DATA LIST REFERENCE TABLE

M1131152001943

⚠ CAUTION

- **When shifting the selector lever to D range, the brakes should be applied so that the vehicle does not move forward.**
- **Driving tests always need two persons: one driver and one observer.**

NOTE: Sensor 1 indicates the sensor mounted at a position closest to the engine, and sensor 2 indicates the sensor mounted at the position second close to the engine.

NOTE: Bank 1 indicates the right bank cylinder, and bank 2 indicates the left bank cylinder.

*NOTE: *1: In a new vehicle [driven approximately 500 km (311 mile) or less], the volume airflow sensor output frequency is sometimes 10% higher than the standard frequency.*

*NOTE: *2: The injector drive time represents the time when the cranking speed is at 250 r/min or below when the power supply voltage is 11 volts.*

*NOTE: *3: In a new vehicle [driven approximately 500 km (311 mile) or less], the injector drive time is sometimes 10% longer than the standard time.*

*NOTE: *4:Disconnect the throttle actuator control motor connector, and then delete the diagnosis code that was recorded during the inspection with the use of the MB991958 scan tool after the inspection has been completed.*

*NOTE: *5: Applicable to GST*

*NOTE: *6: Vehicles for Canada, the headlight, taillight, etc. remain lit even when the lighting switch is in "OFF" position but this is no problem for checks.*

MUT-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
A/C RELAY	49	A/C compressor clutch relay	Engine: warming up, idling		OFF	Procedure No. 32	P.13A-999
			Engine: warming up, idling	A/C compressor clutch is not operating	OFF		
				A/C compressor clutch is operating	ON		
A/C SWITCH	28	A/C switch	Engine: warming up, idling		OFF	Procedure No. 32	P.13A-999
			Engine: warming up, idling	A/C compressor clutch is not operating	OFF		
				A/C compressor clutch is operating	ON		

MUT-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
APP SNS (MAIN)	78	Accelerator pedal position sensor (main)	Ignition switch: ON	Release the accelerator pedal	905 – 1,165 mV	Code No. P2121, P2122, P2123	P.13A-799, P.13A-807, P.13A-816
				Depress the accelerator pedal gradually	Increases in response to the pedal depression stroke		
				Depress the accelerator pedal fully	4,035 mV or more		
APP SNSR (SUB)	77	Accelerator pedal position sensor (sub)	Ignition switch: ON	Release the accelerator pedal	905 – 1,165 mV	Code No. P2126, P2127, P2128	P.13A-824, P.13A-831, P.13A-840
				Depress the accelerator pedal gradually	Increases in response to the pedal depression stroke		
				Depress the accelerator pedal fully	4,035 mV or more		
BARO SENSOR	25	Barometric pressure sensor	Ignition switch: ON	At altitude of 0 m (0 ft)	101 kPa (29.8 in.Hg)	Code No. P0106, P0107, P0108	P.13A-127, P.13A-139, P.13A-149
				At altitude of 600 m (1969 ft)	95 kPa (28.1 in.Hg)		
				At altitude of 1,200 m (3937 ft)	88 kPa (26.0 in.Hg)		
				At altitude of 1,800 m (5906 ft)	81 kPa (23.9 in.Hg)		
BATT VOLTAGE	16	Battery voltage (power supply)	Ignition switch: ON		Battery positive voltage	Procedure No. 28	P.13A-968

MUT-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
CKP SENSOR	22	Crankshaft position sensor (engine speed)	• Engine: cranking • Tachometer: connected		Engine speeds displayed on the scan tool and tachometer are identical.	Code No. P0335	P.13A-483
			Engine: idling	Engine coolant temperature is –20°C (–40°F)	1,300 – 1,500 r/min		
				Engine coolant temperature is 0°C (32°F)	1,300 – 1,500 r/min		
				Engine coolant temperature is 20°C (68°F)	1,300 – 1,500 r/min		
				Engine coolant temperature is 40°C (104°F)	1,040 – 1,240 r/min		
				Engine coolant temperature is 80°C (176°F)	600 – 800 r/min		
CKP SNSR 2	38	Crankshaft position sensor	• Engine: cranking (at less than 2,000 r/min) • Tachometer: connected		The speeds indicated by the scan tool and tachometer match.	Code No. P0335	P.13A-483
CRANK. SIGNAL	18	Crank signal (Ignition switch-ST)	Ignition switch: ON	Engine: stopped	OFF	Procedure No. 30	P.13A-986
				Engine: cranking	ON		
CTP/APP AW	26	Accelerator pedal position switch	Ignition switch: ON	Release the accelerator pedal	ON	Code No. P0510	P.13A-718
				Depress the accelerator pedal slightly	OFF		

MUT-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
ECT SENSOR	21	Engine coolant temperature sensor	Ignition switch: ON or with engine running	Engine coolant temperature is –20°C (–4°F)	–20°C (–4°F)	Code No. P0116, P0117, P0118	P.13A-175, P.13A-183, P.13A-188
				Engine coolant temperature is 0°C (32°F)	0°C (32°F)		
				Engine coolant temperature is 20°C (68°F)	20°C (68°F)		
				Engine coolant temperature is 40°C(104°F)	40°C (104°F)		
				Engine coolant temperature is 80°C (176°F)	80°C (176°F)		
ECT SENSOR	21*5	Engine coolant temperature sensor	Ignition switch: ON or with engine running	Engine coolant temperature is –20°C (–4°F)	–20°C (–4°F)	Code No. P0116, P0117, P0118	P.13A-175, P.13A-183, P.13A-188
				Engine coolant temperature is 0°C (32°F)	0°C (32°F)		
				Engine coolant temperature is 20°C (68°F)	20°C (68°F)		
				Engine coolant temperature is 40°C (104°F)	40°C (104°F)		
				Engine coolant temperature is 80°C (176°F)	80°C (176°F)		

MUT-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
EGR STEP. MTR.	68	EGR valve (stepper motor)	• Engine coolant temperature: 80 – 95°C (176 – 203°F) • Lights and all accessories: OFF*6 • Transmission: P range	Engine is idling	0 – 5 STEP	Code No. P0403	P.13A-519
				2,500 r/min	0 – 10 STEP		
ENGINE LOAD	37	Engine load (volumetric efficiency)	• Engine coolant temperature: 80 – 95°C (176 – 203°F) • Lights, electric cooling fan and all accessories: OFF*6 • Transmission: P range	Engine is idling	15 – 35%	–	–
				2,500 r/min	15 – 35%		
				Engine is revved	Volumetric efficiency increases according to amount of revving.		
ENGINE LOAD	87*5	Calculated load value	Engine: warming up	Engine is idling	12 – 27%	–	–
				2,500 r/min	12 – 25%		

MUT-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
ENGINE SPEED	22*5	Crankshaft position sensor (engine speed) *2	• Engine: cranking • Tachometer: connected		Engine speeds displayed on the scan tool and tachometer are identical.	Code No. P0335	P.13A-483
			Engine: idling	Engine coolant temperature is –20°C (–4°F)	1,300 – 1,500 r/min		
				Engine coolant temperature is 0°C (32°F)	1,300 – 1,500 r/min		
				Engine coolant temperature is 20°C (68°F)	1,300 – 1,500 r/min		
				Engine coolant temperature is 40°C (104°F)	1,040 – 1,240 r/min		
				Engine coolant temperature is 80°C (176°F)	600 – 800 r/min		
FUEL TEMP	4A	Fuel tank temperature sensor	• In cooled state • Ignition switch: ON		Approximately the same as the outdoor temperature	Code No. P0181, P0182, P0183	P.13A-414, P.13A-421, P.13A-427

MUT-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
HO2S BANK1 S1	39	Heated oxygen sensor bank 1, sensor 1 (right front)	Engine: Warming up (Air/fuel mixture is made leaner when decelerating, and is made richer when revving.)	When the engine is running at 4,000 r/min, decelerate suddenly.	200 mV or less	Code No. P0130, P0131, P0132, P0133, P0134	P.13A-225, P.13A-241, P.13A-248, P.13A-253, P.13A-259
				When engine is suddenly raced.	600 – 1,000 mV		
			Engine: Warming up (the heated oxygen sensor signal is used to check the air/fuel mixture ratio, and control condition is also checked by the PCM.)	Engine is idling	Voltage changes repeatedly between 400 mV or less and 600 – 1,000 mV.		
				2500 r/min			
HO2S BANK1 S1	A1*5	Heated oxygen sensor bank 1, sensor 1 (right front)	Engine: Warming up (Air/fuel mixture is made leaner when decelerating, and is made richer when revving.)	When the engine is running at 4,000 r/min, decelerate suddenly.	0.2 V or less		
				When engine is suddenly raced.	0.6 – 1 V	Code No. P0130, P0131, P0132, P0133, P0134	P.13A-225, P.13A-241, P.13A-248, P.13A-253, P.13A-259
			Engine: Warming up (the heated oxygen sensor signal is used to check the air/fuel mixture ratio, and control condition is also checked by the PCM.)	Engine is idling	Voltage changes repeatedly between 0.4 V or less and 0.6 – 1 V.		
				2500 r/min			

MUT-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
HO2S BANK1 S2	69	Heated oxygen sensor bank 1, sensor 2 (right rear)	Engine: warming up	• Transmission: L range • Drive with wide open throttle • Engine: 3,500 r/min or more	600 – 1,000 mV alternate.	Code No. P0136, P0137, P0138, P0139, P0140	P.13A-269, P.13A-285, P.13A-292, P.13A-297, P.13A-301
HO2S BANK1 S2	A2*5	Heated oxygen sensor bank 1, sensor 2 (right rear)	Engine: warming up	• Transmission: L range • Drive with wide open throttle • Engine: 3,500 r/min or more	0.6 – 1 V alternate.	Code No. P0136, P0137, P0138, P0139, P0140	P.13A-269, P.13A-285, P.13A-292, P.13A-297, P.13A-301
HO2S BANK2 S1	11	Heated oxygen sensor bank 2, sensor 1 (left front)	Engine: Warming up (air/fuel mixture is made leaner when decelerating, and is made richer when revving.)	When the engine is running at 4000 r/min, decelerate suddenly.	200 mV or less		
				When engine is suddenly raced.	600 – 1,000 mV	Code No. P0150, P0151, P0152, P0153, P0154	P.13A-305, P.13A-321, P.13A-328, P.13A-333, P.13A-339
			Engine: Warming up (the heated oxygen sensor signal is used to check the air/fuel mixture ratio, and control condition is also checked by the PCM)	Engine is idling	Voltage changes repeatedly between 400 mV or less and 600 – 1,000 mV.		
				2,500 r/min			

MUT-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
HO2S BANK2 S1	A3*5	Heated oxygen sensor bank 2, sensor 1 (left front)	Engine: Warming up (air/fuel mixture is made leaner when decelerating, and is made richer when revving.)	When the engine is running at 4,000 r/min, decelerate suddenly.	0.2 V or less		
				When engine is suddenly raced.	0.6 – 1 V	Code No. P0150, P0151, P0152, P0153, P0154	P.13A-305, P.13A-321, P.13A-328, P.13A-333, P.13A-339
			Engine: Warming up (the heated oxygen sensor signal is used to check the air/fuel mixture ratio, and control condition is also checked by the PCM)	Engine is idling	Voltage changes repeatedly between 0.4 V or less and 0.6 – 1 V.		
				2500 r/min			
HO2S BANK2 S2	59	Heated oxygen sensor bank 2, sensor 2 (left rear)	Engine: warming up	• Transmission: L range • Drive with wide open throttle • Engine: 3,500 r/min or more	600 – 1,000 mV alternate.	Code No. P0156, P0157, P0158, P0159, P0160	P.13A-349, P.13A-365, P.13A-372, P.13A-377, P.13A-381
HO2S BANK2 S2	A4*5	Heated oxygen sensor bank 2, sensor 2 (left rear)	Engine: warming up	• Transmission: L range • Drive with wide open throttle • Engine: 3,500 r/min or more	0.6 – 1 V alternate.	Code No. P0156, P0157, P0158, P0159, P0160	P.13A-349, P.13A-365, P.13A-372, P.13A-377, P.13A-381

MUT-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
IAT SENSOR	13	Intake air temperature sensor	Ignition switch: ON or with engine running	Intake air temperature is –20°C (–4°F)	–20°C (–4°F)	Code No. P0111, P0112, P0113	P.13A-156, P.13A-163, P.13A-168
				Intake air temperature is 0°C (32°F)	0°C (32°F)		
				Intake air temperature is 20°C (68°F)	20°C (68°F)		
				Intake air temperature is 40°C (104°F)	40°C (104°F)		
				Intake air temperature is 80°C (176°F)	80°C (176°F)		
IAT SENSOR	13*5	Intake air temperature sensor	Ignition switch: ON or with engine running	Intake air temperature is –20°C (–4°F)	–20°C (–4°F)	Code No. P0111, P0112, P0113	P.13A-156, P.13A-163, P.13A-168
				Intake air temperature is 0°C (32°F)	0°C (32°F)		
				Intake air temperature is 20°C (68°F)	20°C (68°F)		
				Intake air temperature is 40°C (104°F)	40°C (104°F)		
				Intake air temperature is 80°C (176°F)	80°C (176°F)		
IG. TIMING ADV	44	Ignition coils and ignition power transistor	• Engine: warming up • Timing light is set (to check actual ignition timing)	Engine is idling	2 –18° BTDC	–	–
				2,500 r/min	27 – 47° BTDC		

MUT-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
IG. TIMING ADV	44*5	Ignition coils and ignition power transistor	• Engine: warming up • Timing light is set (to check actual ignition timing)	Engine is idling	2 – 18 deg	–	–
				2,500 r/min	27 – 47 deg		
INJECTOR BNK1	47	Injectors bank 1 (right)*2	Engine: cranking	When engine coolant temperature is 0 °C (32 °F)	100 – 160 ms	–	–
				When engine coolant temperature is 20 °C (68 °F)	37 – 67 ms		
				When engine coolant temperature is 80 °C (176 °F)	9.5 – 11.5 ms		
		Injectors bank 1 (right)*3	• Engine coolant temperature: 80 – 95°C (176 – 203°F) • Lights, electric cooling fan and all accessories: OFF*6 • Transmission: P range	Engine is idling	2.2 – 3.4 ms		
				2,500 r/min	2.0 – 3.2 ms		
				When engine is suddenly revved	Increases		

MUT-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
INJECTOR BNK2	41	Injectors bank 2 (left)*2	Engine: cranking	When engine coolant temperature is 0°C (32°F)	100 – 160 ms	–	–
				When engine coolant temperature is 20°C (68°F)	37 – 67 ms		
				When engine coolant temperature is 80°C (176°F)	9.5 – 11.5 ms		
		Injectors bank 2 (left)*3	• Engine coolant temperature: 80 – 95°C (176 – 203°F) • Lights, electric cooling fan and all accessories: OFF*6 • Transmission: P range	Engine is idling	2.2 – 3.4 ms		
				2,500 r/min	2.0 – 3.2 ms		
				When engine is suddenly revved	Increases		
LONG TRIM B1	81*5	Long-term fuel trim bank 1	Engine: warming up, 2,500 r/min without any load (during closed loop)		–12.5 to 12.5%	Code No. P0171, P0172	P.13A-385, P.13A-393
LONG TRIM B2	83*5	Long-term fuel trim bank 2	Engine: warming up, 2,500 r/min without any load (during closed loop)		–12.5 to 12.5%	Code No. P0174, P0175	P.13A-399, P.13A-407

MUT-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
MAP SENSOR	95	Manifold absolute pressure sensor	Ignition switch: ON	Engine stopped [At altitude of 0 m (0 ft.)]	101 kPa (29.8 in.Hg)	Code No. P0106, P0107, P0108	P.13A-127, P.13A-139, P.13A-149
				Engine stopped [At altitude of 600 m (1,969 ft.)]	95 kPa (28.1 in.Hg)		
				Engine stopped [At altitude of 1,200 m (3,937 ft.)]	88 kPa (26.0 in.Hg)		
				Engine stopped [At altitude of 1,800 m (5,906 ft.)]	81 kPa (23.9 in.Hg)		
				Engine: warming up, idling	16 – 36 kPa (4.7 – 10.6 in.Hg)		
				When engine is suddenly revved	Manifold pressure varies		
MAP/ MDP SNSR.	32*5	Manifold absolute pressure sensor	Ignition switch: ON	Engine stopped [At altitude of 0 m (0 ft.)]	101 kPa (29.8 in.Hg)	Code No. P0106, P0107, P0108	P.13A-127, P.13A-139, P.13A-149
				Engine stopped [At altitude of 600 m (1,969 ft.)]	95 kPa (28.1 in.Hg)		
				Engine stopped [At altitude of 1,200 m (3,937 ft.)]	88 kPa (26.0 in.Hg)		
				Engine stopped [At altitude of 1,800 m (5,906 ft.)]	81 kPa (23.9 in.Hg)		
				Engine: warming up, idling	16 – 36 kPa (4.7 – 10.6 in.Hg)		
				When engine is suddenly revved	Manifold pressure varies		

MUT-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
MIL DISTANCE	A9*5	MIL distance	Running distance in the malfunction indicator lamp (SERVICE ENGINE SOON or Check Engine Lamp) ON			–	–
PSP SWITCH	27	Power steering pressure switch	Engine: idling	Steering wheel stationary	OFF	Code No. P0551	P.13A-728
				Steering wheel turning	ON		
SHORT TRIM B1	82*5	Short-term fuel trim bank 1	Engine: warming up, 2,500 r/min without any load (during closed loop)		–12.5 to 12.5%	Code No. P0171, P0172	P.13A-385, P.13A-393
SHORT TRIM B2	84*5	Short-term fuel trim bank 2	Engine: warming up, 2,500 r/min without any load (during closed loop)		–12.5 to 12.5%	Code No. P0174, P0175	P.13A-399, P.13A-407
SYS. STATUS B1	88*5	Fuel control system status bank 1 (right)	Engine: warming up	2,500 r/min	Closed loop	Code No. P0134	P.13A-259
				When engine is suddenly revved	Open loop – drive condition		
SYS. STATUS B2	89*5	Fuel control system status bank 2 (left)	Engine: warming up	2,500 r/min	Closed loop	Code No. P0154	P.13A-339
				When engine is suddenly revved	Open loop – drive condition		
TANK PRS. SNSR	73	Fuel tank differential pressure sensor	• Ignition switch: ON • Fuel cap removal		–3.3 to 3.3 kPa (–0.97 to 0.97 in.Hg)	–	–
TP LEARN MID	9A	Throttle position sensor (main) mid opening learning value	Ignition switch: ON		500 – 2,000 mV	Code No. P0122, P0123	P.13A-196, P.13A-204

MUT-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
TP SENSOR	8A*5	Throttle position sensor (main)	• Remove the intake air hose at the throttle body • Disconnect the throttle position sensor, and then connect terminal numbers No. 1, No. 2, No. 3 and No. 4 with the use of the special MB991658 tool. • Ignition switch: ON	Fully close the throttle valve with your finger	0 – 10 %	Code No. P0122, P0123	P.13A-196, P.13A-204
				Fully open the throttle valve with your finger	80 – 100 %		

MUT-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
TP SNSR (MAIN)	79	Throttle position sensor (main)*4	• Remove the intake air hose at the throttle body • Disconnect the throttle position sensor, and then connect terminal numbers No. 1, No. 2, No. 3 and No. 4 with the use of the special tool: MB991658. • Ignition switch: ON	Fully close the throttle valve with your finger	200 – 800 mV	Code No. P0122, P0123	P.13A-196, P.13A-204
				Fully open the throttle valve with your finger	3,800 – 4,900 mV		
			No load		450 – 1,000 mV		
			A/C switch: OFF → ON		Voltage varies		
			• A/C switch: OFF • Shift lever: N → D				

MUT-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
TP SNSR (SUB)	14	Throttle position sensor (sub)*4	• Remove the intake air hose at the throttle body • Disconnect the throttle position sensor, and then connect terminal numbers No. 1, No. 2, No. 3 and No. 4 with the use of the special tool: MB991658. • Ignition switch: ON	Fully close the throttle valve with your finger	2,200 – 2,800 mV	Code No. P0222, P0223	P.13A-447, P.13A-456
				Fully open the throttle valve with your finger	3,800 – 4,900 mV		
VAF RESET SIG	34	Volume airflow sensor reset signal	Engine: warming up	Engine is idling	ON	–	–
				2,500 r/min	OFF		
VAF SENSOR	12	Volume airflow sensor (mass airflow rate)*1	• Engine coolant temperature: 80 – 95°C (176 – 203°F) • Lights, electric cooling fan and all accessories: OFF*6 • Transmission: P range	Engine is idling	17 – 43 Hz	–	–
				2,500 r/min	64 – 104 Hz		
				Engine is revved	Frequency (or air flow volume) increases in response to revving		

