/High	<Ref. to GD(H4SO U5)-184, DTC P0503 — VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0506	Idle Control System RPM Lower Than Expected	<Ref. to GD(H4SO U5)-186, DTC P0506 — IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0507	Idle Control System RPM Higher Than Expected	<Ref. to GD(H4SO U5)-188, DTC P0507 — IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0512	Starter Request Circuit	<Ref. to GD(H4SO U5)-190, DTC P0512 — STARTER REQUEST CIRCUIT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0519	Idle Control System Malfunction (Fail-Safe)	<Ref. to GD(H4SO U5)-191, DTC P0519 — IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0565	Cruise Control On Signal	<Ref. to GD(H4SO U5)-192, DTC P0565 — CRUISE CONTROL ON SIGNAL —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0600	Serial Communication Link	<Ref. to GD(H4SO U5)-193, DTC P0600 — CAN COMMUNICATION CIRCUIT—, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0604	Internal Control Module Random Access Memory (RAM) Error	<Ref. to GD(H4SO U5)-194, DTC P0604 — INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0605	Internal Control Module Read Only Memory (ROM) Error	<Ref. to GD(H4SO U5)-196, DTC P0605 — INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0607	Control Module Performance	<Ref. to GD(H4SO U5)-198, DTC P0607 — CONTROL MODULE PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0638	Throttle Actuator Control Range/Performance (Bank 1)	<Ref. to GD(H4SO U5)-202, DTC P0638 — THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0691	Cooling Fan 1 Control Circuit Low	<Ref. to GD(H4SO U5)-206, DTC P0691 — COOLING FAN 1 CONTROL CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0692	Cooling Fan 1 Control Circuit High	<Ref. to GD(H4SO U5)-207, DTC P0692 — COOLING FAN 1 CONTROL CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0703	Torque Converter/Brake Switch “B” Circuit	<Ref. to GD(H4SO U5)-208, DTC P0703 — TORQUE CONVERTER/ BRAKE SWITCH “B” CIRCUIT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0705	Transmission Range Sensor Circuit (PRNDL Input)	<Ref. to GD(H4SO U5)-209, DTC P0705 — TRANSMISSION RANGE SENSOR CIRCUIT (PRNDL INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0710	Transmission Fluid Temperature Sensor Circuit	<Ref. to GD(H4SO U5)-210, DTC P0710 — TRANSMISSION FLUID TEMPERATURE SENSOR CIRCUIT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0716	Input/Turbine Speed Sensor Circuit Range/Performance	<Ref. to GD(H4SO U5)-211, DTC P0716 — INPUT/TURBINE SPEED SENSOR CIRCUIT RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0720	Output Speed Sensor Circuit	<Ref. to GD(H4SO U5)-212, DTC P0720 — OUTPUT SPEED SENSOR CIRCUIT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

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P0726	Engine Speed Input Circuit Range/Performance	<Ref. to GD(H4SO U5)-213, DTC P0726 — ENGINE SPEED INPUT CIRCUIT RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0731	Gear 1 Incorrect Ratio	<Ref. to GD(H4SO U5)-214, DTC P0731 — GEAR 1 INCORRECT RATIO —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0732	Gear 2 Incorrect Ratio	<Ref. to GD(H4SO U5)-215, DTC P0732 — GEAR 2 INCORRECT RATIO —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0733	Gear 3 Incorrect Ratio	<Ref. to GD(H4SO U5)-216, DTC P0733 — GEAR 3 INCORRECT RATIO —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0734	Gear 4 Incorrect Ratio	<Ref. to GD(H4SO U5)-217, DTC P0734 — GEAR 4 INCORRECT RATIO —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0741	Torque Converter Clutch Circuit Performance or Stuck	<Ref. to GD(H4SO U5)-218, DTC P0741 — TORQUE CONVERTER CLUTCH CIRCUIT PERFORMANCE OR STUCK OFF —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0743	Torque Converter Clutch Circuit Electrical	<Ref. to GD(H4SO U5)-219, DTC P0743 — TORQUE CONVERTER CLUTCH CIRCUIT ELECTRICAL —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0748	Pressure Control Solenoid "A" Electrical	<Ref. to GD(H4SO U5)-220, DTC P0748 — PRESSURE CONTROL SOLENOID "A" ELECTRICAL —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0753	Shift Solenoid "A" Electrical	<Ref. to GD(H4SO U5)-221, DTC P0753 — SHIFT SOLENOID "A" ELECTRICAL —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0758	Shift Solenoid "B" Electrical	<Ref. to GD(H4SO U5)-222, DTC P0758 — SHIFT SOLENOID "B" ELECTRICAL —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0771	Shift Solenoid "E" Performance or Stuck Off	<Ref. to GD(H4SO U5)-223, DTC P0771 — SHIFT SOLENOID "E" PERFORMANCE OR STUCK OFF —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0778	Pressure Control Solenoid "B" Electrical	<Ref. to GD(H4SO U5)-224, DTC P0778 — PRESSURE CONTROL SOLENOID "B" ELECTRICAL —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0785	Shift/Timing Solenoid	<Ref. to GD(H4SO U5)-225, DTC P0785 — SHIFT/TIMING SOLENOID —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0851	Neutral Switch Input Circuit Low	<Ref. to GD(H4SO U5)-226, DTC P0851 — NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0852	Neutral Switch Input Circuit High	<Ref. to GD(H4SO U5)-228, DTC P0852 — NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL) —, Diagnostic Trouble Code (DTC) Detecting Criteria.> <Ref. to GD(H4SO U5)-229, DTC P0852 — NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0864	TCM Communication Circuit Range/Performance	<Ref. to GD(H4SO U5)-230, DTC P0864 — TCM COMMUNICATION CIRCUIT RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0865	TCM Communication Circuit Low	<Ref. to GD(H4SO U5)-231, DTC P0865 — TCM COMMUNICATION CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0866	TCM Communication Circuit High	<Ref. to GD(H4SO U5)-232, DTC P0866 — TCM COMMUNICATION CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1088	Tumble Generated Valve Position Sensor 1 Circuit Low	<Ref. to GD(H4SO U5)-234, DTC P1088 — TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1089	Tumble Generated Valve Position Sensor 1 Circuit High	<Ref. to GD(H4SO U5)-236, DTC P1089 — TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1090	Tumble Generated Valve System 1 (Valve Open)	<Ref. to GD(H4SO U5)-238, DTC P1090 — TUMBLE GENERATED VALVE SYSTEM 1 (VALVE OPEN) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

GENERAL DESCRIPTION

DTC	Item	Index
P1091	Tumble Generated Valve System 1 (Valve Close)	<Ref. to GD(H4SO U5)-239, DTC P1091 — TUMBLE GENERATED VALVE SYSTEM 1 (VALVE CLOSE) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1094	Tumble Generated Valve Signal 1 Circuit Malfunction (Open)	<Ref. to GD(H4SO U5)-242, DTC P1094 — TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (OPEN) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1095	Tumble Generated Valve Signal 1 Circuit Malfunction (Short)	<Ref. to GD(H4SO U5)-244, DTC P1095 — TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (SHORT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1110	Atmospheric Pressure Sensor Circuit Malfunction (Low Input)	<Ref. to GD(H4SO U5)-246, DTC P1110 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1111	Atmospheric Pressure Sensor Circuit Malfunction (High Input)	<Ref. to GD(H4SO U5)-247, DTC P1111 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1152	O ₂ Sensor Circuit Range/Performance (Low) (Bank 1 Sensor 1)	<Ref. to GD(H4SO U5)-248, DTC P1152 — O ₂ SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1153	O ₂ Sensor Circuit Range/Performance (High) (Bank 1 Sensor 1)	<Ref. to GD(H4SO U5)-252, DTC P1153 — O ₂ SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1154	O ₂ Sensor Circuit Range/Performance (Low) (Bank 2 Sensor 1)	<Ref. to GD(H4SO U5)-255, DTC P1154 — O ₂ SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK 2 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1155	O ₂ Sensor Circuit Range/Performance (High) (Bank 2 Sensor 1)	<Ref. to GD(H4SO U5)-255, DTC P1155 — O ₂ SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 2 SENSOR 1)—, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1160	Return Spring Failure	<Ref. to GD(H4SO U5)-256, DTC P1160 — RETURN SPRING FAILURE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1400	Fuel Tank Pressure Control Solenoid Valve Circuit Low	<Ref. to GD(H4SO U5)-258, DTC P1400 — FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1420	Fuel Tank Pressure Control Sol. Valve Circuit High	<Ref. to GD(H4SO U5)-260, DTC P1420 — FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1443	Vent Control Solenoid Valve Function Problem	<Ref. to GD(H4SO U5)-262, DTC P1443 — VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1446	Fuel Tank Sensor Control Valve Circuit Low	<Ref. to GD(H4SO U5)-264, DTC P1446 — FUEL TANK SENSOR CONTROL VALVE CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1447	Fuel Tank Sensor Control Valve Circuit High	<Ref. to GD(H4SO U5)-266, DTC P1447 — FUEL TANK SENSOR CONTROL VALVE CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1448	Fuel Tank Sensor Control Valve Range/Performance	<Ref. to GD(H4SO U5)-268, DTC P1448 — FUEL TANK SENSOR CONTROL VALVE RANGE PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1492	EGR Solenoid Valve Signal #1 Circuit Malfunction (Low Input)	<Ref. to GD(H4SO U5)-272, DTC P1492 — EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1493	EGR Solenoid Valve Signal #1 Circuit Malfunction (High Input)	<Ref. to GD(H4SO U5)-274, DTC P1493 — EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1494	EGR Solenoid Valve Signal #2 Circuit Malfunction (Low Input)	<Ref. to GD(H4SO U5)-276, DTC P1494 — EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

GENERAL DESCRIPTION

DTC	Item	Index
P1495	EGR Solenoid Valve Signal #2 Circuit Malfunction (High Input)	<Ref. to GD(H4SO U5)-278, DTC P1495 — EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1496	EGR Solenoid Valve Signal #3 Circuit Malfunction (Low Input)	<Ref. to GD(H4SO U5)-280, DTC P1496 — EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1497	EGR Solenoid Valve Signal #3 Circuit Malfunction (High Input)	<Ref. to GD(H4SO U5)-282, DTC P1497 — EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1498	EGR Solenoid Valve Signal #4 Circuit Malfunction (Low Input)	<Ref. to GD(H4SO U5)-284, DTC P1498 — EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1499	EGR Solenoid Valve Signal #4 Circuit Malfunction (High Input)	<Ref. to GD(H4SO U5)-286, DTC P1499 — EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1518	Starter Switch Circuit Low Input	<Ref. to GD(H4SO U5)-288, DTC P1518 — STARTER SWITCH CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1560	Back-Up Voltage Circuit Malfunction	<Ref. to GD(H4SO U5)-289, DTC P1560 — BACK-UP VOLTAGE CIRCUIT MALFUNCTION —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1700	Throttle Position Sensor Circuit Malfunction for AT	<Ref. to GD(H4SO U5)-290, DTC P1700 — THROTTLE POSITION SENSOR CIRCUIT MALFUNCTION FOR AT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2096	Post Catalyst Fuel Trim System Too Lean Bank 1	<Ref. to GD(H4SO U5)-292, DTC P2096 — POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1 —.>
P2097	Post Catalyst Fuel Trim System Too Rich Bank 1	<Ref. to GD(H4SO U5)-294, DTC P2097 — POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1 —.>
P2098	Post Catalyst Fuel Trim System Too Lean Bank 2	<Ref. to GD(H4SO U5)-296, DTC P2098 — POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 2 —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2099	Post Catalyst Fuel Trim System Too Rich Bank 2	<Ref. to GD(H4SO U5)-296, DTC P2099 — POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 2 —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2101	Throttle Actuator Control Motor Circuit Range/Performance	<Ref. to GD(H4SO U5)-298, DTC P2101 — THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2102	Throttle Actuator Control Motor Circuit Low	<Ref. to GD(H4SO U5)-300, DTC P2102 — THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2103	Throttle Actuator Control Motor Circuit High	<Ref. to GD(H4SO U5)-302, DTC P2103 — THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2109	Throttle/Pedal Position Sensor A Minimum Stop Performance	<Ref. to GD(H4SO U5)-304, DTC P2109 — THROTTLE/PEDAL POSITION SENSOR A MINIMUM STOP PERFORMANCE —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2122	Throttle/Pedal Position Sensor/Switch "D" Circuit Low Input	<Ref. to GD(H4SO U5)-306, DTC P2122 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2123	Throttle/Pedal Position Sensor/Switch "D" Circuit High Input	<Ref. to GD(H4SO U5)-308, DTC P2123 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2127	Throttle/Pedal Position Sensor/Switch "E" Circuit Low Input	<Ref. to GD(H4SO U5)-310, DTC P2127 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT LOW INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2128	Throttle/Pedal Position Sensor/Switch "E" Circuit High Input	<Ref. to GD(H4SO U5)-312, DTC P2128 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT HIGH INPUT —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

GENERAL DESCRIPTION

DTC	Item	Index
P2135	Throttle/Pedal Position Sensor/ Switch "A"/"B" Voltage Rationality	<Ref. to GD(H4SO U5)-314, DTC P2135 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" / "B" VOLTAGE RATIONALITY —, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2138	Throttle/Pedal Position Sensor/ Switch "D"/"E" Voltage Rationality	<Ref. to GD(H4SO U5)-316, DTC P2138 — THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" / "E" VOLTAGE RATIONALITY —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

LIST OF DIAGNOSTIC TROUBLE CODE (DTC)

GENERAL DESCRIPTION

MEMO:

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

2. Diagnostic Trouble Code (DTC) Detecting Criteria

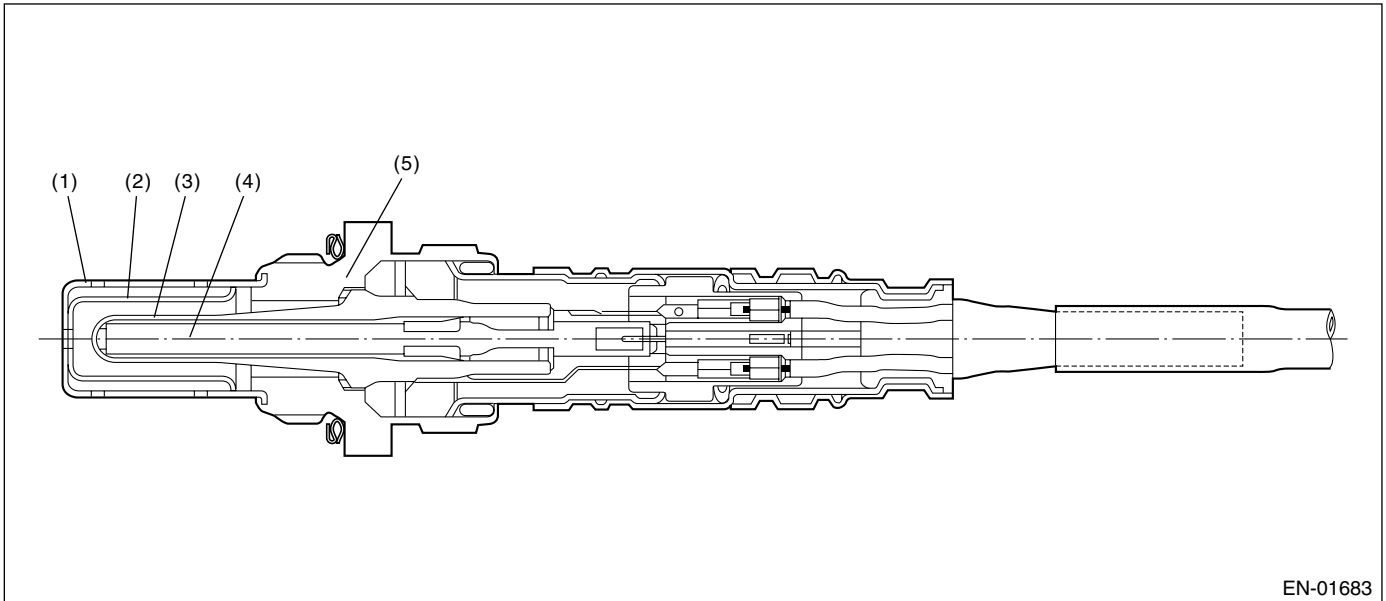
A: DTC P0030 — HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1) —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of front oxygen (A/F) sensor heater.

Judge NG when impedance of front oxygen (A/F) sensor is larger than the standard value by referring to the engine condition such as fuel shut-off in deceleration, etc.

2. COMPONENT DESCRIPTION



EN-01683

- (1) Element cover (Outer)
- (2) Element cover (Inner)
- (3) Sensor element
- (4) Ceramic heater
- (5) Sensor housing

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Continuous time which all the following conditions were filled.	50 seconds or more
Battery voltage	> 10.9 V
After fuel shut-off	20 seconds or more

4. GENERAL DRIVING CYCLE

Perform diagnosis continuously in 50 seconds after starting engine.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (20 seconds). Judge OK and clear NG when the continuous time of not completing the malfunction criteria below becomes more than the time needed for diagnosis (20 seconds).

Judgment Value

Malfunction Criteria	Threshold Value
Impedance of front oxygen (A/F) sensor	> 50 Ω

Time Needed for Diagnosis: 20 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning correction: Not allowed to calculate
- Front oxygen (A/F) sensor sub learning correction: Do not calculate.
- Correction when re-starting at high temperature: Normally minimum value 0.06 → 0
- Purge control: Not allowed to purge

9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

B: DTC P0031 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1)

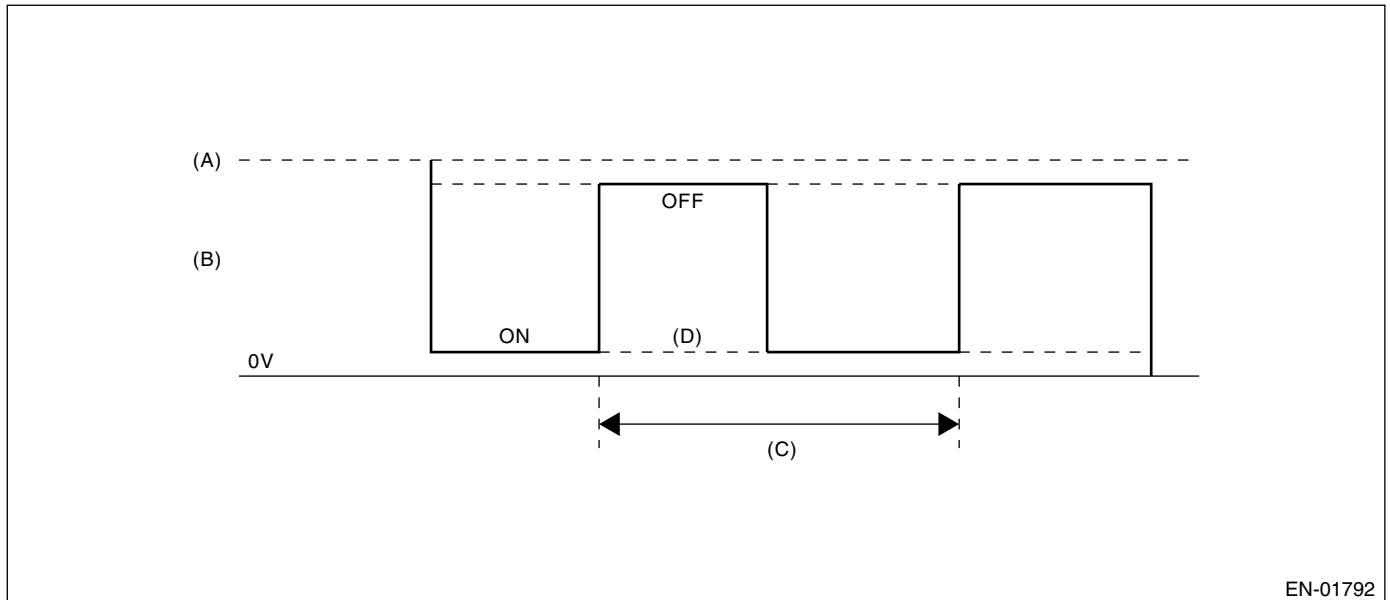
1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of heater.

The heater conducts the duty control. The output terminal voltage at ON becomes 0 V, and the output terminal voltage at OFF becomes battery voltage.

Judge NG when the terminal voltage remains to be Low.

2. COMPONENT DESCRIPTION



EN-01792

- | | |
|---|----------------------|
| (A) Battery voltage | (C) 128 milliseconds |
| (B) Front oxygen (A/F) sensor heater output voltage | (D) Low abnormality |

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 1 second (8 cycles).

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	Low
Front oxygen (A/F) sensor heater control duty	$< 87.5\%$

Time Needed for Diagnosis: 1 second

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when all the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	High

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor heater control: Not allowed to turn on the heater.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- A/F sub learning: Not allowed to calculate the A/F sub learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0 from 0.06 normally.
- Purge control: Not allowed to purge.

9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

C: DTC P0032 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1) —

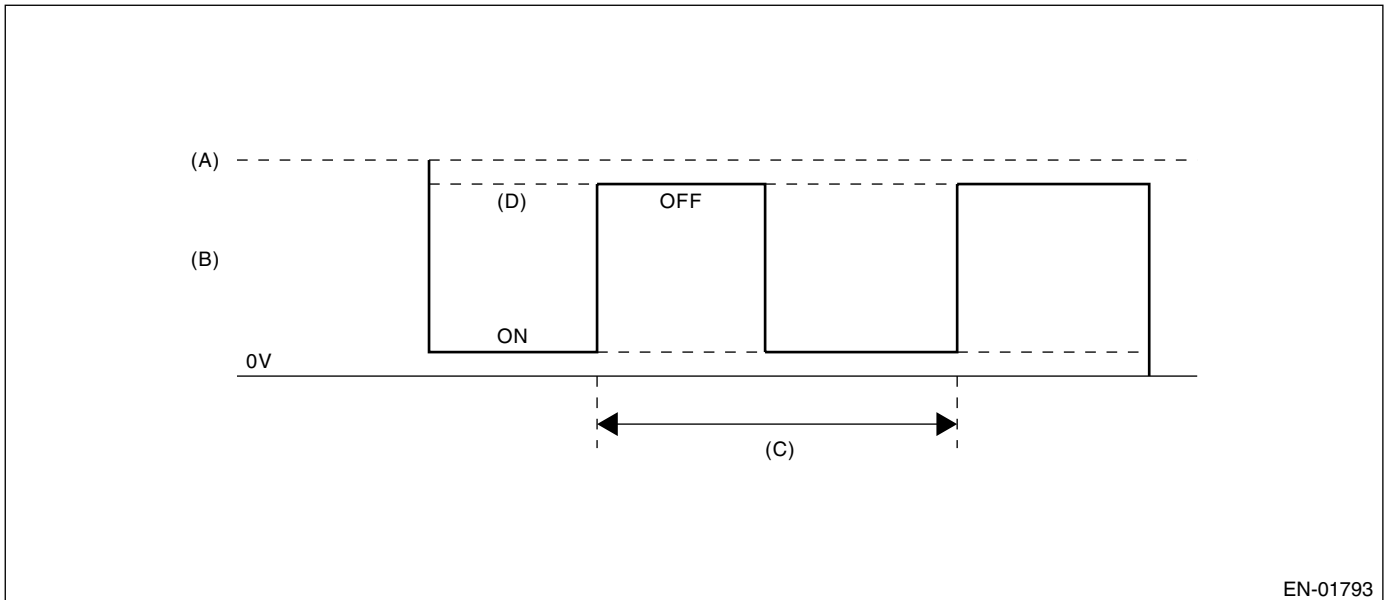
1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of heater.

The heater conducts the duty control. The output terminal voltage at ON becomes 0 V, and the output terminal voltage at OFF becomes battery voltage.

Judge NG when the terminal voltage remains to be High.

2. COMPONENT DESCRIPTION



- (A) Battery voltage
(B) Front oxygen (A/F) sensor heater output voltage
(C) 128 milliseconds
(D) High abnormality output voltage

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform diagnosis continuously.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes 1 second (8 cycles).

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	High
Front oxygen (A/F) sensor heater control duty	≥ 12.5%

Time Needed for Diagnosis: 1 second

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when all the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor heater control: Not allowed to turn on the heater.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- A/F sub learning: Not allowed to calculate the A/F sub learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0 from 0.06 normally.
- Purge control: Not allowed to purge.

9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

D: DTC P0037 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2)

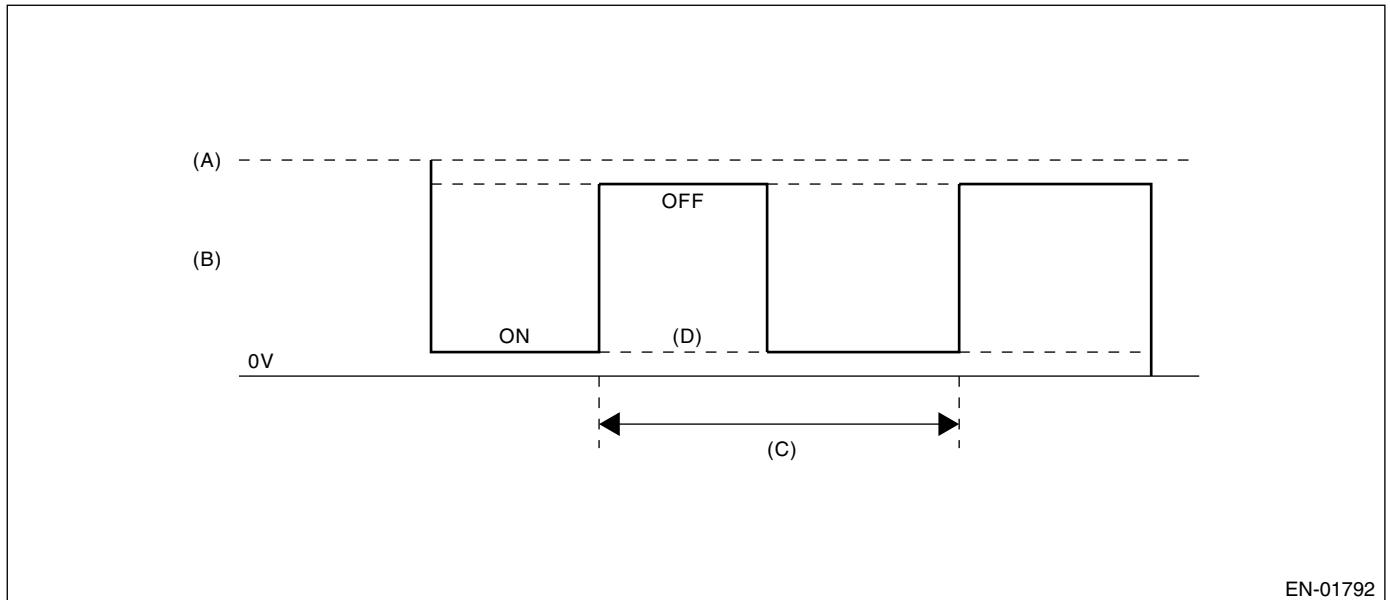
1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of oxygen sensor heater.

Oxygen sensor heater conducted the duty control, and the output terminal voltage at ON is 0 V and the output terminal voltage at OFF is the battery voltage.

Judge NG when the terminal voltage remains to be Low.

2. COMPONENT DESCRIPTION



EN-01792

- (A) Battery voltage
(B) Oxygen sensor heater output voltage
(C) 256 milliseconds (cycles)
(D) Low malfunction

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
Elapsed time after engine starting	≥ 1 second

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after engine starting.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing all the malfunction criteria below becomes more than 2560 millisecond (10 cycles).

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	Low
Oxygen sensor heater control duty	< 75%

Time Needed for Diagnosis: 2.56 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when all the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	High

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Sub feedback control: Not allowed

9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

E: DTC P0038 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2) —

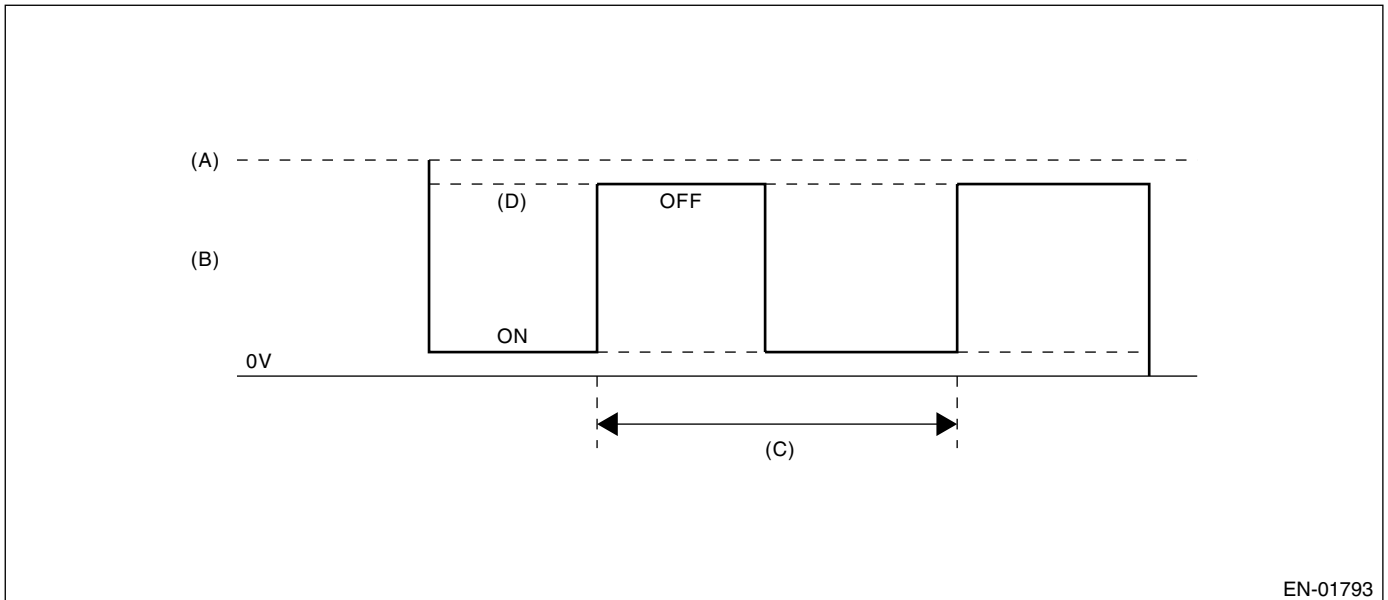
1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of oxygen heater.

Oxygen heater conducted the duty control, and the output terminal voltage at ON is 0 V and the output terminal voltage at OFF is the battery voltage.

Judge NG when the terminal voltage remains to be High.

2. COMPONENT DESCRIPTION



- (A) Battery voltage (C) 256 milliseconds (cycles)
(B) Oxygen sensor heater output voltage (D) High malfunction

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
Elapsed time after engine starting	≥ 1 second

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after engine starting.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing all the malfunction criteria below becomes more than 2560 milliseconds (10 cycles).

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	High
Oxygen sensor heater control duty	≥ 20%

Time Needed for Diagnosis: 2.56 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when all the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Sub feedback control: Not allowed

9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

F: DTC P0043 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 3)

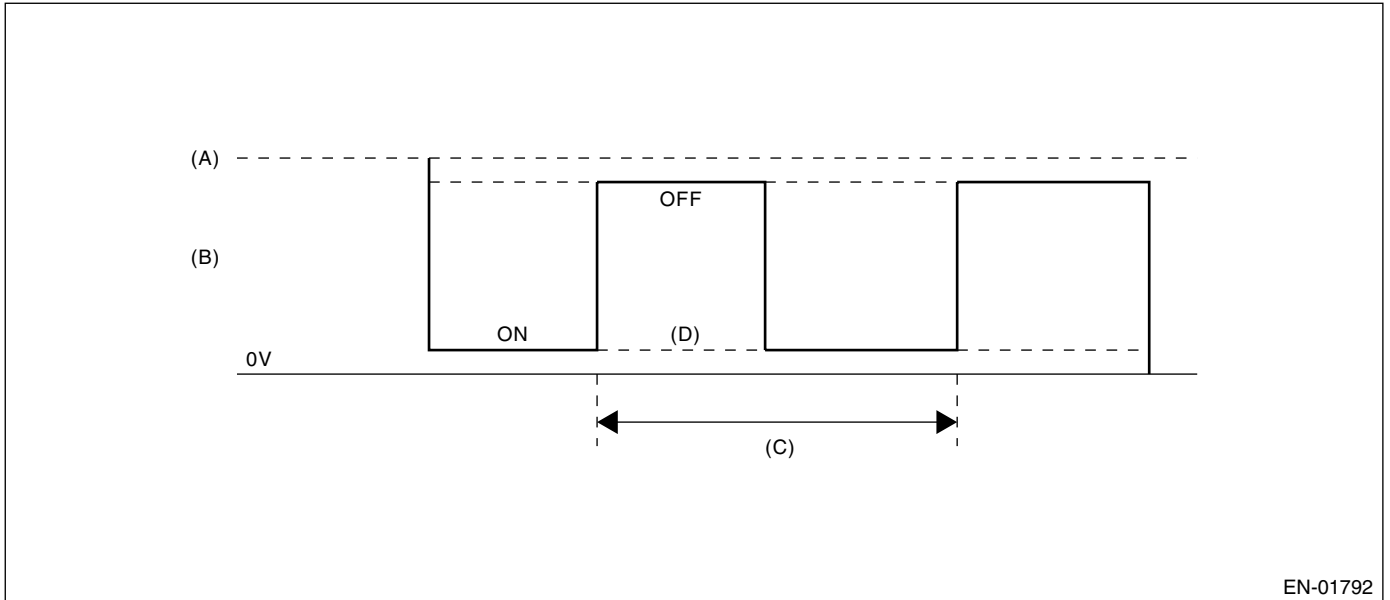
1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of oxygen sensor heater.

Oxygen sensor heater conducted the duty control, and the output terminal voltage at ON is 0 V and the output terminal voltage at OFF is the battery voltage.

Judge NG when the terminal voltage remains to be Low.

2. COMPONENT DESCRIPTION



- (A) Battery voltage
- (B) Oxygen sensor heater output voltage
- (C) 256 milliseconds (cycles)
- (D) Low malfunction

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
Ignition switch	ON
Engine speed	≤ 4500 rpm
Heater output duty ratio	19.9 ←→79.6 %

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after engine starting.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing all the malfunction criteria below becomes more than 5 second.

• Judgment Value

Malfunction Criteria	Threshold Value
Maximum heater output	< 10.12 V

Time Needed for Diagnosis: 5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when all the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Maximum heater voltage	≥ 10.12 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Sub feedback control: Not allowed

9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

G: DTC P0044 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 3) —

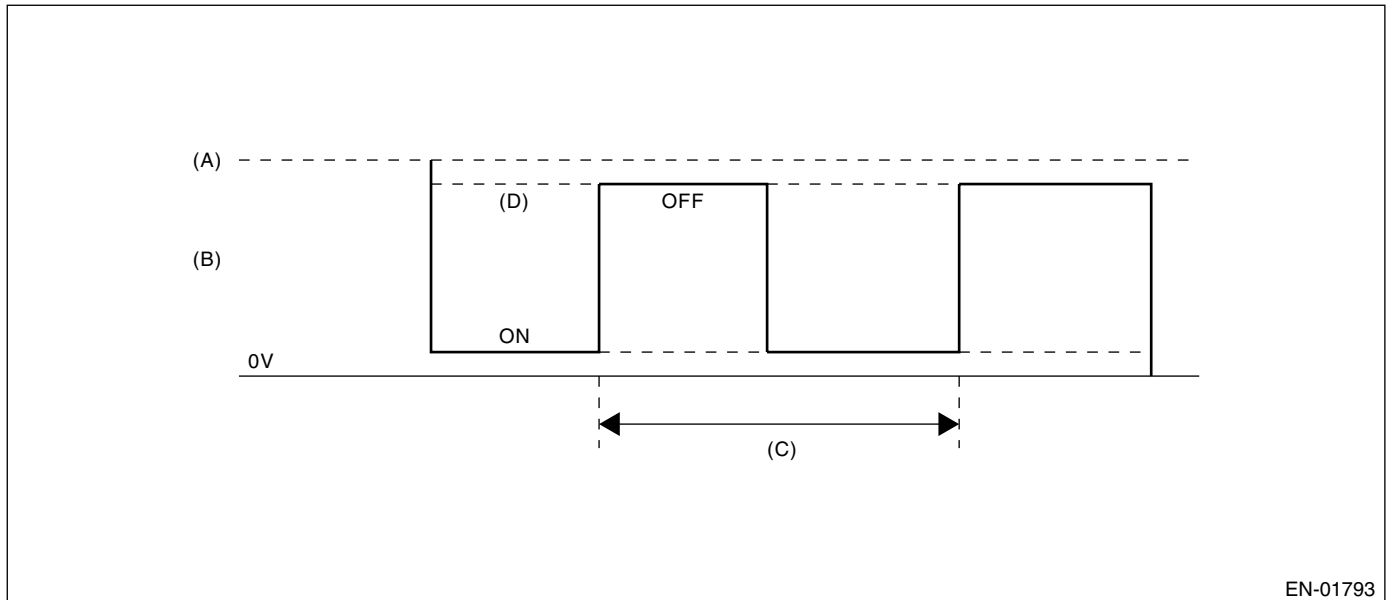
1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of oxygen heater.

Oxygen heater conducted the duty control, and the output terminal voltage at ON is 0 V and the output terminal voltage at OFF is the battery voltage.

Judge NG when the terminal voltage remains to be High.

2. COMPONENT DESCRIPTION



- (A) Battery voltage
- (B) Oxygen sensor heater output voltage
- (C) 256 milliseconds (cycles)
- (D) High malfunction

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
Ignition switch	ON
Engine speed	≤ 4500 rpm
Heater output duty ratio	19.9 ←→79.6 %

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after engine starting.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing all the malfunction criteria below becomes more than 5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Minimum heater voltage	> 1.92 V

Time Needed for Diagnosis: 5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when all the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Minimum heater voltage	≤ 1.92 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Sub feedback control: Not allowed

9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

H: DTC P0050 — HO2S HEATER CONTROL CIRCUIT (BANK 2 SENSOR 1) —

NOTE:

For the detection standard, refer to P0030. <Ref. to GD(H4SO U5)-12, DTC P0030 — HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

I: DTC P0051 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 2 SENSOR 1)

NOTE:

For the detection standard, refer to P0031. <Ref. to GD(H4SO U5)-14, DTC P0031 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

J: DTC P0052 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 2 SENSOR 1) —

NOTE:

For the detection standard, refer to P0032. <Ref. to GD(H4SO U5)-16, DTC P0032 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

K: DTC P0057 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 2 SENSOR 2)

NOTE:

For the detection standard, refer to P0037. <Ref. to GD(H4SO U5)-18, DTC P0037 — HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

L: DTC P0058 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 2 SENSOR 2) —

NOTE:

For the detection standard, refer to P0038. <Ref. to GD(H4SO U5)-20, DTC P0038 — HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

MEMO:

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

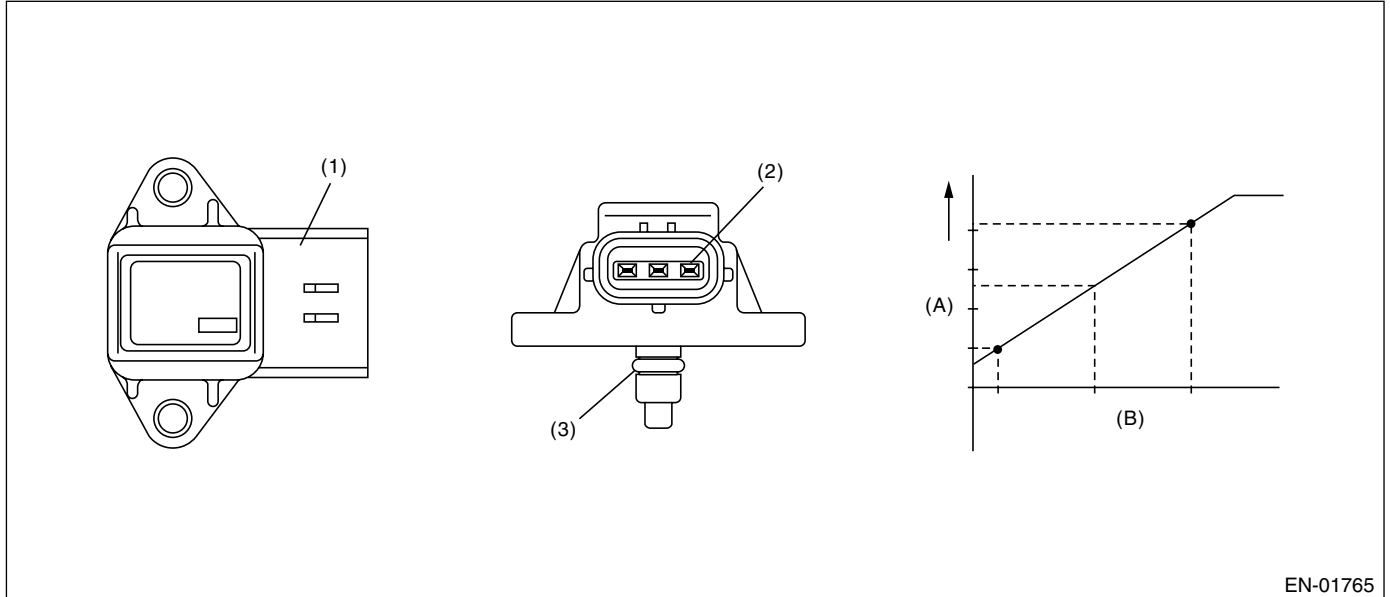
GENERAL DESCRIPTION

M: DTC P0068 — MANIFOLD PRESSURE SENSOR RANGE/PERFORMANCE —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of intake manifold pressure sensor output property. Judge NG when the intake air pressure AD value is Low whereas it seemed to be High from the viewpoint of engine condition, or when it is High whereas it seemed to be Low from the engine condition.

2. COMPONENT DESCRIPTION



EN-01765

- (1) Connector
- (2) Terminal
- (3) O-ring

- (A) Output voltage
- (B) Absolute pressure

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	$\geq 70^{\circ}\text{C}$ (158°F)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after idling.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when either Low side or High side becomes NG. Judge NG when the continuous time of completing the malfunction criteria below becomes more than the predetermined time.

• Judgment Value

Malfunction Criteria	Threshold Value
Low side	
Engine speed	< 2600 rpm
Throttle position	≥ 13°
Intake air amount per engine 0.5 rev.	≥ 0.8 g (0.028 oz)/rev
Output voltage	< 1.3 V
High side	
Engine speed	< 600 ←→ 900 rpm
Throttle position	< 2.44°
Intake air amount per engine 0.5 rev.	< 0.5 g (0.018 oz)/rev
Output voltage	≥ 2.6 V

Time Needed for Diagnosis: Low side 3 seconds, high side 7 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when both Low side and High side become OK. Judge OK when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Low side	
Engine speed	< 2600 rpm
Throttle position	≥ 13°
Intake air amount per engine 0.5 rev.	≥ 8 g (0.28 oz)/rev
Output voltage	≥ 1.3 V
High side	
Engine speed	< 600 ←→ 900 rpm
Throttle position	< 2.44°
Intake air amount per engine 0.5 rev.	< 0.5 g (0.018 oz)/rev
Output voltage	< 2.6 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

- Intake manifold pressure sensor process: Estimate the pressure from engine load.
- ISC feedback: Not allowed to calculate the amount of feedback.
- Heavy fuel judgment: Not allowed to carry out the heavy judgment.
- Fuel cut control: Perform fuel cut when intake manifold pressure sensor is NG. (When fuel injection is large.)

9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

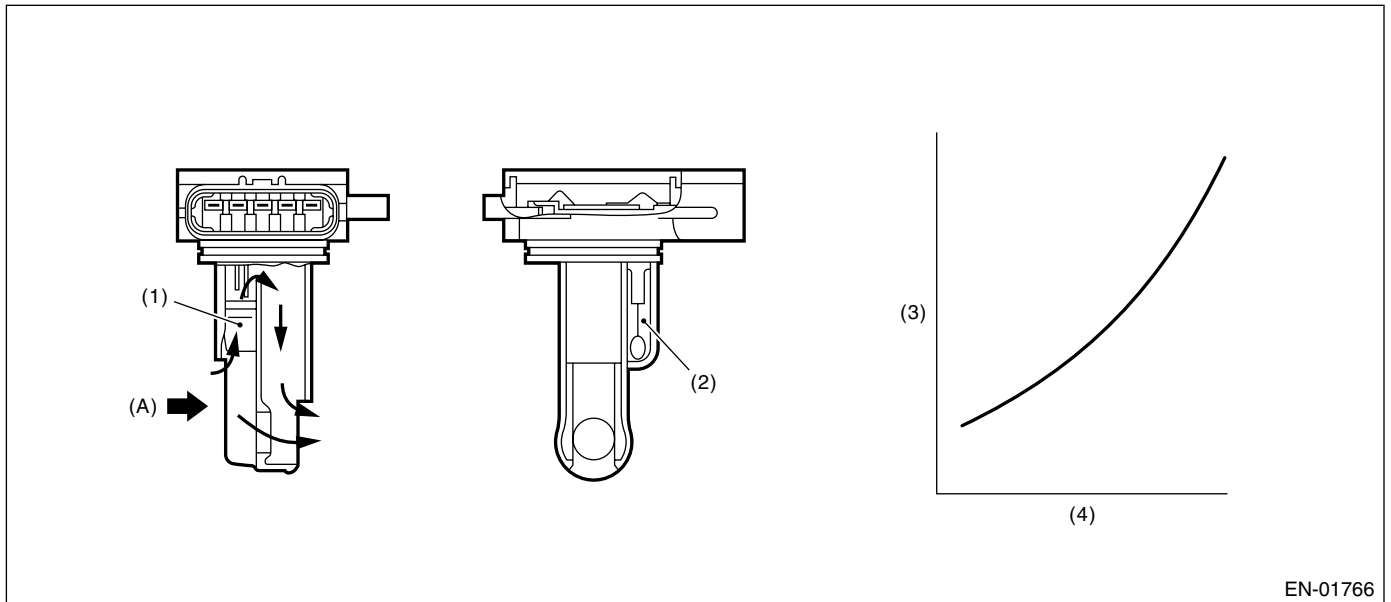
GENERAL DESCRIPTION

N: DTC P0101 — MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of air flow sensor output property. Judge Low side NG when the air flow voltage indicates low value in spite of the driving condition that the air flow voltage might be high; otherwise, judge High side NG when the air flow voltage indicates high value in spite of the driving condition that the air flow voltage might be low. Judge air flow sensor property NG when the Low side or High side becomes NG.

2. COMPONENT DESCRIPTION



EN-01766

(1) Air flow sensor

(2) Intake air temperature sensor

(3) Voltage (V)

(4) Intake air volume (kg/s)

(A) Air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	$\geq 70^{\circ}\text{C}$ (158°F)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after idling.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis.

• Judgment Value

Malfunction Criteria	Threshold Value
Low side NG	
Output voltage	< 1.2 V
Engine speed	≥ 2000 rpm
Throttle angle	≥ 13°
Intake manifold pressure	≥ 53.3 kPa (400 mmHg, 15.7 inHg)
High side NG	
Output voltage	≥ 2.66 V
Engine speed	600 ←→ 900 rpm
Throttle angle	< 2.44°
Intake manifold pressure	< 40.0 kPa (360 mmHg, 11.8 inHg)

Time Needed for Diagnosis:

Low side	3 seconds
High side	10 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK the when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Low side NG	
Output voltage	≥ 1.2 V
Engine speed	≥ 2000 rpm
Throttle angle	≥ 13°
Intake manifold pressure	≥ 53.3 kPa (400 mmHg, 15.7 inHg)
High side NG	
Output voltage	< 2.66 V
Engine speed	600 ←→ 900 rpm
Throttle angle	< 2.44°
Intake manifold pressure	< 40.0 kPa (300 mmHg, 11.8 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

8. FAIL SAFE

- Air flow meter: Engine load is normally calculated by manifold pressure and engine speed; however, calculated only by manifold pressure.
- EVAP conc. learning (fuel): Not allowed to learn.
- Knock compensation:
 - At normal: learned ignition timing value = knock F/B timing value + whole learning timing value + partial learning timing
 - At trouble: learned ignition timing value = -3°CA (retard 3°CA)
knock F/B timing value = 0°CA
 - Whole learning is not allowed.
 - Partial learning is not allowed.
- ISC control: Make the open loop compensation to be the given value (1 g (0.04 oz)/s). Stop calculating the throttle sensor temperature compensation. (Hold the previous value.)

9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

MEMO:

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

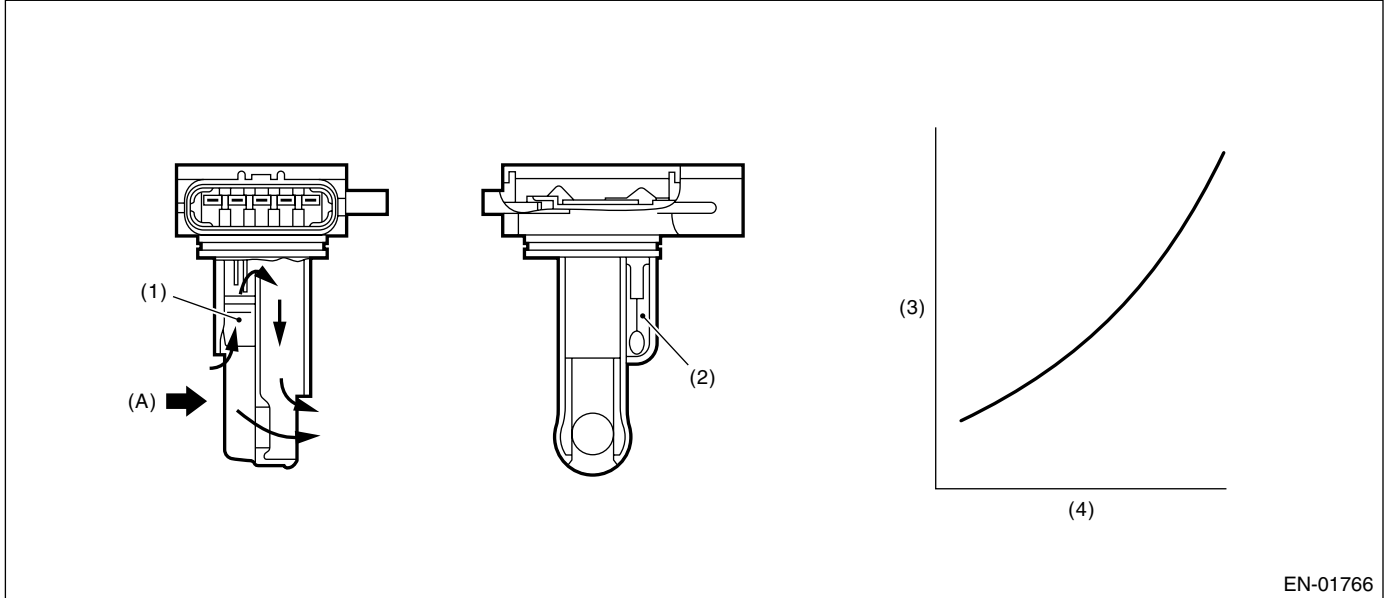
GENERAL DESCRIPTION

O: DTC P0102 — MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of air flow sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



EN-01766

(1) Air flow sensor

(3) Voltage (V)

(A) Air

(2) Intake air temperature sensor

(4) Intake air volume (kg/s)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≤ 0.25 V

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

8. FAIL SAFE

- Air flow meter: Engine load is normally calculated by manifold pressure and engine speed; however, calculated only by manifold pressure.
- EVAP conc. learning (fuel): Not allowed to learn.
- Knock compensation:
 - At normal: learned ignition timing value = knock F/B timing value + whole learning timing value + partial learning timing value
 - At trouble: learned ignition timing value = -3°CA (retard 3°CA)
knock F/B timing value = 0°CA
 - Whole learning is not allowed.
 - Partial learning is not allowed.
- ISC control: Make the open loop compensation to be the given value (1 g (0.04 oz)/s). Stop calculating the throttle sensor temperature compensation. (Hold the previous value.)

9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

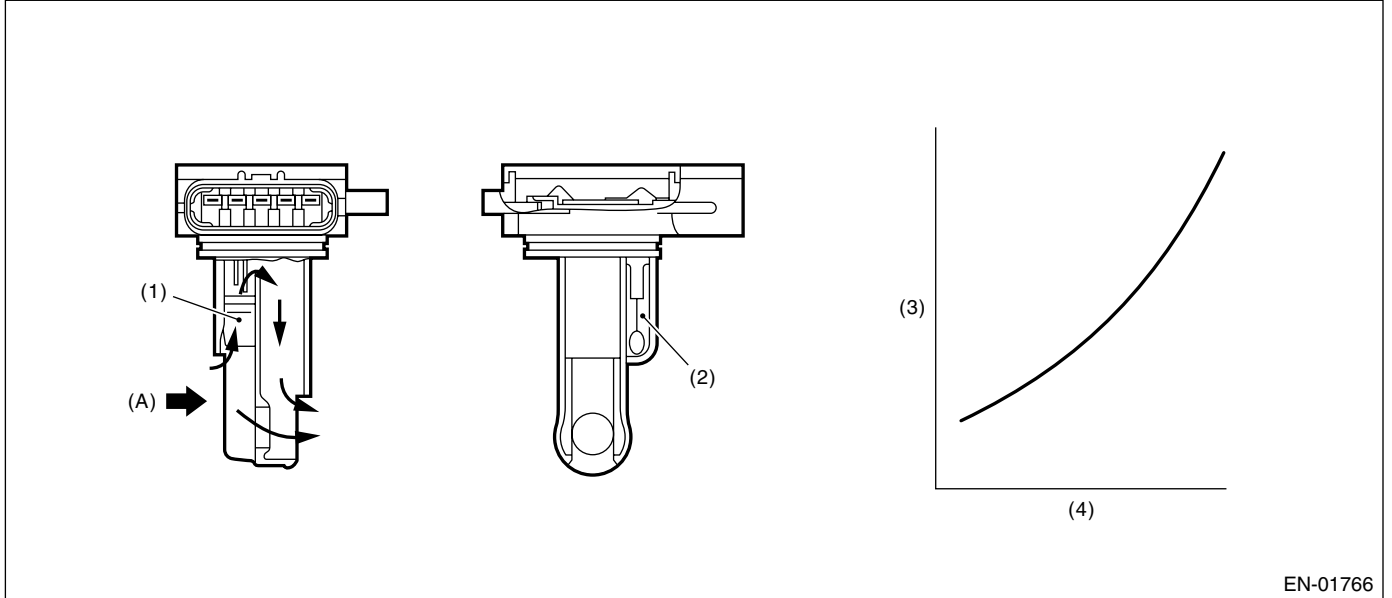
GENERAL DESCRIPTION

P: DTC P0103 — MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of air flow sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



EN-01766

(1) Air flow sensor

(3) Voltage (V)

(A) Air

(2) Intake air temperature sensor

(4) Intake air volume (kg/s)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.985 V

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

8. FAIL SAFE

- Air flow meter: Engine load is normally calculated by manifold pressure and engine speed; however, calculated only by manifold pressure.
- EVAP conc. learning (fuel): Not allowed to learn.
- Knock compensation:
 - At normal: learned ignition timing value = knock F/B timing value + whole learning timing value + partial learning timing value
 - At trouble: learned ignition timing value = -3°CA (retard 3°CA)
knock F/B timing value = 0°CA
 - Whole learning is not allowed.
 - Partial learning is not allowed.
- ISC control: Make the open loop compensation to be the given value (1 g (0.04 oz)/s). Stop calculating the throttle sensor temperature compensation. (Hold the previous value.)

9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

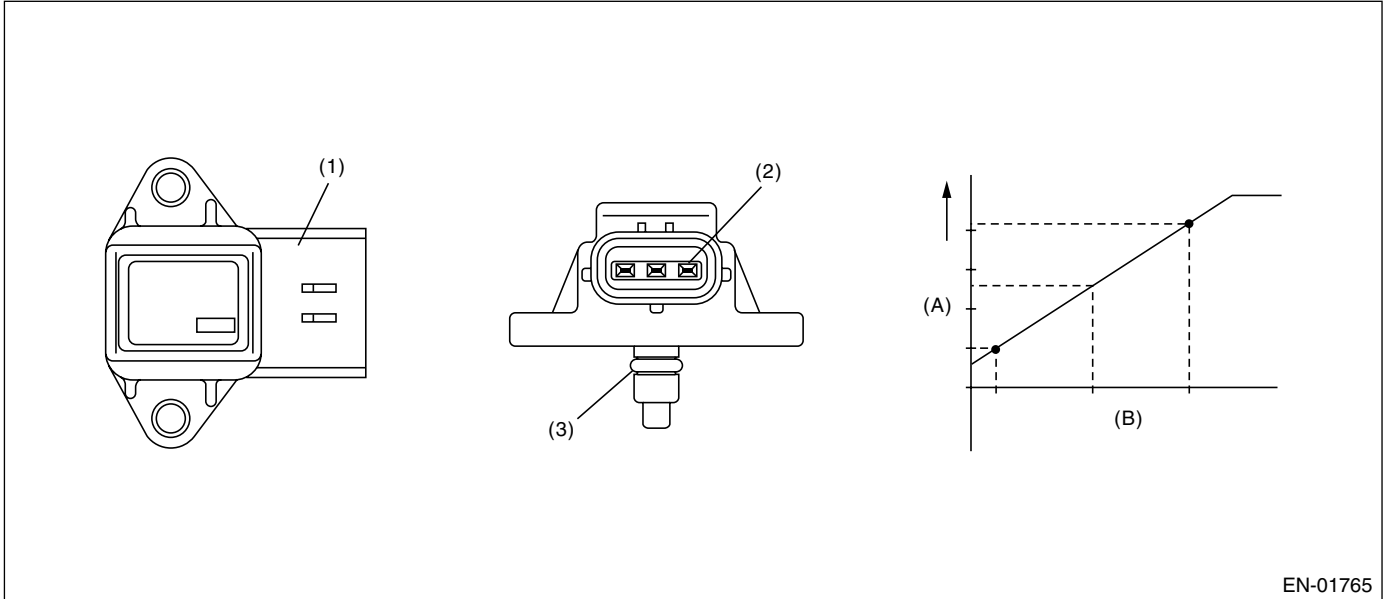
GENERAL DESCRIPTION

Q: DTC P0107 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake manifold pressure sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



EN-01765

- (1) Connector
- (2) Terminal
- (3) O-ring

- (A) Output voltage
- (B) Absolute pressure

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.568 V

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Intake manifold pressure sensor process: Estimate the pressure from engine load.
- ISC feedback: Not allowed to calculate the amount of feedback.
- Heavy fuel judgment: Not allowed to carry out the heavy judgment.
- Fuel cut control: Perform fuel cut when intake manifold sensor is NG. (When amount of fuel injection is large)

9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

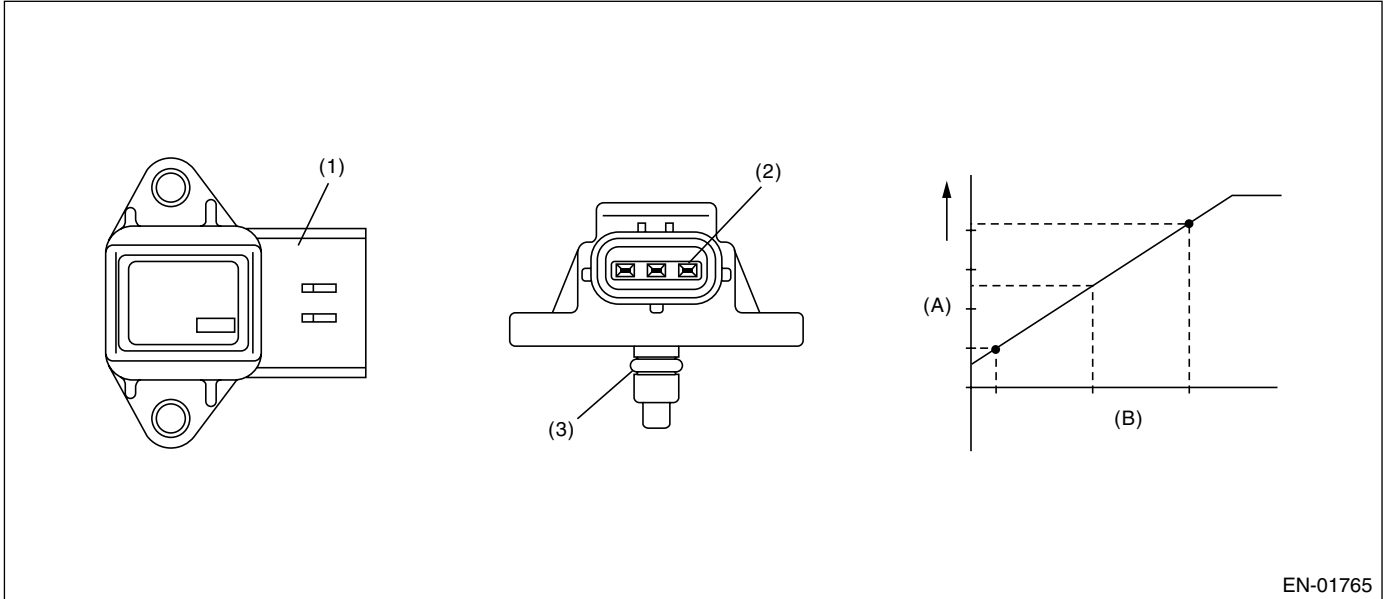
GENERAL DESCRIPTION

R: DTC P0108 — MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake manifold pressure sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



EN-01765

- (1) Connector
- (2) Terminal
- (3) O-ring

- (A) Output voltage
- (B) Absolute pressure

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.921 V

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Intake manifold pressure sensor process: Estimate the pressure from engine load.
- ISC feedback: Not allowed to calculate the amount of feedback.
- Heavy fuel judgment: Not allowed to carry out the heavy judgment.
- Fuel cut control: Perform fuel cut when intake manifold sensor is NG. (When amount of fuel injection is large)

9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

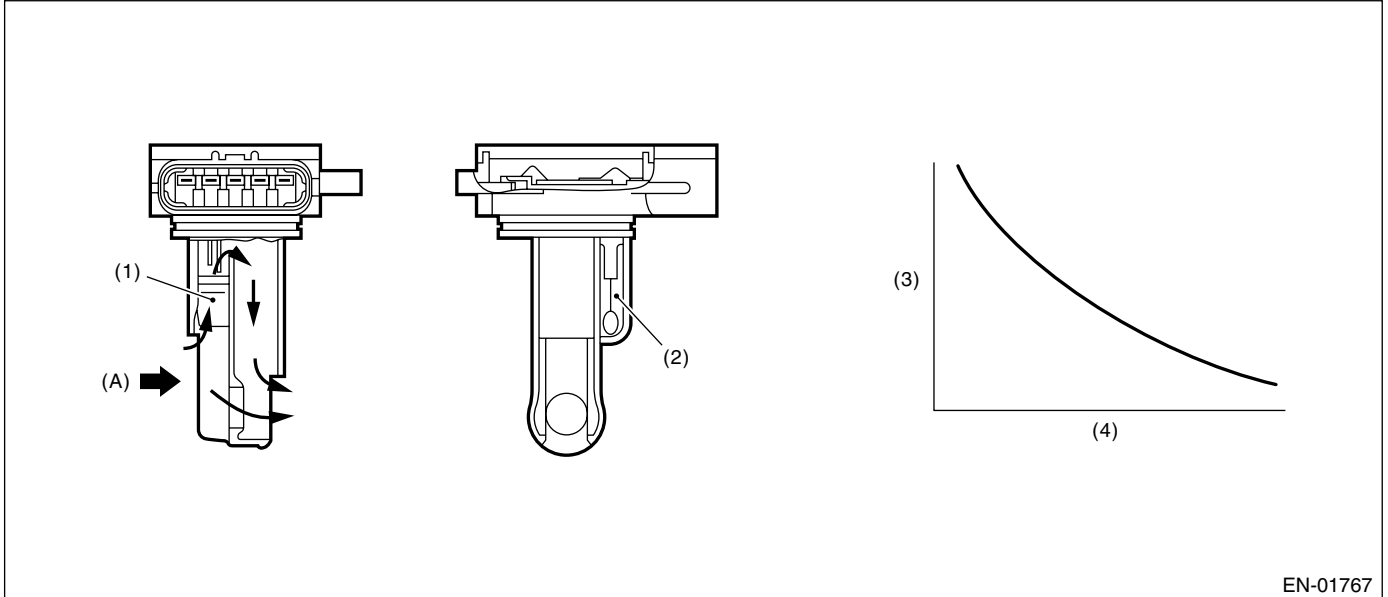
GENERAL DESCRIPTION

S: DTC P0111 — INTAKE AIR TEMPERATURE CIRCUIT RANGE/PERFORMANCE —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of intake air temperature sensor output property. Judge NG when the intake air temperature is not varied whereas it seemed to be varied from the viewpoint of engine condition.

2. COMPONENT DESCRIPTION



EN-01767

(1) Air flow sensor

(2) Intake air temperature sensor

(3) Resistance (Ω)

(4) Intake air temperature $^{\circ}\text{C}$ ($^{\circ}\text{F}$)

(A) Air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Coolant temp. before engine start	< 30 $^{\circ}\text{C}$ (86 $^{\circ}\text{F}$)
Coolant temperature	> 95 $^{\circ}\text{C}$ (203 $^{\circ}\text{F}$)
Battery voltage	\geq 10.9 V
Continuous time when the vehicle speed is less than 60 km/h (37 MPH)	600 seconds or more

4. GENERAL DRIVING CYCLE

Perform the diagnosis when the vehicle speed condition is completed after idling from starting the cooled engine.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 1 second.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage difference between Max. and Min.	< 20 mV (It is equal to approx. 0.5°C (0.9°F) around 25°.)

Time Needed for Diagnosis: 1 second

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage difference between Max. and Min.	≥ 20 mV

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Intake air temperature sensor process: Intake air temperature is fixed at 20°C (68°F).

9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

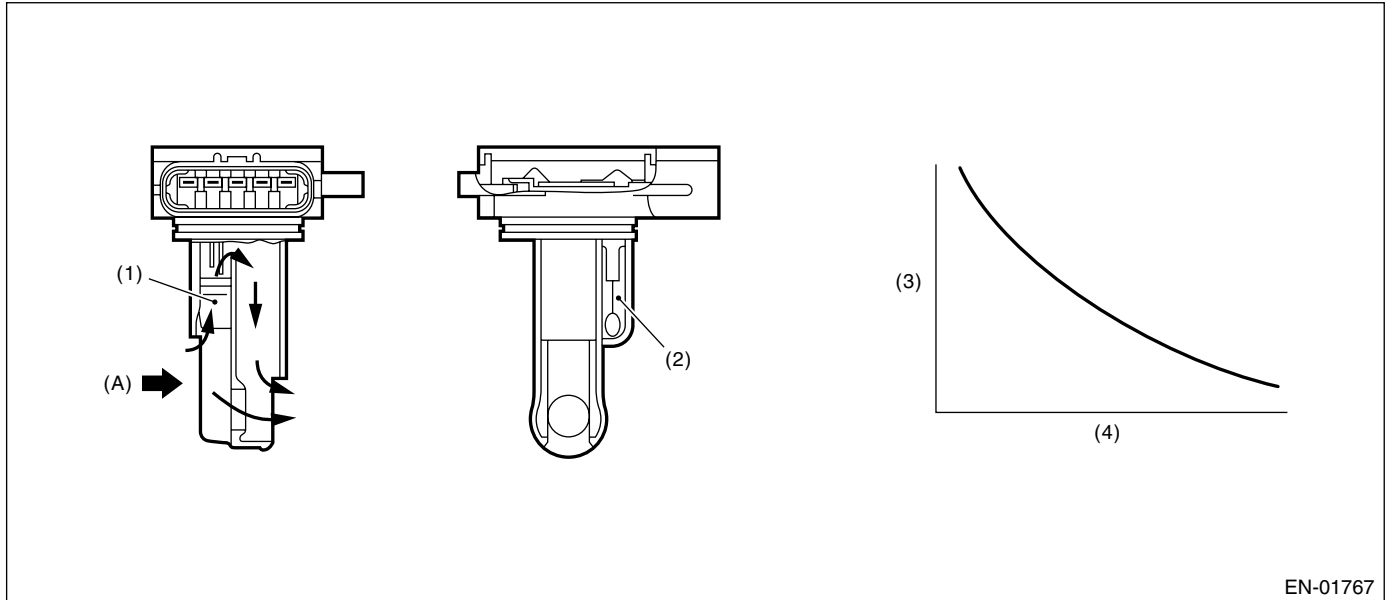
GENERAL DESCRIPTION

T: DTC P0112 — INTAKE AIR TEMPERATURE CIRCUIT LOW INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake air temperature sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(1) Air flow sensor

(3) Resistance (Ω)

(A) Air

(2) Intake air temperature sensor

(4) Intake air temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.165 V
Ignition switch	ON

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.165 V
Ignition switch	ON

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Intake air temperature sensor process: Intake air temperature is fixed at 20°C (68°F).