MUT-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
VAF/MAF SNSR.	12*5	Volume airflow sensor (mass airflow rate)*1	• Engine coolant temperature: 80 – 95°C (176 – 203°F) • Lights, electric cooling fan and all accessories: OFF*6 • Transmission: P range	Engine is idling	3.5 – 7.5 gm/s	–	–
				2,500 r/min	13.6 – 19.6 gm/s		
				Engine is revved	Frequency (or air flow volume) increases in response to revving		
VSS	24*5	Vehicle speed signal	Drive at 40 km/h (25 mph).		Approximately 40 km/h (25 mph)	–	–

ACTUATOR TEST REFERENCE TABLE

M1131152500901

*NOTE: *: Continues for 27 minutes. Can be released by pressing the CLEAR key.*

MUT-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	DRIVE CONTENTS	INSPECTION REQUIREMENT	NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
BASIC TIMING	17*	Basic ignition timing	Set to ignition timing adjustment mode	• Engine: idling • Connect timing light	5°BTDC	–	–
EVAP PURGE SOL	08	Evaporative emission purge solenoid	Solenoid valve turns from OFF to ON.	Ignition switch: ON	Clicks when solenoid valve is driven.	Code No. P0443	P.13A-556
EVAP VENT SOL	29	Evaporative emission ventilation solenoid	Solenoid valve turns from OFF to ON.	Ignition switch: ON	Clicks when solenoid valve is driven.	Code No. P0446	P.13A-565

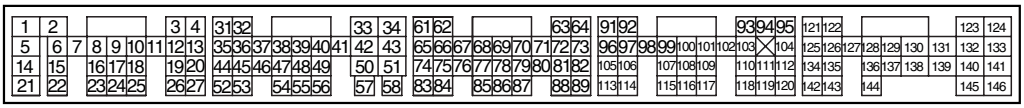
MUT-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	DRIVE CONTENTS	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
FUEL PUMP	07	Fuel pump	Fuel pump operates and fuel is recirculated	Ignition switch: ON	Pinch the return hose with fingers to feel the pulse of the fuel being recirculated	Pulse is felt	Procedure No. 29	P.13A-976
					Listen near the fuel tank for the sound of fuel pump operation	Sound of operation is heard		
NO. 1 INJECTOR	01	Injectors	Cut fuel to No. 1 injector	Engine: warm, idle (cut the fuel supply to each injector in turn and check cylinders which don't affect idling.)		Idling condition becomes different (becomes unstable)	Code No. P0201, P0202, P0203, P0204, P0205, P0206	P.13A-436
NO. 2 INJECTOR	02		Cut fuel to No. 2 injector					
NO. 3 INJECTOR	03		Cut fuel to No. 3 injector					
NO. 4 INJECTOR	04		Cut fuel to No. 4 injector					
NO. 5 INJECTOR	05		Cut fuel to No. 5 injector					
NO. 6 INJECTOR	06		Cut fuel to No. 6 injector					
RADIAT. FAN LO	21	A/C condenser fan	Drive the fan motor	Ignition switch: ON		A/C condenser fan rotate	Procedure No. 27	P.13A-966
TCA FAIL SAFE	34	Throttle actuator control system	Stop the throttle actuator control motor	Ignition switch: ON		Throttle valve is opened slightly	Code No. P0638	P.13A-748
VIC SOLENOID	11	Intake manifold tuning solenoid	Solenoid valve turns from OFF to ON.	Ignition switch: ON		Clicks when solenoid valve is driven	Code No. P0660	P.13A-772

CHECK AT THE POWERTRAIN CONTROL MODULE (PCM)

M1131153600558

TERMINAL VOLTAGE CHECK CHART

PCM Connector Terminal Arrangement



AK201354AB

TERMINAL NO.	INSPECTION ITEM	INSPECTION CONDITION (ENGINE CONDITION)	NORMAL CONDITION
1	No. 1 injector	• Engine: warming up, idling • Suddenly depress the accelerator pedal	From 11 – 14 V momentarily drops slightly
5	No. 2 injector		
14	No. 3 injector		
21	No. 4 injector		
2	No. 5 injector		
6	No. 6 injector		
3	EGR valve (Stepper motor coil <A1>)	Ignition switch: OFF → ON	5 – 8 V (changes about three seconds repeatedly)
12	EGR valve (Stepper motor coil <A2>)		
19	EGR valve (Stepper motor coil <B1>)		
26	EGR valve (Stepper motor coil <B2>)		
4	Intake manifold tuning solenoid	Engine: idling	1 V or less
		Engine: 4,500 r/min	B+
7	Malfunction indicator lamp (SERVICE ENGINE SOON or check engine lamp)	Ignition switch: OFF → ON	1 V or less → 9 – 13 V (after several seconds have elapsed)
8	A/C compressor clutch relay	• Engine: idling • A/C switch: OFF→ ON (A/C compressor is operating)	B+→ 1 V or less as A/C clutch cycles
10	Left bank heated oxygen sensor heater (front)	Engine: warming up, idling (15 seconds after starting engine)	9 – 11 V
		Engine: Revving	9 – 11 V → B+ (momentarily)

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TERMINAL NO.	INSPECTION ITEM	INSPECTION CONDITION (ENGINE CONDITION)		NORMAL CONDITION
11	Evaporative emission ventilation solenoid	Ignition switch: ON		B+
		Carry out the actuator test to drive the solenoid valve.		For approximately Six seconds 1 V or less
15	Throttle actuator control motor relay	Ignition switch: OFF		B+
		Ignition switch: ON		1 V or less
16	Fuel pump relay	Ignition switch: ON		B+
		Engine: idling		1 V or less
17	Condenser fan relay	Condenser fan is not operating		B+
		Condenser fan is running operating		1 V or less
18	Left bank heated oxygen sensor heater (rear)	Engine: warming up, idling		1 V or less
		Engine: Revving		B+
23	Evaporative emission purge solenoid	Ignition switch: ON		B+
		Engine: warm, 3,000 r/min (duty cycle)		Approximately 9 V
24	Right bank heated oxygen sensor heater (rear)	Engine: warming up, idling		1 V or less
		Engine: Revving		B+
25	Right bank heated oxygen sensor heater (front)	Engine: warming up, idling (15 seconds after starting engine)		9 – 11 V
		Engine: Revving		9 – 11 V → B+ (momentarily)
31	Ignition coil – No. 1, No. 4 (ignition power transistor)	Engine: 3,000 r/min		0.3 – 3.0 V
35	Ignition coil – No. 2, No. 5 (ignition power transistor)			
44	Ignition coil – No. 3, No. 6 (ignition power transistor)			
34	Power supply	Ignition switch: ON		B+
43				
37	Volume airflow sensor reset signal	Engine: idling		1 V or less
		Engine: 3,000 r/min		6 – 9 V
38	Accelerator pedal position switch	Ignition switch: ON	closed throttle	0 – 1 V
			Open throttle slightly	4 V or more
47	Power steering pressure switch	Engine: warming up, idling	When steering wheel is stationary	B+
			When steering wheel is turned	1 V or less
50	Ignition switch-IG	Ignition switch: ON		B+

TERMINAL NO.	INSPECTION ITEM	INSPECTION CONDITION (ENGINE CONDITION)		NORMAL CONDITION
51	Ignition switch-ST	Engine: cranking		8 V or more
57	MFI relay (power supply)	Ignition switch: OFF		B+
		Ignition switch: ON		1 V or less
58	Backup power supply	Ignition switch: OFF		B+
63	Volume airflow sensor	Engine: idling		2.2 – 3.2 V
		Engine: 2,500 r/min		
69	A/C switch	Engine: idling	Turn the A/C switch OFF	1 V or less
			Turn the A/C switch ON (A/C compressor is operating)	B+
70	Crankshaft position sensor	Engine: cranking		0.4 – 4.0 V
		Engine: idling		1.5 – 2.5 V
71	Camshaft position sensor	Engine: cranking		0.4 – 3.0 V
		Engine: idling		0.5 – 2.0 V
78	A/C switch 2	Engine: idling Outside air temperature: 25°C or more	when A/C is MAX. COOL condition (when the load by A/C is high)	B+
			when A/C is MAX. HOT condition (when the load by A/C is low)	0 – 3 V
79	Vehicle speed sensor	• Ignition switch: ON • Move the vehicle slowly forward		0 ⇔ 8 – 12 V (changes repeatedly)
81	Fuel tank temperature sensor	Ignition switch: ON	When fuel tank temperature is 0°C (32°F)	2.7 – 3.1 V
			When fuel tank temperature is 20°C (68°F)	2.1 – 2.5 V
			When fuel tank temperature is 40°C (104°F)	1.6 – 2.0 V
			When fuel tank temperature is 80°C (176°F)	0.8 – 1.2 V
82	Fuel tank differential pressure sensor	Engine: idling		1.2 – 3.8 V
87	Tachometer signal	Engine: 3,000 r/min		0.3 – 3.0 V
92	Power supply voltage applied to accelerator pedal position sensor (main)	Ignition switch: ON		4.9 – 5.1 V
97	Sensor supplied voltage	Ignition switch: ON		4.9 – 5.1 V

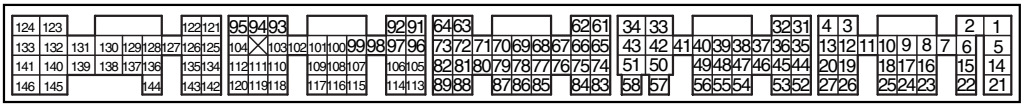
TERMINAL NO.	INSPECTION ITEM	INSPECTION CONDITION (ENGINE CONDITION)		NORMAL CONDITION
98	Engine coolant temperature sensor	Ignition switch: ON	When engine coolant temperature is –20°C (–4°F)	3.9 – 4.5 V
			When engine coolant temperature is 0°C (32°F)	3.2 – 3.8 V
			When engine coolant temperature is 20°C (68°F)	2.3 – 2.9 V
			When engine coolant temperature is 40°C (104°F)	1.3 – 1.9 V
			When engine coolant temperature is 60°C (140°F)	0.7 – 1.3 V
			When engine coolant temperature is 80°C (176°F)	0.3 – 0.9 V
99	Intake air temperature sensor	Ignition switch: ON	When Intake air temperature is –20°C (–4°F)	3.8 – 4.4 V
			When Intake air temperature is 0°C (32°F)	3.2 – 3.8 V
			When Intake air temperature is 20°C (68°F)	2.3 – 2.9 V
			When Intake air temperature is 40°C (104°F)	1.5 – 2.1 V
			When Intake air temperature is 60°C (140°F)	0.8 – 1.4 V
			When Intake air temperature is 80°C (176°F)	0.4 – 1.0 V
100	Barometric pressure sensor	Ignition switch: ON	When altitude is 0 m (0 ft)	3.7 – 4.3 V
			When altitude is 600 m (1,969 ft)	3.4 – 4.0 V
			When altitude is 1,200 m (3,937 ft)	3.2 – 3.8 V
			When altitude is 1,800 m (5,906 ft)	2.9 – 3.5 V
101	Manifold absolute pressure sensor	Engine: idling		0.8 – 2.4 V
		• Engine: idling • Revving (momentary wide open throttle)		Rises from 0.8 – 2.4 V suddenly
106	Power supply voltage applied to throttle position sensor	Ignition switch: ON		4.9 – 5.1 V
107	Accelerator pedal position sensor (sub)	Ignition switch: ON	Release the accelerator pedal	0.905 – 1.165 V
			Depress the accelerator pedal fully	4.035 V or more
108	Left bank heated oxygen sensor (front)	Engine: warming up, 2,500 r/min (check using a digital voltmeter)		0 ⇔ 0.8 V (changes repeatedly)

TERMINAL NO.	INSPECTION ITEM	INSPECTION CONDITION (ENGINE CONDITION)		NORMAL CONDITION
109	Right bank heated oxygen sensor (front)	Engine: warming up, 2,500 r/min (check using a digital voltmeter)		0 ⇔ 0.8 V (changes repeatedly)
113	Throttle position sensor (sub)	• Remove the intake air hose at the throttle body • Disconnect the throttle position sensor, and then connect terminal numbers No. 1, No. 2, No. 3 and No. 4 with the use of the special tool: MB991348. • Ignition switch: ON	Fully close the throttle valve with your finger	2.2 – 2.8 V
			Fully open the throttle valve with your finger	3.8 – 4.9 V
114	Accelerator pedal position sensor (main)	Ignition switch: ON	Release the accelerator pedal	0.905 – 1.165 V
			Depress the accelerator pedal fully	4.035 V or more
115	Throttle position sensor (main)	• Remove the intake air hose at the throttle body • Disconnect the throttle position sensor, and then connect terminal numbers No. 1, No. 2, No. 3 and No. 4 with the use of the special tool: MB991348. • Ignition switch: ON	Fully close the throttle valve with your finger	0.2 – 0.8 V
			Fully open the throttle valve with your finger	3.8 – 4.9 V
116	Left bank heated oxygen sensor (rear)	Engine: warming up	• Transmission: L range • Drive with wide open throttle • Engine: 3,500 r/min or more	0.6 – 1.0 V alternates

TERMINAL NO.	INSPECTION ITEM	INSPECTION CONDITION (ENGINE CONDITION)		NORMAL CONDITION
117	Right bank heated oxygen sensor (rear)	Engine: warming up	• Transmission: L range • Drive with wide open throttle • Engine: 3,500 r/min or more	0.6 – 1.0 V alternates
132	Power supply voltage applied to throttle actuator control motor	Ignition switch: ON		B+
133	Throttle actuator control motor (+)	• Ignition switch: ON • Accelerator pedal: fully opened → fully closed		Decreases slightly (approx. 2 V) from battery voltage.
141	Throttle actuator control motor (–)	• Ignition switch: ON • Accelerator pedal: fully closed → fully opened		Decreases slightly (approx. 2 V) from battery voltage.

TERMINAL RESISTANCE AND CONTINUITY CHECK

PCM Harness Side Connector Terminal Arrangement



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TERMINAL NO.	INSPECTION ITEM	NORMAL CONDITION (INSPECTION CONDITION)
1 – 34	No. 1 injector	13 – 16 Ω [at 20°C (68°F)]
5 – 34	No. 2 injector	
14 – 34	No. 3 injector	
21 – 34	No. 4 injector	
2 – 34	No. 5 injector	
6 – 34	No. 6 injector	
10 – 34	Left bank heated oxygen sensor heater (front)	4.5 – 8.0 Ω [at 20°C (68°F)]
25 – 34	Right bank heated oxygen sensor heater (front)	4.5 – 8.0 Ω [at 20°C (68°F)]
4 – 34	Intake manifold tuning solenoid	29 – 35 Ω [at 20°C (68°F)]

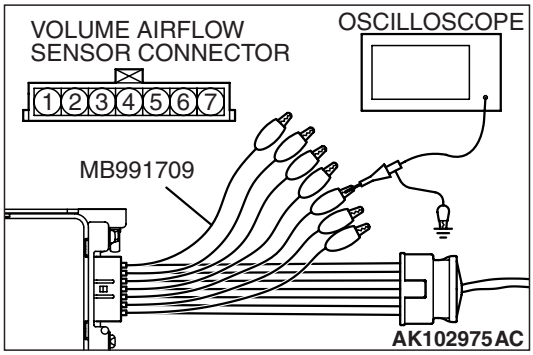
TERMINAL NO.	INSPECTION ITEM	NORMAL CONDITION (INSPECTION CONDITION)
3 – 34	Stepper motor coil (A1)	20 – 24 Ω [at 20°C (68°F)]
12 – 34	Stepper motor coil (A2)	
19 – 34	Stepper motor coil (B1)	
26 – 34	Stepper motor coil (B2)	
18 – 34	Left bank heated oxygen sensor heater (rear)	11 – 18 Ω [at 20°C (68°F)]
24 – 34	Right bank heated oxygen sensor heater (rear)	11 – 18 Ω [at 20°C (68°F)]
23 – 34	Evaporative emission purge solenoid	30 – 34 Ω [at 20°C (68°F)]
11 – 34	Evaporative emission ventilation solenoid	17 – 21 Ω [at 20°C (68°F)]
33 – Body ground	PCM ground	Continuity (2 Ω or less)
42 – Body ground	PCM ground	
144 – Body ground	PCM ground	
145 – Body ground	PCM ground	
98 – 96	Engine coolant temperature sensor	14 – 17 kΩ [when engine coolant temperature is –20°C (–4°F)]
		5.1 – 6.5 kΩ [when engine coolant temperature is 0°C (32°F)]
		2.1 – 2.7 kΩ [when engine coolant temperature is 20°C (68°F)]
		0.9 – 1.3 kΩ [when engine coolant temperature is 40°C (104°F)]
		0.48 – 0.68 kΩ [when engine coolant temperature is 60°C (140°F)]
		0.26 – 0.36 kΩ [when engine coolant temperature is 80°C (176°F)]
99 – 88	Intake air temperature sensor	13 – 17 kΩ [when intake air temperature is – 20°C (–4°F)]
		5.3 – 6.7 kΩ [when intake air temperature is 0°C (32°F)]
		2.3 – 3.0 kΩ [when intake air temperature is 20°C (68°F)]
		1.0 – 1.5 kΩ [when intake air temperature is 40°C (104°F)]
		0.56 – 0.76 kΩ [when intake air temperature is 60°C (140°F)]
		0.30 – 0.42 kΩ [when intake air temperature is 80°C (176°F)]
133 – 141	Throttle actuator control motor	0.3 – 100 Ω [at 20°C (68°F)]

INSPECTION PROCEDURE USING AN OSCILLOSCOPE

M1131154501018

VOLUME AIRFLOW SENSOR

Required Special Tool:
- MB991709: Test Harness



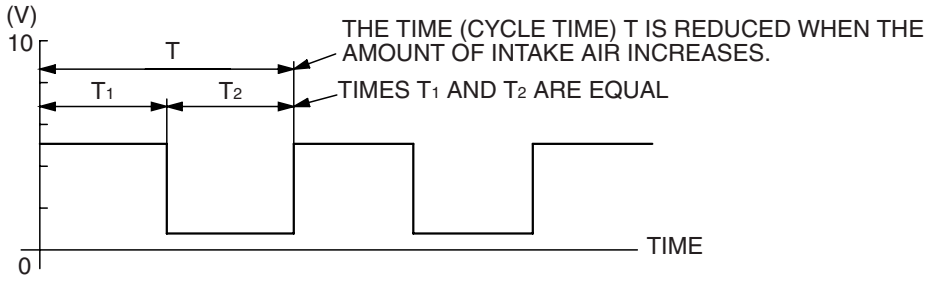
Measurement Method
1. Disconnect the volume airflow sensor connector, and connect the test harness special tool (MB991709) in between. (All terminals should be connected.)
2. Connect the oscilloscope probe to volume airflow sensor connector terminal No. 3.

Alternate method (Test harness not available)
1. Connect the oscilloscope probe to PCM terminal No. 63.

Standard Wave Pattern

Observation condition	
Function	**Special pattern**
Pattern height	Low
Pattern selector	Display
Engine r/min	Idle speed

Standard wave pattern



Observation condition
Rev engine, observe T1 and T2 remain equal.

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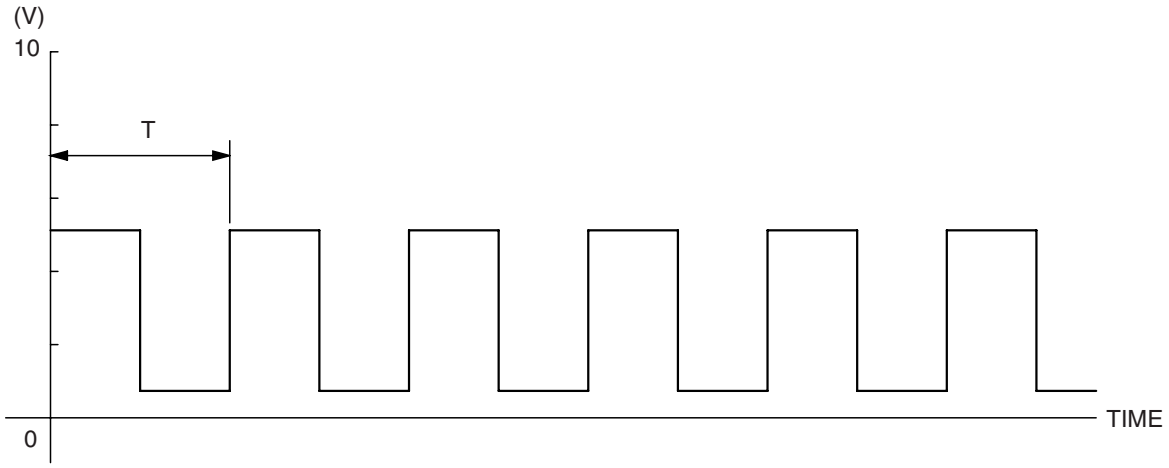
Standard wave pattern



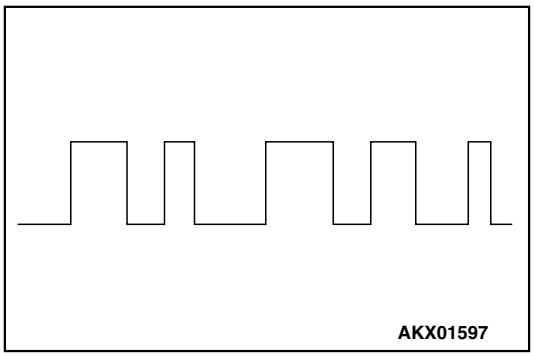
AKX01596 AB

Wave Pattern Observation Points

1. Check that cycle time T becomes shorter and the frequency increases when the engine speed is increased.

Examples of Abnormal Wave Patterns

Example 1



Cause of problem

- Sensor interface malfunction.

Wave pattern characteristics

- Rectangular wave pattern is output even when the engine is not started.

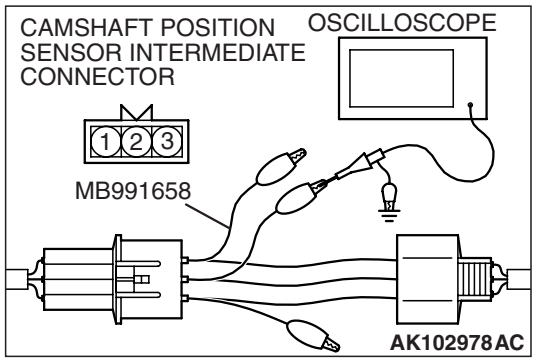
Example 2

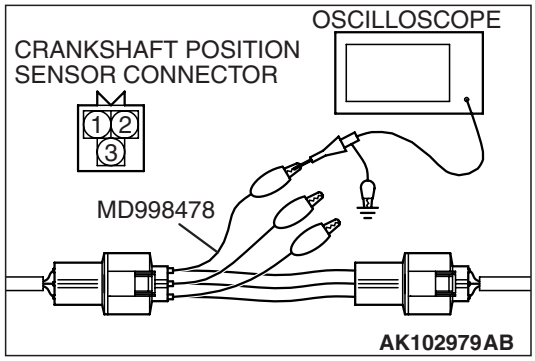
Cause of problem

- Damaged rectifier or vortex generation column.

Wave pattern characteristics

- Unstable wave pattern with non-uniform frequency. An ignition leak will distort the wave pattern temporarily, even if the volume airflow sensor is normal.





CAMSHAFT POSITION SENSOR AND CRANKSHAFT POSITION SENSOR

Required Special Tools:

- MB991658: Test Harness
- MD998478: Test Harness

Measurement Method

1. Disconnect the camshaft position sensor intermediate connector, and connect the test harness special tool (MB991658) in between. (All terminals should be connected.)
2. Connect the oscilloscope probe to camshaft position sensor intermediate connector terminal No. 2.
3. Disconnect the crankshaft position sensor connector, and connect the test harness special tool (MD998478) in between.
4. Connect the oscilloscope probe to crankshaft position sensor connector terminal No. 2 (black clip of special tool).

Alternate method (Test harness not available)

1. Connect the oscilloscope probe to PCM terminal No. 71. (Check the camshaft position sensor signal wave pattern.)
2. Connect the oscilloscope probe to PCM terminal No. 70. (Check the crankshaft position sensor signal wave pattern.)

Standard Wave Pattern

Observation condition	
Function	**Special pattern**
Pattern height	Low
Pattern selector	Display
Engine r/min	Idle speed

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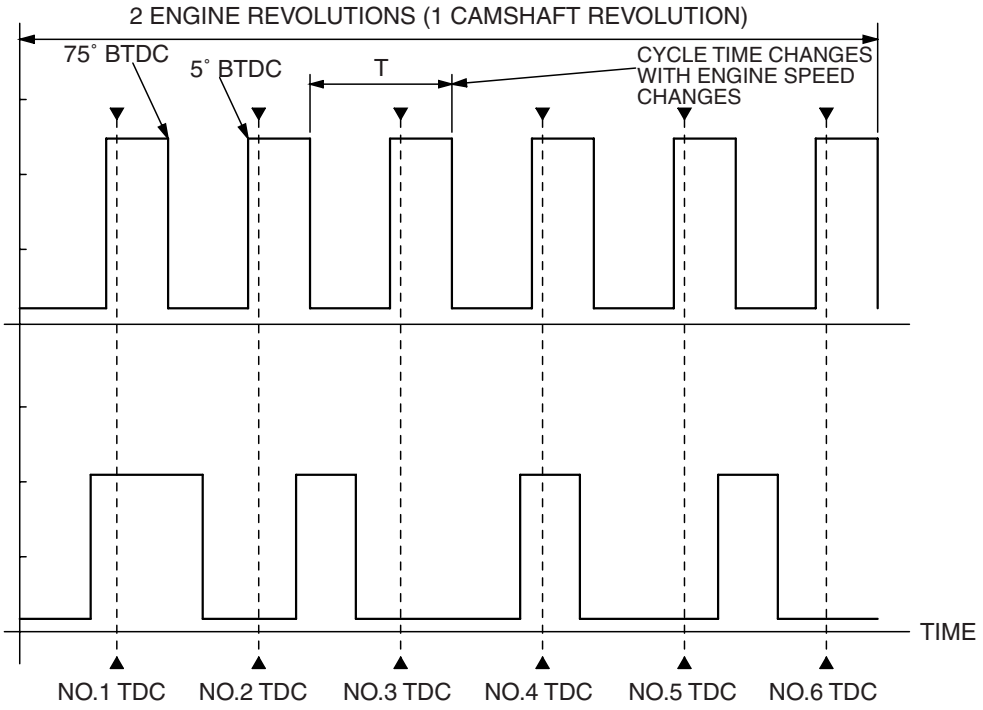
Standard wave pattern



TDC: TOP DEAD CENTER

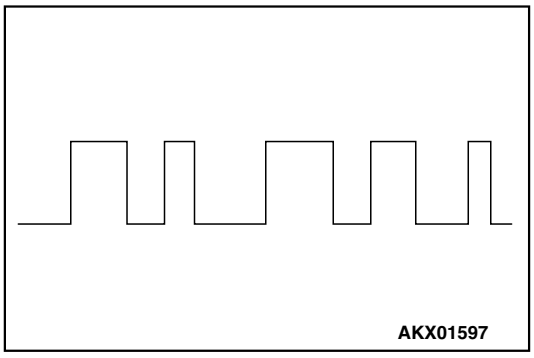
AK401688 AB

Wave Pattern Observation Points

1. Check that cycle time T becomes shorter when the engine speed increased.

Examples of Abnormal Wave Patterns

Example 1



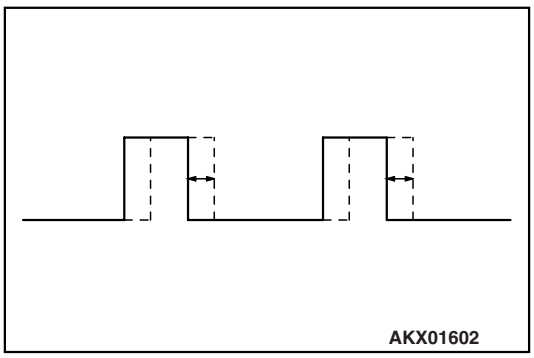
Cause of problem

- Sensor interface malfunction.

Wave pattern characteristics

- Rectangular wave pattern is output even when the engine is not started.

Example 2



Cause of problem

- Loose timing belt.
- Abnormality in sensor disc.

Wave pattern characteristics

- Wave pattern is displaced to the left or right.

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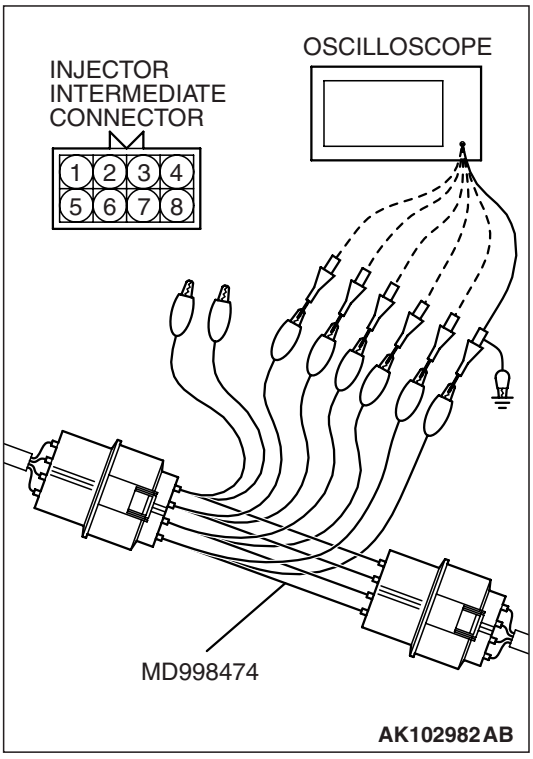
INJECTOR

Required Special Tool:
- MD998474: Test Harness



Measurement Method
1. Disconnect the injector intermediate connector, and connect the test harness special tool (MD998474) in between.
2. Connect the oscilloscope probe to injector intermediate connector terminal to analyze cylinder:
   - Terminal No. 3 (green clip of special tool) for the number 1 cylinder
   - Terminal No. 2 (white clip) for the number 2 cylinder
   - Terminal No. 1 (blue clip) for the number 3 cylinder
   - Terminal No. 7 (yellow clip) for the number 4 cylinder
   - Terminal No. 6 (red clip) for the number 5 cylinder
   - Terminal No. 5 (black clip) for the number 6 cylinder

Alternate method (Test harness not available)
1. Connect the oscilloscope probe to PCM terminal No. 1. (When checking the number 1 cylinder.)
2. Connect the oscilloscope probe to PCM terminal No. 5. (When checking the number 2 cylinder.)
3. Connect the oscilloscope probe to PCM terminal No. 14. (When checking the number 3 cylinder.)
4. Connect the oscilloscope probe to PCM terminal No. 21. (When checking the number 4 cylinder.)
5. Connect the oscilloscope probe to PCM terminal No. 2. (When checking the number 5 cylinder.)
6. Connect the oscilloscope probe to PCM terminal No. 6. (When checking the number 6 cylinder.)

Standard Wave Pattern

Observation conditions	
Function	**Special pattern**
Pattern height	Variable
Variable knob	Adjust while viewing the wave pattern
Pattern selector	Display
Engine r/min	Idle speed

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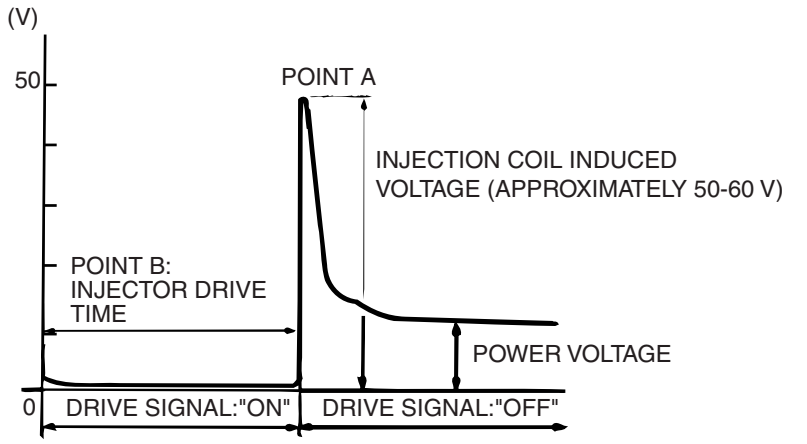
Standard wave pattern

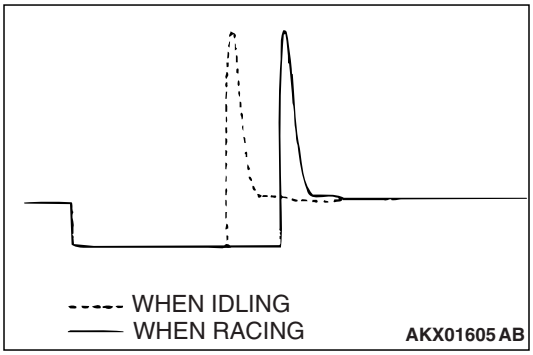


AKX01604 AB

Wave Pattern Observation Points

Point A: Height of injector coil induced voltage.

CONTRAST WITH STANDARD WAVE PATTERN	PROBABLE CAUSE
Injector coil induced voltage is low or doesn't appear at all	Short in the injector solenoid

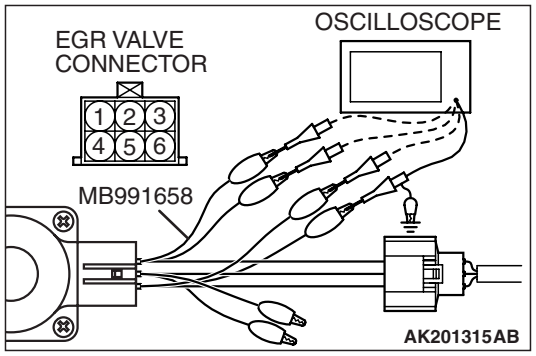


Point B: Injector drive time

1. The injector drive time should be synchronized with the scan tool tester display.
2. When the engine is suddenly revved, the drive time will be greatly extended at first, but the drive time will soon return to original length.

EGR VALVE (STEPPER MOTOR)

Required Special Tool:
- MB991658: Test Harness



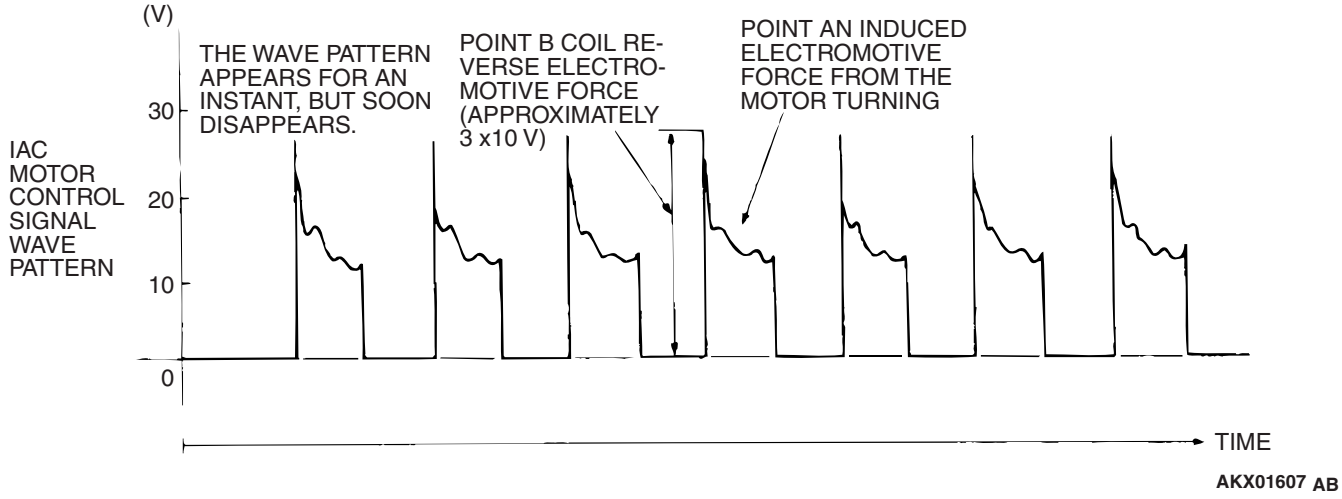
Measurement Method
1. Disconnect the EGR valve connector, and connect the test harness special tool (MB991658) in between. (All terminals should be connected.)
2. Connect the oscilloscope probe to the EGR valve connector terminal No. 1, terminal No. 3, terminal No. 4, No. terminal 6 respectively.

Alternate method (Test harness not available)
1. Connect the oscilloscope probe to PCM terminals No. 3, No. 12, No. 19 and No. 26.

Standard Wave Pattern

Observation condition	
Function	**Special pattern**
Pattern height	High
Pattern selector	Display
Engine condition	Racing

Standard wave pattern



Wave Pattern Observation Points
1. Check that the standard wave pattern appears when the EGR valve is operating.

Point A: Presence or absence of induced electromotive force from the motor turning. (Refer to abnormal wave pattern.)

CONTRAST WITH STANDARD WAVE PATTERN	**PROBABLE CAUSE**
Induced electromotive force does not appear or is extremely small	Malfunction of motor

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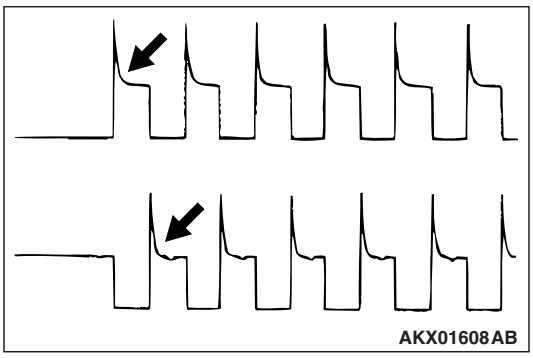
Point B: Height of coil back electromotive force

CONTRAST WITH STANDARD WAVE PATTERN	PROBABLE CAUSE
Coil reverse electromotive force does not appear or is extremely small	Short in the coil

Examples of Abnormal Wave Patterns



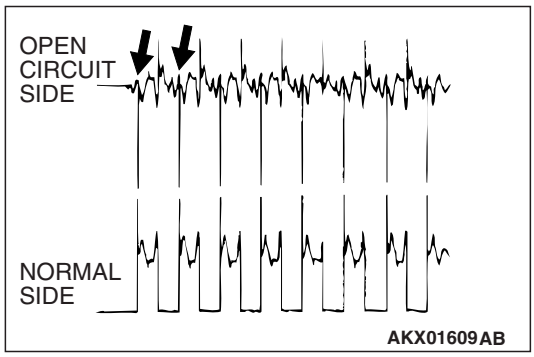
Example 1

Cause of problem

- Malfunction of motor. (Motor is not operating.)

Wave pattern characteristics

- Induced electromotive force from the motor turning does not appear.



Example 2

Cause of problem

- Open circuit in the line between the EGR valve and the PCM.

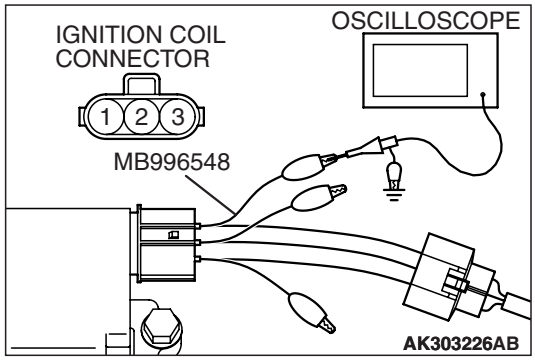
Wave pattern characteristics

- Current is not supplied to the motor coil on the open circuit side. (Voltage does not drop to 0 volt.) Furthermore, the induced electromotive force wave pattern at the normal side is slightly different from the normal wave pattern.

IGNITION COIL AND IGNITION POWER TRANSISTOR

Required Special Tool:

- MB991658: Test Harness Set



Measurement Method

1. Disconnect the ignition coil connector, and connect test harness special tool (MB991658) in between. (All terminals should be connected.)
2. Connect the oscilloscope probe to ignition coil connector terminal No. 3.