9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

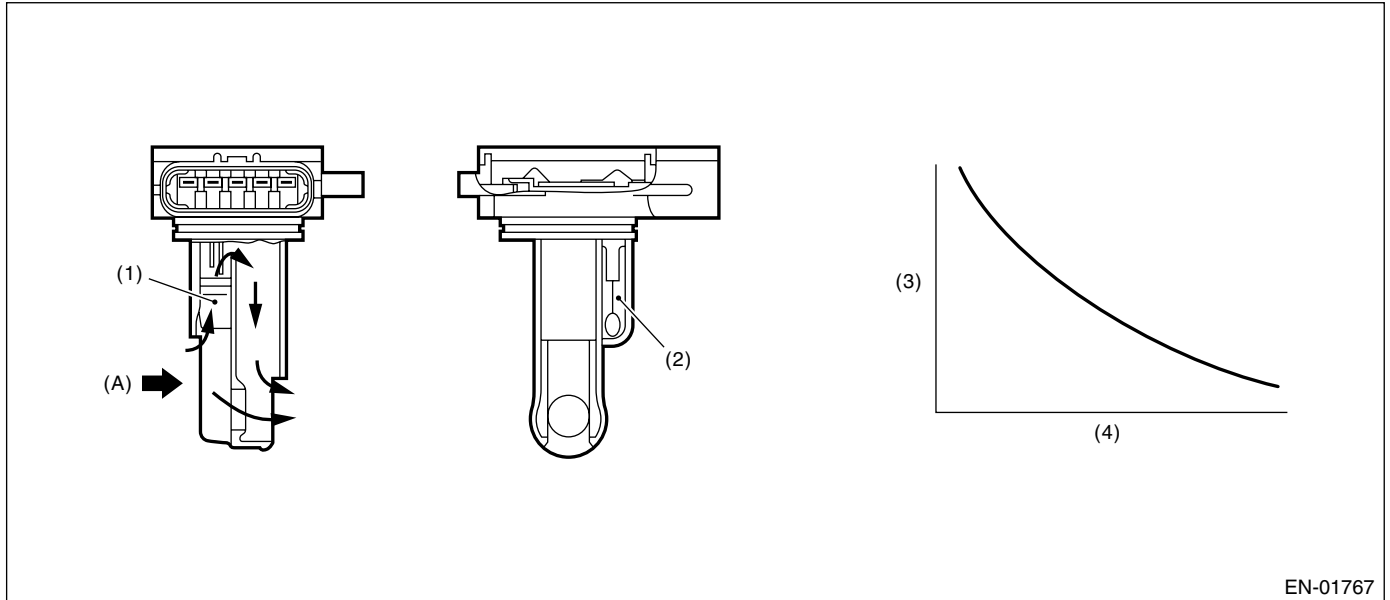
GENERAL DESCRIPTION

U: DTC P0113 — INTAKE AIR TEMPERATURE CIRCUIT HIGH INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake air temperature sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



EN-01767

(1) Air flow sensor

(3) Resistance (Ω)

(A) Air

(2) Intake air temperature sensor

(4) Intake air temperature $^{\circ}\text{C}$ ($^{\circ}\text{F}$)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.716 V
Ignition switch	ON

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 4.716 V
Ignition switch	ON

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Intake air temperature sensor process: Intake air temperature is fixed at 20°C (68°F).

9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

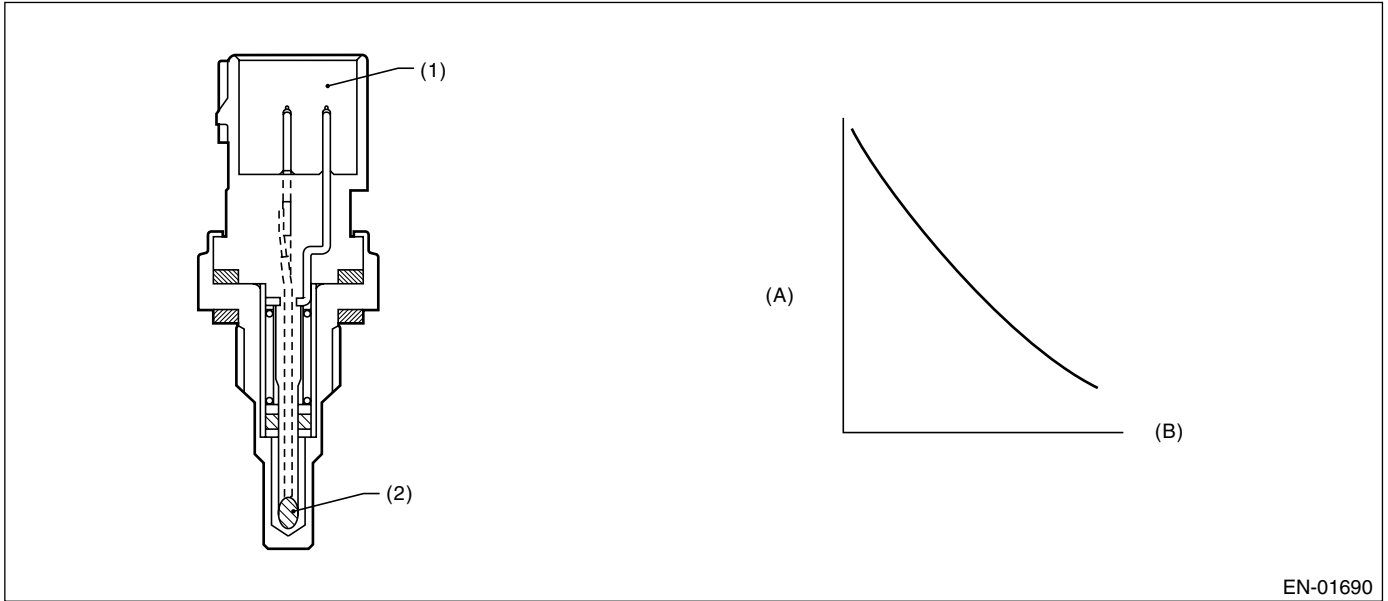
GENERAL DESCRIPTION

V: DTC P0117 — ENGINE COOLANT TEMPERATURE CIRCUIT LOW INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of engine coolant temperature sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



EN-01690

- (1) Connector
- (2) Thermistor element
- (A) Resistance value (kΩ)
- (B) Temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.165 V

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

8. FAIL SAFE

- Engine coolant temperature process: Fix the engine coolant temperature at 70°C (158°F).
- ISC feedback: Calculate the target engine speed setting the engine coolant temperature to 70°C (158°F).
- ISC learning: Not allowed to learn.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.
- Air conditioner control: Not allowed to turn the air conditioner to ON.
- Radiator fan control: Both main and sub fan turn to ON.
- Increase compensation factor at high coolant temperature: Increase normally occurs with high temperature and other conditions; however, occurs with other conditions except coolant temperature condition.
- Tumble generator valve control: Open the tumble generator valve.

9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

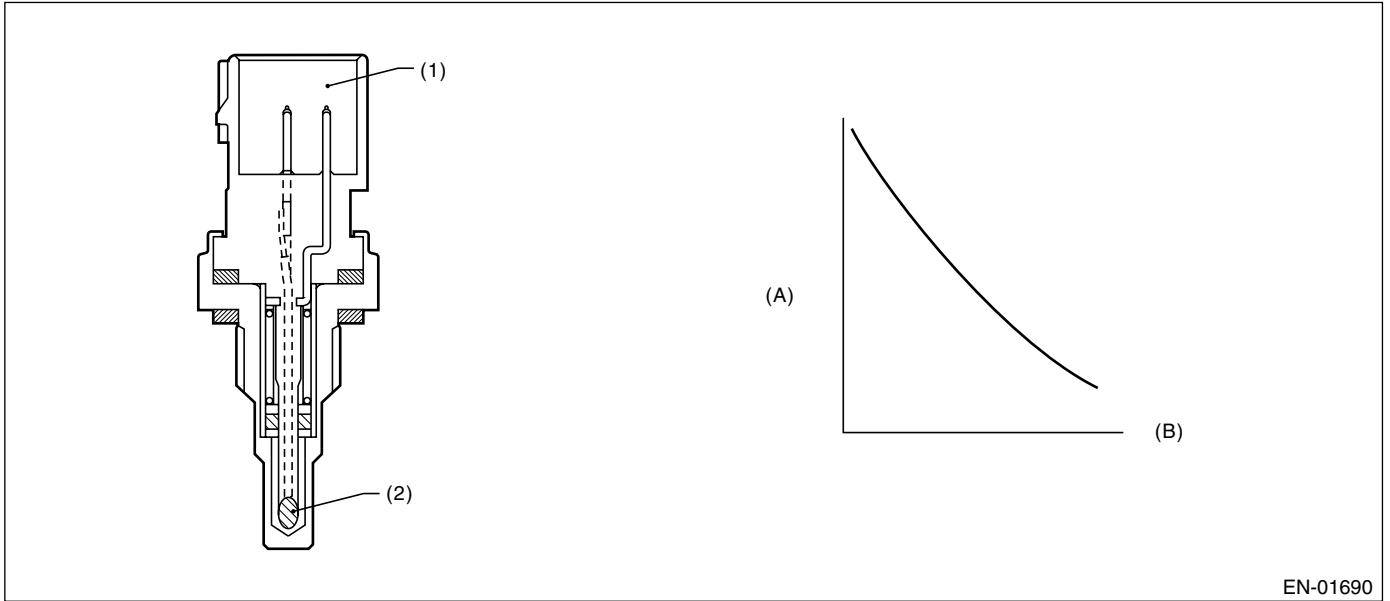
GENERAL DESCRIPTION

W: DTC P0118 — ENGINE COOLANT TEMPERATURE CIRCUIT HIGH INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of engine coolant temperature sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



EN-01690

- (1) Connector
- (2) Thermistor element
- (A) Resistance value (k Ω)
- (B) Temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.716 V

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

8. FAIL SAFE

- Engine coolant temperature process: Fix the engine coolant temperature at 70°C (158°F).
- ISC feedback: Calculate the target engine speed setting the engine coolant temperature to 70°C (158°F).
- ISC learning: Not allowed to learn.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.
- Air conditioner control: Not allowed to turn the air conditioner to ON.
- Radiator fan control: Both main and sub fan turn to ON.
- Increase compensation factor at high coolant temperature: Increase normally occurs with high temperature and other conditions; however, occurs with other conditions except coolant temperature condition.
- Tumble generator valve control: Open the tumble generator valve.

9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

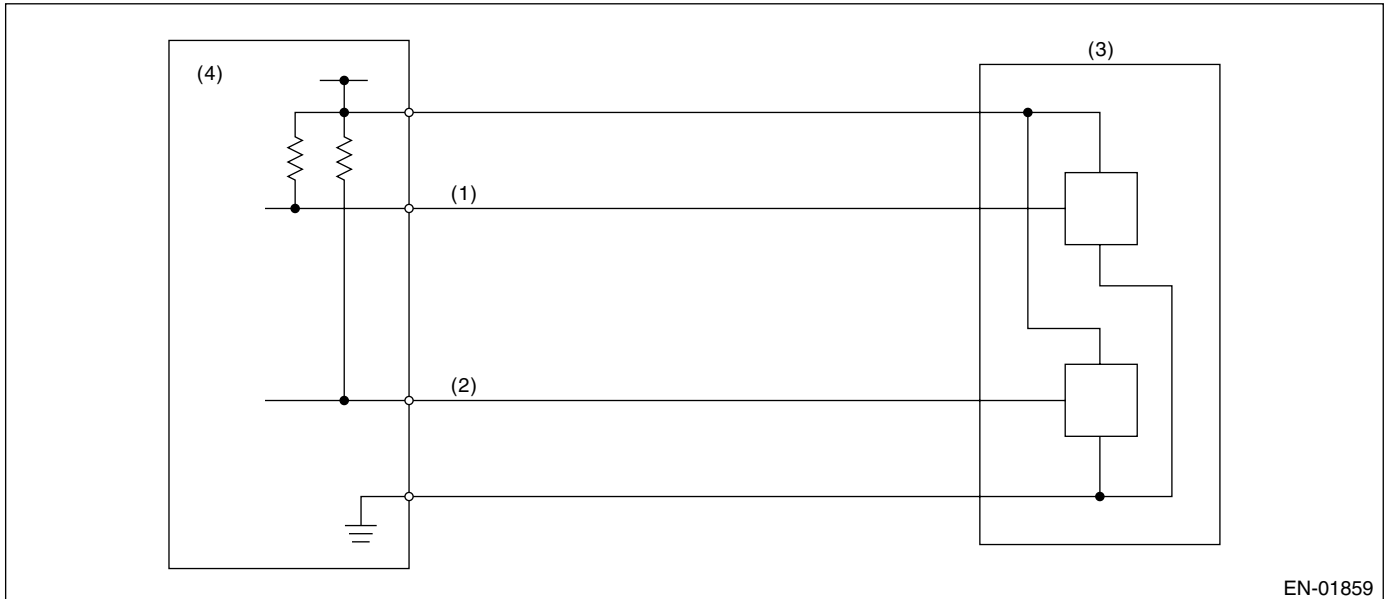
GENERAL DESCRIPTION

X: DTC P0122 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 1.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



- (1) Throttle position sensor 1 signal (3) Throttle position sensor
(2) Throttle position sensor 2 signal (4) Engine control module (ECM)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≥ 0.309 V

Time Needed for Diagnosis: 24 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only engine stop)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

8. FAIL SAFE

Stop power distribution to electric control throttle motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

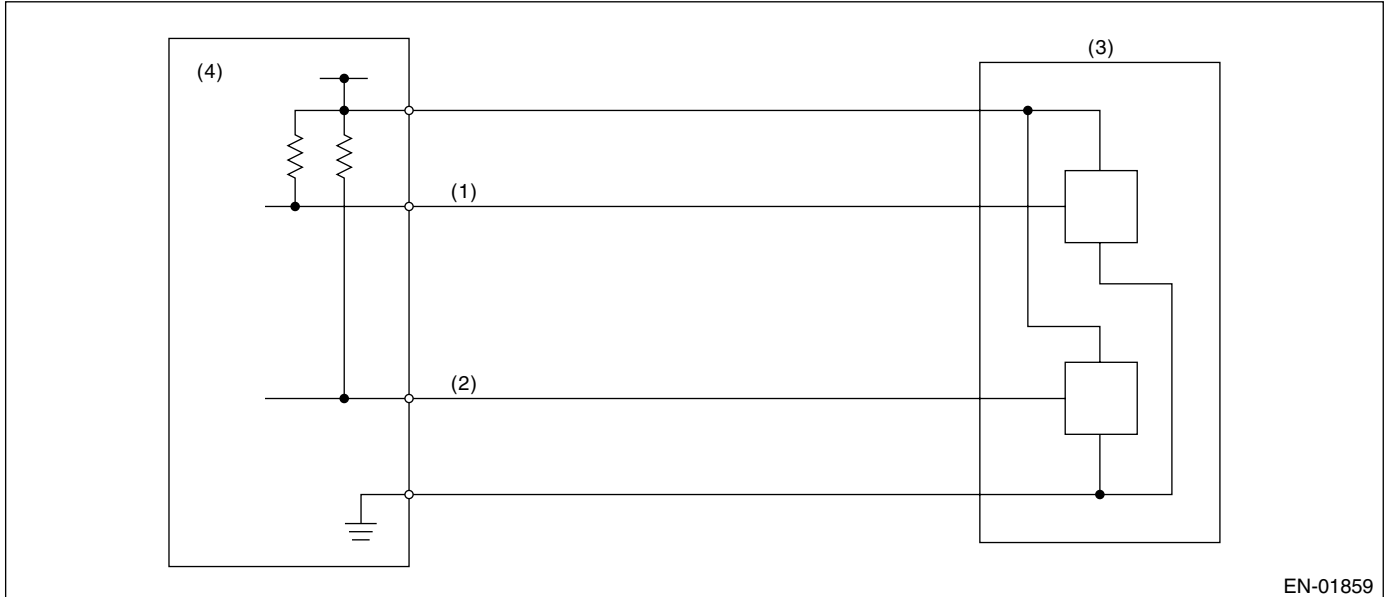
GENERAL DESCRIPTION

Y: DTC P0123 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 1.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



EN-01859

- (1) Throttle position sensor 1 signal (3) Throttle position sensor
(2) Throttle position sensor 2 signal (4) Engine control module (ECM)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≤ 4.646 V

Time Needed for Diagnosis: 24 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only engine stop)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

8. FAIL SAFE

Stop power distribution to electric control throttle motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

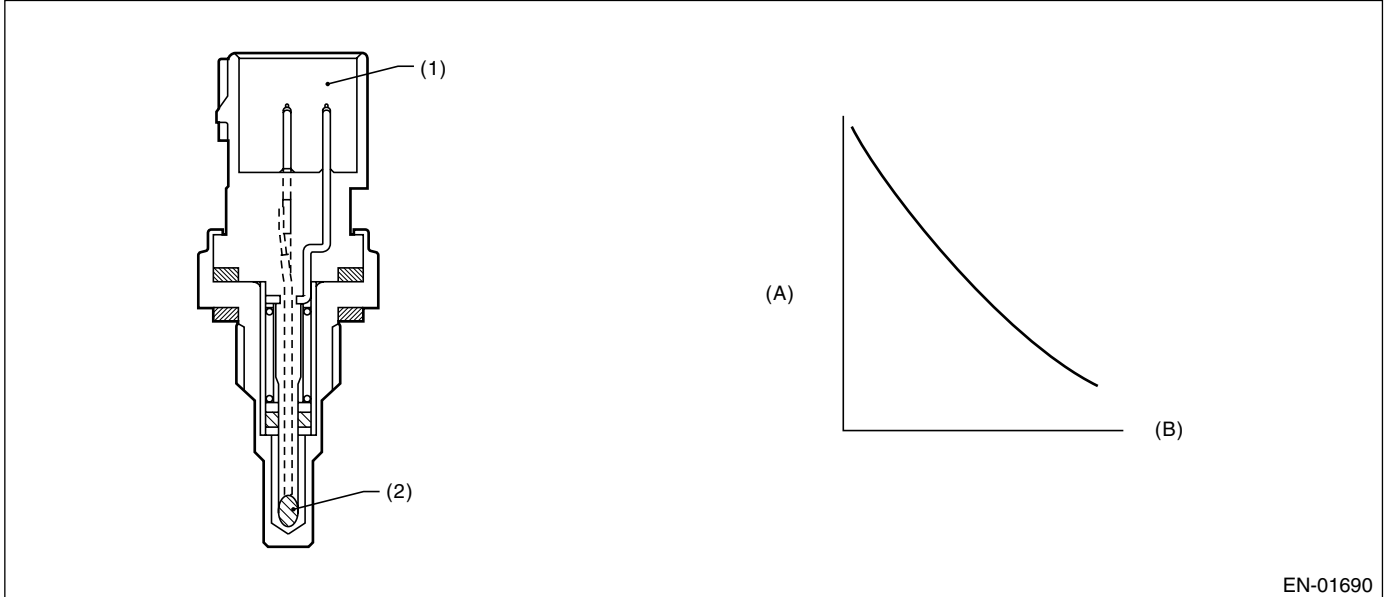
GENERAL DESCRIPTION

Z: DTC P0125 — INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of engine coolant temperature output property. Judge NG when the engine coolant temperature does not rise whereas it seemed to rise from the viewpoint of the engine condition.

2. COMPONENT DESCRIPTION



EN-01690

- (1) Connector
- (2) Thermistor element

- (A) Resistance value (k Ω)
- (B) Temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	≥ 500 rpm
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once after engine starting.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature	$< 20^{\circ}\text{C}$ (68°F)
Timer for diagnosis after engine starting	\geq Timer judgment value after engine starting

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

Timer for diagnosis after engine starting

a) Timer stop at fuel cut mode.

b) During the driving conditions except a) above, timer count up by 64 milliseconds + TWCNT milliseconds at every 64 milliseconds.

Where, TWCNT is determined as follows,

TWCNT = 0 at idle switch ON,

TWCNT show on the following table at idle switch OFF.

Temperature °C (°F)	Vehicle speed km/h (MPH)							
	0 (0)	8 (4.97)	16 (9.94)	24 (14.9)	32 (19.9)	40 (24.9)	48 (29.8)	56 (34.8)
-20 (-4)	0 ms	37.16 ms	74.272 ms	111.41 ms	126.66 ms	141.91 ms	163.59 ms	185.26 ms
-10 (14)	0 ms	27.39 ms	54.782 ms	82.173 ms	99.65 ms	117.13 ms	135.96 ms	154.80 ms
0 (32)	0 ms	17.646 ms	35.292 ms	52.938 ms	72.64 ms	92.34 ms	108.34 ms	124.33 ms
10 (50)	0 ms	7.9012 ms	15.802 ms	23.704 ms	45.63 ms	67.556 ms	80.711 ms	93.867 ms

Judgment value of timer after engine starting

$$t = 455 - 27 \times T_i$$

T_i is the lowest coolant temperature after starting the engine.

Time Needed for Diagnosis: To be determined. (It is varied by the Min. engine coolant temperature and engine conditions such as vehicle speed and engine coolant temperature.)

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature	$\geq 20^\circ\text{C}$ (68°F)

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

- Engine coolant temperature process: Fix the engine coolant temperature at 70°C (158°F).
- ISC feedback: Calculate the target engine speed setting the engine coolant temperature to 70°C (158°F).
- ISC learning: Not allowed to learn.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.
- Air conditioner control: Not allowed to turn the air conditioner to ON.
- Radiator fan control: Both main and sub fan turn to ON.
- Increase compensation factor at high coolant temperature: Increase normally occurs with high temperature and other conditions; however, occurs with other conditions except coolant temperature condition.
- Tumble generator valve control: Open the tumble generator valve.

9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

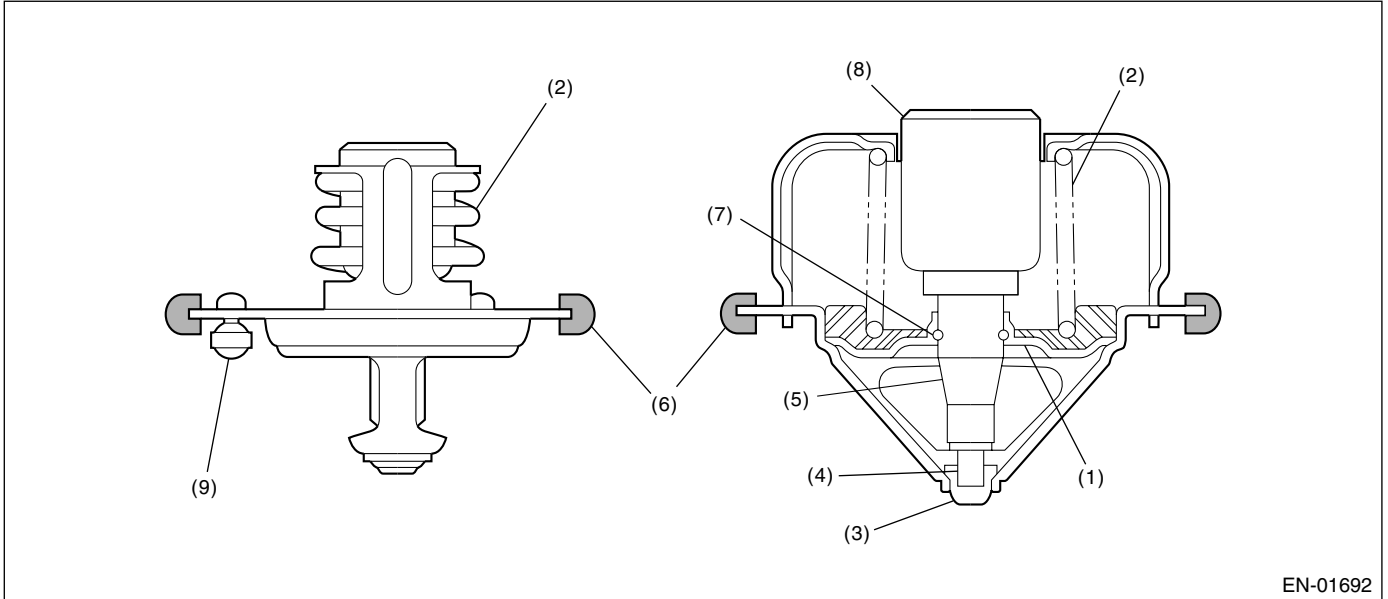
GENERAL DESCRIPTION

AA:DTC P0128 — COOLANT THERMOSTAT (COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE) —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of thermostat function. Judge NG when the engine coolant temperature is lower than the estimated engine coolant temperature and the difference between them is large. Judge OK when the engine coolant temperature becomes 70°C (158°F) and the difference is small before judging NG.

2. COMPONENT DESCRIPTION



EN-01692

- | | | |
|-------------|--------------------|------------------|
| (1) Valve | (4) Piston | (7) Stop ring |
| (2) Spring | (5) Guide | (8) Wax element |
| (3) Stopper | (6) Rubber packing | (9) Jiggle valve |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 30 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Engine coolant temperature at engine starting	$< 55^{\circ}\text{C}$ (131°F)
Engine coolant temperature (Estimated – measured) coolant temperature	$< 70^{\circ}\text{C}$ (158°F) $> 30^{\circ}\text{C}$ (86°F)
Vehicle speed	≥ 30 km/h (19 MPH)

Time Needed for Diagnosis: 30 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Engine coolant temperature at engine starting	$< 55^{\circ}\text{C}$ (131°F)
Engine coolant temperature (Estimated – measured) coolant temperature	$\geq 70^{\circ}\text{C}$ (158°F) $\leq 30^{\circ}\text{C}$ (86°F)

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

AB:DTC P0129 — BAROMETRIC PRESSURE TOO LOW —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of atmospheric pressure sensor output property. Judge NG when the atmospheric pressure sensor output is largely different from the intake manifold pressure at engine starting.

2. COMPONENT DESCRIPTION

Atmospheric pressure sensor is built in ECM.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	< 300 rpm
Vehicle speed	< 1 km/h (0.62 MPH)

4. GENERAL DRIVING CYCLE

Perform the diagnosis before engine starting with the ignition switch ON.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.3 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Atmospheric – manifold absolute pressure	≥ 26.7 kPa (200 mmHg, 7.88 inHg)
Intake manifold pressure at engine starting – manifold absolute pressure	< 1.33 kPa (10 mmHg, 2.95 inHg)

Time Needed for Diagnosis: 0.3 seconds

Malfunction Indicator Light Illumination: Detect when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the continuous time of completing the malfunction criteria below becomes more than 0.3 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Atmospheric – manifold absolute pressure	< 26.7 kPa (200 mmHg, 7.88 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Atmospheric pressure sensor process: Fix the atmospheric pressure to 101 kPa (760 mmHg, 29.8 inHg).

9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

MEMO:

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

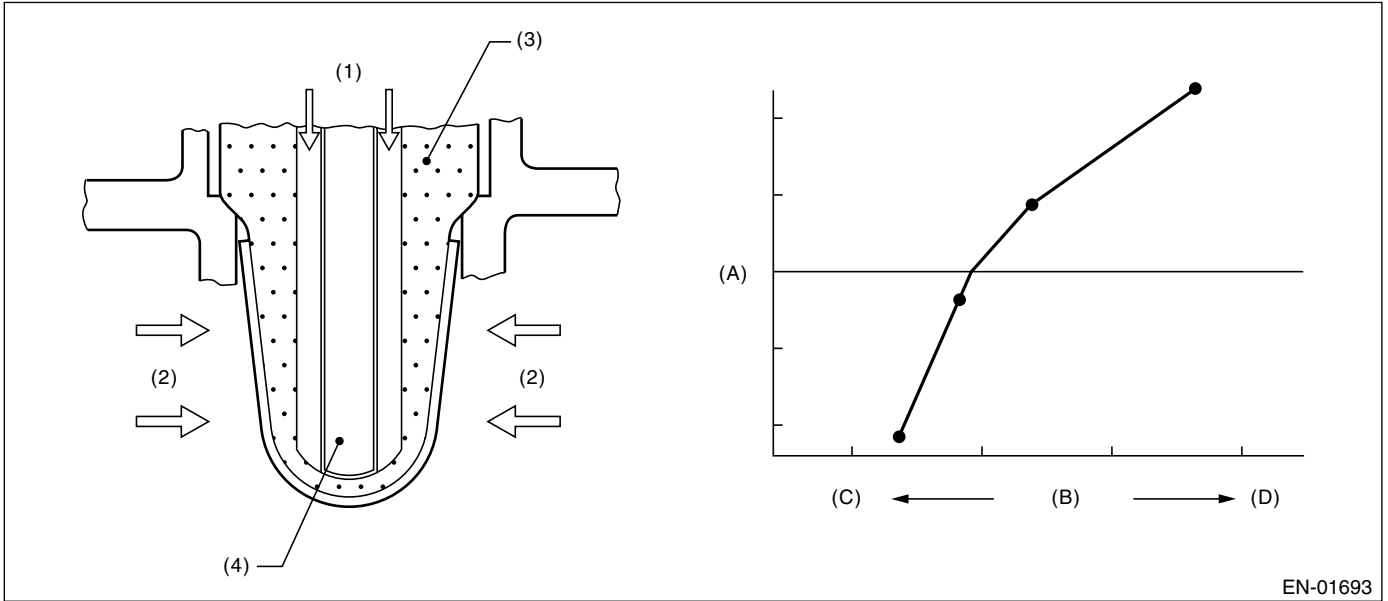
AC:DTC P0131 — O₂ SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1) —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of sensor.

Judge NG when the element impressed voltage is out of range, or the element current is out of range.

2. COMPONENT DESCRIPTION



EN-01693

- | | |
|----------------------|-------------------------|
| (1) Atmosphere | (A) Electromotive force |
| (2) Exhaust | (B) Air fuel ratio |
| (3) ZrO ₂ | (C) Lean |
| (4) Ceramic heater | (D) Rich |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing any malfunction criteria below becomes more than 1 second.

Judgment Value

Malfunction Criteria	Threshold Value
Input voltage	< 1.8 V
Input current	< -0.005 A

Time Needed for Diagnosis: 1 second

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor heater control: Not allowed to turned on the heater.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- A/F sub learning: Not allowed to calculate the A/F sub learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0 from 0.06 normally.
- Purge control: Not allowed to purge.

9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

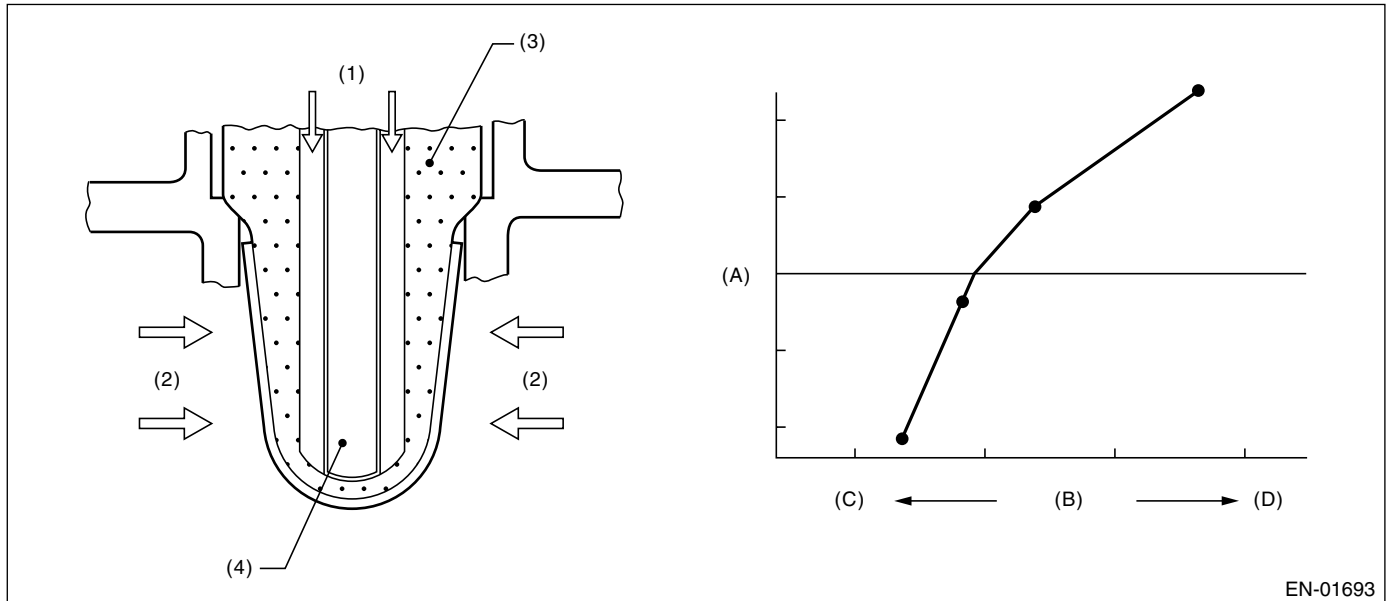
AD:DTC P0132 — O₂ SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1) —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of sensor.

Judge NG when the element impressed voltage is out of range, or the element current is out of range.

2. COMPONENT DESCRIPTION



EN-01693

- | | |
|----------------------|-------------------------|
| (1) Atmosphere | (A) Electromotive force |
| (2) Exhaust | (B) Air fuel ratio |
| (3) ZrO ₂ | (C) Lean |
| (4) Ceramic heater | (D) Rich |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing any malfunction criteria below becomes more than 1 second.

Judgment Value

Malfunction Criteria	Threshold Value
Input voltage	≥ 3.8 V
Input current	≥ 0.005 A

Time Needed for Diagnosis: 1 second

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor heater control: Not allowed to turned on the heater.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- A/F sub learning: Not allowed to calculate the A/F sub learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0 from 0.06 normally.
- Purge control: Not allowed to purge.

9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

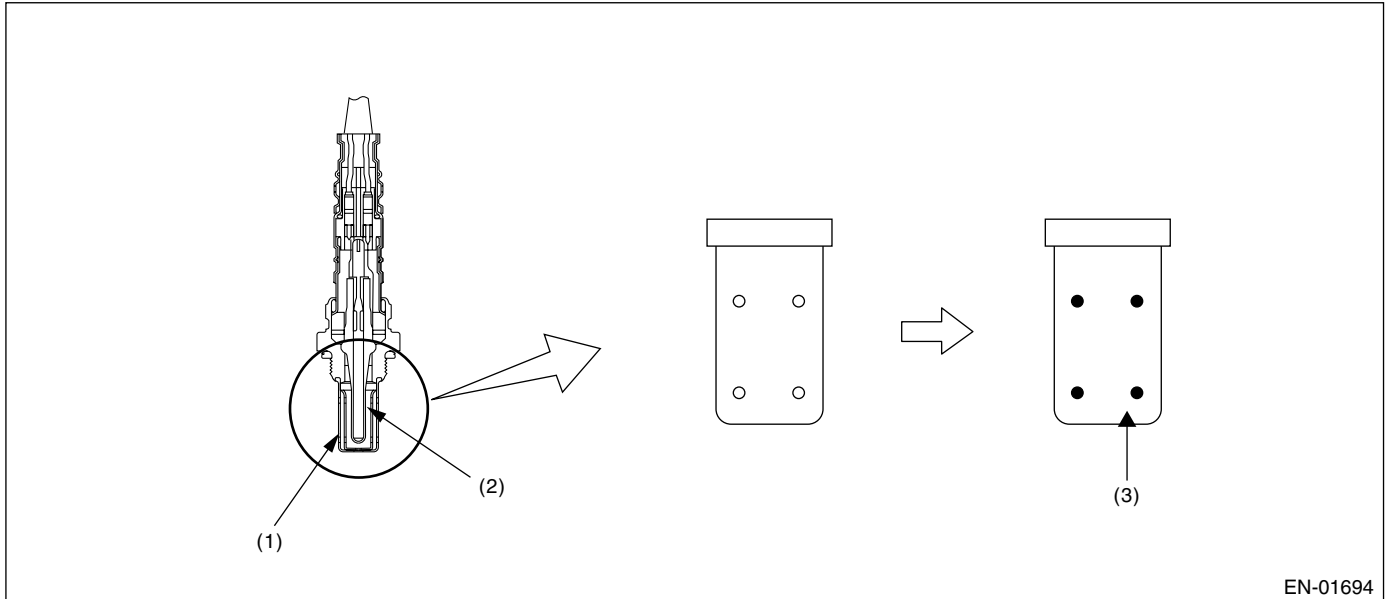
DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

AE:DTC P0133 — O₂ SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

Detect time-lag of front oxygen (A/F) sensor response. Front oxygen (A/F) sensor cover has some ventilation holes for exhaust gas. Clogged ventilation holes are diagnosed. When the holes are clogged, the A/F output variation becomes slow comparing with the actual A/F variation because oxygen which reaches the zirconia layer is insufficient. Therefore, if the cover has clogged holes, the rich to lean judgment in ECM is delayed when the change from rich to lean is caused.



EN-01694

(1) Cover

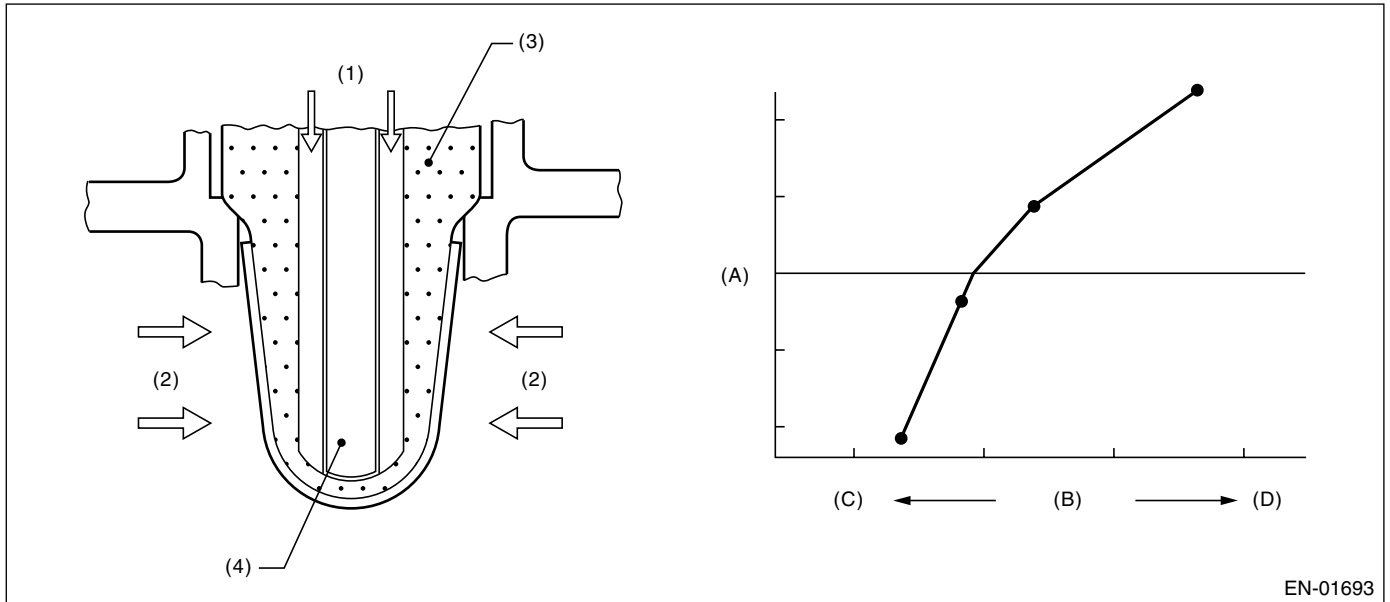
(2) Zirconia

(3) Clogging

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

2. COMPONENT DESCRIPTION



EN-01693

- | | |
|----------------------|-------------------------|
| (1) Atmosphere | (A) Electromotive force |
| (2) Exhaust | (B) Air fuel ratio |
| (3) ZrO ₂ | (C) Lean |
| (4) Ceramic heater | (D) Rich |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
All secondary parameter enable conditions	more than 1 second
Battery voltage	> 10.9 V
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Closed loop control with main feedback operating	operating
Impedance of front oxygen (A/F) sensor	0 ↔ 50 Ω
After engine starting	60 seconds or more
Engine coolant temperature	≥ 70°C (158°F)
Engine speed	1000 ↔ 3200 rpm
Vehicle speed	10 ↔ 120 km/h (6.21 ↔ 74.6 MPH)
Amount of intake air	10 ↔ 40 g (0.35 ↔ 1.41 oz)/s
Engine load change during 0.5 engine rev.	≤ 0.02 g (0.001 oz)/rev
Learning value of EVAP conc. during purge	≤ 0.2
Total time of operating canister purge	20 seconds or more

4. GENERAL DRIVING CYCLE

Perform diagnosis only once at a constant speed of 10 to 120 km/h (6.21 to 74.6 MPH) in 120 seconds after starting the engine.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Integrate the difference of f_{af} in every 128 milliseconds and difference of λ value.

After integrate 350 seconds, calculate the diagnosis value.

Judge NG when the malfunction criteria below are completed. Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
$para_{fca} = td2f_{af}/td2l_{md}$ where, $td2f_{af}(N) = td2f_{af}(n-1) + d2f_{af}(n) $ $td2l_{md}(N) = td2l_{md}(n-1) + d2l_{md}(n) $ add up for a total of 210 seconds $d2f_{af}(n) = (f_{af}(n) - f_{af}(n-1)) - (f_{af}(n-1) - f_{af}(n-2))$ $d2l_{md}(n) = (l_{md}(n) - l_{md}(n-1)) - (l_{md}(n-1) - l_{md}(n-2))$ f_{af} = main feedback compensation coefficient every 128 milliseconds l_{md} = output lambda every 128 milliseconds	≥ 0.12

Time Needed for Diagnosis: 350 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning correction: Not allowed to calculate.
- A/F sub learning correction: Not allowed to calculate.
- Correction when re-starting at high temperature: Normally minimum value 0.3 \rightarrow 0.
- Purge control: Not allowed to purge.

9. ECM OPERATING AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

MEMO:

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

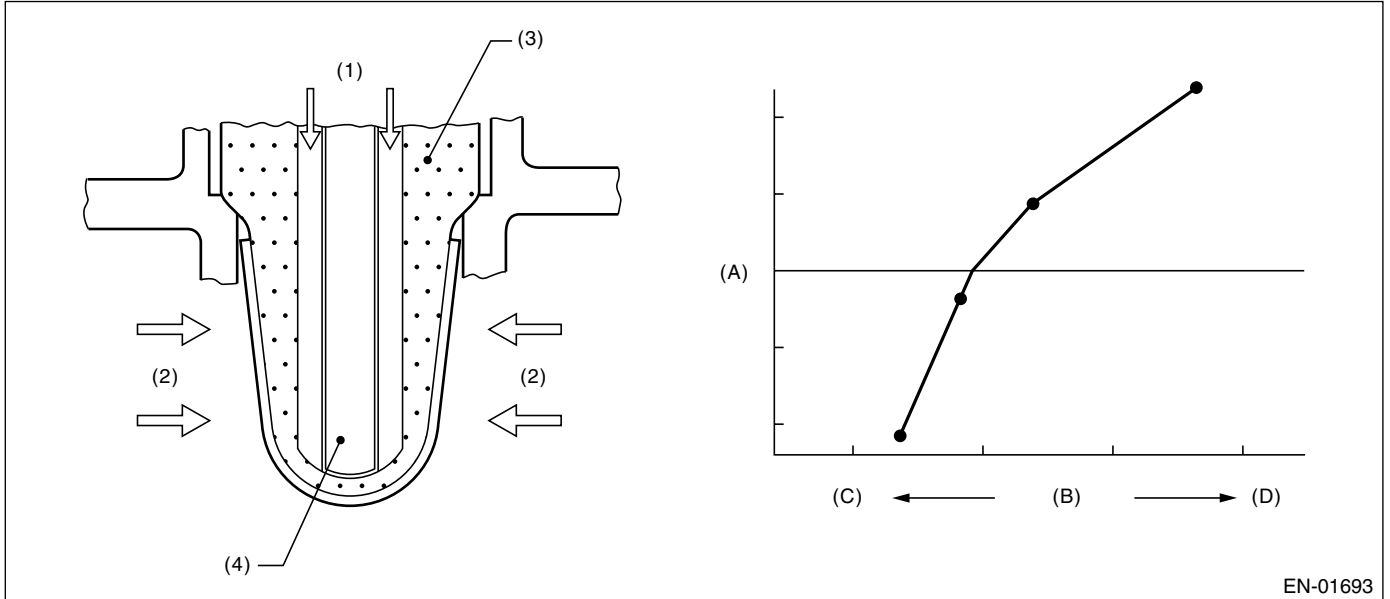
GENERAL DESCRIPTION

AF:DTC P0134 — O₂ SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1) —

1. OUTLINE OF DIAGNOSIS

Detect the open circuit of sensor.
Judge NG when the element impedance is large.

2. COMPONENT DESCRIPTION



EN-01693

- | | |
|----------------------|-------------------------|
| (1) Atmosphere | (A) Electromotive force |
| (2) Exhaust | (B) Air fuel ratio |
| (3) ZrO ₂ | (C) Lean |
| (4) Ceramic heater | (D) Rich |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Voltage	≥ 10.9 V
Time after engine starting	≥ 24 seconds
Variable amount of Front O ₂ (A/F) sensor heater control duty every 128 milliseconds	≥ 28000%
Front lambda sensor impedance	≥ 500 Ω

Time Needed for Diagnosis: 5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor heater control: Not allowed to turned on the heater.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- A/F sub learning: Not allowed to calculate the A/F sub learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0 from 0.06 normally.
- Purge control: Not allowed to purge.

9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

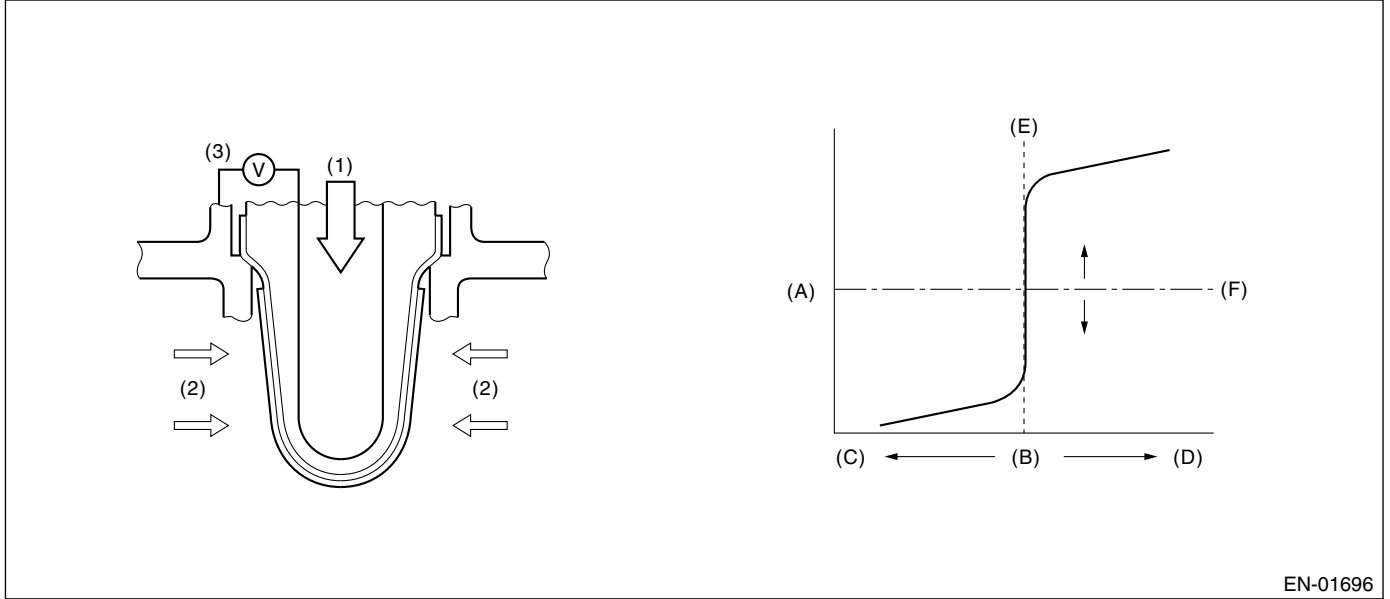
GENERAL DESCRIPTION

AG:DTC P0137 — O₂ SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2) —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of oxygen sensor open or short circuit. Judge NG when the oxygen sensor voltage may be abnormal from oxygen sensor voltage value with considering the conditions such as intake air amount, engine coolant temperature, main feedback control.

2. COMPONENT DESCRIPTION



EN-01696

- (1) Atmosphere
- (2) Exhaust
- (3) Electromotive force
- (A) Electromotive force
- (B) Air fuel ratio
- (C) Rich
- (D) Lean
- (E) Theoretical air fuel ratio
- (F) Comparative voltage

3. ENABLE CONDITION (USED ONLY FOR MALFUNCTION JUDGMENT)

Secondary Parameters	Enable Conditions
Closed loop control of oxygen sensor	In operation
Target output voltage of oxygen sensor	≥ 0.6 V
Amount of intake air	≥ 10 g/s
Engine coolant temperature	≥ 70°C (158°F)
Misfire detection during 200 engine revs.	< 5 times
Compensation factor for front oxygen (A/F) sensor	Not in limit value
Battery voltage	> 10.9 V
6 seconds or more fuel shut-off in decel. time	Experience

4. GENERAL DRIVING CYCLE

Perform the diagnosis once after starting the engine.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Max. output voltage	< 550 mV

Time Needed for Diagnosis: 200 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Low side diagnosis of oxygen sensor voltage	Incomplete
Max. output voltage	≥ 550 mV

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Sub feedback control: Not allowed

9. ECM OPERATING AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and malfunction standard value. (For test mode \$06)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

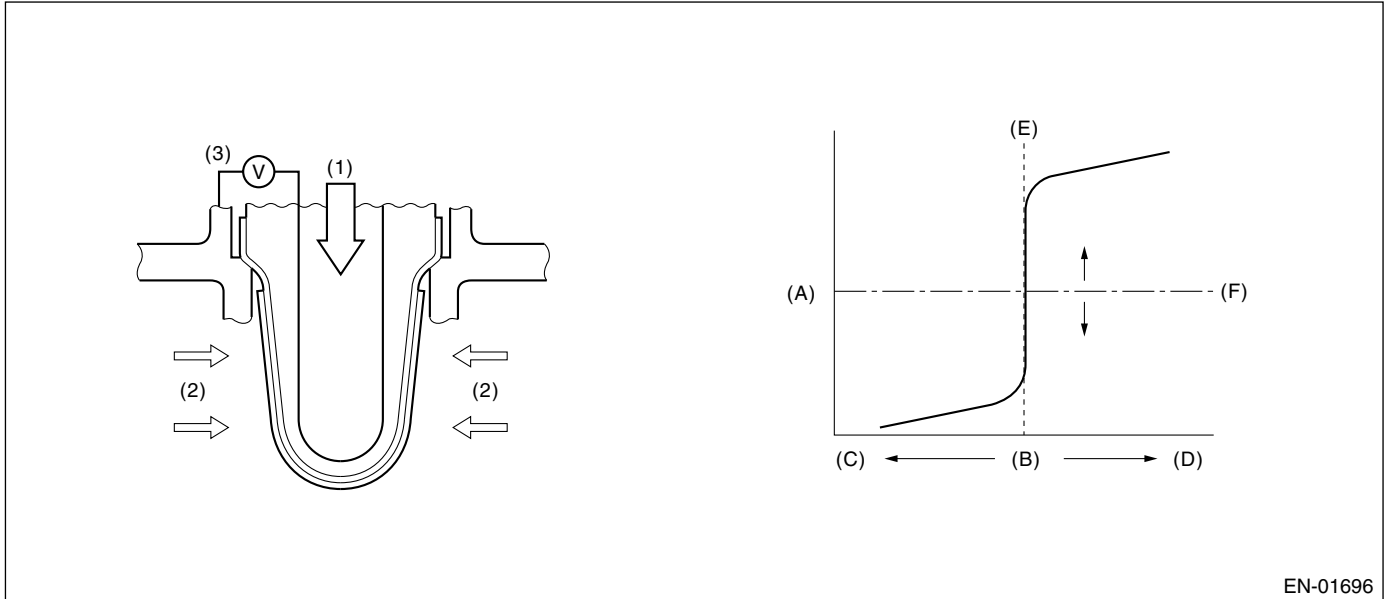
GENERAL DESCRIPTION

AH:DTC P0138 — O₂ SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2) —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of oxygen sensor open or short circuit. Judge NG when the oxygen sensor voltage may be abnormal with considering the conditions such as intake air amount, engine coolant temperature, main feedback control.

2. COMPONENT DESCRIPTION



EN-01696

- (1) Atmosphere
- (2) Exhaust
- (3) Electromotive force

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Rich

- (D) Lean
- (E) Theoretical air fuel ratio
- (F) Comparative voltage

3. ENABLE CONDITION (USED ONLY FOR MALFUNCTION JUDGMENT)

Secondary Parameters	Enable Conditions
Closed loop control of oxygen sensor	In operation
Target output voltage of oxygen sensor	≥ 0.6 V
Amount of intake air	≥ 10 g/s
Engine coolant temperature	≥ 70°C (158°F)
Misfire detection during 200 engine revs.	< 5 times
Compensation factor for front oxygen (A/F) sensor	Not in limit value
Battery voltage	> 10.9 V
6 seconds or more fuel shut-off in decel. time	Experience

4. GENERAL DRIVING CYCLE

Perform the diagnosis once after starting the engine.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Min. output voltage	> 250 mV

Time Needed for Diagnosis: 200 seconds

Malfunction Indicator Light Illumination: Detect when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
High side diagnosis of oxygen sensor voltage	Incomplete
Min. output voltage	≤ 250 mV

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Sub feedback control: Not allowed

9. ECM OPERATING AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and malfunction fiducial value. (For test mode \$06)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

AI: DTC P0139 — O₂ SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2)

1. OUTLINE OF DIAGNOSIS

Detect the slow response of rear oxygen sensor.

Judge NG when the Rich → Lean response diagnosis or Lean → Rich response diagnosis is NG and judge OK when both response diagnoses are OK.

[Rich → Lean diagnosis response]

(1) When the measured response time is larger than a threshold, since the A/F ratio is rich, the response time of the output change of O₂ sensor when changing from Rich to Lean is measured, and it judges with NG, and when small, it judges with OK.

(2) When O₂ sensor voltage at the time of a fuel shut-off in deceleration return is large (rich), it judges with NG.

[Lean → Rich diagnosis response]

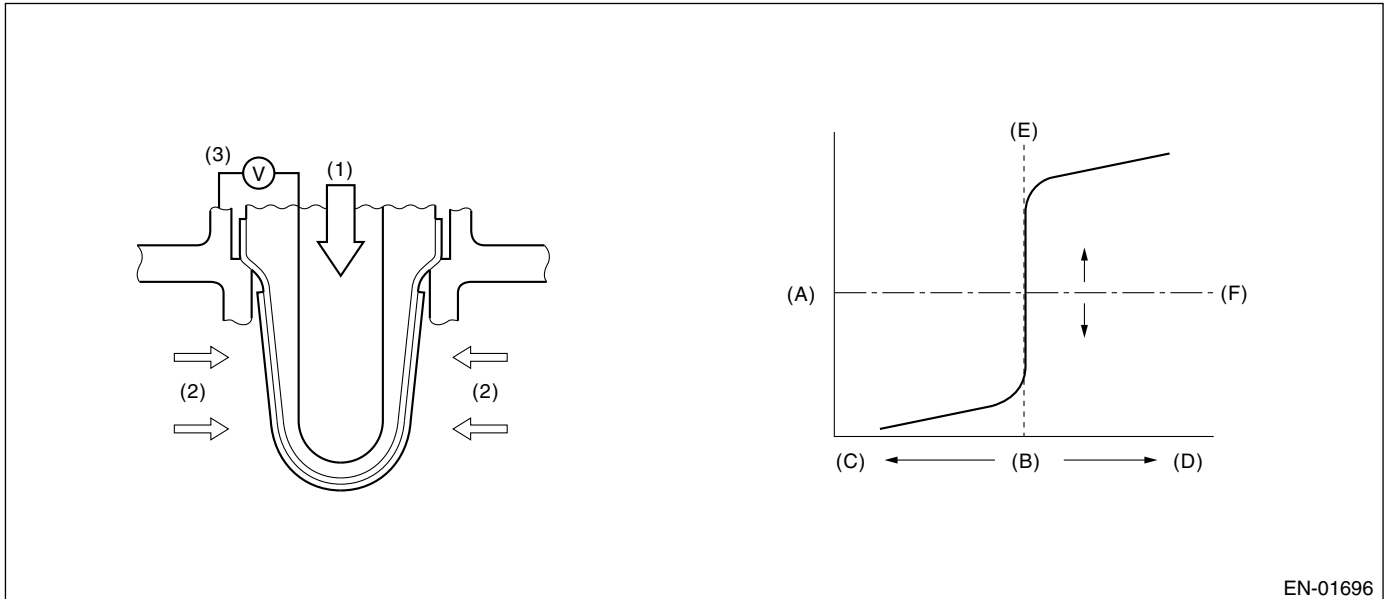
(1) The response time of output change of O₂ sensor when an A/F ratio changes from Lean to Rich is measured, and it is referred to as NG when the measured response time is larger than a threshold.

(2) It is referred to as NG when O₂ sensor voltage after recovery of fuel shut-off in deceleration is small and still small.

• Diagnostic Method

Measure the response time of the output change of the oxygen sensor when the A/F ratio changes from rich to lean. And Judge NG when the measured response time is larger than the threshold value.

2. COMPONENT DESCRIPTION



EN-01696

- (1) Atmosphere
- (2) Exhaust
- (3) Electromotive force

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Rich

- (D) Lean
- (E) Theoretical air fuel ratio
- (F) Comparative voltage

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

3. ENABLE CONDITION

- Rich → Lean response diagnosis

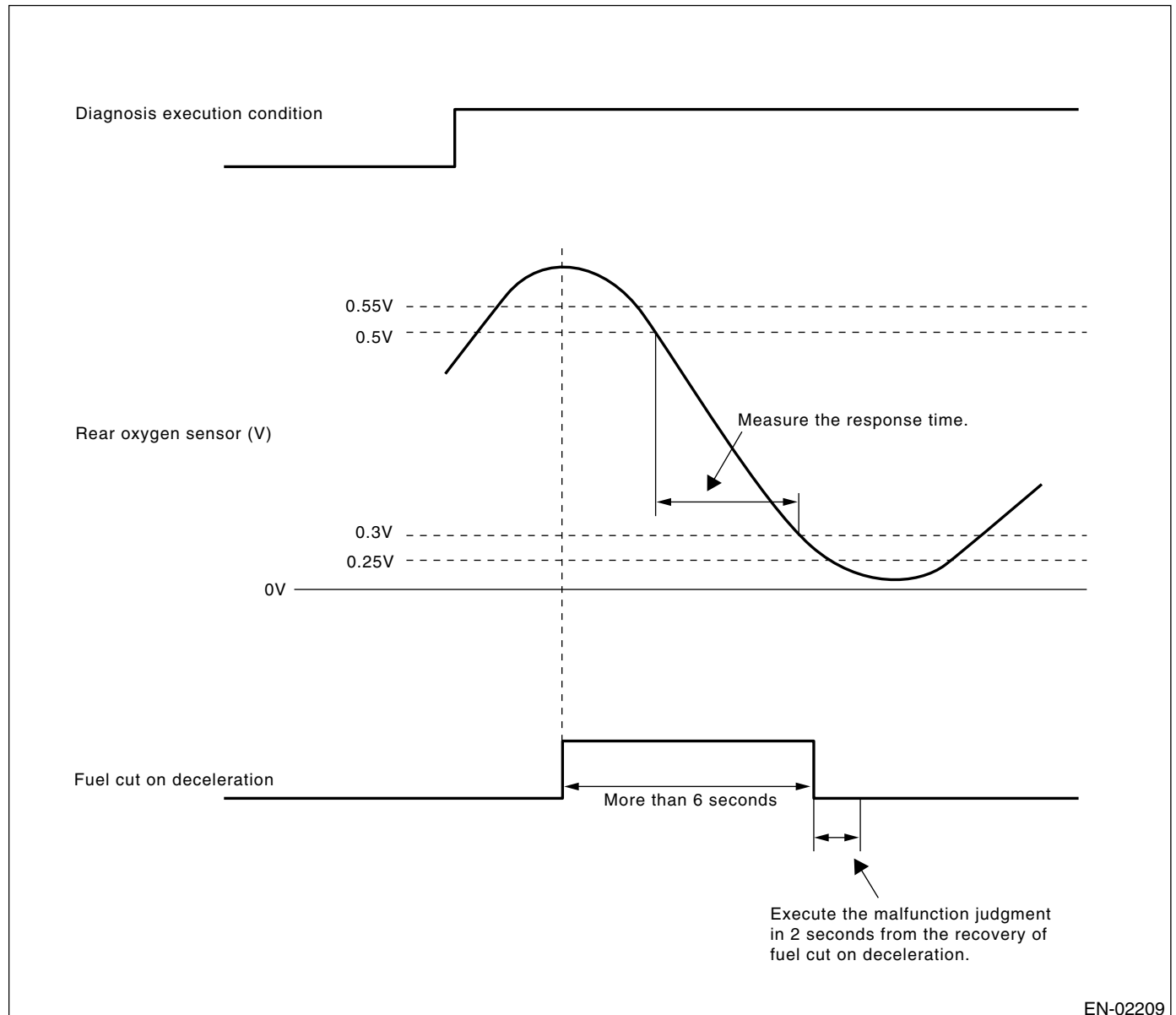
Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
A/F sub feedback control condition	Completed
6 seconds or more fuel shut-off indecel. time	Experienced
After fuel cut	≥ 2 seconds

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once when fuel shut-off in deceleration after rapid acceleration. (Pay attention to oxygen sensor voltage for the timing of deceleration.)

5. DIAGNOSTIC METHOD

When the oxygen sensor output voltage changes from 0.55 V (rich) to 0.25 V (lean), calculate the Min. value of response time regarded as judgment value while the output varies from 0.5 V to 0.3 V.



EN-02209

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

• Abnormality Judgment

(1) Judge NG when the judgment value is larger than the threshold value after fuel shut-off in deceleration. Response time (Diagnosis value) > Threshold value → Abnormal

NOTE:

Variation time of rear oxygen sensor output voltage is short during fuel shut-off in deceleration. Carry out the NG judgment only after the fuel shut-off in deceleration. As for OK judgment, without the condition of fuel shut-off in deceleration, judge OK if the value is below the threshold value.

Judge NG when the malfunction criteria below are completed in 2 seconds after the recovery of fuel shut-off in deceleration which requires 6 seconds or more.

(2) Judge NG when the O₂ sensor voltage after recovery of fuel shut-off in deceleration is large. Judge NG when fuel shut-off in deceleration is also long (6s or more), and although carried out the fuel shut-off in deceleration cut return, when O₂ sensor voltage is large (more than 0.55V).

• Judgment Value

Malfunction Criteria	Threshold Value
Shortest time change from rich (500 mV O ₂ output) to lean (300 mV) if voltage reduces from 550 mV to 250 mV.	> 0.698 milliseconds
Longest time to change to 550 mV	> 2 seconds

Time Needed for Diagnosis: 1 time

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgement

(1) Judge Normal when the response time (diagnostic value) is smaller than threshold (judgment value) when changing to lean since O₂ sensor voltage.

(2) A normal judging is not carried out.

• Judgment Value

Judge OK when the following standards value are completed.

Malfunction Criteria	Threshold Value
Change of the shortest time from rich (500 mV O ₂ output), when voltage decreases from 550 mV to 250 mV to lean (300 mV).	≤ 0.698 seconds

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Sub feedback control: Not allowed

9. ECM OPERATING AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

10. ENABLE CONDITION

- Lean → Rich response diagnosis

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

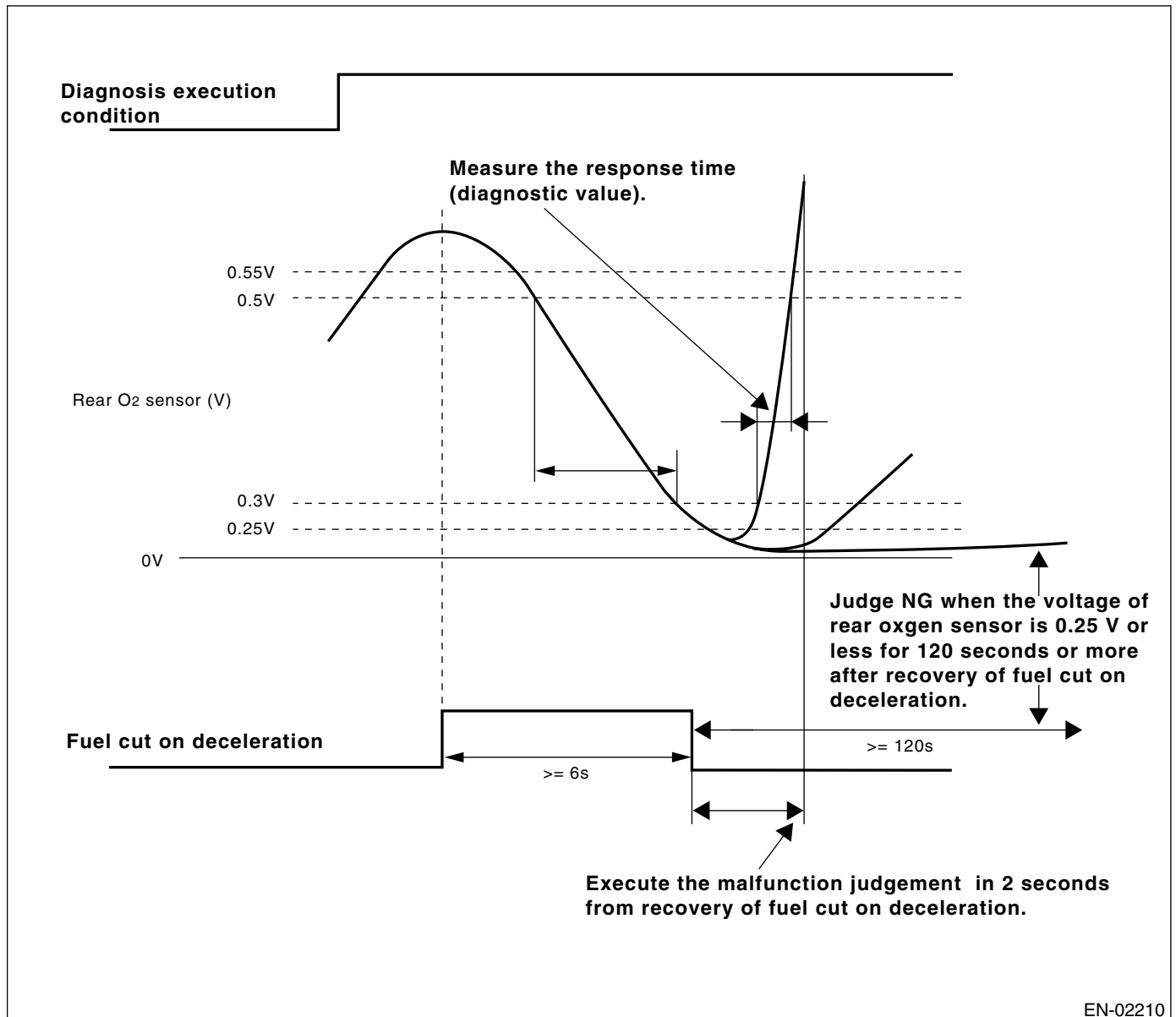
Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
A/F main feedback control condition	Completed
Deterioration diagnosis for oxygen sensor response	Not completed

11.GENERAL DRIVING CYCLE

Perform the diagnosis only once when fuel shut-off in deceleration after rapid acceleration. (Pay attention to oxygen sensor voltage for the timing of deceleration.)

12.DIAGNOSTIC METHOD

When the oxygen sensor output voltage changes from 0.25 V (lean) to 0.55 V (rich), calculate the Min. value of response time regarded as judgment value while the output varies from 0.3 V to 0.5 V.



• Abnormality Judgment

(1) Judge NG when the judgment value is larger than the threshold value after recovery of fuel shut-off in deceleration.

Response time (Diagnosis value) > Threshold value → Abnormal

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

(2) Judge NG when the O₂ sensor voltage after recovery of fuel shut-off in deceleration is small.

• Judgment Value

Malfunction Criteria	Threshold Value
Shortest time change from lean (300 mV O ₂ output) to rich (500 mV) if voltage reduces from 500 mV to 250 mV.	> 2 seconds
Longest time to change to 250 mV	> 120 seconds

Time Needed for Diagnosis: 1 time

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgement

(1) Judge Normal when the response time (diagnostic value) is smaller than threshold (judgment value) when changing to lean since O₂ sensor voltage.

Response Time (diagnosis value) ≤ Threshold value → Normal

(2) A normal judging is not carried out.

• Judgment Value

Judge OK when the following standards value are completed.

Malfunction Criteria	Threshold Value
Change of the shortest time from rich (300 mV O ₂ output), when voltage decreases from 550 mV to 250 mV to lean (500 mV).	≤ 0.698 seconds

13.DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

14.MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

15.FAIL SAFE

Sub feedback control: Not allowed

16.ECM OPERATING AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

MEMO:

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

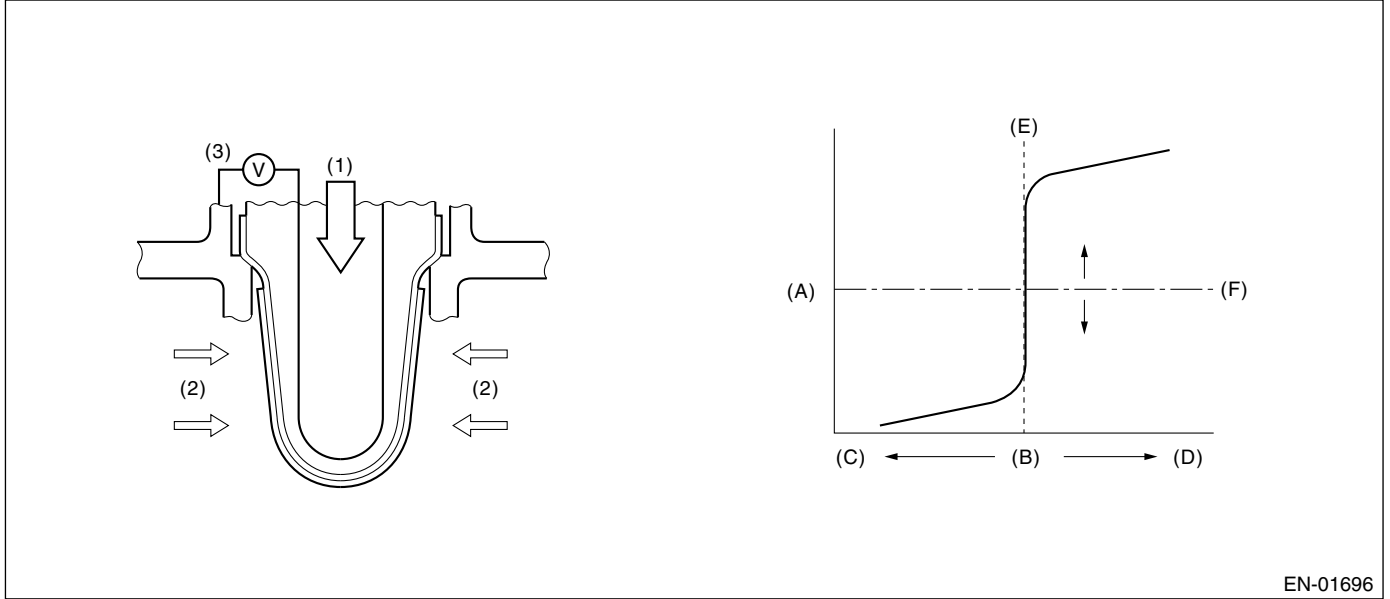
GENERAL DESCRIPTION

AJ:DTC P0143 — O₂ SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 3) —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of oxygen sensor open or short circuit. Judge NG when the oxygen sensor voltage may be abnormal from oxygen sensor voltage value with considering the conditions such as intake air amount, engine coolant temperature, main feedback control.