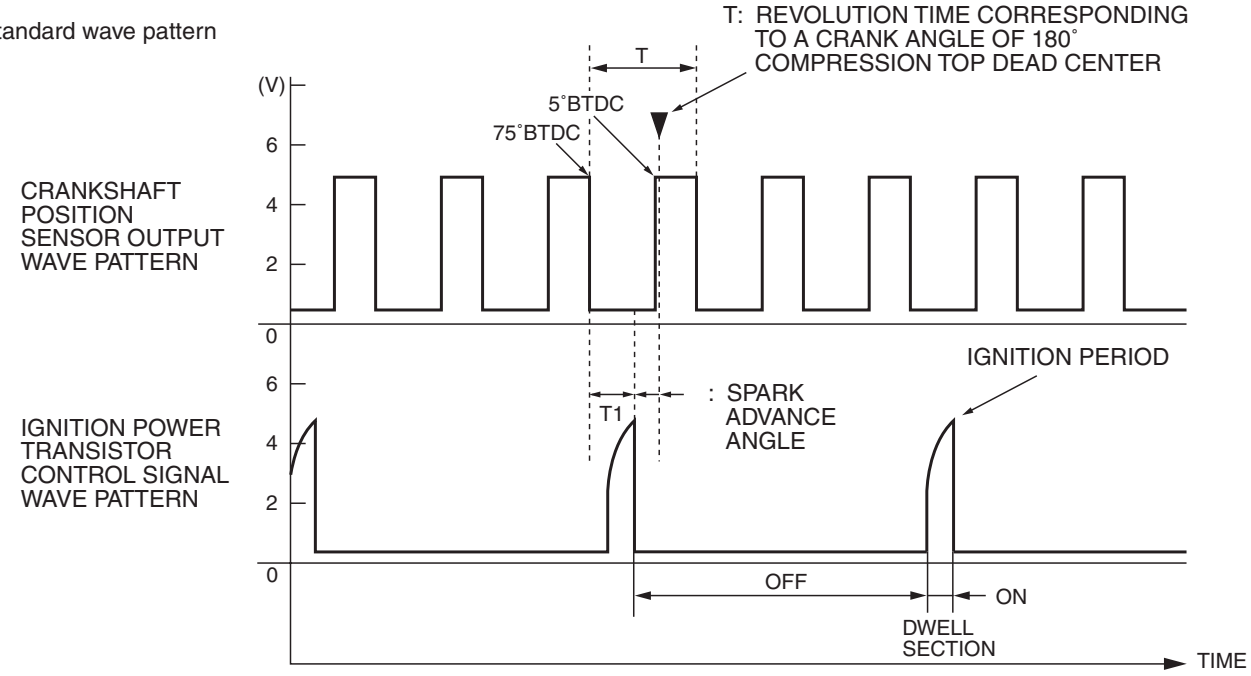
Alternate method (Test harness not available)

Connect the oscilloscope probe to PCM terminals No. 31 (for number 1 – number 4), terminal No. 35 (for number 2 – number 5) , terminal No. 44 (for number 3 – number 6) respectively.

Standard Wave Pattern

Observation condition	
Function	**Special pattern**
Pattern height	Low
Pattern selector	Display
Engine r/min	Approximately 1,200 r/min

Standard wave pattern



T1: TIME COMPUTED BY THE PCM

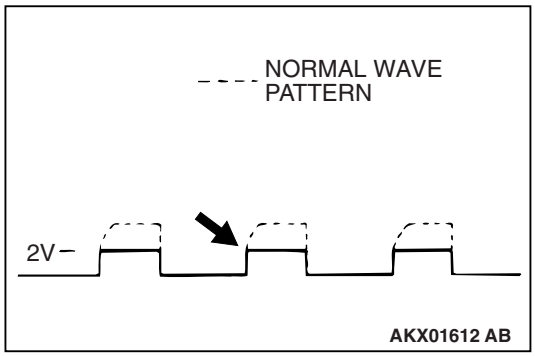
AK201316AB

Wave Pattern Observation Points

Point: Condition of wave pattern build-up section and maximum voltage (Refer to abnormal wave pattern examples 1 and 2.

CONDITION OF WAVE PATTERN BUILD-UP SECTION AND MAXIMUM VOLTAGE	PROBABLE CAUSE
Rises from approximate 2 volts to approximate 4.5 volts at the top-right	Normal
2-volt rectangular wave	Open-circuit in ignition primary circuit
Rectangular wave at power voltage	Ignition power transistor malfunction

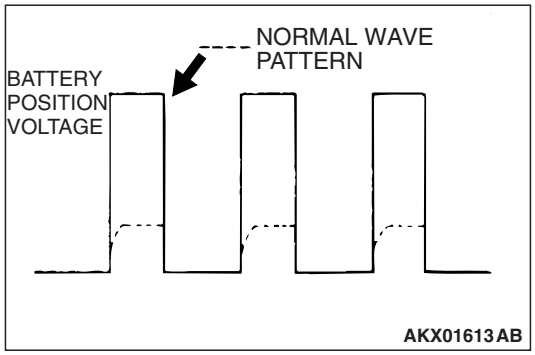
TSB Revision



Examples of Abnormal Wave Patterns

Example 1 (Wave pattern during engine cranking)

- Cause of problem
  Open-circuit in ignition primary circuit
- Wave pattern characteristics
  Top-right part of the build-up section cannot be seen, and voltage value is approximately 2 volts too low.

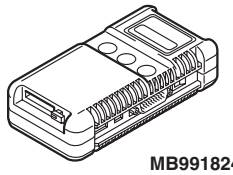
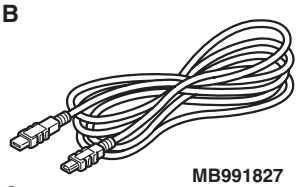
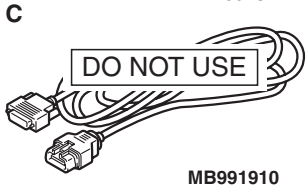
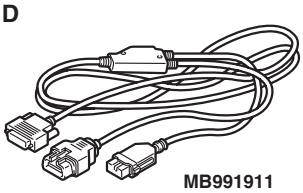
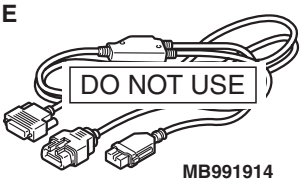
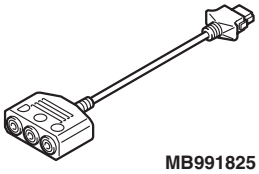
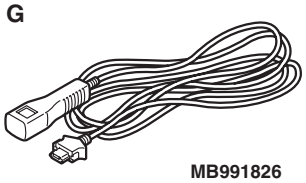
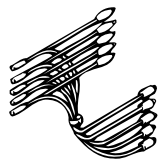


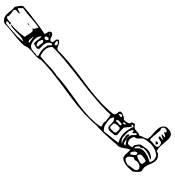
Example 2 (Wave pattern during engine cranking)

- Cause of problem
  Malfunction in ignition power transistor
- Wave pattern characteristics
  Power voltage results when the ignition power transistor is ON.

SPECIAL TOOLS

M1131000601475

TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
A  MB991824 B  MB991827 C  MB991910 D  MB991911 E  MB991914 F  MB991825 G  MB991826 MB991958	MB991958 A: MB991824 B: MB991827 C: MB991910 D: MB991911 E: MB991914 F: MB991825 G: MB991826 MUT-III sub assembly A: Vehicle Communication Interface (V.C.I.) B: MUT-III USB Cable C: MUT-III Main Harness A (Vehicles with CAN communication system) D: MUT-III Main Harness B (Vehicles without CAN communication system) E: MUT-III Main Harness C (for Daimler Chrysler models only) F: MUT-III Adapter Harness G: MUT-III Trigger Harness	MB991824-KIT *NOTE: G: MB991826 MUT-III Trigger Harness is not necessary when pushing V.C.I. ENTER key.*	• Reading diagnostic trouble code • MFI system inspection • Measurement of fuel pressure **⚠ CAUTION** **For vehicles with CAN communication, use MUT-III main harness A to send simulated vehicle speed. If you connect MUT-III main harness B instead, the CAN communication does not function correctly.**
 MB991658	MB991658 Test harness set	Tool not available	• Inspection using an oscilloscope • Adjustment of accelerator pedal position sensor • Inspection of throttle position sensor

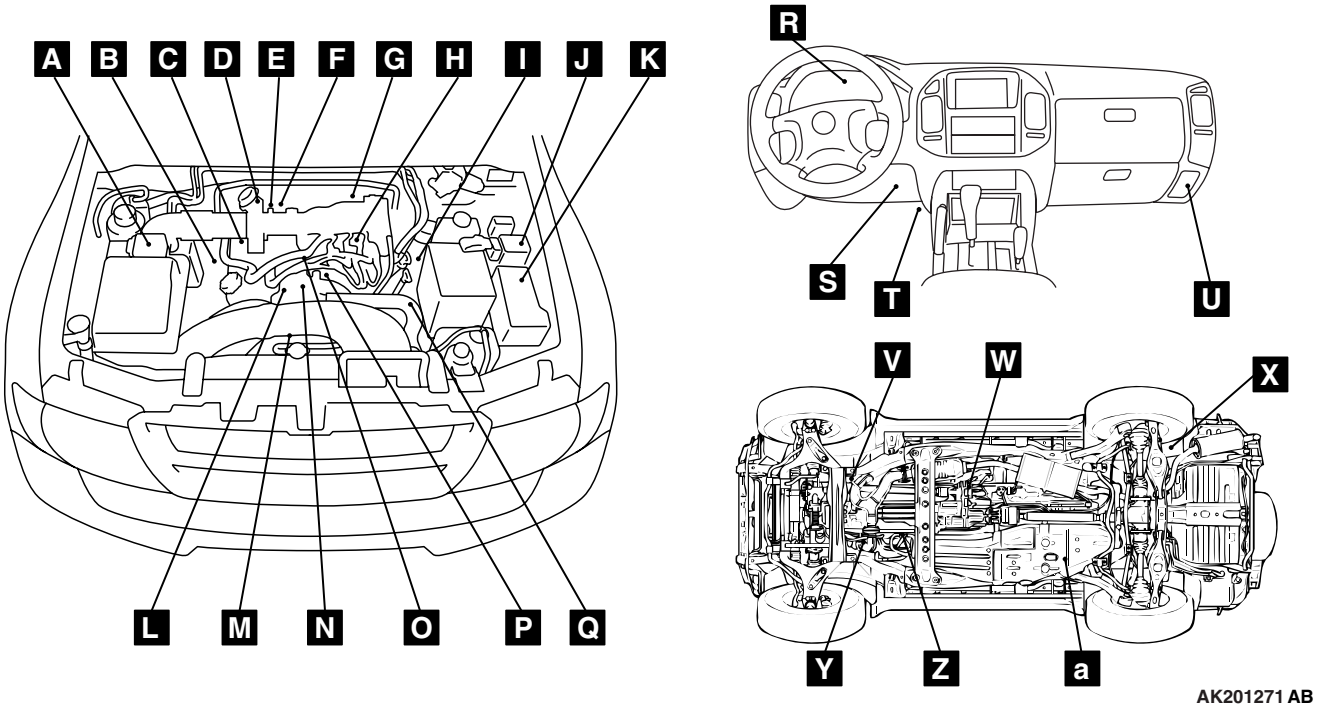
TOOL	TOOL NUMBER AND NAME	SUPERSESSION	APPLICATION
	MB991709 Test harness set	MB991709-01	Inspection using an oscilloscope
	MD998474 Test harness (8 pin, square)	MD998474-01	Inspection using an oscilloscope
	MD998464 Test harness (4 pin, square)	MD998464-01	Inspection of heated oxygen sensor
	MB991316 Test harness (4 pin, square)	Tool not available	Inspection of heated oxygen sensor
	MD998478 Test harness (3 pin, triangle)	MD998478-01	Inspection using an oscilloscope
 MB991637	MB991637 Fuel pressure gauge set	Tool not available	Measurement of fuel pressure
	MD998709 Adaptor hose	MIT210196	Measurement of fuel pressure
	MD998742 Hose adaptor	MD998742-01	Measurement of fuel pressure

ON-VEHICLE SERVICE

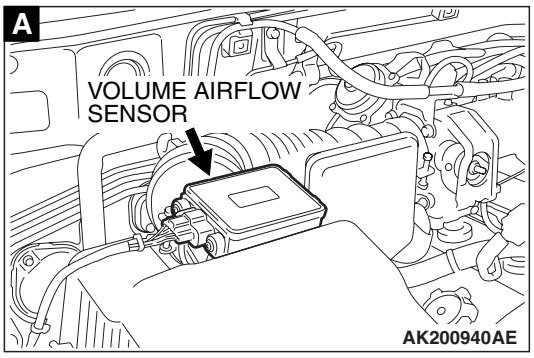
COMPONENT LOCATION

M1131002101186

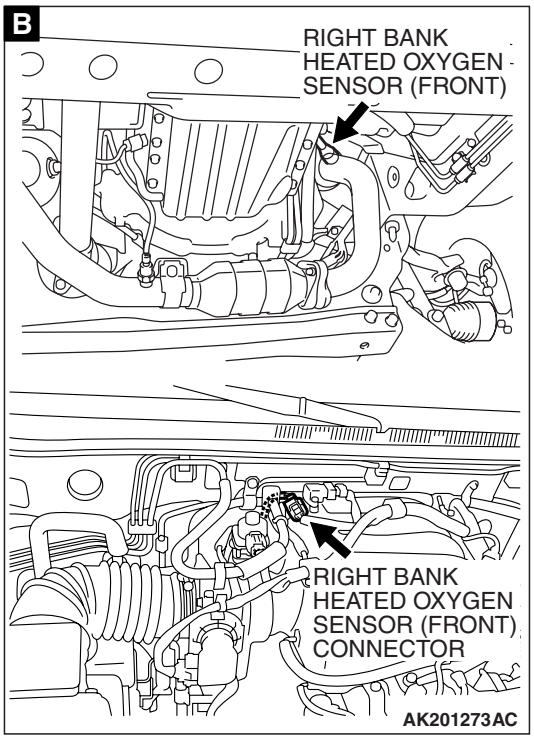
NAME	SYMBOL	NAME	SYMBOL
Accelerator pedal position sensor (with built-in accelerator pedal position switch)	S	Left bank heated oxygen sensor (front)	I
Air conditioning compressor clutch relay	K	Left bank heated oxygen sensor (rear)	V
Camshaft position sensor	G	Malfunction Indicator Lamp (SERVICE ENGIEN SOON or check engine lamp)	R
Crankshaft position sensor	M	Manifold absolute pressure sensor	F
Data link connector	T	Multiport fuel injection (MFI) relay	J
EGR valve	D	Powertrain control module	U
Engine coolant temperature sensor	L	Power steering pressure switch	Q
Evaporative emission purge solenoid	E	Right bank heated oxygen sensor (front)	B
Evaporative emission ventilation solenoid	X	Right bank heated oxygen sensor (rear)	Y
Fuel level sensor	a	Throttle actuator control motor	C
Fuel pump relay	J	Throttle actuator control motor relay	J
Fuel tank differential pressure sensor	a	Throttle position sensor	C
Fuel tank temperature sensor	a	Transmission range switch	Z
Ignition coil	H	Intake manifold tuning solenoid	P
Injector	O	Vehicle speed sensor	W
Intake manifold tuning solenoid	P	Volume airflow sensor (with built-in intake air temperature sensor and barometric pressure sensor)	A
Knock sensor	N		