2. COMPONENT DESCRIPTION



- (1) Atmosphere
- (2) Exhaust
- (3) Electromotive force

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Rich

- (D) Lean
- (E) Theoretical air fuel ratio
- (F) Comparative voltage

3. ENABLE CONDITION (USED ONLY FOR MALFUNCTION JUDGMENT)

Secondary Parameters	Enable Conditions
Closed loop control of oxygen sensor	In operation (Both banks)
Target output voltage of oxygen sensor	≥ 0.6 V
Amount of intake air	≥ 30 g (1.06 oz)/s
Engine coolant temperature	≥ 70°C (158°F)
Misfire detection during 200 engine revs.	< 5 times
Compensation factor for front oxygen (A/F) sensor	Not in limit value (Both banks)
Battery voltage	> 10.9 V
6 seconds or more fuel shut-off in decel.	Experience

4. GENERAL DRIVING CYCLE

Perform the diagnosis once after starting the engine.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Max. output voltage	< 400 mV

Time Needed for Diagnosis: 320 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Low side diagnosis of rear oxygen sensor voltage	Incomplete
Max. output voltage	≥ 400 mV

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Sub feedback control: Not allowed

9. ECM OPERATING AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

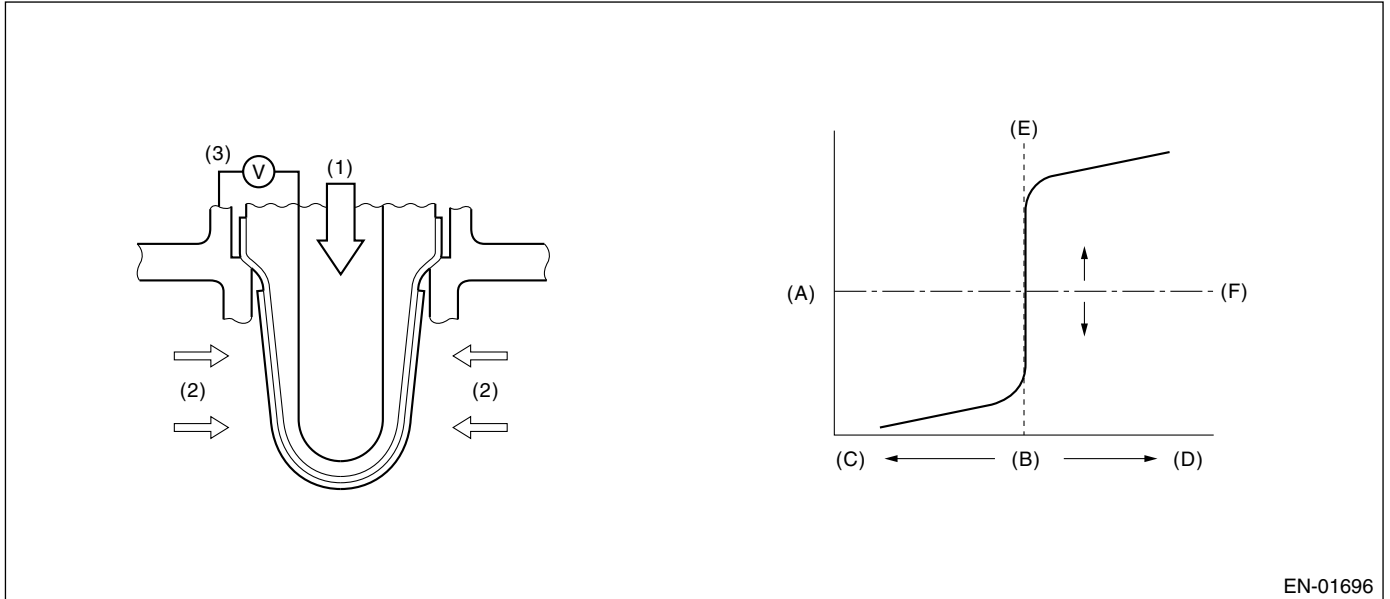
GENERAL DESCRIPTION

AK:DTC P0144 — O₂ SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 3) —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of oxygen sensor open or short circuit. Judge NG when the oxygen sensor voltage may be abnormal with considering the conditions such as intake air amount, engine coolant temperature, main feedback control.

2. COMPONENT DESCRIPTION



EN-01696

- (1) Atmosphere
- (2) Exhaust
- (3) Electromotive force

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Rich

- (D) Lean
- (E) Theoretical air fuel ratio
- (F) Comparative voltage

3. ENABLE CONDITION (USED ONLY FOR MALFUNCTION JUDGMENT)

Secondary Parameters	Enable Conditions
Closed loop control of oxygen sensor	In operation (Both banks)
Target output voltage of oxygen sensor	≥ 0.6 V
Amount of intake air	≥ 30 g (1.06 oz)/s
Engine coolant temperature	≥ 70°C (158°F)
Misfire detection during 200 engine revs.	< 5 times
Compensation factor for front oxygen (A/F) sensor	Not in limit value (Both banks)
Battery voltage	> 10.9 V
Cumulative time for completing the conditions with main feedback control	≥ 320 seconds
6 seconds or more fuel shut-off in decel. from engine speed of 1700 rpm or more	Experienced

4. GENERAL DRIVING CYCLE

Perform the diagnosis once after starting the engine.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Min. output voltage	> 150 mV

Time Needed for Diagnosis: 320 seconds

Malfunction Indicator Light Illumination: Detect when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
High side diagnosis of rear oxygen sensor voltage	Incomplete
Min. output voltage	≤ 150 mV

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Sub feedback control: Not allowed

9. ECM OPERATING AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

AL:DTC P0151 — O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 2 SENSOR 1) —

NOTE:

For the detection standard, refer to P0131. <Ref. to GD(H4SO U5)-62, DTC P0131 — O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

AM:DTC P0152 — O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 2 SENSOR 1)

NOTE:

For the detection standard, refer to P0132. <Ref. to GD(H4SO U5)-64, DTC P0132 — O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

AN:DTC P0153 — O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 2 SENSOR 1) —

NOTE:

For the detection standard, refer to P0133. <Ref. to GD(H4SO U5)-66, DTC P0133 — O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

AO:DTC P0154 — O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 2 SENSOR 1) —

NOTE:

For the detection standard, refer to P0134. <Ref. to GD(H4SO U5)-70, DTC P0134 — O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

AP:DTC P0157 — O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 2 SENSOR 2) —

NOTE:

For the detection standard, refer to P0137. <Ref. to GD(H4SO U5)-72, DTC P0137 — O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

AQ:DTC P0158 — O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 2 SENSOR 2)

NOTE:

For the detection standard, refer to P0138. <Ref. to GD(H4SO U5)-74, DTC P0138 — O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

AR:DTC P0159 — O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 2 SENSOR 2) —

NOTE:

For the detection standard, refer to P0139. <Ref. to GD(H4SO U5)-76, DTC P0139 — O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

MEMO:

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

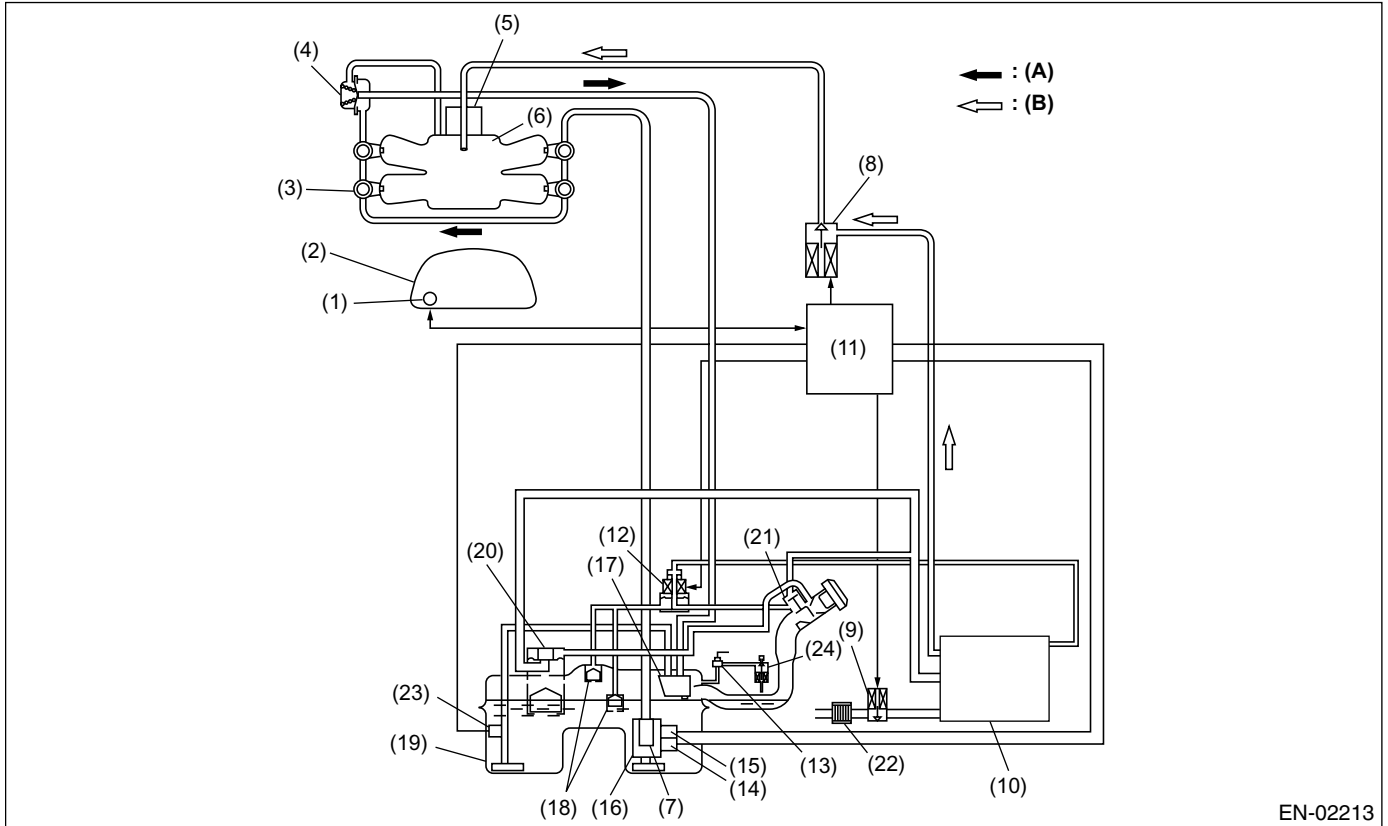
GENERAL DESCRIPTION

AS:DTC P0171 — SYSTEM TOO LEAN (BANK 1) —

1. OUTLINE OF DIAGNOSIS

Detect the fuel system malfunction by the amount of main feedback control.

• Fuel System Diagnosis



EN-02213

- | | | |
|----------------------------------|--------------------------------------|---|
| (1) Fuel meter | (10) Canister | (19) Fuel tank |
| (2) Combination meter | (11) Engine control module (ECM) | (20) Vent valve |
| (3) Fuel injector | (12) Pressure control solenoid valve | (21) Shut-off valve |
| (4) Pressure regulator | (13) Fuel tank pressure sensor | (22) Drain filter |
| (5) Throttle body | (14) Fuel temperature sensor | (23) Fuel sub level sensor |
| (6) Intake manifold | (15) Fuel level sensor | (24) Tank pressure switching solenoid valve |
| (7) Fuel filter | (16) Fuel pump | (A) Fuel line |
| (8) Purge control solenoid valve | (17) Jet pump | (B) Evaporation fuel line |
| (9) Drain valve | (18) Fuel cut valve | |

• Diagnostic Method

Fuel system is diagnosed by comparing the target air fuel ratio calculated by ECM with the actual air fuel ratio measured by sensor.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

2. ENABLE CONDITION

- Lean side

Secondary Parameters	Enable Conditions
A/F main learning system	In operation
Engine coolant temperature	$\geq 70^{\circ}\text{C}$ (158°F)
Intake air amount	\geq Map 5
Intake air change during 0.5 engine rev.	≤ 0.02 g (0.001 oz)/rev
Learning value of EVAP conc. during purge	< 0.1
Cumulative time of canister purge after engine start	20 seconds or more
Continuous period after canister purge starting	30 seconds or more

Map 5

Engine speed (rpm)	idle	650	1000	1500	2000	2500	3000	3500	4000	4500
Measured value (g (oz)/rev)	NA	0,218 (0.008)	0.216 (0.008)	0.199 (0.007)	0.203 (0.007)	0.206 (0.007)	0.196 (0.007)	0.195 (0.007)	0.21 (0.007)	0.217 (0.008)

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at engine idling after warm-up or a constant speed.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge that the fuel system malfunction occurs when the time during completing the malfunction criteria below continues 30 seconds or more by comparing the diagnosed value (fsobd) with threshold value.

• Judgment Value

Malfunction Criteria	Threshold Value
$\text{fsobd} = (\text{sglmd} - \text{tglm da}) + \text{faf} + \text{flaf}$ where, sglmd = measured lambda tglm da = target lambda faf = main feedback compensation coefficient every 64 milliseconds flaf = main feedback learning compensation coefficient	$\geq \text{fsobdL1}$ See Map 4 fsobdL1 = lean side threshold value of fsobd

Map 4 Threshold value for fuel system malfunction criteria

Amount of air [g(oz)/s]	0 (0)	3.2 (0.113)	6.4 (0.226)	9.6 (0.339)	12.8 (0.451)	16 (0.564)	19.2 (0.677)
fsobdL1 (%)	40	40	33.2	26.5	26.5	26.5	26.5

Time Needed for Diagnosis: 10 seconds \times 3 times

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when the malfunction criteria below are continued for 10 seconds.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

• Judgment Value

Malfunction Criteria	Threshold Value
$fsobd = (sglmd - tglmda) + faf + flaf$	< 19%

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When OK with similar drive in 3 driving cycles.
- When "Clear Memory" was performed

7. FAIL SAFE

None

8. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

MEMO:

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

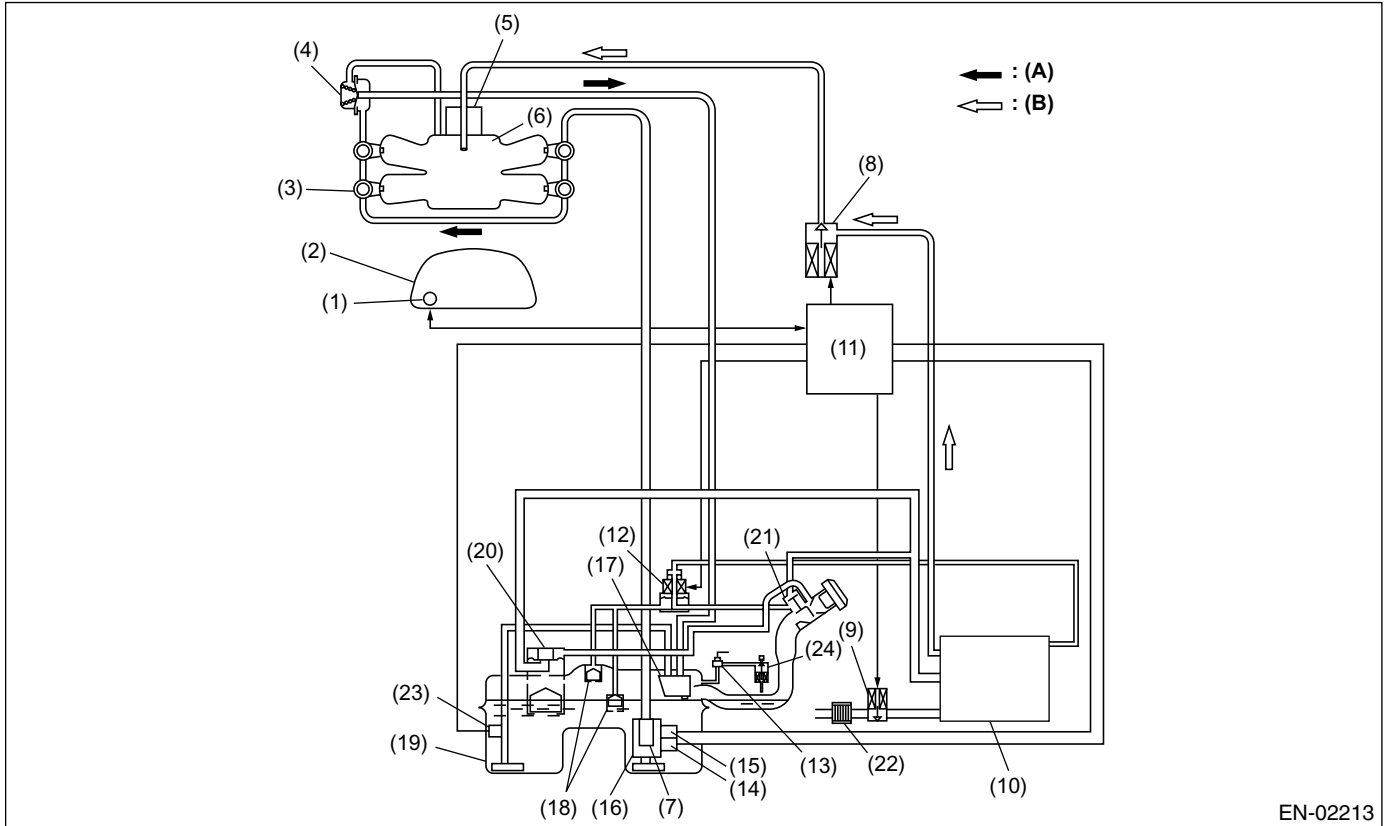
GENERAL DESCRIPTION

AT:DTC P0172 — SYSTEM TOO RICH (BANK 1) —

1. OUTLINE OF DIAGNOSIS

Detect the fuel system malfunction by the amount of main feedback control.

• Fuel System Diagnosis



EN-02213

- | | | |
|----------------------------------|--------------------------------------|---|
| (1) Fuel meter | (10) Canister | (19) Fuel tank |
| (2) Combination meter | (11) Engine control module (ECM) | (20) Vent valve |
| (3) Fuel injector | (12) Pressure control solenoid valve | (21) Shut-off valve |
| (4) Pressure regulator | (13) Fuel tank pressure sensor | (22) Drain filter |
| (5) Throttle body | (14) Fuel temperature sensor | (23) Fuel sub level sensor |
| (6) Intake manifold | (15) Fuel level sensor | (24) Tank pressure switching solenoid valve |
| (7) Fuel filter | (16) Fuel pump | (A) Fuel line |
| (8) Purge control solenoid valve | (17) Jet pump | (B) Evaporation line |
| (9) Drain valve | (18) Fuel cut valve | |

• Diagnostic Method

Fuel system is diagnosed by comparing the target air fuel ratio calculated by ECM with the actual air fuel ratio measured by sensor.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
A/F main learning system	In operation
Engine coolant temperature	≥ 70°C (158°F)
Intake air amount	≥ Map 5
Intake air change during 0.5 engine rev.	≤ 0.02 g (0.001 oz)/rev
Learning value of EVAP conc. during purge	< 0.1
Cumulative time of canister purge after engine start	20 seconds or more
Continuous period after canister purge starting	30 seconds or more

Map 5

Engine speed (rpm)	idle	650	1000	1500	2000	2500	3000	3500	4000	4500
Measured value (g (oz)/rev)	NA	0.218 (0.008)	0.216 (0.008)	0.199 (0.007)	0.203 (0.007)	0.206 (0.007)	0.196 (0.007)	0.195 (0.007)	0.21 (0.007)	0.217 (0.008)

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at engine idling after warm-up or a constant speed.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge that the fuel system malfunction occurs when the time during completing the malfunction criteria below continues 30 seconds or more by comparing the diagnosed value (fsobd) with threshold value.

• Judgment Value

Malfunction Criteria	Threshold Value
$fsobd = (sglmd - tglmda) + faf + flaf$ where, sglmd = measured lambda tglmda = target lambda faf = main feedback compensation coefficient every 64 milliseconds flaf = main feedback learning compensation coefficient	$\leq fsobdR1$ See Map 4 fsobdR1 = rich side threshold value of fsobd

Map 4 Threshold value for fuel system malfunction criteria for System E

Amount of air [g(oz)/s]	0 (0)	3.2 (0.113)	6.4 (0.226)	9.6 (0.339)	12.8 (0.451)	11.7 (0.413)	19.2 (0.677)
fsobdR1 (%)	-40	-40	-33.2	-26.5	-26.5	-26.5	-26.5

Time Needed for Diagnosis: 10 seconds × 3 times

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when the malfunction criteria below are continued for 10 seconds.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

• Judgment Value

Malfunction Criteria	Threshold Value
$fsobd = (sglmd - tglmda) + faf + flaf$	$\geq -20\%$

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When OK with similar drive in 3 drive cycles.
- When "Clear Memory" was performed

7. FAIL SAFE

- Purge control solenoid valve control: Not allowed to purge.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.

8. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

AU:DTC P0174 — SYSTEM TOO LEAN (BANK 2) —

NOTE:

For the detection standard, refer to P0171. <Ref. to GD(H4SO U5)-88, DTC P0171 — SYSTEM TOO LEAN (BANK 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

AV:DTC P0175 — SYSTEM TOO RICH (BANK 2) —

NOTE:

For the detection standard, refer to P0172. <Ref. to GD(H4SO U5)-92, DTC P0172 — SYSTEM TOO RICH (BANK 1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

AW:DTC P0181 — FUEL TEMPERATURE SENSOR “A” CIRCUIT RANGE/PERFORMANCE —

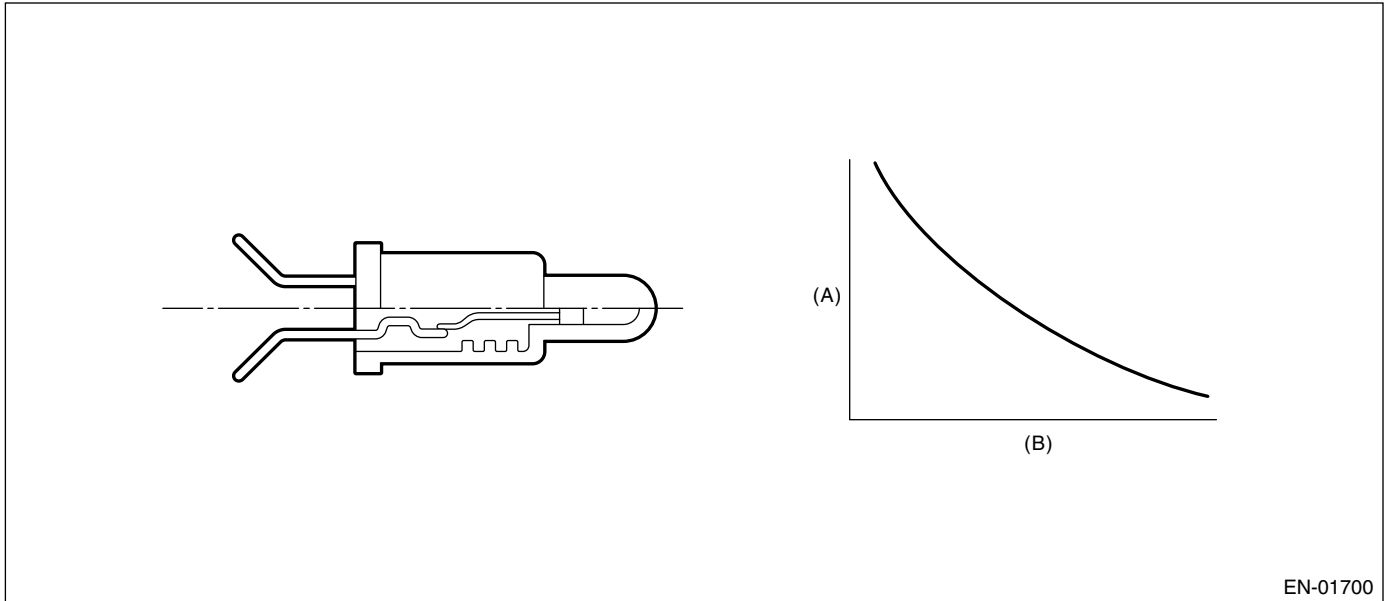
1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel temperature sensor output property. Perform the diagnosis in two methods; namely, drift diagnosis and stuck diagnosis. Judge NG when either of them results in NG, and judge OK when both of them result in OK.

• Drift Diagnosis

Normally fuel temperature is lower than engine coolant temperature. When the fuel temperature becomes higher than the engine coolant temperature, the range is considered to be shifted, and make an NG judgment.

2. COMPONENT DESCRIPTION



EN-01700

(A) Resistance (Ω)

(B) Fuel temperature $^{\circ}\text{C}$ ($^{\circ}\text{F}$)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 120 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Fuel level	$\geq 9.6 \text{ } \ell$ (2.54 US gal, 2.11 Imp gal)
After engine starting	20 seconds or more
Engine coolant temperature – engine coolant temperature at engine starting	$> 10^{\circ}\text{C}$ (18°F)
Fuel temperature – engine coolant tem- perature	$\geq 10^{\circ}\text{C}$ (18°F)
Battery voltage	$> 10.9 \text{ V}$

Time Needed for Diagnosis: 120 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Fuel level	$\geq 9.6 \text{ } \ell$ (2.54 US gal, 2.11 Imp gal)
After engine starting	20 seconds or more
Engine coolant temperature – engine coolant temperature at engine starting	$> 10^{\circ}\text{C}$ (18°F)
Fuel temperature – engine coolant tem- perature	$< 10^{\circ}\text{C}$ (18°F)
Battery voltage	$> 10.9 \text{ V}$

• Stuck Diagnosis

If the fuel temperature which might rise along with the engine idling (the cumulative amount of intake air after engine starting is large) does not increase, the engine is considered to be stuck and make an NG judgment.

6. ENABLE CONDITION

Secondary Parameters	Enable Conditions
After engine starting	20 seconds or more
Battery voltage	$> 10.9 \text{ V}$

7. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 20 seconds or more after starting the engine.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

8. DIAGNOSTIC METHOD

- **Abnormality Judgment**

Judge NG when the malfunction criteria below are completed.

- **Judgment Value**

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	≥ 551 kg (1215 lb)
Fuel temperature difference between Max. and Min.	$< 3^{\circ}\text{C}$ (5.4°F)

Time Needed for Diagnosis: To be determined.

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

- **Normality Judgment**

Judge OK when the malfunction criteria below are completed.

- **Judgment Value**

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	≥ 551 kg (1215 lb)
Fuel temperature difference between Max. and Min.	$\geq 3^{\circ}\text{C}$ (5.4°F)

9. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

10. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

11. FAIL SAFE

None

12. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

MEMO:

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

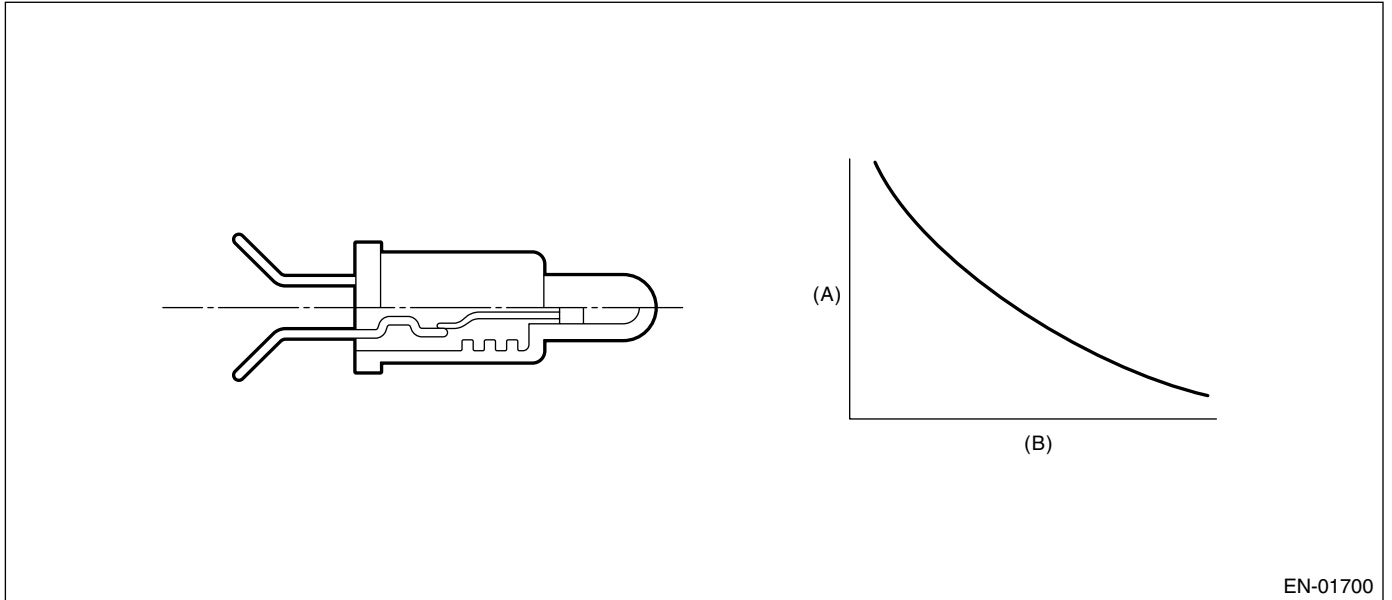
GENERAL DESCRIPTION

AX:DTC P0182 — FUEL TEMPERATURE SENSOR “A” CIRCUIT LOW INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel temperature sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(A) Resistance (Ω)

(B) Fuel temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.165 V
Battery voltage	≥ 10.9 V

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK when the cumulative time until completing the malfunction criteria below becomes more than 2.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.165 V
Battery voltage	≥ 10.9 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

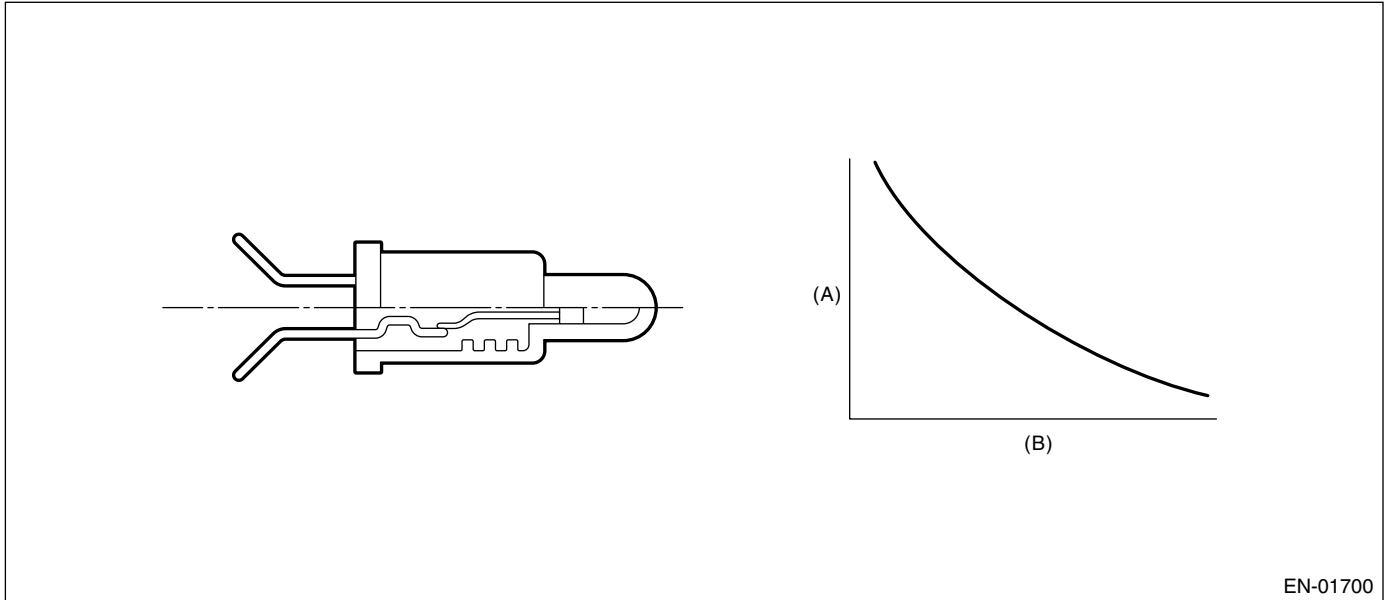
GENERAL DESCRIPTION

AY:DTC P0183 — FUEL TEMPERATURE SENSOR “A” CIRCUIT HIGH INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel temperature sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



(A) Resistance (Ω)

(B) Fuel temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	$\geq 4.716 \text{ V}$
Battery voltage	$\geq 10.9 \text{ V}$

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK when the cumulative time until completing the malfunction criteria below becomes more than 2.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	$< 4.716 \text{ V}$
Battery voltage	$\geq 10.9 \text{ V}$

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

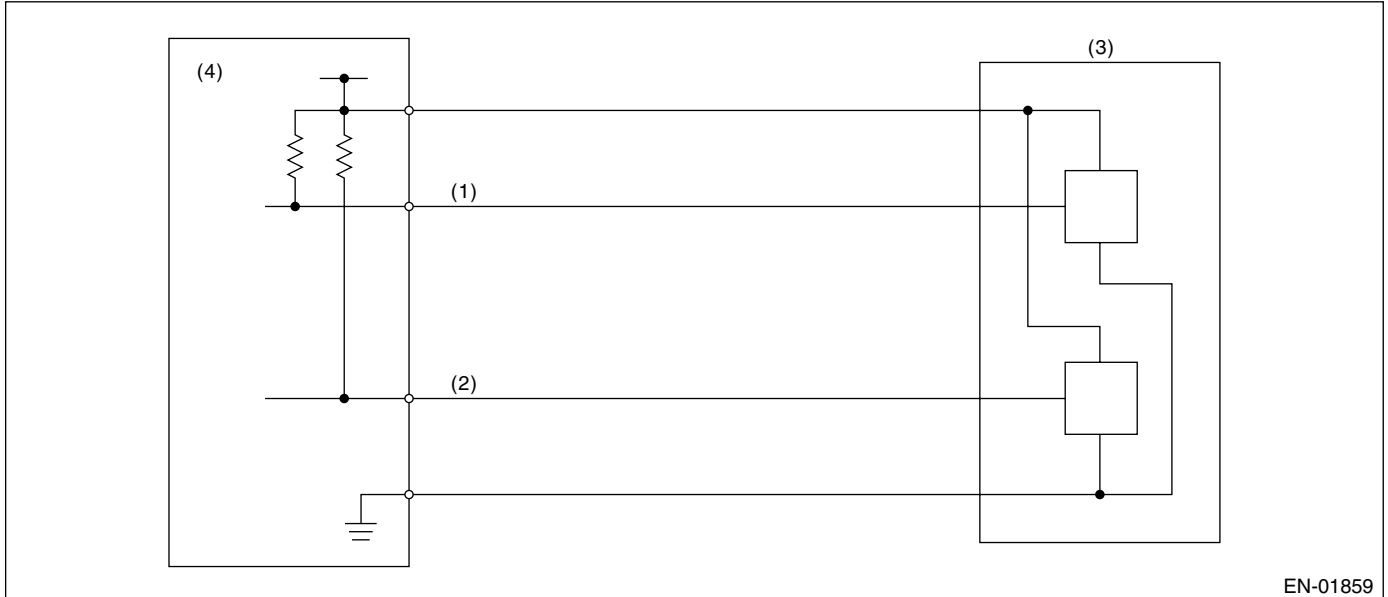
GENERAL DESCRIPTION

AZ:DTC P0222 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT LOW INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 2.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



EN-01859

- (1) Throttle position sensor 1 signal (3) Throttle position sensor
(2) Throttle position sensor 2 signal (4) Engine control module (ECM)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≥ 0.749 V

Time Needed for Diagnosis: 24 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only engine stop)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

8. FAIL SAFE

Stop power distribution to electric control throttle motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

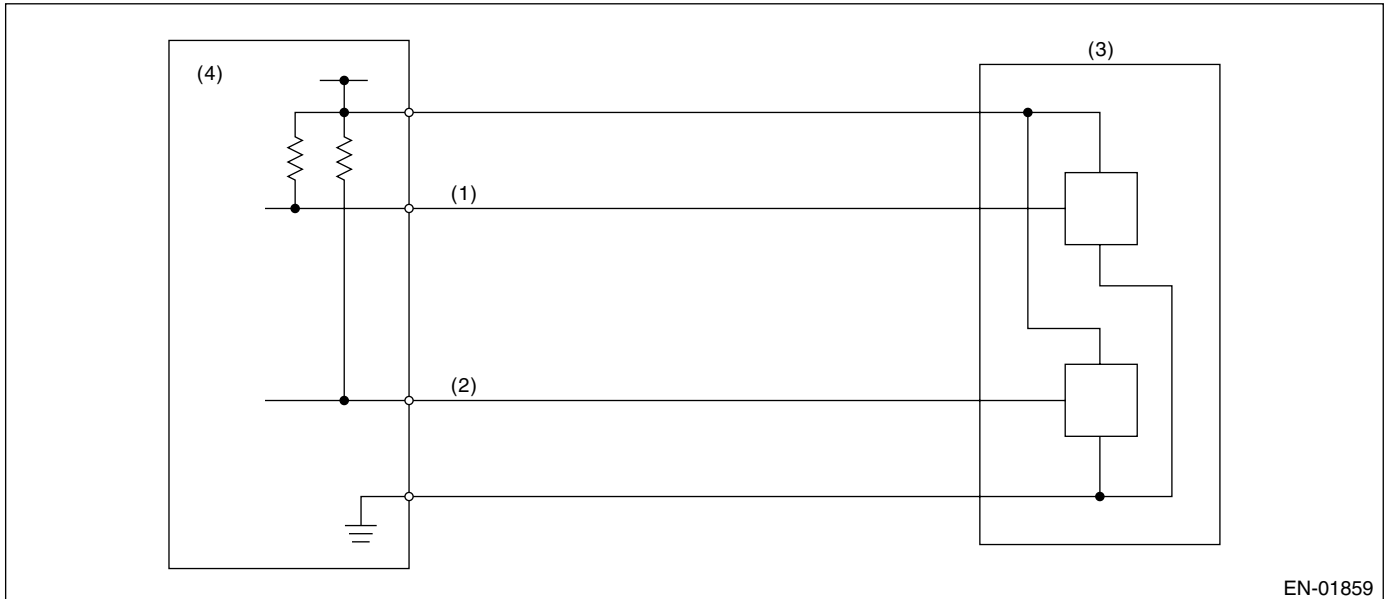
GENERAL DESCRIPTION

BA:DTC P0223 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT HIGH INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 2.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



EN-01859

- | | |
|---------------------------------------|---------------------------------|
| (1) Throttle position sensor 1 signal | (3) Throttle position sensor |
| (2) Throttle position sensor 2 signal | (4) Engine control module (ECM) |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≤ 4.747 V

Time Needed for Diagnosis: 24 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only engine stop)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

8. FAIL SAFE

Stop power distribution to electric control throttle motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

BB:DTC P0301 — CYLINDER 1 MISFIRE DETECTED —

1. OUTLINE OF DIAGNOSIS

Detect whether the misfire occurred or not. (Revolution fluctuation method) Monitoring the misfire which influences exhaust deterioration (1.5 times of FTP) and catalyst damage is made obligatory by the law. Misfire affecting these two has three patterns below.

- Intermittent misfire (The same cylinder misfires in random, or different cylinders misfire in random.): FTP 1.5 times misfire
- Every time misfire (The same cylinder misfires every time.): FTP 1.5 times misfire, Catalyst damage misfire

The following detecting methods are adopted for these detection.

- 1) Intermittent misfire: FTP 1.5 times misfire
 - 180° Interval Difference Method (MT: 1,800 rpm or less; AT: None)
 - 360° Interval Difference Method (whole range)
 - 720° Interval Difference Method (3,000 rpm or less)
- 2) Every time misfire: FTP 1.5 times misfire, Catalyst damage misfire
 - 360° Interval Difference Method

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
All secondary parameter enable conditions	More than 1 second
Intake manifold pressure change during 0.5 engine rev.	< 11.3 kPa (85 mmHg, 3.35 inHg)
Engine speed change	< 700 rpm/32 milliseconds
Throttle position change during 16 milliseconds	< 8°
Fuel shut-off function	Not operating
Atmospheric pressure	≥ 75.0 kPa (563 mmHg, 22.2 inHg)
Fuel level	≥ 9.6 ℓ (2.54 US gal, 2.11 Imp gal)
AT torque control	Not in operation
Air condition	No switching ON ↔ OFF
Radiator fan	No switching ON ↔ OFF
Power steering switch	No switching ON ↔ OFF
Starter	ON, or OFF, or change from ON to OFF
Evaporative system leak check	Not in operation
Engine speed	462.5 — 6500 rpm
Intake manifold pressure	> Map 3 or more
Battery voltage	≥ 8 V
Conclusion of fuel parameter	Not supervolatile

Map3

MT (Vehicle Speed < 64.4 km/h (40 MPH))

rpm	700	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500
kPa	25.6	23.2	22.2	22.8	21.9	23.5	26.9	29.4	30.9	32.5	37.3	42.6	45.1
(mmHg, inHg)	(194.8, 7.67)	(174.1, 6.85)	(166.8, 6.57)	(171, 6.73)	(164.3, 6.47)	(175.9, 6.92)	(201.6, 7.94)	(220.5, 8.68)	(232.1, 9.14)	(243.5, 9.59)	(280.1, 11.03)	(319.8, 12.59)	(338, 13.31)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

MT (Vehicle Speed \geq 64.4 km/h (40 MPH))

rpm	700	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500
kPa (mmHg, inHg)	36.8 (276, 10.87)	33.3 (250, 9.84)	33.3 (250, 9.84)	35.2 (264, 10.39)	34.4 (258, 10.16)	37.1 (278, 10.94)	37.3 (280, 11.02)	37.2 (279, 10.98)	37.5 (281, 11.06)	37.4 (280.5, 11.04)	37.4 (280.1, 11.03)	42.6 (319.8, 12.59)	45.1 (338, 13.31)

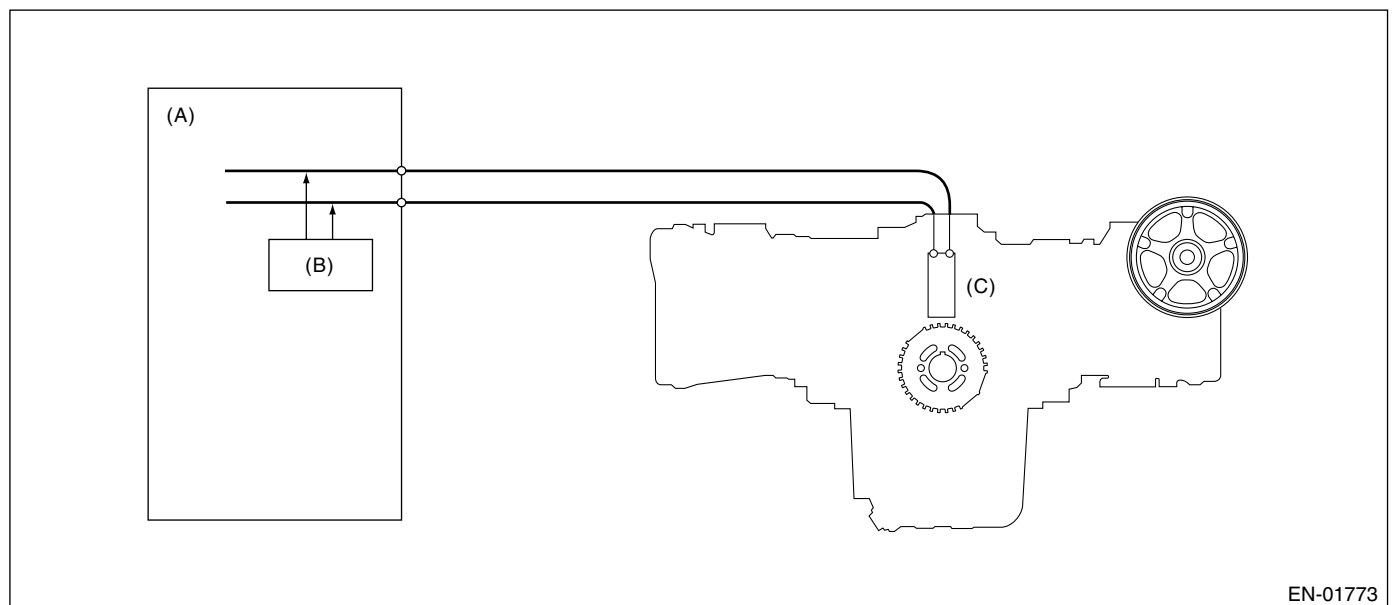
AT

rpm	700	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500
kPa (mmHg, inHg)	27.6 (207, 8.15)	24.0 (180, 7.09)	23.1 (173, 6.81)	23.9 (179, 7.05)	22.8 (171, 6.73)	24.1 (181, 7.13)	27.3 (204.6, 8.06)	29.8 (223.5, 8.78)	32.7 (245.1, 9.65)	34.2 (256.5, 10.10)	39.2 (294.1, 11.58)	44.6 (334.8, 13.18)	46.7 (350, 13.78)

3. GENERAL DRIVING CYCLE

- Detecting misfire between idling and high revolution.
- Perform the diagnosis continuously.

4. DIAGNOSTIC METHOD



(A) Engine control module (ECM)

(B) Diagnosis circuit

(C) Crankshaft position sensor

When the misfire occurred, the engine speed is decreased and the crankshaft position speed will change. Calculate the interval difference value (diagnostic value) from crankshaft position speed by the following formula, and judge whether the misfire occurs or not comparing the calculated result with judgment value. Counting the number of misfire up, and if the misfire ratio is higher during 1000 rev. or 200 rev., judge NG for the corresponding cylinder.

Calculate the diagnostic value (from crankshaft position speed)

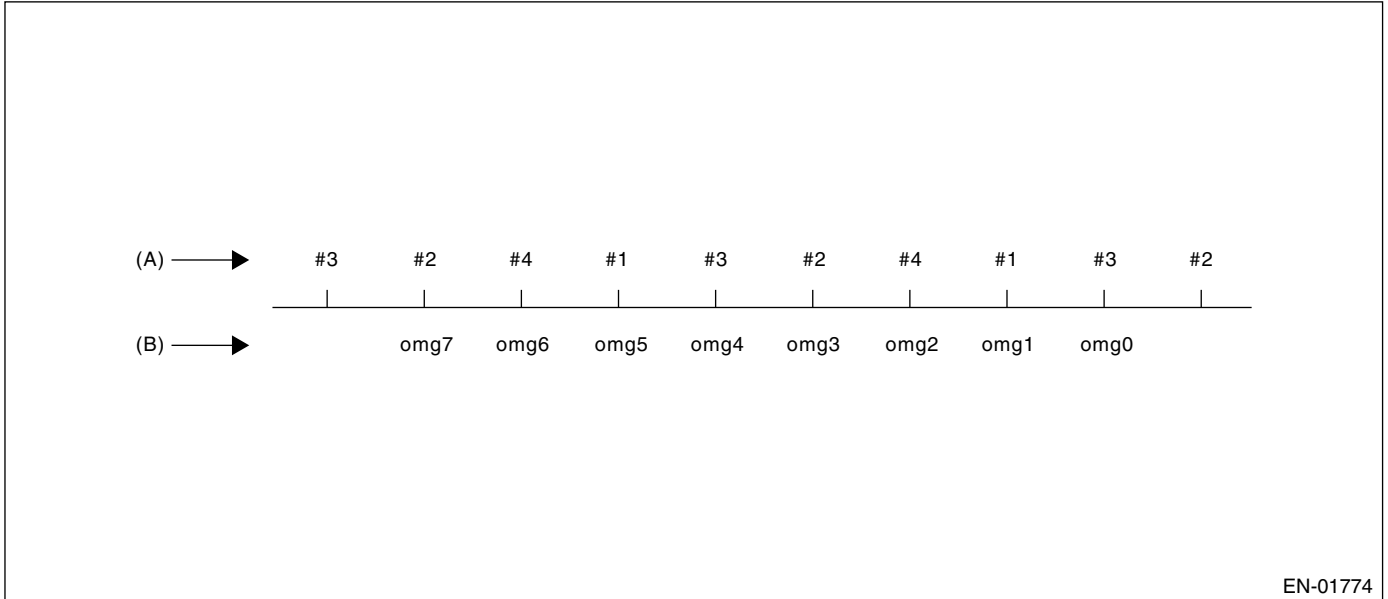
- Misfire detection every single ignition (Compare diagnostic value with judgment value)
- 180° Interval Difference Method
 - 360° Interval Difference Method
 - 720° Interval Difference Method

- NG judgment (Judge misfire occurrence required by the law) (Compare number of misfire with judgment)
- FTP1.5 times misfire NG judgment
 - Catalyst damage misfire NG judgment

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

As the following figure, pick out a random cylinder as the standard and name it omg 0. And the former crankshaft position speed is named omg 1, the second former crankshaft position speed is named omg 2, the third is named omg 3, and the following is the same.



EN-01774

(A) Ignition order

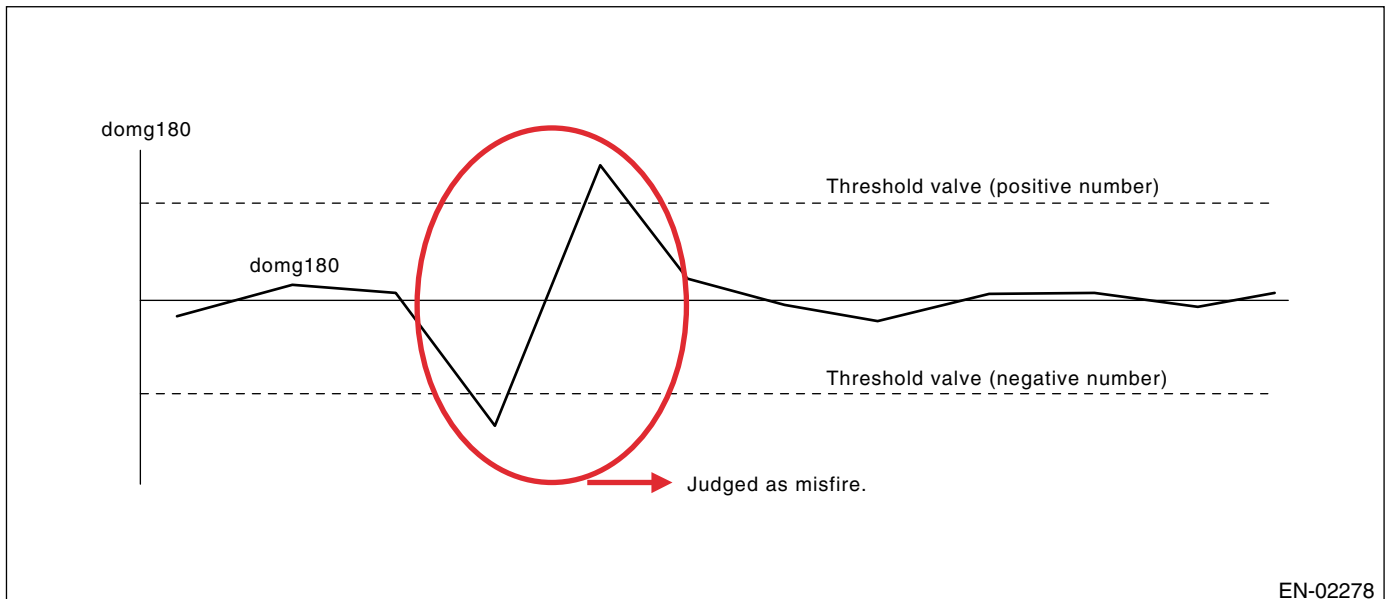
(B) Crankshaft position speed

• 180° Interval Difference Method

Diagnosis value $domg180 = (omg_{-1} - omg_0) - (omg_5 - omg_1)/4$

Judge misfire occurs in the following cases.

- $domg180 > \text{judgment value of positive side}$
- $domg180 \leq \text{judgment value of negative side}$
(judgment value before 180°CA)



EN-02278

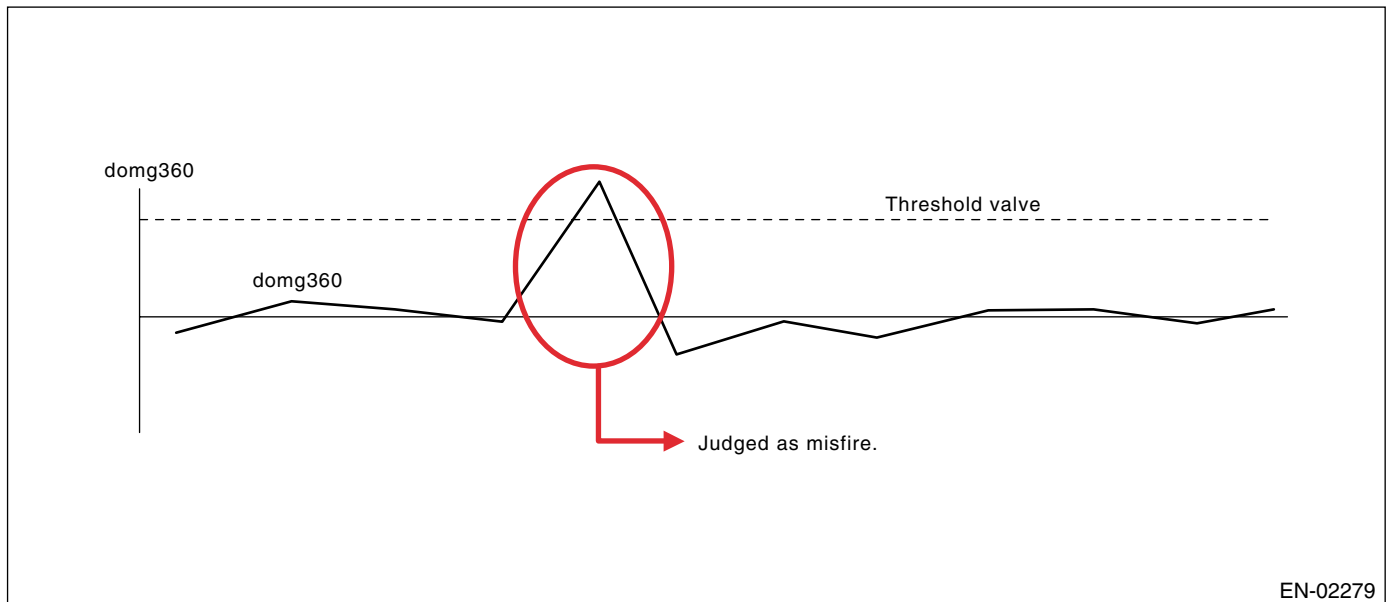
DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

• 360° Interval Difference Method

Diagnosis value $\text{domg } 360 = (\text{omg } 1 - \text{omg } 0) - (\text{omg } 3 - \text{omg } 2)$

Misfire judgment $\text{domg } 360 > \text{judgment value} \rightarrow \text{Misfire occurs}$

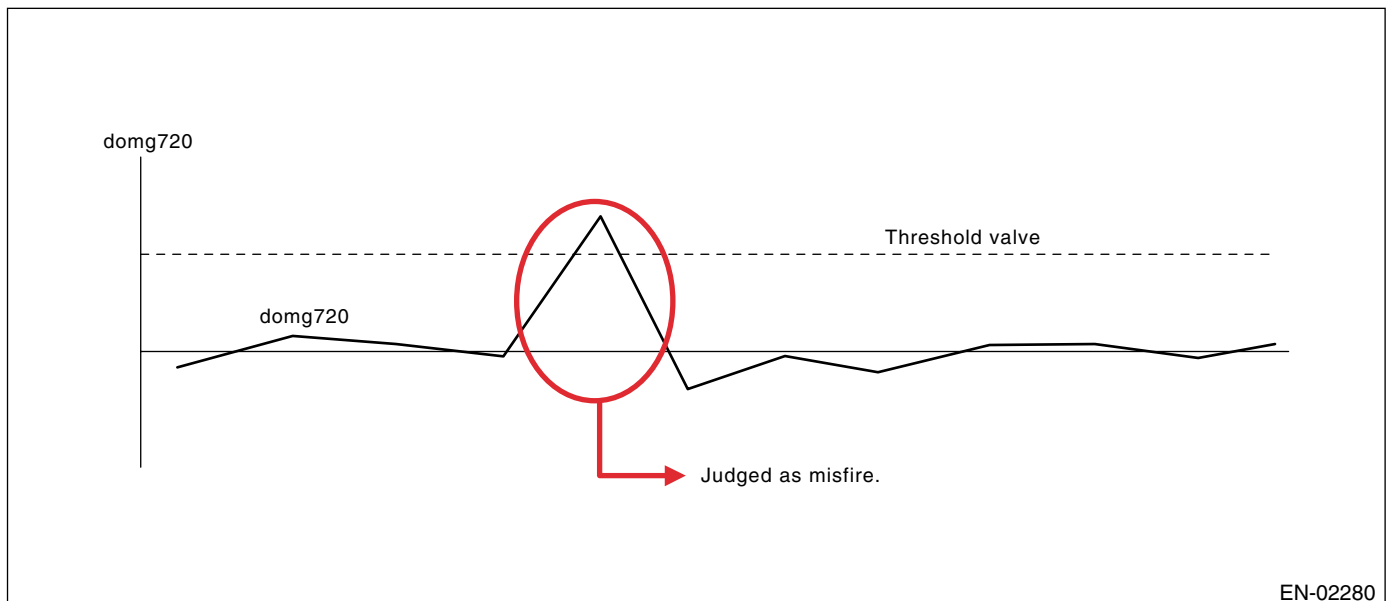


EN-02279

• 720° Interval Difference Method

Diagnosis value $\text{domg } 720 = (\text{omg } 1 - \text{omg } 0) - (\text{omg } 5 - \text{omg } 4)$

Misfire judgment $\text{domg } 720 > \text{judgment value} \rightarrow \text{Misfire occurs}$



EN-02280

• FTP 1.5 times misfire (Misfire occurrence level affecting exhaust gas)

• Judgment Value (Judge that malfunction occurs when the misfire ratio is high in 1000 engine revs.)

Malfunction Criteria	Threshold Value
FTP emission judgment value	> 1.0% in 1000 revs.

Time Needed for Diagnosis: 1000 engine revs.

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

- **Catalyst damage misfire (Misfire occurrence level damaging catalyst)**
- **Judgment Value (Judge that malfunction occurs when the misfire ratio is high in 200 engine revs. (400 ignitions))**

Malfunction Criteria	Threshold Value
Catalyst damage misfire judgment value	See Map 1

Map 1 Fault criteria threshold for misfire which would result in catalyst damage

Percentage		Intake air (g (oz) /rev.)							
		0.16 (0.0006)	0.28 (0.010)	0.4 (0.014)	0.52 (0.018)	0.64 (0.023)	0.76 (0.027)	0.92 (0.032)	1.1 (0.039)
Engine speed (rpm)	700	22.5	22.5	22.5	22.5	22.5	12.5	12.5	12.5
	1000	22.5	22.5	22.5	12.5	12.5	12.5	8.3	8.3
	1500	22.5	22.5	12.5	12.5	8.3	8.3	8.3	8.3
	2000	12.5	12.5	8.3	8.3	8.3	6.3	8.3	8.3
	2500	8.3	8.3	8.3	6.3	5	5	5	5
	3000	8.3	8.3	6.3	5	5	-	-	-
	3500	6.3	6.3	5	-	-	-	-	-
	4000	6.3	6.3	5	-	-	-	-	-
	4500	6.3	6.3	5	-	-	-	-	-
	5000	6.3	6.3	5	-	-	-	-	-
	5500	6.3	6.3	5	-	-	-	-	-
	6000	6.3	6.3	5	-	-	-	-	-
6200	6.3	6.3	5	-	-	-	-	-	

EN-02214

These figures mean the misfire ratio (%) in 400 ignitions; for example, 22.5 (%) means 400 (ignition) × 22.5 (%) = 90 (ignition) or more, so this case is judged misfire.

Time Needed for Diagnosis: 200 engine revs.

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

None

8. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

BC:DTC P0302 — CYLINDER 2 MISFIRE DETECTED —

NOTE:

For the diagnostic procedure, refer to DTC P0301. <Ref. to GD(H4SO U5)-108, DTC P0301 — CYLINDER 1 MISFIRE DETECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

BD:DTC P0303 — CYLINDER 3 MISFIRE DETECTED —

NOTE:

For the diagnostic procedure, refer to DTC P0301. <Ref. to GD(H4SO U5)-108, DTC P0301 — CYLINDER 1 MISFIRE DETECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

BE:DTC P0304 — CYLINDER 4 MISFIRE DETECTED —

NOTE:

For the diagnostic procedure, refer to DTC P0301. <Ref. to GD(H4SO U5)-108, DTC P0301 — CYLINDER 1 MISFIRE DETECTED —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

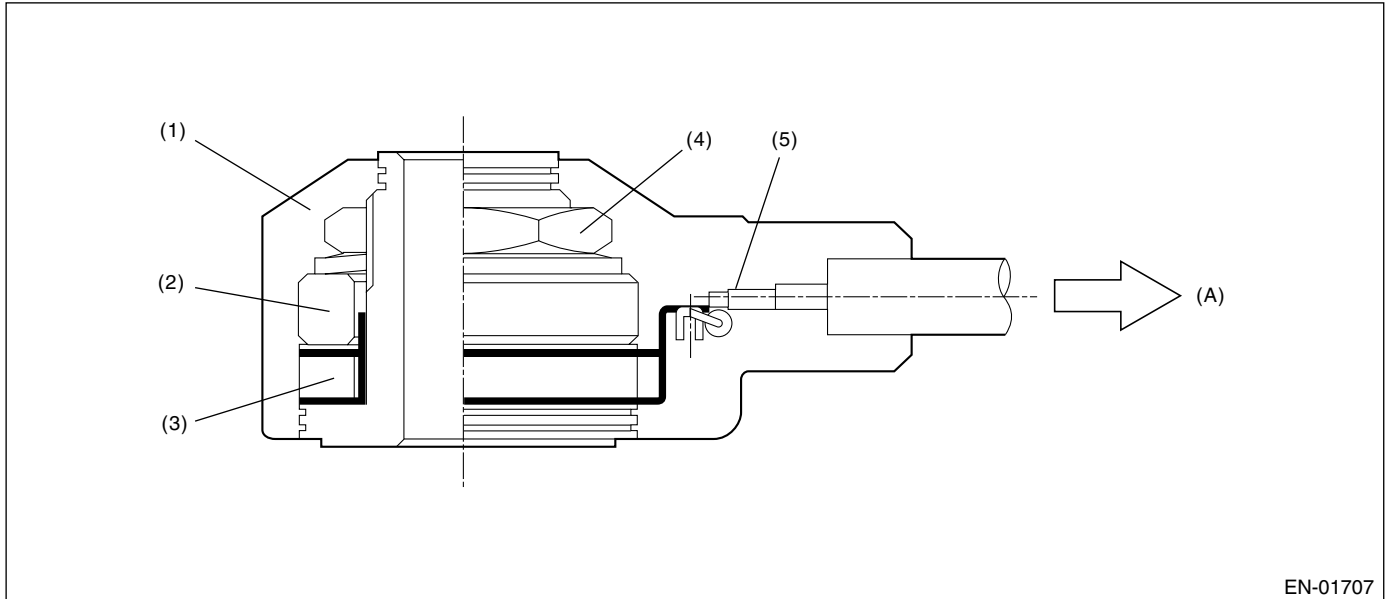
GENERAL DESCRIPTION

BF:DTC P0327 — KNOCK SENSOR 1 CIRCUIT LOW INPUT (BANK 1 OR SINGLE SENSOR) —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the knock sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



- (1) Case
- (2) Weight
- (3) Piezoelectric element

- (4) Nut
- (5) Resistance

- (A) To knock sensor harness

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 1 second.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.25 V
Ignition switch	ON

Time Needed for Diagnosis: 1 second

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.25 V
Ignition switch	ON

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Knock compensation:

- At normal: Learned ignition timing value = knock F/B timing value + whole learning timing value + partial learning timing value.
- At trouble: Learned ignition timing = -3°CA (Retard 3°CA)

Knock F/B timing value = 0°CA

Whole learning is not allowed.

Partial learning is not allowed.

9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

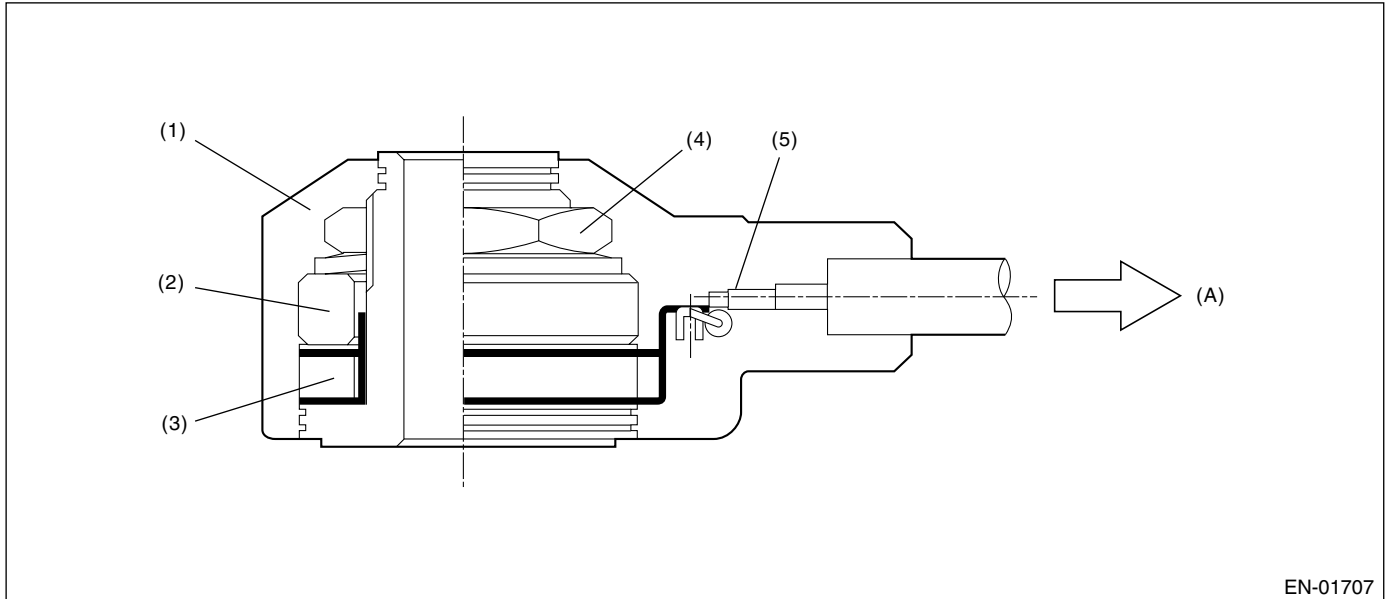
GENERAL DESCRIPTION

BG:DTC P0328 — KNOCK SENSOR 1 CIRCUIT HIGH INPUT (BANK 1 OR SINGLE SENSOR) —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the knock sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



- (1) Case
- (2) Weight
- (3) Piezoelectric element

- (4) Nut
- (5) Resistance

- (A) To knock sensor harness

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform diagnosis continuously.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 1 second.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.7 V
Ignition switch	ON

Time Needed for Diagnosis: 1 second

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 4.7 V
Ignition switch	ON

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Knock compensation:

- At normal: Learned ignition timing value = knock F/B timing value + whole learning timing value + partial learning timing value.
- At trouble: Learned ignition timing = -3°CA (Retard 3°CA)

Knock F/B timing value = 0°CA

Whole learning is not allowed.

Partial learning is not allowed.

9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

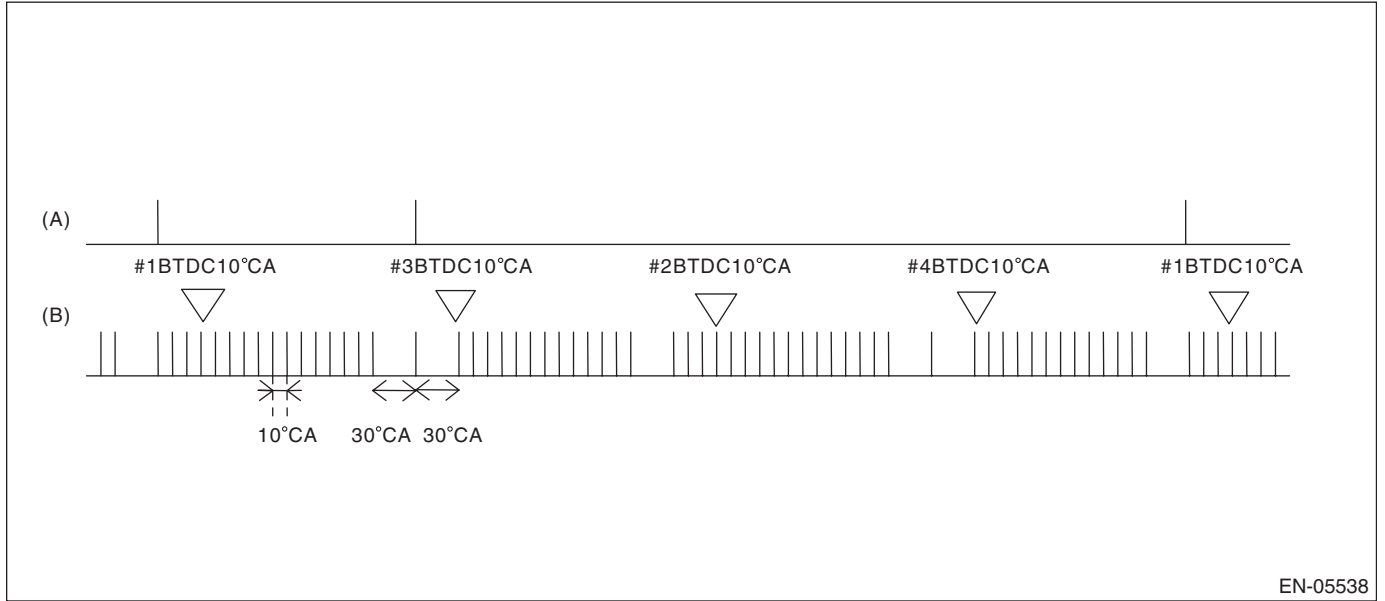
GENERAL DESCRIPTION

BH:DTC P0335 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT —

1. OUTLINE OF DIAGNOSIS

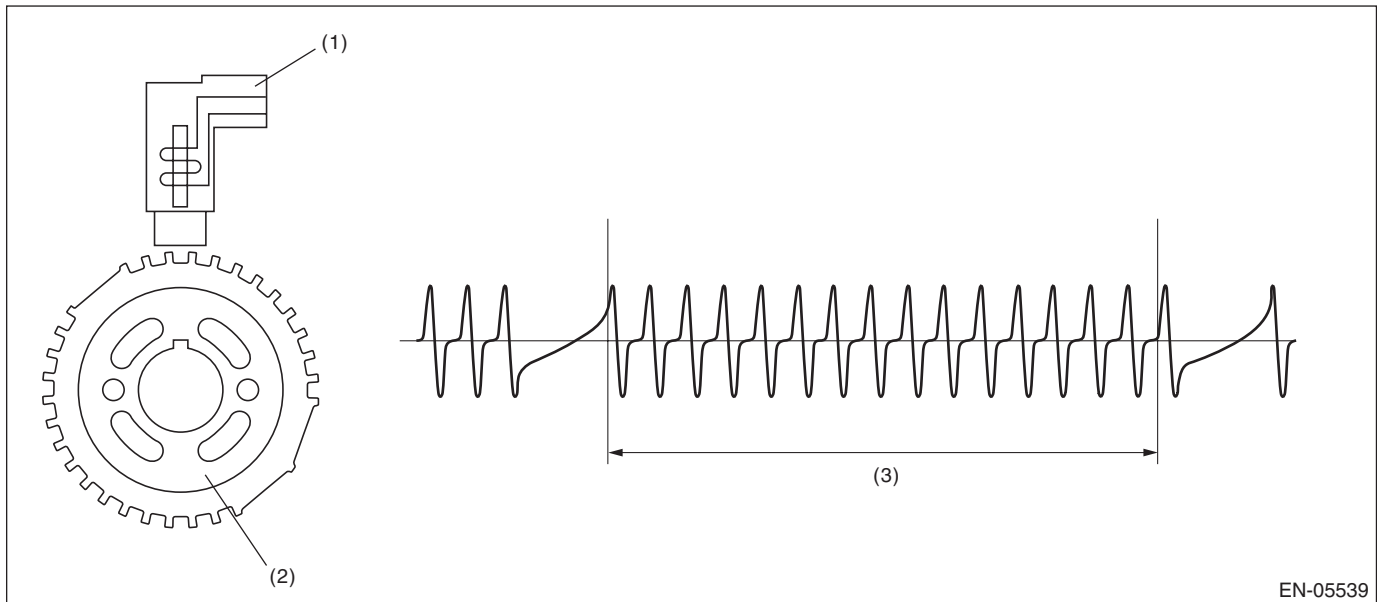
Detect the open or short circuit of crankshaft position sensor. Judge NG when the crankshaft signal does not input regardless of turning the starter.