AK201271 AB



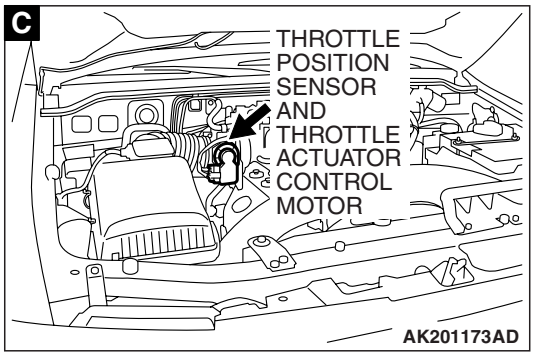
AK200940AE



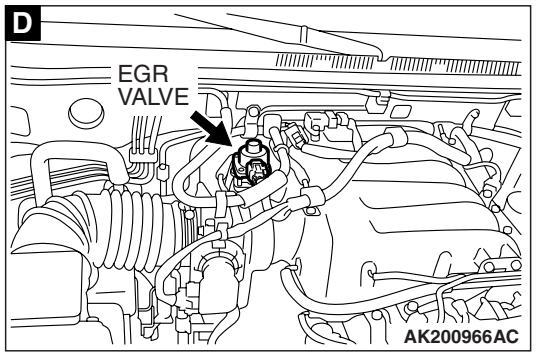
AK201273AC

TSB Revision

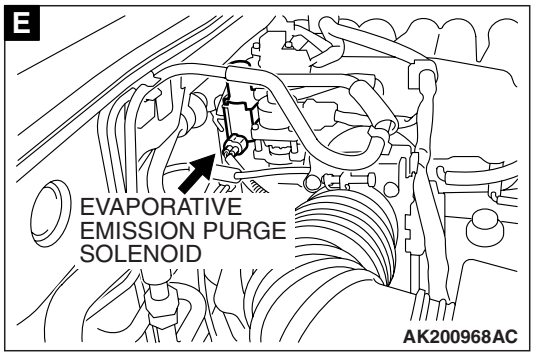
C


THROTTLE POSITION SENSOR AND THROTTLE ACTUATOR CONTROL MOTOR
AK201173AD

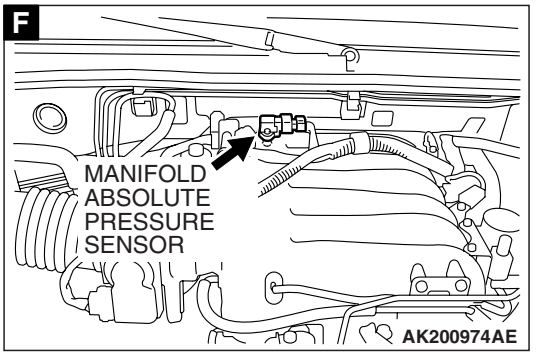
D


EGR VALVE
AK200966AC

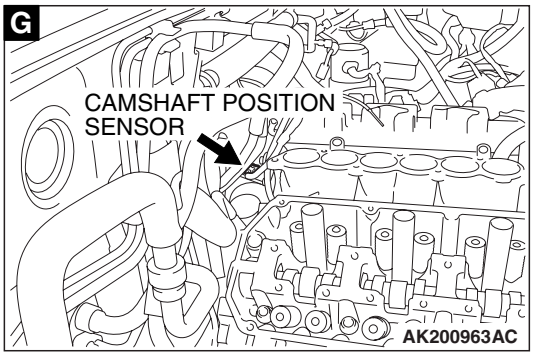
E


EVAPORATIVE EMISSION PURGE SOLENOID
AK200968AC

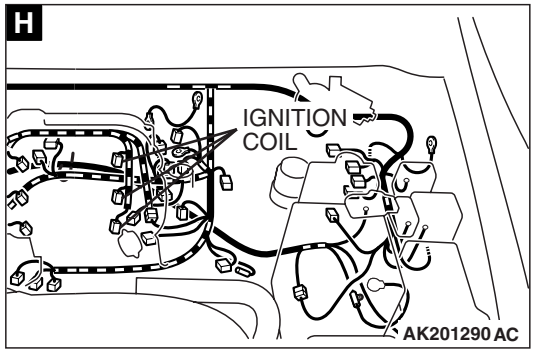
F


MANIFOLD ABSOLUTE PRESSURE SENSOR
AK200974AE

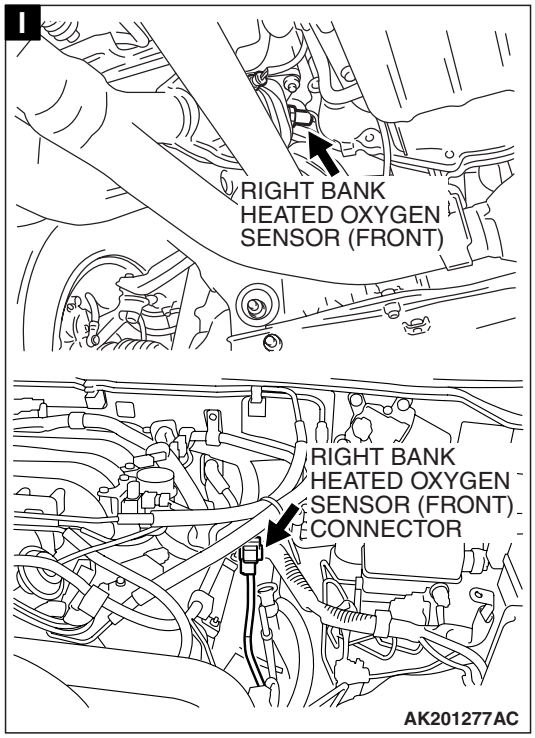
G


CAMSHAFT POSITION SENSOR
AK200963AC

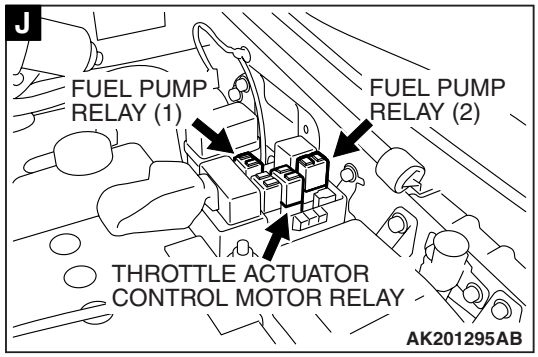
H


IGNITION COIL
AK201290AC

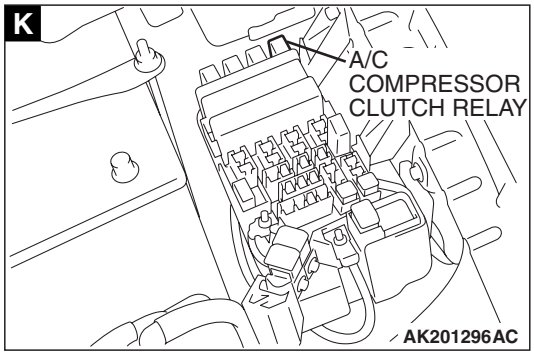
I


RIGHT BANK
HEATED OXYGEN
SENSOR (FRONT)
RIGHT BANK
HEATED OXYGEN
SENSOR (FRONT)
CONNECTOR
AK201277AC

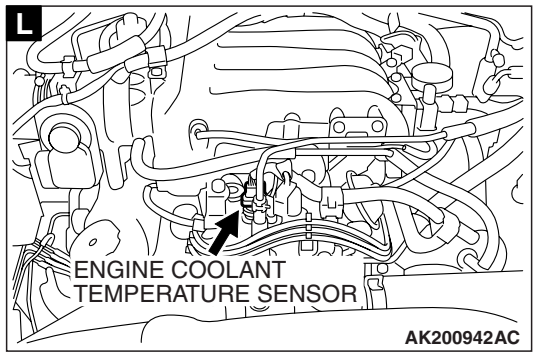
J


FUEL PUMP
RELAY (1)
FUEL PUMP
RELAY (2)
THROTTLE ACTUATOR
CONTROL MOTOR RELAY
AK201295AB

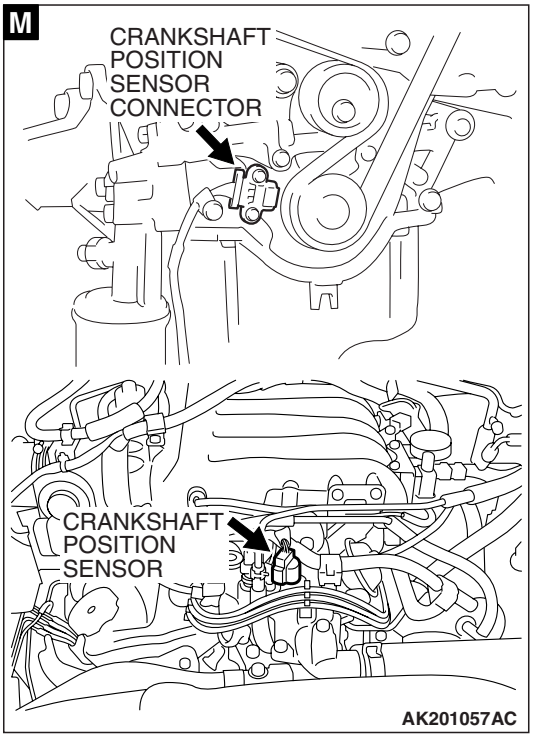
K


A/C
COMPRESSOR
CLUTCH RELAY
AK201296AC

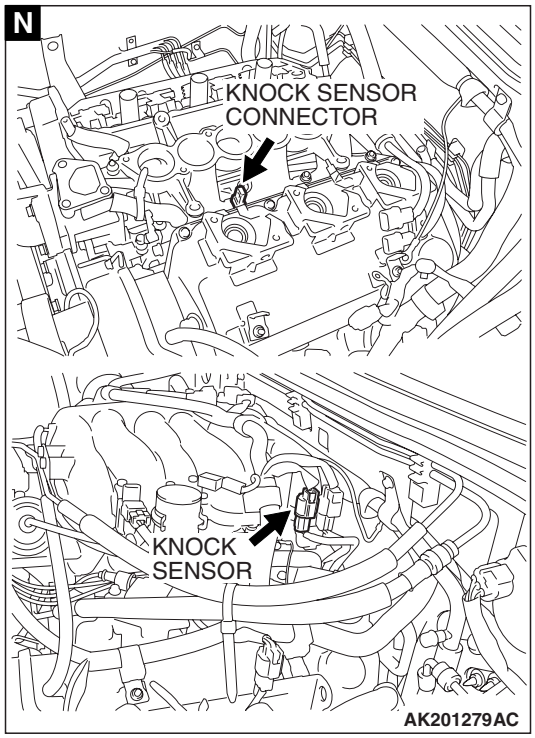
L


ENGINE COOLANT
TEMPERATURE SENSOR
AK200942AC

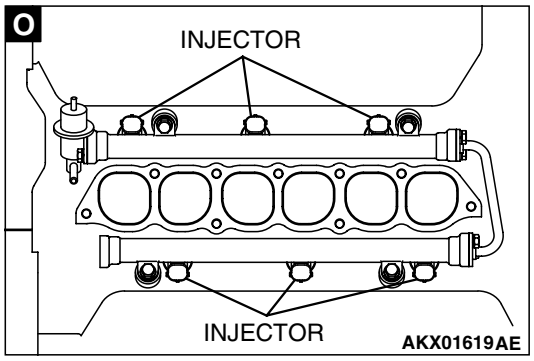
M


CRANKSHAFT POSITION SENSOR CONNECTOR
CRANKSHAFT POSITION SENSOR
AK201057AC

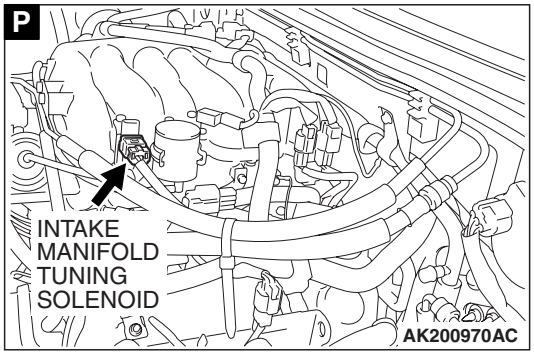
N


KNOCK SENSOR CONNECTOR
KNOCK SENSOR
AK201279AC

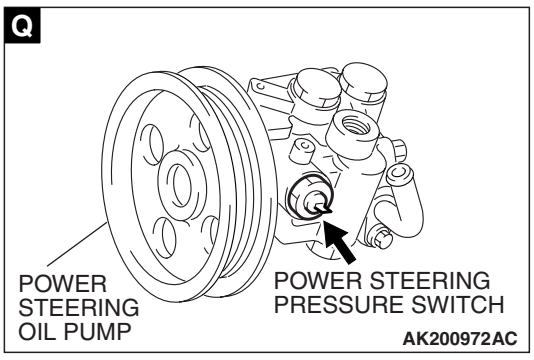
O


INJECTOR
INJECTOR
AKX01619AE

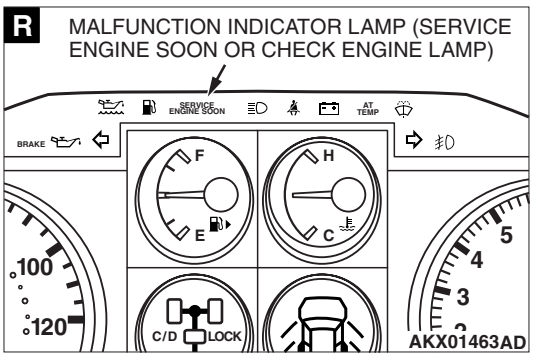
P


INTAKE MANIFOLD TUNING SOLENOID
AK200970AC

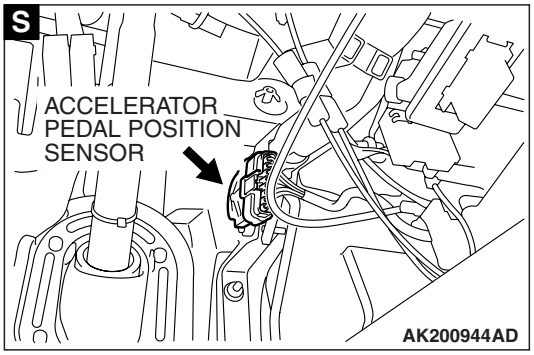
Q


POWER STEERING OIL PUMP
POWER STEERING PRESSURE SWITCH
AK200972AC

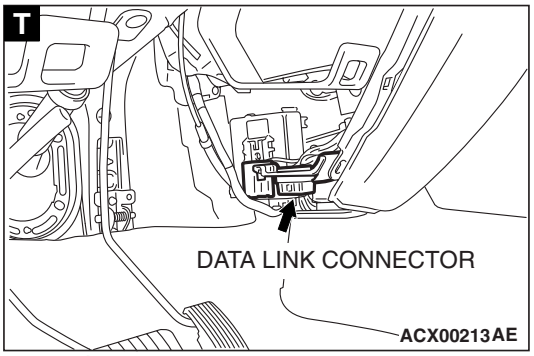
R


MALFUNCTION INDICATOR LAMP (SERVICE ENGINE SOON OR CHECK ENGINE LAMP)
SERVICE ENGINE SOON
AT TEMP
BRAKE
F
E
H
C
100
120
C/D
LOCK
5
4
3
AKX01463AD

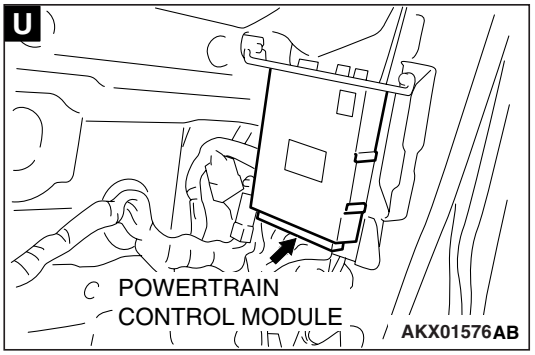
S


ACCELERATOR
PEDAL POSITION
SENSOR
AK200944AD

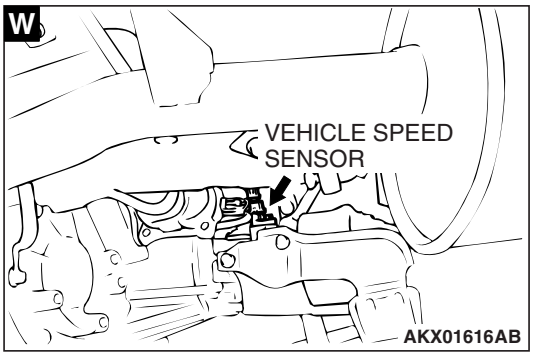
T


DATA LINK CONNECTOR
ACX00213AE

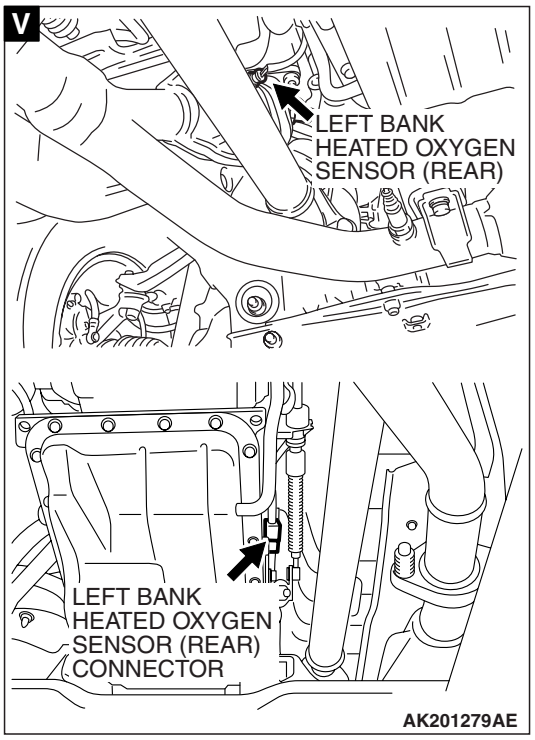
U


POWERTRAIN
CONTROL MODULE
AKX01576AB

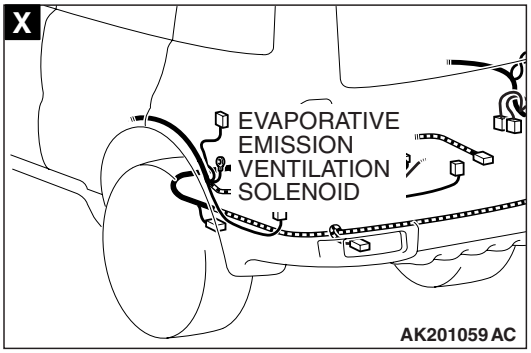
W


VEHICLE SPEED
SENSOR
AKX01616AB

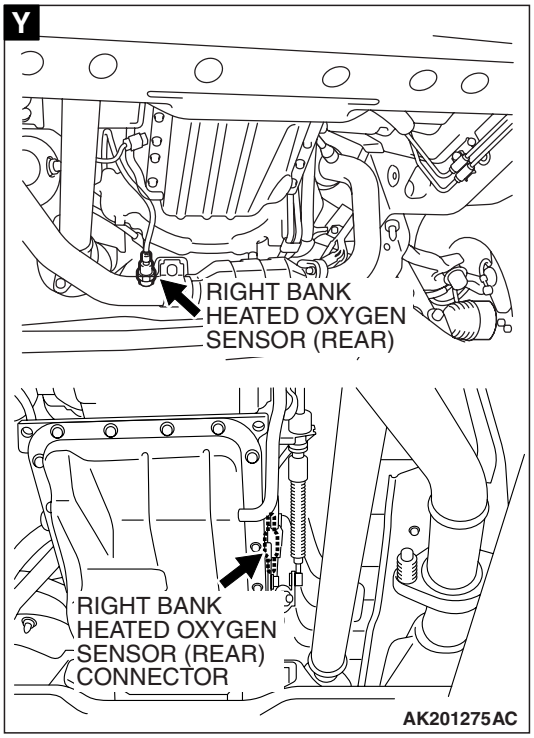
V


LEFT BANK
HEATED OXYGEN
SENSOR (REAR)
LEFT BANK
HEATED OXYGEN
SENSOR (REAR)
CONNECTOR
AK201279AE

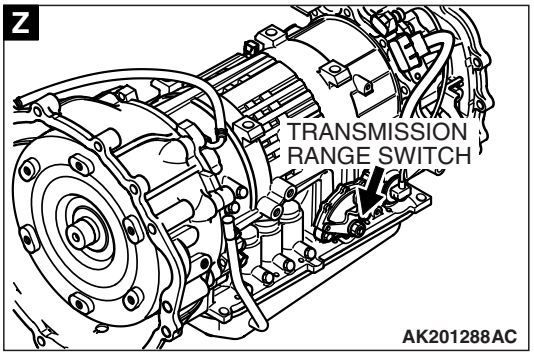
X



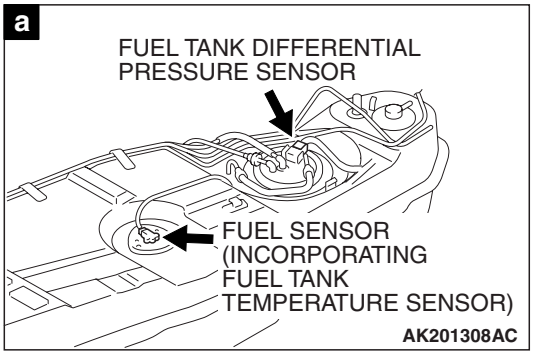
Y



Z



a



TSB Revision

THROTTLE BODY (THROTTLE VALVE AREA) CLEANING

M1131001000796

⚠ *WARNING*

If the throttle valve is operated in service, a finger might be injured as the result of being caught by the throttle valve. Make sure that the ignition switch is surely in "LOCK" (OFF) position before the service in order that the throttle valve cannot be operated.

1. Remove the throttle body.

⚠ **CAUTION**

- **Do not spray the cleaning solvent directly to the throttle valve.**
- **Make sure the cleaning solvent does not enter the motor and the sensor through the shaft.**

2. Spray cleaning solvent on a clean cloth.
3. Wipe off the dirt around the throttle valve with the cloth sprayed with cleaning solvent.
4. Attach the air intake hose.

ACCELERATOR PEDAL POSITION SENSOR ADJUSTMENT

M1131050500049

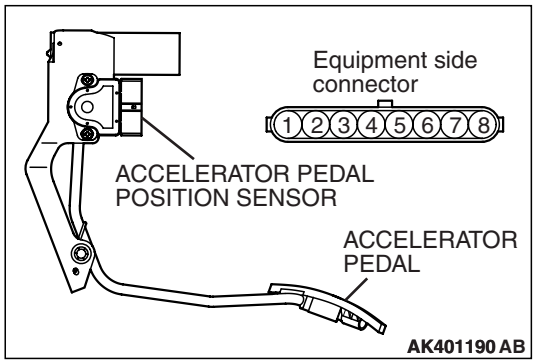
Required Special Tool:

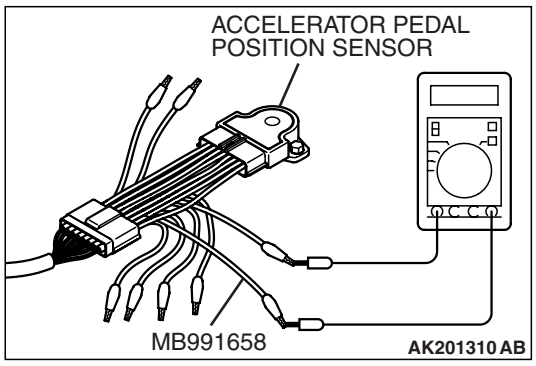
- MB991658: Test Harness Set

⚠ **CAUTION**

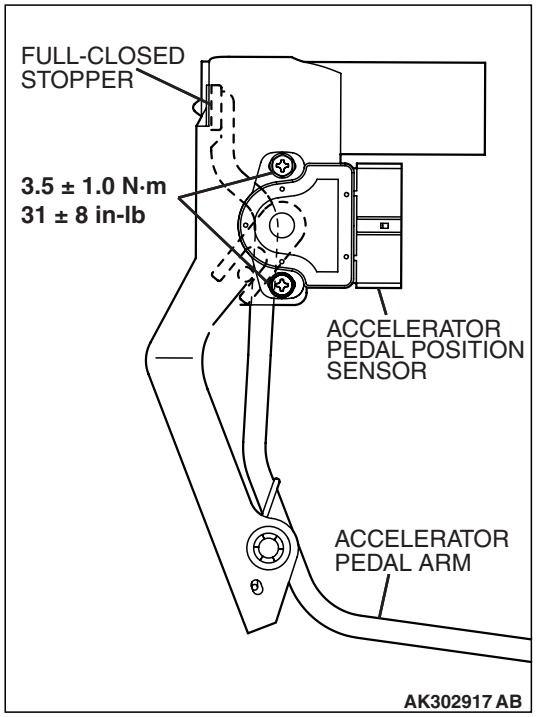
1. **The accelerator pedal position sensor should not be moved unnecessarily; it has been precisely adjusted by the manufacture. If the adjustment is disturbed for any reason, readjust as follows.**
2. **If the adjustment is disturbed for any reason, readjust as follows.**

1. Remove the accelerator pedal complete.





2. Connect the scan tool MB991958 to the data link connector. If the can tool MB991958 is not used, carry out the following steps.
   (1) Disconnect the accelerator pedal position sensor connector, and connect the special tool (test harness: MB991658) to that connector. (Be careful not to confuse the terminal numbers.)
   (2) Connect a digital voltmeter between accelerator pedal position sensor connector terminal No. 3 accelerator pedal position sensor (main) output and terminal No. 3 accelerator pedal position sensor (main) earth.
3. Loosen the accelerator pedal position sensor mounting bolts, and hold the accelerator pedal position sensor temporary.



4. Check that the accelerator pedal arm touches the full-closed stopper.
5. Turn the ignition switch to the ON position. (but do not start the engine.)
6. Turn the accelerator pedal position sensor until the output from accelerator pedal position sensor (main) satisfies the standard value.

   Standard value: 0.905 – 1.165 volts
7. Tighten the accelerator pedal position sensor mounting bolts to specified torque.

   Tightening torque: 3.5 ± 1.0 N·m (31 ± 8 in-lb)
8. Install the accelerator pedal complete.

FUEL PRESSURE TEST

M1131001901190

Required Special Tools:

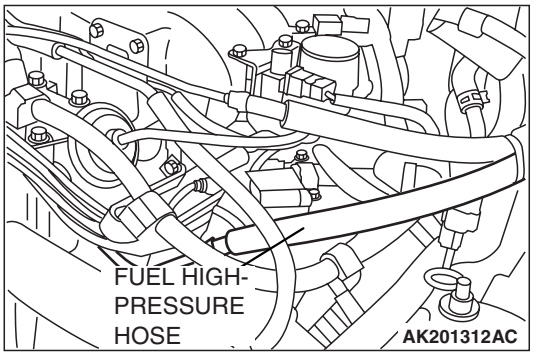
- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991911: Main Harness B
- MB991637: Fuel Pressure Gauge Set
- MD998709: Adaptor Hose
- MD998742: Hose Adaptor

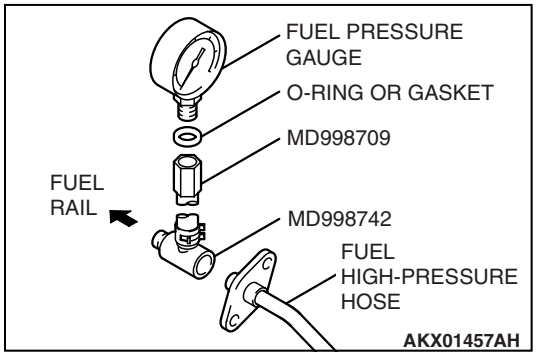
1. Release residual pressure from the fuel line to prevent fuel spray. (Refer to P.13A-1051.)

⚠ WARNING

To prevent a fire, cover the hose connection with shop towels to prevent splashing of fuel that could be caused by some residual pressure in the fuel pipe line.

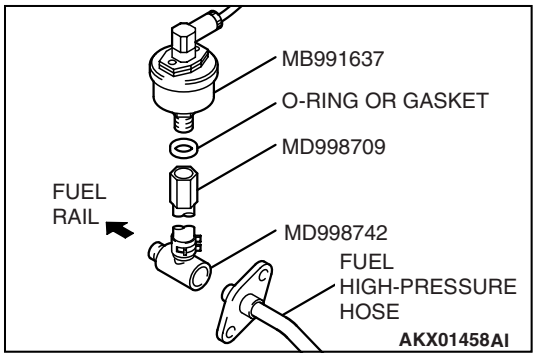
2. Disconnect the fuel high-pressure hose at the fuel rail side.
3. Assemble the fuel pressure measurement tools as follows.





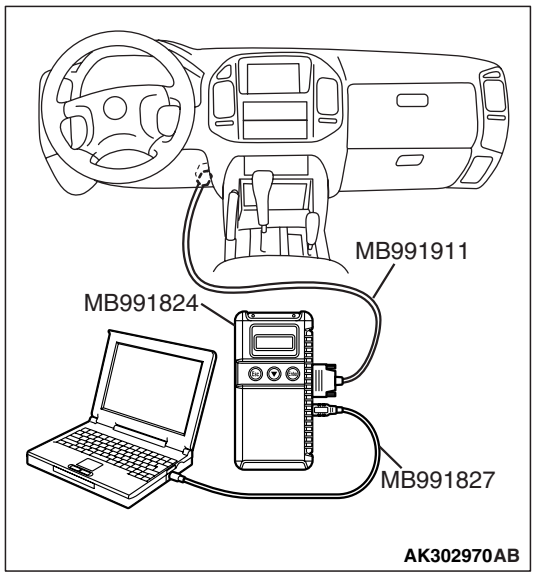
<When using the fuel pressure gauge>

1. Remove the union joint and bolt from special tool MD998709 (adapter hose) and instead attach special tool MD998742 (hose adapter) to the adapter hose.
2. Place a suitable O-ring or gasket on the assembled special tools MD998709 and MD998742 and install the fuel pressure gauge.
3. Install the assembled fuel pressure measurement tools between the fuel rail and fuel high-pressure hose.



<When using special tool MB991637 (fuel pressure gauge set)>

1. Remove the union joint and bolt from special tool MD998709 (adapter hose) and instead attach special tool MD998742 (hose adapter) to the adapter hose.
2. Install special tool MB991637 (fuel pressure gauge set) into assembled special tools MD998709 and MD998742 via a gasket.
3. Install the assembled fuel pressure measurement tools between the fuel rail and fuel high-pressure hose.

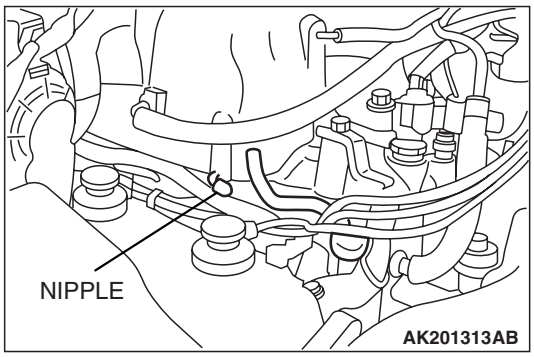


⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

4. Connect scan tool MB991958 to the data link connector.
5. Use Actuator test 07 to drive the fuel pump. Check that there is no fuel leaking from any section when the fuel pump is operating.
6. Stop the fuel pump.
7. Start the engine and run at idle.
8. Measure fuel pressure while the engine is running at idle.

   Standard value: Approximately 270 kPa (38 psi) at curb idle



9. Disconnect the vacuum hose (blue stripe) from the fuel pressure regulator and measure the fuel pressure with the hose end closed with your finger.

   Standard value: 330 – 350 kPa (47 – 50 psi) at curb idle

10. Check to see that fuel pressure at idle does not drop even after the engine has been revved several times.
11. Revving the engine repeatedly, hold the fuel return hose lightly with your fingers to feel that fuel pressure is present in the return hose.

    NOTE: If the fuel flow rate is low, there will be no fuel pressure in the return hose.

12.If any of fuel pressure measured in steps 8 to 11 is out of specification, troubleshoot and repair according to the table below.

SYMPTOM	PROBABLE CAUSE	REMEDY
• Fuel pressure too low • Fuel pressure drops after racing • No fuel pressure in fuel return hose	Clogged fuel filter	Replace fuel filter
	Fuel leaking to return side due to poor fuel regulator valve seating or settled spring	Replace fuel pressure regulator
	Low fuel pump delivery pressure	Replace fuel pump
Fuel pressure too high	Binding valve in fuel pressure regulator	Replace fuel pressure regulator
	Clogged fuel return hose or pipe	Clean or replace hose or pipe
Same fuel pressure when vacuum hose is connected and when disconnected	Damaged vacuum hose or clogged nipple	Replace vacuum hose or clean nipple
	Defective fuel pressure regulator	Replace fuel pressure regulator

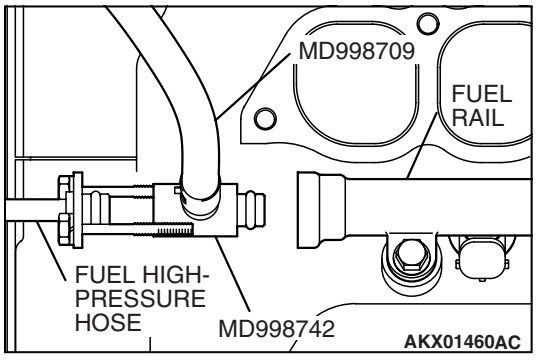
13.Stop the engine and observe fuel pressure gauge reading. It is normal if the reading does not drop within two minutes. If it does, observe the rate of drop and troubleshoot and repair according to the table below. Start, then stop the engine.

(1) Squeeze the fuel return line closed to confirm leak-down occurs from defective fuel pressure regulator.

(2) Squeeze the fuel supply line closed to confirm leak-down occurs from defective fuel pump check valve.

(3) If pressure continues to drop with both fuel lines squeezed closed, injector(s) are leaking.

SYMPTOM	PROBABLE CAUSE	REMEDY
Fuel pressure drops gradually after engine is stopped	Leaky injector	Replace injector
	Leaky fuel regulator valve seat	Replace fuel pressure regulator
Fuel pressure drops sharply immediately after engine is stopped	Check valve in fuel pump is held open	Replace fuel pump



14.Release residual pressure from the fuel pipe line. (Refer to P.13A-1051.)

⚠ *WARNING*

Cover the hose connection with shop towels to prevent splash of fuel that could be caused by some residual pressure in the fuel pipe line.

15.Remove the fuel pressure gauge, and special tools MD998709, MD998742 and MB991637 from the fuel rail.

16.Replace the O-ring at the end of the fuel high-pressure hose with a new one.

17.Fit the fuel high-pressure hose into the fuel rail and tighten the bolts to specified torque.

Tightening torque: 4.9 ± 1.0 N·m (43 ± 8 in-lb)

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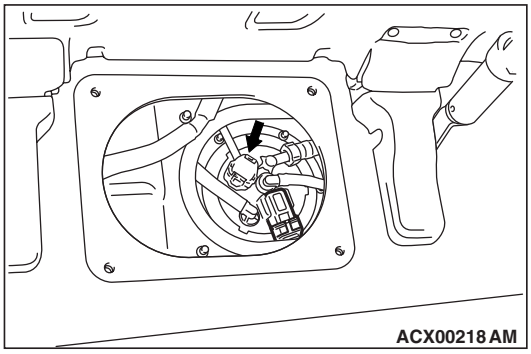
18.Check for fuel leaks.
(1) Use scan tool MB991502 to operate the fuel pump.
(2) Check the fuel line for leaks and repair as needed.
19.Disconnect scan tool MB991958.

FUEL PUMP CONNECTOR DISCONNECTION (HOW TO REDUCE PRESSURIZED FUEL LINES)

M1131000900677

When removing the fuel pipe, hose, etc., release fuel pressure to prevent fuel splay.

1. Turn the ignition switch to the "LOCK" (OFF) position.
2. Fold down the second seat.
3. Remove the service hole cover (upper) and packing.
4. Remove the service hole cover (lower) and packing.
5. Disconnect fuel pump module connector.
6. Start the engine and let it run until it stops naturally. Turn the ignition switch to the "LOCK" (OFF) position.
7. Connect the fuel pump module connector.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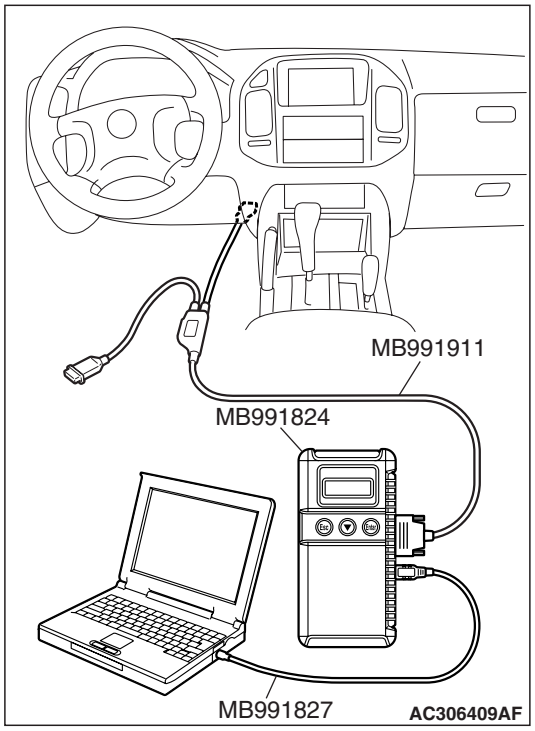
FUEL PUMP OPERATION CHECK

M1131002000744

Required Special Tools:

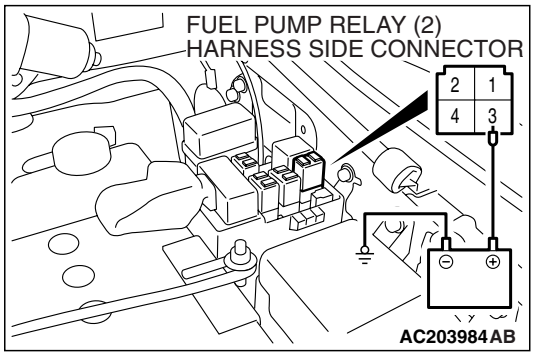
- MB991958: Scan Tool (MUT-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: MUT-III USB Cable
  - MB991911: MUT-III Main Harness B
- MB991223: Harness Set
- MB992006: Extra Fine Probe



⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

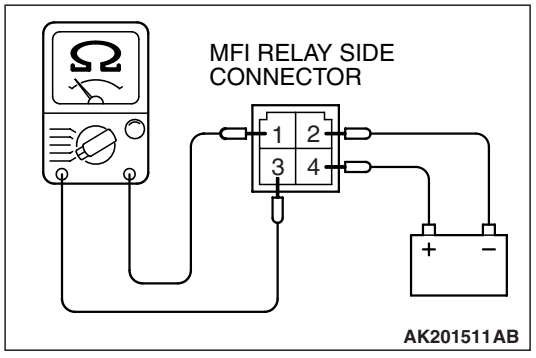
1. Check the operation of the fuel pump by using scan tool MB991958 to force-drive the fuel pump.
2. If the fuel pump will not operate, check by using the following procedure, and if it is normal, check the drive circuit.
   (1) Turn the ignition switch to the "LOCK" (OFF) position.



   (2) Remove fuel pump relay (2).
   Connect terminal number 3 of the harness-side connector to the battery.
   Check if the fuel pump operation sound can be heard at this time.
   NOTE: As the fuel pump is an in-tank type, the fuel pump sound is hard to hear, so remove the fuel filler cap and check from the tank inlet.
   (3) Check the fuel pressure by pinching the fuel hose with the fingertips.
   (4) Install fuel pump relay (2).

MULTIPORT FUEL INJECTION (MFI) RELAY, THROTTLE ACTUATOR CONTROL MOTOR RELAY AND FUEL PUMP RELAY CONTINUITY CHECK

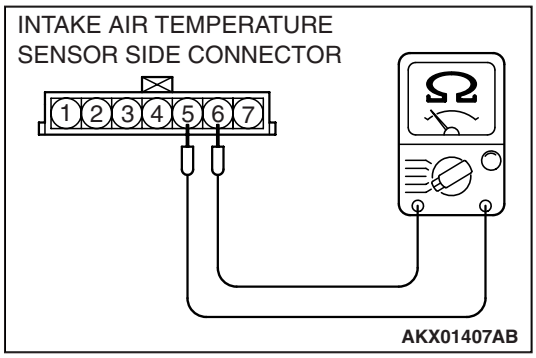
M1131052000040



BATTERY VOLTAGE	BATTERY POWER SUPPLY TERMINAL	SPECIFIED CONDITION
Supplied	2-4	1-3
Not supplied	–	2-4

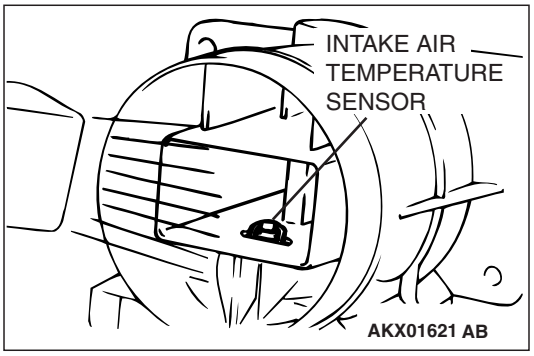
INTAKE AIR TEMPERATURE SENSOR CHECK

M1131002800847



1. Disconnect the volume airflow sensor connectors.
2. Measure resistance between terminals 5 and 6.

Standard value:
13 – 17 kΩ [at –20°C (–4°F)]
5.3 – 6.7 kΩ [at 0°C (32°F)]
2.3 – 3.0 kΩ [at 20°C (68°F)]
1.0 – 1.5 kΩ [at 40°C (104°F)]
0.56 – 0.76 kΩ [at 60°C (140°F)]
0.30 – 0.42 kΩ [at 80°C (176°F)]



3. If not within specifications, replace the volume airflow sensor.
4. Measure resistance while heating the sensor using a hair dryer.

Normal condition:

TEMPERATURE	RESISTANCE (kΩ)
Higher	Smaller

5. If resistance does not decrease as heat increases, replace the volume airflow sensor assembly.

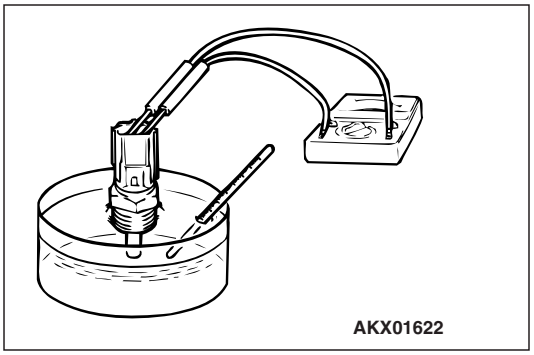
ENGINE COOLANT TEMPERATURE SENSOR CHECK

M1131003100807

⚠ CAUTION
Be careful not to touch the connector (resin section) with the tool when removing and installing.

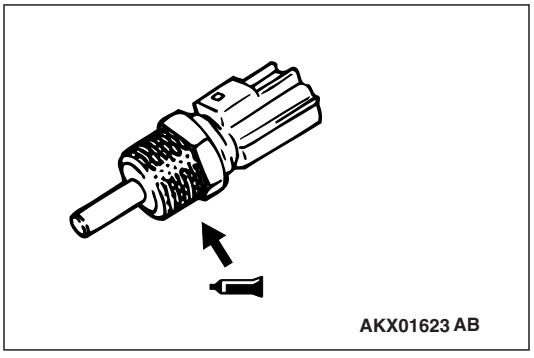
1. Drain engine coolant, then remove the engine coolant temperature sensor.
2. With the temperature sensing portion of engine coolant temperature sensor immersed in hot water, check the resistance.

Standard value:
14 – 17 kΩ [at –20°C (–4°F)]
5.1 – 6.5 kΩ [at 0°C (32°F)]
2.1 – 2.7 kΩ [at 20°C (68°F)]
0.9 – 1.3 kΩ [at 40°C (104°F)]
0.48 – 0.68 kΩ [at 60°C (140°F)]
0.26 – 0.36 kΩ [at 80°C (176°F)]



3. If resistance deviates from the standard value greatly, replace the sensor.
4. Apply 3M™ AAD part number 8731 or equivalent to threaded portion.
5. Install the engine coolant temperature sensor and tighten it to the specified torque.

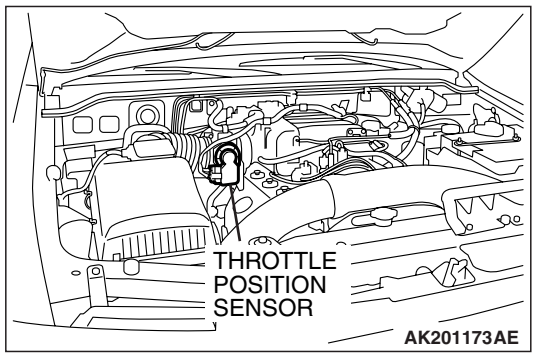
Tightening torque: 29 ± 10 N·m (22 ± 7 ft-lb)



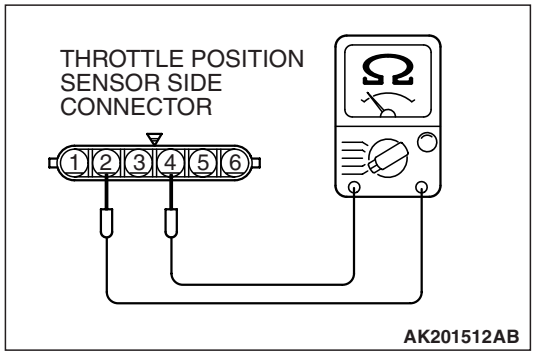
TSB Revision

THROTTLE POSITION SENSOR CHECK

M1131003200718



1. Disconnect the throttle position sensor connector.



2. Measure the resistance between the throttle position sensor side connector terminal No. 2 (sensor power supply) and terminal No. 4 (sensor ground).