2. COMPONENT DESCRIPTION



(A) Camshaft signal

(B) Crankshaft signal



(1) Crankshaft position sensor

(2) Crankshaft sprocket

(3) Crankshaft half-turn

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Starter switch	ON
Crankshaft position sensor signal	Not detected
Battery voltage	≥ 8 V

Time Needed for Diagnosis: 3 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Crankshaft position sensor signal	Input exists
Battery voltage	≥ 8 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

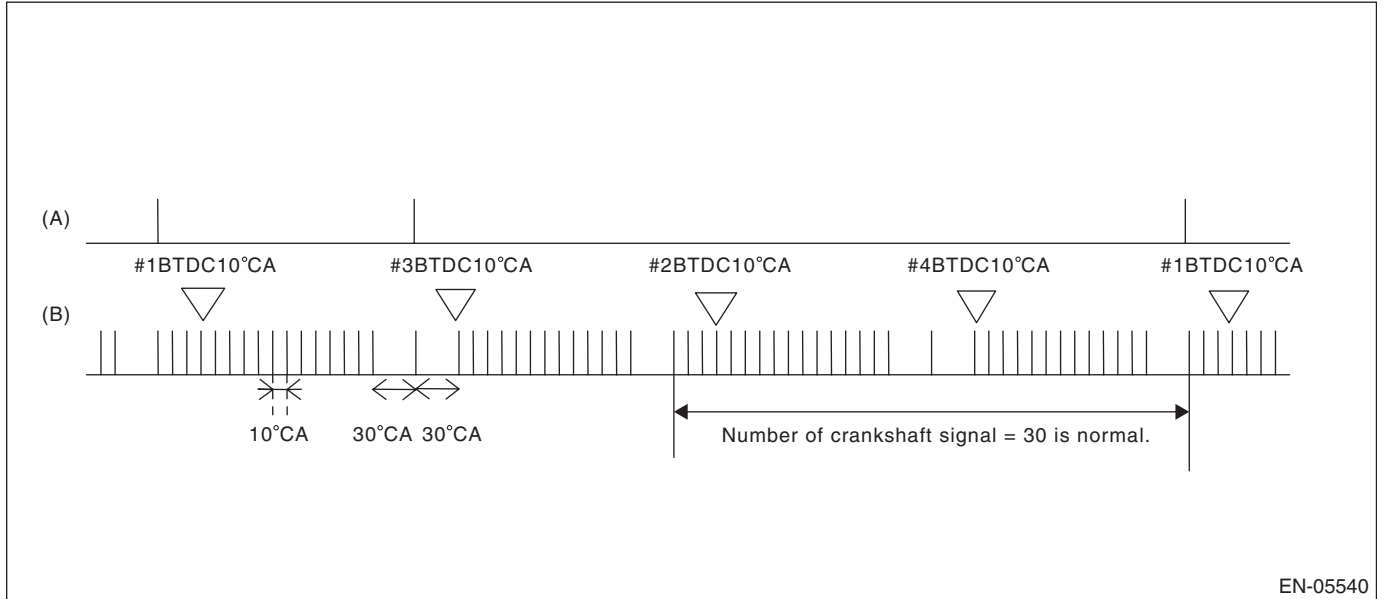
GENERAL DESCRIPTION

BI: DTC P0336 — CRANKSHAFT POSITION SENSOR “A” CIRCUIT RANGE/ PERFORMANCE —

1. OUTLINE OF DIAGNOSIS

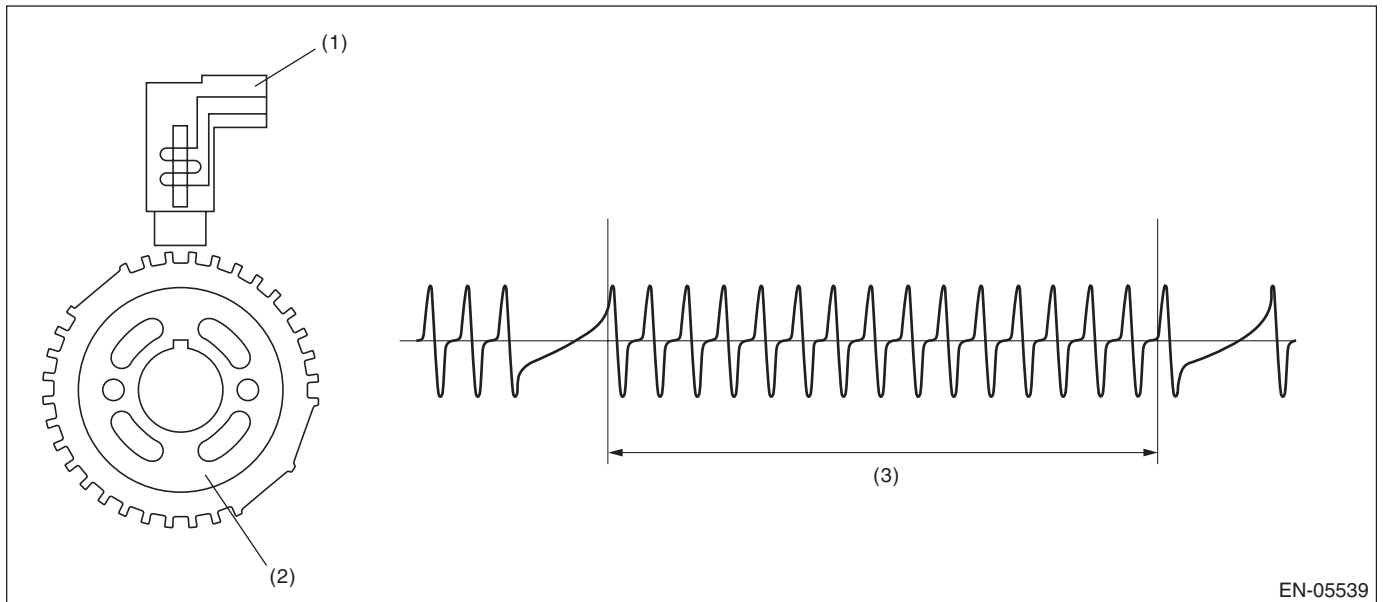
Detect the malfunction of crankshaft position sensor output property. Judge NG when the number of crankshaft signal every 1 revolution becomes abnormal.

2. COMPONENT DESCRIPTION



(A) Camshaft signal

(B) Crankshaft signal



(1) Crankshaft position sensor

(2) Crankshaft sprocket

(3) Crankshaft half-turn

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 8 \text{ V}$
Engine speed	$< 4000 \text{ rpm}$

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously under 4000 rpm engine speed.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when all the malfunction criteria below are completed more than 10 times in a row.

• Judgment Value

Malfunction Criteria	Threshold Value
Cylinder number distinction	Completed
Amount of crank sensor signal during 1 rev.	Not = 30

Time Needed for Diagnosis: 10 engine revs.

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Cylinder number distinction	Completed
Amount of crank sensor signal during 1 rev.	= 30

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

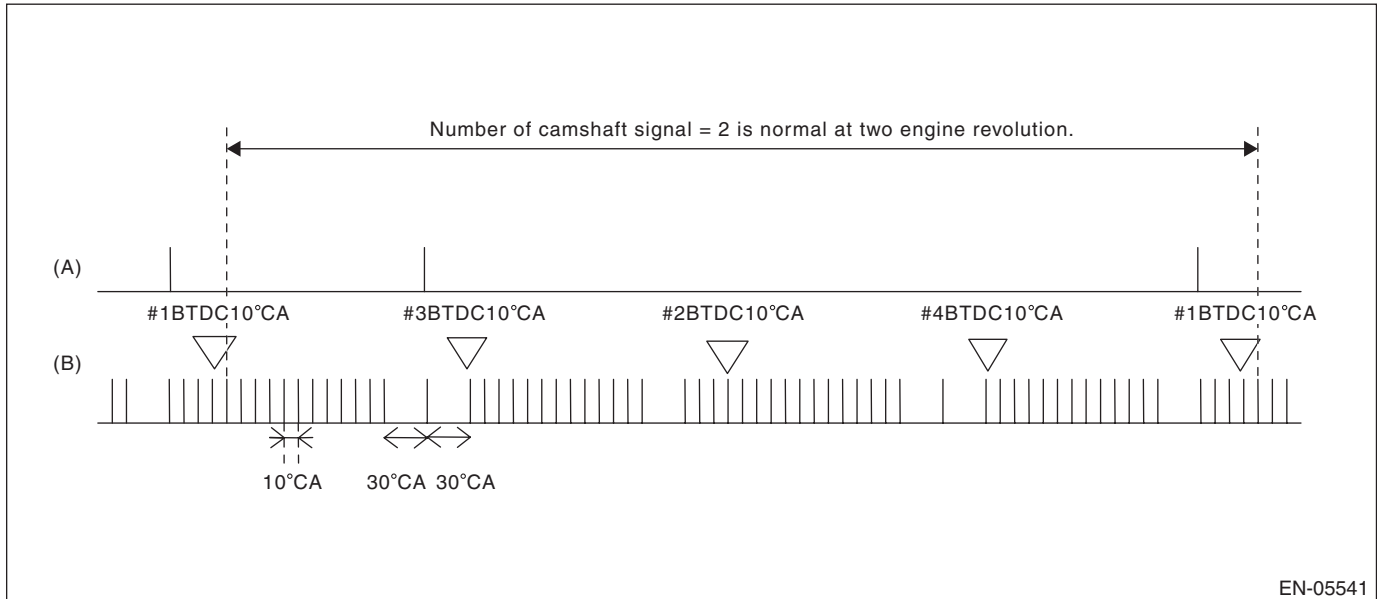
GENERAL DESCRIPTION

BJ:DTC P0340 — CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR) —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of camshaft position sensor. Judge NG when the number of camshaft signal remains to be abnormal.

2. COMPONENT DESCRIPTION



- (A) Camshaft signal
- (B) Crankshaft signal

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the engine speed continues 8 revolutions or more for the malfunction criteria below.

• Judgment Value

Malfunction Criteria	Threshold Value
Voltage	$\geq 8\text{ V}$
Number of camshaft position sensor signal during 2 rev.	Except 2

Time Needed for Diagnosis: 8 rev.

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Voltage	$\geq 8\text{ V}$
Number of camshaft position sensor signal during 2 rev.	Except 2

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

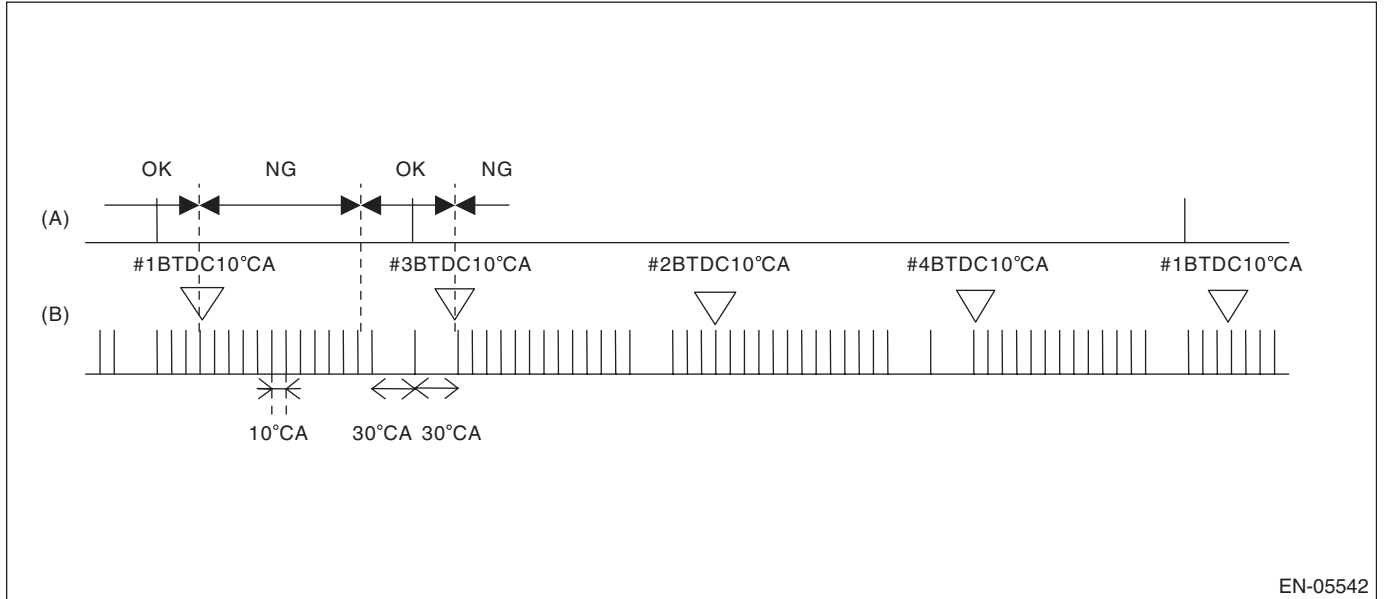
GENERAL DESCRIPTION

BK:DTC P0341 — CAMSHAFT POSITION SENSOR “A” CIRCUIT RANGE/PERFORMANCE (BANK 1 OR SINGLE SENSOR) —

1. OUTLINE OF DIAGNOSIS

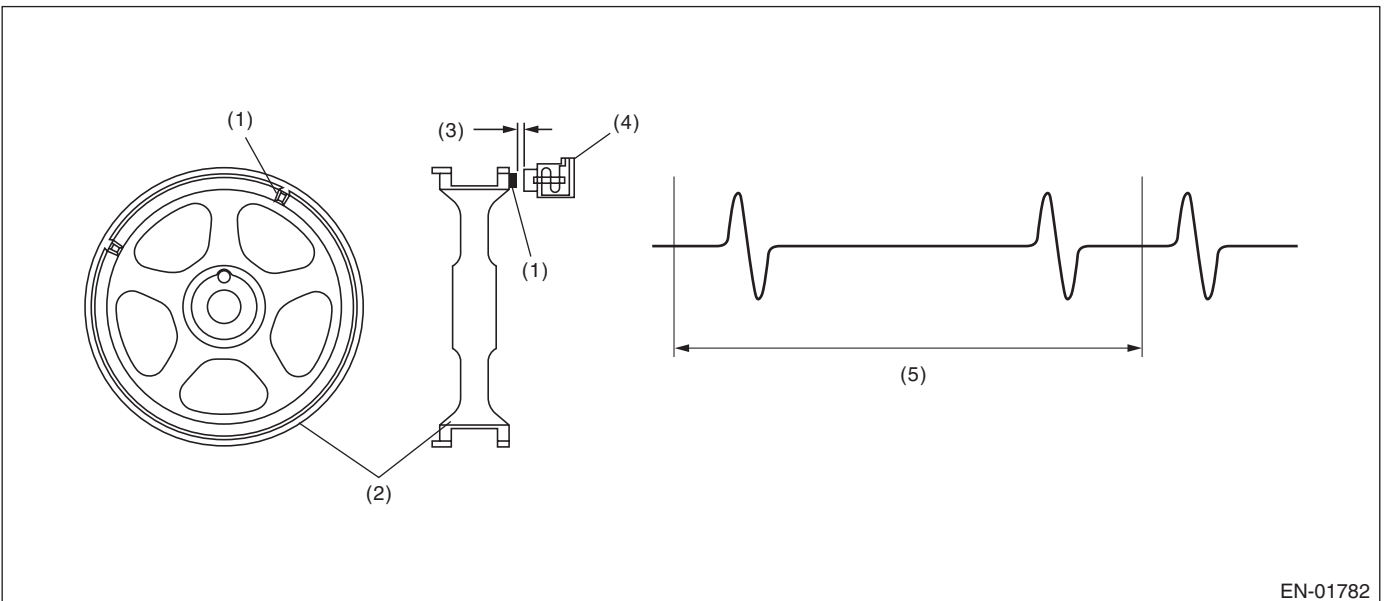
Detect the malfunction of camshaft position sensor output property. Judge NG when the camshaft line signal input timing is shifted from the crankshaft signal because of timing belt tooth chip, etc.

2. COMPONENT DESCRIPTION



(A) Camshaft signal

(B) Crankshaft signal



EN-01782

- (1) Boss
- (2) Camshaft sprocket

- (3) Air gap
- (4) Camshaft position sensor

- (5) Camshaft one revolution (Engine two revolutions)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Cylinder number distinction	Completed
Battery voltage	≥ 8 V
Engine speed	550 \longleftrightarrow 1000 rpm
Engine operation	In idle
Misfire	Not detect

4. GENERAL DRIVING CYCLE

Perform the diagnosis at idling continuously.

5. DIAGNOSTIC METHOD

Judge NG when the engine speed continues 5 revolutions for the malfunction criteria below. Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Position of camshaft position sensor signal	Not between BTDC 10°CA and BTDC 80°CA

Time Needed for Diagnosis: 5 revs.

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

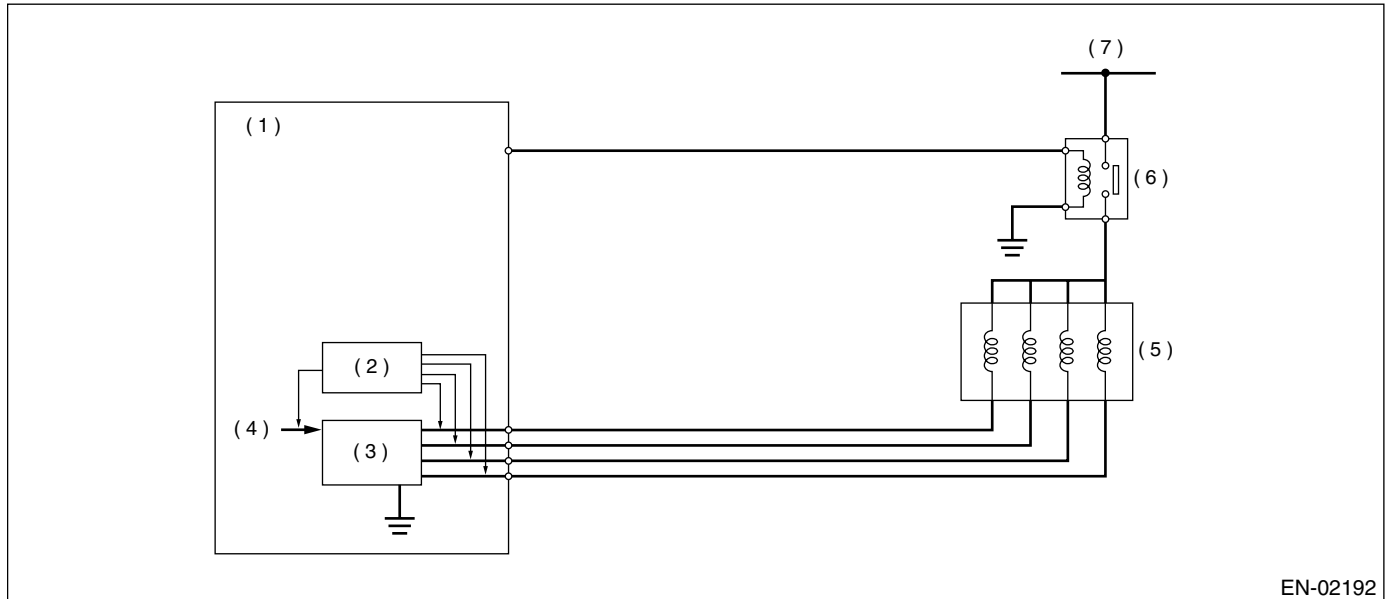
BL:DTC P0400 — EXHAUST GAS RECIRCULATION FLOW —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of EGR system.

Intake manifold pressure (negative pressure) is stable because the throttle valve is fully closed during the fuel shut-off in deceleration. In this case, the intake manifold pressure changes when EGR valve is opened or closed. Judge EGR system is OK or NG according to intake manifold pressure change amount.

2. COMPONENT DESCRIPTION



(1) ECU

(2) Detecting circuit

(3) Switching circuit

(4) CPU

(5) EGR valve

(6) Main relay

(7) Battery voltage

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
After engine starting	40 secs. or more
Engine coolant temperature	$\geq 70^{\circ}\text{C}$ (158°F)
Engine speed	1000 \longleftrightarrow 3000 rpm
Intake manifold pressure (absolute pressure)	13.3 \longleftrightarrow 38.7 kPa (100 \longleftrightarrow 290 mmHg, 3.94 \longleftrightarrow 11.42 inHg)
Estimated ambient temperature	$\geq 5^{\circ}\text{C}$ (41°F)
Throttle position	$< 0.25^{\circ}$
Battery voltage	$> 10.9\text{ V}$
Atmospheric pressure	$\geq 75.0\text{ kPa}$ (563 mmHg, 22.17 inHg)
Vehicle speed	$\geq 48\text{ km/h}$ (30 MPH)
Fuel shut-off function	Operation
Neutral switch	OFF and 1 second after changing from "ON" to "OFF"
Load (air conditioner, power steering, lights, rear defroster, heater fan and radiator fan)	5 secs. or more no change
Amount of EGR actual step = condition of 0 step	Continuing for 2 seconds or more.

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once at the fuel shut-off in deceleration in vehicle speed more than 48 km/h (approx. 30 MPH). Pay attention to vehicle speed and engine speed. (The diagnosis is not completed if vehicle speed and engine speed are out of condition due to deceleration.)

5. DIAGNOSTIC METHOD

Measure the pressure in the following procedures when the enable conditions are completed, and then diagnosis by calculating the result.

(1) PMOF1 is equal to the intake manifold pressure at enable condition completed, and EGR target step is set to 50 steps (almost fully opened).

(2) PMON is equal to the intake manifold pressure in 1 second after EGR target step is set 50 steps (when enable conditions are completed), and EGR target step is set to 0 step.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

(3) PMOF2 is equal to the intake manifold pressure in 1 second after EGR target step is set to 0 step (in 2 seconds after enable conditions are completed).

4) Calculate the judged value using the following formula.

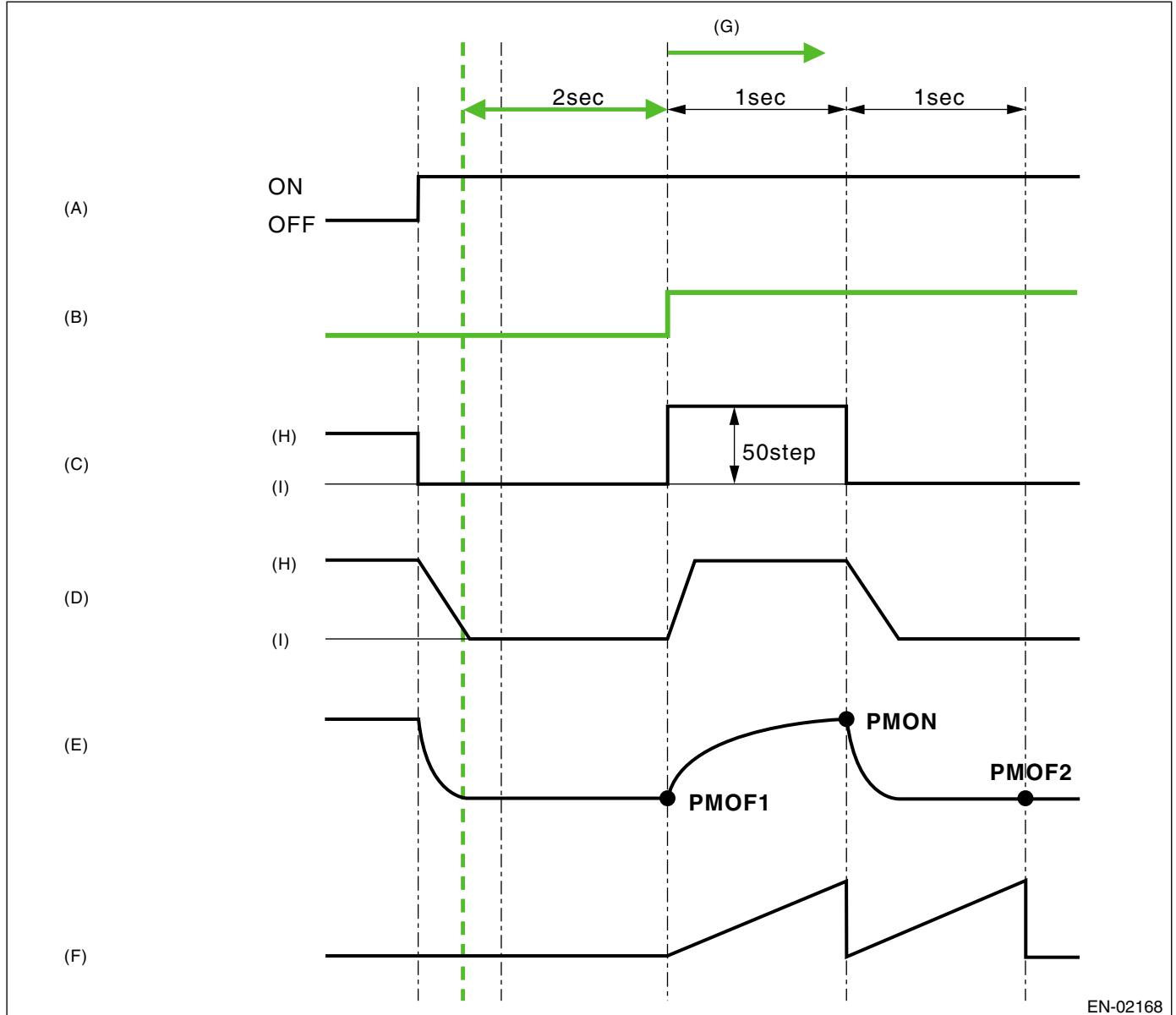
$$\text{Judged value} = [\text{PMON} - (\text{PMOF1} + \text{PMOF2})/2]$$

Judged value < 18.63 mmHg, 2.48 kPa (18.63 mmHg, 0.733 inHg) → NG

Judged value ≥ 2.48 kPa (18.63 mmHg, 0.733 inHg) → OK

Time Needed for Diagnosis: 4 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.



EN-02168

- (A) Fuel shut-off in deceleration
- (B) Diagnosis enable condition
- (C) EGR target step
- (D) EGR actual step

- (E) Intake manifold pressure (At normal condition)
- (F) Diagnosis mode timer
- (G) Diagnosis starts.

- (H) Open
- (I) Close

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

A/F main learning: Not allowed

Knock learning: Not allowed

EGR control: Not allowed to operate

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnosis value and trouble standard value. (For test mode \$06)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

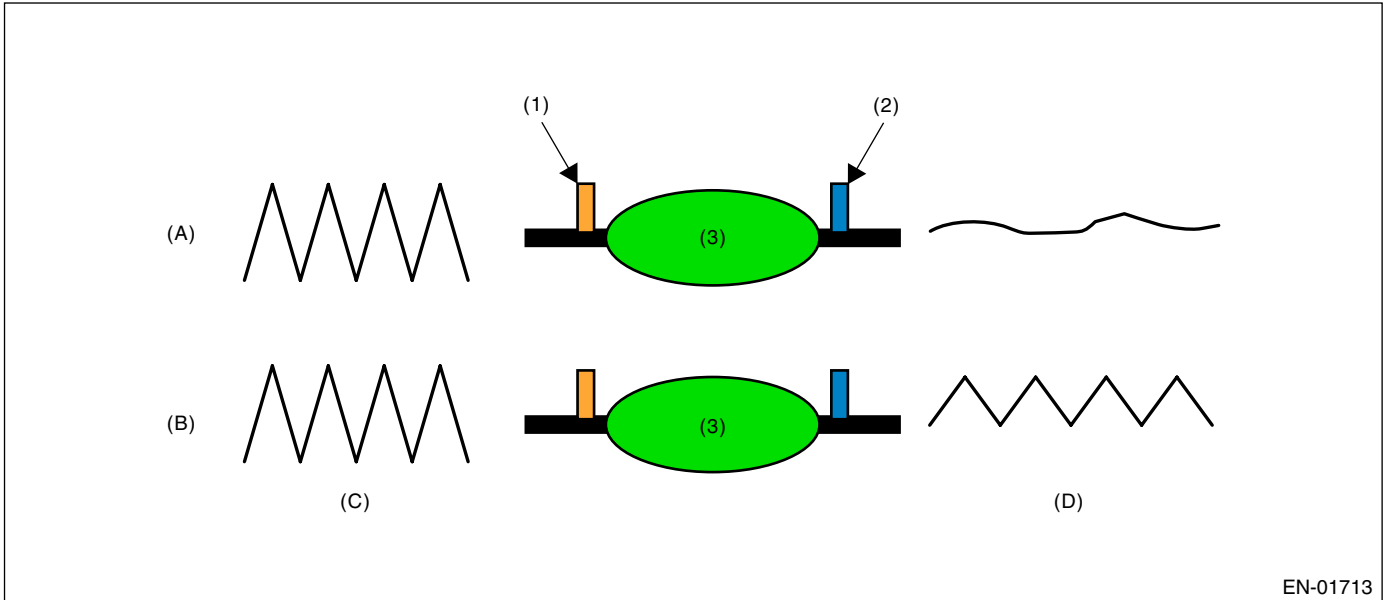
BM:DTC P0420 — CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1) —

1. OUTLINE OF DIAGNOSIS

Detect the deterioration of catalyst function.

Though the front oxygen sensor output would change slowly with a new catalyst, the sensor output with a deteriorated catalyst becomes high and the inversion time is shortened. For this reason, the catalyst diagnosis is carried out by monitoring the front oxygen sensor output and comparing it with the front A/F sensor output.

2. COMPONENT DESCRIPTION



- (1) Front oxygen (A/F) sensor
- (2) Front oxygen sensor
- (3) Catalyst

- (A) Normal
- (B) Deterioration

- (C) Front oxygen (A/F) sensor waveform
- (D) Front oxygen sensor waveform

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Engine coolant temperature	≥ 70°C (158°F)
Catalyst warm-up counter on Map 2	≥ 8000
Misfire detection during 200 engine revs.	< 5 times
Learning value of evaporation gas density	< 0.20
Sub feedback	Operating
Evaporative system diagnostic	Not in operation
Difference between actual and target time lambda < 0.10	1000 milliseconds or more
Vehicle speed	≥ 70 km/h (43.5 MPH)
Amount of intake air	10 ↔ 40 g (0.35 ↔ 1.41 oz)/s
Engine load change every 0.5 engine revs.	< 0.02 g/rev
Rear O ₂ output change from below 660 mV to over	Experienced after fuel cut
After engine starting	≥ 210 seconds
Purge execution cumulative time	5 seconds or more

• Map 2

Add the following value every 512 milliseconds.

Amount of intake air (g (oz)/s)	0 (0)	3.2 (0.113)	6.4 (0.226)	9.6 (0.339)	12.8 (0.451)	16 (0.564)	19.2 (0.677)	22.4 (0.790)	25.6 (0.903)	28.8 (1.016)	32 (1.129)	35.2 (1.242)
Integrated value for warm-up counter	-8	-8	20	32	52	82	113	143	173	204	234	264

4. GENERAL DRIVING CYCLE

Perform the diagnosis once at the constant vehicle speed 70 km/h (43 MPH).

5. DIAGNOSTIC METHOD

After the malfunction criteria are completed, calculate the output fluctuation value of front oxygen (A/F) sensor (with right and left) and output fluctuation value of front oxygen sensor (with right and left).

Calculate the diagnosis value when the front oxygen (A/F) sensor output fluctuation value more than specified value. (With right and left)

Diagnostic values on both sides are added and total is considered as a final diagnostic value.

Judge NG when the malfunction criteria below are completed, and judge OK when they are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Total value which was added from the diagnostic values on both sides.	> 11.6

Time Needed for Diagnosis: 55 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

MEMO:

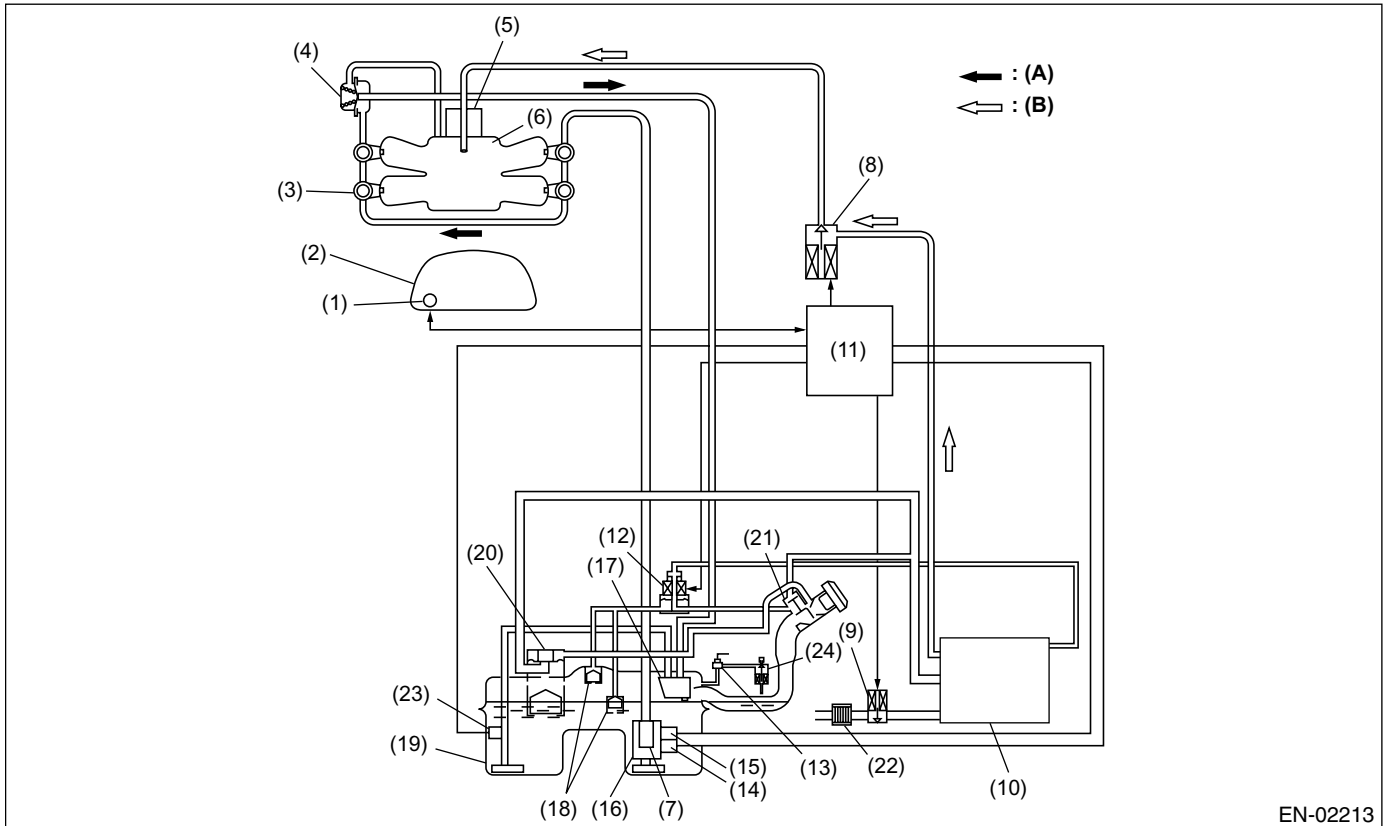
DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

BN:DTC P0442 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK) —

1. OUTLINE OF DIAGNOSIS

Perform the diagnosis of leakage of fuels system and valve functions.



EN-02213

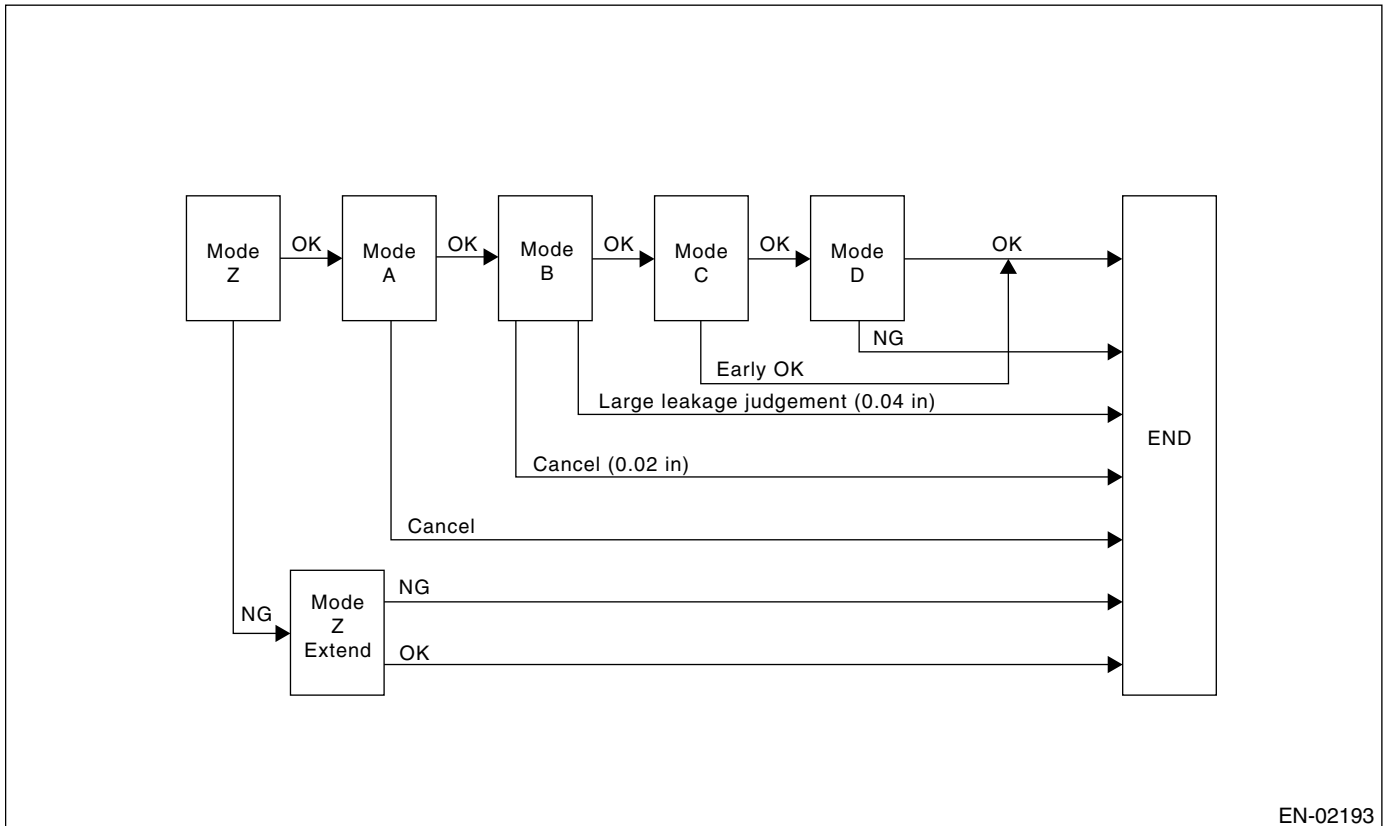
- | | | |
|----------------------------------|--------------------------------------|---|
| (1) Fuel meter | (10) Canister | (19) Fuel tank |
| (2) Combination meter | (11) Engine control module (ECM) | (20) Vent valve |
| (3) Fuel injector | (12) Pressure control solenoid valve | (21) Shut-off valve |
| (4) Pressure regulator | (13) Fuel tank pressure sensor | (22) Drain filter |
| (5) Throttle body | (14) Fuel temperature sensor | (23) Fuel sub level sensor |
| (6) Intake manifold | (15) Fuel level sensor | (24) Tank pressure switching solenoid valve |
| (7) Fuel filter | (16) Fuel pump | (A) Fuel line |
| (8) Purge control solenoid valve | (17) Jet pump | (B) Evaporation fuel line |
| (9) Drain valve | (18) Fuel cut valve | |

In this system diagnosis, checking for leakage and valve function is conducted by changing the fuel tank pressure with each solenoid valve switched to ON/OFF, and monitoring the pressure change using the fuel tank pressure sensor. 0.04-inch diagnosis is performed in the order of mode Z, mode A, mode B, mode C and mode D, and 0.02-inch diagnosis is performed in the order of mode Y, mode A, mode B, mode C and mode D.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

• 0.04-inch Diagnosis



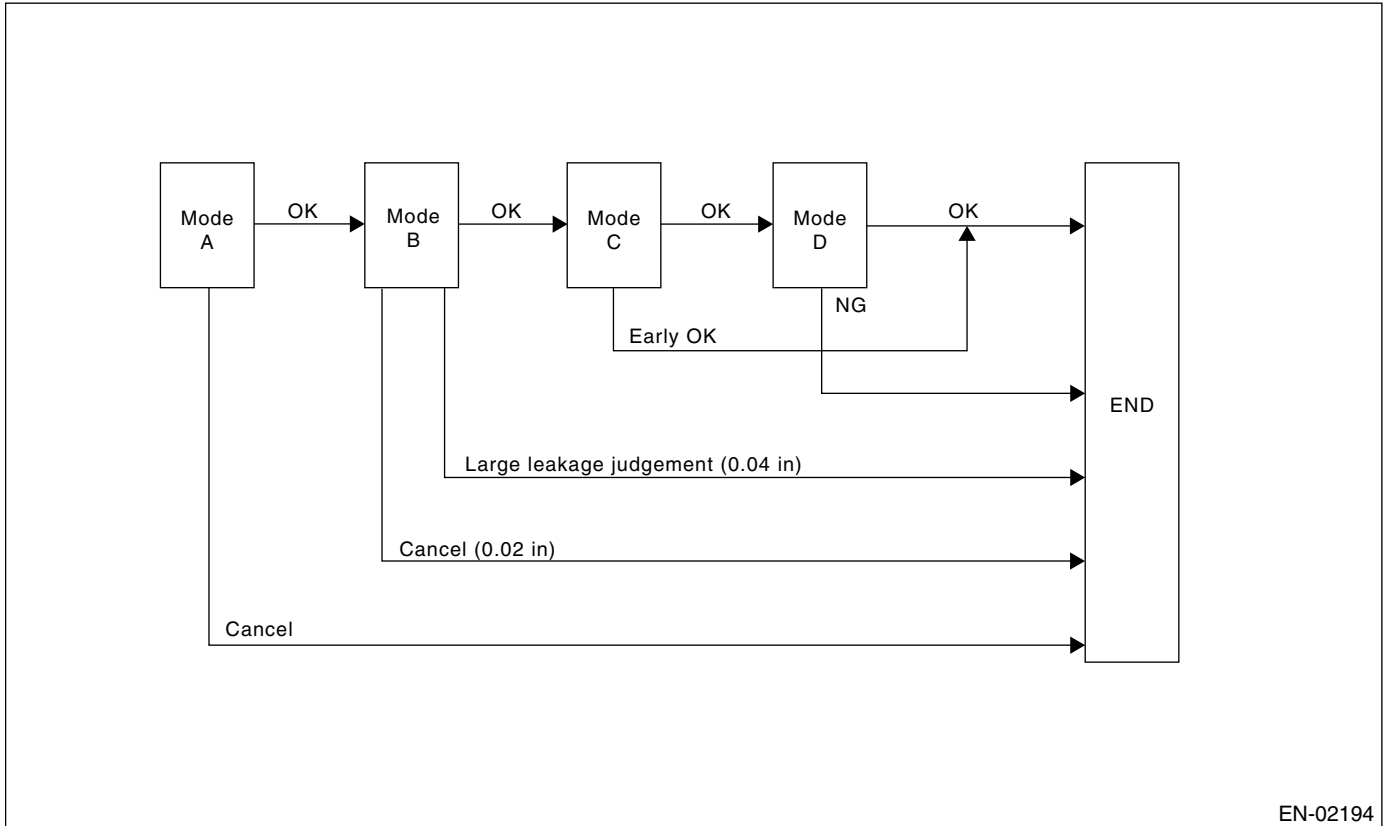
EN-02193

Mode	Mode Description	Diagnosis Period
Mode Z (CPC abnormal open diagnosis)	Diagnosis starts when there is a change in fuel tank pressure amount. Purge control solenoid valve open trouble diagnosis begins.	3 — 16 seconds
Mode A (Estimated evaporation amount)	Calculate the tank pressure change amount (P1).	10 seconds
Mode B (Sealed negative pressure, large leakage judgment)	Introduce the intake manifold pressure to the fuel tank and reduce the tank pressure to the desired value. If the tank pressure cannot be reduced, it is diagnosed as large leak.	5 — 25 seconds
Mode C (Pressure increase check advanced OK judgment)	Wait until the tank pressure becomes the desired value (detection starting pressure of P2). If the tank pressure does not become the value, make advanced OK judgment.	1 — 15 seconds
Mode D (Negative pressure variation measurement evaporation leakage diagnosis)	Calculate the tank pressure variation (P2), and obtain the diagnostic value using P1 of Mode 1. Perform the evaporation leakage diagnosis using the diagnostic value.	10 seconds

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

• 0.02-inch Diagnosis



EN-02194

Mode	Mode Description	Diagnosis Period
Mode Y (Tank pressure stabilization)	Return the tank pressure to atmosphere.	15 seconds
Mode A (Estimated evaporation amount)	Calculate the tank pressure change amount (P1).	28 seconds
Mode B (Negative pressure sealed)	Introduce the intake manifold pressure to the fuel tank and reduce the tank pressure to the desired value.	5 — 14 seconds
Mode C (Pressure increase check advanced OK judgment)	Wait until the tank pressure becomes the desired value (detection starting pressure of P2). If the tank pressure does not become the value, make advanced OK judgment.	1 — 36 seconds
Mode D (Negative pressure variation measurement evaporation leakage diagnosis)	Calculate the tank pressure variation (P2), and obtain the diagnostic value using P1 of Mode 1. Perform the evaporation leakage diagnosis using the diagnostic value.	24 seconds

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

• Mode Table for Evaporative Emission Control System Diagnosis

Mode	Behavior of tank internal pressure under normal conditions	Diagnostic item	DTC
Mode Z	Nearly same as atmospheric pressure (equivalent pressure of 0 kPa (0 mmHg, 0 inHg))	CPC is judged to be stuck open.	P0457
Mode A	Pressure is in proportion to amount of evaporative emission.		
Mode B	Negative pressure is formed due to intake manifold negative pressure	Large leakage	P0457
Mode C	Target pressure is reached.		None
Mode D	Pressure change is small.	EVAP system is judged to have large leak [1.0 mm (0.04 in.)].	P0442
		EVAP. system is judged to have small leak [0.5 mm (0.02 in.)].	P0456

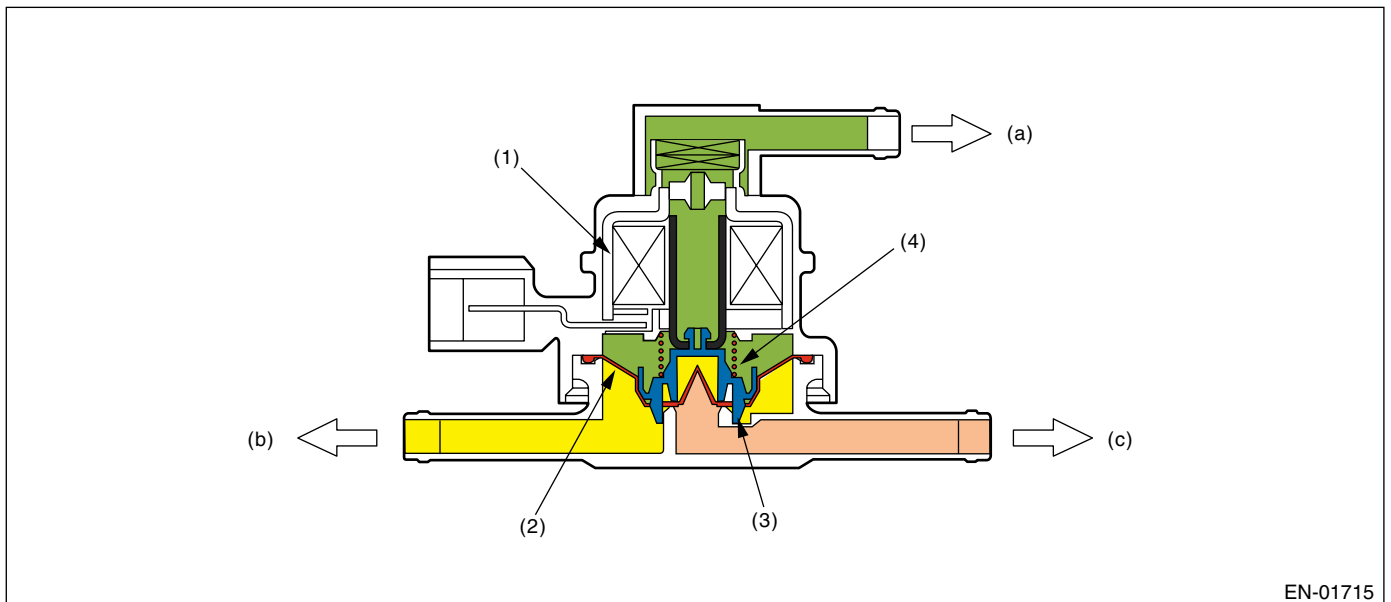
2. COMPONENT DESCRIPTION

• Pressure Control Solenoid Valve

PCV controls the fuel tank pressure to be equal to the atmospheric air pressure.

Normally, the solenoid is set to OFF. And the valve opens and closes mechanically in accordance with the pressure difference between tank and atmospheric air, or tank and canister.

The valve is forcibly opened by setting the solenoid to ON at the time of diagnosis.



EN-01715

- | | |
|---------------|--------------------------|
| (1) Solenoid | (a) Atmospheric pressure |
| (2) Diaphragm | (b) Fuel tank |
| (3) Valve | (c) Canister |
| (4) Spring | |

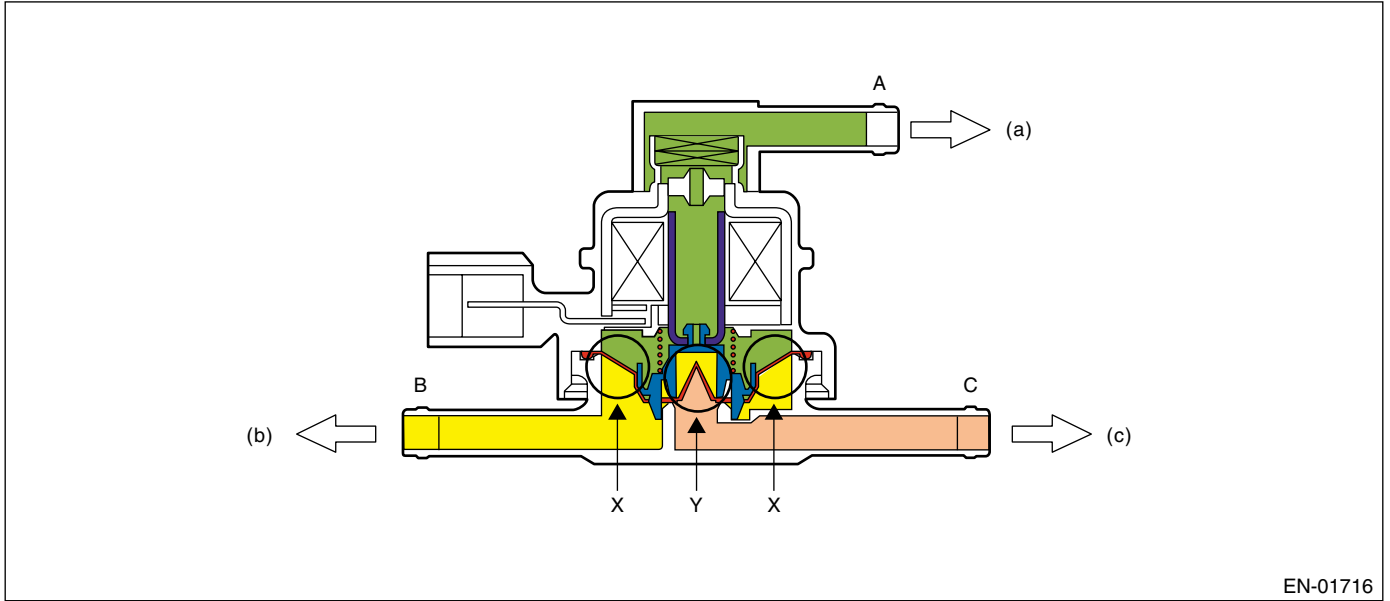
DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

• Valve Operation and Air Flow

In the figure below, divided by the diaphragm, the part above X is charged with atmospheric air pressure, and the part below X is charged with tank pressure. Also, the part above Y is charged with tank pressure, and the part below Y is charged with canister pressure.

If the atmospheric air pressure port is A, tank pressure port is B, and canister pressure port is C, the air flows according to pressure difference from each port as shown in the table below.



EN-01716

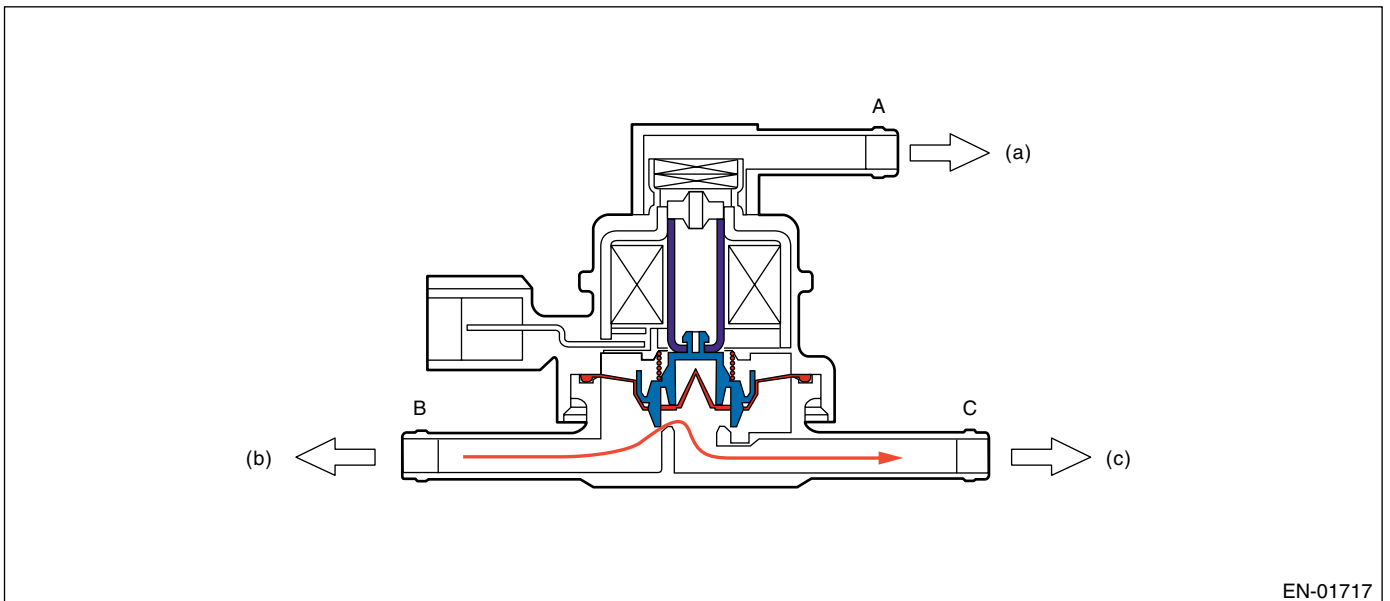
(a) Atmospheric pressure

(b) Fuel tank

(c) Canister

Condition of pressure	Flow
$A < B$ (solenoid OFF)	$B \rightarrow C$
$B < C$ (solenoid OFF)	$C \rightarrow B$
Solenoid ON	$B \leftrightarrow C$

• When $A < B$ (Solenoid OFF)



EN-01717

(a) Atmospheric pressure

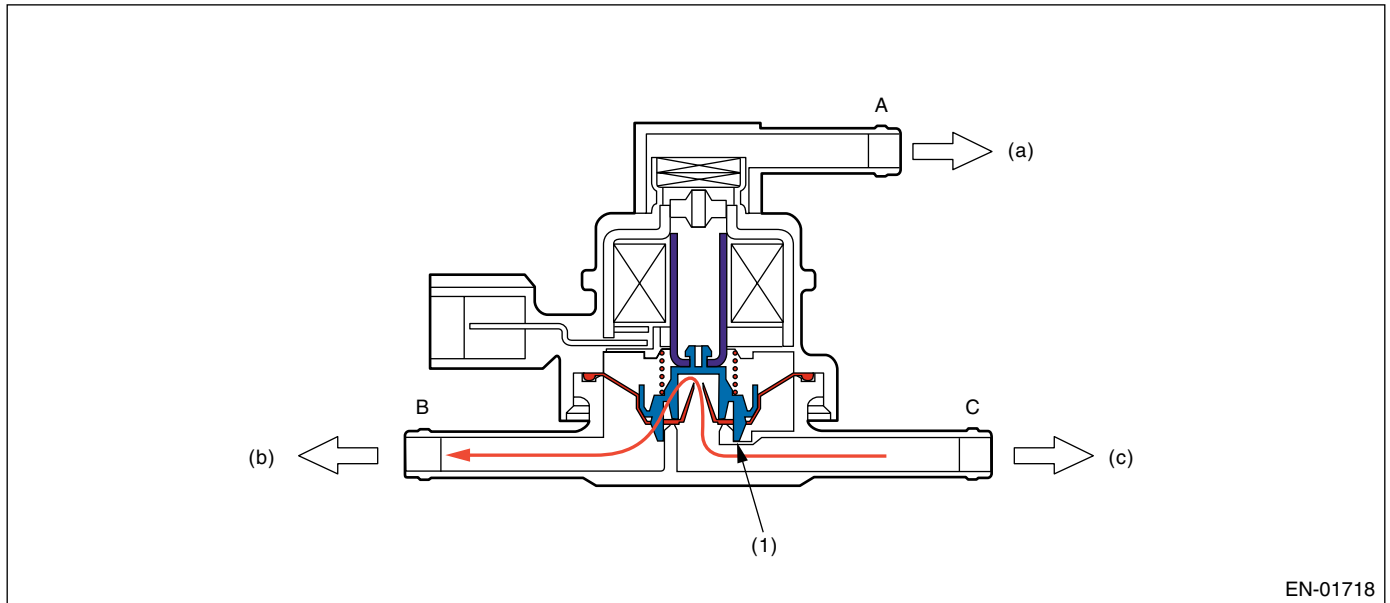
(b) Fuel tank

(c) Canister

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

• When $B < C$ (Solenoid OFF)



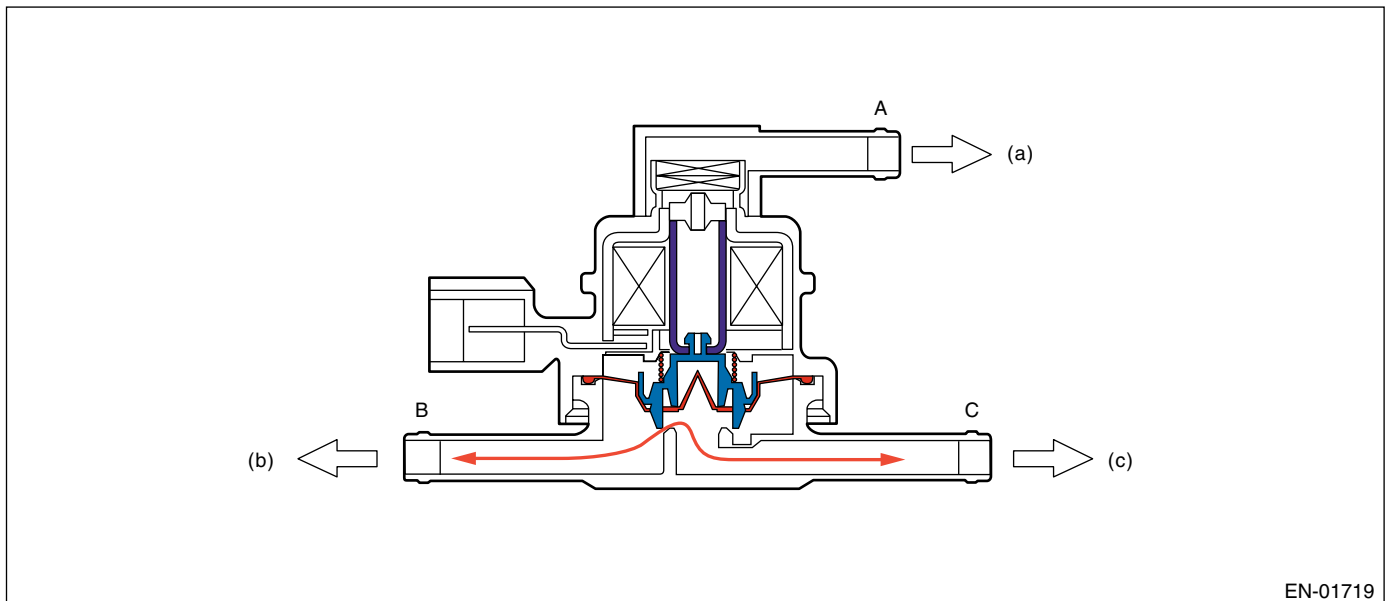
(1) Valve

(a) Atmospheric pressure

(b) Fuel tank

(c) Canister

• When Solenoid is ON



(a) Atmospheric pressure

(b) Fuel tank

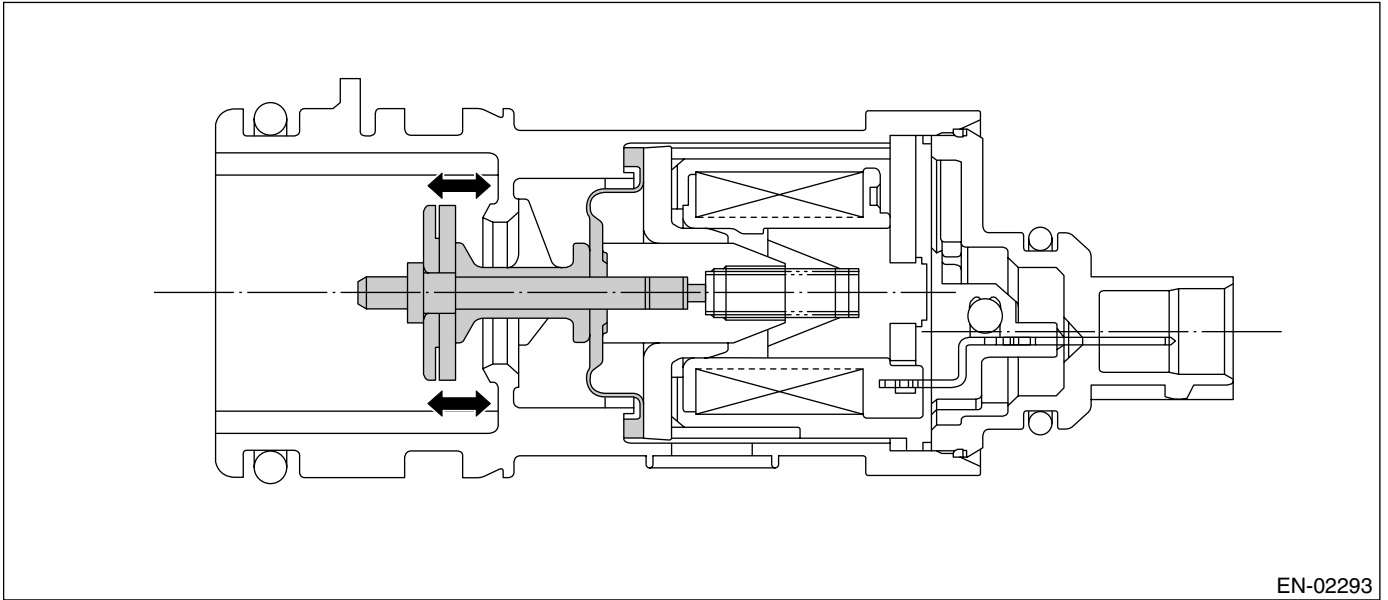
(c) Canister

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

- **CCV**

CCV controls the ambient air to be introduced to the canister.



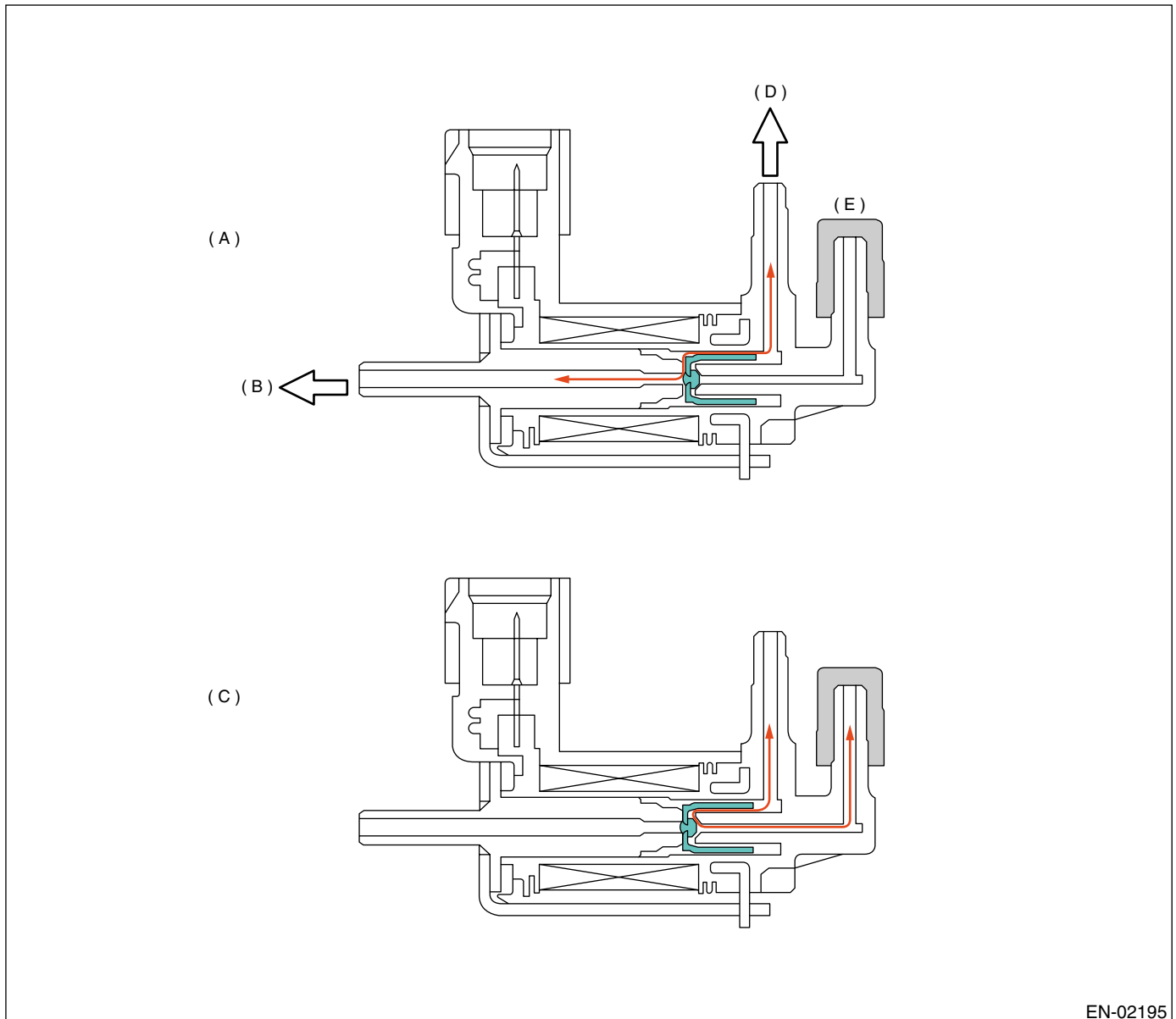
EN-02293

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

• Tank Pressure Switching Solenoid

One of the atmospheric pressure switching solenoid valves is connected to fuel tank pressure sensor and the other is released to atmosphere. The passage to fuel tank pressure sensor is usually released to atmosphere because the solenoid is set to OFF, but the solenoid is set to ON at diagnosis and the passage open to atmosphere can be closed.



EN-02195

(A) Released to atmosphere
(Solenoid OFF)

(B) Ambient air

(C) During diagnostics (Solenoid ON)

(D) To pressure sensor

(E) Plug

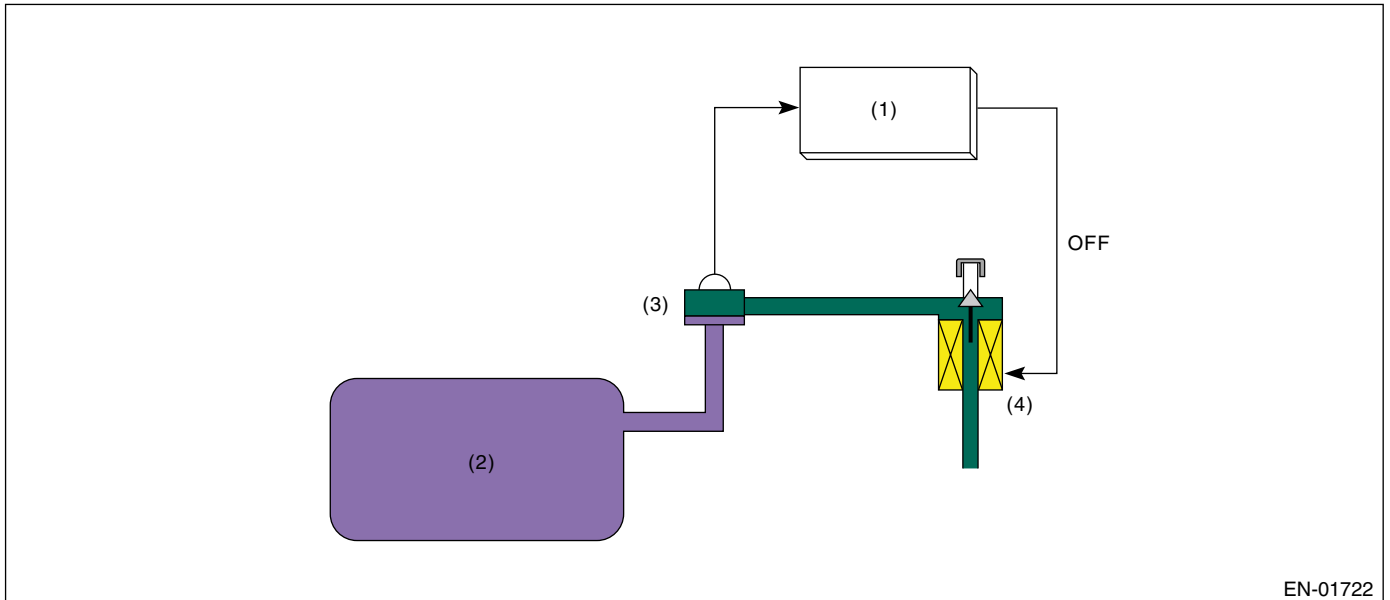
DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

• Purpose of this solenoid

Fuel tank pressure sensor detects the difference between the atmospheric air pressure and the tank pressure and the ECM monitors the pressure difference.

Even if the tank pressure is constant, the atmospheric air pressure varies depending on the driving height, and the pressure signal transmitted to ECM will change.



EN-01722

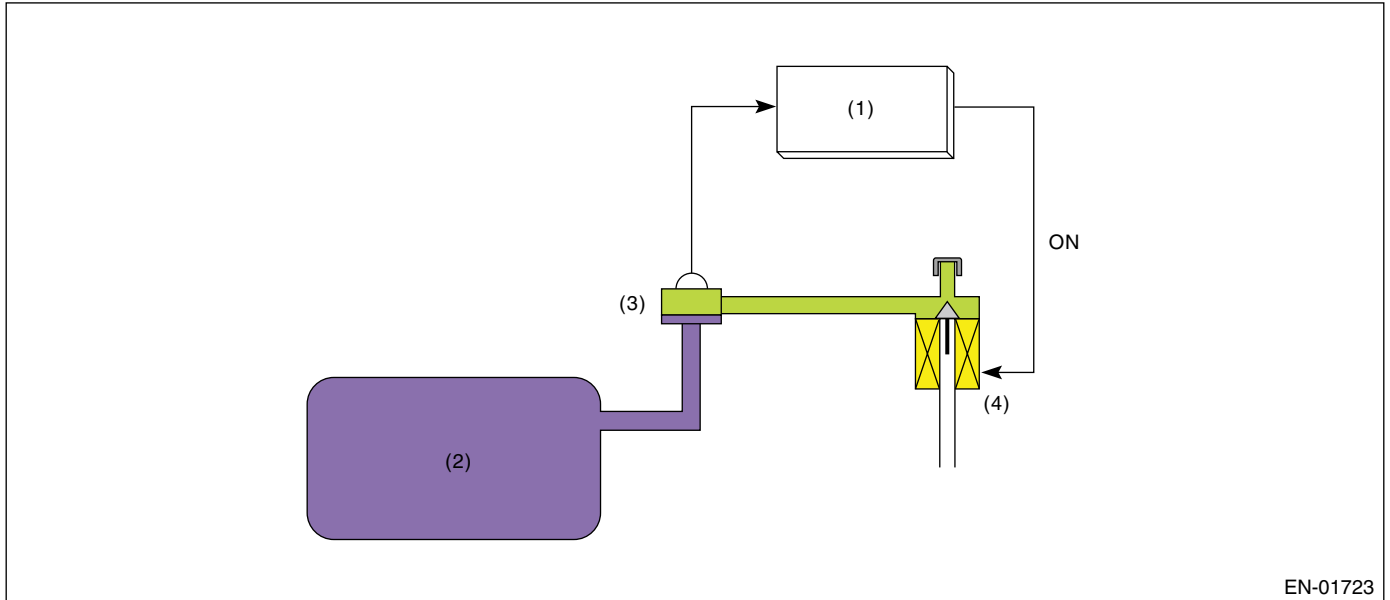
- (1) Engine control module (ECM)
- (2) Fuel tank
- (3) Fuel tank pressure sensor

- (4) Atmospheric pressure switching solenoid

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

Especially, in the small leakage [0.5 mm (0.02 in)], minute change in the tank pressure has to be detected. This diagnosis period is long (approx. 29 seconds). And if the driving height changes during the diagnosis, the atmospheric air pressure changes. In this case, it becomes difficult to precisely detect the tank pressure variation, causing erroneous diagnosis. Therefore, using the atmospheric pressure switching solenoid, atmospheric air is sealed between the fuel tank pressure sensor and atmospheric pressure switching solenoid, maintaining the air pressure constant and enabling the detection of minute variation of tank pressure.



EN-01723

- (1) Engine control module (ECM)
- (2) Fuel tank
- (3) Fuel tank pressure sensor
- (4) Atmospheric pressure switching solenoid

NOTE:

ECM also has the atmospheric air pressure sensor, and always monitors atmospheric air. However, as the monitoring range is large, that is, 53 to 107 kPa (400 to 800 mmHg, 16 to 32 inHg) it is not suitable for detection of minute pressure variation.

In the case of small leakage diagnosis, the tank pressure variation is very small, that is, 0.13 to 0.27 kPa (1 to 2 mmHg, 0.04 to 0.08 inHg) and the fuel tank pressure sensor is equipped.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

3. ENABLE CONDITION

0.04-inch Diagnosis

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9 \text{ V}$
Barometric pressure	$\geq 75.1 \text{ kPa (563 mmHg, 22.2 inHg)}$
After engine starting	856 seconds or more
Learning value of evaporation gas density	≤ 0.08
Engine speed	$1050 \leftrightarrow 6500 \text{ rpm}$
Fuel tank pressure	$\leq -1.43 \text{ kPa (-10.7 mmHg, -0.42 inHg)}$
Intake manifold vacuum (relative pressure)	$< -26.7 \text{ kPa (-200 mmHg, -7.87 inHg)}$
Vehicle speed	$\geq 32 \text{ km/h (20 MPH)}$
Fuel level	$9 \leftrightarrow 48 \text{ l (2.54} \leftrightarrow 12.68 \text{ US gal, 2.11} \leftrightarrow 10.56 \text{ Imp gal)}$
Closed air/fuel ratio control	In operation
Fuel temperature	$-10 \leftrightarrow 45^\circ\text{C (14} \leftrightarrow 113^\circ\text{F)}$
Intake air temperature	$\geq -10^\circ\text{C (14}^\circ\text{F)}$
Pressure change per second	$< 0.13 \text{ kPa (0.95 mmHg, 0.04 inHg)}$
Min. pressure change per second – Max. pressure change per second	$< 0.23 \text{ kPa (1.7 mmHg, 0.07 inHg)}$
Fuel level change	$< 3.0 \text{ l (2.1 US qt, 1.8 Imp gal)/128 milliseconds}$
Air fuel ratio	$> 0.76 \text{ — } 1.25$

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

0.02-inch Diagnosis

Secondary Parameters	Enable Conditions
(At starting a diagnosis)	
Battery voltage	$\geq 10.9 \text{ V}$
Atmospheric pressure	$\geq 75.1 \text{ kPa}$ (563 mmHg, 22.2 inHg)
Since last incomplete diagnosis event of 0.02-inch leakage	$\geq 120 \text{ seconds}$
After engine starting	335 second or more
Fuel temperature	$-10 \leftrightarrow 35^\circ\text{C}$ (14 \leftrightarrow 95°F) < 2400 seconds
Or engine coolant temperature at engine start	< 40°C (104°F)
And time after engine start	< 2400 seconds
Fuel level	9.6 \leftrightarrow 48 ℓ (2.54 \leftrightarrow 12.68 US gal, 2.11 \leftrightarrow 10.56 Imp gal)
(Ambient – fuel) temperature	< 1°C (1.8°F)
Fuel tank pressure below –3.01 kPa (–22.8 mmHg, –0.88 inHg) (during same driving cycle)	Up to 2 times
Intake manifold vacuum (relative pressure)	< –8.0 kPa (–60 mmHg, –2.36 inHg)
Fuel tank pressure	–0.13 — 1.27 kPa (–1 — 9.5 mmHg, –0.04 — 0.37 inHg)
Vehicle speed	$\geq 68 \text{ km/h}$ (42 MPH)
Closed air/fuel ratio control	In operation
Engine speed	$\geq 1500 \text{ rpm}$
(During diagnosis)	
P1	–0.07 \leftrightarrow 0.13 kPa (–0.5 \leftrightarrow 1.0 mmHg, 0.020 \leftrightarrow 0.039 inHg)
Pressure change per second	< 0.13 kPa (0.96 mmHg, 0.04 inHg)
Fuel level change	2 \leftrightarrow 3 ℓ (2.1 \leftrightarrow 3.2 US qt, 1.8 \leftrightarrow 2.6 Imp qt)
Tank pressure	< 1.40 kPa (10.5 mmHg, 0.41 inHg)
Min. tank pressure change per second – Max. tank pressure change per second	< 0.23 kPa (1.7 mmHg, 0.067 inHg)
Change of atmospheric pressure during P1 calculation	–0.02 \leftrightarrow 0.13 kPa (–0.15 \leftrightarrow 0.95 mmHg, –0.006 \leftrightarrow 0.037 inHg)
Change of atmospheric pressure during P2 calculation	–0.17 \leftrightarrow 0.17 kPa (–1.3 \leftrightarrow 1.3 mmHg, –0.051 \leftrightarrow 0.051 inHg)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

4. GENERAL DRIVING CYCLE

• 0.04-inch Diagnosis

- Perform the diagnosis only once in more than 856 seconds after the engine start at the constant driving speed of 32 km/h (20 MPH) or more.
- Pay attention to the fuel temperature and fuel level.

• 0.02-inch Diagnosis

- Perform diagnosis in more than 335 seconds after engine start at the constant speed of 68 km/h (42 MPH) or more, and judged OK or NG.
- If not judged OK or NG, repeat the diagnosis.
- Pay attention to the fuel temperature and fuel level.

5. DIAGNOSTIC METHOD

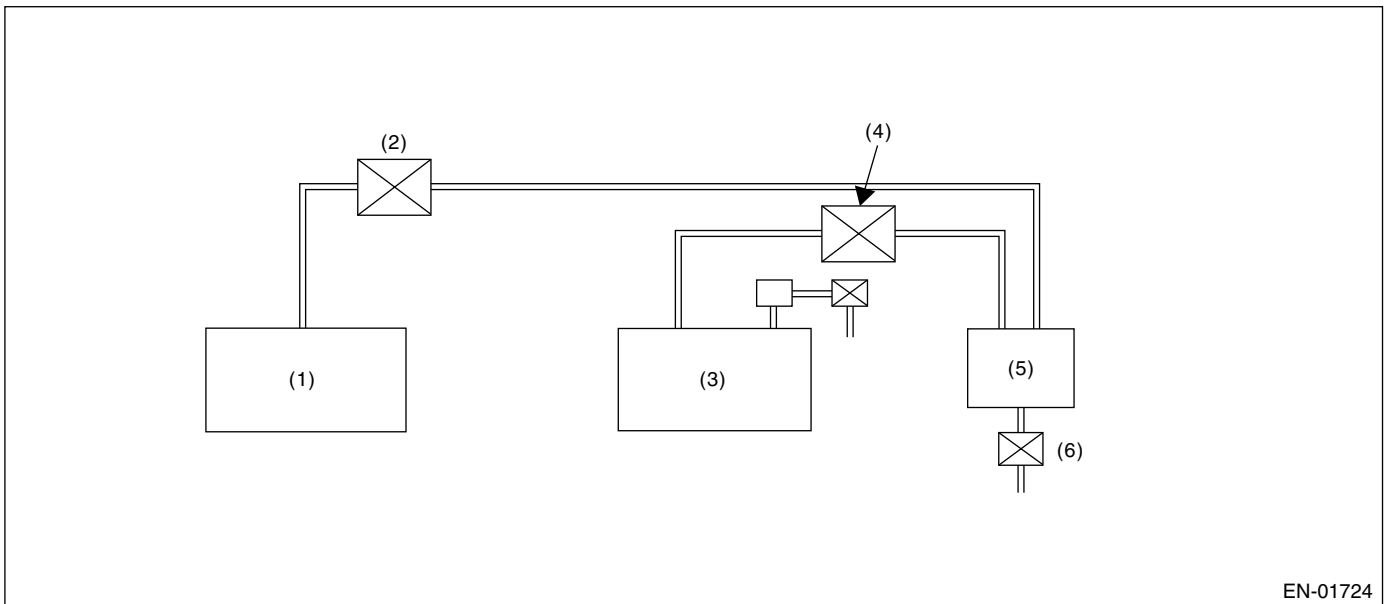
• MODE Z (Purge control solenoid valve open malfunction diagnosis, CPC close malfunction diagnosis)

DTC P0457

• Purpose of Mode Z

When performing the leakage diagnosis of EVAP system, CPC has to operate normally. Therefore, mode Z is used to diagnose the CPC open fixation.

If the CPC open fixation trouble is detected, the EVAP system leakage diagnosis is cancelled.

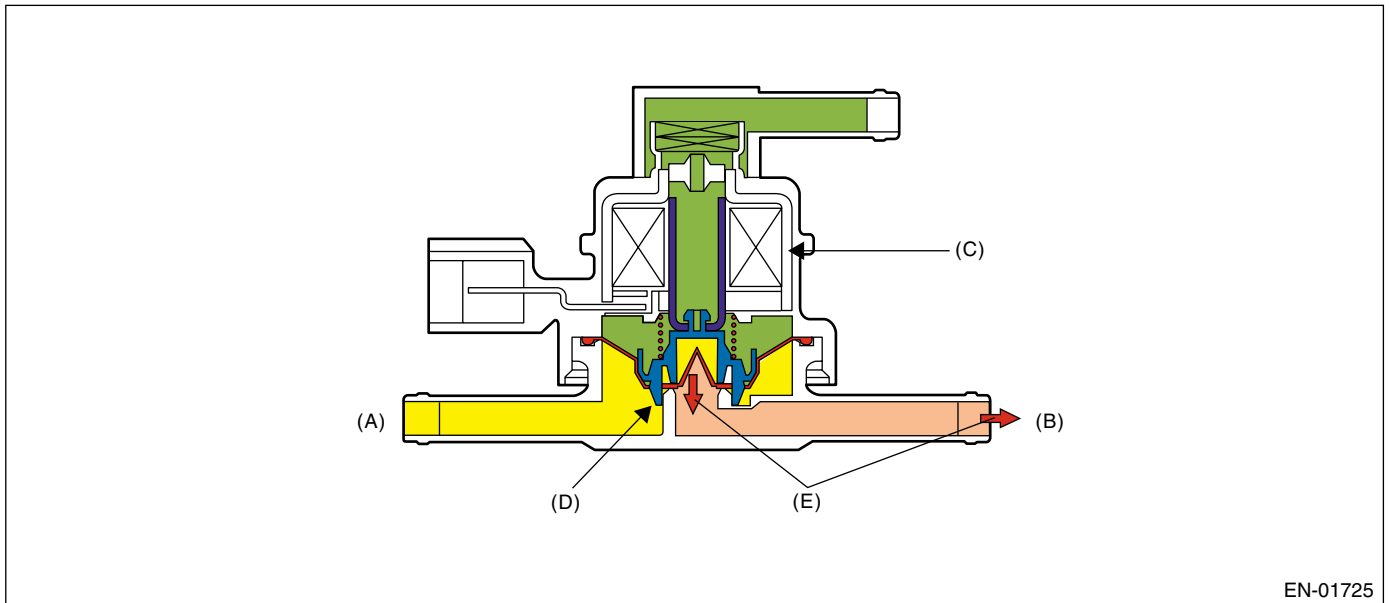


EN-01724

- | | | |
|---------------------------------------|---|---------------------|
| (1) Engine | (4) Pressure control solenoid valve close | (6) CCV stuck close |
| (2) Purge control solenoid valve open | (5) Canister | |
| (3) Fuel tank | | |

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

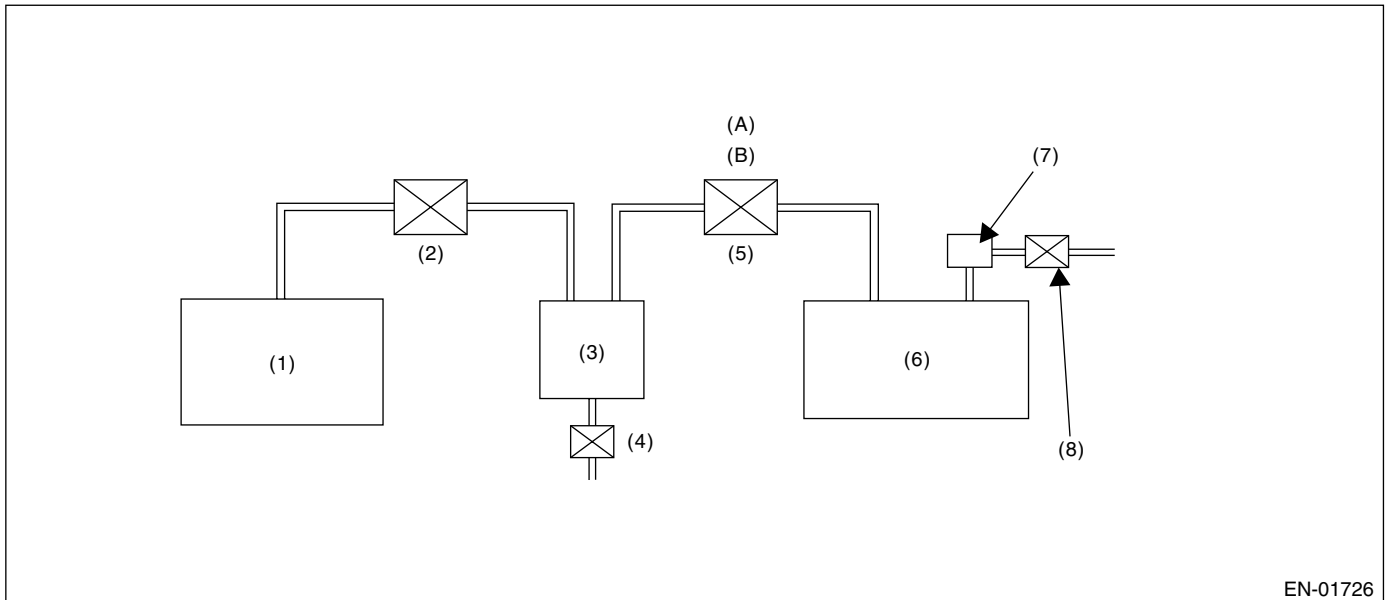


EN-01725

- | | | |
|-------------------------------------|---------------------------|-----------------------|
| (A) To fuel tank | (C) Solenoid ON | (E) Negative pressure |
| (B) To canister (Negative pressure) | (D) Valve cannot be open. | |

• Diagnostic method

CPC open fixation diagnosis are performed in mode Z as shown in the figure below.

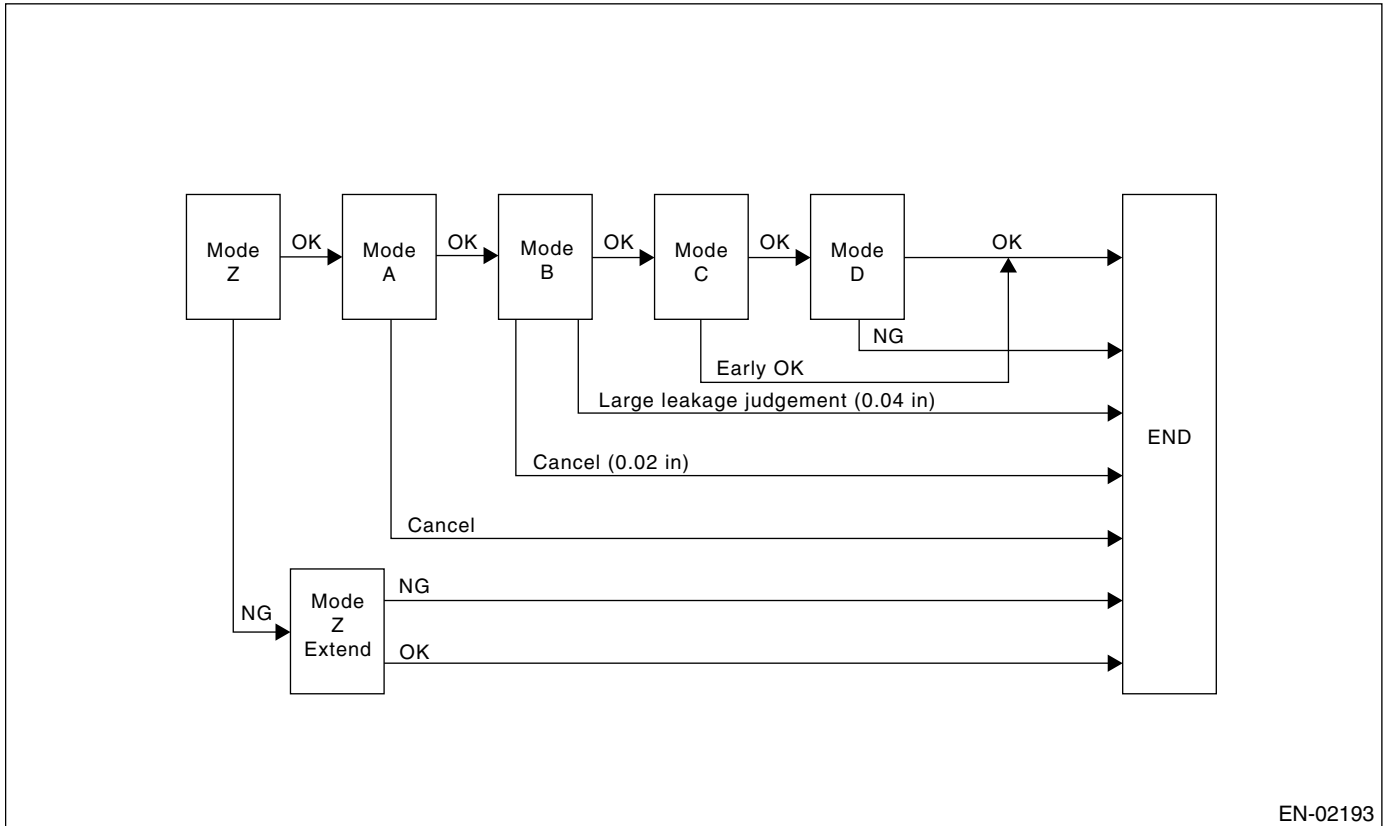


EN-01726

- | | | |
|----------------------------------|-------------------------------------|--|
| (1) Engine | (4) Drain valve | (7) Fuel tank pressure sensor |
| (2) Purge control solenoid valve | (5) Pressure control solenoid valve | (8) Tank pressure switching solenoid valve |
| (3) Canister | (6) Fuel tank | |

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION



EN-02193

• Diagnosing function of CPC [P0457]

CPC functional diagnosis is performed by monitoring the tank pressure in Mode Z.

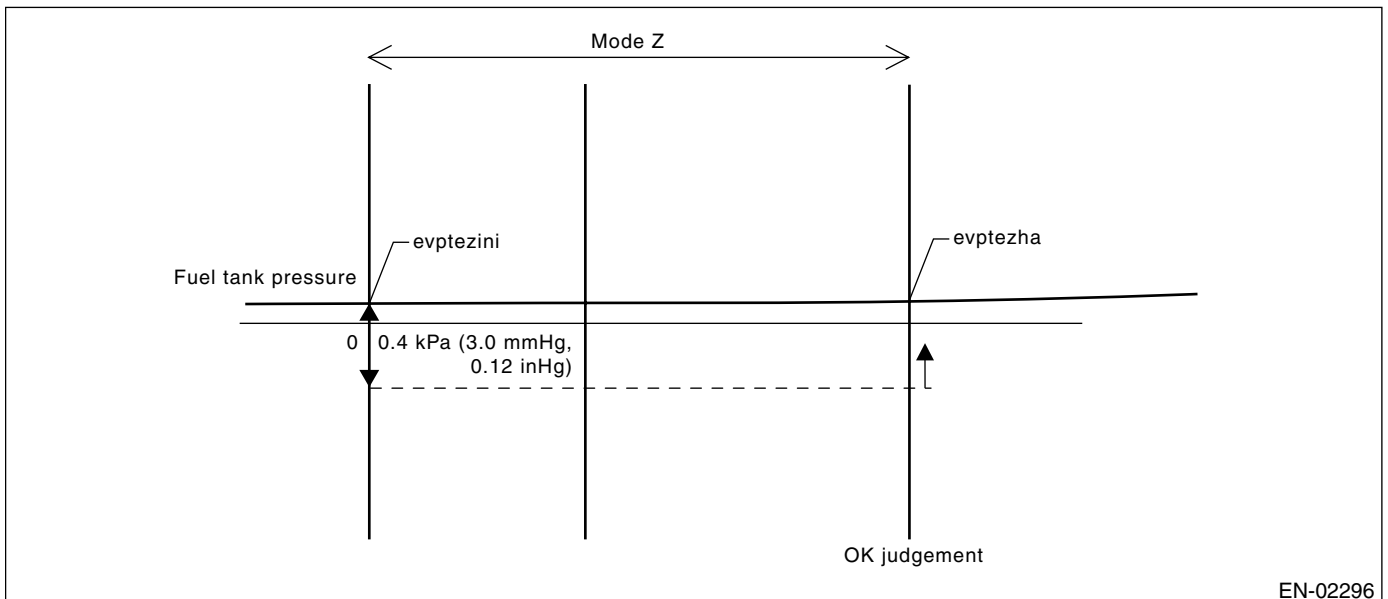
Normality Judgment

Make OK judgment in 3 seconds after Mode Z started, and change to Mode A if OK.

• Judgment Value

Malfunction Criteria	Threshold Value	DTC
(Tank pressure when Mode Z started) — (Tank pressure when Mode Z finished)	≤ 0.4 kPa (3 mmHg, 0.12 inHg)	P0457

• Normal Operation



EN-02296

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

- $evptez - evptezha \leq 0.4 \text{ kPa (3.0 mmHg, 0.12 inHg)}$

Judge normal when calculation is completed.

Abnormality Judgment

If OK judgment cannot be made, extend Mode Z 16 seconds more, and judge NG when all the criteria below are completed in 16 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value	DTC
(Tank pressure when Mode Z started) – (Tank pressure when Mode Z finished)	$> 0.6 \text{ kPa (4.5 mmHg, 0.18 inHg)}$	P0457
Tank pressure when Mode Z started	$\leq 1.43 \text{ kPa (10.7 mmHg, 0.42 inHg)}$	
Time for no fuel rolling of 2 \varnothing or more	$\geq 40 \text{ seconds}$	

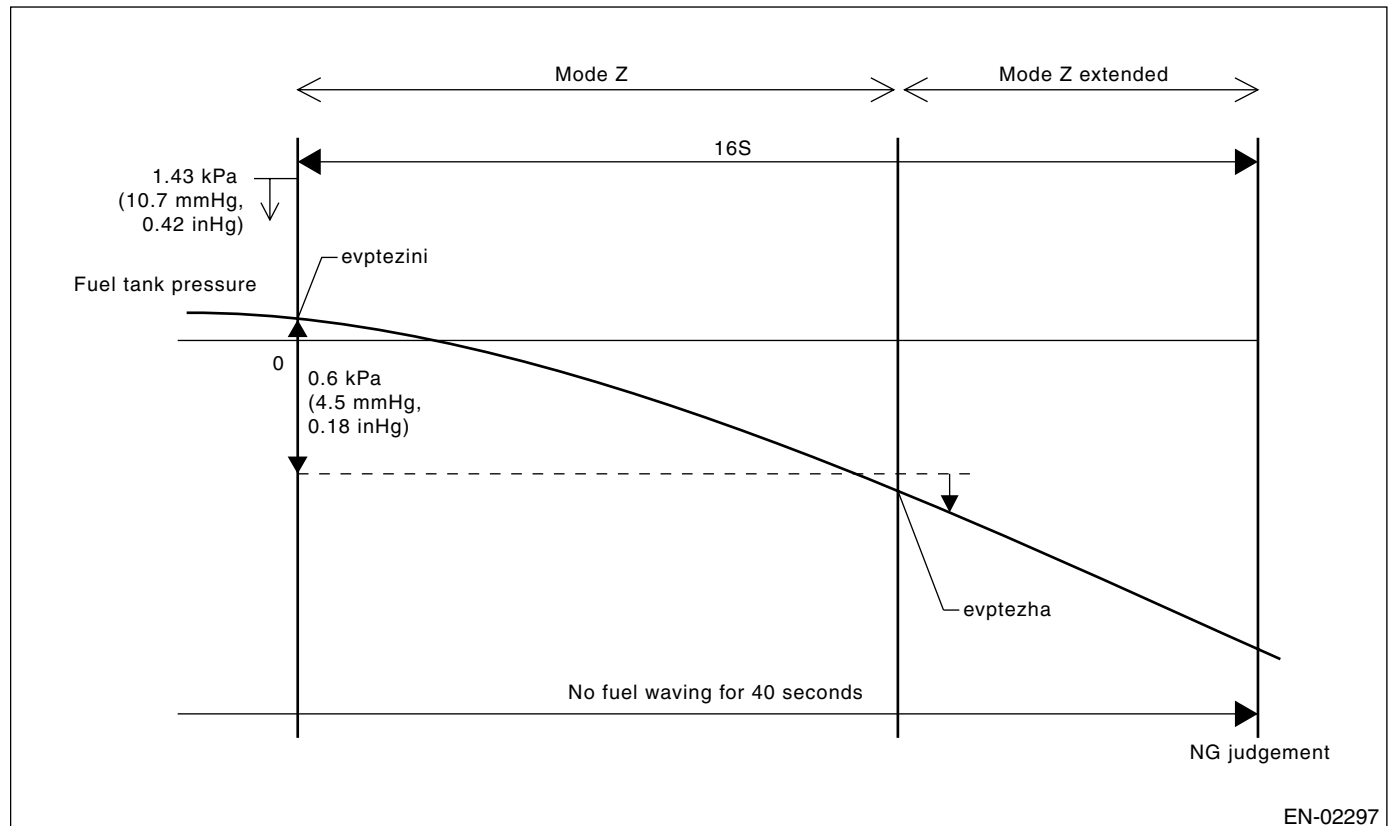
Time Needed for Diagnosis: 16 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Finish the Evap. diagnosis when making NG judgment for purge control solenoid valve open fixation.

Cancel the Evap. diagnosis when the OK/NG judgment for drain valve close fixation and purge control solenoid valve open fixation cannot be made in Mode Z.

• Purge Control Solenoid Valve Open Fixation



- $evptezini \leq 1.43 \text{ kPa (10.7 mmHg, 0.42 inHg)}$
- No fuel rolling of above 2 \varnothing (0.79 US gal, 0.67 Imp gal) for more than 40 seconds.

Judge normal when these calculations are completed.

• Leak Diagnosis

DTC P0442

DTC P0456

DTC P0457

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

• Diagnostic method

- The diagnostic method consists of creating a sealed vacuum in the fuel tank and then determining the presence of leakage from the speed at which the tank internal pressure returns to atmospheric pressure.
- The diagnosis is divided into the following five phases.

Mode A: (Estimation of evaporation gas yield)

The amount of change of tank pressure (P1) in Mode A is calculated. After calculating P1, change to Mode B.

Mode B: (Seal negative pressure)

Introduce the negative pressure in the intake manifold to the tank.

Approx. 0 → -1.4 kPa (0 → -10.5 mmHg, 0 → -0.41 inHg) (0.04-in diagnosis)

Approx. 0 → -3.05 kPa (0 → -22.9 mmHg, 0 → -0.9 inHg) (0.02-in diagnosis)

When the pressure above (desired negative pressure) is reached, Mode C is entered.

In this case, if the tank pressure does not become the desired negative pressure, judge that there is a large leakage in the system.

Judge NG when the malfunction criteria below is completed.

Finish the Evap. diagnosis when judging large leak (10 seconds) in 0.04-inch diagnosis. Cancel the diagnosis (14 seconds) in 0.02-inch diagnosis.

Abnormality Judgment

Judge NG (large leak) when the criteria below are completed in the specified time.

• Judgment Value

Malfunction Criteria	Threshold Value	DTC
(0.04-inch diagnosis) Or time for Mode B (Min. value of tank pressure during Mode B) – (Tank pressure when Mode B started)	≥ 10 seconds < -0.3 kPa (-2 mmHg, -0.08 inHg)	P0457

Mode C: (Check increasing pressure)

Stop the introduction of negative pressure. (Wait until the tank pressure returns to the start level of P2 calculation.)

Change to Mode D when the tank pressure returns to the start level of P2 calculation.

Judge immediate OK and change to Mode E when it does not return in spite of spending the specified time.

	Tank pressure when P2 calculation started	Time for immediate OK judgment
0.04-inch diagnosis	-1.3 kPa (-9.75 mmHg, -0.38 inHg)	15 seconds
0.02-inch diagnosis	-3 kPa (-22.5 mmHg, -0.89 inHg)	36 seconds

Mode D: (Measurement of negative pressure changes)

Monitor the pressure variation in the tank in Mode Z. In this case, the tank pressure increases, that is, the pressure becomes as high as the atmospheric air pressure, because evaporator is generated. However, if any leakage exists, the pressure increases additionally in proportion to this leakage. The pressure variation of this tank is P2.

After calculating P2, perform following small leak diagnosis.

• After Mode D

Assigning P1 and P2, which are tank variations measured in Mode A and Mode B, to the formula below, judge the small leakage of the system. If the measured judgment value exceeds the threshold value, it is judged to be malfunction.

• 0.04-inch Diagnosis

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

Abnormality Judgment

Judge NG when the criteria below are completed and judge OK when not completed.

• Judgment Value

Malfunction Criteria	Threshold Value	DTC
P2 – 1.5 × P1 P2: Change of tank pressure within 10 seconds on Mode D P1: Change of tank pressure within 10 seconds on Mode A	> Value on map 7. *Threshold value: Figure (Fuel level vs Tank temperature)	P0442

*1.5: Compensation value of the amount of evaporator occurrence. (Because evaporator increases more when becoming negative pressure.)

• Map 7 Limit of malfunction criteria for 0.04-inch leak as Evap. diagnosis.

Fuel temperature & Fuel level	25°C (77°F)	30°C (86°F)	35°C (95°F)	40°C (104°F)	45°C (113°F)
10 L (2.6 US gal, 2.2 Imp gal)	0.32 kPa (2.4 mmHg, 0.094 inHg)	0.33 kPa (2.5 mmHg, 0.098 inHg)	0.35 kPa (2.6 mmHg, 0.102 inHg)	0.35 kPa (2.65 mmHg, 0.104 inHg)	0.36 kPa (2.7 mmHg, 0.106 inHg)
20 L (5.3 US gal, 4.4 Imp gal)	0.35 kPa (2.6 mmHg, 0.102 inHg)	0.36 kPa (2.7 mmHg, 0.106 inHg)	0.37 kPa (2.8 mmHg, 0.110 inHg)	0.39 kPa (2.9 mmHg, 0.114 inHg)	0.40 kPa (3.0 mmHg, 0.118 inHg)
30 L (7.9 US gal, 6.6 Imp gal)	0.40 kPa (3.0 mmHg, 0.118 inHg)	0.45 kPa (3.4 mmHg, 0.134 inHg)	0.47 kPa (3.5 mmHg, 0.138 inHg)	0.48 kPa (3.6 mmHg, 0.142 inHg)	0.49 kPa (3.7 mmHg, 0.146 inHg)
40 L (10.6 US gal, 8.8 Imp gal)	0.43 kPa (3.25 mmHg, 0.128 inHg)	0.47 kPa (3.5 mmHg, 0.138 inHg)	0.49 kPa (3.65 mmHg, 0.144 inHg)	0.50 kPa (3.75 mmHg, 0.148 inHg)	0.51 kPa (3.85 mmHg, 0.152 inHg)
50 L (13.2 US gal, 11.0 Imp gal)	0.47 kPa (3.5 mmHg, 0.138 inHg)	0.48 kPa (3.6 mmHg, 0.142 inHg)	0.51 kPa (3.8 mmHg, 0.150 inHg)	0.52 kPa (3.9 mmHg, 0.154 inHg)	0.53 kPa (4.0 mmHg, 0.157 inHg)

• 0.02-inch Diagnosis

Abnormality Judgment

Judge NG when the criteria below are completed.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

• Judgment Value

Malfunction Criteria	Threshold Value	DTC
P2 – 1.5 × P1 P2: Change of tank pressure within 22 seconds on Mode D P1: Change of tank pressure within 22 seconds on Mode A	> Value on map 8. *Threshold value: Figure (Fuel level vs Tank temperature)	P0456

• Map 8 Limit of malfunction criteria for 0.04-inch leak as Evap. diagnosis.

Fuel temperature & Fuel level	25°C (77°F)	30°C (86°F)	35°C (95°F)	40°C (104°F)
10 L (2.6 US gal, 2.2 Imp gal)	0.32 kPa (2.39 mmHg, 0.094 inHg)	0.32 kPa (2.39 mmHg, 0.094 inHg)	0.37 kPa (2.77 mmHg, 0.109 inHg)	0.73 kPa (5.49 mmHg, 0.216 inHg)
20 L (5.3 US gal, 4.4 Imp gal)	0.35 kPa (2.63 mmHg, 0.104 inHg)	0.36 kPa (2.68 mmHg, 0.106 inHg)	0.41 kPa (3.04 mmHg, 0.120 inHg)	0.79 kPa (5.92 mmHg, 0.233 inHg)
30 L (7.9 US gal, 6.6 Imp gal)	0.39 kPa (2.96 mmHg, 0.117 inHg)	0.39 kPa (2.96 mmHg, 0.117 inHg)	0.44 kPa (3.3 mmHg, 0.130 inHg)	0.85 kPa (6.34 mmHg, 0.250 inHg)
40 L (10.6 US gal, 8.8 Imp gal)	0.43 kPa (3.2 mmHg, 0.126 inHg)	0.43 kPa (3.2 mmHg, 0.126 inHg)	0.48 kPa (3.58 mmHg, 0.141 inHg)	0.89 kPa (6.7 mmHg, 0.264 inHg)
50 L (13.2 US gal, 11.0 Imp gal)	0.46 kPa (3.43 mmHg, 0.135 inHg)	0.46 kPa (3.43 mmHg, 0.135 inHg)	0.51 kPa (3.86 mmHg, 0.152 inHg)	0.93 kPa (7 mmHg, 0.276 inHg)

Normality Judgment

Judge OK when the criteria below are completed.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

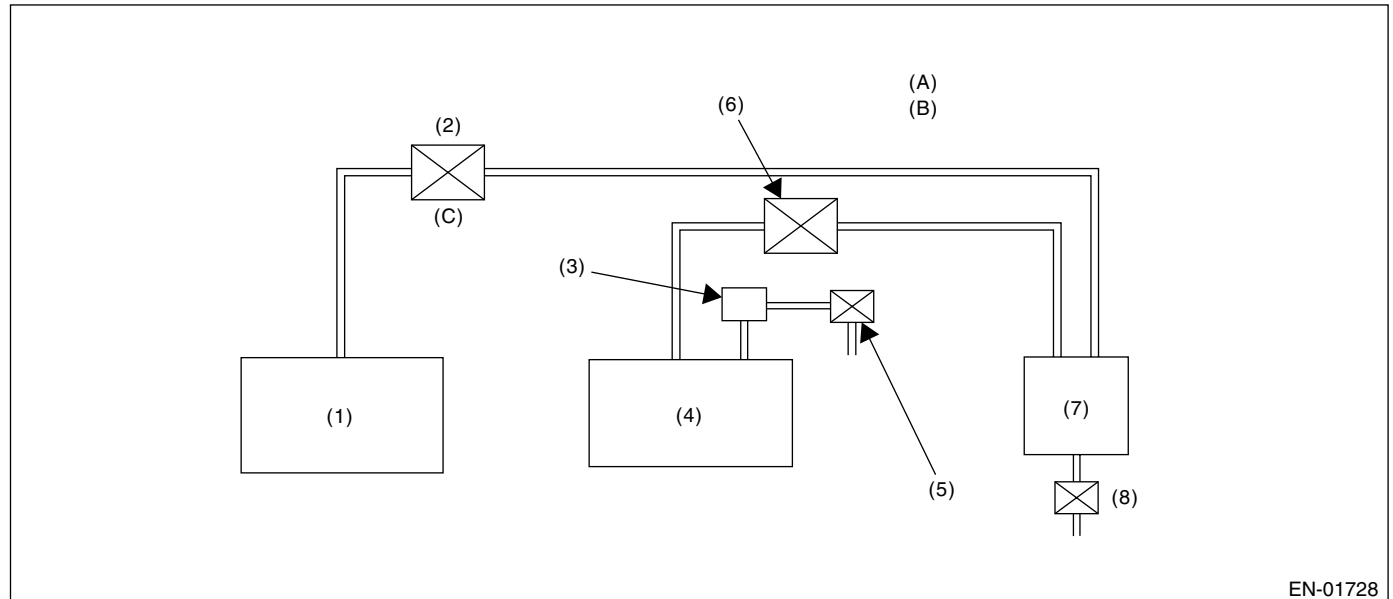
• Judgment Value

Malfunction Criteria	Threshold Value	DTC
P2 – 1.5 × P1	< Valve on map 9.	P0456

• Map 9.

Fuel temperature & Fuel level	25°C (77°F)	30°C (86°F)	35°C (95°F)	40°C (104°F)
10 L (2.6 US gal, 2.2 Imp gal)	0.21 kPa (1.59 mmHg, 0.063 inHg)	0.21 kPa (1.59 mmHg, 0.063 inHg)	0.26 kPa (1.97 mmHg, 0.078 inHg)	0.31 kPa (2.36 mmHg, 0.093 inHg)
20 L (5.3 US gal, 4.4 Imp gal)	0.28 kPa (2.09 mmHg, 0.082 inHg)	0.28 kPa (2.09 mmHg, 0.082 inHg)	0.33 kPa (2.45 mmHg, 0.096 inHg)	0.37 kPa (2.81 mmHg, 0.111 inHg)
30 L (7.9 US gal, 6.6 Imp gal)	0.35 kPa (2.59 mmHg, 0.102 inHg)	0.35 kPa (2.59 mmHg, 0.102 inHg)	0.39 kPa (2.92 mmHg, 0.115 inHg)	0.43 kPa (3.26 mmHg, 0.128 inHg)
40 L (10.6 US gal, 8.8 Imp gal)	0.30 kPa (2.26 mmHg, 0.089 inHg)	0.30 kPa (2.26 mmHg, 0.089 inHg)	0.35 kPa (2.64 mmHg, 0.104 inHg)	0.40 kPa (3.02 mmHg, 0.119 inHg)
50 L (13.2 US gal, 11.0 Imp gal)	0.26 kPa (1.93 mmHg, 0.076 inHg)	0.26 kPa (1.93 mmHg, 0.076 inHg)	0.31 kPa (2.36 mmHg, 0.093 inHg)	0.37 kPa (2.78 mmHg, 0.109 inHg)

If not judged OK or NG, repeat the diagnosis until judged OK or NG.

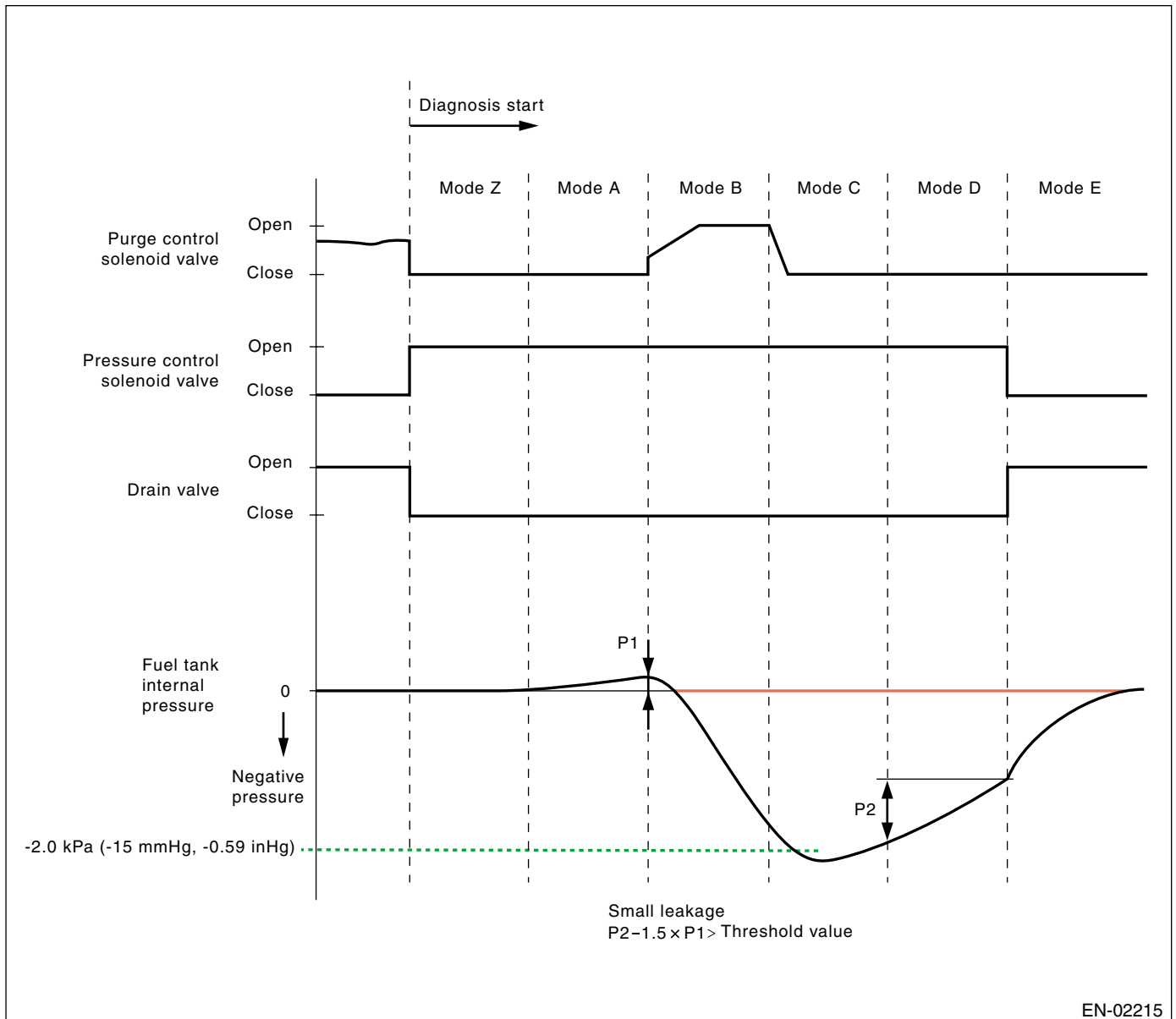


EN-01728

- | | | |
|----------------------------------|---|-------------------------------------|
| (1) Engine | (4) Fuel tank | (6) Pressure control solenoid valve |
| (2) Purge control solenoid valve | (5) Atmospheric pressure switching solenoid | (7) Canister |
| (3) Fuel tank pressure sensor | | (8) Drain valve |

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION



• Time Needed for Diagnosis:

0.04-inch:	30 — 100 seconds
0.02-inch:	30 — 100 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous drive cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

None

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

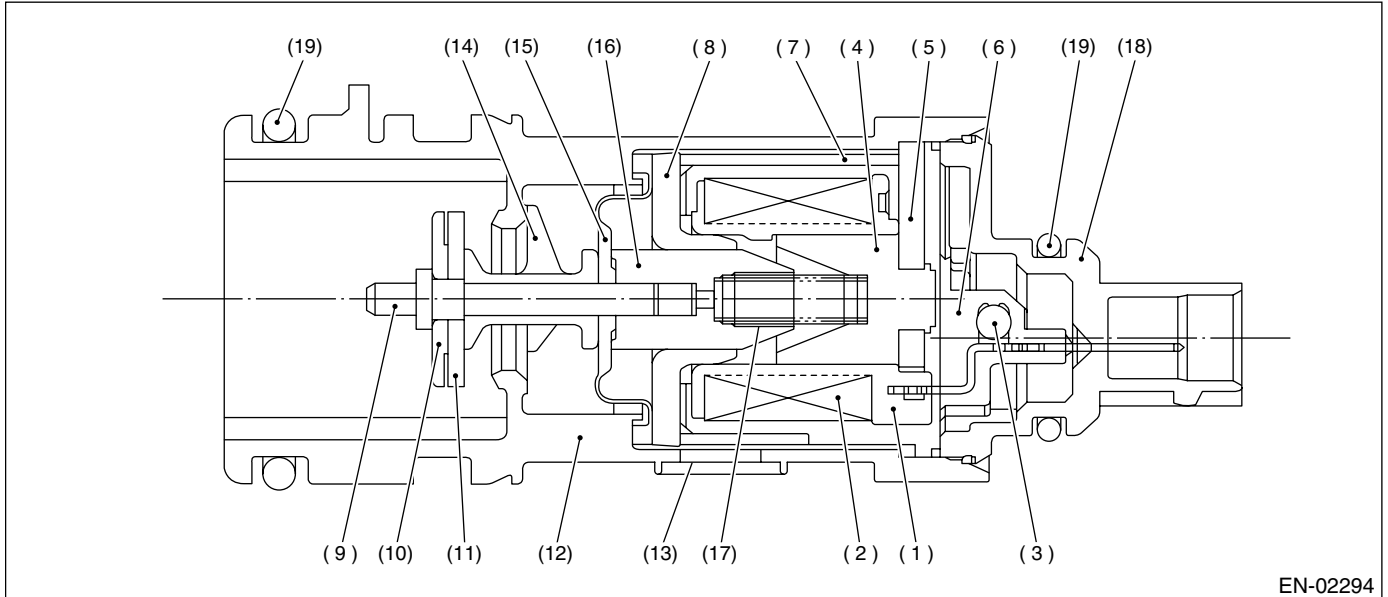
BO:DTC P0447 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of drain valve.

Judge NG when the ECM output level is different from the actual terminal level.

2. COMPONENT DESCRIPTION



EN-02294

- | | | |
|-----------------|--------------------|------------------|
| (1) Bobbin | (8) Magnetic plate | (15) Diaphragm |
| (2) Coil | (9) Shaft | (16) Moving core |
| (3) Diode | (10) Plate | (17) Spring |
| (4) Stator core | (11) Valve | (18) Cover |
| (5) End plate | (12) Housing | (19) O-ring |
| (6) Body | (13) Filter | |
| (7) Yoke | (14) Retainer | |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM sends OFF signal	Low

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM sends OFF signal	High

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

PCV control: Open the PCV solenoid.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

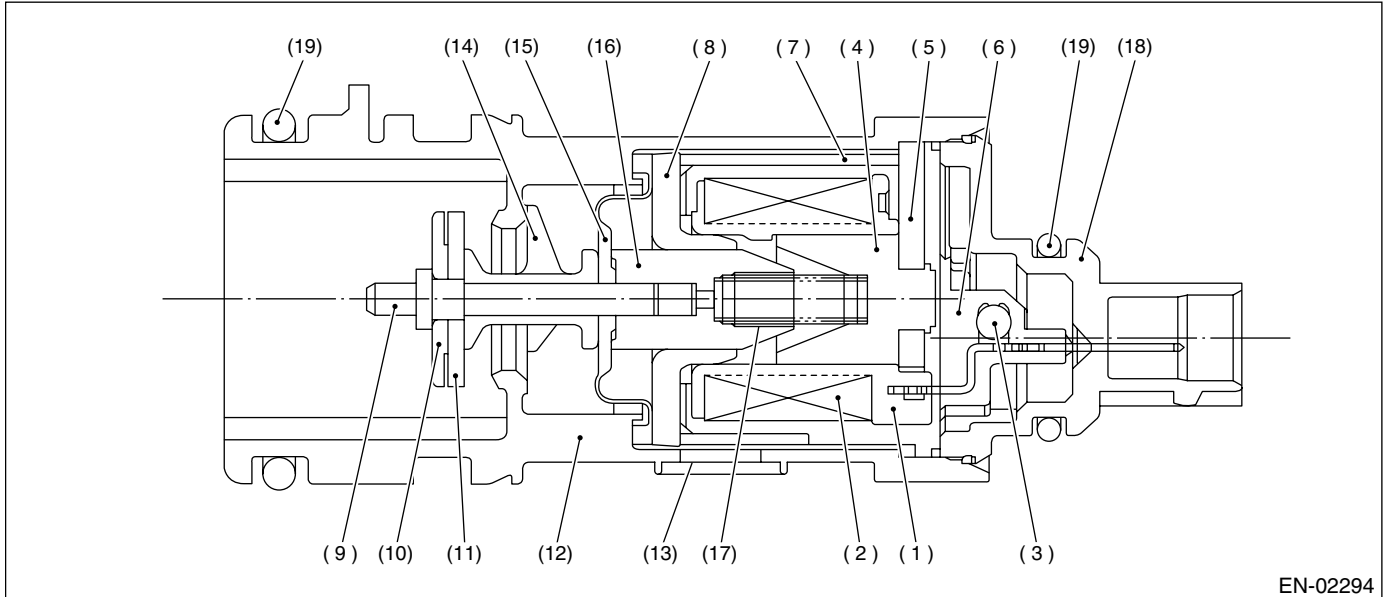
BP:DTC P0448 — EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of drain valve.

Judge NG when the ECM output level is different from the actual terminal level.

2. COMPONENT DESCRIPTION



EN-02294

- | | | |
|-----------------|--------------------|------------------|
| (1) Bobbin | (8) Magnetic plate | (15) Diaphragm |
| (2) Coil | (9) Shaft | (16) Moving core |
| (3) Diode | (10) Plate | (17) Spring |
| (4) Stator core | (11) Valve | (18) Cover |
| (5) End plate | (12) Housing | (19) O-ring |
| (6) Body | (13) Filter | |
| (7) Yoke | (14) Retainer | |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM sends ON signal	High

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM sends ON signal	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

PCV control: Open the PCV solenoid.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

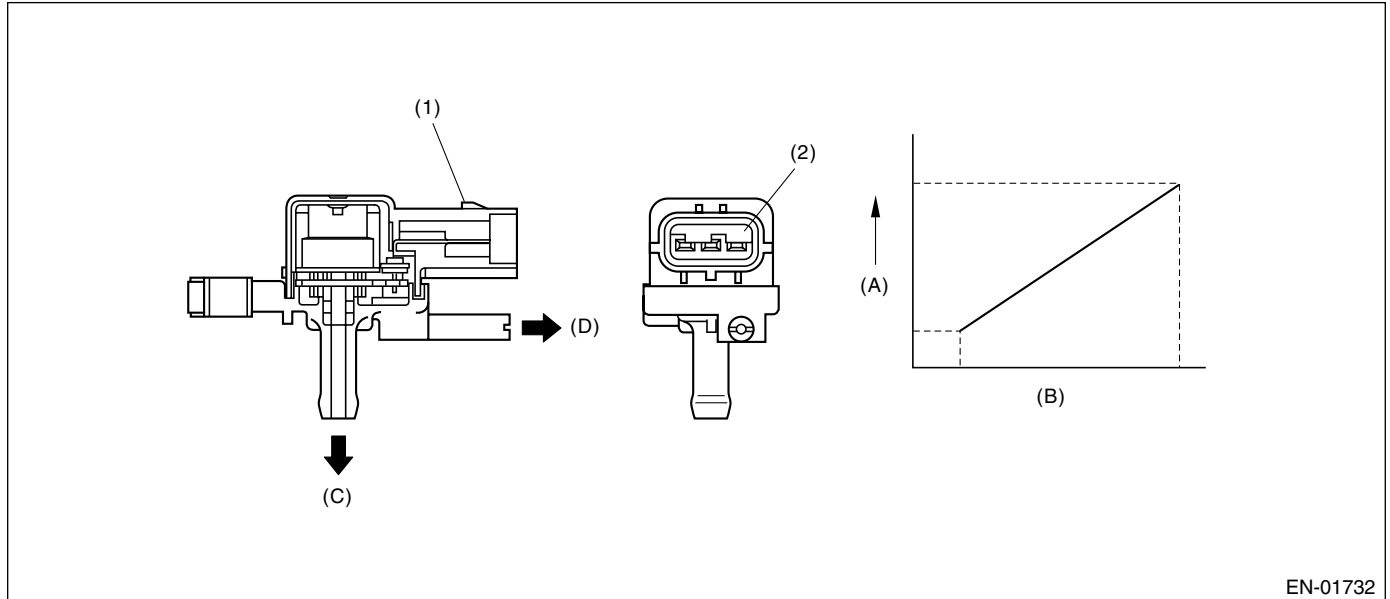
BQ:DTC P0451 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR RANGE/PERFORMANCE —

1. OUTLINE OF DIAGNOSIS

Detect the tank pressure sensor output property abnormality.

Judge NG when there is no pressure variation, which should exist in the tank, considering the engine status.

2. COMPONENT DESCRIPTION



EN-01732

(1) Connector

(2) Terminal

(A) Output voltage

(B) Input voltage

(C) To fuel tank

(D) To atmospheric pressure switching solenoid

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
After starting the engine	60 second or more
Fuel level	$\geq 9.6 \ell$ (10.1 US gal, 8.4 Imp gal)
Fuel temperature	$< 35^{\circ}\text{C}$ (95°F)
Battery voltage	$\geq 10.9 \text{ V}$
Atmospheric pressure	$> 75.1 \text{ kPa}$ (563 mmHg, 22.2 inHg)

4. GENERAL DRIVING CYCLE

- Perform the diagnosis continuously in 60 seconds or more after starting the engine.
- Be sure to check the fuel level and fuel temperature.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below is completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Number of times when the difference between the Max. fuel level and the Min. fuel level every 60 seconds is 2 ℓ (0.53 US gal, 0.44Imp gal) or more (with enable condition completed)	≥ 16 times
Max. – Min. tank pressure (with enable condition completed)	< 0.05 kPa (0.375 mmHg, 0.02 inHg)
Max. – Min. fuel temperature (with enable condition completed)	≥ 7°C (12.6 °F)

If the fuel level (Max. – Min.) in every 60 seconds is less than 2 ℓ , extend 60 seconds more and make judgment with the Max. and Min. fuel level in 120 seconds.

If the difference did not appear though the time extended, extend the time (180, 240, 300 seconds) and continue the judgment.

Diagnosis counter will count up when the difference of fuel level (Max. – Min.) is more than 2 ℓ .

Time Needed for Diagnosis: 1 minute × 16 times or more

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in two continuous drive cycles.

• Normality Judgment

Judge OK when the malfunction criteria below is completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Max. – Min. tank pressure	≥ 0.05 kPa (0.375 mmHg, 0.02 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Purge control solenoid valve control: Purge fixation mode is prohibited.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

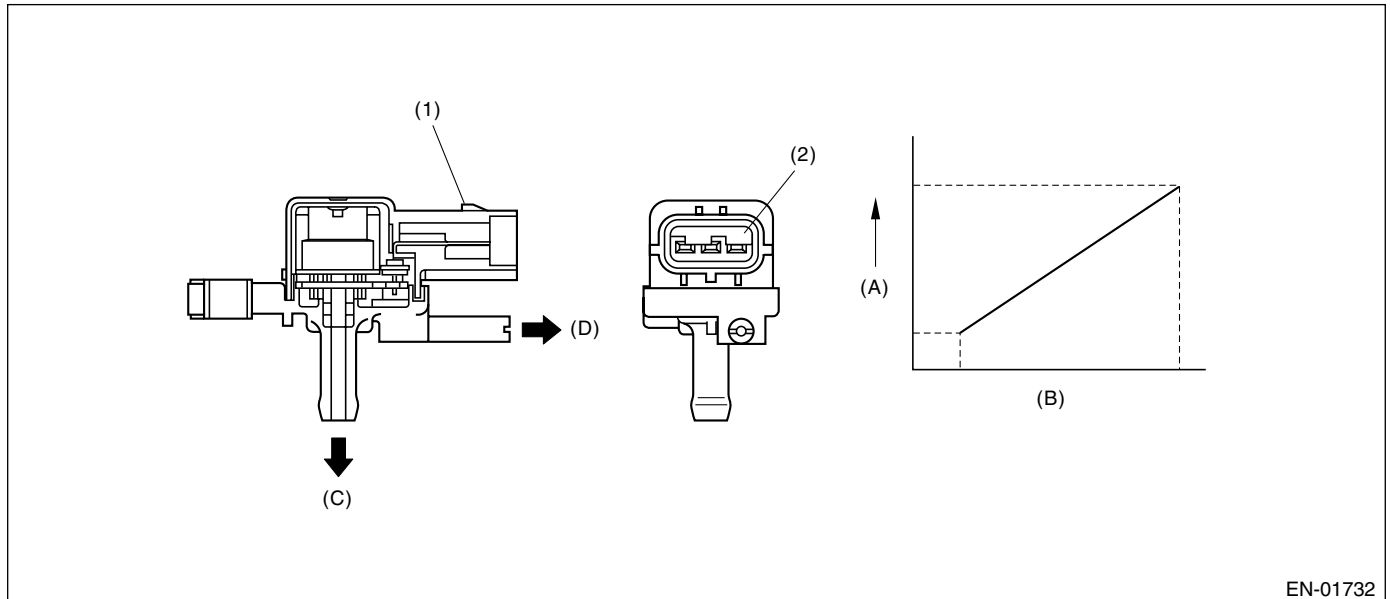
GENERAL DESCRIPTION

BR:DTC P0452 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the fuel tank pressure sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



EN-01732

(1) Connector

(2) Terminal

(A) Output voltage

(B) Input voltage

(C) To fuel tank

(D) To atmospheric pressure switching solenoid

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 15 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	< -7.44 kPa (-55.86 mmHg, -2.20 inHg)

Time Needed for Diagnosis: 15 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK when the malfunction criteria below is completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	< -7.44 kPa (-55.86 mmHg, -2.20 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Purge control solenoid valve control: Purge fixation mode is prohibited.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

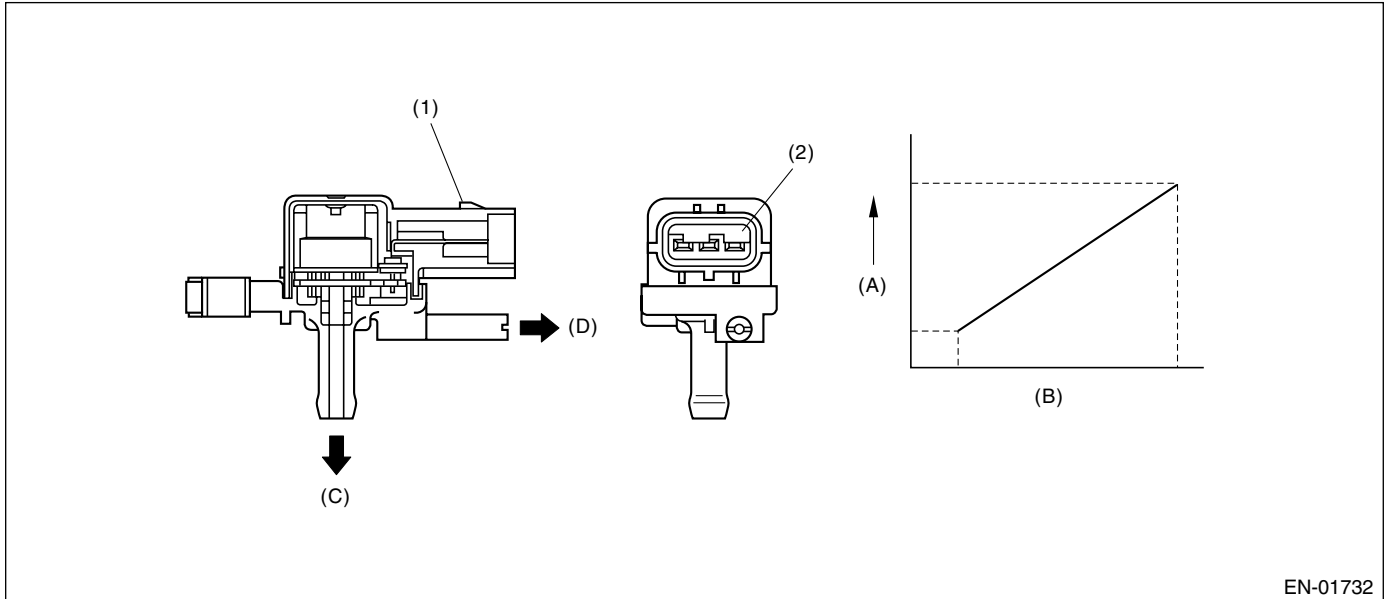
GENERAL DESCRIPTION

BS:DTC P0453 — EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the breaking/shortage of the fuel tank pressure sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



EN-01732

(1) Connector

(A) Output voltage

(C) To fuel tank

(2) Terminal

(B) Input voltage

(D) To atmospheric pressure switching solenoid

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Vehicle speed	≥ 2 km/h (1.24 MPH)
All conditions of EVAP canister purge	Complete
Evaporation gas density learning value	≤ 0.08
Main feedback compensation coefficient	≥ 0.9
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when purging.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 15 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	≥ 7.98 kPa (59.86 mmHg, 2.36 inHg)
Fuel temperature	$< 35^{\circ}\text{C}$ (95°F)
Atmospheric pressure	≥ 75.1 kPa (563 mmHg, 22.2 inHg)

Time Needed for Diagnosis: 15 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK when the malfunction criteria below is completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	≥ 7.98 kPa (59.86 mmHg, 2.36 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Purge control solenoid valve control: Purge fixation mode is prohibited.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

BT:DTC P0456 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK) —

1. OUTLINE OF DIAGNOSIS

For detecting conditions, refer to DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK). <Ref. to GD(H4SO U5)-134, DTC P0442 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

BU:DTC P0457 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF) —

1. OUTLINE OF DIAGNOSIS

For detecting conditions, refer to DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK). <Ref. to GD(H4SO U5)-134, DTC P0442 — EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

MEMO:

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

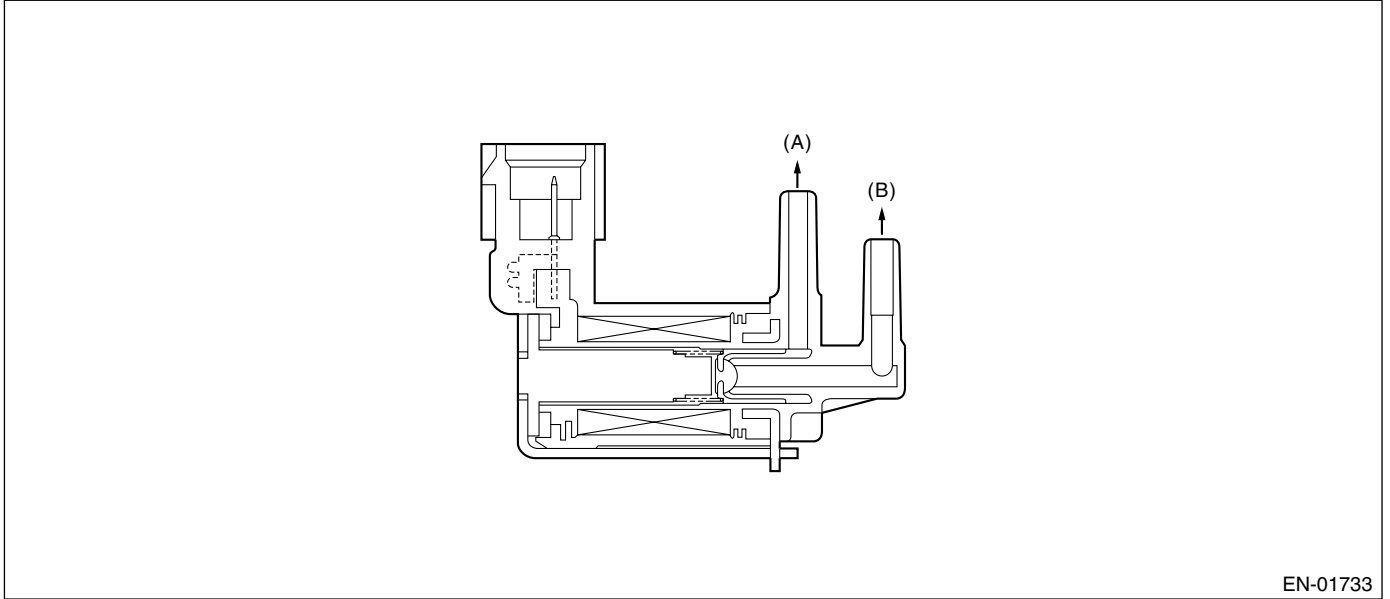
GENERAL DESCRIPTION

BV:DTC P0458 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT LOW —

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of purge control solenoid valve.
Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(A) To canister

(B) To intake manifold

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Continuous time of completing criteria below.	≥ 2.5 seconds
Duty ratio of 'ON'	$< 75\%$
Terminal output voltage	Low

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear NG when the malfunction criterion below is completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage	High

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

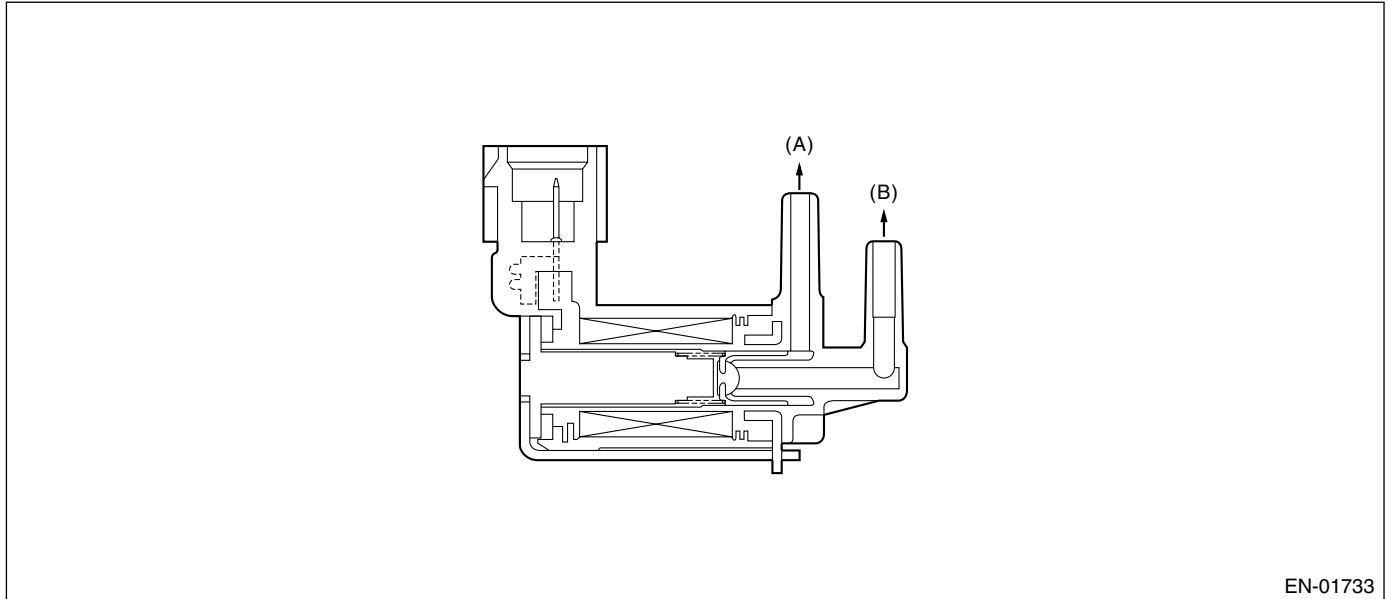
GENERAL DESCRIPTION

BW:DTC P0459 — EVAPORATIVE EMISSION CONTROL SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH —

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of purge control solenoid valve.
Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



EN-01733

(A) To canister

(B) To intake manifold

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Continuous time of completing criteria below.	≥ 2.5 seconds
Duty ratio of 'ON'	$\geq 25\%$
Terminal output voltage	High

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear NG when the malfunction criterion below is completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

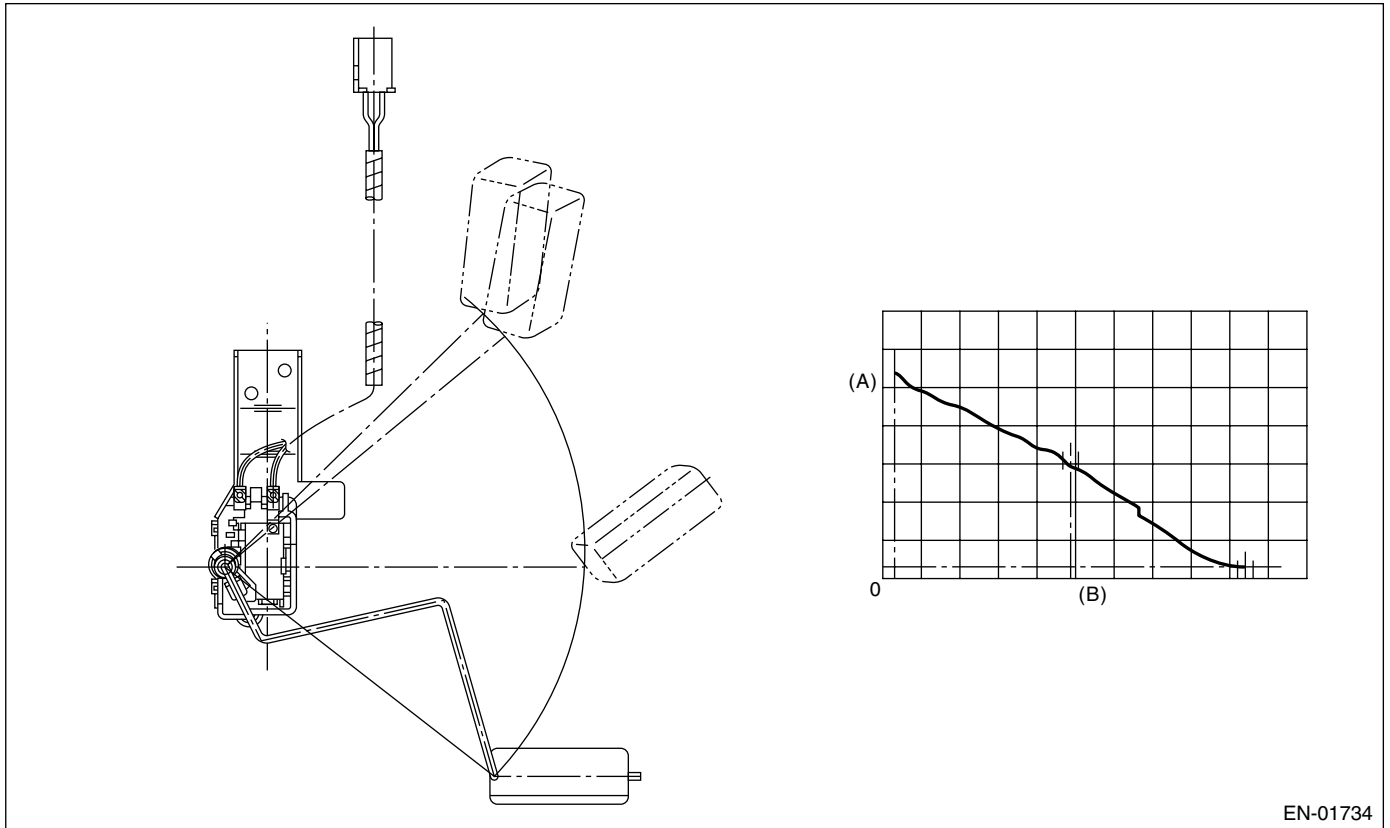
BX:DTC P0461 — FUEL LEVEL SENSOR CIRCUIT RANGE/PERFORMANCE —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel level sensor output property.