   Standard value: 2.0 – 4.0 kΩ [at 20°C (68°F)]

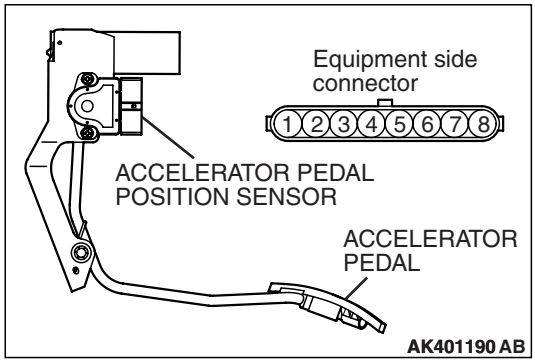
3. If resistance is outside the standard value, replace the throttle body assembly.

ACCELERATOR PEDAL POSITION SENSOR CHECK

M1131003400109

1. Disconnect the accelerator pedal position sensor connector.
2. Measure the resistance between accelerator pedal position sensor connector terminal No. 1 [accelerator pedal position sensor (main) earth] and terminal No. 2 [accelerator pedal position sensor (main) power supply], and between terminal No.7 [accelerator pedal position sensor (sub) earth] and terminal No. 8 [accelerator pedal position sensor (sub) power supply].

   Standard value: 3.5 – 6.5 kΩ



3. Measure the resistance between accelerator pedal position sensor connector terminal No. 2 [accelerator pedal position sensor (main) power supply] and terminal No. 3 [accelerator pedal position sensor (main) output]; and between terminal No.8 [accelerator pedal position sensor (sub) power supply] and terminal No. 6 [accelerator pedal position sensor (sub) output].

Normal condition:

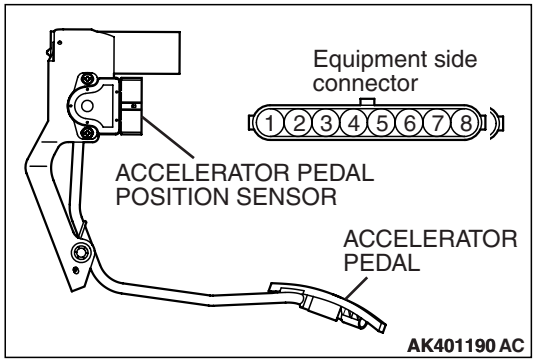
When accelerator pedal is gently depressed	Changes comparatively smoothly in proportion to the accelerator pedal depression amount.

4. If the measured values are outside the standard value range, or if the resistance does not change smoothly, replace the accelerator pedal position sensor.

   NOTE: After replacement, adjust the accelerator pedal position sensor. (Refer to P.13A-1047.)

ACCELERATOR PEDAL POSITION SWITCH CHECK

M1131052500090



1. Disconnect the accelerator pedal position sensor connector.
2. Check continuity between terminal No. 4 (accelerator pedal position switch) and No. 5 (sensor earth) of the connector.

Normal condition:

Accelerator pedal	Continuity
Depressed	No continuity
Released	Continuity (0 kΩ)

3. If defective, replace the accelerator pedal position sensor assembly.

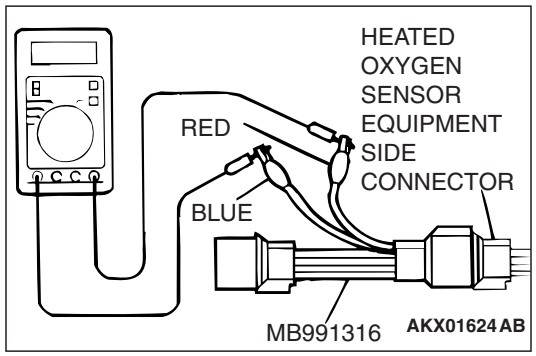
   NOTE: After replacement, adjust the accelerator pedal position sensor. (Refer to P.13A-1047.)

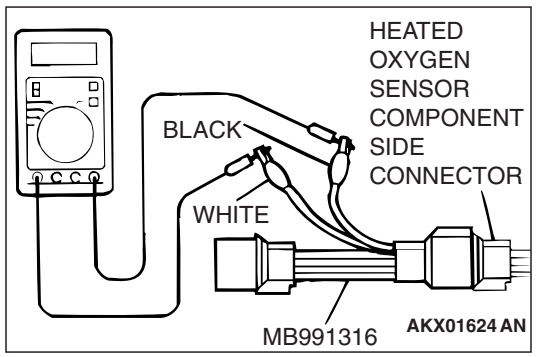
HEATED OXYGEN SENSOR CHECK

M1131005001326

Required Special Tools:

- MB991316: Test Harness Set
- MD998464: Test Harness





<Left bank heated oxygen sensor (front)>

1. Using scan tool MB991958, observe HO_2S reading. If values are unsatisfactory, or if a scan tool is not available, use the following procedure:
   (1) Disconnect the heated oxygen sensor connector and connect special tool MB991316 to the connector on the heated oxygen sensor side.
   (2) Make sure that there is continuity [4.5 – 8.0 ohms at 20°C (68°F)] between terminal No. 1 (red clip) and terminal No. 3 (blue clip) on the heated oxygen sensor connector
   (3) If there is no continuity, replace the heated oxygen sensor.
   (4) Warm up the engine until engine coolant is 80°C (176°F) or higher.
   (5) Perform a racing for 5 minutes or more with the engine speed of 4,500 r/min.
   (6) Connect a digital voltage meter between terminal No. 2 (black clip) and terminal No. 4 (white clip).

2. While repeatedly revving the engine, measure the heated oxygen sensor output voltage.

Standard value:

ENGINE	HEATED OXYGEN SENSOR OUTPUT VOLTAGE	REMARKS
When revving engine	0.6 – 1.0 V	If you make the air/fuel ratio rich by revving the engine repeatedly, a normal heated oxygen sensor will output a voltage of 0.6 – 1.0 V.

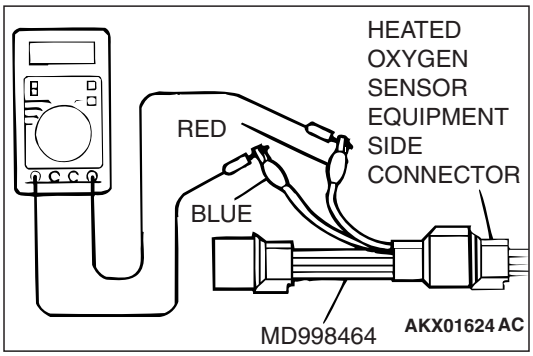
⚠ CAUTION

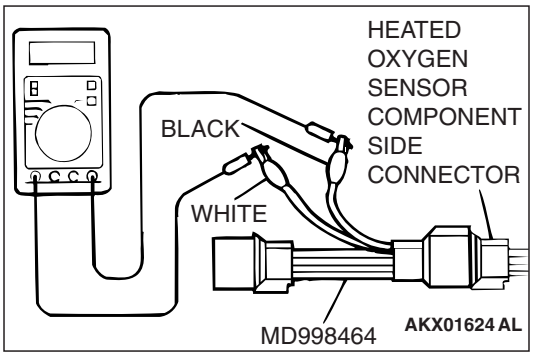
- **Be very careful when connecting the jumper wire; incorrect connection can damage the heated oxygen sensor.**
- **Be careful the heater is broken when voltage of beyond 8 volts is applied to the heated oxygen sensor heater.**

NOTE: If the sufficiently high temperature [of approximate 400°C (752°F) or more] is not reached although the heated oxygen sensor is normal, the output voltage would be possibly low although the rich air/fuel ratio. Therefore, if the output voltage is low, use a jumper wire to connect the terminal No. 1 (red clip) and the terminal No. 3 (blue clip) of the heated oxygen sensor with the positive terminal and the negative terminal of 8 volts power supply respectively, then check again.

3. If the sensor is defective, replace the heated oxygen sensor.

NOTE: For removal and installation of the heated oxygen sensor, refer to GROUP 15, Exhaust Pipe and Main Muffler P.15-13.





<Right bank heated oxygen sensor (front)>

1. Using scan tool MB991958, observe HO_2S reading. If values are unsatisfactory, or if a scan tool is not available, use the following procedure:
   (1) Disconnect the heated oxygen sensor connector and connect special tool MD998464 to the connector on the heated oxygen sensor side.
   (2) Make sure that there is continuity [4.5 – 8.0 ohms at 20°C (68°F)] between terminal No. 1 (red clip) and terminal No. 3 (blue clip) on the heated oxygen sensor connector
   (3) If there is no continuity, replace the heated oxygen sensor.
   (4) Warm up the engine until engine coolant is 80°C (176°F) or higher.
   (5) Perform a racing for 5 minutes or more with the engine speed of 4,500 r/min.
   (6) Connect a digital voltage meter between terminal No. 2 (black clip) and terminal No. 4 (white clip).
2. While repeatedly revving the engine, measure the heated oxygen sensor output voltage.

Standard value:

ENGINE	HEATED OXYGEN SENSOR OUTPUT VOLTAGE	REMARKS
When revving engine	0.6 – 1.0 V	If you make the air/fuel ratio rich by revving the engine repeatedly, a normal heated oxygen sensor will output a voltage of 0.6 – 1.0 V.

⚠ CAUTION

- **Be very careful when connecting the jumper wire; incorrect connection can damage the heated oxygen sensor.**
- **Be careful the heater is broken when voltage of beyond 8 volts is applied to the heated oxygen sensor heater.**

NOTE: If the sufficiently high temperature [of approximate 400°C (752°F) or more] is not reached although the heated oxygen sensor is normal, the output voltage would be possibly low although the rich air/fuel ratio. Therefore, if the output voltage is low, use a jumper wire to connect the terminal No. 1 (red clip) and the terminal No. 3 (blue clip) of the heated oxygen sensor with the positive terminal and the negative terminal of 8 volts power supply respectively, then check again.

3. If the sensor is defective, replace the heated oxygen sensor.

NOTE: For removal and installation of the heated oxygen sensor, refer to GROUP 15, Exhaust Pipe and Main Muffler P.15-13.

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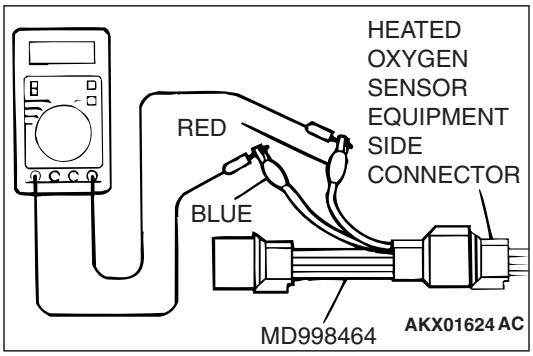
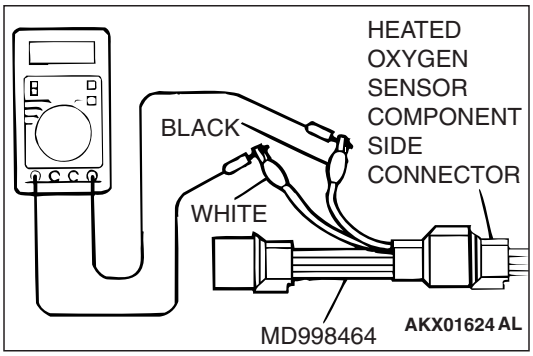




<Left bank heated oxygen sensor (rear)>

1. Using scan tool MB991958, observe HO_2S reading. If values are unsatisfactory, or if a scan tool is not available, use the following procedure:
   (1) Disconnect the heated oxygen sensor connector and connect special tool MD998464 to the connector on the heated oxygen sensor side.
   (2) Make sure that there is continuity [11 – 18 ohms at 20°C (68°F)] between terminal No. 1 (red clip) and terminal No. 3 (blue clip) on the heated oxygen sensor connector
   (3) If there is no continuity, replace the heated oxygen sensor.
   (4) Warm up the engine until engine coolant is 80°C (176°F) or higher.
   (5) Drive at 50 km/h (31 mph) or more for 10 minutes.
   (6) Connect a digital voltage meter between terminal 2 (black clip) and terminal No. 4 (white clip).
2. Measure the output voltage of the heated oxygen sensor under the following driving.
   - Transmission: "L" range
   - Drive with wide open throttle
   - Engine: 3,500 r/min or more

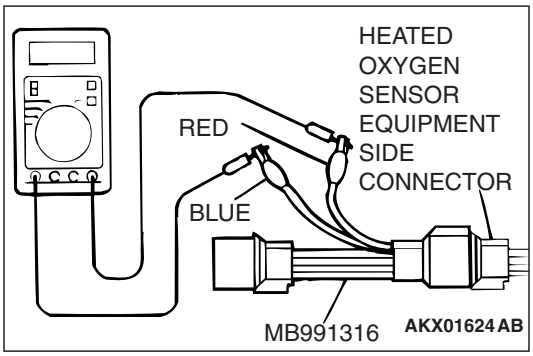
   Standard value:

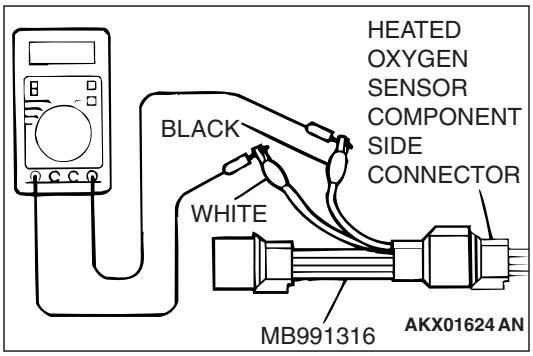
ENGINE	HEATED OXYGEN SENSOR OUTPUT VOLTAGE	REMARKS
When revving engine	0.6 – 1.0 V	If you make the air/fuel ratio rich by revving the engine repeatedly, a normal heated oxygen sensor will output a voltage of 0.6 – 1.0 V.

NOTE: If the sufficiently high temperature [of approximate 400°C (752°F) or more] is not reached although the heated oxygen sensor is normal, the output voltage would be possibly low although the rich air/fuel ratio.

3. If the sensor is defective, replace the heated oxygen sensor.

NOTE: For removal and installation of the heated oxygen sensor, refer to GROUP 15, Exhaust Pipe and Main Muffler P.15-13.





<Right bank heated oxygen sensor (rear)>

1. Using scan tool MB991958, observe HO_2S reading. If values are unsatisfactory, or if Scan tool is not available, use the following procedure:
   (1) Disconnect the heated oxygen sensor connector and connect special tool MB991316 to the connector on the heated oxygen sensor side.
   (2) Make sure that there is continuity [11 – 18 ohms at 20°C (68°F)] between terminal No. 1 (red clip) and terminal No. 3 (blue clip) on the heated oxygen sensor connector
   (3) If there is no continuity, replace the heated oxygen sensor.
   (4) Warm up the engine until engine coolant is 80°C (176°F) or higher.
   (5) Drive at 50 km/h (31 mph) or more for 10 minutes.
   (6) Connect a digital voltage meter between terminal No. 2 (black clip) and terminal No. 4 (white clip).
2. Measure the output voltage of the heated oxygen sensor under the following driving.
   - Transmission: "L" range
   - Drive with wide open throttle
   - Engine: 3,500 r/min or more

   Standard value:

ENGINE	HEATED OXYGEN SENSOR OUTPUT VOLTAGE	REMARKS
When revving engine	0.6 – 1.0 V	If you make the air/fuel ratio rich by revving the engine repeatedly, a normal heated oxygen sensor will output a voltage of 0.6 – 1.0 V.

NOTE: If the sufficiently high temperature [of approximate 400°C (752°F) or more] is not reached although the heated oxygen sensor is normal, the output voltage would be possibly low although the rich air/fuel ratio.

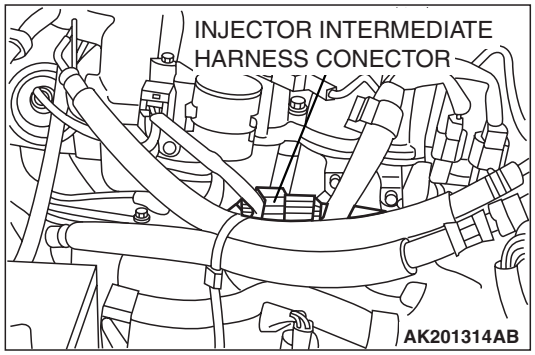
3. If the sensor is defective, replace the heated oxygen sensor.

NOTE: For removal and installation of the heated oxygen sensor, refer to GROUP 15, Exhaust Pipe and Main Muffler P.15-13.

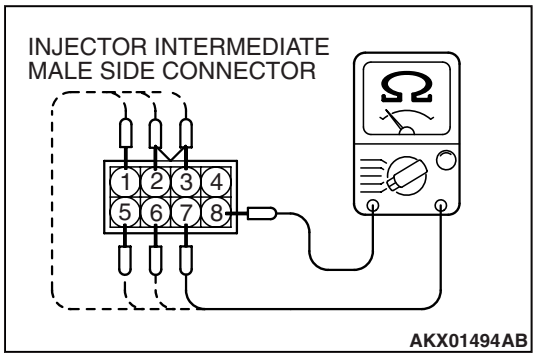
INJECTOR CHECK

M1131005200907

Measurement of Resistance between Terminals



1. Disconnect the injector intermediate connector.



2. Measure the resistor between the injector intermediate male side connector terminals.

Standard value:

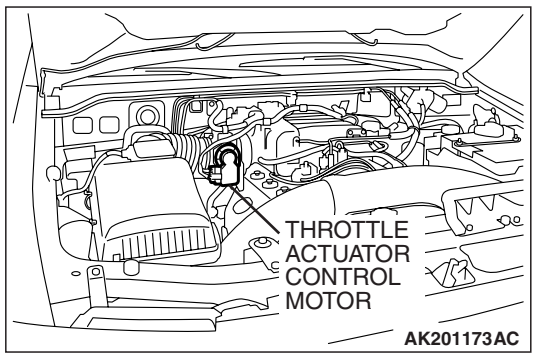
INJECTOR NO.	MEASUREMENT TERMINAL	RESISTANCE
NO. 1	8 – 3	13 – 16 kΩ [20°C (68°F)]
NO. 2	8 – 2	
NO. 3	8 – 1	
NO. 4	8 – 7	
NO. 5	8 – 6	
NO. 6	8 – 5	

3. Connect the injector intermediate connector.

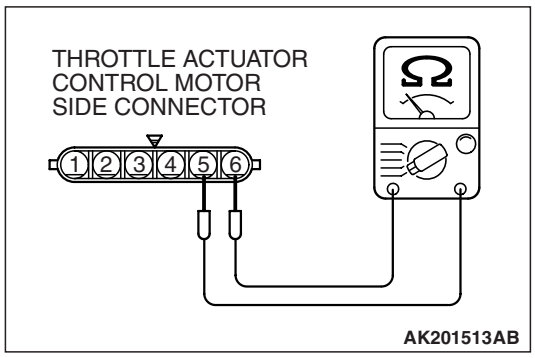
THROTTLE ACTUATOR CONTROL MOTOR CHECK

M1131051000229

<Operation Inspection>



1. Disconnect the air intake hose from the throttle body.
2. Set the ignition switch to the ON position.
3. Operate the accelerator pedal and confirm that the throttle valve is opening and closing accordingly.



<Checking the Terminal Resistance>

1. Disconnect the throttle position sensor connector.
2. Measure the resistance between terminal No. 5 and No. 6.

   Standard value 0.3 – 100 ohms [at 20°C (68°F)]
3. If resistance is outside the standard value, replace the throttle body assembly.

EVAPORATIVE EMISSION PURGE SOLENOID CHECK

M1131005600370

Refer to GROUP 17, Emission Control System – Evaporative Emission System – Evaporative Emission Purge Solenoid Check P.17-67.

EVAPORATIVE EMISSION VENTILATION SOLENOID CHECK

M1131012800309

Refer to GROUP 17, Emission Control System – Evaporative Emission Canister and Fuel Tank Pressure Relief Valve – Evaporative Emission Canister and Fuel Tank Pressure Relief Valve Inspection P.17-75.

EGR VALVE CHECK

M1131051500086

Refer to GROUP 17, Emission Control System – Exhaust Gas Recirculation (EGR) System – EGR Valve Check.P.17-70

INTAKE MANIFOLD TUNING SOLENOID CHECK

M1131006500064

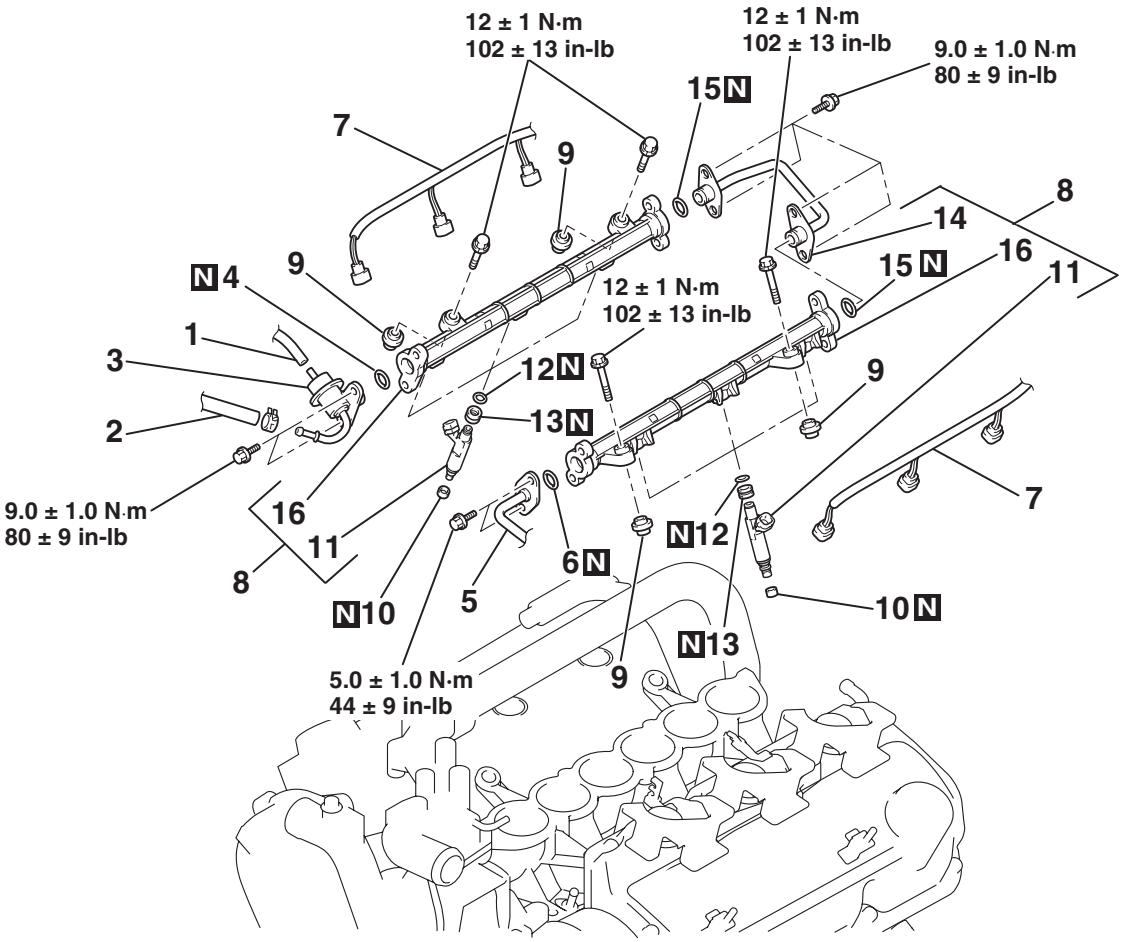
Refer to GROUP 15, Intake and Exhaust System – On-vehicle Service – Intake Manifold Tuning Solenoid Check P.15-4.

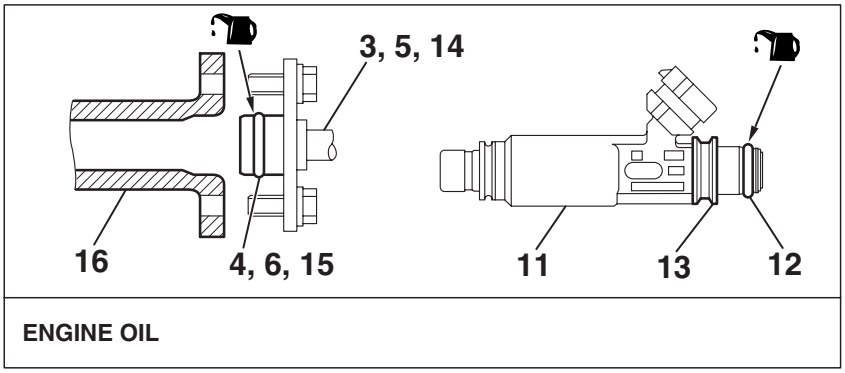
INJECTOR

REMOVAL AND INSTALLATION

M1131007100791

Pre-removal Operation	Post-installation Operation
• Fuel Line Pressure Reduction (Refer to P.13A-1051). • Intake Manifold Plenum Removal (Refer to GROUP15 P.15-7).	• Intake Manifold Plenum Installation (Refer to GROUP 15 P.15-7). • Fuel Leakage Inspection





AC203985AB

REMOVAL STEPS

1. VACUUM HOSE
2. FUEL RETURN HOSE CONNECTION
>>A<< 3. FUEL PRESSURE REGULATOR
4. O-RING
>>A<< 5. FUEL HIGH-PRESSURE HOSE CONNECTION

<<A>>

REMOVAL STEPS (Continued)

6. O-RING
7. INJECTOR CONNECTORS
8. FUEL INJECTORS, FUEL PIPE AND FUEL RAILS ASSEMBLY
9. INSULATORS
10. INSULATORS
>>A<< 11. INJECTORS

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REMOVAL STEPS (Continued)

12. O-RINGS
13. GROMMETS
>>**A**<< 14. FUEL PIPE
15. O-RINGS
16. FUEL RAILS

REMOVAL SERVICE POINT

<<A>> FUEL INJECTORS, FUEL PIPE AND FUEL RAILS ASSEMBLY REMOVAL

⚠ CAUTION

Do not drop the injector.

INSTALLATION SERVICE POINT

>>A<< FUEL PIPE/INJECTORS/FUEL PRESSURE REGULATOR/FUEL HIGH-PRESSURE HOSE INSTALLATION

⚠ CAUTION

Do not let the engine oil get into the fuel rail. Or the injectors will be damaged.

1. Apply a drop of new engine oil to the O-rings.
2. Turn the fuel pipe to the right and left to install to the fuel rails. Repeat for injectors, fuel pressure regulator and fuel high-pressure hose.
   Be careful not to damage the O-ring. After installing, check that the item turns smoothly.
3. If it does not turn smoothly, the O-ring may be trapped, remove the item, re-install it into the fuel rails and check again.
4. Tighten the fuel pipe, fuel high-pressure hose and fuel pressure regulator to the specified torque.

   Tightening torque:
   9.0 ± 1.0 N·m (80 ± 9 in-lb) <Fuel pipe and fuel pressure regulator>
   5.0 ± 1.0 N·m (44 ± 9 in-lb) <Fuel high-pressure hose>

THROTTLE BODY ASSEMBLY

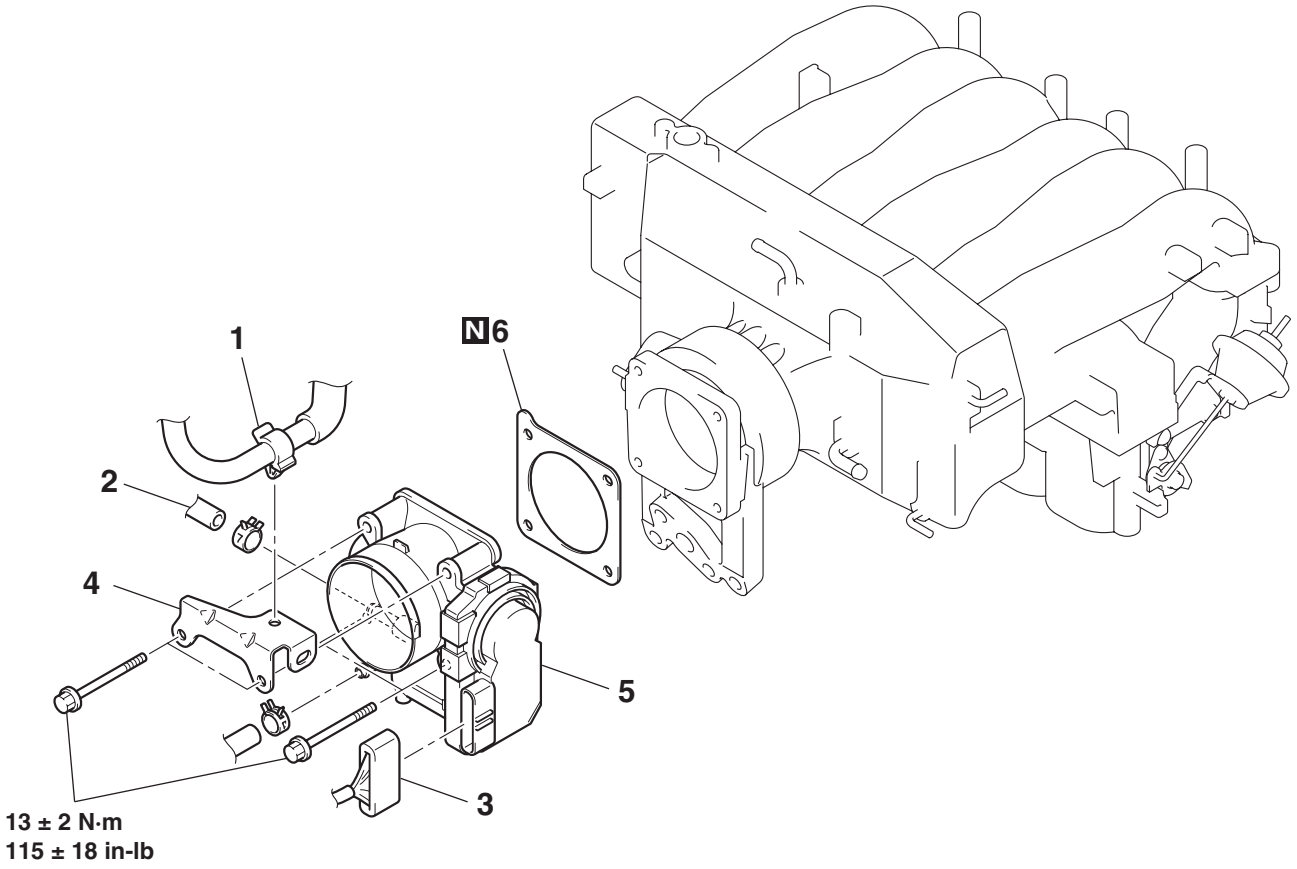
REMOVAL AND INSTALLATION

M1131007701224

⚠ CAUTION

When the throttle body assembly replacement is performed, use scan tool MB991958 to initialize the learning value (Refer to GROUP 00, Initialization Procedure for Learning Value in MFI Engine P.00-23).

Pre-removal and Post-installation Operation
- Engine Coolant Draining and Refilling (Refer to GROUP 00, Maintenance Service P.00-49).
- Intake Air Duct and Air Cleaner Housing Cover Assembly Removal and Installation (Refer to GROUP 15, Air Cleaner P.15-6).



AC203986AC

REMOVAL STEPS
- >>B<< • INITIALIZATION PROCEDURE (INSTALLATION ONLY)
1. PURGE HOSE CLIP CONNECTION
2. WATER HOSES CONNECTION

REMOVAL STEPS (Continued)
3. THROTTLE POSITION SENSOR CONNECTOR
4. PURGE HOSE BRACKET
5. THROTTLE BODY
- >>A<< 6. THROTTLE BODY GASKET

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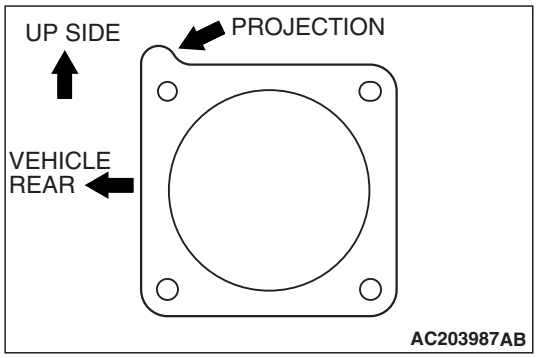
INSTALLATION SERVICE POINTS

>>A<< THROTTLE BODY GASKET INSTALLATION

⚠ CAUTION

Poor idling may result if the throttle body gasket is installed incorrectly.

Install the throttle body gasket as shown in the illustration.



>>B<< INITIALIZATION PROCEDURE

Turn the ignition switch on then off, and keep it off for at least 10 seconds.

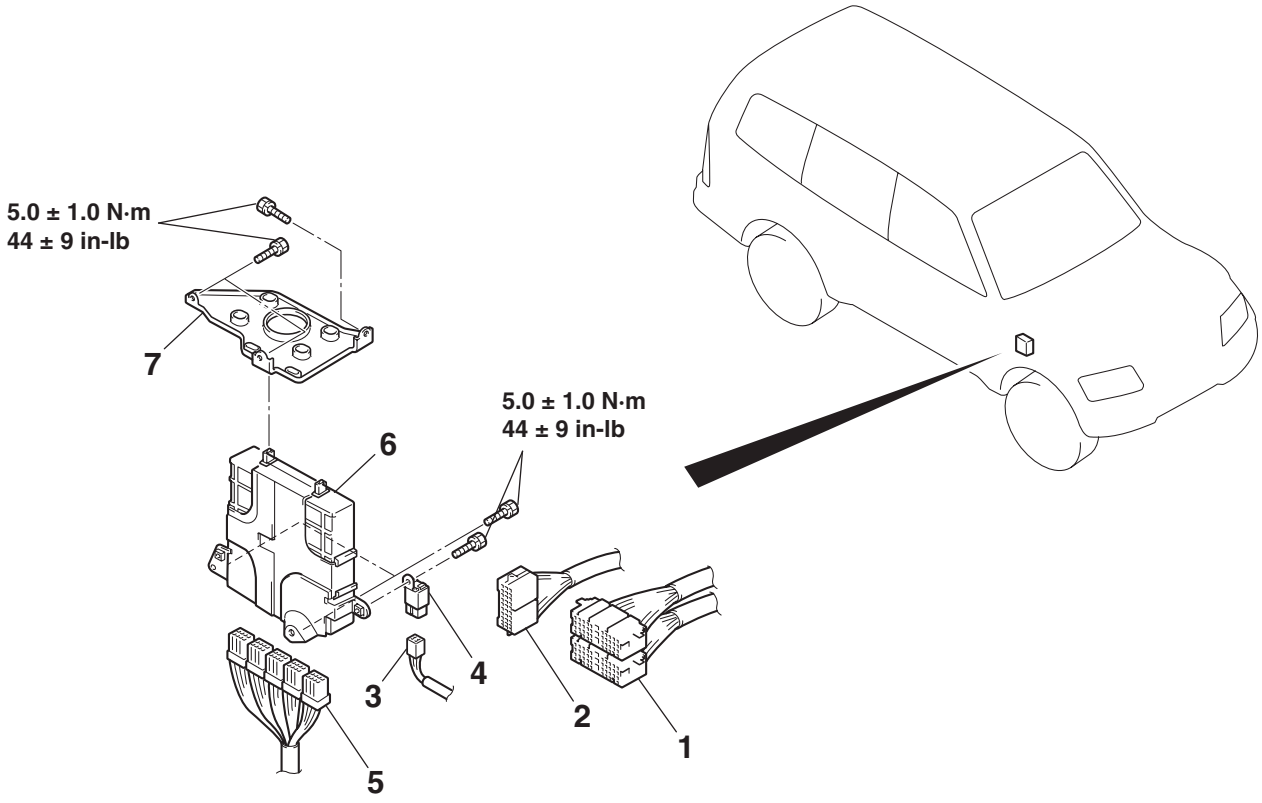
POWERTRAIN CONTROL MODULE (PCM)

REMOVAL AND INSTALLATION

M1131033400276

⚠ CAUTION

Always register the ignition key(s) when the PCM is replaced (Refer to GROUP 54A, On-vehicle Service – Immobilizer ID Code Registration P.54A-29).



AC204613AC

REMOVAL STEPS

>>A<< • INITIALIZATION PROCEDURE (INSTALLATION ONLY)
• COWL SIDE TRIM <RH> (REFER TO GROUP 52A, TRIM P.52A-8.)
1. INSTRUMENT PANEL HARNESS AND FRONT DOOR HARNESS <RH> CONNECTION
2. INSTRUMENT PANEL HARNESS AND FLOOR HARNESS <RH> CONNECTION

REMOVAL STEPS (Continued)

3. A/T CONTROL RELAY CONNECTOR
4. A/T CONTROL RELAY
5. PCM CONNECTOR
6. PCM
• INSTRUMENT PANEL ASSEMBLY (REFER TO GROUP 52A, INSTRUMENT PANEL ASSEMBLY P.52A-3.)
7. PCM BRACKET

INSTALLATION SERVICE POINT

>>A<< INITIALIZATION PROCEDURE

Turn the ignition switch on then off, and keep it off for at least 10 seconds.

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SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

M1131011600551

ITEM	SPECIFICATION
Engine coolant temperature sensor	29 ± 10 N·m (22 ± 7 ft-lb)
Fuel pipe attaching bolts	9.0 ± 1.0 N·m (80 ± 9 in-lb)
Fuel pressure regulator attaching bolts	9.0 ± 1.0 N·m (80 ± 9 in-lb)
Fuel rail mounting bolts	12 ± 1 N·m (102 ± 13 in-lb)
Fuel high-pressure hose attaching bolts	5.0 ± 1.0 N·m (44 ± 9 in-lb)
Throttle body mounting bolts	13 ± 2 N·m (115 ± 18 in-lb)
PCM bracket bolt	5.0 ± 1.0 N·m (44 ± 9 in-lb)
PCM bracket mounting bolt	5.0 ± 1.0 N·m (44 ± 9 in-lb)

GENERAL SPECIFICATIONS

M1131000200935

ITEMS		SPECIFICATIONS
Throttle body	Throttle bore mm (in.)	65 (2.56)
	Throttle position sensor	Hall element type
	Throttle actuator control motor	DC motor type, having brushes
Powertrain control module (PCM)	Identification model No.	E6T38399
Sensors	Volume airflow sensor	Karman vortex type
	Barometric pressure sensor	Semiconductor type
	Intake air temperature sensor	Thermistor type
	Engine coolant temperature sensor	Thermistor type
	Heated oxygen sensor	Zirconia type
	Accelerator pedal position sensor	Variable resistor type
	Accelerator pedal position switch	Contact switch type
	Transmission range switch	Contact switch type
	Camshaft position sensor	Electromagnetic resistance element type
	Crankshaft position sensor	Hall element type
	Knock sensor	Piezoelectric type
	Power steering pressure switch	Contact switch type
	Manifold absolute pressure sensor	Semiconductor type
Actuators	Multiport fuel injection (MFI) relay	Contact switch type
	Fuel pump relay	Contact switch type
	Throttle actuator control motor relay	Contact switch type
	Injector type and number	Electromagnetic type, 6
	Injector identification mark	GDH305
	EGR valve	Stepper motor type
	Evaporative emission purge solenoid	Duty cycle type solenoid valve

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ITEMS		SPECIFICATIONS
Fuel pressure regulator	Regulator pressure kPa (psi)	335 (47.6)

SERVICE SPECIFICATIONS

M1131000301128

ITEMS		STANDARD VALUE
Accelerator pedal position sensor adjusting voltage mV		0.905 – 1.165
Basic idle speed r/min		700 ± 50
Fuel pressure kPa (psi)	Vacuum hose disconnected	330 – 350 (47 – 50) at curb idle
	Vacuum hose connected	Approximately 270 (38) at curb idle
Intake air temperature sensor resistance kΩ	–20°C (–4°F)	13 – 17
	0°C (32°F)	5.3 – 6.7
	20°C (68°F)	2.3 – 3.0
	40°C (104°F)	1.0 – 1.5
	60°C (140°F)	0.56 – 0.76
	80°C (176°F)	0.30 – 0.42
Engine coolant temperature sensor resistance kΩ	–20°C (–4°F)	14 – 17
	0°C (32°F)	5.1 – 6.5
	20°C (68°F)	2.1 – 2.7
	40°C (104°F)	0.9 – 1.3
	60°C (140°F)	0.48 – 0.68
	80°C (176°F)	0.26 – 0.36
Throttle position sensor resistance kΩ		2.0 – 4.0 [at 20°C (68°F)]
Accelerator pedal position sensor (main, sub) resistance kΩ		3.5 – 6.5
Heated oxygen sensor output voltage V		0.6 – 1.0
Heated oxygen sensor heater resistance Ω	HO_2S (front)	4.5 – 8.0
	HO_2S (rear)	11 – 18
Injector coil resistance Ω		13 – 16 [at 20°C (68°F)]
Throttle actuator control motor coil resistance Ω		0.3 – 100 [at 20°C (68°F)]

SEALANT AND ADHESIVE

M1131000500754

ITEM	SPECIFIED SEALANT
Engine coolant temperature sensor threaded portion	3M™ AAD part number 8731or equivalent