Judge NG when the fuel level does not vary whereas it seemed to vary be in a usual driving speed.

2. COMPONENT DESCRIPTION



EN-01734

(A) Fuel level

(B) Resistance

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	> 331 kg (729.7 lb)
Max.– Min. fuel level output	< 2.6 ℓ (0.69 US gal, 0.57 Imp gal)
Battery voltage	≥ 10.9 V
After engine start	More than 0.5 seconds

Time Needed for Diagnosis: To be determined.

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	> 331 kg (729.7 lb)
Max.– Min. fuel level output	≥ 2.6 ℓ (0.69 US gal, 0.57 Imp gal)
Battery voltage	≥ 10.9 V
After engine start	More than 0.5 seconds

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

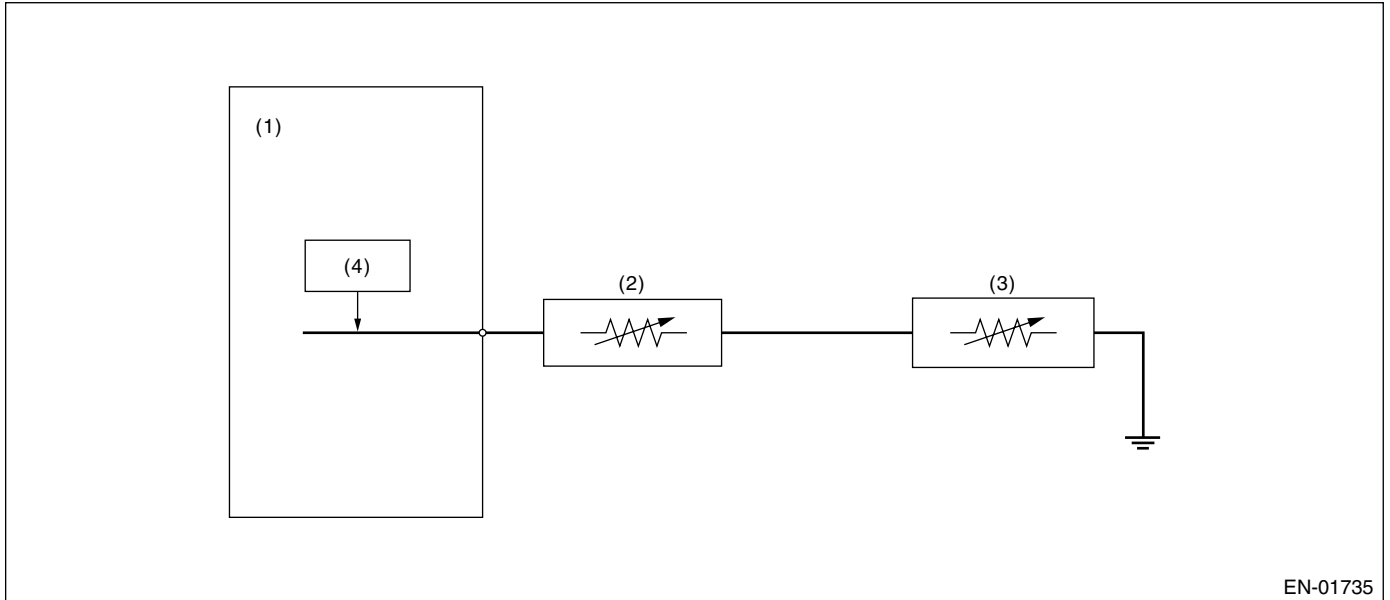
GENERAL DESCRIPTION

BY:DTC P0462 — FUEL LEVEL SENSOR CIRCUIT LOW INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel level sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



- (1) Engine control module (ECM)
- (2) Fuel level sensor
- (3) Fuel sub level sensor
- (4) Detecting circuit

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (2.5 seconds).

• Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	$\geq 10.9\text{ V}$
After engine starting	3 seconds or more
Output voltage	$< 0.015\text{ V}$

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	$\geq 10.9\text{ V}$
After engine starting	3 seconds or more
Output voltage	$\geq 0.015\text{ V}$

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

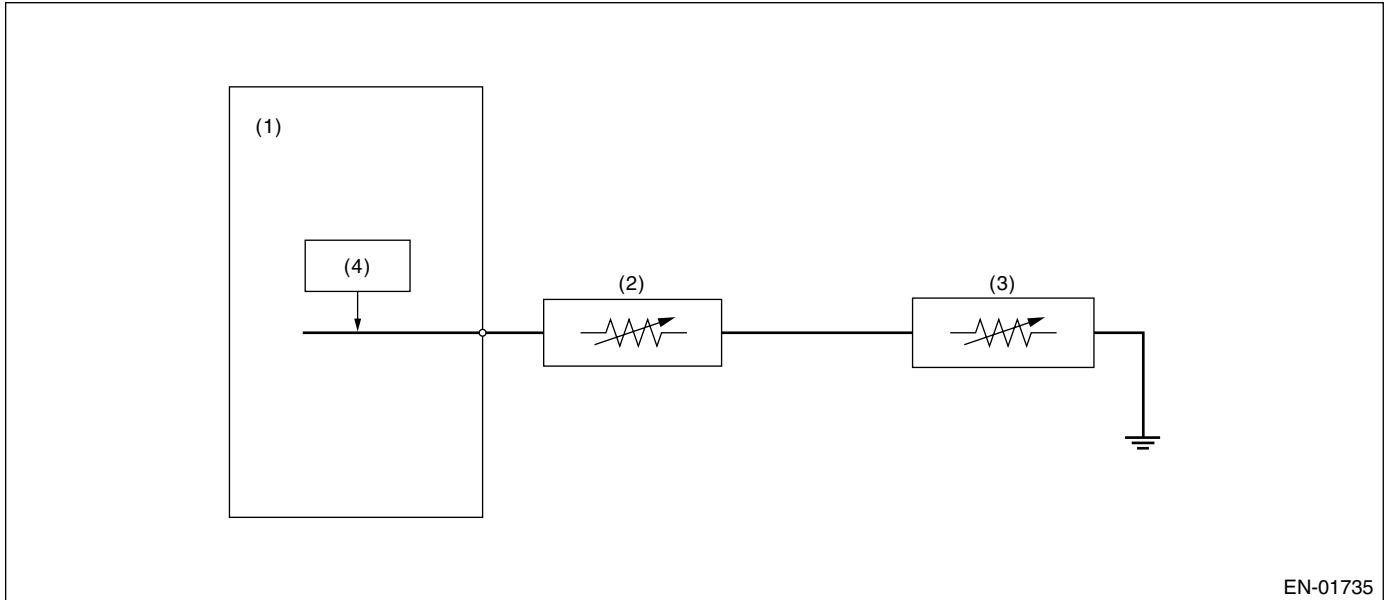
GENERAL DESCRIPTION

BZ:DTC P0463 — FUEL LEVEL SENSOR CIRCUIT HIGH INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel level sensor. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



- (1) Engine control module (ECM)
- (2) Fuel level sensor
- (3) Fuel sub level sensor
- (4) Detecting circuit

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (2.5 seconds).

• Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	3 seconds or more
Output voltage	≥ 4.926 V

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	3 seconds or more
Output voltage	< 4.926 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

CA:DTC P0464 — FUEL LEVEL SENSOR CIRCUIT INTERMITTENT —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of unstable output from fuel level sensor caused by noise.

Judge NG when the max. value and cumulative value of output voltage variation of fuel level sensor is larger than the threshold value.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	≥ 500 rpm
After engine starting	1 second or more
Ignition switch	ON
Battery voltage	> 10.9 V
Idle switch	ON
Fuel level	9.6 ↔ 48 ℓ (10.1 ↔ 50.7 US gal, 8.4 ↔ 42.2 Imp gal)
Vehicle speed = 0 km/h (0 MPH)	10 seconds or more

3. GENERAL DRIVING CYCLE

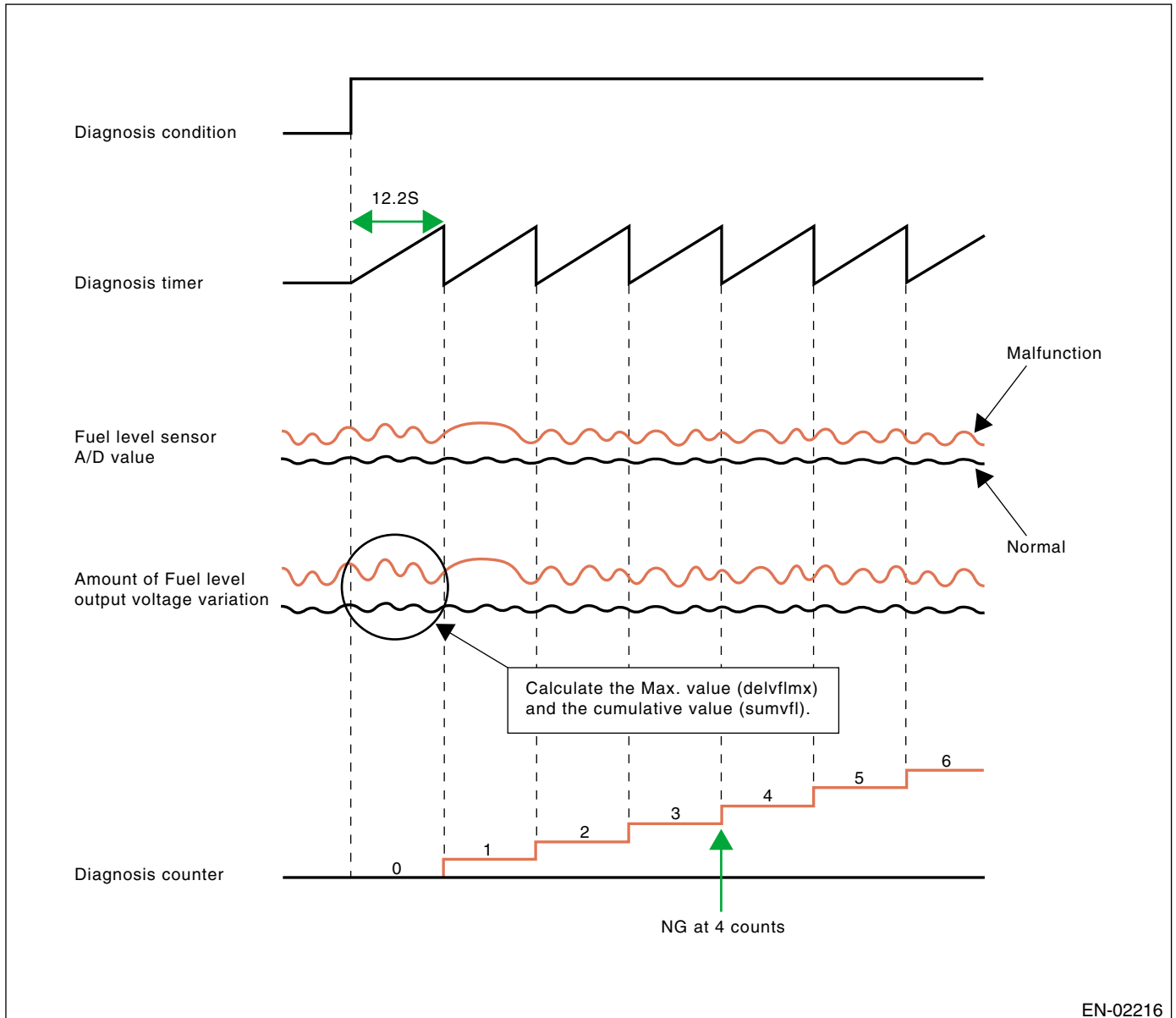
- Perform the diagnosis continuously in idling condition.
- Pay attention to the fuel level.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

4. DIAGNOSTIC METHOD

Calculate the Max. value (delvflmx) and cumulative value (sumvfl) of output voltage variation of fuel level sensor during 12.24 seconds. Judge it normal when both max. and cumulative values are not over the threshold value. Otherwise, when either of them is over the threshold value, count the diagnosis counter up. And judge NG if the counter indicated 4 counts.



DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Integrated times of the condition reaching follows, DELFLMAX $\geq 0.2 \leftrightarrow 0.26$ V or SUMFL ≥ 16 V where, DELFLMAX is Max. deviation of sensor output during 12.2 seconds. SUMFL is integrated value of sensor output deviation during 12.2 seconds.	≥ 4 times

Do not count the diagnosis counter up when the following conditions are completed during 12.3 seconds.

Max – Min of tank pressure during 12.2 seconds	≥ 0.05 kPa (0.375 mmHg, 0.02 inHg)
Max – Min of battery voltage during 12.2 seconds	≥ 0.465 V

Time Needed for Diagnosis: 12.2 seconds \times 4 times

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
DELFLMAX SUMFL Where, DELFLMAX is Max. deviation of sensor output during 12.2 seconds. SUMFL is integrated value of sensor output deviation during 12.2 seconds.	$< 0.2 \leftrightarrow 0.26$ V < 16 V

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

CB:DTC P0483 — COOLING FAN RATIONALITY CHECK —

1. OUTLINE OF DIAGNOSIS

Detect the function abnormality of the radiator fan.

Judge NG when the engine coolant temperature slowly decreases even when the radiator fan is rotating.

2. ENABLE CONDITION

Diagnostic enable condition is completed if the radiator fan changes from OFF to ON when all of the conditions below are completed. When one of the conditions below is not completed, the diagnostic enable condition is not completed.

Secondary Parameters	Enable Conditions
Engine Speed	562.5 — 900 rpm
Idle switch	ON
Vehicle speed	< 2 km/h (1.2 MPH)
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when the radiator fan changes from OFF to ON when idling.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 5 minutes.

• Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature	≥ 100°C (212°F)
Radiator fan signal changes	OFF to ON
Engine coolant temperature	Not reducing

Time Needed for Diagnosis: 5 minutes

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Radiator fan signal changes	OFF to ON
Engine coolant temperature	Reducing

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

CC:DTC P0502 — VEHICLE SPEED SENSOR CIRCUIT LOW INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of vehicle speed sensor.

Judge NG when low vehicle speed (0 km/h (0 MPH)) remains whereas it seemed to be in a usual driving speed.

2. ENABLE CONDITION (USED WITH ABNORMAL JUDGEMENT)

Secondary Parameters	Enable Conditions
Engine speed	< 4000 rpm
Fuel cut in decel.	Operating
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously during fuel cut in deceleration.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 4 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Vehicle speed	< 1

Time Needed for Diagnosis: 4 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when all malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Vehicle speed	≥ 1
Starter switch	OFF
Time after starter switch ON → OFF	≥ 3 seconds

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

- Accelerator sensor signal process: Not allowed all closed points learning.
- Vehicle speed sensor signal process: Vehicle speed = 10 km/h (6 MPH)
- Fuel cut control: Not allowed vehicle speed 0 km/h (0 MPH) fuel cut. Normally the high vehicle speed fuel cut performs on "and" of vehicle speed condition and engine speed, but perform the fuel cut only on engine speed condition (4,400 rpm or more).
- ISC control: Set the open loop compensation to specified value (1 g (0.04 oz)/s). Not allowed ISC feedback volume calculation.
- Air conditioner control: Not allowed air conditioner cut at accelerating.
- Radiator fan control: ON both main/sub.
- Judge gear ratio: Control as gear fixed on 6th.
- Tumble generator valve control: Open the tumble generator valve.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

CD:DTC P0503 — VEHICLE SPEED SENSOR INTERMITTENT/ERRATIC/HIGH —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of vehicle speed sensor.

Judge NG when high vehicle speed (240 km/h (149.1 MPH) or more) remains whereas it seemed to be in a usual driving speed.

2. ENABLE CONDITION (USED WITH ABNORMAL JUDGEMENT)

Secondary Parameters	Enable Conditions
Engine speed	< 4000 rpm
Fuel cut in decel.	Operating
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously during fuel cut in deceleration.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than 4 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Vehicle speed	≥ 240

Time Needed for Diagnosis: 4 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when all malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Vehicle speed	< 240
Starter switch	OFF
Time after starter switch ON → OFF	≥ 3 seconds

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

- Accelerator sensor signal process: Not allowed all closed points learning.
- Vehicle speed sensor signal process: Vehicle speed = 10 km/h (6 MPH)
- Fuel cut control: Not allowed vehicle speed 0 km/h (0 MPH) fuel cut. Normally the high vehicle speed fuel cut performs on "and" of vehicle speed condition and engine speed, but perform the fuel cut only on engine speed condition (4,400 rpm or more).
- ISC control: Set the open loop compensation to specified value (1 g (0.04 oz)/s). Not allowed ISC feedback volume calculation.
- Air conditioner control: Not allowed air conditioner cut at accelerating.
- Radiator fan control: ON both main/sub.
- Judge gear ratio: Control as gear fixed on 6th.
- Tumble generator valve control: Open the tumble generator valve.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

CE:DTC P0506 — IDLE CONTROL SYSTEM RPM LOWER THAN EXPECTED —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction that actual engine speed is not close to target engine speed during idling.
Judge NG when actual engine speed is not close to target engine speed during idling.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	$\geq 70^{\circ}\text{C}$ (158°F)
Battery voltage	$\geq 10.9\text{ V}$
Atmospheric pressure	$> 75.1\text{ kPa}$ (563 mmHg, 22.2 inHg)
Fuel level	$\geq 9.6\ \ell$ (2.54 US gal, 2.11 Imp gal)
After engine starting	10 seconds or more
Feedback in ISC	In operation
Measured lambda (left and right)	0.81 \longleftrightarrow 1.1
After air condition switching ON-OFF, OFF-ON	5.1 seconds or more
After in-manifold pressure change more than 4 kPa (30 mmHg, 1.2 inHg)	> 5 seconds
After neutral switch ON-OFF event	> 5 seconds
Vehicle speed	0 km/h (0 MPH)

3. GENERAL DRIVING CYCLE

Always perform diagnosis during idling after engine warmed.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criterion below becomes more than the time needed for diagnosis (10 seconds \times 3 times).

• Judgment Value

Malfunction Criteria	Threshold Value
Actual – target engine speed	$< -100\text{ rpm}$
Feedback correction for idle air control solenoid valve	Max.

Time Needed for Diagnosis: 10 seconds \times 3 times

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criterion below becomes more than the time needed for diagnosis (10 seconds).

• Judgment Value

Malfunction Criteria	Threshold Value
Actual – target engine speed	$\geq -100\text{ rpm}$

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

CF:DTC P0507 — IDLE CONTROL SYSTEM RPM HIGHER THAN EXPECTED —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction that actual engine speed is not close to target engine speed during idling.
Judge NG when actual engine speed is not close to target engine speed during idling.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	≥ 70°C (158°F)
Battery voltage	≥ 10.9 V
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Fuel level	≥ 9.6 ℓ (2.54 US gal, 2.11 Imp gal)
After engine starting	10 seconds or more
Feedback in ISC	In operation
Lambda (left and right)	0.81 ←→ 1.1
After air condition switching ON-OFF, OFF-ON	5.1 seconds or more
After in-manifold pressure change more than 4 kPa (30 mmHg, 1.2 inHg)	> 5 seconds
After neutral switch ON-OFF event	> 5 seconds
Vehicle speed	0 km/h (0 MPH)

3. GENERAL DRIVING CYCLE

Always perform diagnosis during idling after engine warmed.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criterion below becomes more than the time needed for diagnosis (10 seconds × 3 times).

• Judgment Value

Malfunction Criteria	Threshold Value
Actual – target eng. speed	≥ 200 rpm
Feedback correction for idle air control solenoid valve	Min.

Time Needed for Diagnosis: 10 seconds × 3 times

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear NG when the continuous time of completing the malfunction criterion below becomes more than the time needed for diagnosis (10 seconds).

• Judgment Value

Malfunction Criteria	Threshold Value
Actual – target eng. speed	< 200 rpm

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

CG:DTC P0512 — STARTER REQUEST CIRCUIT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of starter SW.

Judge ON NG when the starter SW signal remains to be on.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 minutes.

• Judgment Value

Malfunction Criteria	Threshold Value
Engine speed	> 500 rpm
Starter OFF signal	Not detect
Battery voltage	> 8 V

Time Needed for Diagnosis: 180 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge ON OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Starter OFF signal	Detect
Battery voltage	> 8 V

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

CH:DTC P0519 — IDLE CONTROL SYSTEM MALFUNCTION (FAIL-SAFE) —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction that engine speed increases more than that in normal condition during idling.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Feedback in ISC	In operation
Vehicle speed	< 4 km/h (2.49 MPH)
After engine starting	1 seconds or more

3. GENERAL DRIVING CYCLE

Always perform diagnosis at less than 4 km/h (2.49 MPH) of vehicle speed.

4. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the all malfunction criteria below becomes more than the time needed for diagnosis (2 seconds).

Judgment Value

Malfunction Criteria	Threshold Value
Engine speed – target eng. speed	≥ 1000 rpm
Feedback value for ISC	≤ 0
Engine speed change every 180 degree engine rev.	≥ -5 rpm

Time Needed for Diagnosis: 2 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear NG when the continuous time until completing the malfunction criteria below becomes more than the time needed for diagnosis (5 seconds).

• Judgment Value

Malfunction Criteria	Threshold Value
Engine speed – target eng. speed	< 200 rpm

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

Fuel shut-off: Shut-off fuel for only #1 and #2 cylinder, or for all cylinder in accordance with vehicle speed, engine speed, throttle position

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

CI: DTC P0565 — CRUISE CONTROL ON SIGNAL —

1. OUTLINE OF DIAGNOSIS

Judge NG when the cruise control set signal is continued to be ON for a certain period of time at the vehicle speed less than 20 km/h (12 MPH).

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Vehicle speed	≤ 20 km/h (12.4 MPH)

3. GENERAL DRIVING CYCLE

Always perform diagnosis at vehicle speed 20 km/h (12.4 MPH) or less.

4. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Canceling signal	No signal

Time Needed for Diagnosis: 10 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

CJ:DTC P0600 — CAN COMMUNICATION CIRCUIT—

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of CAN communication.

It judges as NG when CAN communication becomes impossible, the CAN communication with AT becomes impossible, and the data from AT is not normal.

2. COMPONENT DISCRIPTION

CAN connects between ECU and TCU with high speed.

(Common Specification)

CAN PROTOCOL 2.0B (active)

Frame format: 11 bit ID Frame (Standard frame)

(High Speed CAN)

ISO 11898 compliance

Communication Speed: 500 kbps

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery Voltages	> = 10.9 V
Starter switch	OFF
Engine	run

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

5. DIAGNOSTIC METHOD

• JUDGMENT OF MALFUNCTION

It judges as NG if any of the following conditions are judged as NG. It judges as OK if all of the following conditions are judged as OK within 1s, and the NG memory is cleared.

• Judgement Value

Malfunction Criteria	Threshold Value
Buss off flag or warning flag	Set
ID cannot be received from TCU	= 500 m/s

Time needed for Diagnosis: 1 time

Malfunction Indicator Light Illumination: Illuminates simultaneously when malfunction is detected.

6. DTC CLEAR CONDITION

When the OK driving cycle was completed 40 consecutive times.

When "Clear Memory" was performed.

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 consecutive times.
- When "Clear Memory" was performed.

8. FAIL-SAFE

None

9. ECM OPERATING AT DTC SETTING

Store the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

CK:DTC P0604 — INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR —

1. OUTLINE OF DIAGNOSIS

Detect the function abnormality of the micro-computer (RAM).

Judge NG when either the main CPU normal RAM or sub CPU normal RAM is abnormal. Judge OK when both of them are normal.

At initial routine, write the data to all area of RAM. Judge OK when same data can be read out, and judge NG when same data cannot be read out.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

Perform the diagnosis in the initial routine.

3. GENERAL DRIVING CYCLE

Perform the diagnosis immediately after IG key SW is turned ON.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Main CPU normal RAM abnormality Write 5AA5A55A, and read out. (All area of RAM) Or write A55A5AA5, and read out. (All area of RAM)	Cannot be read out 5AA5A55A. Cannot be read out A55A5AA5.
Sub CPU normal RAM abnormality. Write 5AA5, and read out. (All area of RAM) Or write A55A, and read out. (All area of RAM)	Cannot be read out 5AA5. Cannot be read out A55A.

Time Needed for Diagnosis: 100 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Main CPU normal RAM abnormality Write 5AA5A55A, and read out. (All area of RAM) Or write A55A5AA5, and read out. (All area of RAM)	Cannot be read out 5AA5A55A. Cannot be read out A55A5AA5.
Sub CPU normal RAM abnormality. Write 5AA5, and read out. (All area of RAM) Or write A55A, and read out. (All area of RAM)	Cannot be read out 5AA5. Cannot be read out A55A.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

CL:DTC P0605 — INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR —

1. OUTLINE OF DIAGNOSIS

Judge NG when SUM value of ROM is out of the standard value.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
SUM value of ROM	Standard value

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only at engine stop)

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

Stop the current to electric control throttle motor. (Fix the throttle opening angle to 6°.)

8. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnosis value and malfunction criteria value. (For test mode \$06)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

MEMO:

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

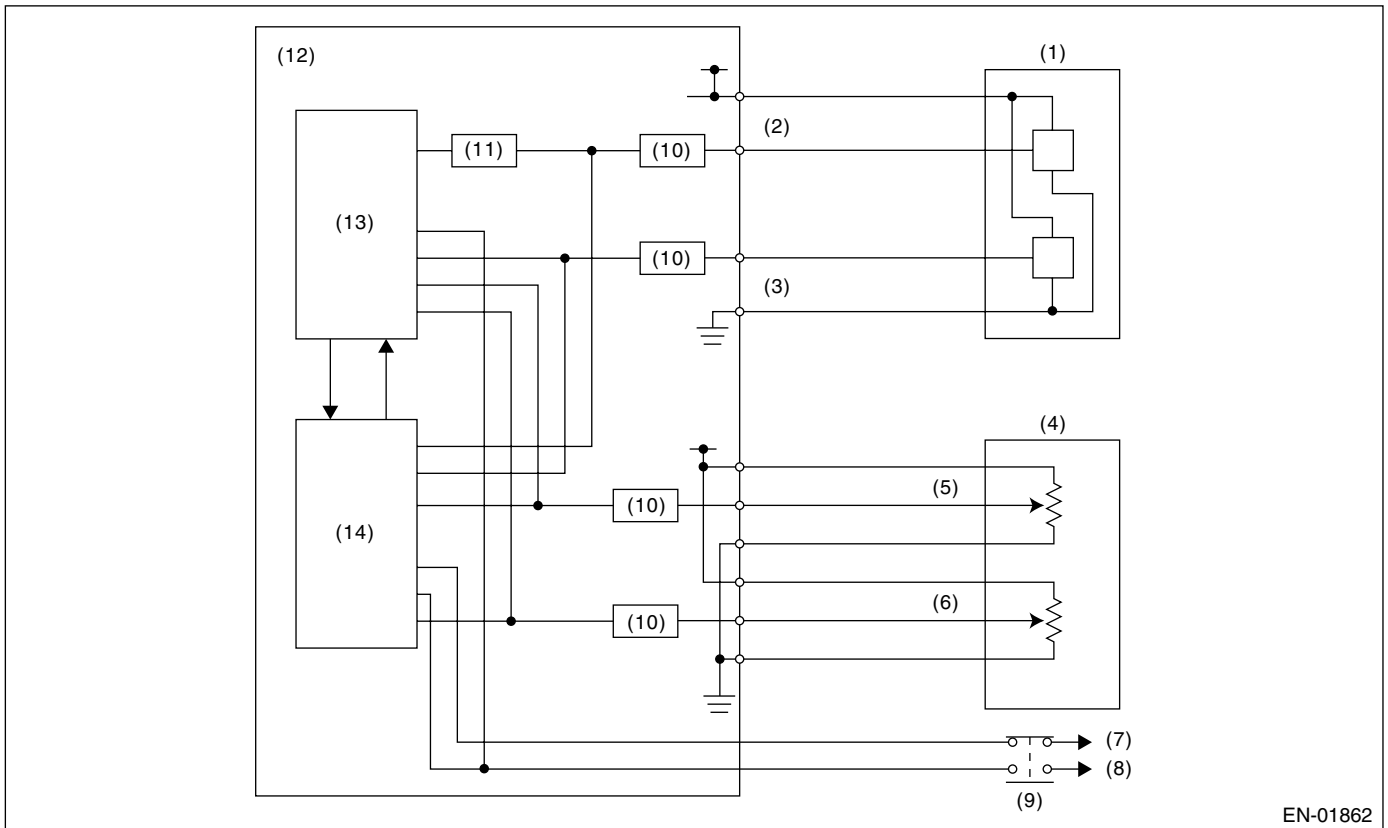
CM:DTC P0607 — CONTROL MODULE PERFORMANCE —

1. OUTLINE OF DIAGNOSIS

Judge NG when either the following is completed.

- When the read value of throttle position sensor 1 signal is mismatched between main CPU and sub CPU.
- When the read value of accelerator position sensor 1 signal is mismatched between main CPU and sub CPU.
- When the sub CPU operates abnormally.
- When the communication between main CPU and sub CPU is abnormal.
- When the input amplifier circuit of throttle position sensor 1 is abnormal.
- When the cruise control cannot be canceled correctly.
- When the signal of brake SW1 and 2 is mismatched.
- When the directed angle from main CPU is abnormal.

2. COMPONENT DESCRIPTION



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- | | | |
|---|---------------------------------------|----------------------------------|
| (1) Throttle position sensor | (6) Accelerator pedal position sensor | (12) Engine control module (ECM) |
| (2) Throttle position sensor 1 | 2 | (13) Sub CPU |
| (3) Throttle position sensor 2 | (7) Battery | (14) Main CPU |
| (4) Accelerator pedal position sensor | (8) Stop light | |
| (5) Accelerator pedal position sensor 1 | (9) Brake switch | |
| | (10) I/F circuit | |

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Ignition switch	ON
None	—
None	—
Throttle opening angle	
Brake SW (with cruise control)	ON
None	—
Cruise control	OFF

4. GENERAL DRIVING CYCLE

- (1) — (4): Always perform the diagnosis continuously.
(5): Always perform the diagnosis continuously on idling.
(6): Perform the diagnosis when the brake pedal is depressed.
(7): Always perform the diagnosis continuously.
(8): Always perform the diagnosis continuously when the cruise control pedal is not operating.

5. DIAGNOSTIC METHOD

Judge OK and clear NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
(1) Difference of CPU on reading value of throttle position sensor signal	Within 0.12 V
(2) Difference of CPU on reading value of accelerator position sensor signal	Within 0.07 V
(3) WD pulse from sub CPU	WD pulse occur
(4) Communication between CPU	Possible to communicate
(5) Difference of signal on connection of amplifier	Within $\times 4 \pm 0.6$ V
(6) Cruise control cancel signal at brake ON	Cruise control cancel signal ON
(7) Brake switch 1, 2 signal	SW 1 and 2 are matched
(8) Throttle opening angle directing value	Within the opening angle $+3.4^\circ$ which calculated from accelerator opening angle coefficient.

Time Needed for Diagnosis:

- (1) 250 milliseconds
(2) 250 milliseconds
(3) 200 milliseconds
(4) 200 milliseconds
(5) 24 milliseconds
(6) 250 milliseconds
(7) 200 milliseconds
(8) 250 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Stop the current to electric control throttle motor. (Fix the throttle opening angle to 6°.)

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnosis value and malfunction criteria value. (For test mode \$06)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

MEMO:

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

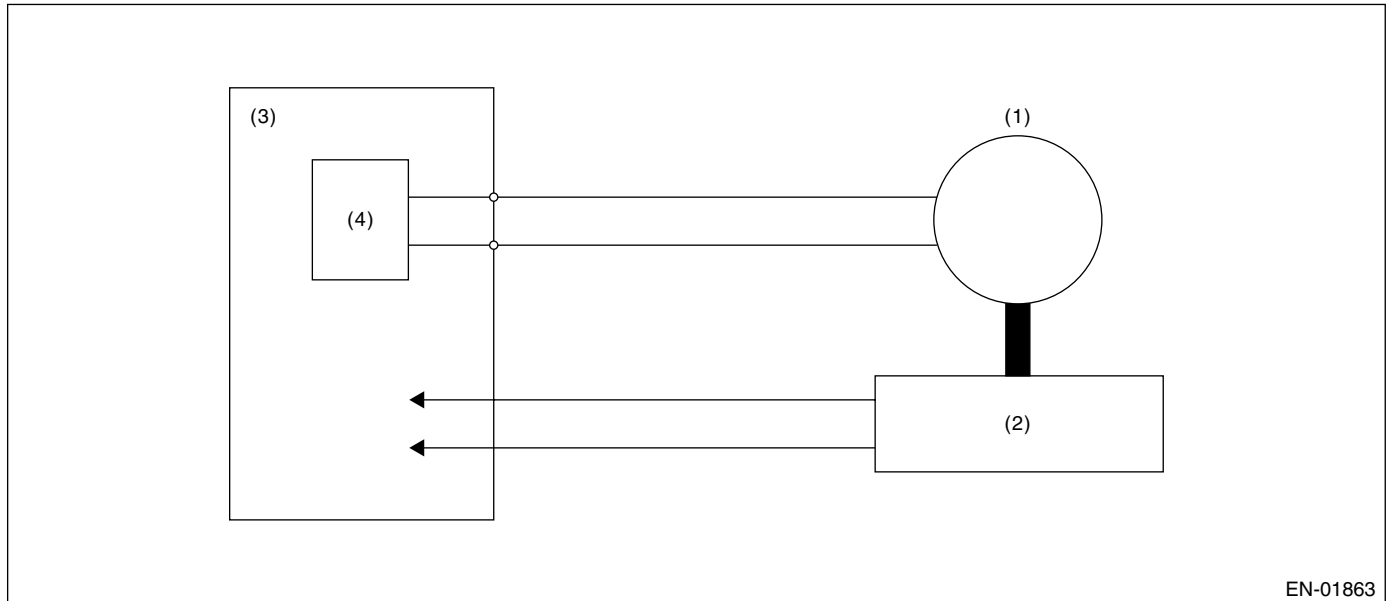
GENERAL DESCRIPTION

CN:DTC P0638 — THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1) —

1. OUTLINE OF DIAGNOSIS

Judge NG when the target opening angle and actual opening angle is mismatched or the current to motor is more than specified duty for specified time continuously.

2. COMPONENT DESCRIPTION



- (1) Motor
- (2) Throttle position sensor
- (3) Engine control module (ECM)
- (4) Drive circuit

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Normal operation of electric control throttle	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously when the electric control throttle is operating.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Judge OK and clear NG when the malfunction criteria below are completed.

Judgment Value

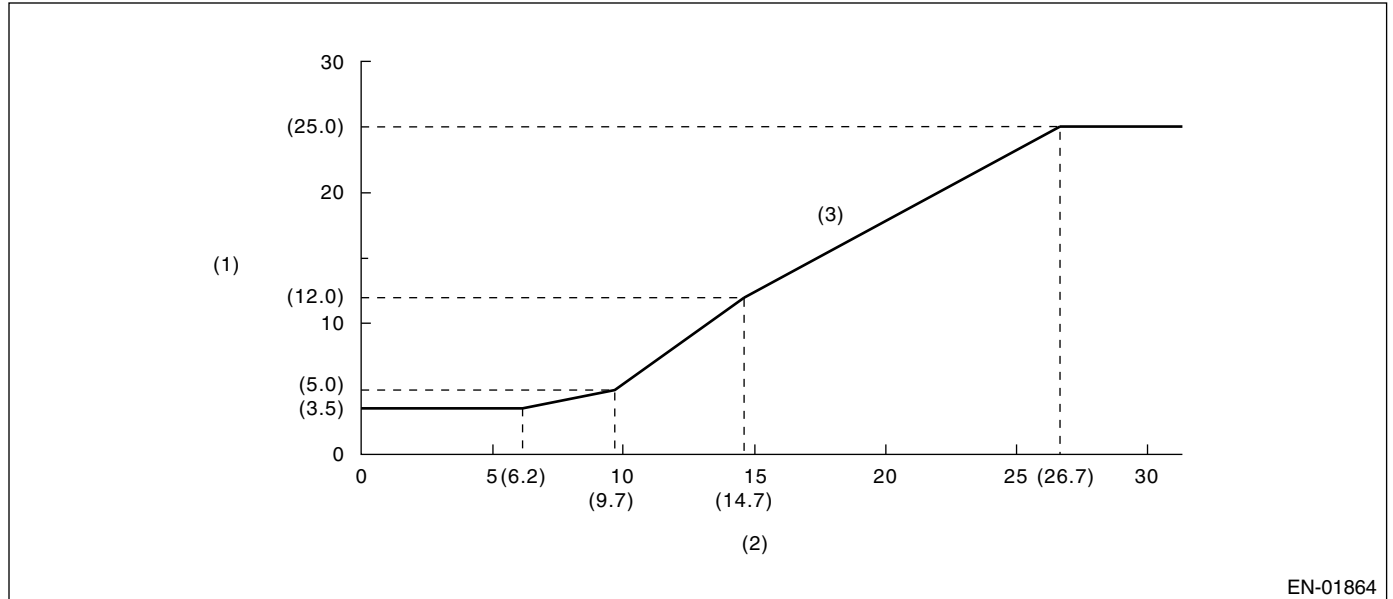
Malfunction Criteria	Threshold Value
Difference between target opening angle and actual opening angle	Less than 3.5°
Output duty to drive circuit	Less than 95%

Time Needed for Diagnosis:

Target opening angle and actual opening angle: 250 milliseconds (For NG) 2000 milliseconds (For OK)

Output duty to drive circuit: 2000 milliseconds

Details of Judgment



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(1) Difference between target opening angle and actual opening angle (°)

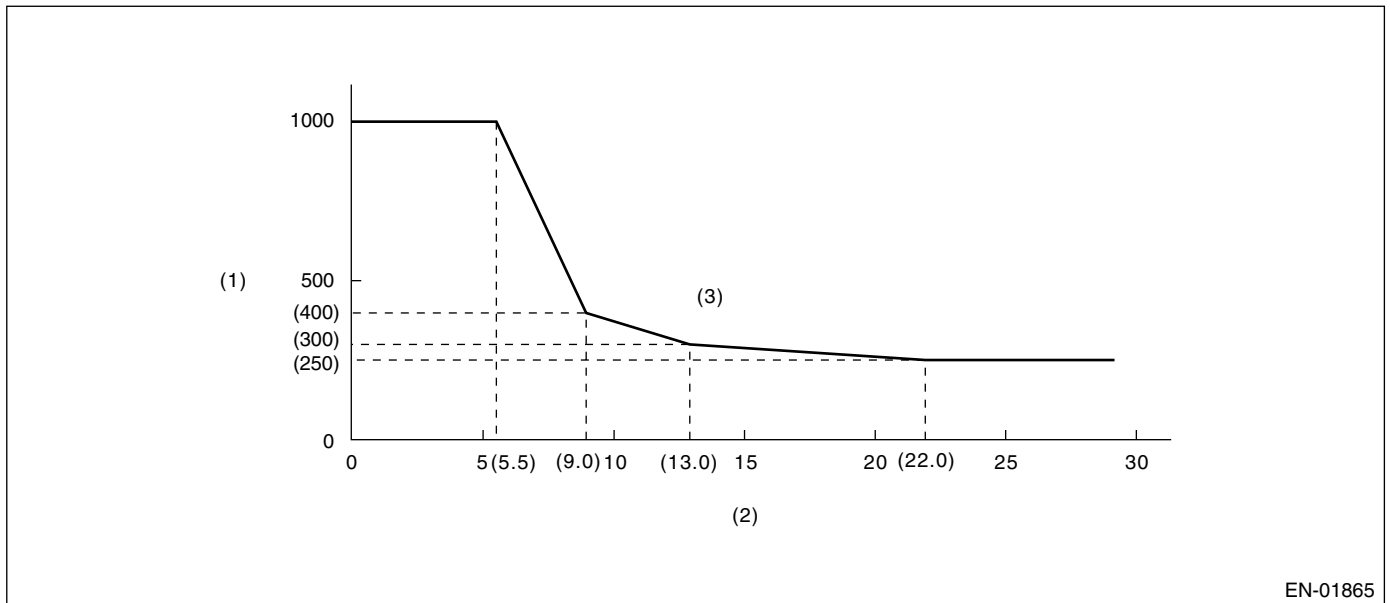
(2) Target throttle opening angle (°)

(3) NG area

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

Details of Judgment (Always 1000 milliseconds when the actual opening angle \leq target opening angle)



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(1) Judgment time (milliseconds)

(2) Throttle position sensor 1 opening angle

(3) NG area

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only engine stopped)

8. FAIL SAFE

Stop the current to electric control throttle motor. (Fix the throttle opening angle to 6°.)

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnosis value and malfunction criteria value. (For test mode \$06)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

MEMO:

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

CO:DTC P0691 — COOLING FAN 1 CONTROL CIRCUIT LOW —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the radiator fan circuit.

Judge NG when the ECM output level differs from the actual terminal level.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than 2.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
After starting the engine	1 seconds or more
Engine speed	≥ 500 rpm
Ignition switch	ON
Battery voltage	≥ 10.9 V
Terminal voltage level when ECM transmits OFF signal	Low level

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
After starting the engine	1 seconds or more
Engine speed	≥ 500 rpm
Ignition switch	ON
Battery voltage	≥ 10.9 V
Terminal voltage level when ECM transmits OFF signal	High level

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

CP:DTC P0692 — COOLING FAN 1 CONTROL CIRCUIT HIGH —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the radiator fan circuit.

Judge NG when the ECM output level differs from the actual terminal level.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than 2.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
After starting the engine	1 seconds or more
Engine speed	≥ 500 rpm
Ignition switch	ON
Battery voltage	≥ 10.9 V
Terminal voltage level when ECM transmits ON signal	High level

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
After starting the engine	1 seconds or more
Engine speed	≥ 500 rpm
Ignition switch	ON
Battery voltage	≥ 10.9 V
Terminal voltage level when ECM transmits ON signal	Low level

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

CQ:DTC P0703 — TORQUE CONVERTER/BRAKE SWITCH “B” CIRCUIT —

1. OUTLINE OF DIAGNOSIS

Judge NG when the AT brake switch circuit becomes battery short, ground short or open circuit.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Vehicle speed change	30 to 0 km/h (18.6 to 0 MPH) 0 to 30 km/h (0 to 18.6 MPH)

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
ON signal	No signal
OFF signal	No signal

Time Needed for Diagnosis: 15 times

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

CR:DTC P0705 — TRANSMISSION RANGE SENSOR CIRCUIT (PRNDL INPUT)

1. OUTLINE OF DIAGNOSIS

Judge NG when the “D” range switch becomes ground short or open circuit.

2. COMPONENT DESCRIPTION

Inhibitor switch ensures the safety at engine start. This switch is installed to the right side of transmission case, and operated by selector lever. When the selector lever is in the “P” or “N” range, the engine will start because the electric circuit in inhibitor switch is closed and the starter circuit is connected. When the selector lever is in the “R”, “D”, “3”, “2” or “1” range, the electric circuit in inhibitor switch is open; therefore, the engine cannot be cranked. In the “R” range, the back-up light will illuminate because the back-up light circuit in the switch is connected. In addition to the functions above, the inhibitor switch has the circuit which detects the selected range position at the present and transmits the range signal to the TCM.

3. ENABLE CONDITION

Secondary Parameters		Enable Conditions
(1)	Shift Vehicle speed	“N” to “3” ≥ 60 km/h (37 MPH)
(2)	Engine speed Battery voltage	> 500 rpm > 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria		Threshold Value
(1)	“D” signal continuously	Not detected
(2)	Simultaneous signal	≥ 2

Time Needed for Diagnosis:

- 63.75 seconds (1)
- 10 seconds (2)

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

CS:DTC P0710 — TRANSMISSION FLUID TEMPERATURE SENSOR CIRCUIT —

1. OUTLINE OF DIAGNOSIS

- Judge NG when ATF temperature sensor becomes open circuit, battery short or ground short.
- Judge NG when ATF temperature sensor is faulty.

2. COMPONENT DESCRIPTION

ATF temperature sensor is installed to the hydraulic control valve body of transmission as a unit with transmission harness. This sensor detects ATF temperature and outputs it as electric resistance signal.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	$\leq 0.1 \text{ V}$
Output at $\geq 80 \text{ km/h}$ (50 MPH) after 5 minutes from reaching more than 4.8 V	$\geq 4.7 \text{ V}$

Time Needed for Diagnosis: 63.75 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Control ATF temperature at a constant temperature 80°C (176°F)

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

CT:DTC P0716 — INPUT/TURBINE SPEED SENSOR CIRCUIT RANGE/PERFORMANCE —

1. OUTLINE OF DIAGNOSIS

Judge NG when the turbine speed signal is not transmitted for some reasons.

2. COMPONENT DESCRIPTION

Torque converter turbine speed sensor (output shaft speed sensor) is installed to the outside of transmission case. This sensor detects the turbine speed of torque converter by the peripheral speed of high clutch drum connected to input shaft. And then it transmits the sine wave signal (32 pulses per rev.) to TCM. TCM calculates the ratio of the input shaft speed to vehicle speed, and then makes a judgment whether to shift or not.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	≥ 1500 rpm
Vehicle speed	≥ 40 km/h (25 MPH)
Range switch	"D", "3", "2" or "1"

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Perform the diagnosis when the conditions below were continued for 2 seconds.

- (1) Except "P", "N", "R" ranges and inhibitor switch is normal.
- (2) Engine speed is more than 3000 rpm.
- (3) Vehicle speed is 30 km/h (19 MPH) and vehicle speed sensor is normal.
- (4) Turbine speed is more than 600 rpm.

Judgment Value

Malfunction Criteria	Threshold Value
Output from turbine shaft speed	< 600 rpm

Time Needed for Diagnosis: Immediately

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

CU:DTC P0720 — OUTPUT SPEED SENSOR CIRCUIT —

1. OUTLINE OF DIAGNOSIS

Judge NG when an abnormal large signal is input to the front vehicle speed sensor, or no signal is input to the rear vehicle speed sensor.

2. COMPONENT DESCRIPTION

This vehicle speed sensor (output shaft speed sensor) is installed to the outside of transmission case. This sensor detects the front wheel speed, and transmits the sine wave signal (32 pulses per rev.) to TCM. TCM converts the signal to pulse signal, and transmits to both of the ECM and the combination meter.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Vehicle speed	≥ 20 km/h (12 MPH)

4. GENERAL DRIVING CYCLE

Always perform the diagnosis with more than 20 km/h (12 MPH) vehicle speed.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Number of vehicle speed sensor signal each 1 second	≥ 4698 or no signal

Time Needed for Diagnosis: 63.75 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

- Use the normal vehicle speed sensor signal when either of them is normal.
- Use the vehicle speed calculated from the current gear position and turbine speed when both front and rear wheels are troubled.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

CV:DTC P0726 — ENGINE SPEED INPUT CIRCUIT RANGE/PERFORMANCE —

1. OUTLINE OF DIAGNOSIS

Judge NG when the engine speed is not input in the status of running the engine.

2. COMPONENT DESCRIPTION

Engine speed sensor is installed to the outside of engine body and crank part. This sensor detects the crank speed, and transmits the sine wave signal (2 pulses per rev.) to TCM.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Output from mass air flow sensor	≥ 1.0 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Engine speed	≤ 400 rpm

Time Needed for Diagnosis: 63.75 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

CW:DTC P0731 — GEAR 1 INCORRECT RATIO —

1. OUTLINE OF DIAGNOSIS

Judge NG when the expected present gear is different from the actual gear.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Throttle angle	$\geq 15^\circ$
Vehicle speed	≥ 10 km/h (6 MPH)
Range switch	"D", "3", "2" or "1"
Upshift or downshift events	Not in operation

3. GENERAL DRIVING CYCLE

Always perform the diagnosis with less than 10 km/h (6 MPH) vehicle speed.

4. DIAGNOSTIC METHOD

Perform the diagnosis when the conditions below are not completed for more than 40 milliseconds on normal control.

- (1) Vehicle speed is more than 10 km/h (6 MPH).
- (2) Throttle sensor is more than a certain angle.
- (3) Shifted to "D", "3", "2" or "1" range, and range signal is normal.
- (4) More than 1 second passed after shift change finished.

Judgment Value

Malfunction Criteria	Threshold Value
GR/(1st gear ratio) where, GR = (vehicle speed sensor 1 output)/ (turbine shaft speed sensor output)	$> 110\%$ or $< 90\%$

Time Needed for Diagnosis: 3 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

CX:DTC P0732 — GEAR 2 INCORRECT RATIO —

1. OUTLINE OF DIAGNOSIS

Judge NG when the expected present gear is different from the actual gear.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Throttle angle	$\geq 15^\circ$
Vehicle speed	≥ 10 km/h (6 MPH)
Range switch	"D", "3", "2" or "1"
Upshift or downshift events	Not in operation

3. GENERAL DRIVING CYCLE

Always perform the diagnosis with less than 10 km/h (6 MPH) vehicle speeds.

4. DIAGNOSTIC METHOD

Perform the diagnosis when the conditions below are not completed for more than 40 milliseconds on normal control.

- (1) Vehicle speed is more than 10 km/h (6 MPH).
- (2) Throttle sensor is more than a certain angle.
- (3) Shifted to "D", "3", "2" or "1" range, and range signal is normal.
- (4) More than 1 second passed after shift change finished.

Judgment Value

Malfunction Criteria	Threshold Value
GR/(2nd gear ratio) Where, GR = (Vehicle speed sensor 1 output)/ (Turbine shaft speed sensor output)	$> 110\%$ or $< 90\%$

Time Needed for Diagnosis: 3 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

CY:DTC P0733 — GEAR 3 INCORRECT RATIO —

1. OUTLINE OF DIAGNOSIS

Judge NG when the expected present gear is different from the actual gear.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Throttle angle	$\geq 15^\circ$
Vehicle speed	≥ 10 km/h (6 MPH)
Range switch	"D", "3", "2" or "1"
Upshift or downshift events	Not in operation

3. GENERAL DRIVING CYCLE

Always perform the diagnosis with less than 10 km/h (6 MPH) vehicle speeds.

4. DIAGNOSTIC METHOD

Perform the diagnosis when the conditions below are not completed for more than 40 milliseconds on normal control.

- (1) Vehicle speed is more than 10 km/h (6 MPH).
- (2) Throttle sensor is more than a certain angle.
- (3) Shifted to "D", "3", "2" or "1" range, and range signal is normal.
- (4) More than 1 second passed after shift change finished.

Judgment Value

Malfunction Criteria	Threshold Value
GR/(3rd gear ratio) Where, GR = (Vehicle speed sensor 1 output)/ (Turbine shaft speed sensor output)	$> 110\%$ or $< 90\%$

Time Needed for Diagnosis: 3 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

CZ:DTC P0734 — GEAR 4 INCORRECT RATIO —

1. OUTLINE OF DIAGNOSIS

Judge NG when the expected present gear is different from the actual gear.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Throttle angle	$\geq 15^\circ$
Vehicle speed	≥ 10 km/h (6 MPH)
Range switch	"D", "3", "2" or "1"
Upshift or downshift events	Not in operation

3. GENERAL DRIVING CYCLE

Always perform the diagnosis with less than 10 km/h (6 MPH) vehicle speeds.

4. DIAGNOSTIC METHOD

Perform the diagnosis when the conditions below are not completed for more than 40 milliseconds on normal control.

- (1) Vehicle speed is more than 10 km/h (6 MPH).
- (2) Throttle sensor is more than a certain angle.
- (3) Shifted to "D", "3", "2" or "1" range, and range signal is normal.
- (4) More than 1 second passed after shift change finished.

Judgment Value

Malfunction Criteria	Threshold Value
GR/(4th gear ratio) Where, GR = (Vehicle speed sensor 1 output)/ (Turbine shaft speed sensor output)	$> 110\%$ or $< 90\%$

Time Needed for Diagnosis: 3 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

DA:DTC P0741 — TORQUE CONVERTER CLUTCH CIRCUIT PERFORMANCE OR STUCK OFF —

1. OUTLINE OF DIAGNOSIS

Judge NG when the engine speed is different from the turbine speed for some reasons at AT lock-up.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
In 4th gear position, duty ratio for duty solenoid valve	$\geq 90\%$

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Engine speed \geq (output shaft speed \times 4th gear ratio $\times 9/8$)	

Time Needed for Diagnosis: 10.2 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

Not allowed to lock up.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

DB:DTC P0743 — TORQUE CONVERTER CLUTCH CIRCUIT ELECTRICAL —

1. OUTLINE OF DIAGNOSIS

Judge NG when the lock-up duty solenoid becomes battery short, ground short or open circuit.

2. COMPONENT DESCRIPTION

Lock-up duty solenoid is installed to the transmission hydraulic control valve body. The duty ratio is controlled by the signal from TCM. This allows the lock-up clutch to be connected or released smoothly by controlling the lock-up control valve.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Vc at "ON" signal from ECM	Low level
Vc at "OFF" signal from ECM	High level

Time Needed for Diagnosis: 0.14 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

DC:DTC P0748 — PRESSURE CONTROL SOLENOID “A” ELECTRICAL —

1. OUTLINE OF DIAGNOSIS

Judge NG when the line pressure duty solenoid becomes battery short, ground short or open circuit.

2. COMPONENT DESCRIPTION

Line pressure duty solenoid is installed to the transmission hydraulic control valve body. The duty ratio is controlled by the signal from TCM. This allows controlling the pressure modifier valve and accumulator control valve A, and allows the line pressure to be adjusted to the pressure appropriate for driving condition.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Vc at “ON” signal from ECM	Low level
Vc at “OFF” signal from ECM	High level

Time Needed for Diagnosis: 0.14 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Control the shift to be fixed in 3rd gear.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

DD:DTC P0753 — SHIFT SOLENOID “A” ELECTRICAL —

1. OUTLINE OF DIAGNOSIS

Judge NG when the shift solenoid 1 becomes battery short, ground short or open circuit.

2. COMPONENT DESCRIPTION

Shift solenoid 1 Shift solenoid is installed to the transmission hydraulic control valve body. This solenoid is switched on or off by the signal from TCM. Gear positions will change depending on the solenoid condition which is ON or OFF.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Collector voltage of transistor (Vc) for solenoid valve is inconsistent with signal from ECM	

Time Needed for Diagnosis: 30 milliseconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Control the shift to be fixed in 3rd gear.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

DE:DTC P0758 — SHIFT SOLENOID “B” ELECTRICAL —

1. OUTLINE OF DIAGNOSIS

Judge NG when the shift solenoid 2 becomes battery short, ground short or open circuit.

2. COMPONENT DESCRIPTION

Shift solenoid 2 Shift solenoid is installed to the transmission hydraulic control valve body. This solenoid is switched on or off by the signal from TCM. Gear positions will change depending on the solenoid condition which is ON or OFF.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Vc for solenoid valve is inconsistent with signal from ECM	

Time Needed for Diagnosis: 30 milliseconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Control the shift to be fixed in 3rd gear.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

DF:DTC P0771 — SHIFT SOLENOID “E” PERFORMANCE OR STUCK OFF —

1. OUTLINE OF DIAGNOSIS

Judge NG when the low clutch timing solenoid becomes battery short, ground short or open circuit.

2. COMPONENT DESCRIPTION

Low clutch timing solenoid Low clutch timing solenoid is installed to the transmission hydraulic control valve body. This solenoid is switched on or off by the signal from TCM. This allows controlling the low clutch timing valve B and reverse inhibitor valve.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Vc at “ON” signal from ECM	Low level
Vc at “OFF” signal from ECM	High level

Time Needed for Diagnosis: 30 milliseconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

DG:DTC P0778 — PRESSURE CONTROL SOLENOID “B” ELECTRICAL —

1. OUTLINE OF DIAGNOSIS

Judge NG when the 2-4 brake duty solenoid becomes battery short, ground short or open circuit.

2. COMPONENT DESCRIPTION

2-4 brake duty solenoid is installed to the transmission hydraulic control valve body. The duty ratio is controlled by the signal from TCM. This solenoid decreases the change gear shock by adjusting the 2-4 brake pressure during 2-4 brake operation.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Vc at “ON” signal from ECM	Low level
Vc at “OFF” signal from ECM	High level

Time Needed for Diagnosis: 0.14 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

Control the shift to be fixed in 3rd gear.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

DH:DTC P0785 — SHIFT/TIMING SOLENOID —

1. OUTLINE OF DIAGNOSIS

Judge NG when the 2-4 brake timing solenoid becomes battery short, ground short or open circuit.

2. COMPONENT DESCRIPTION

2-4 brake timing solenoid is installed to the transmission hydraulic control valve body. This solenoid is switched on or off by the signal from TCM. This allows controlling the 2-4 brake timing valve B and decreases the change gear shock.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Vc at "ON" signal from ECM	Low level
Vc at "OFF" signal from ECM	High level

Time Needed for Diagnosis: 30 milliseconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

DI: DTC P0851 — NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL) —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the neutral SW.

Judge NG when the ECM neutral terminal input differs from the reception data from TCM.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After starting the engine	2 seconds or more
Starter switch	OFF

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds or more after starting the engine.

4. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 6.5 seconds. Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch signal when park/neutral = "ON" & any other switches = "OFF" on AT	OFF

Time Needed for Diagnosis: 6.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

Cruise control: Not allowed to command cruise control.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

DJ:DTC P0851 — NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL) —

1. OUTLINE OF DIAGNOSIS

Judge the open or short circuit of the neutral SW.

Judge NG when there is no change in the neutral SW even if the driving shift was applied. (There is neutral SW ON/OFF inversion from the vehicle speed and engine speed.)

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After starting the engine	2 seconds or more
Starter switch	OFF

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds or more after starting the engine.

4. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed 3 time or more after the neutral SW change. Judge OK and clear NG if there is change in the neutral SW.

Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch signal (while changing from a to b below)	OFF
Driving condition change	a) to b)
a) Vehicle speed = 0 km/h (0 MPH) & engine speed 600 — 900 rpm	
b) Vehicle speed ≥ 64 km/h (40 MPH) & engine speed 1600 — 2550 rpm	

Time Needed for Diagnosis: 3 monitoring

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

Cruise control: Not allowed to command cruise control.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

DK:DTC P0852 — NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL) —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the neutral SW.

Judge NG when the ECM neutral terminal input differs from the reception data from TCM.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After starting the engine	2 seconds or more
Starter switch	OFF

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds or more after starting the engine.

4. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the malfunction criteria below becomes more than 6.5 seconds. Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch signal when park/neutral = "OFF" & any other switches = "ON" on AT	ON

Time Needed for Diagnosis: 6.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

Cruise control: Not allowed to command cruise control.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

DL:DTC P0852 — NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL) —

1. OUTLINE OF DIAGNOSIS

Judge the open or short circuit of the neutral SW.

Judge NG when there is no change in the neutral SW even if the driving shift was applied. (There is neutral SW ON/OFF inversion from the vehicle speed and engine speed.)

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After starting the engine	2 seconds or more
Starter switch	OFF

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds or more after starting the engine.

4. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed 3 time or more after the neutral SW change. Judge OK and clear NG if there is change in the neutral SW.

Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch signal (while changing from a to b below)	ON
Driving condition change	a) to b)
a) Vehicle speed = 0 km/h (0 MPH) & engine speed 600 — 900 rpm	
b) Vehicle speed ≥ 64 km/h (40 MPH) & engine speed 1600 — 2550 rpm	

Time Needed for Diagnosis: 3 monitoring

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

Cruise control: Not allowed to command cruise control.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

DM:DTC P0864 — TCM COMMUNICATION CIRCUIT RANGE/PERFORMANCE —

1. OUTLINE OF DIAGNOSIS

Detect malfunction of communication of AT diagnosis.
Judge NG when communication format is disagreement.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
Engine speed	≥ 500 rpm

3. GENERAL DRIVING CYCLE

Perform diagnosis after starting.

4. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (60 seconds). Judge OK and clear NG when receiving normal data.

Judgment Value

Malfunction Criteria	Threshold Value
AT malfunction data reception control	Not receive normal data

Time Needed for Diagnosis: 60 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

DN:DTC P0865 — TCM COMMUNICATION CIRCUIT LOW —

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit in AT diagnosis line.

Judge NG when the AT diagnosis input line signal remains Low.

2. COMPONENT DESCRIPTION

Data frame as “Start signal (Low_40 ms + High_20 ms) → Data → End signal” is transmitted every approx. 1 second.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
Engine speed	≥ 500 rpm

4. GENERAL DRIVING CYCLE

Perform diagnosis after starting.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (3 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
AT diagnosis input line signal	Low

Time Needed for Diagnosis: 3 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in two continuous drive cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

DO:DTC P0866 — TCM COMMUNICATION CIRCUIT HIGH —

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit in AT diagnosis line.

Judge NG when the AT diagnosis input line signal remains High.

2. COMPONENT DESCRIPTION

Data frame as “Start signal (Low_40 ms + High_20 ms) → Data → End signal” is transmitted every approx. 1 second.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
Engine speed	≥ 500 rpm

4. GENERAL DRIVING CYCLE

Perform diagnosis after starting.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time until completing the malfunction criteria below becomes more than the time needed for diagnosis (3 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
AT diagnosis input line signal	High

Time Needed for Diagnosis: 3 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in two continuous drive cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

MEMO:

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

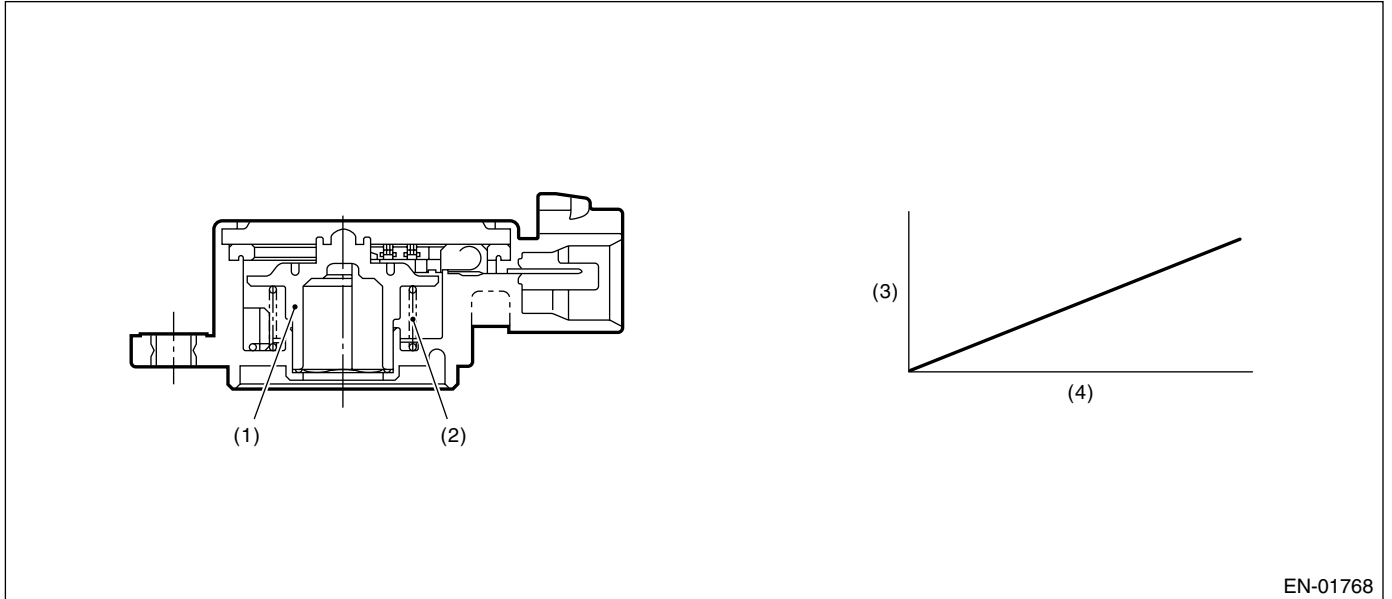
GENERAL DESCRIPTION

DP:DTC P1088 — TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT LOW —

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of tumble generated valve position sensor.
Judge NG when the value is out of standard range.

2. COMPONENT DESCRIPTION



EN-01768

(1) Rotor

(2) Return spring

(3) Voltage (V)

(4) Tumble generated valve angle (°)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform diagnosis.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (0.5 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.182 V

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Tumble generated valve position

- Learning of tumble generated valve position fully closed and date renewed to close side.
- Learning of tumble generated valve position fully opened and date renewed to open side.

Basic advance angle

- Change the map for calculating to the map for malfunction of the tumble generator valve.

Electronic control throttle

- Change the angle operation of accelerator position sensor demand target throttle opening calculation to the map for malfunction of the tumble generator valve.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

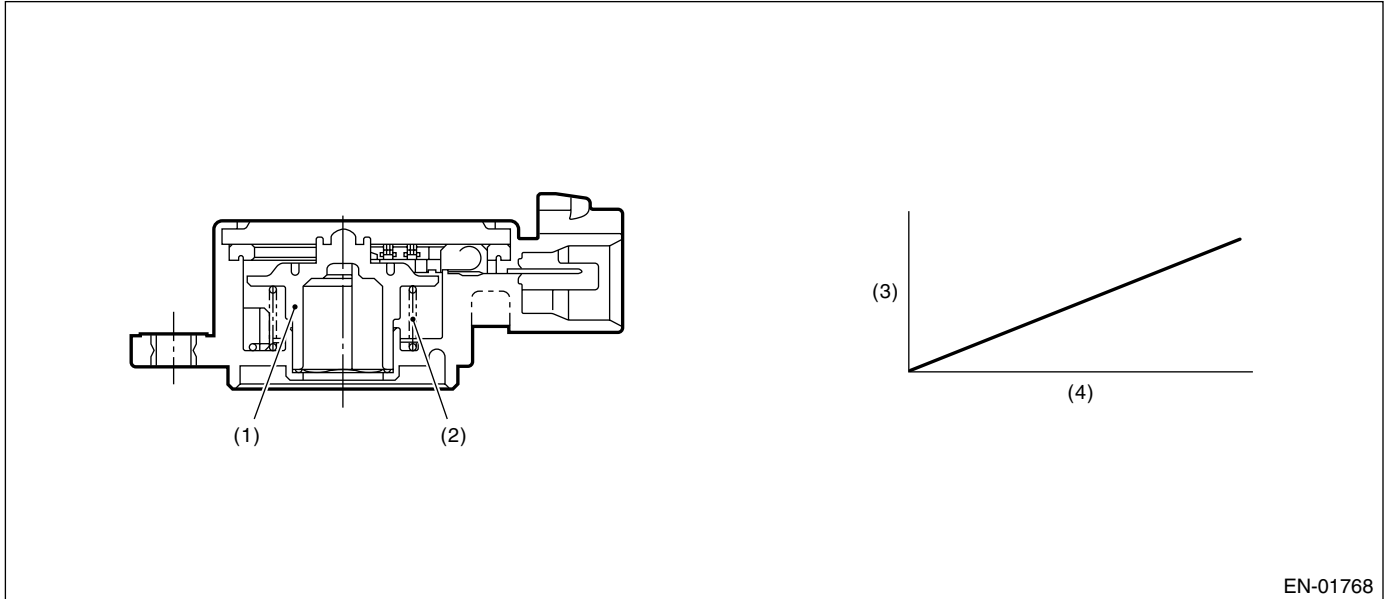
GENERAL DESCRIPTION

DQ:DTC P1089 — TUMBLE GENERATED VALVE POSITION SENSOR 1 CIRCUIT HIGH —

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of tumble generated valve position sensor.
Judge NG when the value is out of standard range.

2. COMPONENT DESCRIPTION



EN-01768

(1) Rotor

(2) Return spring

(3) Voltage (V)

(4) Tumble generated valve angle (°)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform diagnosis.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (0.5 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.843 V

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Tumble generated valve position

- Learning of tumble generated valve position fully closed and date renewed to close side.
- Learning of tumble generated valve position fully opened and date renewed to open side.

Basic advance angle

- Change the map for calculating to the map for malfunction of the tumble generator valve.

Electronic control throttle

- Change the angle operation of accelerator position sensor demand target throttle opening calculation to the map for malfunction of the tumble generator valve.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

DR:DTC P1090 — TUMBLE GENERATED VALVE SYSTEM 1 (VALVE OPEN) —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of tumble generated valve motor function.

Judge open fixing malfunction when the opening degree is large even after finishing the tumble generated valve open driving.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Engine coolant temperature	$\geq 0^{\circ}\text{C}$ (32°F)
Ambient temperature	$\geq 0^{\circ}\text{C}$ (32°F)

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Tumble generated valve angle	$\geq 52.5^{\circ}$
Tumble generated valve "close" signal output	2.5 seconds or more

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Tumble generated valve angle	$< 52.5^{\circ}$
Tumble generated valve "close" signal output	2.5 seconds or more

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

Tumble generated valve opening

- For tumble generated valve all closing points learning, not allowed to update to the closing side.
- For tumble generated valve all opening points learning, not allowed to update to the opening side.

Tumble generated valve control

- Output the open signal.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

DS:DTC P1091 — TUMBLE GENERATED VALVE SYSTEM 1 (VALVE CLOSE) —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of tumble generated valve motor function.

Judge close fixing malfunction when the opening degree is small even after finishing the tumble generated valve open driving.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Engine coolant temperature	$\geq 0^{\circ}\text{C}$ (32°F)
Ambient temperature value estimated	$\geq 0^{\circ}\text{C}$ (32°F)

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Tumble generated valve angle	$< 52.5^{\circ}$
Tumble generated valve "open" signal output	2.2 seconds or more

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Tumble generated valve angle	$\geq 52.5^{\circ}$
Tumble generated valve "open" signal output	2.2 seconds or more

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

7. FAIL SAFE

Tumble generated valve opening

- For tumble generated valve all closing points learning, not allowed to update to the closing side.
- For tumble generated valve all opening points learning, not allowed to update to the opening side.

Tumble generated valve control

- Output the close signal.

Basic advance angle

- Change the map for calculating to the map for malfunction of the tumble generator valve.

Electronic control throttle

- Change the angle operation of accelerator position sensor demand target throttle opening calculation to the map for malfunction of the tumble generator valve.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

MEMO:

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

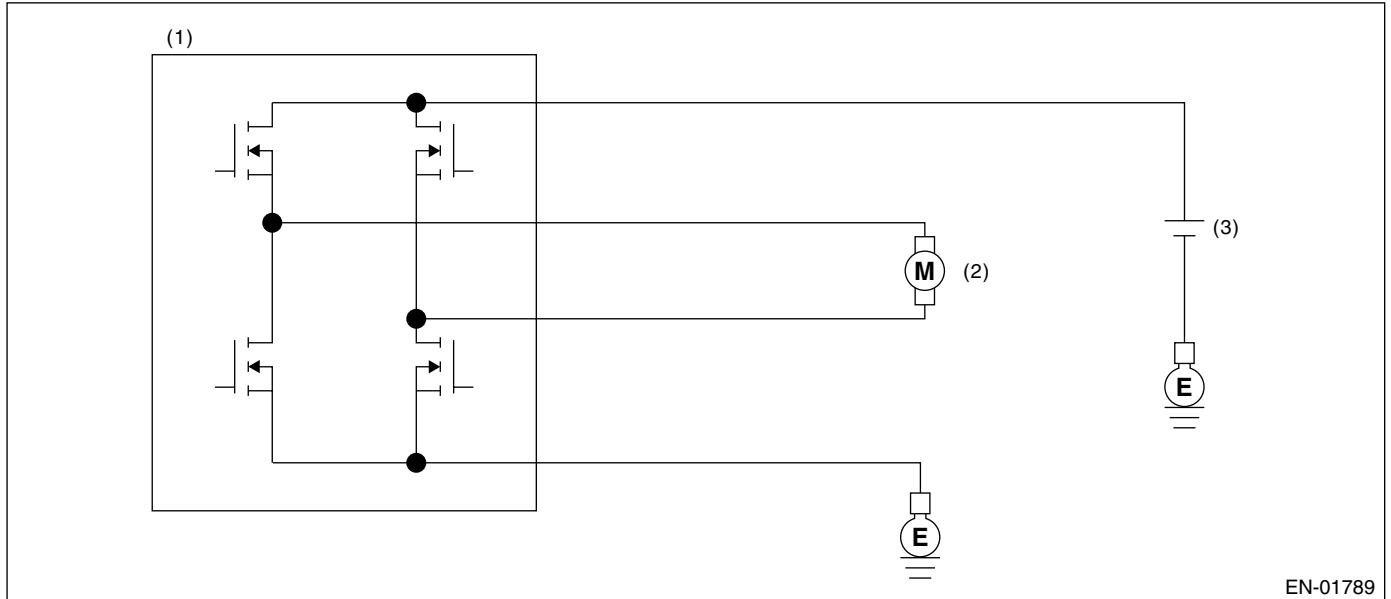
DT:DTC P1094 — TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (OPEN) —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tumble generated valve motor.

Judge NG when the open signal is sent from IC after tumble generated valve driving IC diagnosis.

2. COMPONENT DESCRIPTION



EN-01789

(1) Engine control module (ECM)

(2) Tumble generated valve

(3) Battery

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Output signal from ECM	Before changing from ON to OFF
Output ON signal from ECM	20 milli-seconds or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed by tumble generated valve driving IC, and then NG signal is sent to main IC. At the main IC, judge NG when the NG signal is sent continuously during 3.5 seconds. Judge OK and clear the NG when the OK signal is sent.

Judgment Value

Malfunction Criteria	Threshold Value
(Open NG)	
Diagnosis input — Open	High
Diagnosis input — Short	High

Time Needed for Diagnosis: 3.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Tumble generated valve control: Not allowed to move tumble generated valve.

Basic advance angle

- Change the map for calculating to the map for malfunction of the tumble generator valve.

Electronic control throttle

- Change the angle operation of accelerator position sensor demand target throttle opening calculation to the map for malfunction of the tumble generator valve.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

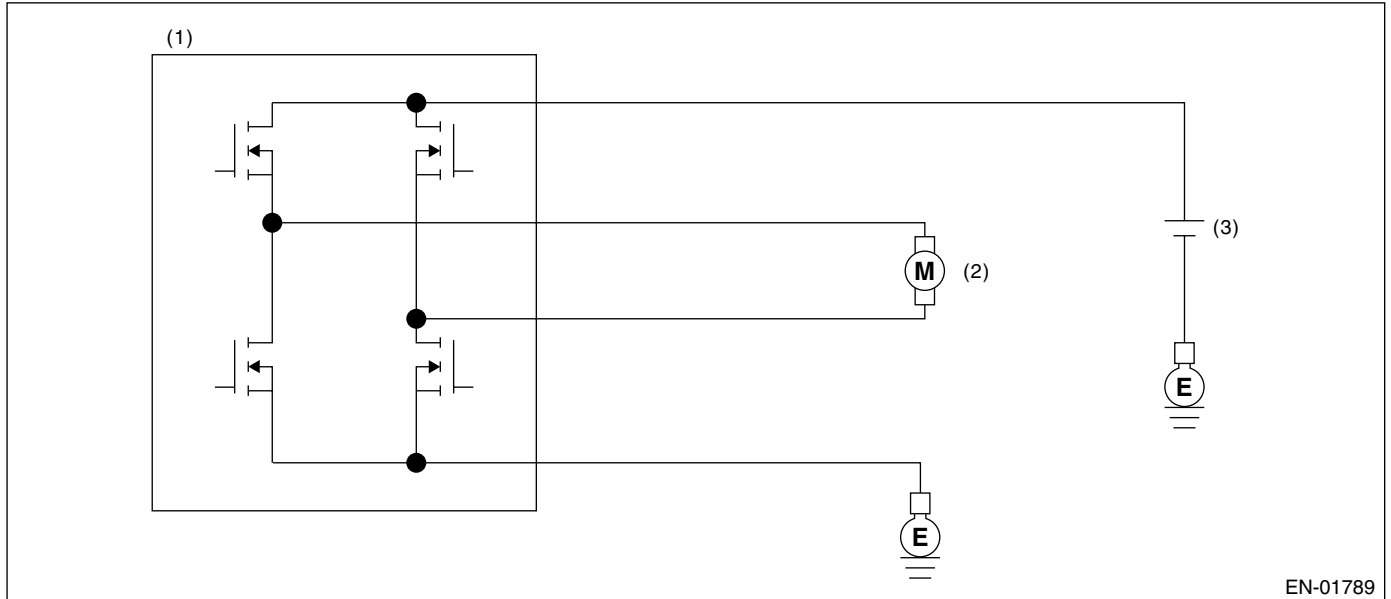
DU:DTC P1095 — TUMBLE GENERATED VALVE SIGNAL 1 CIRCUIT MALFUNCTION (SHORT) —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tumble generated valve motor.

Judge NG when the overcurrent signal is sent from IC after tumble generated valve driving IC diagnosis.

2. COMPONENT DESCRIPTION



EN-01789

(1) Engine control module (ECM)

(2) Tumble generated valve

(3) Battery

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Output signal from ECM	Before changing from ON to OFF
Output ON signal from ECM	20 milli-seconds or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed by tumble generated valve driving IC, and then NG signal is sent to main IC. At the main IC, judge NG when the NG signal is sent continuously during 3.5 seconds. Judge OK and clear the NG when the OK signal is sent.

Judgment Value

Malfunction Criteria	Threshold Value
Diagnosis input — Open	Low
Diagnosis input — Short	High

Time Needed for Diagnosis: 3.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Tumble generated valve control: Not allowed to move tumble generated valve.

Basic advance angle

- Change the map for calculating to the map for malfunction of the tumble generator valve.

Electronic control throttle

- Change the angle operation of accelerator position sensor demand target throttle opening calculation to the map for malfunction of the tumble generator valve.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

DV:DTC P1110 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (LOW INPUT) —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of atmospheric pressure sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION

Atmospheric pressure sensor is built in ECM.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	< 0.118 V

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	≥ 0.118 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Atmospheric pressure sensor process: Fix the atmospheric pressure to 101.3 kPa (760 mmHg, 29.9 inHg).

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

DW:DTC P1111 — ATMOSPHERIC PRESSURE SENSOR CIRCUIT MALFUNCTION (HIGH INPUT) —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of atmospheric pressure sensor.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION

Atmospheric pressure sensor is built in ECM.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 0.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	≥ 4.941 V

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	< 4.941 V

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Atmospheric pressure sensor process: Fix the atmospheric pressure to 101.3 kPa (760 mmHg, 29.9 inHg).

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

DX:DTC P1152 — O₂ SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1) —

1. OUTLINE OF DIAGNOSIS

Detect that lambda value remains Low.

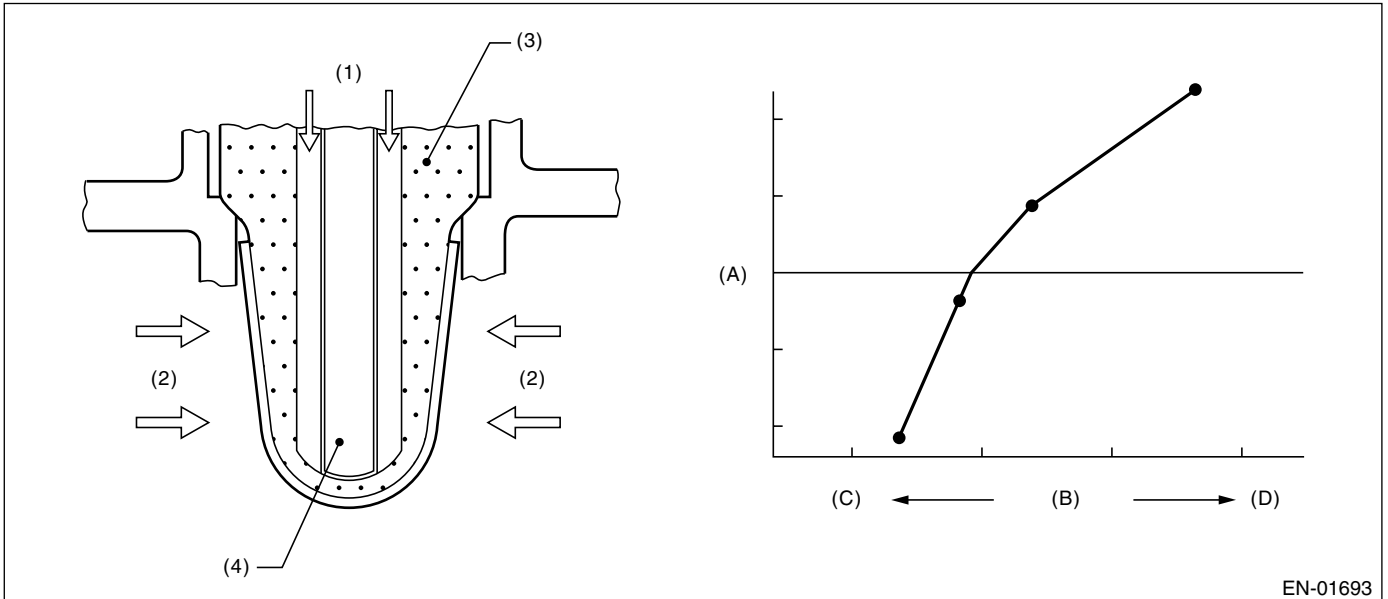
Judge NG when lambda value is abnormal in accordance with lambda value of front oxygen (A/F) sensor and running condition that is vehicle speed, amount of intake air engine coolant temperature, sub feedback control, etc.

Lambda value = Actual air fuel ratio/Theoretical air fuel ratio

Lambda > 1: Lean

Lambda < 1: Rich

2. COMPONENT DESCRIPTION



EN-01693

- (1) Atmosphere
- (2) Exhaust
- (3) ZrO₂
- (4) Ceramic heater

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Lean
- (D) Rich

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
All secondary parameters to be in enable conditions	4 seconds or more
Battery voltage	> 10.9 V
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Rear oxygen sensor sub feedback	Operating
Rear oxygen sensor output voltage – feedback target voltage	–0.2 V ↔ 0.1 V
or rear oxygen sensor sub feedback compensation coefficient	On Min.
or rear oxygen sensor sub feedback compensation coefficient	On Max.
After engine starting	60 seconds or more
Engine coolant temperature	≥ 70°C (158°F)
Vehicle speed	≥ 20 km/h (12 MPH)
Amount of intake air	≥ 6 g (0.21 oz)/s
Load change during 0.5 engine rev.	≤ 0.02 g (0.001 oz)/rev
Impedance of front oxygen (A/F) sensor	0 ↔ 50 Ω
Learning value of evaporation gas density	≤ 0.2
Total time of operating canister purge	20 seconds or more

4. GENERAL DRIVING CYCLE

Perform diagnosis continuously at a constant speed of 20 km/h (12 MPH) or more since 60 seconds after starting the engine.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (10 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output lambda when rear oxygen sensor sub feedback compensation coefficient being at not high limit	≤ 0.85

Time Needed for Diagnosis: 10 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning compensation: Not allowed to calculate
- Front oxygen (A/F) sensor sub learning compensation: Not allowed to calculate
- Correction when re-starting at high temperature: Normally minimum value 0.06 → 0
- Purge control: Not allowed to purge

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

MEMO:

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

DY:DTC P1153 — O₂ SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1) —

1. OUTLINE OF DIAGNOSIS

Detect that lambda value remains High.

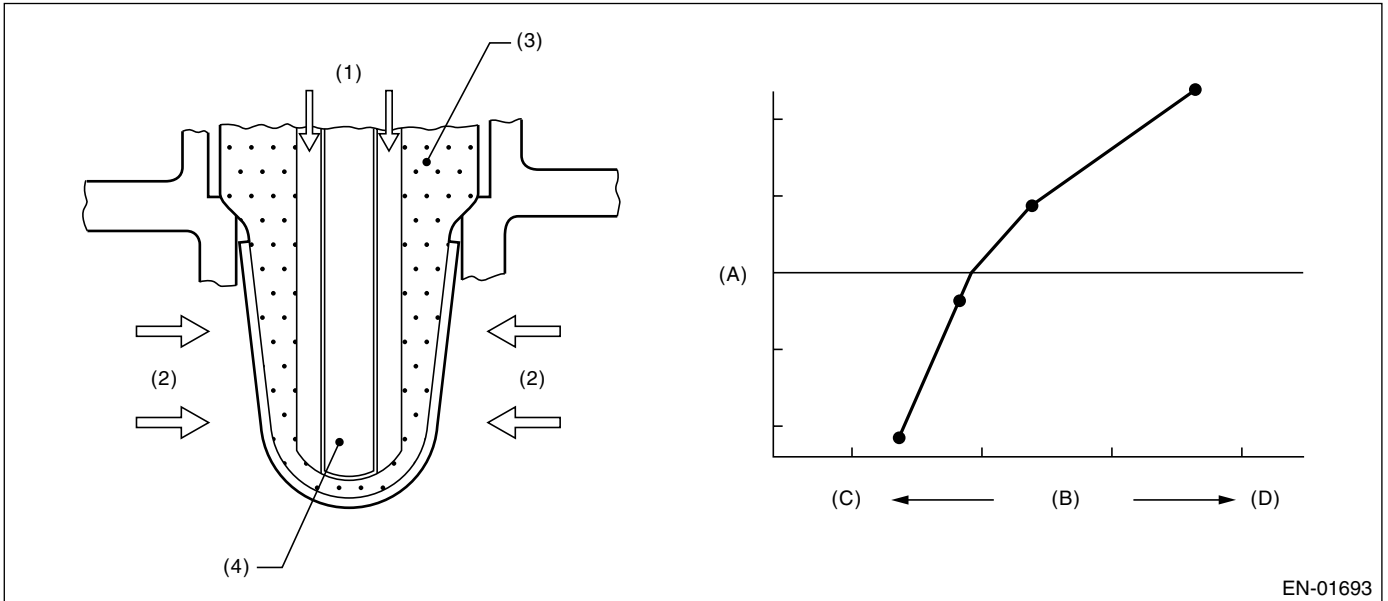
Judge NG when lambda value is abnormal in accordance with lambda value of front oxygen (A/F) sensor and running condition that is vehicle speed, amount of intake air engine coolant temperature, sub feedback control, etc.

Lambda value = Actual air fuel ratio/Theoretical air fuel ratio

Lambda > 1: Lean

Lambda < 1: Rich

2. COMPONENT DESCRIPTION



EN-01693

(1) Atmosphere

(2) Exhaust

(3) ZrO₂

(4) Ceramic heater

(A) Electromotive force

(B) Air fuel ratio

(C) Lean

(D) Rich

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
All secondary parameters to be in enable conditions	4 seconds or more
Battery voltage	> 10.9 V
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Rear oxygen sensor sub feedback	Operating
Rear oxygen sensor output voltage – feedback target voltage	–0.2 V ↔ 0.1 V
or rear oxygen sensor sub feedback compensation coefficient	On Min.
or rear oxygen sensor sub feedback compensation coefficient	On Max.
After engine starting	60 seconds or more
Engine coolant temperature	≥ 70°C (158°F)
Vehicle speed	≥ 20 km/h (12 MPH)
Amount of intake air	≥ 6 g (0.21 oz)/s
Load change during 0.5 engine rev.	≤ 0.02 g (0.001 oz)/rev
Impedance of front oxygen (A/F) sensor	0 ↔ 50 Ω
Learning value of evaporation gas density	≤ 0.2
Total time of operating canister purge	20 seconds or more

4. GENERAL DRIVING CYCLE

Perform diagnosis continuously at a constant speed of 20 km/h (12 MPH) or more since 60 seconds after starting the engine.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than the time needed for diagnosis (10 seconds). Judge OK and clear NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output lambda when rear O ₂ sensor sub feedback compensation coefficient value being at not low limit	≥ 1.15

Time Needed for Diagnosis: 10 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning compensation: Not allowed to calculate
- Front oxygen (A/F) sensor sub learning compensation: Not allowed to calculate.
- Correction when re-starting at high temperature: Normally minimum value 0.06 → 0
- Purge control: Not allowed to purge

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

DZ:DTC P1154 — O₂ Sensor Circuit Range/Performance (Low) (Bank 2 Sensor 1) —

NOTE:

For the detection standard, refer to P1152.<Ref. to GD(H4SO U5)-248, DTC P1152 — O₂ SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK1 SENSOR1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

EA:DTC P1155 — O₂ Sensor Circuit Range/Performance (High) (Bank 2 Sensor 1)—

NOTE:

For the detection standard, refer to P1153.<Ref. to GD(H4SO U5)-252, DTC P1153 — O₂ SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK1 SENSOR1) —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

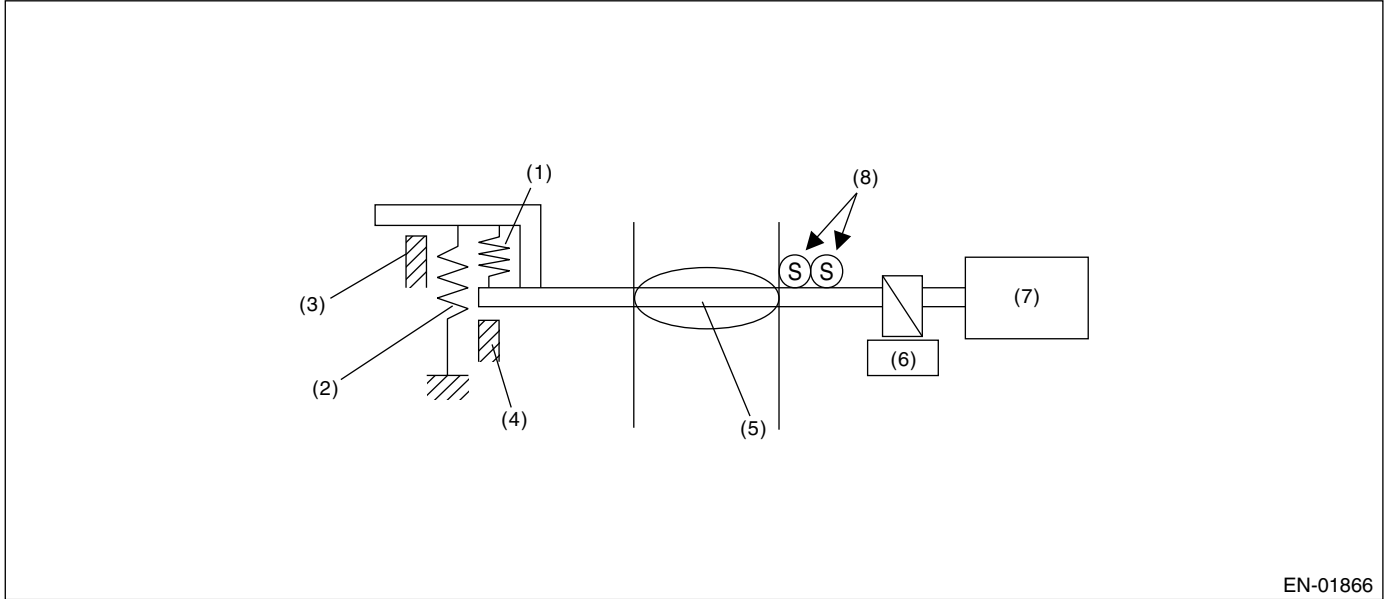
GENERAL DESCRIPTION

EB:DTC P1160 — RETURN SPRING FAILURE —

1. OUTLINE OF DIAGNOSIS

Judge NG when the valve does not move to the close direction with the motor power stopped and the valve open more than the default opening.

2. COMPONENT DESCRIPTION



- | | | |
|--------------------------|-------------------------|----------------------------------|
| (1) Opener spring | (4) Full closed stopper | (7) DC motor |
| (2) Return spring | (5) Throttle valve | (8) Main and sub throttle sensor |
| (3) Intermediate stopper | (6) Gear | |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Throttle opening	OFF
Motor continuity	OFF

4. GENERAL DRIVING CYCLE

- Ignition switch ON → OFF
- Ignition switch OFF → ON (After clear memory only)

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Opening variation after continuity is set to OFF	$\geq 2^\circ$

Time Needed for Diagnosis: 600 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only engine stop)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only engine stop)

8. FAIL SAFE

Fix the throttle opening to 6°.

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

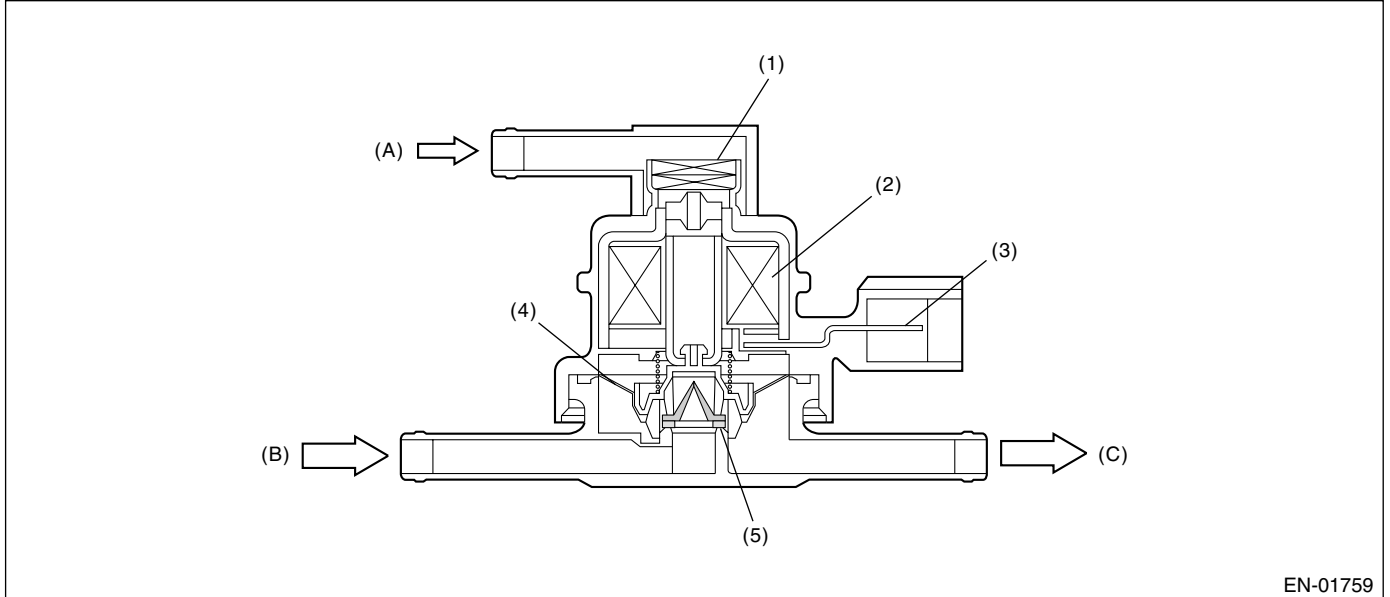
GENERAL DESCRIPTION

EC:DTC P1400 — FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW —

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of pressure control solenoid valve. Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



EN-01759

- | | | |
|------------------------|---------------|--------------------------|
| (1) Filter | (4) Diaphragm | (A) Atmospheric pressure |
| (2) Coil | (5) Valve | (B) Shut off valve |
| (3) Connector terminal | | (C) To fuel tank |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than time needed for diagnosis (2.5 seconds). Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage when ECM outputs off signal	Low

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in two continuous drive cycles.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

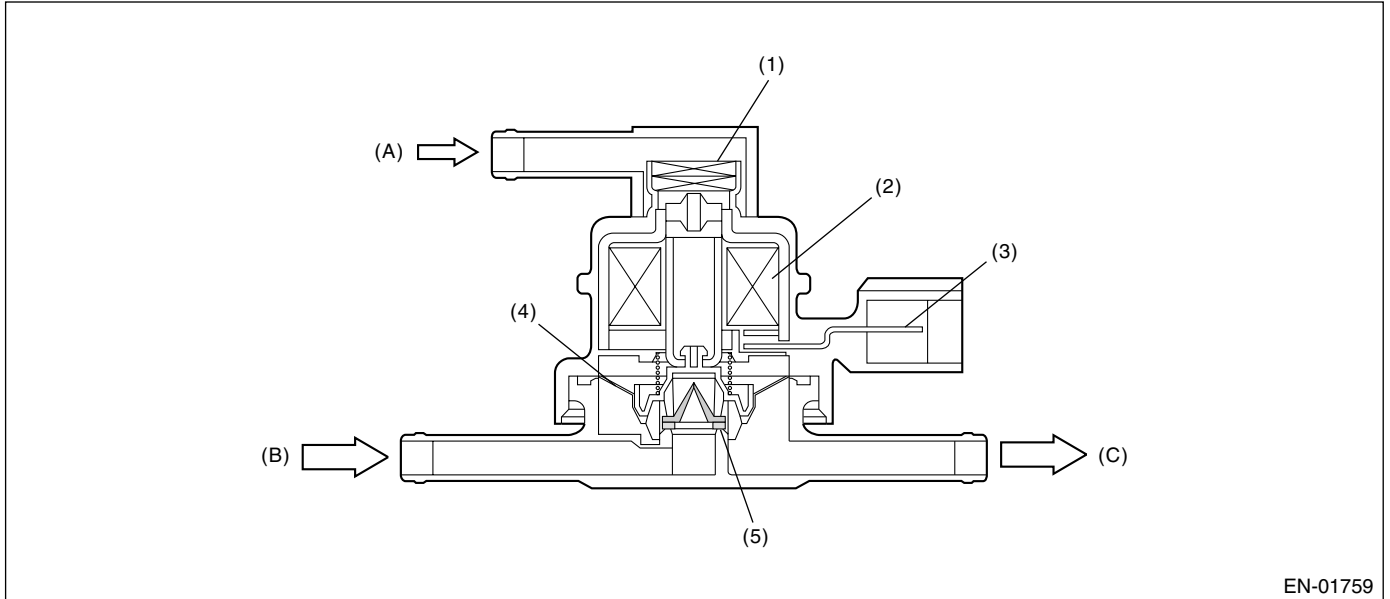
GENERAL DESCRIPTION

ED:DTC P1420 — FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH —

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of pressure control solenoid valve.
Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



- | | | |
|------------------------|---------------|--------------------------|
| (1) Filter | (4) Diaphragm | (A) Atmospheric pressure |
| (2) Coil | (5) Valve | (B) Shut off valve |
| (3) Connector terminal | | (C) To fuel tank |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	$\geq 10.9 \text{ V}$
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than time needed for diagnosis (2.5 seconds). Judge OK and clear the NG when the malfunction criteria below are not completed.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage when ECM outputs off signal	High

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in two continuous drive cycles.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

None

9. ECM OPERATING AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

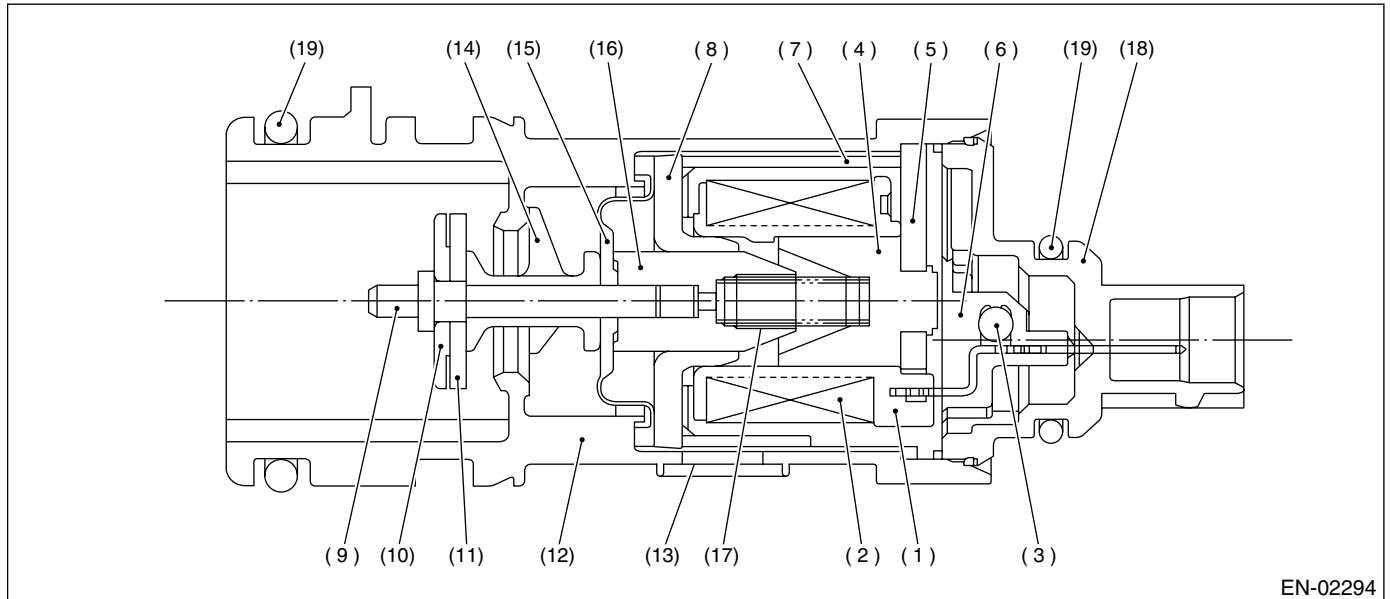
GENERAL DESCRIPTION

EE:DTC P1443 — VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM —

1. OUTLINE OF DIAGNOSIS

Detect the drain valve function abnormality.
Judge NG when the fuel tank pressure is small.

2. COMPONENT DESCRIPTION



- | | | |
|-----------------|--------------------|-------------------|
| (1) Bobbin | (8) Magnetic plate | (15) Diaphragm |
| (2) Coil | (9) Shaft | (16) Movable core |
| (3) Diode | (10) Plate | (17) Spring |
| (4) Stator core | (11) Valve | (18) Cover |
| (5) End plate | (12) Housing | (19) O-ring |
| (6) Body | (13) Filter | |
| (7) Yoke | (14) Retainer | |

3. ENABLE CONDITION

Secondary Parameter	Enable Condition
Drain valve	Open
Battery voltage	≥ 10.9 V
Atmospheric pressure	≥ 75.0 kPa (563 mmHg, 22.17 inHg)
Tank pressure when starter ON → OFF	$-0.7 \leftrightarrow 1.5$ kPa ($-5 \leftrightarrow 11$ mmHg, $-0.20 \leftrightarrow 0.43$ inHg)

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 3 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Tank pressure	-4.0 kPa (-30 mmHg, -1.18 inHg)

Time Needed for Diagnosis: 3 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as the malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Tank pressure	-4.0 kPa (-30 mmHg, -1.18 inHg)
Cumulative time when the malfunction criteria below are completed	≥ 30 seconds
Duty ratio of purge control solenoid valve	Except 0
Fuel temperature	-10 ↔ 45°C (14 ↔ 113°F)
Relative ratio of intake manifold	-26.7 kPa (-200 mmHg, -7.87 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

PCV control: Open the PCV solenoid.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

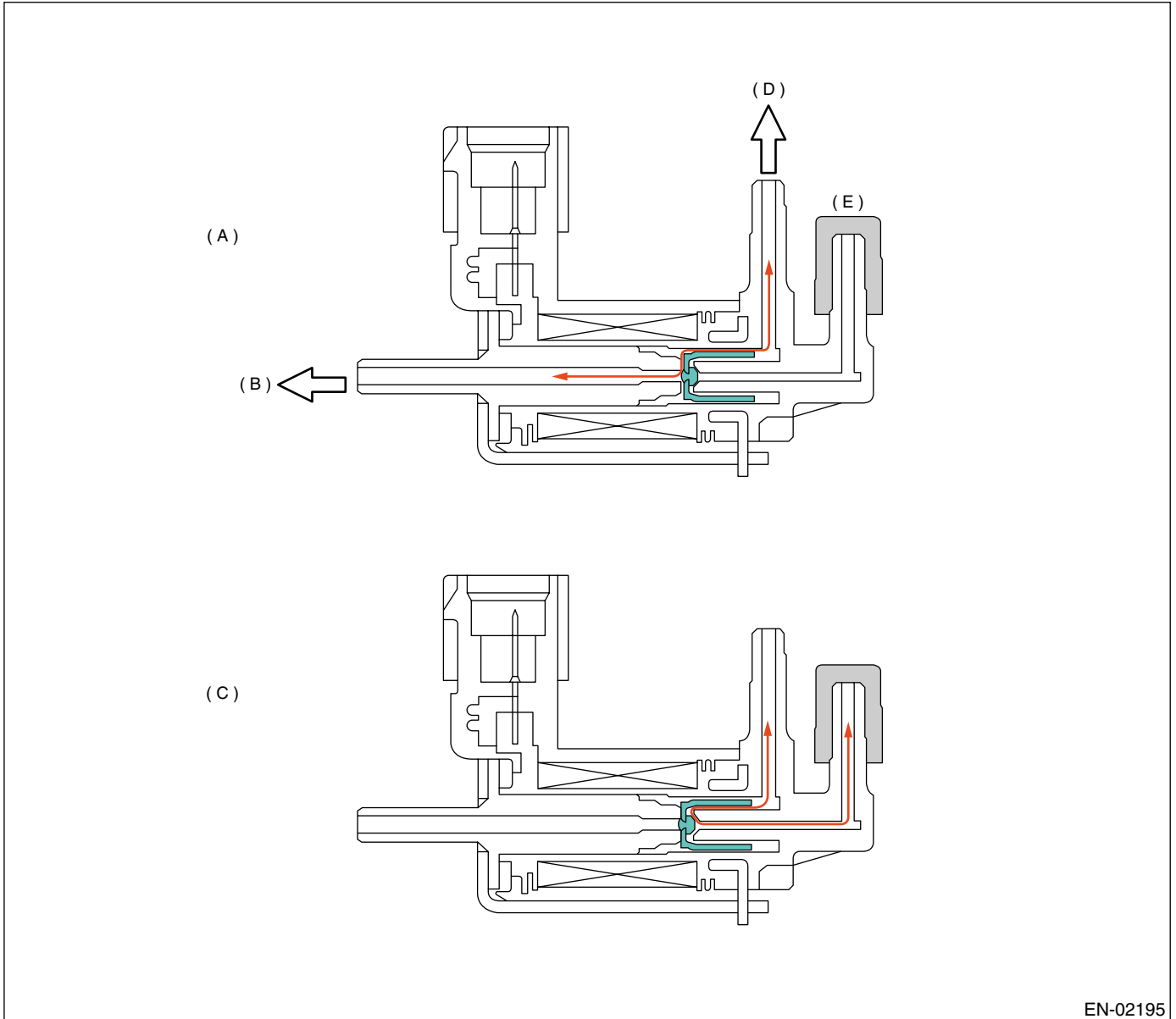
EF:DTC P1446 — FUEL TANK SENSOR CONTROL VALVE CIRCUIT LOW —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tank pressure switching solenoid.

Judge NG when the ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



EN-02195

(A) Vent control (solenoid OFF)

(C) During diagnostics (Solenoid ON)

(E) Plug

(B) Atmosphere

(D) To pressure sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM sent OFF signals	Low
Ignition switch	ON

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM sent OFF signals	High
Ignition switch	ON

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

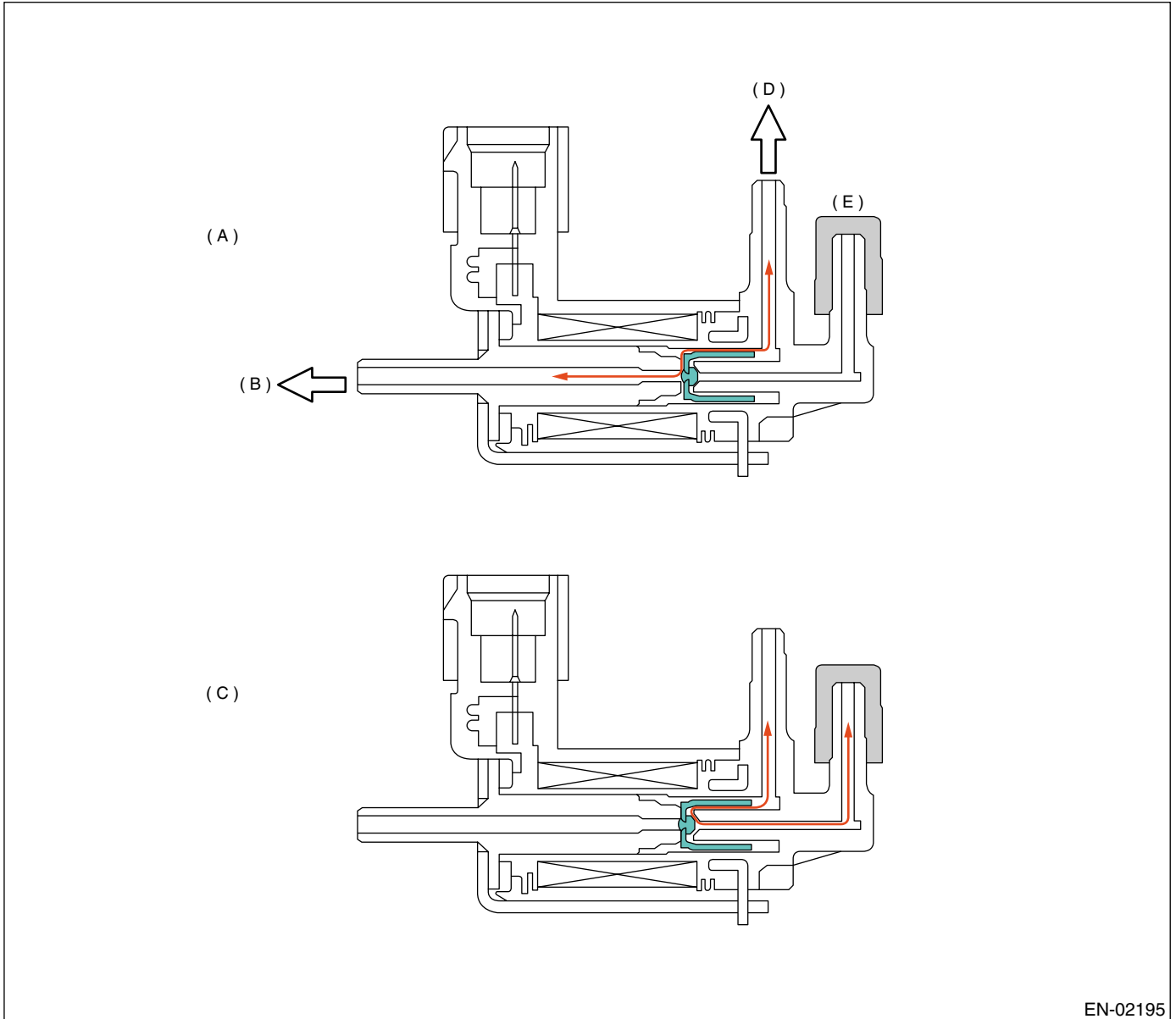
EG:DTC P1447 — FUEL TANK SENSOR CONTROL VALVE CIRCUIT HIGH —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tank pressure switching solenoid.

Judge NG when the ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



EN-02195

(A) Vent control (solenoid OFF)
(B) Atmosphere

(C) During diagnostics (Solenoid ON)
(D) To pressure sensor

(E) Plug

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the cumulative time of completing the malfunction criteria below becomes more than 2.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM sent ON signals	High
Ignition switch	ON

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in two continuous drive cycles.

• Normality Judgment

Judge OK when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM sent OFF signals	Low
Ignition switch	ON

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

EH:DTC P1448 — FUEL TANK SENSOR CONTROL VALVE RANGE PERFORMANCE —

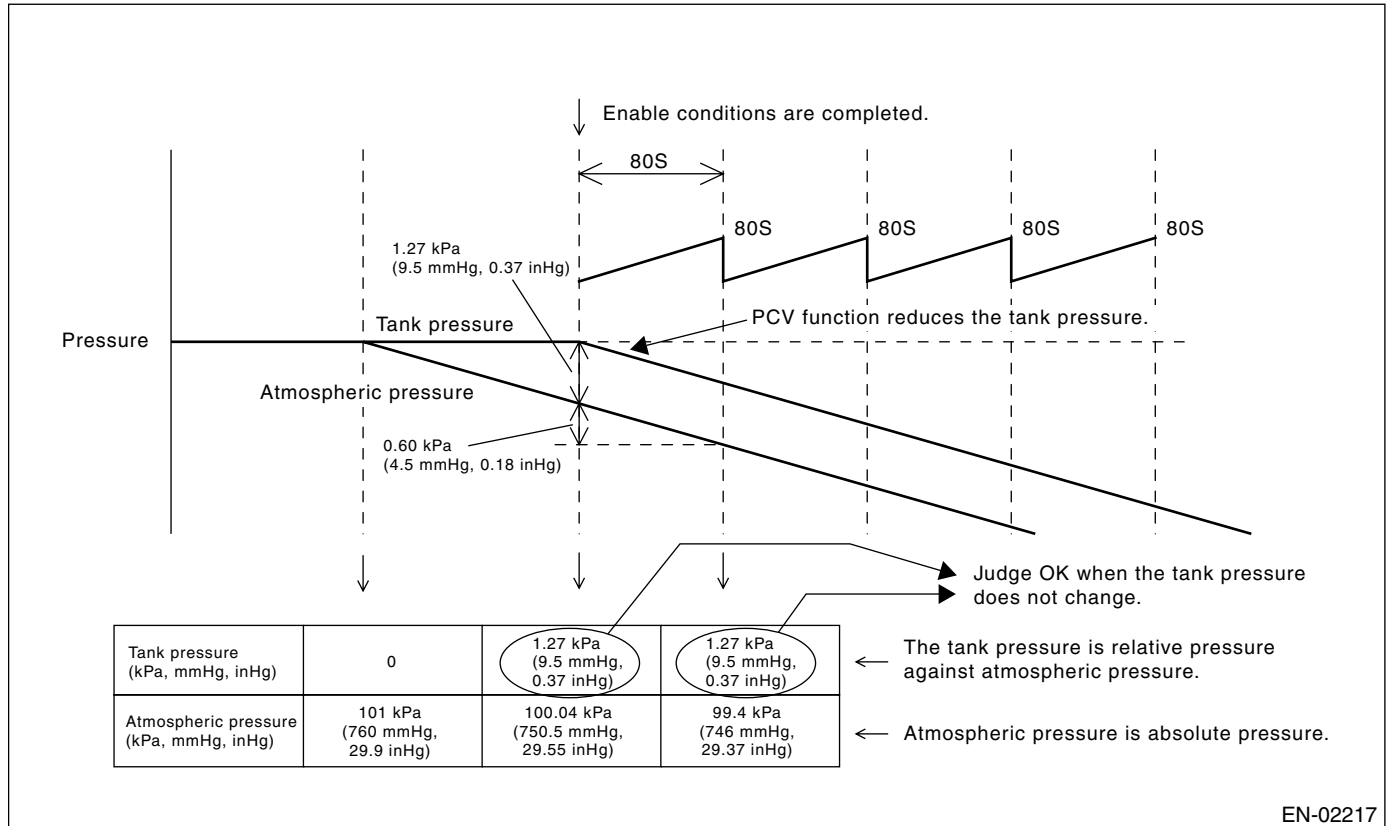
1. OUTLINE OF DIAGNOSIS

Detect the tank pressure switching solenoid function abnormality.

The tank pressure sensor is a relative pressure sensor, which normally compares the pressure with the atmospheric pressure. The tank pressure switching solenoid is a solenoid, which shifts the compare space from opening to closed during the EVAP diagnosis. Detect the malfunction that the compare space remains closed. (Not judge NG after enable condition completed but assume NG before enable condition completed.)

• Normality Judgment

Judge OK when the fuel tank pressure does not change (or changes by less than 0.60 kPa (4.5 mmHg, 0.177 inHg) at atmospheric pressure changing by 0.60 kPa (4.5 mmHg, 0.177 inHg) or more per 80 seconds.

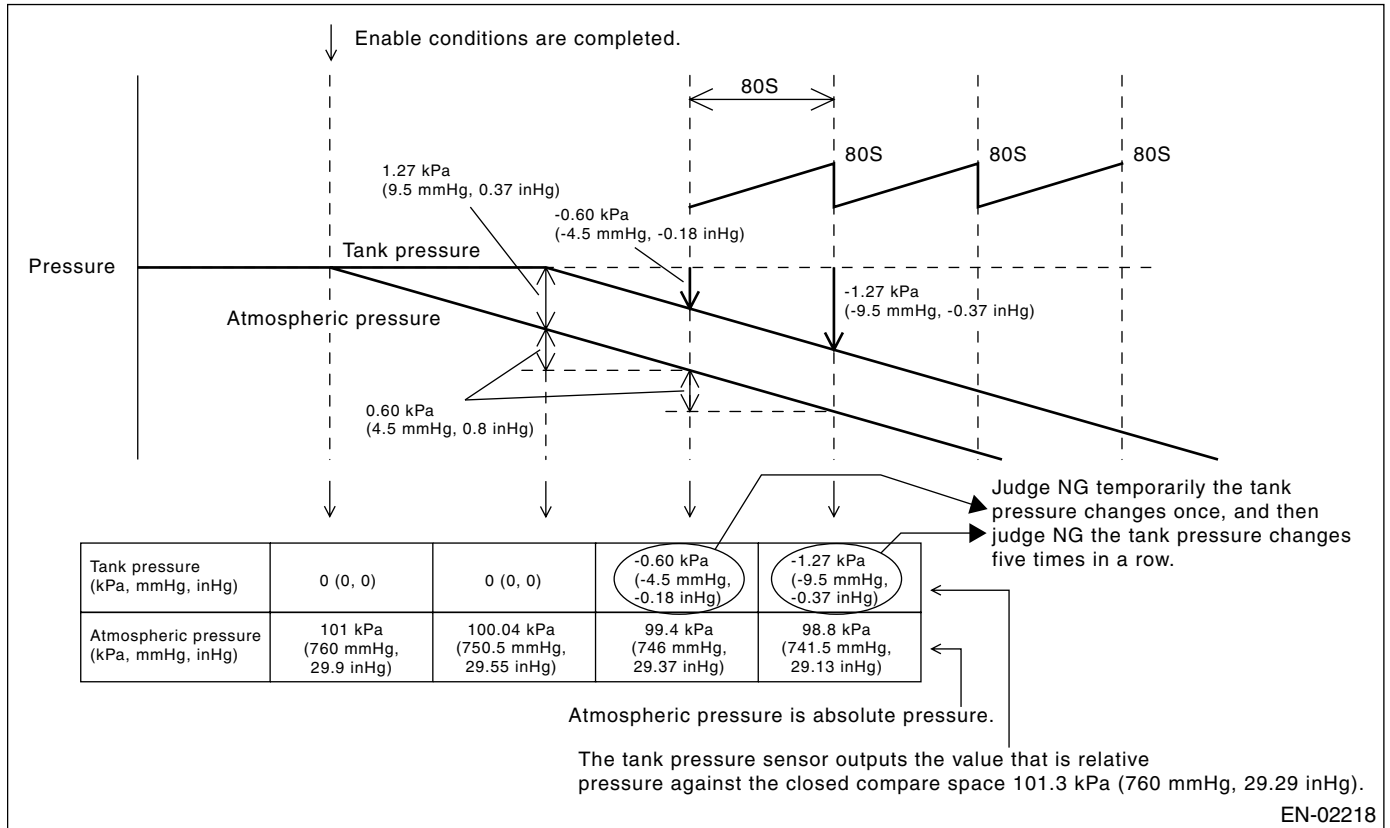


DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

• Abnormality Judgment

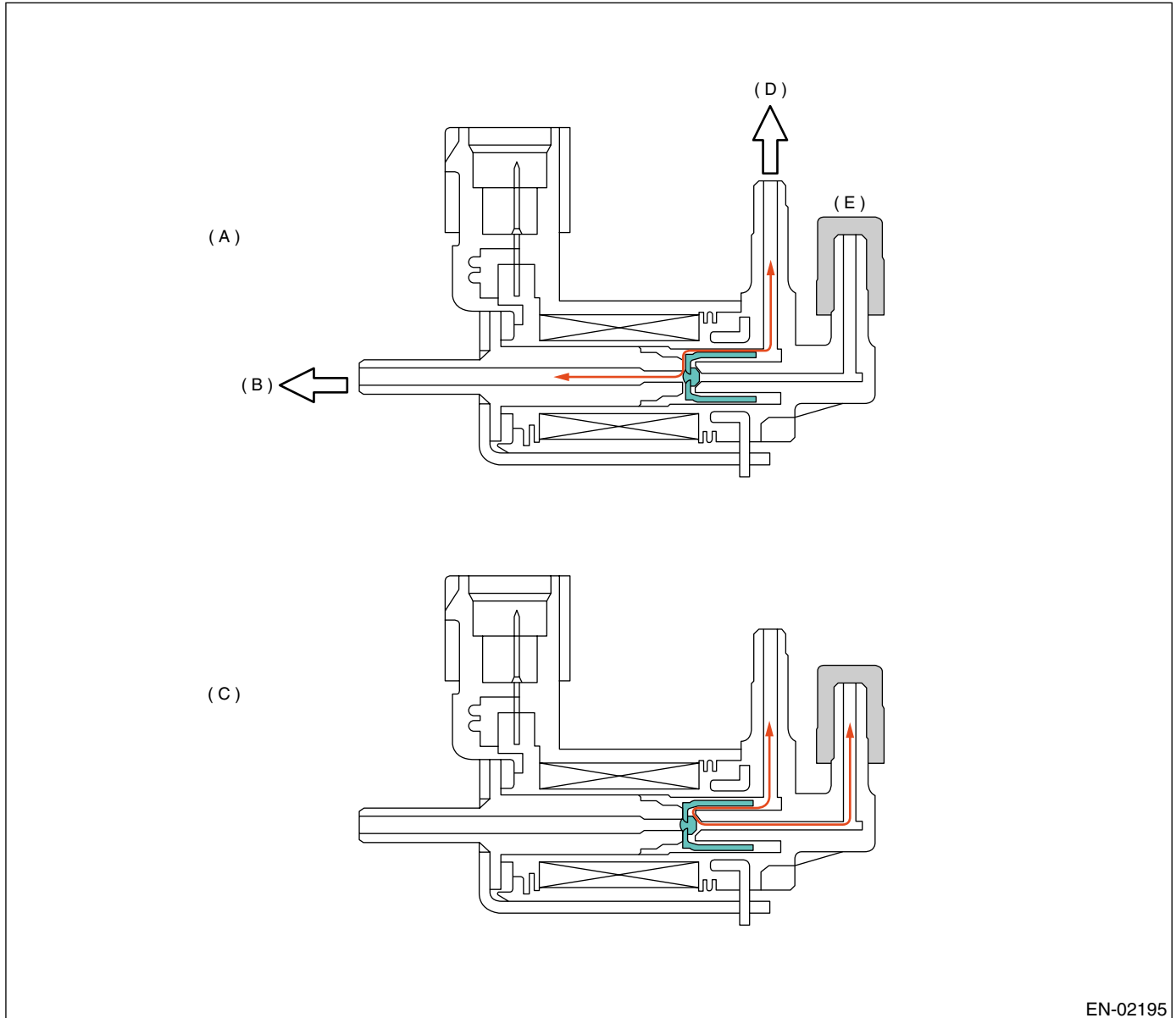
Judge NG temporarily when the fuel tank pressure changes by 0.60 kPa (4.5 mmHg, 0.18 inHg) or more at atmospheric pressure changing by 0.60 kPa (4.5 mmHg, 0.18 inHg) or more per 80 seconds, and then judge NG when the previous condition is completed 3 times in a row.



DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

2. COMPONENT DESCRIPTION



EN-02195

- (A) Atmospheric air is released (Solenoid OFF) (B) Ambient air (D) To pressure sensor
 (C) During diagnosis (Solenoid ON) (E) Plug

3. ENABLE CONDITION

Secondary Parameter	Enable Condition
Battery voltage	≥ 10.9 V
Fuel level	9.6 ↔ 48 ℓ (2.54 ↔ 12.68 US gal, 2.11 ↔ 10.56 Imp gal)
Evaporation system diagnosis	Not in operation
After starting the engine	80 seconds or more
Fuel tank pressure	< 0.1 kPa (1 mmHg, 0.04 inHg) or > 1.27 kPa (9.5 mmHg, 0.37 inHg)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when the fuel tank pressure is large or small in 80 seconds or more after starting the engine.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the malfunction criteria below is completed 3 times.

• Judgment Value

Malfunction Criteria	Threshold Value
Atmospheric air change in 80 seconds	≥ 0.67 kPa (4.5 mmHg, 0.2 inHg)
Fuel tank pressure change in 80 seconds	≥ 0.67 kPa (4.5 mmHg, 0.2 inHg)
Fuel level change	$< 3 \ell$ (3.2 US qt, 2.6 Imp qt)

Time Needed for Diagnosis: 80 seconds \times 5 times

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below is completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Atmospheric air change in 80 seconds	≥ 0.60 kPa (4.5 mmHg, 0.18 inHg)
Fuel tank pressure change in 80 seconds	< 0.60 kPa (4.5 mmHg, 0.18 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

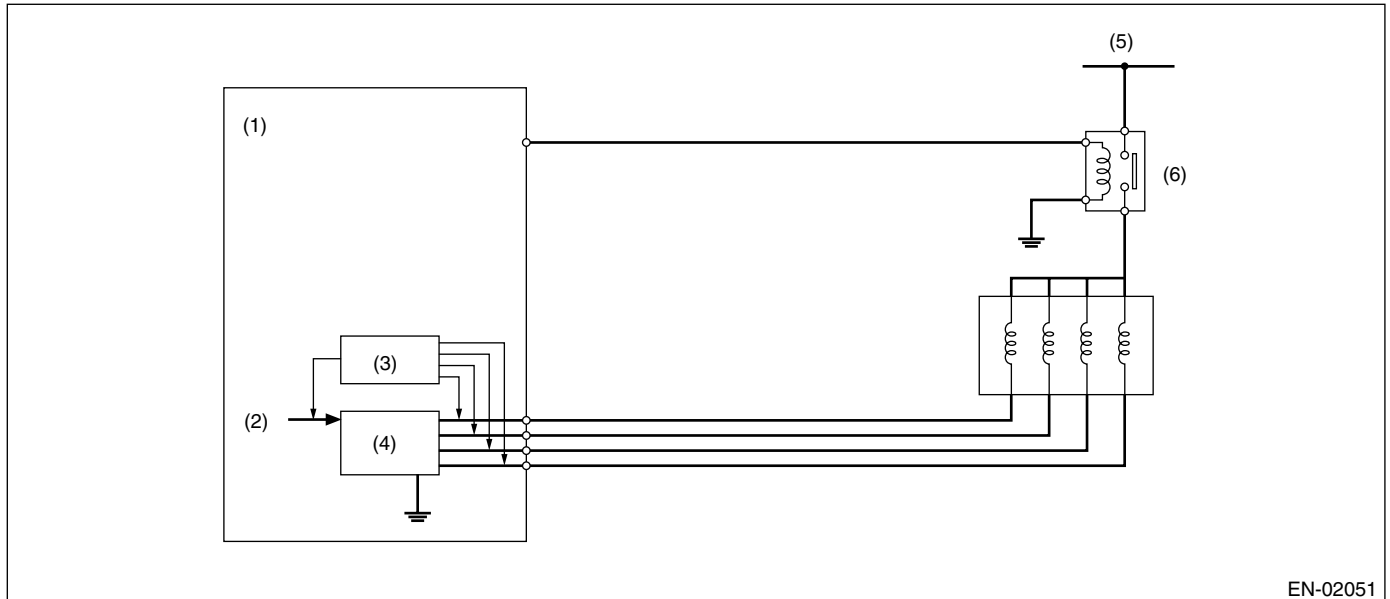
GENERAL DESCRIPTION

EI: DTC P1492 — EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT) —

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of EGR.
- Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



EN-02051

(1) Engine Control Module (ECM)

(3) Detecting circuit

(5) Battery voltage

(2) CPU

(4) Switching circuit

(6) Main relay

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Target position of EGR valve	> 0 step
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when EGR operating.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below becomes more than time needed for diagnosis.

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs OFF signal	Low level

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are not completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs ON signal	High level

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning compensation: Not allowed to calculate
- Knock sensor learning compensation: Not allowed to calculate
- EGR control: Not allowed to operate

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

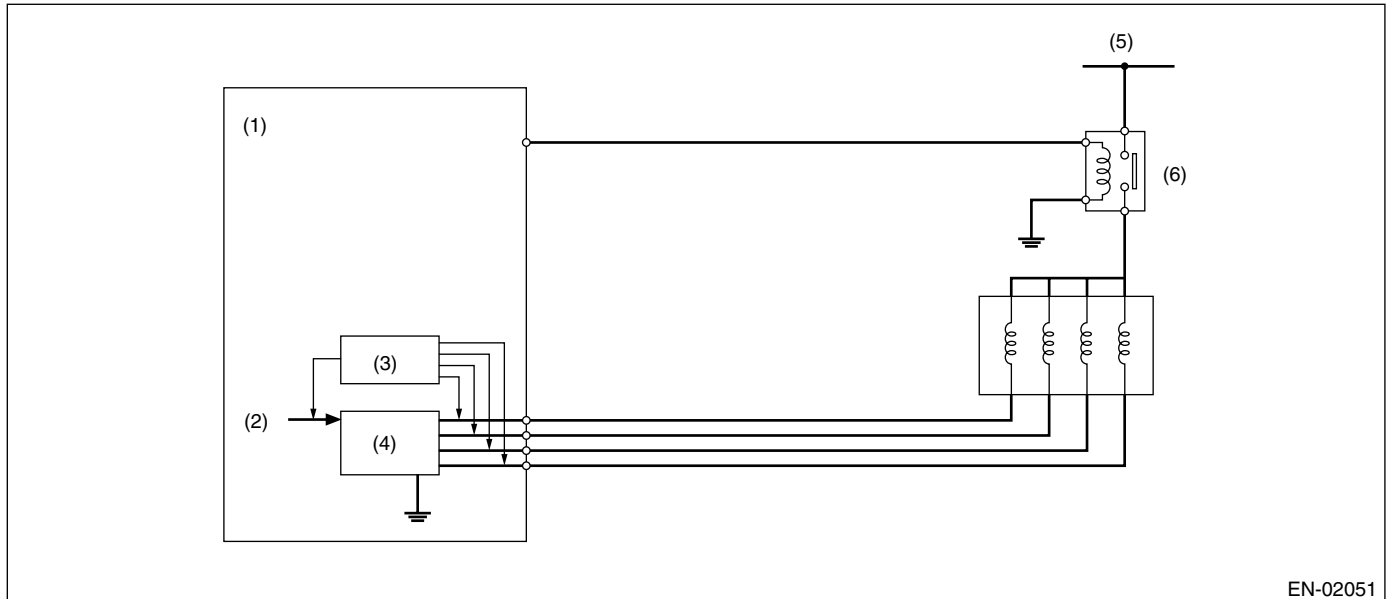
GENERAL DESCRIPTION

EJ:DTC P1493 — EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT) —

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of EGR.
- Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(1) Engine Control Module (ECM)

(3) Detecting circuit

(5) Battery voltage

(2) CPU

(4) Switching circuit

(6) Main relay

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below becomes more than time needed for diagnosis.

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs ON signal	High level

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are not completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs OFF signal	Low level

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning compensation: Not allowed to calculate
- Knock sensor learning compensation: Not allowed to calculate
- EGR control: Not allowed to operate

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

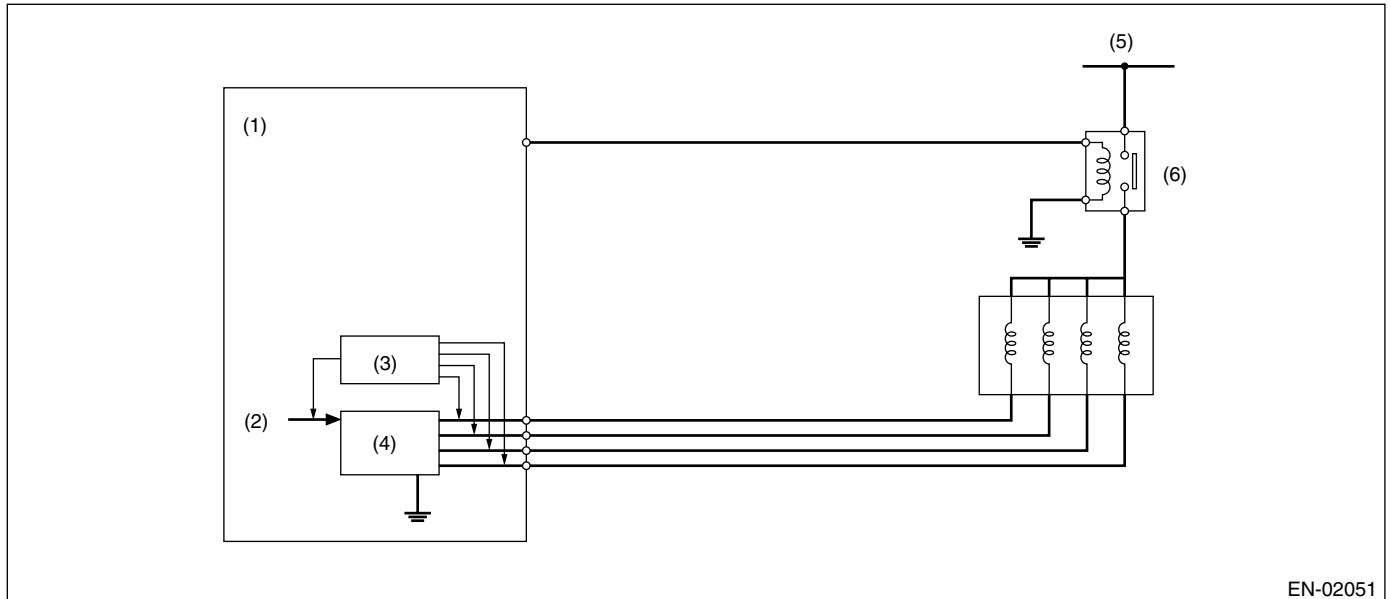
GENERAL DESCRIPTION

EK:DTC P1494 — EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (LOW INPUT) —

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of EGR.
- Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(1) Engine Control Module (ECM)

(3) Detecting circuit

(5) Battery voltage

(2) CPU

(4) Switching circuit

(6) Main relay

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Target position of EGR valve	> 0 step
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when EGR operating.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below becomes more than time needed for diagnosis.

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs OFF signal	Low level

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are not completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs ON signal	High level

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning compensation: Not allowed to calculate
- Knock sensor learning compensation: Not allowed to calculate
- EGR control: Not allowed to operate

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

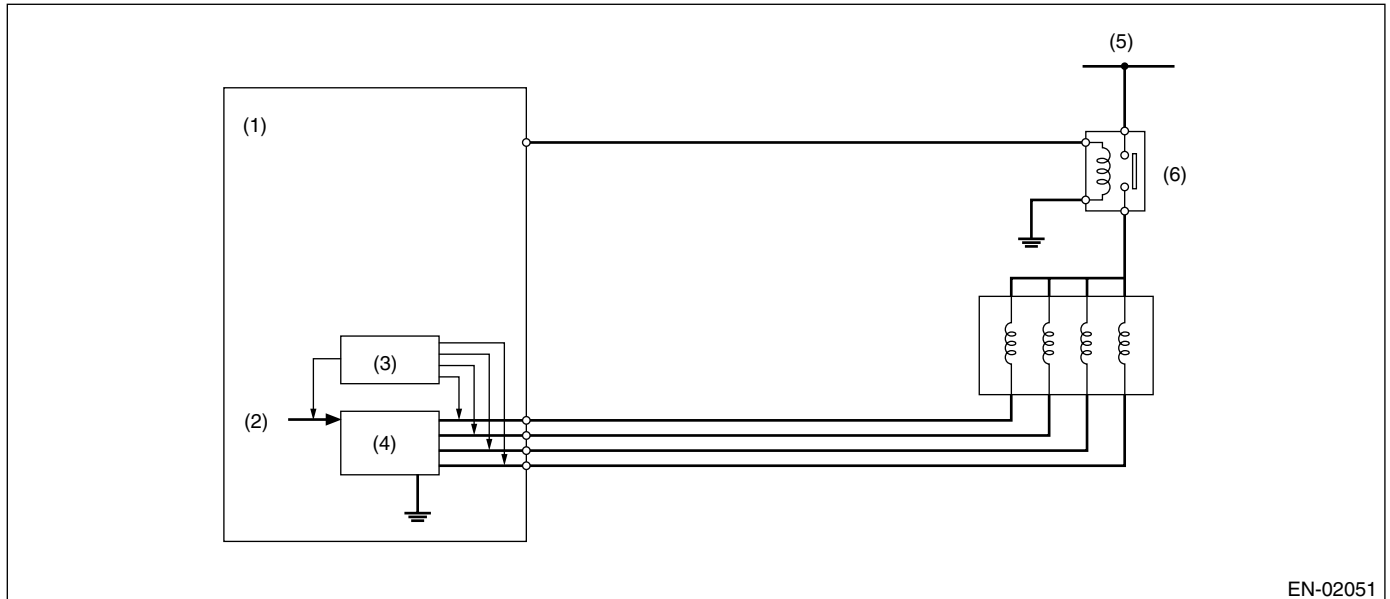
GENERAL DESCRIPTION

EL:DTC P1495 — EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (HIGH INPUT) —

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of EGR.
- Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(1) Engine Control Module (ECM)

(3) Detecting circuit

(5) Battery voltage

(2) CPU

(4) Switching circuit

(6) Main relay

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below becomes more than time needed for diagnosis.

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs OFF signal	Low level

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are not completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs ON signal	High level

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning compensation: Not allowed to calculate
- Knock sensor learning compensation: Not allowed to calculate
- EGR control: Not allowed to operate

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

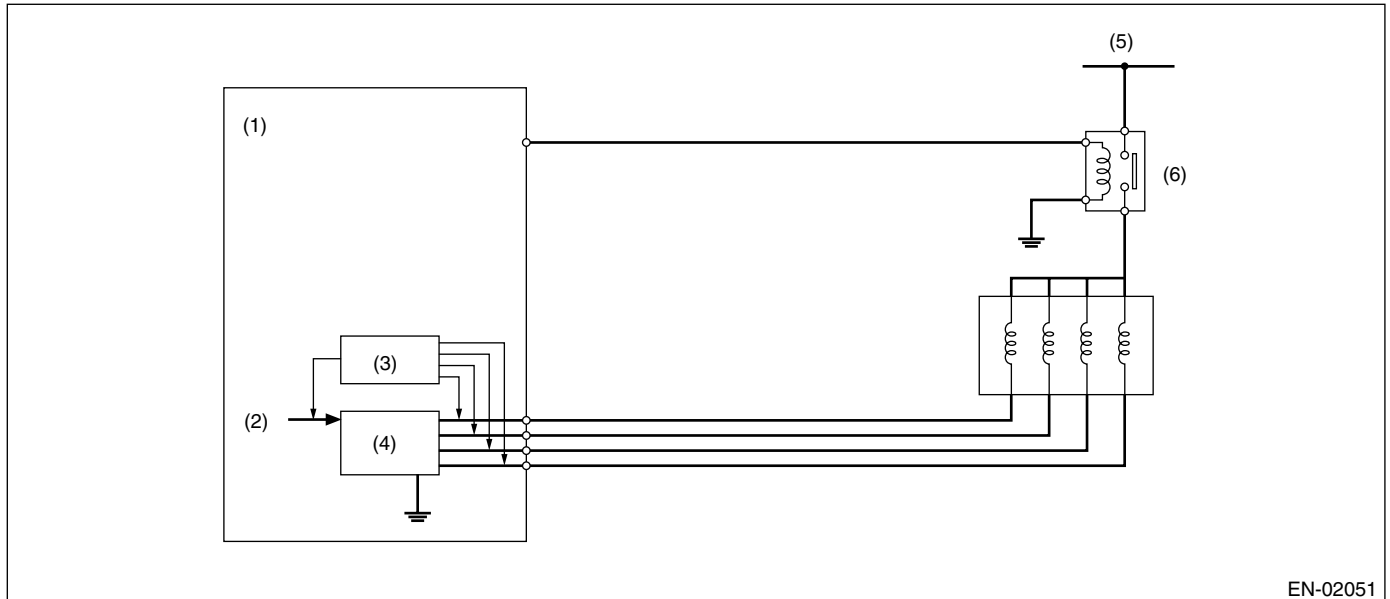
GENERAL DESCRIPTION

EM:DTC P1496 — EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (LOW INPUT) —

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of EGR.
- Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(1) Engine Control Module (ECM)

(3) Detecting circuit

(5) Battery voltage

(2) CPU

(4) Switching circuit

(6) Main relay

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Target position of EGR valve	> 0 step
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when EGR operating.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below becomes more than time needed for diagnosis.

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs OFF signal	Low level

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are not completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs ON signal	High level

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning compensation: Not allowed to calculate
- Knock sensor learning compensation: Not allowed to calculate
- EGR control: Not allowed to operate

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

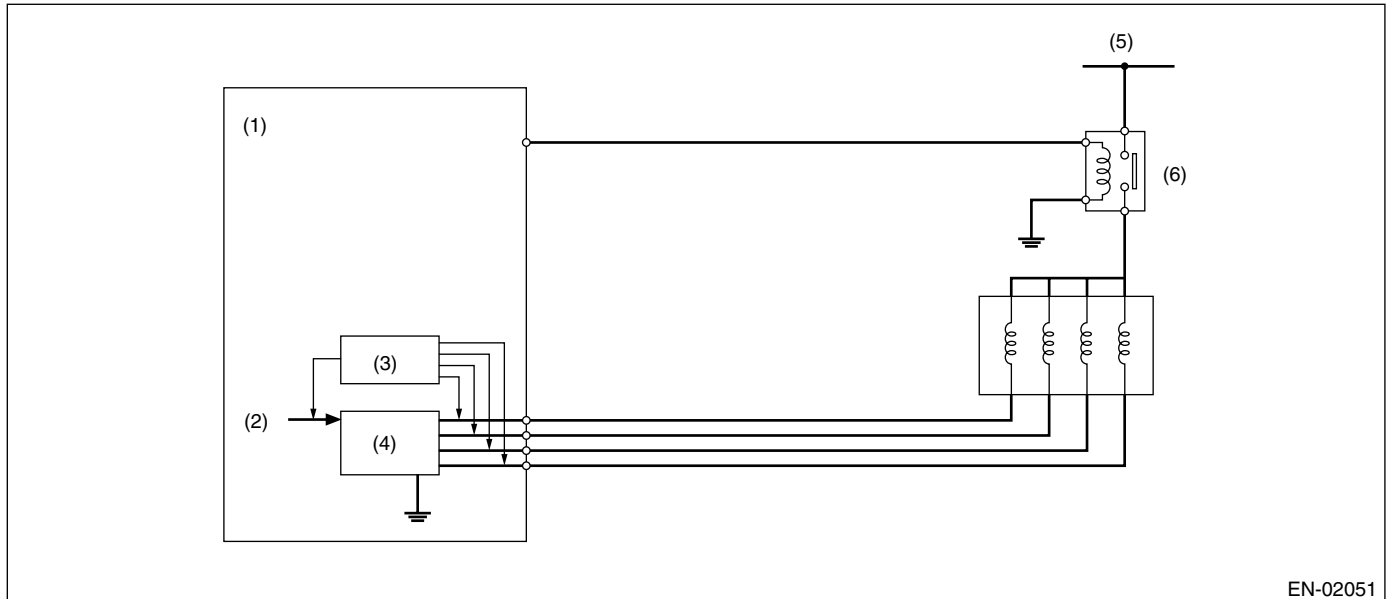
GENERAL DESCRIPTION

EN:DTC P1497 — EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (HIGH INPUT) —

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of EGR.
- Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(1) Engine Control Module (ECM)

(3) Detecting circuit

(5) Battery voltage

(2) CPU

(4) Switching circuit

(6) Main relay

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below becomes more than time needed for diagnosis.

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs ON signal	High level

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are not completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs OFF signal	Low level

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning compensation: Not allowed to calculate
- Knock sensor learning compensation: Not allowed to calculate
- EGR control: Not allowed to operate

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

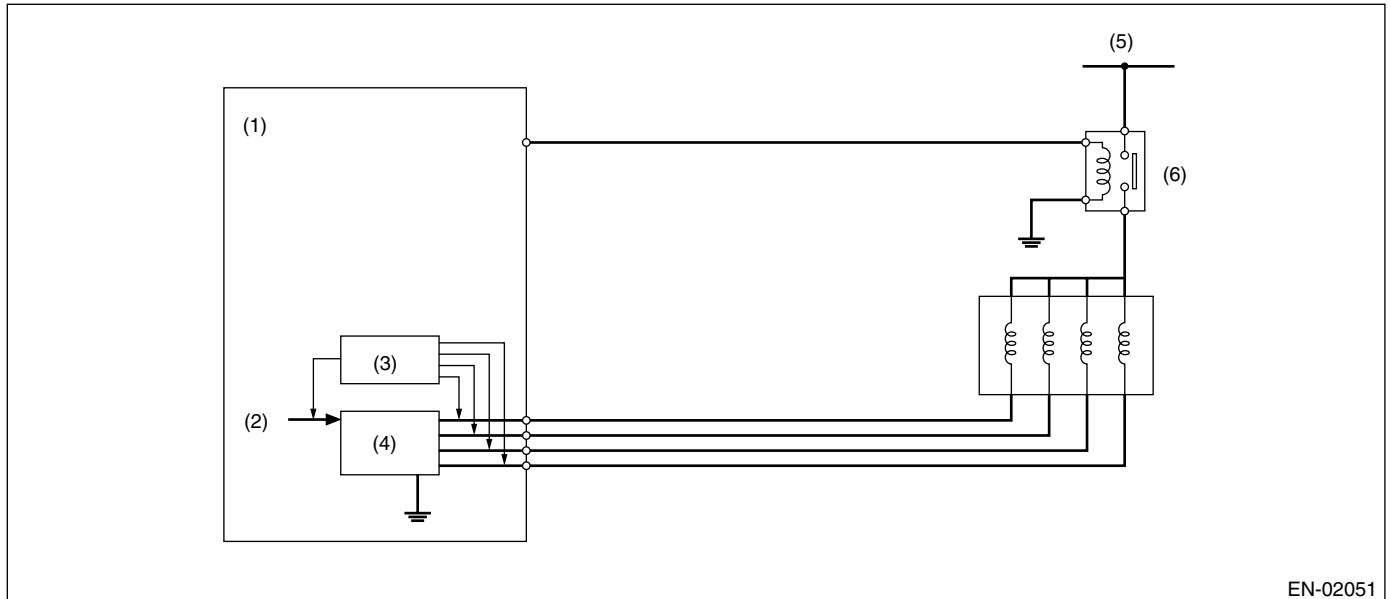
GENERAL DESCRIPTION

EO:DTC P1498 — EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT) —

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of EGR.
- Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(1) Engine Control Module (ECM)

(3) Detecting circuit

(5) Battery voltage

(2) CPU

(4) Switching circuit

(6) Main relay

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Target position of EGR valve	> 0 step
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when EGR operating.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below becomes more than time needed for diagnosis.

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs OFF signal	Low level

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are not completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs ON signal	High level

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning compensation: Not allowed to calculate
- Knock sensor learning compensation: Not allowed to calculate
- EGR control: Not allowed to operate

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

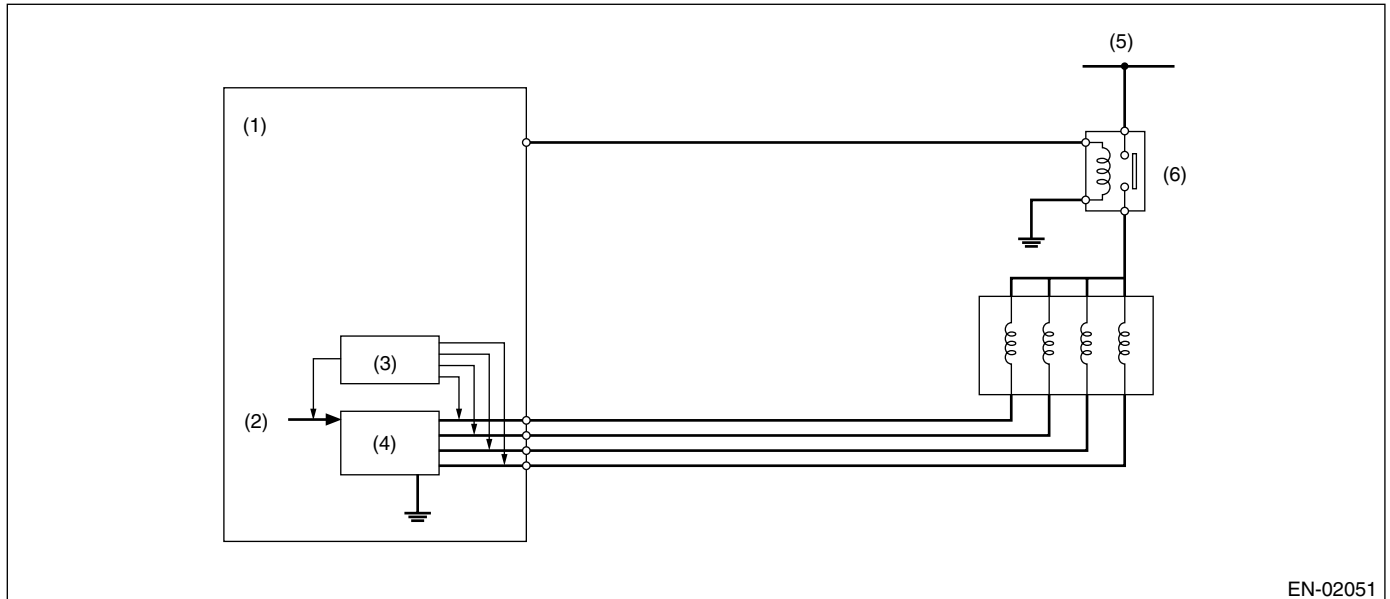
GENERAL DESCRIPTION

EP:DTC P1499 — EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT) —

1. OUTLINE OF DIAGNOSIS

- Detect the open/short circuit of EGR.
- Judge NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



(1) Engine Control Module (ECM)

(3) Detecting circuit

(5) Battery voltage

(2) CPU

(4) Switching circuit

(6) Main relay

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time until completing the malfunction criteria below becomes more than time needed for diagnosis.

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs ON signal	High level

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear the NG when the malfunction criteria below are not completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs OFF signal	Low level

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning compensation: Not allowed to calculate
- Knock sensor learning compensation: Not allowed to calculate
- EGR control: Not allowed to operate

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

EQ:DTC P1518 — STARTER SWITCH CIRCUIT LOW INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of starter SW.

Judge OFF NG when it turns to “after engine starting” while the starter has never been set to ON.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge OFF NG when the the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Vehicle speed	< 1 km/h (0.62 MPH)
Starter ON signal	Not detected
Engine speed after the engine speed of less than 500 rpm continues 0.8 seconds or more	≥ 500 rpm

Time Needed for Diagnosis: 1 second

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

• Normality Judgment

Judge OFF OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Starter ON	Experienced
Battery voltage	> 8 V

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

ER:DTC P1560 — BACK-UP VOLTAGE CIRCUIT MALFUNCTION —

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the back-up voltage circuit.

Judge NG when the back-up voltage becomes smaller than the battery voltage.

2. ENABLE CONDITION

Secondary Parameter	Enable Condition
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 2.5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Voltage of back-up power	Low
Battery voltage	≥ 10.9 V
Engine speed	≥ 500 rpm

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

• Normality Judgment

Judge OK and clear NG when the malfunction criteria below is completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Voltage of back-up power supply	High
Battery voltage	≥ 10.9 V
Engine speed	≥ 500 rpm

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

ES:DTC P1700 — THROTTLE POSITION SENSOR CIRCUIT MALFUNCTION FOR AT —

1. OUTLINE OF DIAGNOSIS

Judge NG when the voltage from throttle sensor is out of specified value.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis.

4. DIAGNOSTIC METHOD

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≤ 0.1 or ≥ 4.6 V

Time Needed for Diagnosis: 63.75 seconds

Malfunction Indicator Light Illumination: Detect when malfunction occurs in two continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

7. FAIL SAFE

Make the throttle angle to 3/8, and the line pressure and 2-4B pressure to maximum.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

MEMO:

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

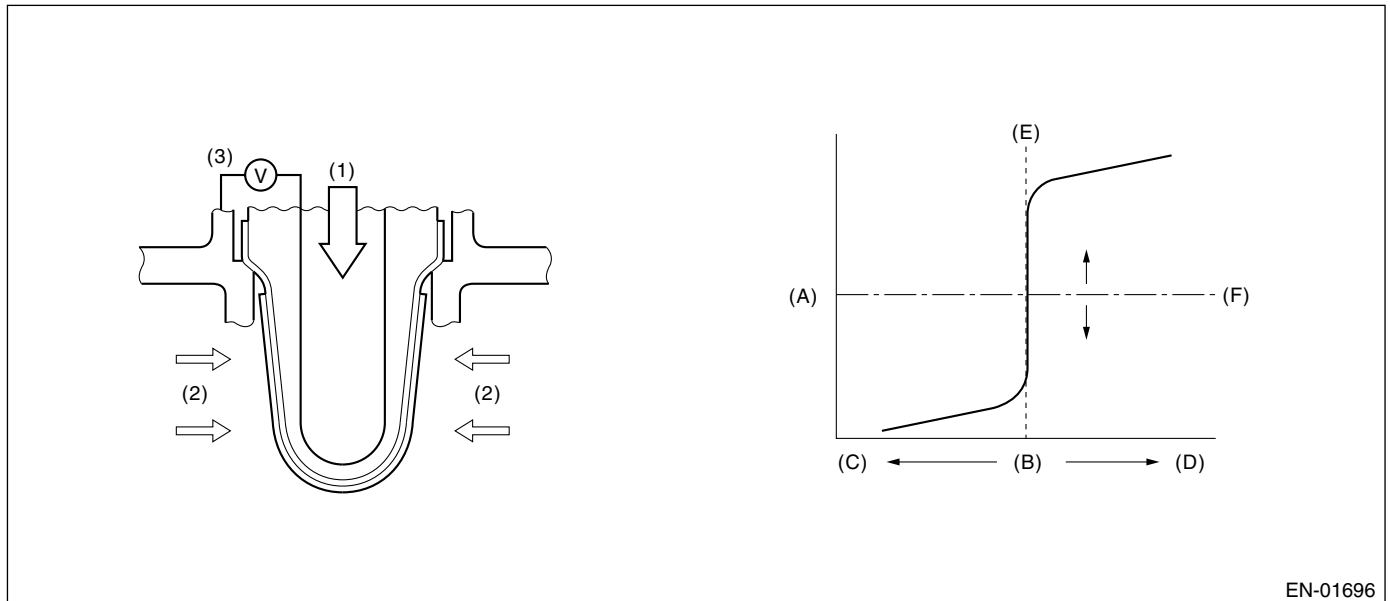
ET:DTC P2096 — POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1 —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel system from the amount of sub feedback control.

Judge NG when the sub feedback learning value sticks to lean sides during sub feedback learning control.

2. COMPONENT DESCRIPTION



EN-01696

- (1) Atmosphere
- (2) Exhaust gas
- (3) Electromotive force

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Rich

- (D) Lean
- (E) Theoretical air fuel ratio
- (F) Comparative voltage

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Continuous time of completing all condition below	1 second or more
Main feedback	In operation
Sub feedback	In operation
Engine coolant temperature	$\geq 70^{\circ}\text{C}$ (158 $^{\circ}\text{F}$)
Amount of intake air	$\geq 8 \leftrightarrow 25$ g (0.28 $\leftrightarrow 0.88$ oz)/sec
Amount of intake air change during 0.5 engine rev.	≤ 0.02 g (0.001 oz)/rev
Learning value of EVAP conc. during purge	≤ 0.03
Total time of operating canister purge after engine starting	20 seconds or more

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at a constant speed of 50 to 100 km/h (31 to 62 MPH).

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 5 seconds. Judge OK when it becomes less than 5 seconds.

• Judgment Value

Malfunction Criteria	Threshold Value
Sub feedback learning value	≤ -0.015 V

Time Needed for Diagnosis: 5 seconds \times 1 time

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When OK with similar drive in 3 drive cycles
- When "Clear Memory" was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

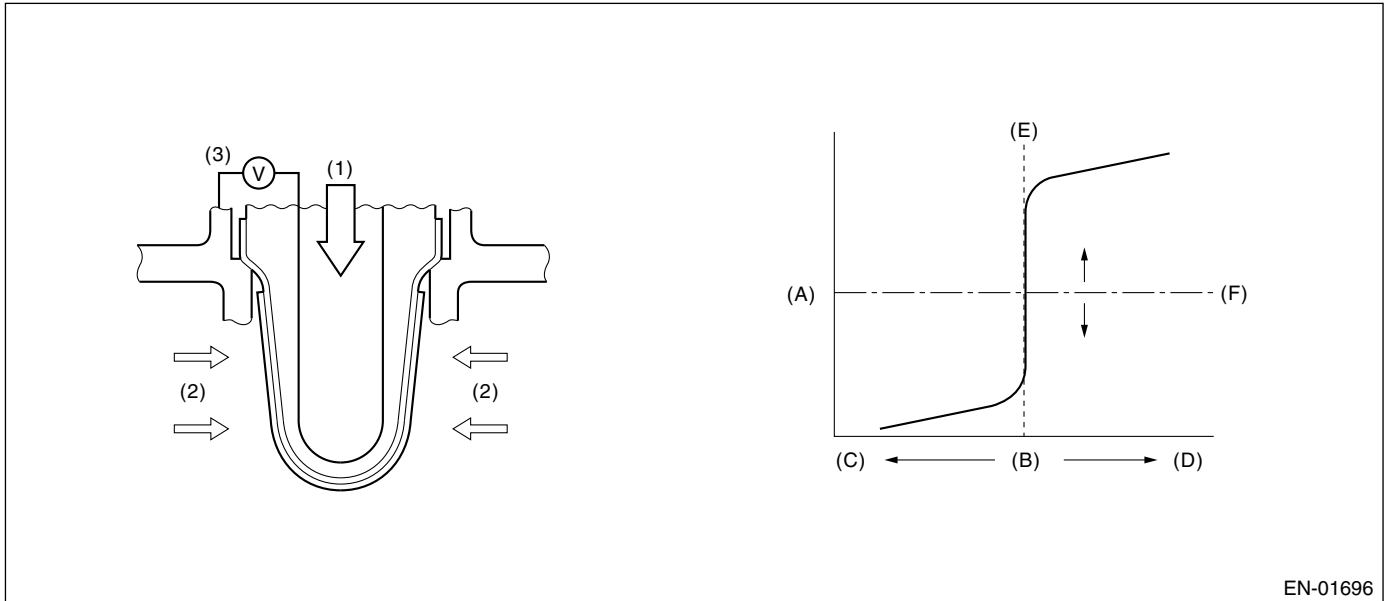
EU:DTC P2097 — POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1 —

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel system from the amount of sub feedback control.

Judge NG when the sub feedback learning value sticks to rich sides during sub feedback learning control.

2. COMPONENT DESCRIPTION



EN-01696

- (1) Atmosphere
- (2) Exhaust gas
- (3) Electromotive force

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Rich

- (D) Lean
- (E) Theoretical air fuel ratio
- (F) Comparative voltage

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Continuous time of completing all condition below	1 second or more
Main feedback	In operation
Sub feedback	In operation
Engine coolant temperature	$\geq 70^{\circ}\text{C}$ (158 $^{\circ}\text{F}$)
Amount of intake air	≥ 15 g (0.53 oz)/sec
Amount of intake air change during 0.5 engine rev.	≤ 0.02 g (0.001 oz)/rev
Learning value of EVAP conc. during purge	≤ 0.03
Total time of operating canister purge after engine starting	20 seconds or more

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at a constant speed 50 to 100 km/h (31 to 62 MPH).

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of completing the malfunction criteria below becomes more than 5 seconds. Judge OK when it becomes less than 5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Sub feedback learning value	> 0.015 V

Time Needed for Diagnosis: 5 seconds ×1 time

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous drive cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When OK with similar drive in 3 drive cycles.
- When "Clear Memory" was performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

EV:DTC P2098 — Post Catalyst Fuel Trim System Too Lean Bank 2 —

NOTE:

For the detection standard, refer to P2096. <Ref. to GD(H4SO U5)-292, DTC P2096 — POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1 —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

EW:DTC P2099 — Post Catalyst Fuel Trim System Too Rich Bank 2 —

NOTE:

For the detection standard, refer to P2097. <Ref. to GD(H4SO U5)-294, DTC P2097 — POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1 —, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

MEMO:

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

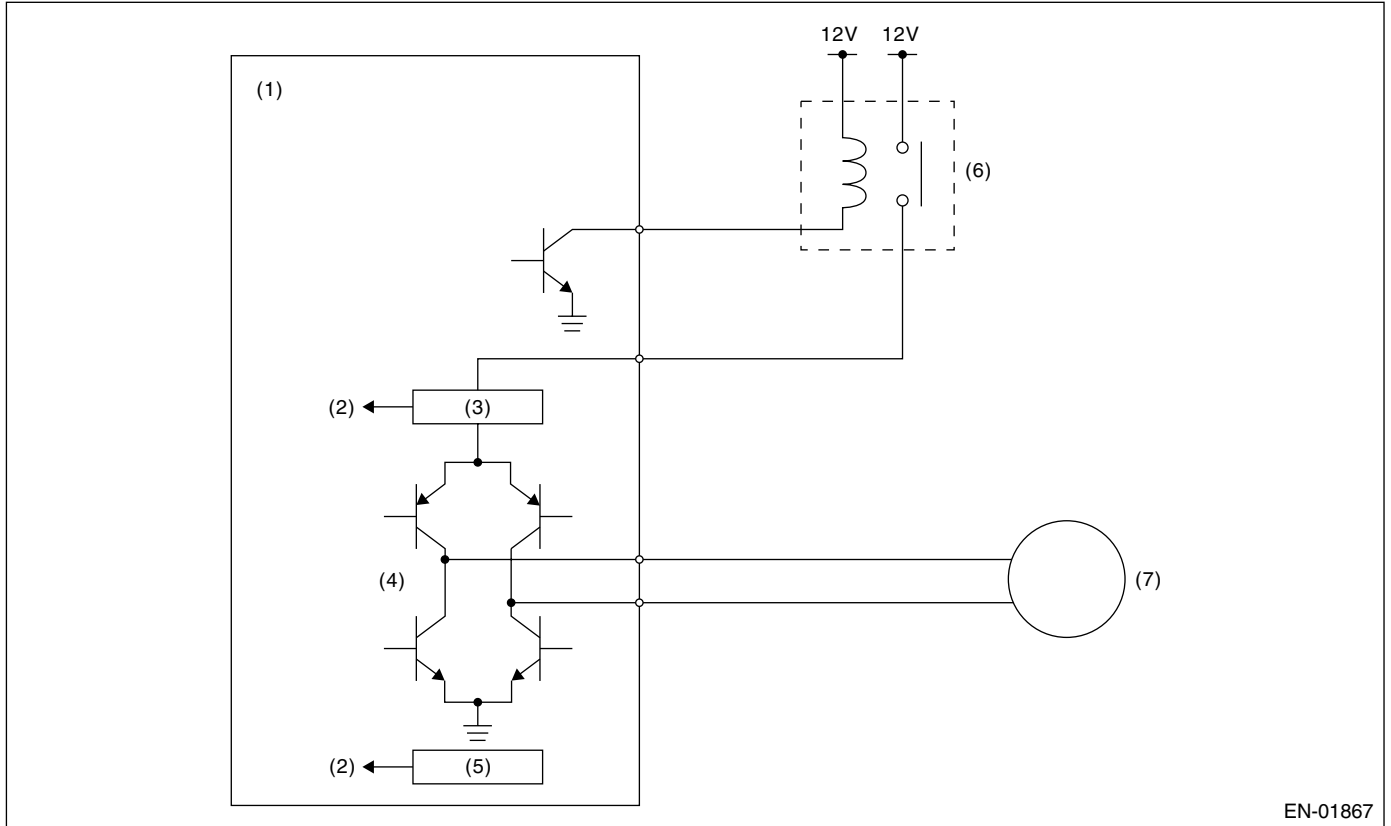
GENERAL DESCRIPTION

EX:DTC P2101 — THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/ PERFORMANCE —

1. OUTLINE OF DIAGNOSIS

Judge NG when the motor current becomes large or drive circuit is heated.

2. COMPONENT DESCRIPTION



EN-01867

- | | | |
|-----------------------------------|---------------------------------------|-----------|
| (1) Engine control unit (ECM) | (4) Drive circuit | (7) Motor |
| (2) Detection circuit | (5) Temperature detection circuit | |
| (3) Overcurrent detection circuit | (6) Electronic control throttle relay | |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Under control of electronic control throttle	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Motor current	≤ 8 A
Drive circuit inner temperature	$\leq 175^{\circ}\text{C}$ (347°F)

Time Needed for Diagnosis:

- 500 milliseconds (NG judgment)
- 2000 milliseconds (OK judgment)

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only engine stop)

8. FAIL SAFE

Stop the continuity to the electronic control throttle motor. (Fix the throttle opening angle to 6° .)

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

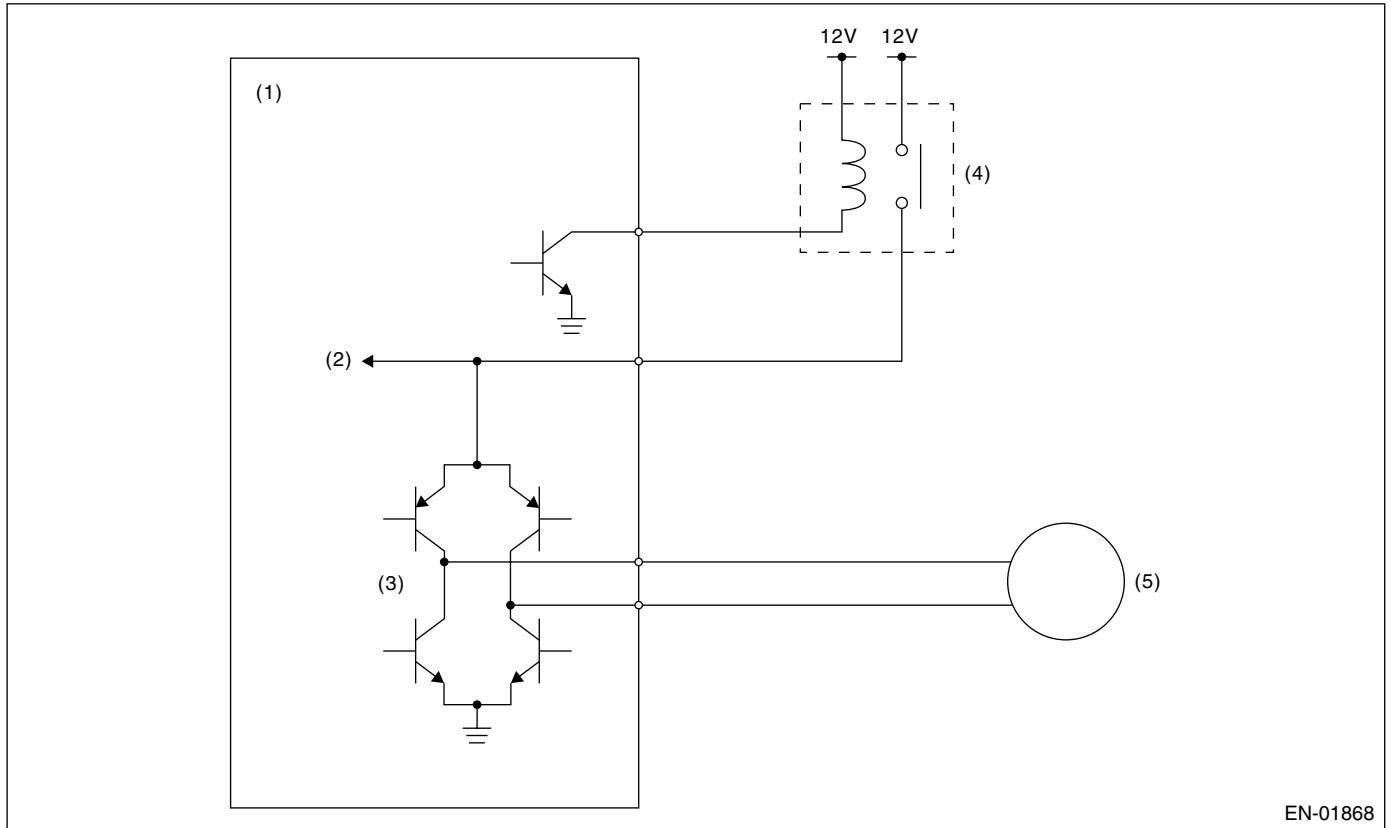
GENERAL DESCRIPTION

EY:DTC P2102 — THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW —

1. OUTLINE OF DIAGNOSIS

Judge NG when the electronic control throttle power is not supplied even when ECM sets the electric control throttle relay to ON.

2. COMPONENT DESCRIPTION



EN-01868

- (1) Engine control module (ECM) (3) Drive circuit (5) Motor
 (2) Voltage detection circuit (4) Electronic control throttle relay

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Electronic control throttle relay output	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Motor power voltage	$\geq 5 \text{ V}$

Time Needed for Diagnosis:

- 400 milliseconds (For NG)
- 2000 milliseconds (For OK)

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only engine stop)

8. FAIL SAFE

Stop the continuity to the electronic control throttle motor. (Fix the throttle opening angle to 6°.)

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

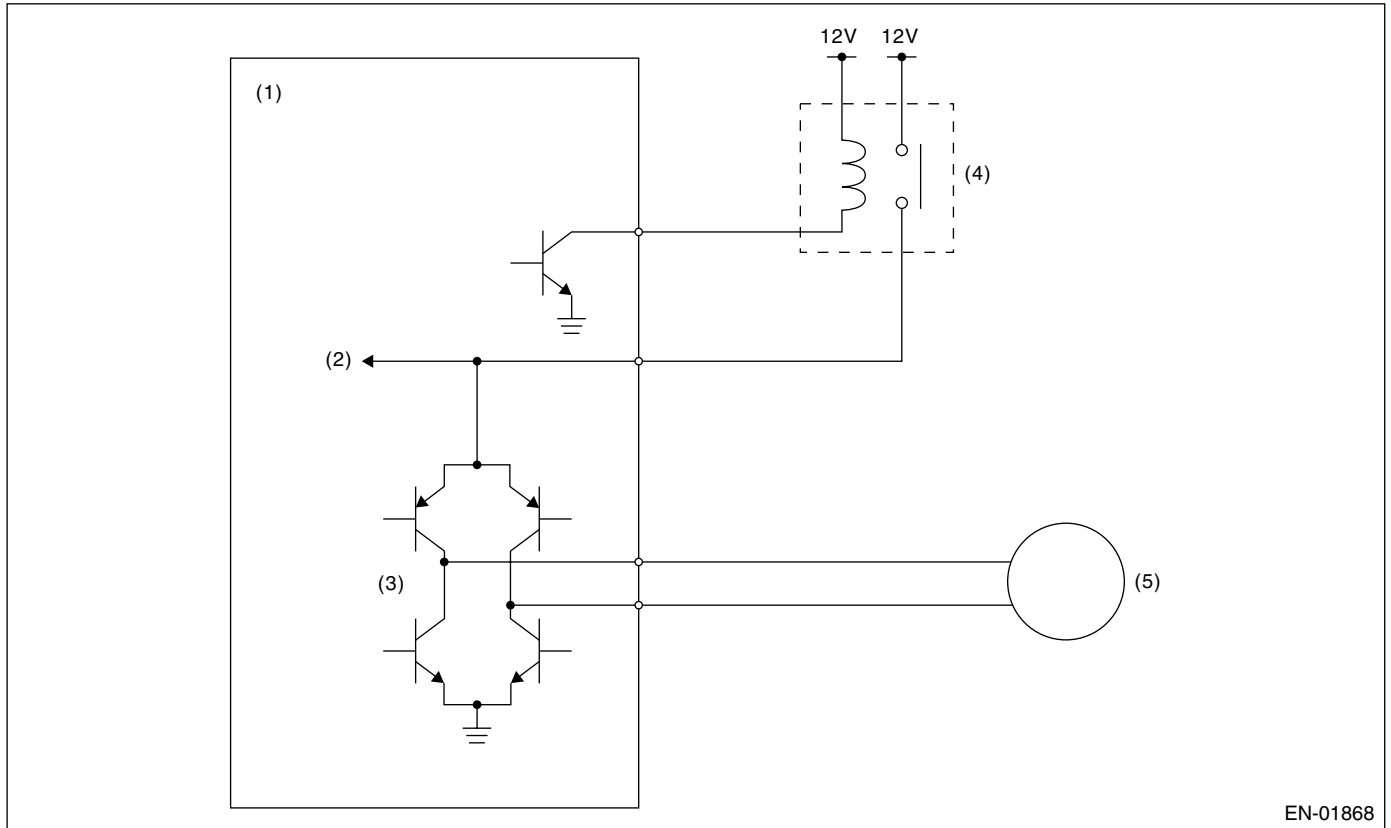
GENERAL DESCRIPTION

EZ:DTC P2103 — THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH —

1. OUTLINE OF DIAGNOSIS

Judge NG when the electronic control throttle power is not supplied even when ECM sets the electric control throttle relay to OFF.

2. COMPONENT DESCRIPTION



EN-01868

- (1) Engine control module (ECM) (3) Drive circuit (5) Motor
 (2) Voltage detection circuit (4) Electronic control throttle relay

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Electronic control throttle relay output	OFF

4. GENERAL DRIVING CYCLE

- Ignition switch ON → OFF
- Ignition switch OFF → ON (After clear memory only)

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Motor power voltage	≤ 5 V

Time Needed for Diagnosis:

- 600 milliseconds (For NG)
- 400 milliseconds (For OK)

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only engine stop)

8. FAIL SAFE

Stop the continuity to the electronic control throttle motor. (Fix the throttle opening angle to 6°.)

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

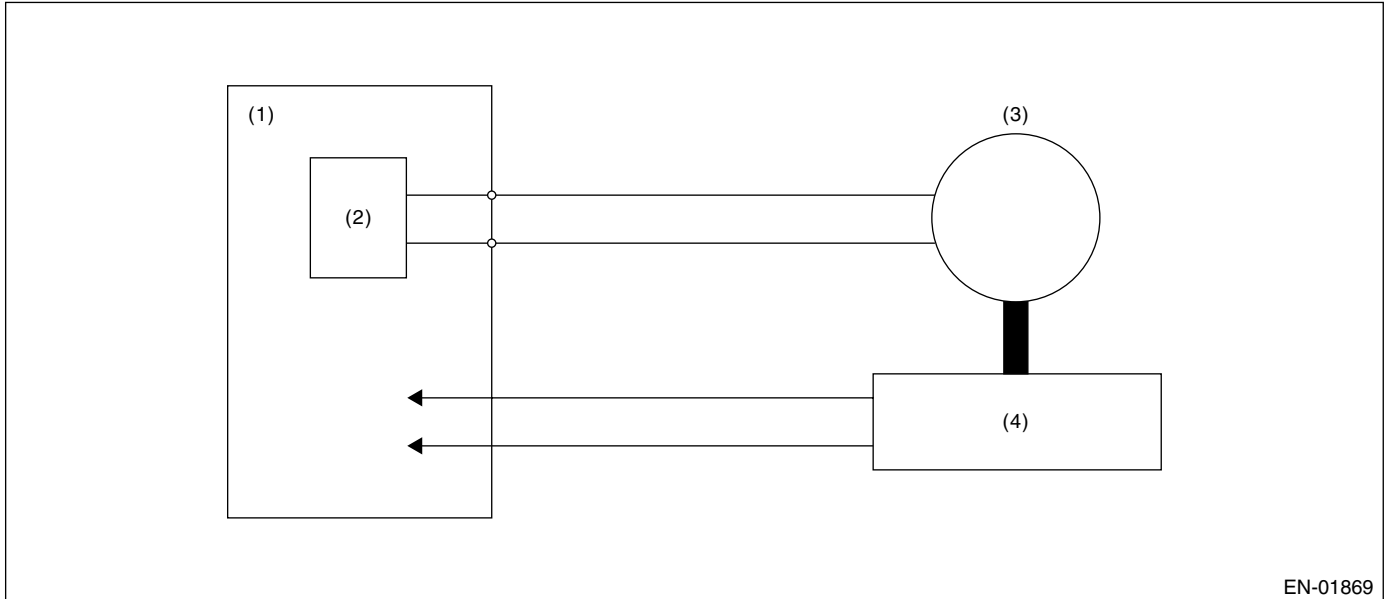
GENERAL DESCRIPTION

FA:DTC P2109 — THROTTLE/PEDAL POSITION SENSOR A MINIMUM STOP PERFORMANCE —

1. OUTLINE OF DIAGNOSIS

Judge NG when all close point learning cannot be conducted or an abnormal value is detected.

2. COMPONENT DESCRIPTION



EN-01869

- (1) Engine control module (ECM)
- (2) Drive circuit
- (3) Motor
- (4) Throttle position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON → OFF
Ignition switch (after clear memory only)	OFF → ON

4. GENERAL DRIVING CYCLE

Perform the diagnosis at all close point learning.

5. DIAGNOSTIC METHOD

• Abnormality Judgment

Judge OK and clear the NG when the malfunction criteria below are completed.

• Judgment Value

Malfunction Criteria	Threshold Value
Throttle sensor voltage at all close point learning	0.41 — 0.79 V
Time for all close point learning completion	Within 80 milliseconds

Time Needed for Diagnosis: None

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only engine stop)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only engine stop)

8. FAIL SAFE

Stop the continuity to the electronic control throttle motor. (Fix the throttle opening angle to 6°.)

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

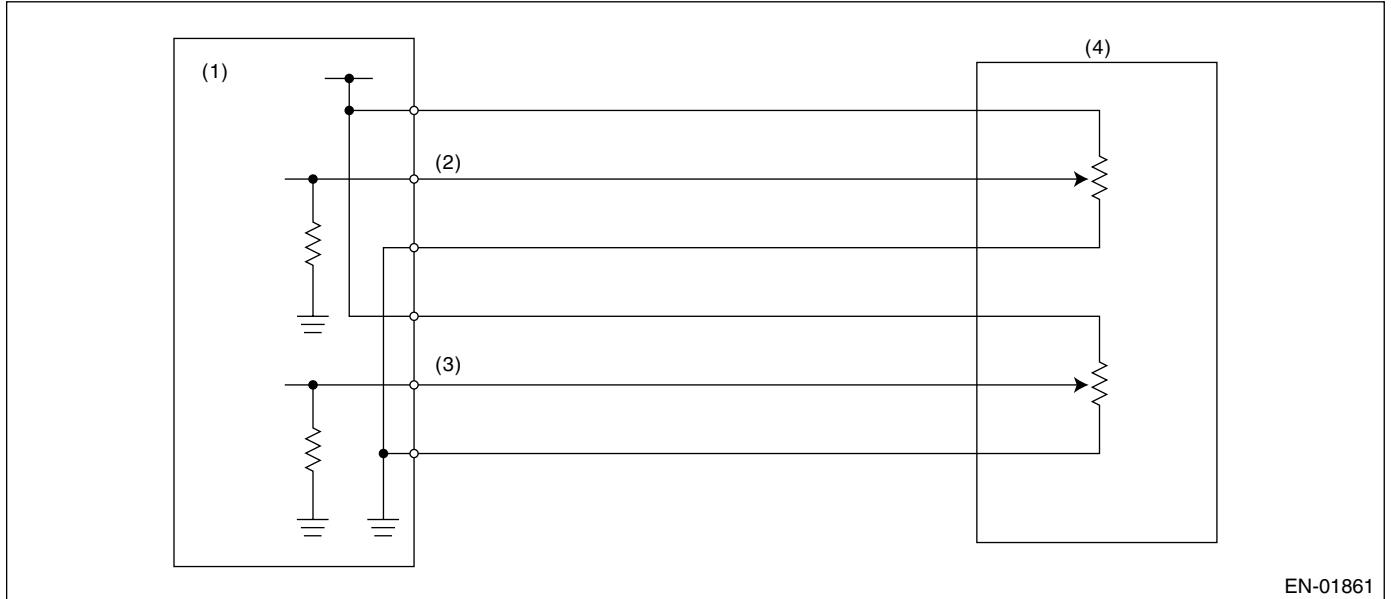
GENERAL DESCRIPTION

FB:DTC P2122 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT LOW INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of accelerator pedal position sensor 1.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



EN-01861

- | | |
|---|---|
| (1) Engine control module (ECM) | (3) Accelerator pedal position sensor 2 signal. |
| (2) Accelerator pedal position sensor 1 signal. | (4) Accelerator pedal position sensor |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≥ 0.308 V

Time Needed for Diagnosis: 100 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only engine stop)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Multi malfunction: Fix the throttle opening angle to 6°.

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

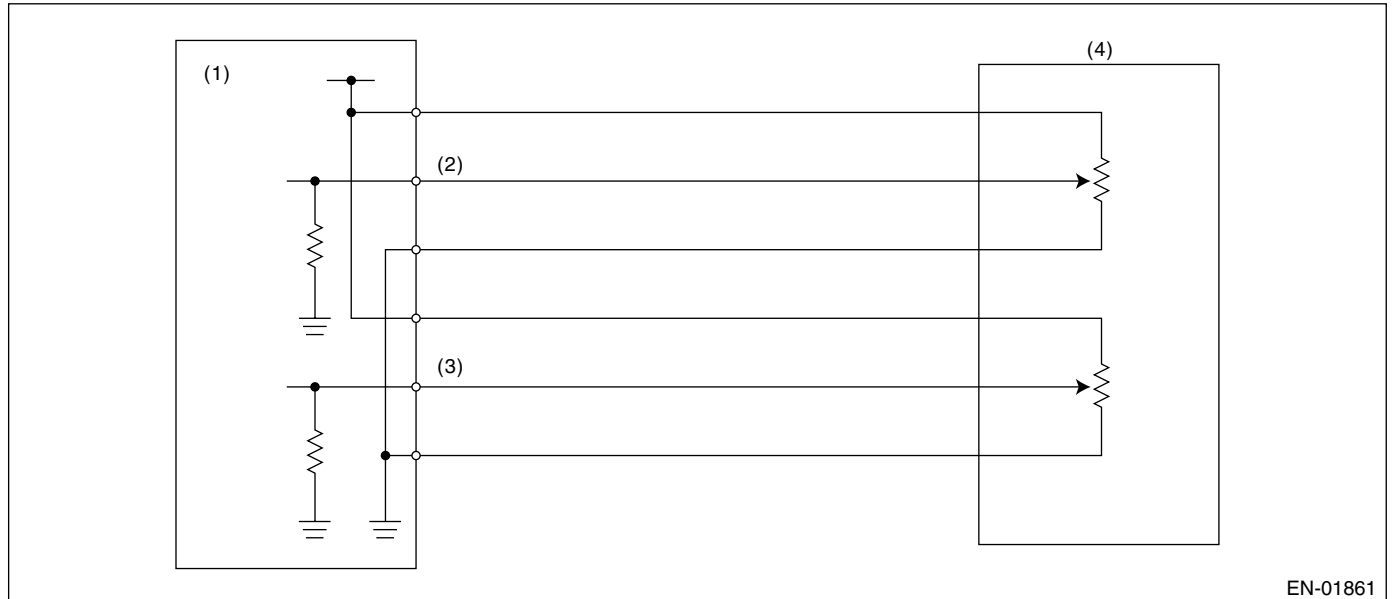
GENERAL DESCRIPTION

FC:DTC P2123 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT HIGH INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of accelerator pedal position sensor 1.
Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



- (1) Engine control module (ECM)
- (2) Accelerator pedal position sensor 1 signal.
- (3) Accelerator pedal position sensor 2 signal.
- (4) Accelerator pedal position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≤ 4.856 V

Time Needed for Diagnosis: 100 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only engine stop)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Multi malfunction: Fix the throttle opening angle to 6°.

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

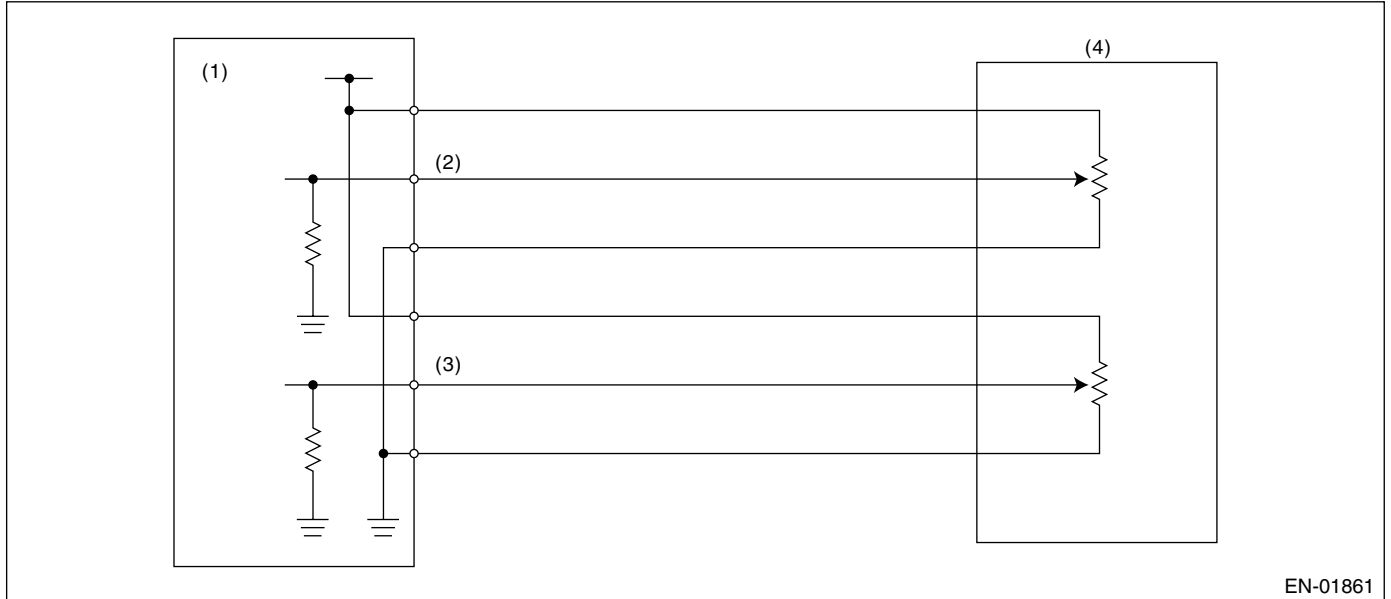
GENERAL DESCRIPTION

FD:DTC P2127 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT LOW INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of accelerator pedal position sensor 2. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



EN-01861

- | | |
|---|---|
| (1) Engine control module (ECM) | (3) Accelerator pedal position sensor 2 signal. |
| (2) Accelerator pedal position sensor 1 signal. | (4) Accelerator pedal position sensor 3 signal. |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 2 input voltage	≥ 0.308 V

Time Needed for Diagnosis: 100 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only engine stop)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Multi malfunction: Fix the throttle opening angle to 6°.

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

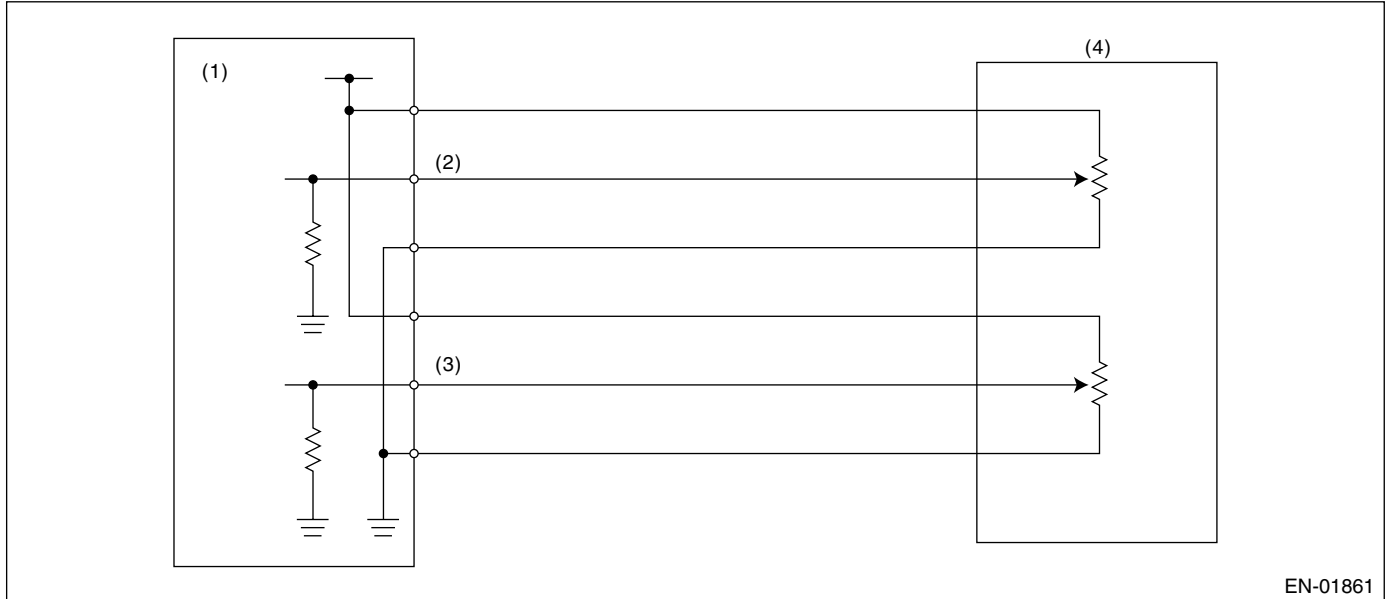
GENERAL DESCRIPTION

FE:DTC P2128 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT HIGH INPUT —

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of accelerator pedal position sensor 2. Judge NG when out of the standard value.

2. COMPONENT DESCRIPTION



EN-01861

- | | |
|---|---|
| (1) Engine control module (ECM) | (3) Accelerator pedal position sensor 2 signal. |
| (2) Accelerator pedal position sensor 1 signal. | (4) Accelerator pedal position sensor 3 signal. |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 2 input voltage	≥ 0.308 V

Time Needed for Diagnosis: 100 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When “Clear Memory” was performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When “Clear Memory” was performed (Only engine stop)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Multi malfunction: Fix the throttle opening angle to 6°.

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

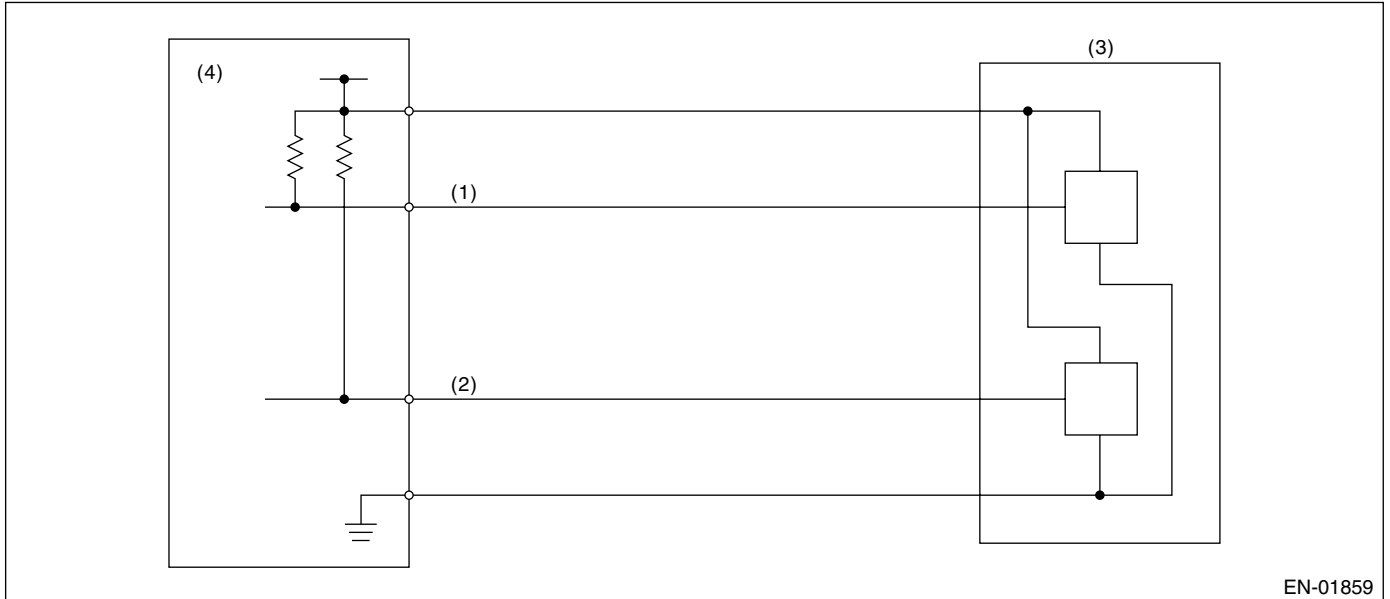
GENERAL DESCRIPTION

FF:DTC P2135 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” / “B” VOLTAGE RATIONALITY —

1. OUTLINE OF DIAGNOSIS

Judge NG when the signal level of throttle position sensor 1 is different from the throttle position sensor 2.

2. COMPONENT DESCRIPTION



- (1) Throttle position sensor 1 signal. (3) Throttle position sensor
 (2) Throttle position sensor 2 signal. (4) Engine control module (ECM)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

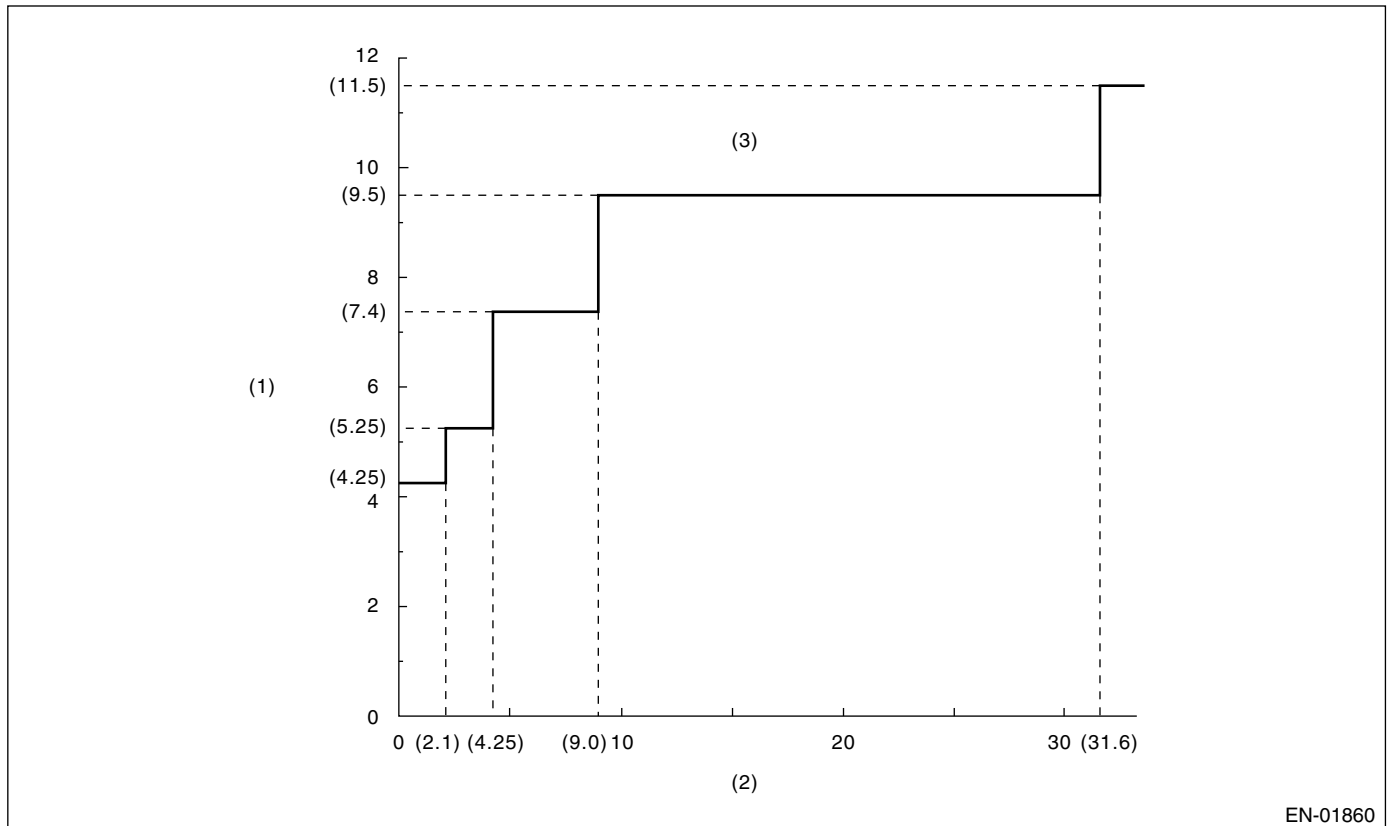
Judgment Value

Malfunction Criteria	Threshold Value
Signal difference between two sensors	$\leq 4.25^\circ$

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

Details of Judgment Value



EN-01860

(1) Sensor output difference (°)

(2) Throttle position sensor 1 opening angle (°)

(3) NG area

Time Needed for Diagnosis: 212 milliseconds(NG judgment) 24 milliseconds(OK judgment)

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed (Only engine stop)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed (Only engine stop)

8. FAIL SAFE

Stop the continuity to electronic control throttle motor. (Fix the throttle opening angle to 6°.)

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

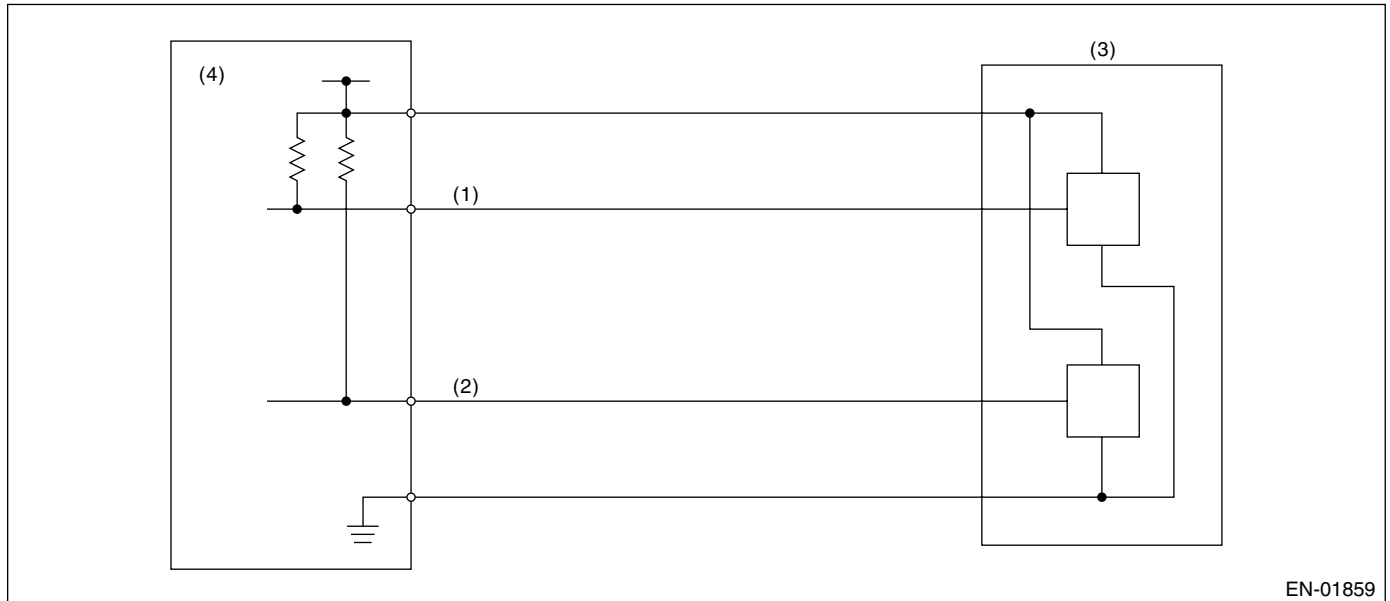
GENERAL DESCRIPTION

FG:DTC P2138 — THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” / “E” VOLTAGE RATIONALITY —

1. OUTLINE OF DIAGNOSIS

Judge NG when the signal level of throttle position sensor 1 is different from the throttle position sensor 2.

2. COMPONENT DESCRIPTION



EN-01859

- | | |
|---|---|
| (1) Engine control module (ECM) | (3) Accelerator pedal position sensor 2 signal. |
| (2) Accelerator pedal position sensor 1 signal. | (4) Accelerator pedal position sensor |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge OK and clear the NG when the malfunction criteria below are completed.

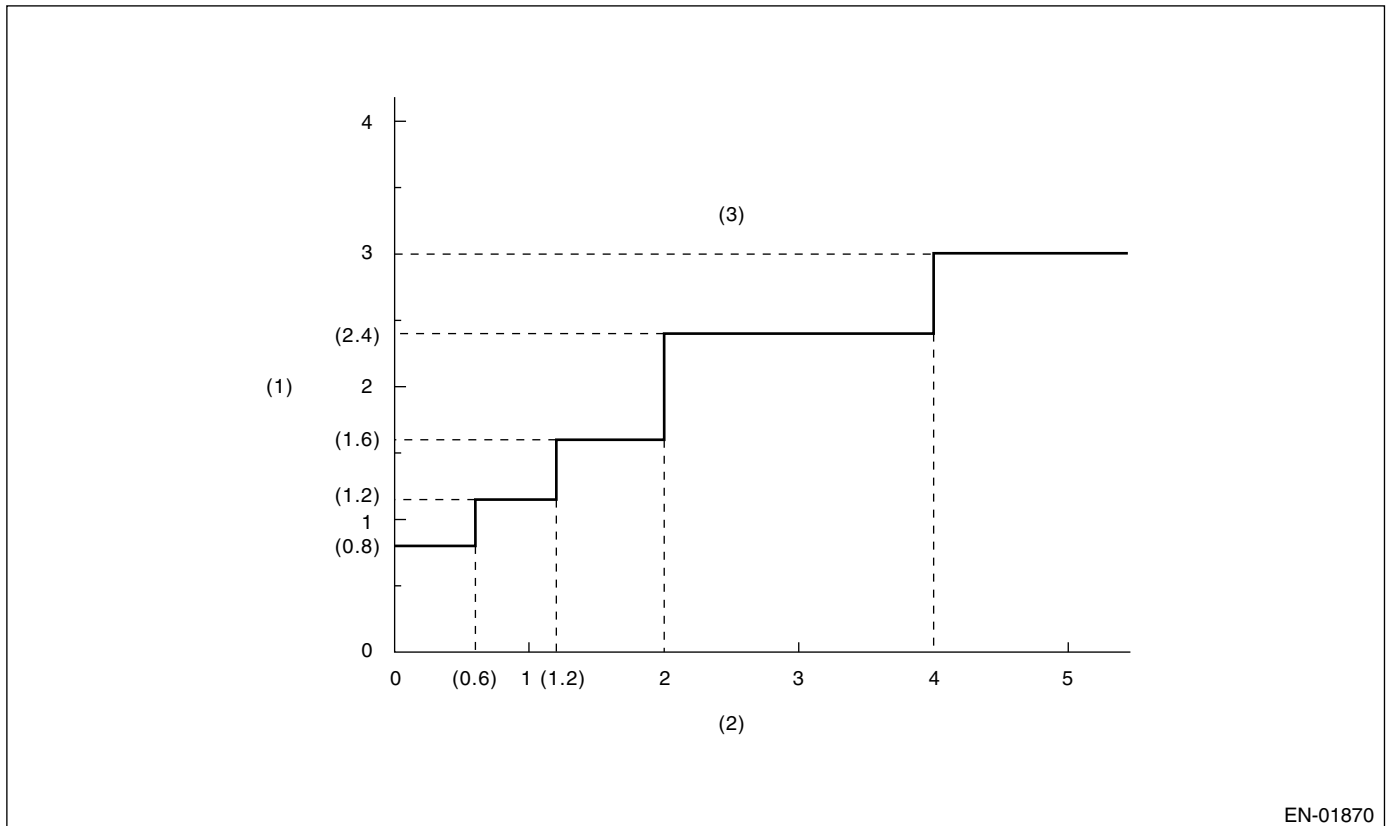
Judgment Value

Malfunction Criteria	Threshold Value
Signal difference between two sensors	$\leq 0.8^\circ$

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

Details of Judgment Value



EN-01870

(1) Sensor output difference (°)

(2) Accelerator pedal position sensor
2 opening angle (°)

(3) NG area

Time Needed for Diagnosis:

- 116 milliseconds (For NG)
- 1000 milliseconds (For OK)

Malfunction Indicator Light Illumination: Illuminates as soon as malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle was completed 40 times in a row
- When "Clear Memory" was performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle was completed 3 times in a row
- When "Clear Memory" was performed

8. FAIL SAFE

Fix the throttle opening angle to 6°.

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

DIAGNOSTIC TROUBLE CODE (DTC) DETECTING CRITERIA

GENERAL DESCRIPTION

MEMO: