

TROUBLESHOOTING

E13EFAQ

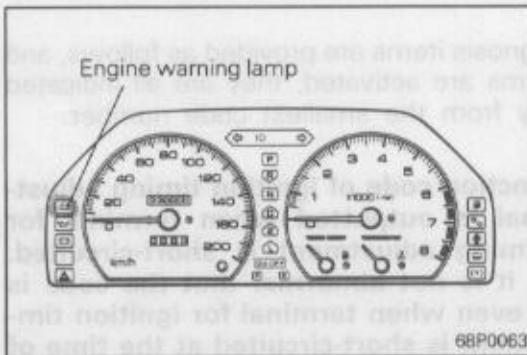
EXPLANATION OF TROUBLESHOOTING PROCEDURES

Refer to P.13-123-45.

ENGINE WARNING LAMP (CHECK ENGINE LAMP)

Refer to P.13-123-48.

ITEMS INDICATED BY THE ENGINE WARNING LAMP



Engine control unit
Oxygen sensor
Air flow sensor
Intake air temperature sensor
Throttle position sensor
Coolant temperature sensor
Crank angle sensor
Top dead centre sensor
Barometric pressure sensor
Detonation sensor
Ignition timing adjustment signal
Injector
Ignition coil, power transistor unit <DOHC>

Caution

Engine warning lamp will come on even when terminal for ignition timing adjustment is short-circuited. Therefore, it is not abnormal that the lamp comes on even when terminal for ignition timing adjustment is short-circuited at the time of ignition timing adjustment.

ENGINE WARNING LAMP INSPECTION

- Check that when the ignition switch is turned ON, the lamp illuminates for about 5 seconds and then goes out.
- If the lamp does not illuminate, check for open circuit in harness, blown fuse and blown bulb.

SELF-DIAGNOSIS

The engine control unit monitors the input/output signals (some signals at all times and the others under specified conditions) of the engine control unit.

When it is noticed that an irregularity has continued for a specified time or longer from when the irregular signal is initially monitored, passing a certain number, the engine control unit judges that an irregularity has occurred, memorizes the malfunction code, and outputs the signal to the self-diagnosis output terminal.

There are 15 diagnosis items, including the normal state, and the diagnosis results can be read out with a multi-use tester (MUT).

Moreover, since memorization of the malfunction codes is backed up directly by the battery, the diagnosis results are memorized even if the ignition key is turned off. The malfunction codes will, however, be erased when the battery terminal or the engine control unit connector is disconnected.

In addition, the malfunction code can also be erased by turning the ignition switch to ON and sending the malfunction code erase signal from the MUT to the engine control unit.

Caution

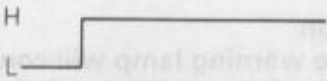
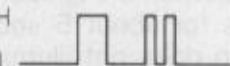
If the sensor connector is disconnected with the ignition switch turned on, the malfunction code is memorized. In this case, send the malfunction code erase signal from the MUT to the engine control unit and the diagnosis memory will be erased.

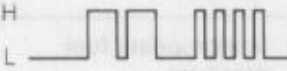
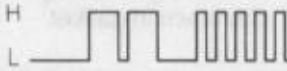
The 15 diagnosis items are provided as follows, and if plural items are activated, they are all indicated sequentially from the smallest code number.

Caution

The malfunction code of ignition timing adjustment signal is outputted when terminal for ignition timing adjustment is short-circuited. Therefore, it is not abnormal that the code is outputted even when terminal for ignition timing adjustment is short-circuited at the time of ignition timing adjustment.

Diagnosis Chart

Output preference order	Diagnosis item	Malfunction code			Check item (Remedy)
		Output signal pattern	No.	Memory	
1	Engine control unit	 12A0104	—	—	(Replace engine control unit)
2	Oxygen sensor	 12A0104	11	Retained	• Harness and connector • Fuel pressure • Injectors (Replace if defective.) • Intake air leaks • Oxygen sensor
3	Air flow sensor	 12A0104	12	Retained	• Harness and connector (If harness and connector are normal, replace air flow sensor assembly.)
4	Intake air temperature sensor	 12A0104	13	Retained	• Harness and connector • Intake air temperature sensor
5	Throttle position sensor	 12A0104	14	Retained	• Harness and connector • Throttle position sensor • Idle position switch
6	Coolant temperature sensor	 12A0107	21	Retained	• Harness and connector • Coolant temperature sensor

Output preference order	Diagnosis item	Malfunction code			Check item (Remedy)
		Output signal pattern	No.	Memory	
7	Crank angle sensor	 12A0107	22	Retained	• Harness and connector (If harness and connector are normal, replace distributor <SOHC> or crank angle sensor <DOHC> assembly.)
8	Top dead centre sensor	 12A0107	23	Retained	• Harness and connector (If harness and connector are normal, replace distributor <SOHC> or crank angle sensor <DOHC> assembly.)
9	Vehicle speed sensor (reed switch)	 12A0107	24	Retained	• Harness and connector • Vehicle speed sensor (reed switch)
10	Barometric pressure sensor	 12A0107	25	Retained	• Harness and connector (If harness and connector are normal, replace barometric pressure sensor assembly.)
11	Detonation sensor	 12A0107	31	Retained	• Harness and connector (If harness and connector are normal, replace detonation sensor)
12	Ignition timing adjustment signal	 12A0107	36	—	• Harness and connector
13	Injector	 12A0105	41	Retained	• Harness and connector • Injector coil resistance
14 <DOHC>	Ignition coil, power transistor unit	 12A0105	44	Retained	• Harness and connector • Ignition coil • Power transistor unit
14 <SOHC>	Servo valve position sensor	 12A0106	55	Retained	• Harness and connector • Servo valve position sensor • Idle speed control servo (DC motor)
15	Normal state	 12A0104	—	—	—

NOTE

1. Replace the engine control unit if a malfunction code is output although the inspection reveals that there is no problem with the check items.
2. The code numbers will be displayed in order, starting from the lowest.

PROBLEM DIAGNOSIS CONTENT CHART

NOTE

*: Fail-Safe/backup function is operating.

Malfunction code No.	Diagnosis item	Diagnosis contents	Probable cause	Remarks (Trouble symptom, etc.)
—	Engine control unit	Abnormality in engine control unit	—	● Engine stalls ● Starting is impossible
11	Oxygen sensor	Oxygen sensor signal voltage does not change (lean/rich) even when air/fuel ratio feedback control (close loop control) operates.	(1) Oxygen sensor malfunction (2) Open circuit or short circuit in oxygen sensor, or connector contact is defective	● Reduction in exhaust gas purification efficiency*
			(3) Inappropriate fuel pressure (4) Injector malfunction (5) Air leaking in through clearance in gasket	● Reduction in exhaust gas purification efficiency* ● Poor starting ● Unstable idling ● Poor acceleration
12	Air flow sensor	Frequency of air flow sensor signal is 10 Hz or less, even though engine is running.	(1) Air flow sensor malfunction (2) Open circuit or short circuit in air flow sensor, or connector contact is defective	● Poor acceleration* ● Inappropriate idle speed* ● Unstable idling*
13	Intake air temperature sensor	(1) Voltage of intake air temperature sensor signal is 4.5V or more. (2) Voltage of intake air temperature sensor signal is 0.27V or less.	(1) Intake air temperature sensor malfunction (2) Open circuit or short circuit in the intake air temperature sensor, or connector contact is defective	● Slightly poor driveability* ● At high temperatures: (a) Poor starting* (b) Unstable idling*
14	Throttle position sensor	(1) Voltage of throttle position sensor signal is 0.2V or less. (2) Voltage of throttle position sensor signal is 2V or more, even though idle position switch is ON.	(1) Throttle position sensor malfunction, or adjustment is defective (2) Open circuit or short circuit in throttle position sensor, or connector contact is defective	● Slightly poor acceleration <M/T> ● Poor driveability <A/T> ● Engine stalls
			(3) Idle position switch ON malfunction (4) Short circuit in idle position switch signal wire	● Engine stalls ● Racing is impossible

Malfunction code No.	Diagnosis item	Diagnosis contents	Probable cause	Remarks (Trouble symptom, etc.)
21	Coolant temperature sensor	(1) Voltage of coolant temperature sensor signal is 4.6V or more. (2) Voltage of coolant temperature sensor signal is 0.11V or less. (3) While engine is warming up, coolant temperature sensor signal shows a drop in engine coolant temperature.	(1) Coolant temperature sensor malfunction. (2) Open circuit or short circuit in coolant temperature sensor, or connector contact is defective.	When engine is cold: • Poor starting* • Unstable idling* • Poor acceleration*
22	Crank angle sensor	Voltage of crank angle sensor signal does not change (high/low), even though engine has been cranking for 4 seconds or more.	(1) Crank angle sensor malfunction. (2) Open circuit or short circuit in crank angle sensor, or connector contact is defective.	• Engine stalls • Starting is impossible
23	Top dead centre sensor	Voltage of top dead centre sensor signal does not change (high/low), even though engine is running.	(1) Top dead centre sensor malfunction. (2) Open circuit or short circuit in top dead centre sensor, or connector contact is defective.	• Engine stalls* <DOHC> • Unstable idling* <SOHC> • Poor acceleration* <SOHC>
24	Vehicle speed sensor (reed switch)	Voltage of vehicle speed sensor does not change (high/low) even though vehicle is accelerating at an engine speed of 3,000 r/min. or more.	(1) Vehicle speed sensor malfunction. (2) Open circuit or short circuit in vehicle speed sensor, or connector contact is defective.	Engine stalls when vehicle stops after decelerating

Malfunction code No.	Diagnosis item	Diagnosis contents	Probable cause	Remarks (Trouble symptom, etc.)
25	Barometric pressure sensor	(1) Voltage of barometric pressure sensor signal is 4.5V or more. (2) Voltage of barometric pressure sensor signal is 0.2V or less.	(1) Barometric pressure sensor malfunction (2) Open circuit or short circuit in barometric pressure sensor, or connector contact is defective	● Poor starting* ● Unstable idling* ● Poor acceleration*
31	Detonation sensor	Detonation sensor signal voltage is abnormal.	(1) Detonation sensor malfunction (2) Open circuit or short circuit in detonation sensor, or connector contact is defective	● Poor acceleration*
36	Ignition timing adjustment signal	Ignition timing adjustment signal wire is short-circuited to earth.	(1) Ignition timing adjustment signal wire is short-circuited to earth	● Poor acceleration ● Engine overheats
41	Injector	Injectors do not operate for a continuous 4 second period while engine is cranking or idling.	(1) Injector malfunction (2) Open circuit or short circuit in injector, or connector contact is defective	● Poor starting ● Unstable idling ● Poor acceleration
44	Ignition coil, power transistor unit <DOHC>	Ignition signal is not input while engine is running. However, this excludes cases where no ignition signal is input to any cylinders.	(1) Ignition coil malfunction (2) Open circuit or short circuit in ignition primary circuit, or connector contact is defective (3) Power transistor unit malfunction	● Unstable idling* ● Poor acceleration* ● Poor starting*

Malfunction code No.	Diagnosis item	Diagnosis contents	Probable cause	Remarks (Trouble symptom, etc.)
55	Servo valve position sensor <SOHC>	Servo valve does not move to the intended position (opening angle), even though idle speed control servo motor operates many times.	(1) Servo valve position sensor malfunction (2) Open circuit or short circuit in servo valve position sensor, or connector contact is defective (3) Idle speed control servo motor (DC motor) malfunction (4) Open circuit or short circuit in idle speed control servo motor (DC motor), or connector contact is defective	• Inappropriate idle speed* • Engine stops* • Unstable idling*

FAIL-SAFE/BACKUP FUNCTION TABLE

When the main sensor malfunctions are detected by the self-diagnosis function, the vehicle is controlled by means of the pre-set control logic to maintain safe conditions for driving.

Malfunctioning item	Control contents during malfunction
Air flow sensor	(1) Determines the fuel injection timing and ignition timing by means of the throttle position sensor (TPS) signal and the engine speed signal (crank angle sensor signal). (2) Fixes the ISC servo in the appointed position so idle speed control is not performed.
Intake air temperature sensor	Controls as if the intake air temperature is 25°C (77°F).
Throttle position sensor (TPS)	No increase in fuel injection amount during acceleration due to the throttle position sensor signal.
Coolant temperature sensor	Controls as if the coolant temperature is 80°C (176°F).
Top dead centre sensor	(1) Injects fuel into the cylinders in the order 1-3-4-2 with irregular timing. (However, after the ignition switch is turned to ON, the No. 1 cylinder top dead centre is not detected at all.) (2) After 4 seconds from a malfunction being detected, the fuel supply is cut off. <DOHC> (However, when the No. 1 cylinder top dead centre is not detected after the ignition switch is turned to ON.)
Barometric pressure sensor	Controls as if the barometric pressure is 101 kPa (760 mmHg, 30 in.Hg).
Detonation sensor	Retards the ignition timing from normal ignition timing to timing where knocking doesn't occur.
Ignition coil, power transistor unit <DOHC>	Cuts off the fuel supply to cylinders with an abnormal ignition signal.
Servo valve position sensor <SOHC>	Idle speed control is not performed.
Oxygen sensor	Air/fuel ratio feedback control (closed loop control) is not performed.

READ OUT OF MALFUNCTION CODE

Refer to P.13-123-54.

CHECK CHART CLASSIFIED BY PROBLEM SYMPTOMS

Problem symptoms Check items	Starting		Idling stability			Driving						Stop- ping	Reference page
	Will not start	Starting problem	Idling instability (Rough idling)	Incorrect idling speed	Improper idling continuity	Hesitation, sag	Poor acceleration	Stumble	Shock	Surge	Knocking	Run-on (Dieseling)	
Power supply	① ①												P.13-123-68 <SOHC> P.13-123-147 <DOHC>
Engine control unit power earth	② ②												P.13-123-71
Fuel pump	③ ③	① ①			① ①	① ①	① ①						P.13-123-72
Air flow sensor					⑫ ⑫	⑨ ⑨		⑤ ⑤	⑥ ⑥		④ ④		P.13-123-150
Intake air temperature sensor			⑥			⑤ ⑤	④ ④				② ②		P.13-123-154
Barometric pressure sensor			⑧			⑧ ⑧	⑥ ⑥				③ ③		P.13-123-157
Coolant temperature sensor		③	⑦ ⑥	① ①	⑥ ⑥	⑦ ⑦	⑤ ⑤	④ ④		③ ③			P.13-123-159
Throttle position sensor						⑥ ⑥		③ ③	④ ④				P.13-123-83
Idle position switch			④ ④	② ②	⑤ ⑤								P.13-123-86
Servo valve position sensor <SOHC>			③ ③	⑥ ③	④ ④				⑤ ⑤				P.13-123-88
Top dead centre sensor	⑤ ⑤	⑥ ⑦			⑨ ⑨				② ②				P.13-123-162 <SOHC> P.13-123-163 <DOHC>
Crank angle sensor	⑥ ⑥	⑦ ⑧			⑩ ⑨				③ ③				P.13-123-167 <SOHC> P.13-123-169 <DOHC>
Ignition switch-ST	④ ④	③ ④											P.13-123-98
Ignition switch-ST and inhibitor switch (A/T)	④ ④	③ ④		⑤									P.13-123-172
Vehicle speed sensor					⑦				⑦				P.13-123-99
Power steering fluid pressure switch				③									P.13-123-101
Air conditioner switch and power relay				④									P.13-123-103
Detonation sensor											① ①		P.13-123-174
Oxygen sensor			⑩										P.13-123-176
Injectors	⑧ ⑧	② ②	② ②		③ ③	② ②	② ②	① ①		① ①		①	P.13-123-181
Idle speed control servo		④ ⑤	① ①	⑦ ④	② ②				⑧ ⑦				P.13-123-114 <SOHC> P.13-123-183 <DOHC>
Ignition coil and power transistor	⑦ ⑦				⑪ ⑩		⑦ ⑦		① ①		⑥ ⑤		P.13-123-188 <SOHC> P.13-123-189 <DOHC>
Purge control solenoid valve			⑨										P.13-123-120
EGR control solenoid valve						④ ④		⑥ ⑥		④ ④			P.13-123-193
Fuel pressure		⑤ ⑥	⑤ ⑤		⑧ ⑦	③ ③	③ ③	② ②		② ②			P.13-123-194

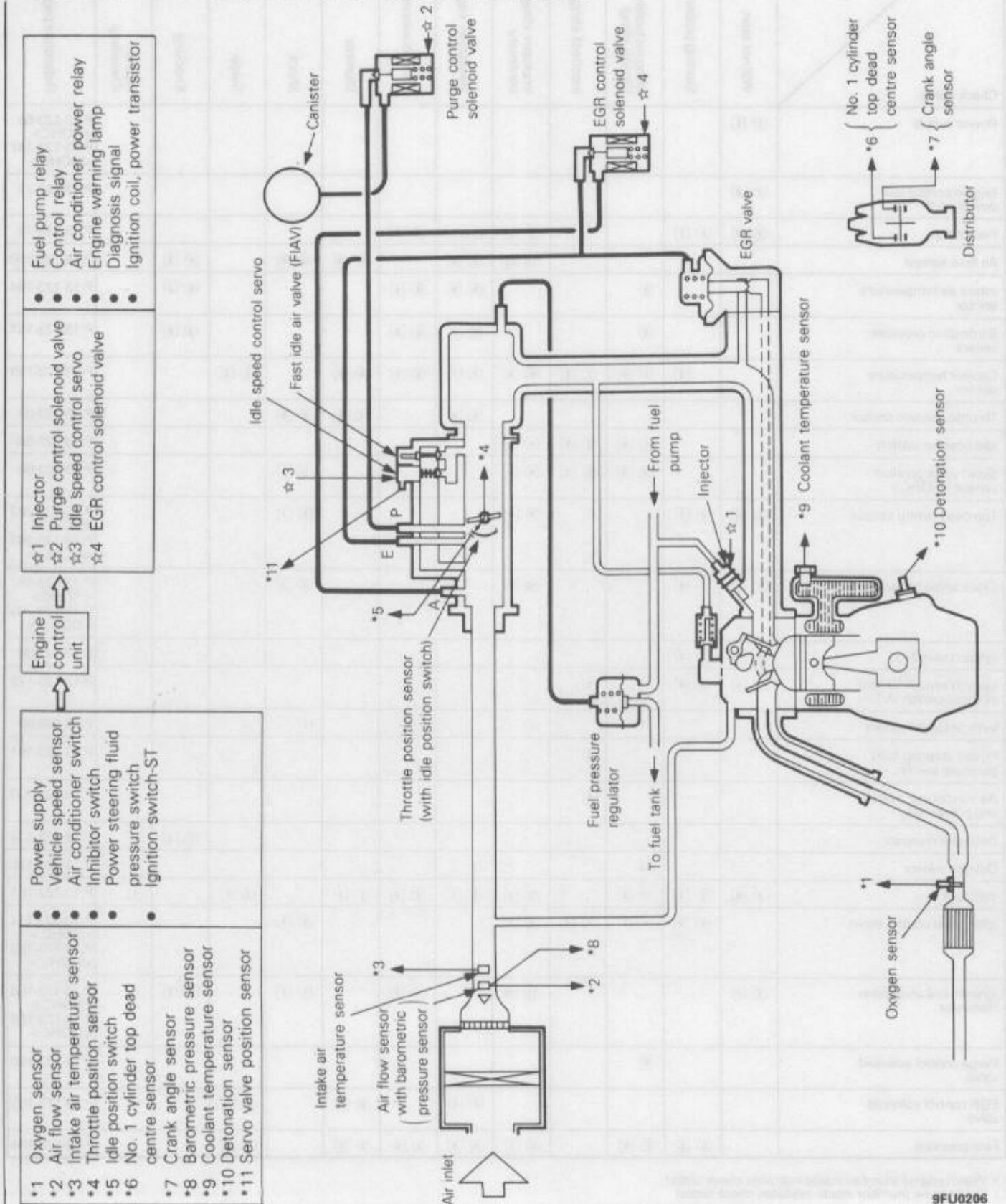
○: Warm engine (number inside indicates check order)
□: Cold engine (number inside indicates check order)

PROBLEM SYMPTOM TABLE (FOR YOUR INFORMATION)

Refer to P.13-123-57.

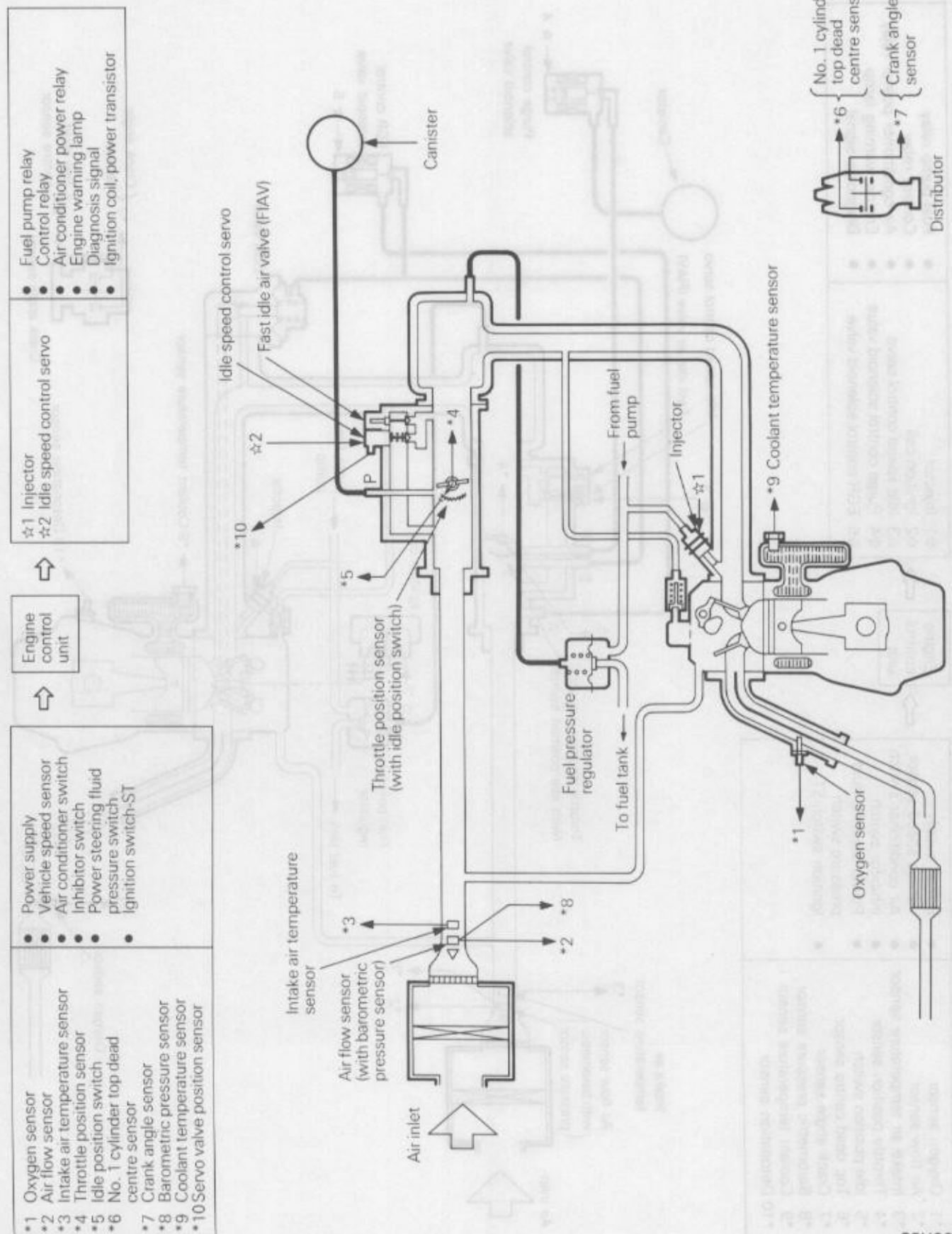
VACUUM HOSE PIPING DIAGRAM

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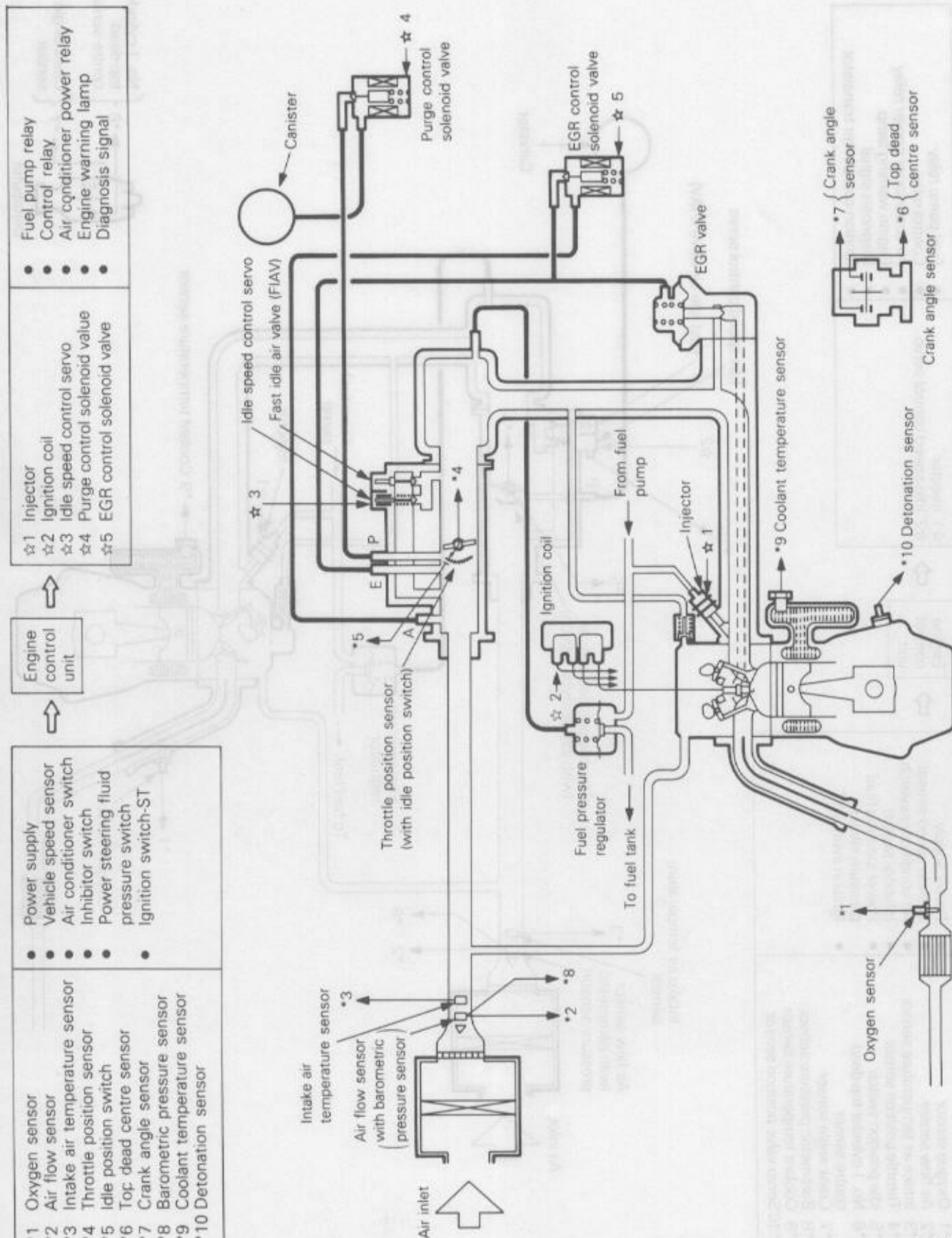


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<4G92-SOHC — Vehicles for Australia>



<4G93-DOHC>



9FU0207

**THROTTLE BODY (THROTTLE VALVE AREA)
CLEANING**

E13HAJF

Refer to P.13-123-59.

**IDLE POSITION SWITCH AND THROTTLE POSITION
SENSOR ADJUSTMENT**

E13HAKJ

Refer to P.13-123-59.

Fixed SAS-to-throttle lever distance
(to be adjusted with feeler gauge): 0.65 mm (0.0256 in.)**FIXED SAS ADJUSTMENT**

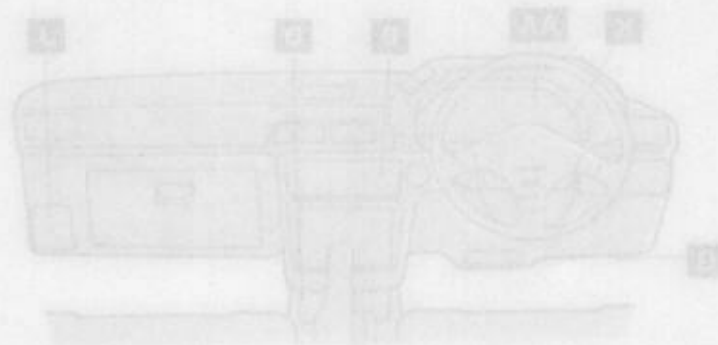
E13HAMF

Refer to P.13-123-61.

BASIC IDLE SPEED ADJUSTMENT

E13HANI

Refer to P.13-123-61.

Standard value: 800 r/min.

COMPONENTS LOCATION

E130AAJ

Name	Symbol	Name	Symbol
Air conditioner relay	A	Idle speed control servo	M ^{*1} , N ^{*2}
Air conditioner switch	B	Ignition coil (power transistor)	O ^{*1} , P ^{*2}
Air flow sensor (with incorporated intake air temperature sensor and barometric pressure sensor)	C	Ignition timing adjustment connector	Q
		Inhibitor switch <A/T>	R
Control relay	D	Injector	S
Coolant temperature sensor	E ^{*1} , F ^{*2}	Oxygen sensor	T ^{*3} , U ^{*4}
Diagnosis connector	G	Power steering fluid pressure switch	V
Detonation sensor	H ^{*3}	Purge control solenoid valve	W ^{*2}
EGR control solenoid valve	I ^{*3}	Throttle position sensor (with idle position switch)	X
Engine control unit	J	Top dead centre sensor and crank angle sensor	Y ^{*1} , Z ^{*2}
Engine warning lamp (check engine lamp)	K	Vehicle speed sensor (reed switch)	AA
Fuel pump check terminal	L		

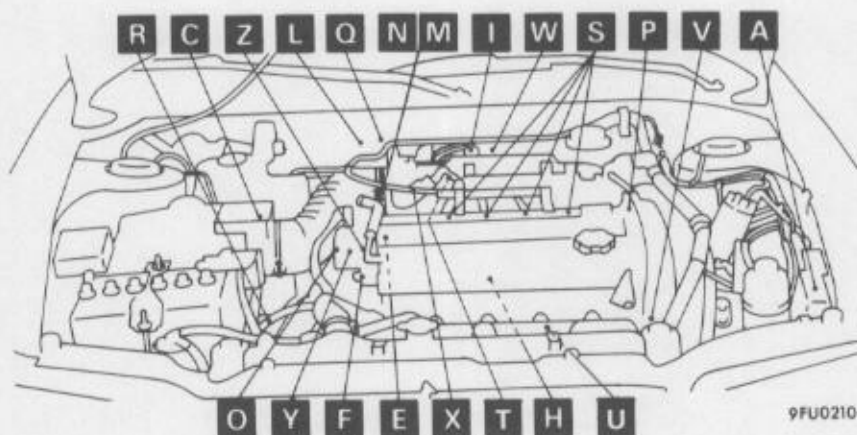
NOTE

*1: <SOHC>

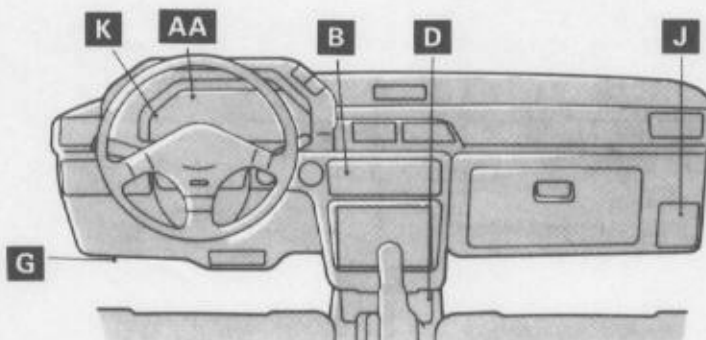
*2: <DOHC>

*3: Vehicles for Europe and General Export

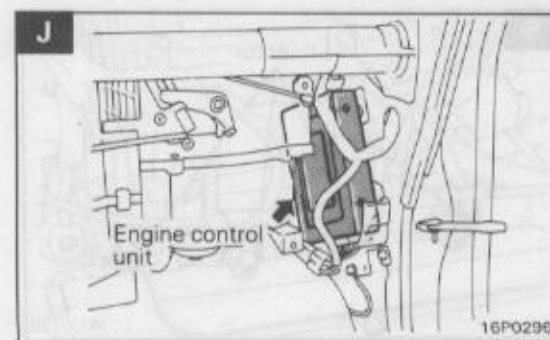
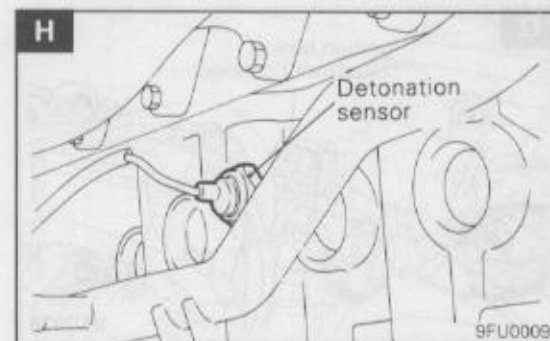
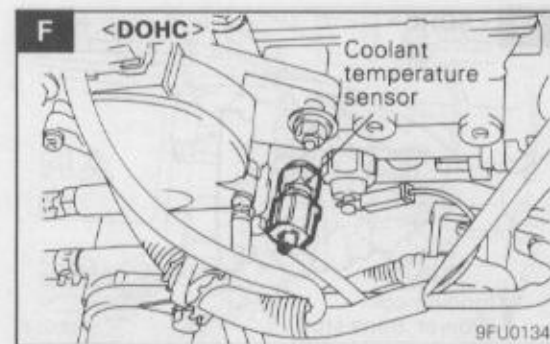
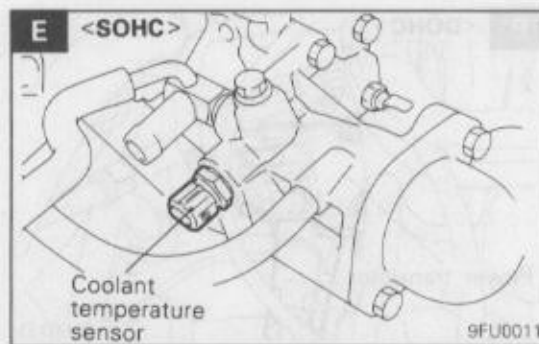
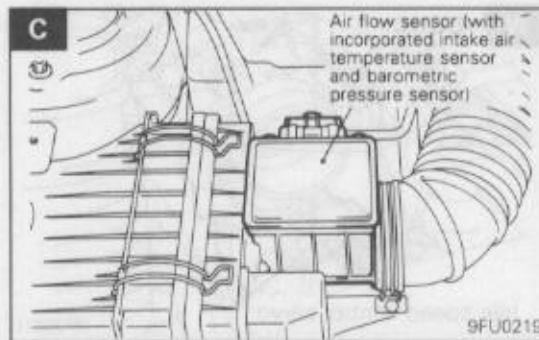
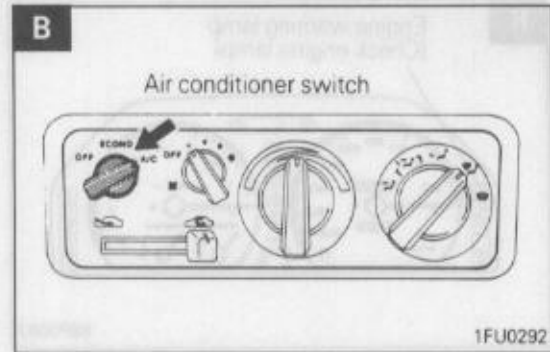
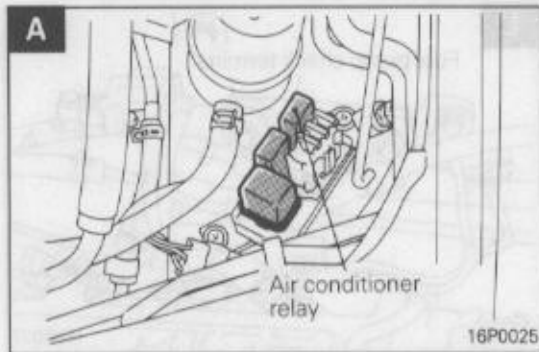
*4: Vehicles for Australia

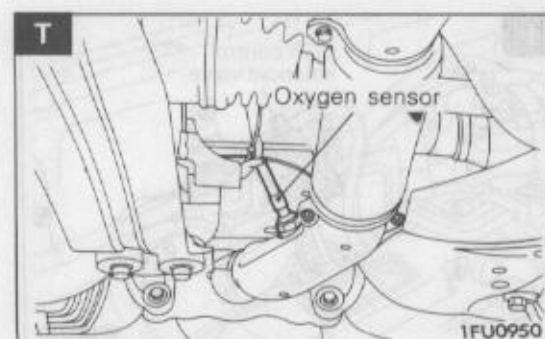
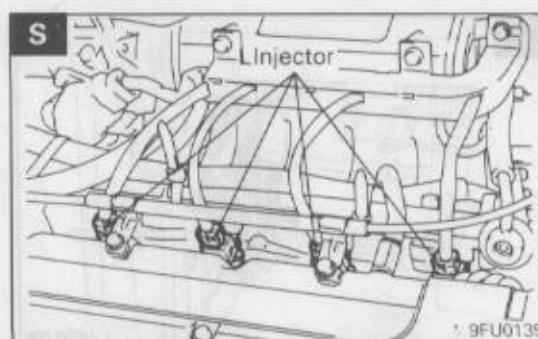
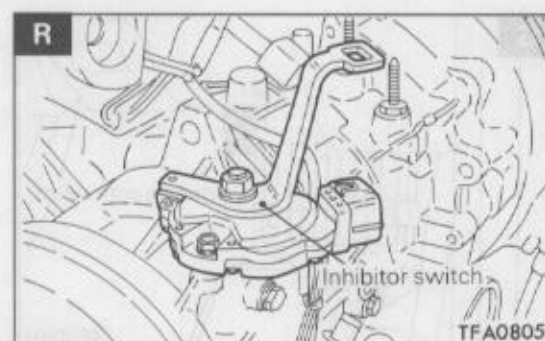
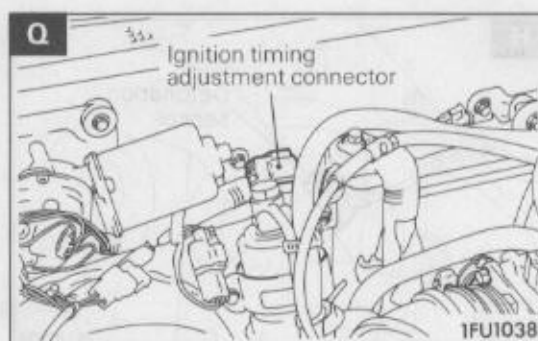
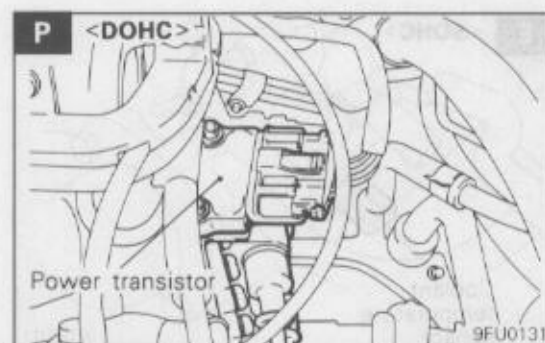
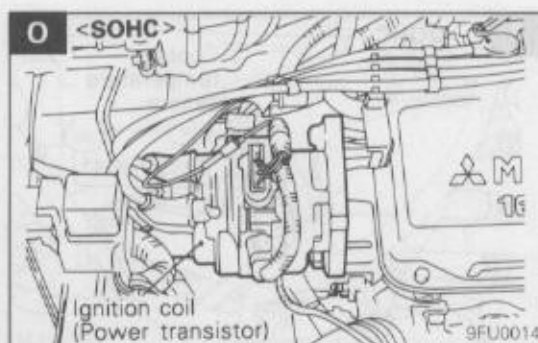
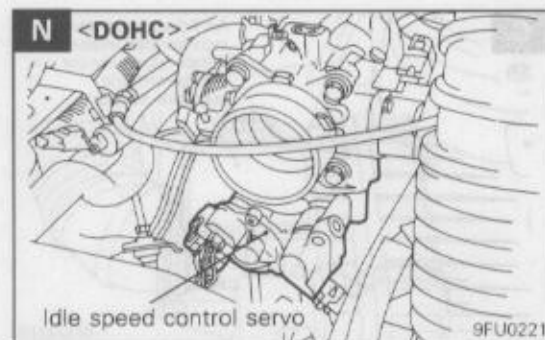
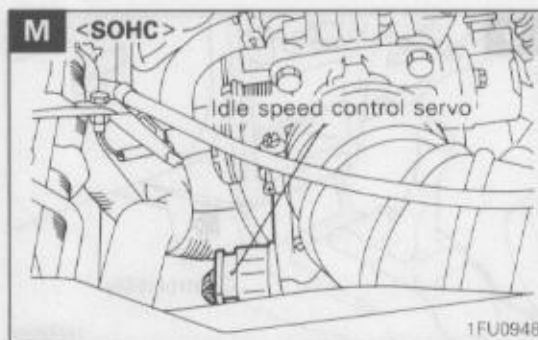
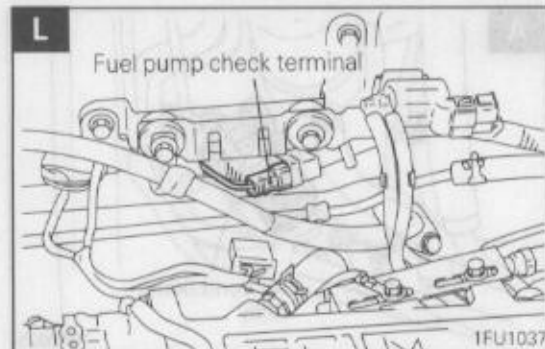
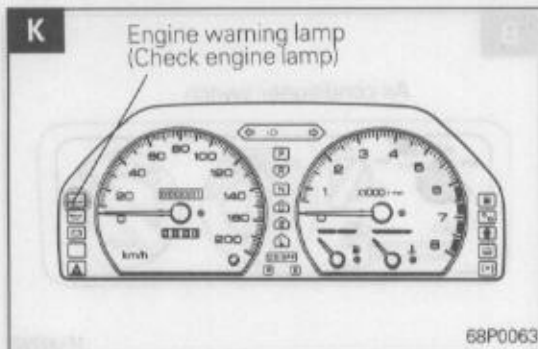


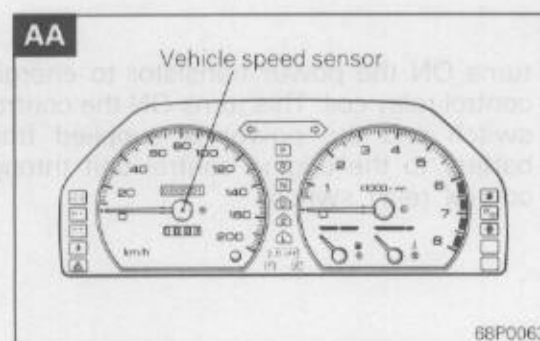
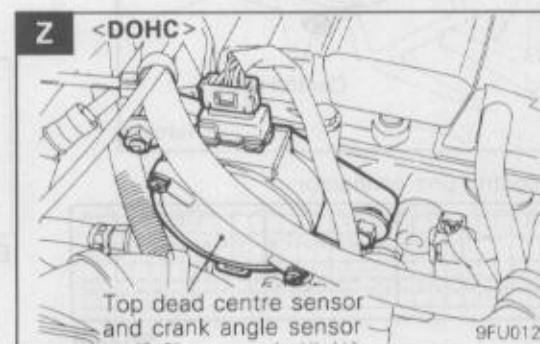
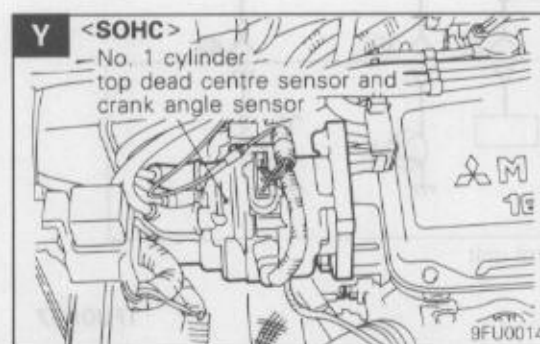
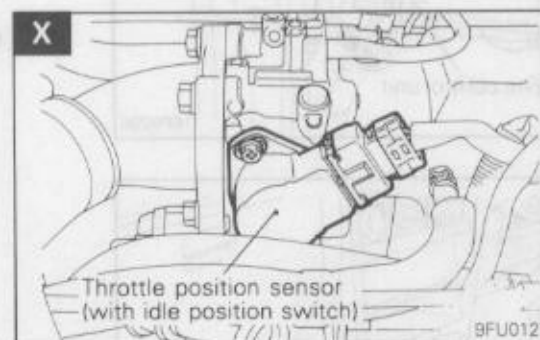
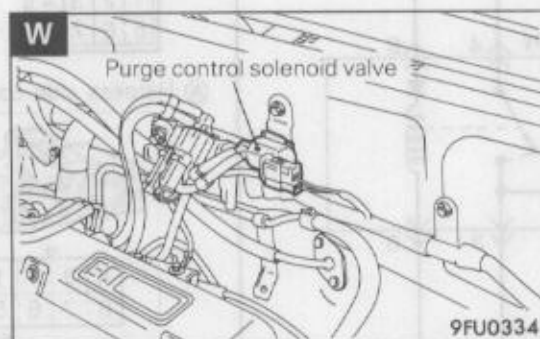
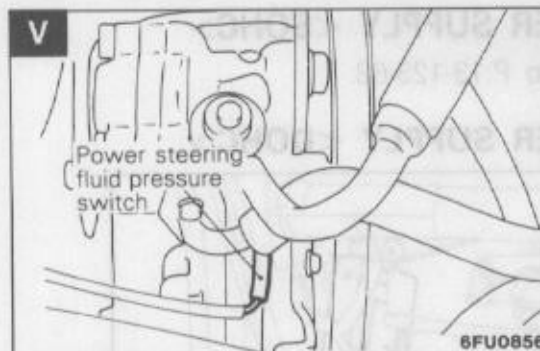
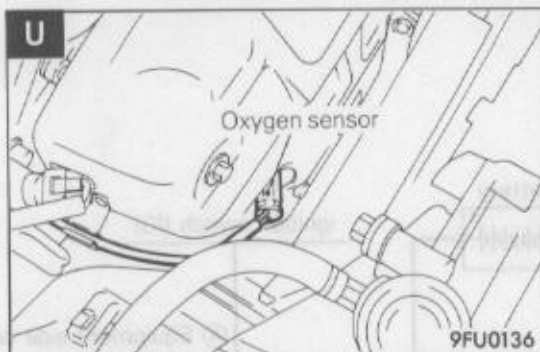
9FU0210



6FU1023





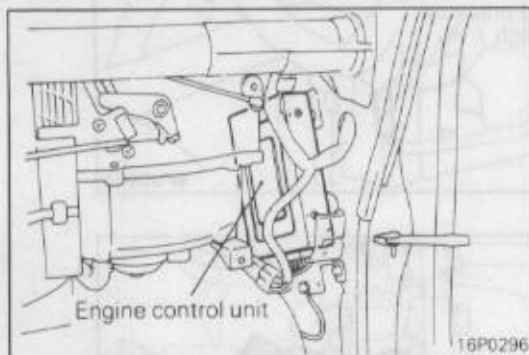


INSPECTION PROCEDURE USING THE MULTI-USE TESTER (MUT)

Refer to P.13-123-67.

POWER SUPPLY <SOHC>

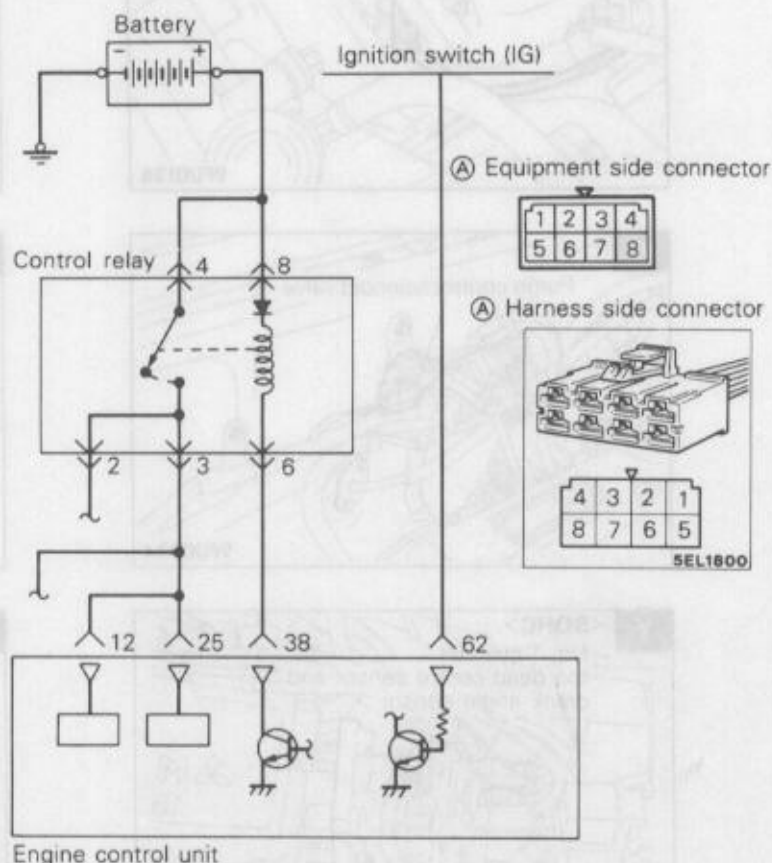
Refer to P.13-123-68.

POWER SUPPLY <DOHC>

Engine control unit connector

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62
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9FU0101



1FU0807

OPERATION

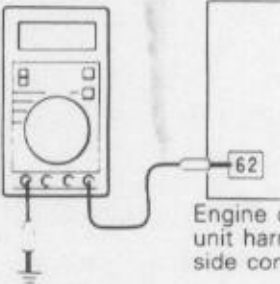
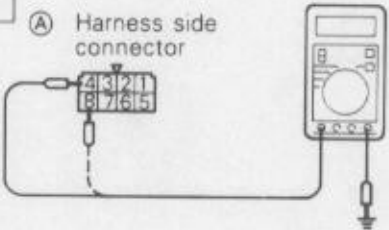
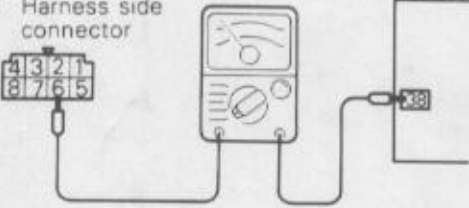
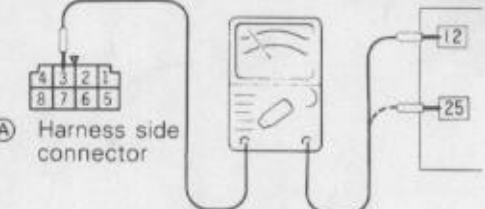
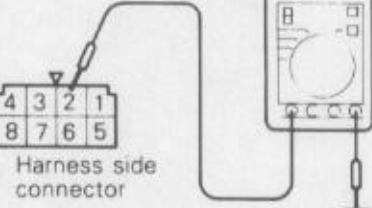
- While the ignition switch is ON, battery power is supplied to the engine control unit, the injector, the air flow sensor, etc.
- When the ignition switch is turned ON, the battery voltage is applied from the ignition switch to the engine control unit, which then

turns ON the power transistor to energize the control relay coil. This turns ON the control relay switch and the power is supplied from the battery to the engine control unit through the control relay switch.

INSPECTION**Using MUT**

Function	Item No.	Data display	Check condition	Standard value
Data reading	16	Engine control unit power voltage	Ignition switch: ON	SV

HARNESS INSPECTION

1  Engine control unit harness side connector 01L0427	Measure the ignition switch terminal input voltage. Engine control unit connector: Disconnected <table border="1"> <thead> <tr> <th>Ignition switch</th> <th>Voltage (V)</th> </tr> </thead> <tbody> <tr> <td>OFF</td> <td>0-1</td> </tr> <tr> <td>ON</td> <td>SV</td> </tr> </tbody> </table> OK → 2 ✗ → Repair the harness. (Ignition switch - (A) 62) or check the ignition switch.	Ignition switch	Voltage (V)	OFF	0-1	ON	SV	2 Repair the harness. (Ignition switch - (A) 62) or check the ignition switch.
Ignition switch	Voltage (V)							
OFF	0-1							
ON	SV							
2  (A) Harness side connector 1FU0808	Measure the power supply voltage of the control relay. Control relay connector: Disconnected <table border="1"> <thead> <tr> <th>Voltage (V)</th> </tr> </thead> <tbody> <tr> <td>SV</td> </tr> </tbody> </table> OK → 3 ✗ → Repair the harness. (Battery - (A) 4) (Battery - (A) 8)	Voltage (V)	SV	3 Repair the harness. (Battery - (A) 4) (Battery - (A) 8)				
Voltage (V)								
SV								
3  (A) Harness side connector Engine control unit harness side connector 1FU0809	Check for open-circuit, or short-circuit to earth, between the engine control unit and the control relay. - Engine control unit connector: Disconnected - Control relay connector: Disconnected OK → 4 ✗ → Repair the harness. (A) 6 - (38)	4 Repair the harness. (A) 6 - (38)						
4  (A) Harness side connector Engine control unit harness side connector 01A0374	Check for open-circuit, or short-circuit to earth, between the engine control unit and the control relay. - Engine control unit connector: Disconnected - Control relay connector: Disconnected OK → 5 ✗ → Repair the harness. (12 - (A) 3) (25 - (A) 3)	5 Repair the harness. (12 - (A) 3) (25 - (A) 3)						
5  (A) Harness side connector 6FU1751	Measure the power voltage to the actuator. - Control relay connector: Connected - Engine control relay connector: Connected <table border="1"> <thead> <tr> <th>Engine</th> <th>Voltage (V)</th> </tr> </thead> <tbody> <tr> <td>Cranking</td> <td>8V or more</td> </tr> <tr> <td>Racing</td> <td>SV</td> </tr> </tbody> </table> OK → STOP ✗ → Replace the control relay.	Engine	Voltage (V)	Cranking	8V or more	Racing	SV	STOP Replace the control relay.
Engine	Voltage (V)							
Cranking	8V or more							
Racing	SV							

CONTROL RELAY INSPECTION

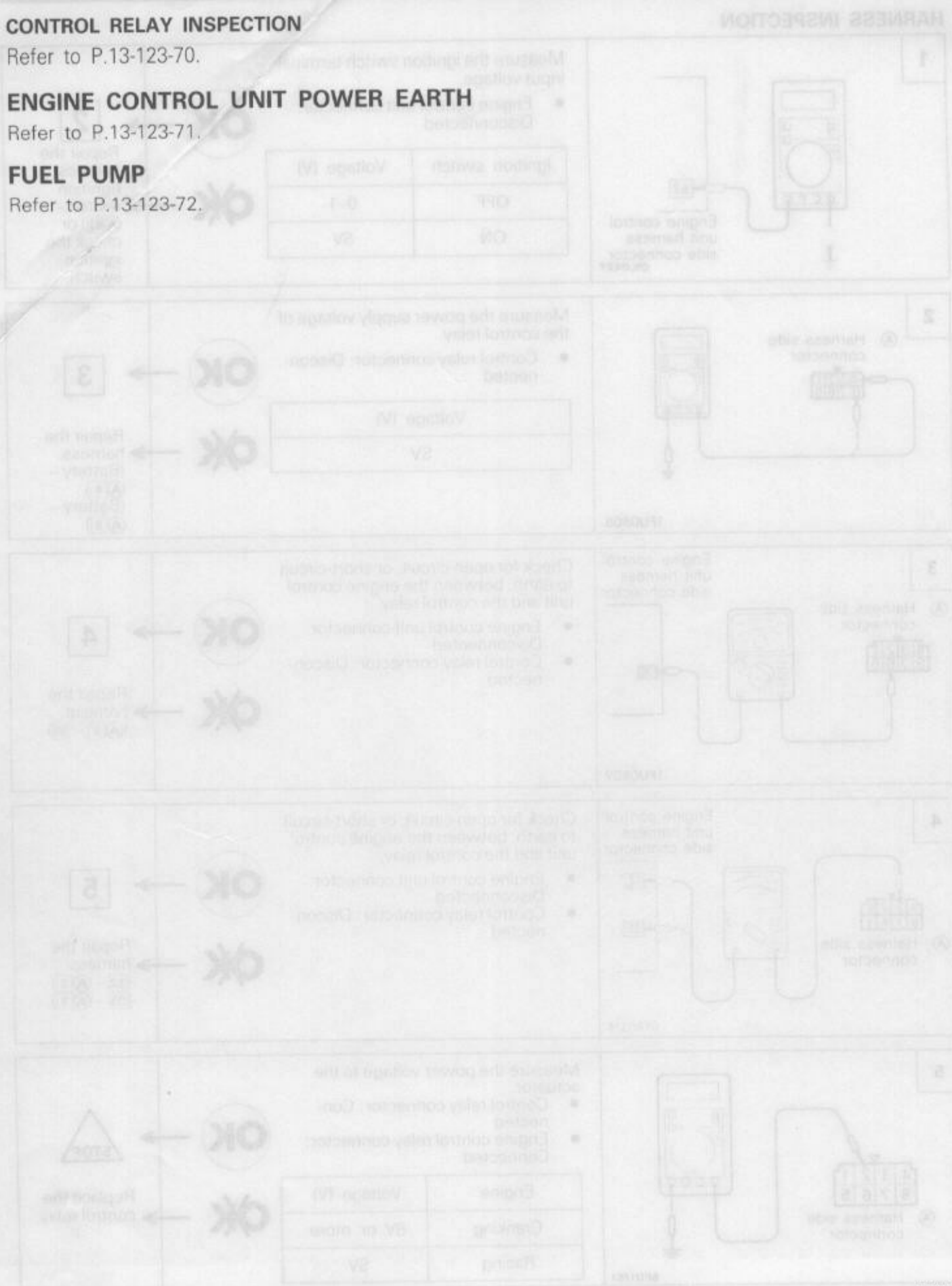
Refer to P.13-123-70.

ENGINE CONTROL UNIT POWER EARTH

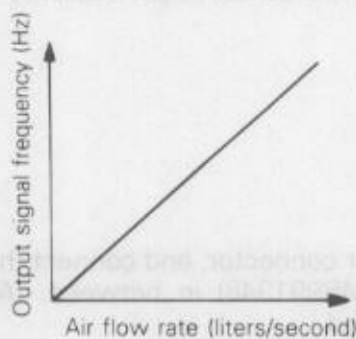
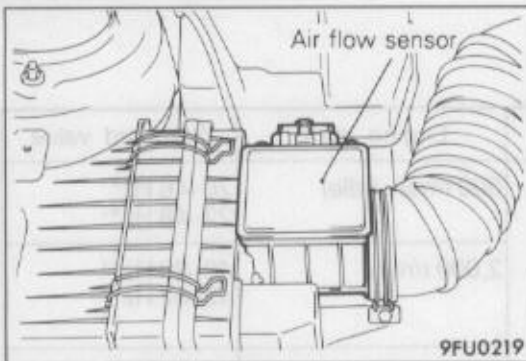
Refer to P.13-123-71.

FUEL PUMP

Refer to P.13-123-72.



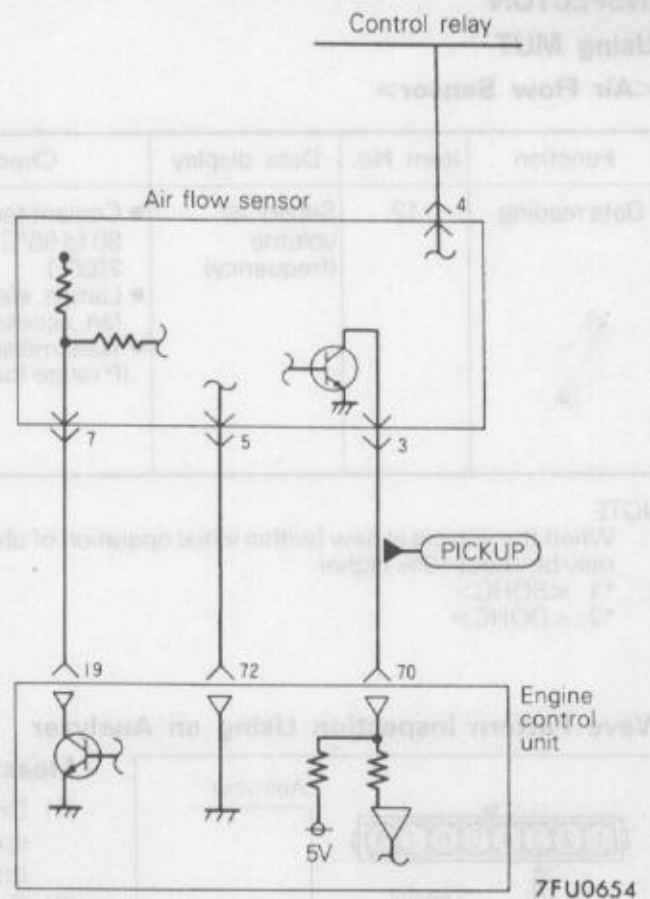
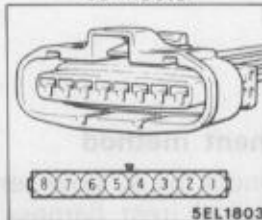
AIR FLOW SENSOR



(A) Equipment side connector



(A) Harness side connector



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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Engine control unit connector

9FU0101

OPERATION

- The air flow sensor located in the air cleaner converts the engine intake air volume into a pulse signal of frequency proportional to the air volume and inputs it to the engine control unit, which then computes the fuel injection rate, etc. based on the input signal.
- The air flow sensor power is supplied from the control relay to the air flow sensor and is earthed by the engine control unit. The air flow sensor generates a pulse signal as it repeatedly connects and disconnects between the 5V voltage supplied from the engine control unit and earth.

TROUBLESHOOTING HINTS

Hint 1: If the engine stalls occasionally, crank the engine and shake the air flow sensor harness. If the engine stalls, poor contact of the air flow sensor connector is suspected.

Hint 2: If the air flow sensor output frequency is other than 0 when the ignition switch is turned ON (but not starting the engine), faulty air flow sensor or engine control unit is suspected.

Hint 3: If the engine can be run idle even though the air flow sensor output frequency is out of specification, troubles are often found in other than the air flow sensor itself.

[Examples]

- Disturbed air flow in the air flow sensor
(Disconnected air duct, clogged air cleaner element)
- Poor combustion in the cylinder
(Faulty spark plug, ignition coil, injector, incorrect compression pressure, etc.)
- Air leaking into the intake manifold through gap of gasket, etc.
- Loose EGR valve seat

INSPECTOR

Using MUT

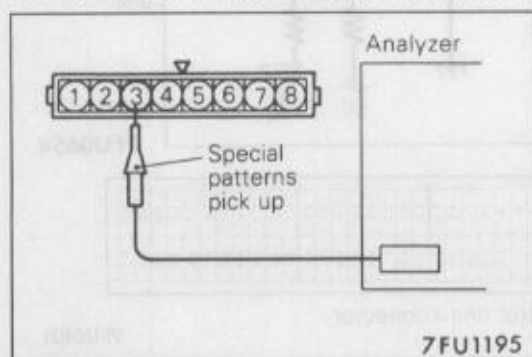
<Air Flow Sensor>

Function	Item No.	Data display	Check condition	Engine state	Standard value
Data reading	12	Sensor air volume (frequency)	- Coolant temperature: 80 to 95°C (176 to 203°F) - Lamps, electric cooling fan, accessories: OFF - Transmission: Neutral (P range for A/T)	800 r/min. (Idle)	20–46 Hz* ¹ 22–48 Hz* ²
				2,000 r/min.	40–80 Hz* ¹ 42–82 Hz* ²
				Racing	Frequency increases with racing

NOTE

- When the vehicle is new [within initial operation of about 500 km (300 miles)], the air flow sensor output frequency may be about 10% higher.
- *1: <SOHC>
*2: <DOHC>

Wave Pattern Inspection Using an Analyzer



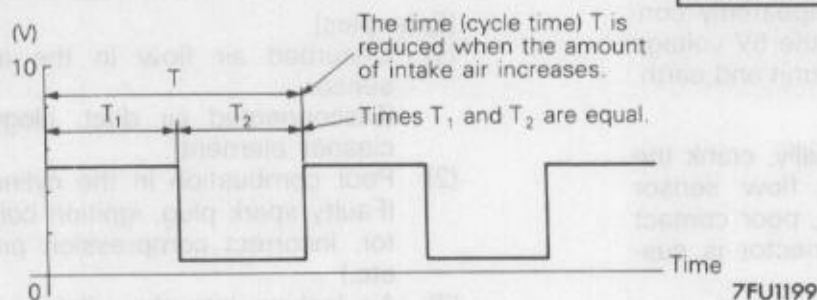
Measurement method

- Disconnect the air flow sensor connector, and connect the special tool (test harness: MB991348) in between. (All terminals should be connected.)
- Connect the analyzer special patterns pickup to air flow sensor connector terminal ③.

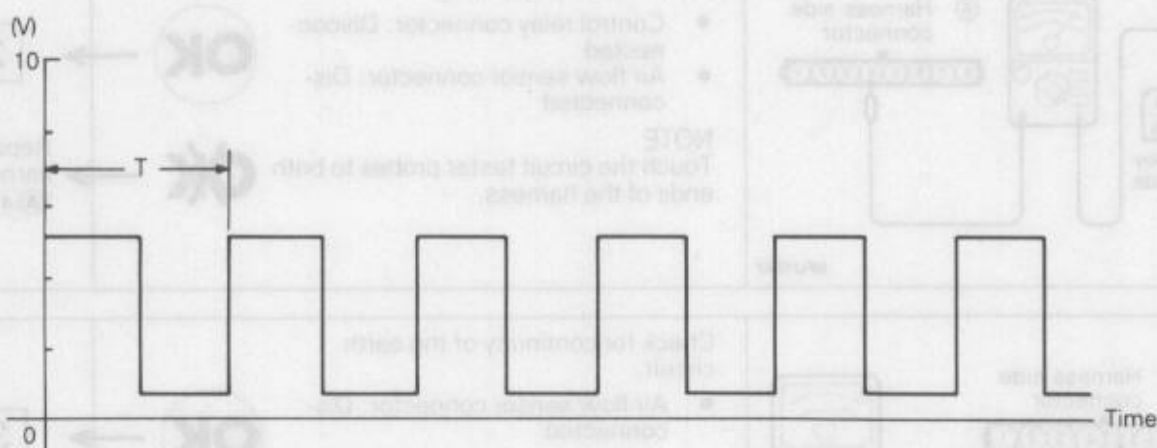
Standard wave pattern

Observation conditions

Function	Special patterns
Pattern height	Low
Pattern selector	Display
Engine r/min.	Idle speed (800 r/min.)



Observation conditions (from conditions above engine speed is increased by racing.)



7FU0880

Wave pattern observation points

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



01P0199

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

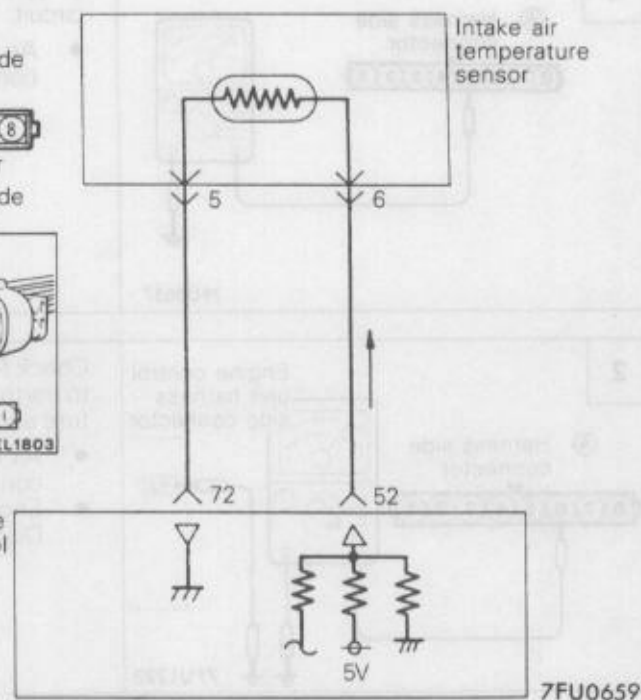
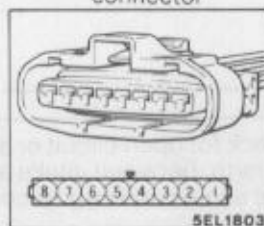
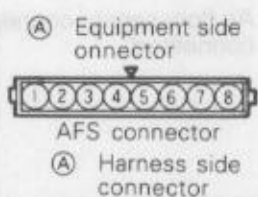
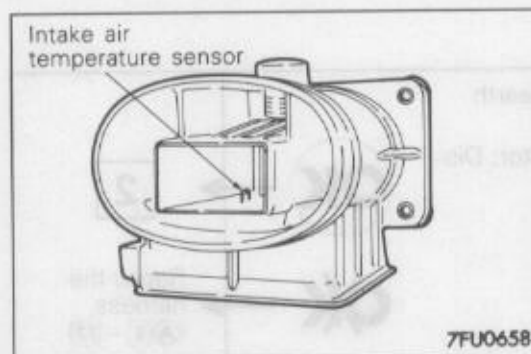
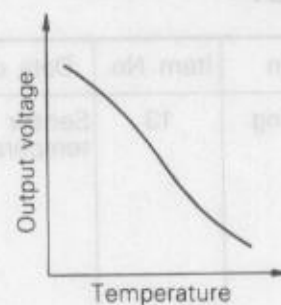
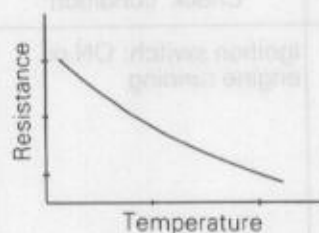
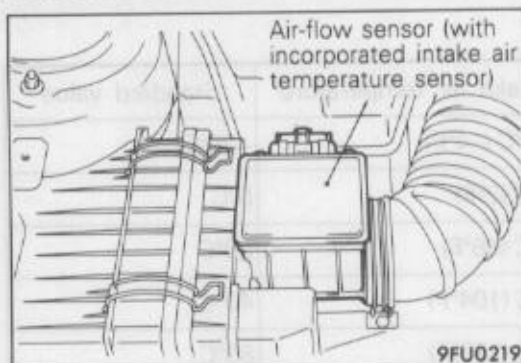
Wave pattern characteristics

Unstable wave pattern with non-uniform frequency. However, when an ignition leak occurs during acceleration, the wave pattern will be distorted temporarily, even if the air flow sensor is normal.

HARNESS INSPECTION

1 Control relay harness side connector Harness side connector 6FU1767	Check for continuity between air flow sensor and control relay. - Control relay connector: Disconnected - Air flow sensor connector: Disconnected NOTE Touch the circuit tester probes to both ends of the harness.	OK → 2 ✗ → Repair the harness. (A4 - B3)		
2 Harness side connector 7FU0657	Check for continuity of the earth circuit. Air flow sensor connector: Disconnected	OK → 3 ✗ → Repair the harness. (A5 - 72)		
3 Harness side connector Engine control unit harness side connector 7FU1222	Check for open-circuit, or short-circuit to earth, between air flow sensor and engine control unit. - Air flow sensor connector: Disconnected - Engine control unit connector: Disconnected	OK → 4 ✗ → Repair the harness. (A3 - 70) (A7 - 19)		
4 Harness side connector 7FU0656	Measure the impressed voltage. - Air flow sensor connector: Disconnected - Engine control unit connector: Disconnected - Ignition switch: ON <table border="1"> <thead> <tr> <th>Voltage (V)</th> </tr> </thead> <tbody> <tr> <td>4.8-5.2</td> </tr> </tbody> </table>	Voltage (V)	4.8-5.2	OK → STOP ✗ → Replace the engine control unit.
Voltage (V)				
4.8-5.2				

INTAKE AIR TEMPERATURE SENSOR



Engine control unit connector

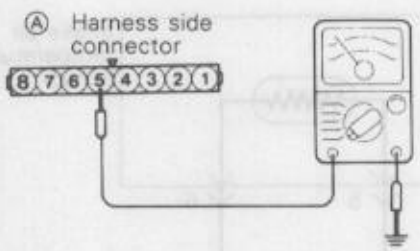
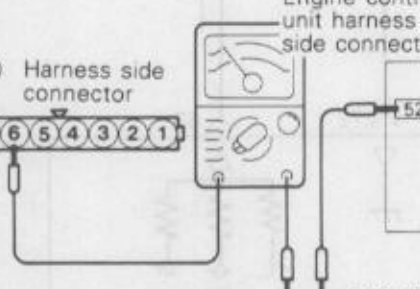
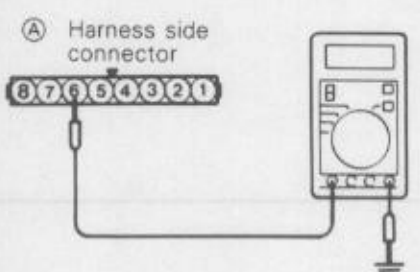
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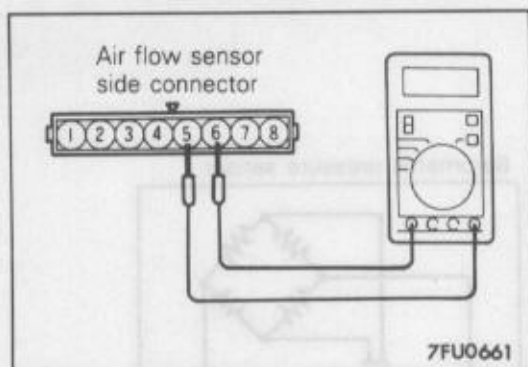
INSPECTION

Using MUT

Function	Item No.	Data display	Check condition	Intake air temperature	Standard value
Data reading	13	Sensor temperature	Ignition switch: ON or engine running	-20°C (-4°F)	-20°C
				0°C (32°F)	0°C
				20°C (68°F)	20°C
				40°C (104°F)	40°C
				80°C (176°F)	80°C

HARNESS INSPECTION

1  (A) Harness side connector 7FU0657	Check for continuity of the earth circuit. Air flow sensor connector: Disconnected OK → 2 ✗ → Repair the harness. (A) 5 - 72		
2  (A) Harness side connector Engine control unit harness side connector 7FU1223	Check for open-circuit or short-circuit to earth, between intake air temperature sensor and engine control unit. - Air flow sensor connector: Disconnected - Engine control unit connector: Disconnected OK → 3 ✗ → Repair the harness. (A) 6 - 52		
3  (A) Harness side connector 7FU0660	Measure the impressed voltage. - Air flow sensor connector: Disconnected - Engine control unit connector: Disconnected - Ignition switch: ON <table border="1"> <tr> <td>Voltage (V)</td> </tr> <tr> <td>4.5-4.9</td> </tr> </table> OK → STOP ✗ → Replace the engine control unit.	Voltage (V)	4.5-4.9
Voltage (V)			
4.5-4.9			



SENSOR INSPECTION

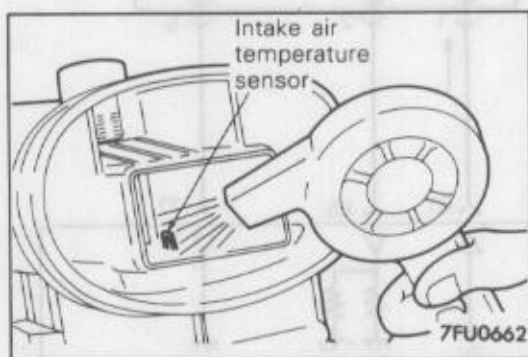
- (1) Disconnect the air flow sensor connectors.
- (2) Measure resistance between terminals ⑤ and ⑥.

Temperature [°C (°F)]	Resistance (kΩ)
0 (32)	6.0
20 (68)	2.7
80 (176)	0.4

- (3) Measure resistance while heating the sensor using a hair drier.

Temperature [°C (°F)]	Resistance (kΩ)
Higher	Smaller

- (4) If the value deviates from the standard value or the resistance remains unchanged, replace the air flow sensor assembly.



7FU0661

Engine control unit connector



7FU0663

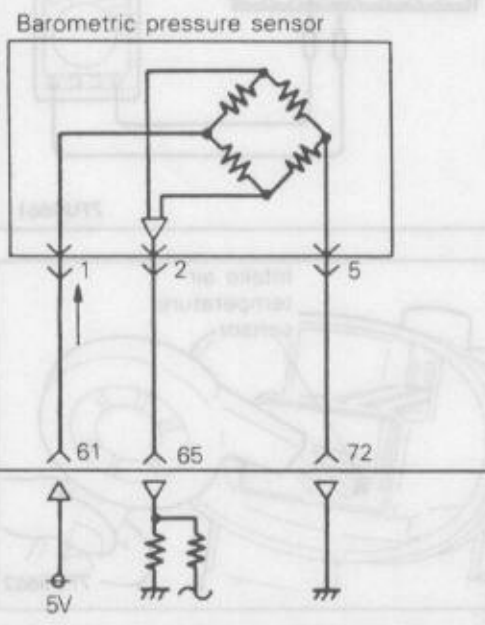
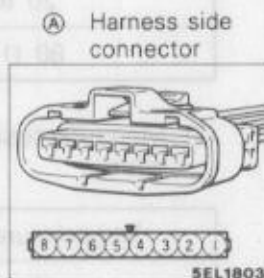
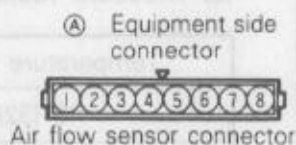
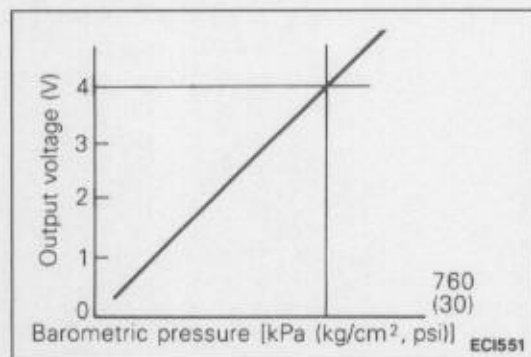
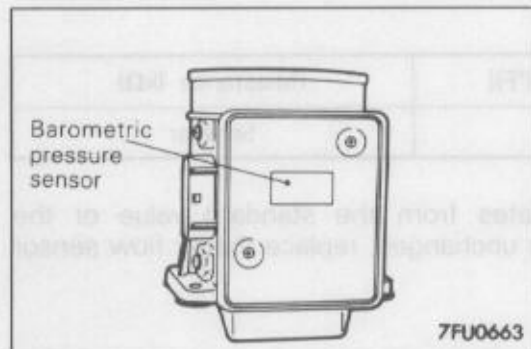
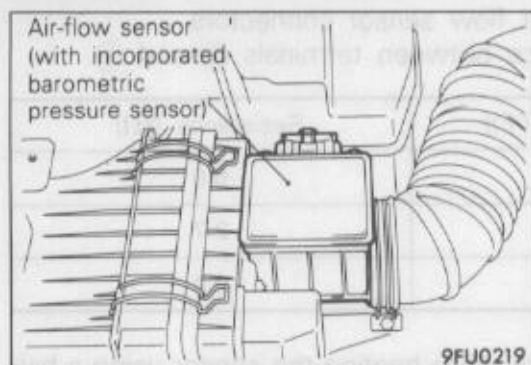
TROUBLESHOOTING HINTS

- Hint 1: If the barometric pressure sensor is faulty, your drivability is ruined at high altitudes in particular.
- Hint 2: If the pressure indication of the barometric pressure sensor drops significantly during high-speed driving, check the air cleaner for clogging.

OPERATION

- The barometric pressure sensor converts the barometric pressure into a voltage and outputs a voltage signal that varies from 0.5V to 4.5V according to the engine coolant temperature and the engine speed.
- The 5V power in the engine control unit is supplied to the barometric pressure sensor. It flows through the circuit in the sensor and is then output to the engine control unit.
- The barometric pressure sensor output voltage, which is proportional to the barometric pressure, is supplied to the engine control unit.

BAROMETRIC PRESSURE SENSOR



7FU0664

Engine control unit connector

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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9FU0101

OPERATION

- The barometric pressure sensor converts the barometric pressure into a voltage and inputs it to the engine control unit, which then corrects the fuel injection rate, etc. based on the input signal.
- The 5V power in the engine control unit is supplied to the barometric pressure sensor. It flows through the circuit in the sensor and is then earthed in the engine control unit.
- The barometric pressure sensor output voltage which is proportional to the barometric pressure (absolute pressure) is supplied to the engine control unit.

TROUBLESHOOTING HINTS

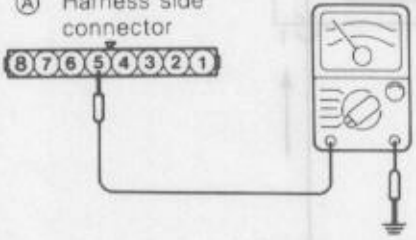
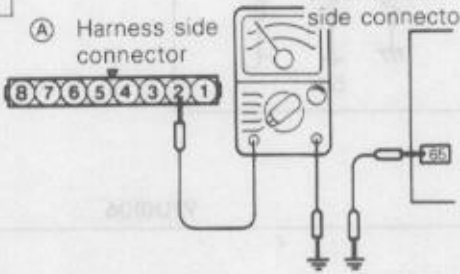
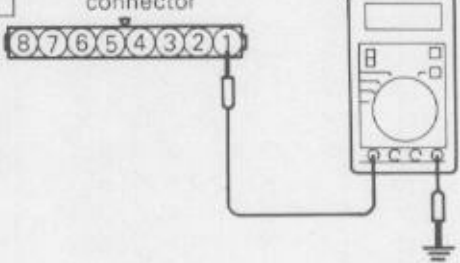
- Hint 1: If the barometric pressure sensor is faulty, poor driveability is caused at high altitude, in particular.
- Hint 2: If the pressure indication of the barometric pressure sensor drops significantly during high speed driving, check the air cleaner for clogging.

INSPECTION

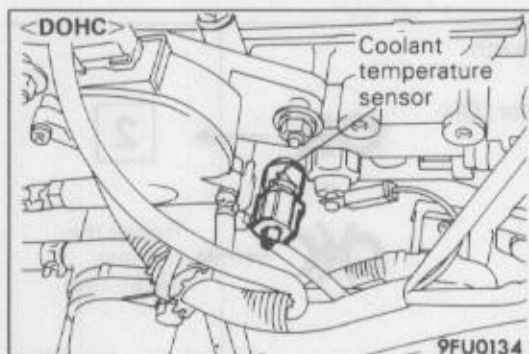
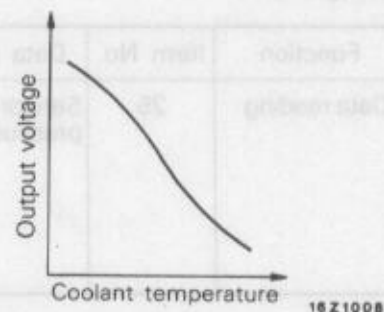
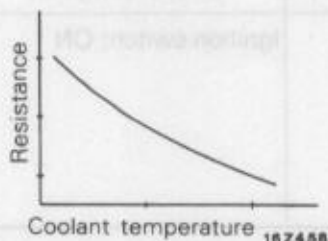
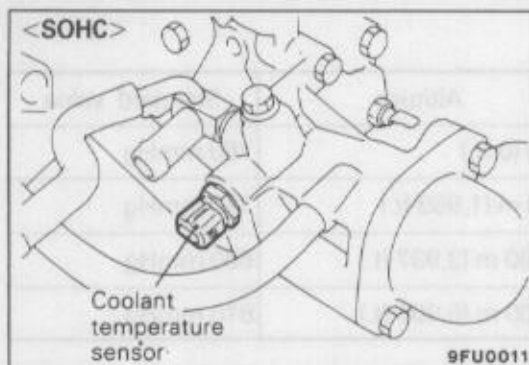
Using MUT

Function	Item No.	Data display	Check condition	Altitude	Standard value
Data reading	25	Sensor pressure	Ignition switch: ON	0 m (0 ft.)	760 mmHg
				600 m (1,969 ft.)	710 mmHg
				1,200 m (3,937 ft.)	660 mmHg
				1,800 m (5,906 ft.)	610 mmHg

HARNESS INSPECTION

1 (A) Harness side connector  7FU0657	Check for continuity of the earth circuit. Air flow sensor connector: Disconnected OK → 2 ✗ → Repair the harness. (A 5 - 72)		
2 (A) Harness side connector Engine control unit harness side connector  7FU0666	Check for an open-circuit, or a short-circuit to earth between the engine control unit and the barometric pressure sensor. - Air flow sensor connector: Disconnected - Engine control unit connector: Disconnected OK → 3 ✗ → Repair the harness. (A 2 - 65)		
3 (A) Harness side connector  7FU0665	Measure the impressed voltage of the barometric pressure sensor. - Air flow sensor connector: Disconnected - Engine control unit connector: Connected - Ignition switch: ON <table border="1"> <tr> <td>Voltage (V)</td> </tr> <tr> <td>4.8-5.2</td> </tr> </table> OK → STOP ✗ → Repair the engine control unit.	Voltage (V)	4.8-5.2
Voltage (V)			
4.8-5.2			

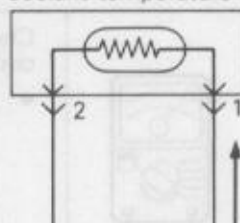
COOLANT TEMPERATURE SENSOR



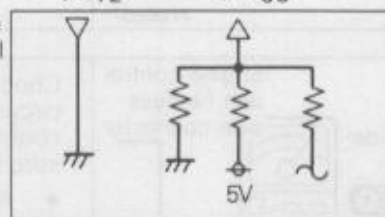
① Equipment side connector



Coolant temperature sensor



Engine control unit



Engine control unit connector

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61

9FU0101

9FU0106

OPERATION

Refer to P.13-123-80.

TROUBLESHOOTING HINTS

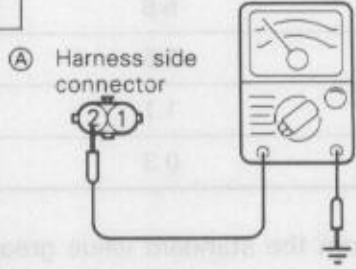
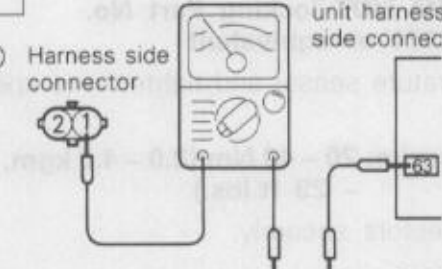
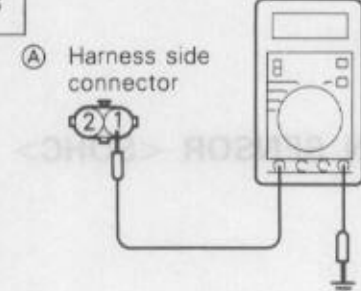
Refer to P.13-123-80.

INSPECTION

Using MUT

Function	Item No.	Data display	Check condition	Coolant temperature	Standard value
Data reading	21	Sensor temperature	Ignition switch: ON or engine operating	-20°C (-4°F)	-20°C
				0°C (32°F)	0°C
				20°C (68°F)	20°C
				40°C (104°F)	40°C
				80°C (176°F)	80°C

HARNESS INSPECTION

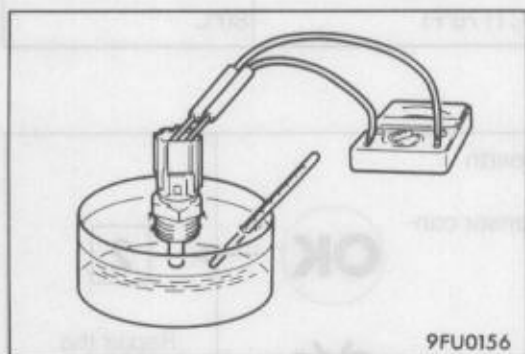
1  9FU0112	Check for continuity of the earth circuit. Coolant temperature sensor connector: Disconnected	OK → 2 OK → Repair the harness. (A 2 - 72)		
2  9FU0113	Check for open-circuit, or short-circuit to earth between coolant temperature and engine control unit. - Coolant temperature sensor connector: Disconnected - Engine control unit connector: Disconnected	OK → 3 OK → Repair the harness. (A 1 - 63)		
3  9FU0114	Measure the impressed voltage. - Coolant temperature sensor connector: Disconnected - Engine control unit connector: Connected - Ignition switch: ON <table border="1"> <tr> <td>Voltage (V)</td> </tr> <tr> <td>4.5-4.9</td> </tr> </table>	Voltage (V)	4.5-4.9	OK → STOP OK → Replace the engine control unit.
Voltage (V)				
4.5-4.9				

SENSOR INSPECTION

Caution

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

- (1) Remove coolant temperature sensor from the intake manifold.



9FU0156

- (2) With temperature sensing portion of coolant temperature sensor immersed in hot water, check resistance.

Temperature [°C (°F)]	Resistance (kΩ)
0 (32)	5.8
20 (68)	2.5
40 (104)	1.1
80 (176)	0.3

- (3) If the resistance deviates from the standard value greatly, replace the sensor.

INSTALLATION

- (1) Apply sealant to threaded portion.

Specified sealant: 3M NUT locking Part No. 4171 or equivalent

- (2) Install coolant temperature sensor and tighten it to specified torque.

Sensor tightening torque: 20 – 40 Nm (2.0 – 4.0 kgm, 15 – 29 ft.lbs.)

- (3) Fasten harness connectors securely.

THROTTLE POSITION SENSOR

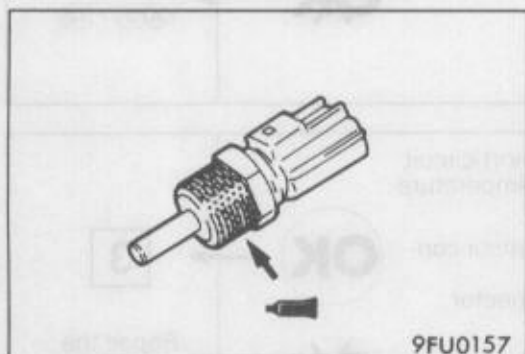
Refer to P.13-123-83.

IDLE POSITION SWITCH

Refer to P.13-123-86.

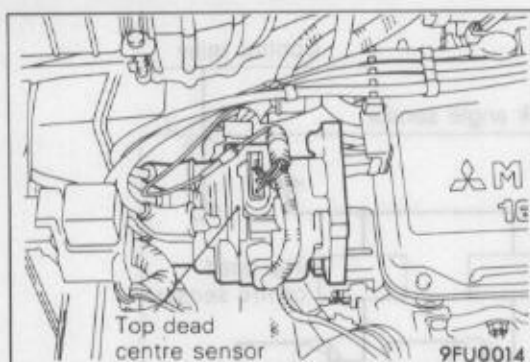
SERVO VALVE POSITION SENSOR <SOHC>

Refer to P.13-123-88.

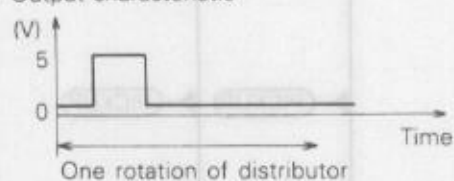


9FU0157

TOP DEAD CENTRE SENSOR <SOHC>



Output characteristic

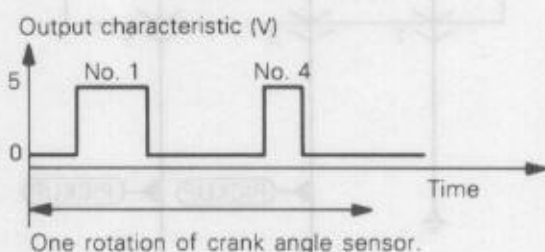
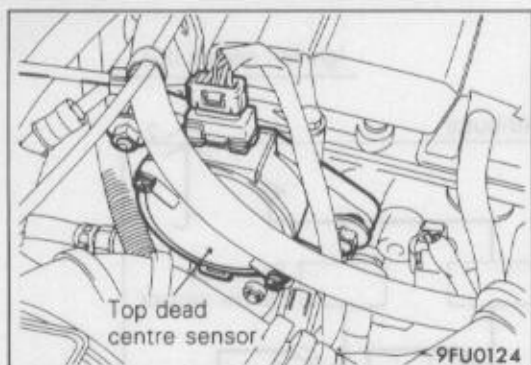


01R0102

Engine control unit connector

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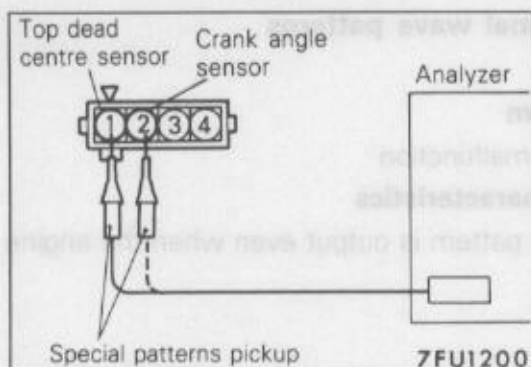
TOP DEAD CENTRE SENSOR <DOHC>



01A0528

Engine control unit connector

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INSPECTION

Wave Pattern Inspection Using an Analyzer

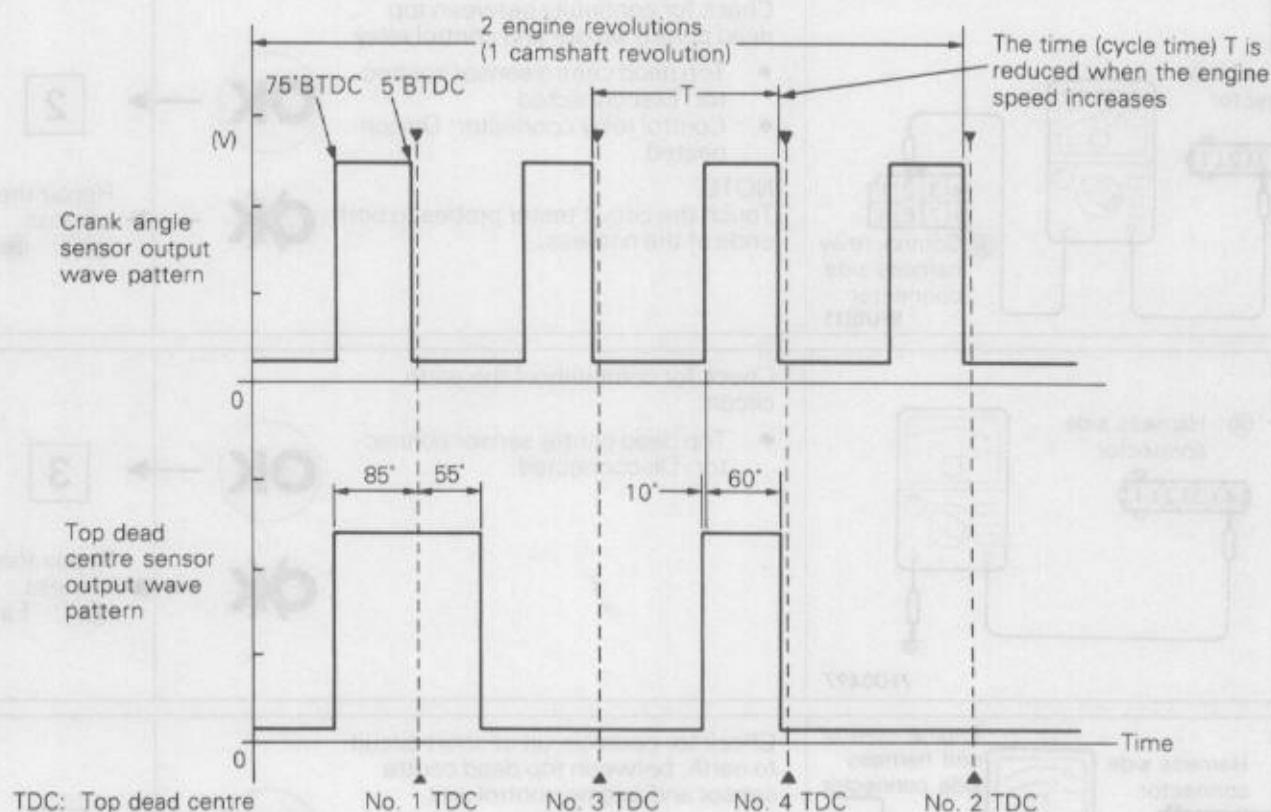
Measurement method

- (1) Disconnect the top dead centre sensor & crank angle sensor connector and connect the special tool (test harness: MB991348) in between. (All terminals should be connected.)
- (2) Connect the analyzer special patterns pickup to crank angle sensor terminal ①. (When checking the top dead centre sensor signal wave pattern.)
- (3) Connect the analyzer special patterns pickup to crank angle sensor connector terminal ②. (When inspecting the crank angle sensor signal wave pattern.)

Standard wave pattern

Observation conditions

Function	Special patterns
Pattern height	Low
Pattern selector	Display
Engine r/min.	Idle speed (800 r/min.)



9FU0213

Wave pattern observation points

Check to be sure that cycle time T becomes shorter when the engine speed increases.

Examples of abnormal wave patterns

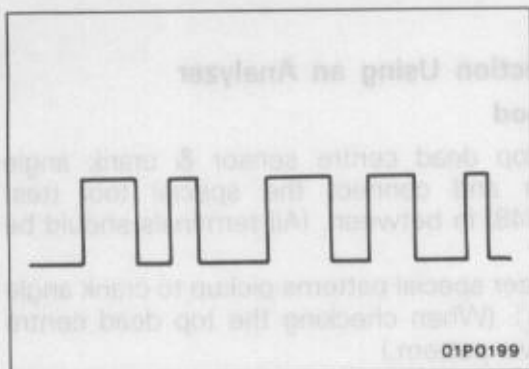
• Example 1

Cause of problem

Sensor interface malfunction

Wave pattern characteristics

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



• Example 2

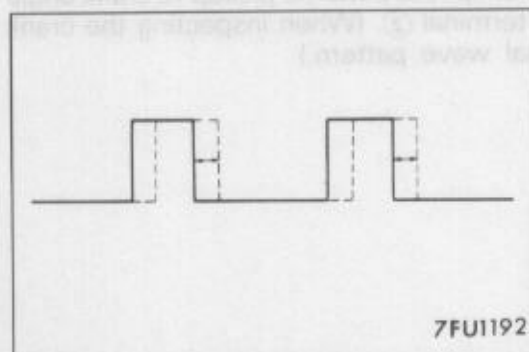
Cause of problem

Loose timing belt

Abnormality in sensor disk

Wave pattern characteristics

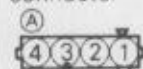
Wave pattern is displaced to the left or right.



HARNESS INSPECTION

1

Harness side connector

Control relay harness side connector
9FU0115

Check for continuity between top dead centre sensor and control relay.

- Top dead centre sensor connector: Disconnected
- Control relay connector: Disconnected

NOTE

Touch the circuit tester probes to both ends of the harness.

OK →

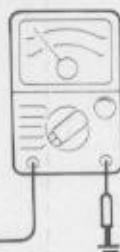
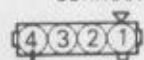
2

✗ →

Repair the harness.
(A 3 - B 2)

2

(A) Harness side connector



7FU0497

Check for continuity of the earth circuit.

- Top dead centre sensor connector: Disconnected

OK →

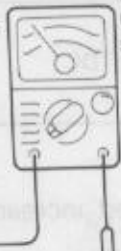
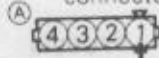
3

✗ →

Repair the harness.
(A 4 - Earth)

3

Harness side connector



Engine control unit harness side connector

68

7FU1231

Check for open-circuit or short-circuit to earth, between top dead centre sensor and engine control unit.

- Engine control unit connector: Disconnected
- Top dead centre sensor connector: Disconnected

OK →

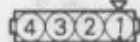
4

✗ →

Repair the harness.
(A 1 - 68)

4

① Harness side connector



7FU0498

Measure the impressed voltage.

- Top dead centre sensor connector: Disconnected
- Engine control unit connector: Connected
- Ignition switch: ON

Voltage (V)
4.8-5.2



Replace the engine control unit.

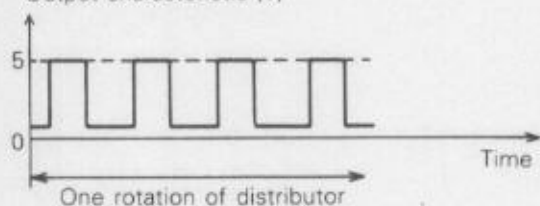
7FU0498

7FU0498

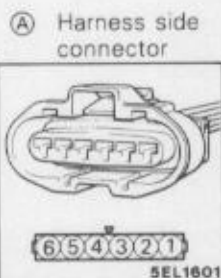
OPERATION

- The crank angle sensor detects the crank angle (rotation position) of each cylinder, converts it to a pulse signal and outputs it to the engine control unit. The engine control unit compares the engine speed and the intake air amount for one stroke and outputs the throttle drive signal and injection advance signal based on this signal.
- Power to the crank angle sensor is supplied from the ignition switch (IG), and the earth is located in the body. A 5V voltage is applied from the engine control unit to the crank angle sensor output terminal, and the crank angle sensor generates a pulse signal as it switches from OPEN to SHORT (power transistor inside the sensor switches ON/OFF between the output terminal and the earth).

A detailed line drawing of an engine compartment, specifically focusing on the front of the engine. A label 'Crank angle sensor' with a leader line points to a sensor mounted on the crankshaft pulley. To the right, the 'M 1.6' engine designation is visible. The bottom right corner of the diagram is labeled '9FU0014'.

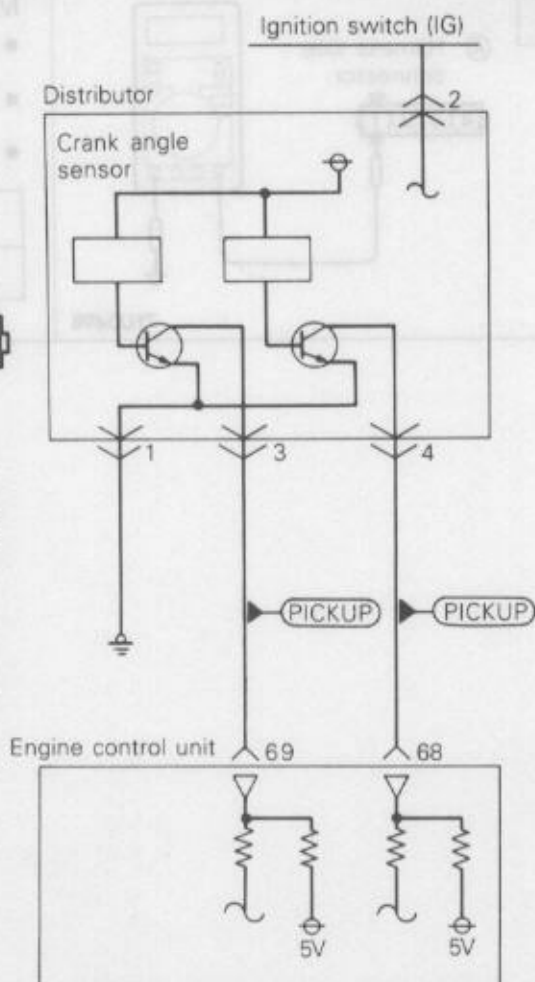


01R0103



Engine control unit connector

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9FU0101

9FU0027

- The crank angle sensor detects the crank angle (piston position) of each cylinder, converts it to a pulse signal and inputs it to the engine control unit. The engine control unit computes the engine speed and the intake air amount for one stroke and outputs the injector drive signal and injection command signal based on this signal.
- Power to the crank angle sensor is supplied from the ignition switch (IG), and the earth is located in the body. A 5V voltage is applied from the engine control unit to the crank angle sensor output terminal, and the crank angle sensor generates a pulse signal as it switches from OPEN to SHORT (power transistor inside the sensor switches ON/OFF) between the output terminal and the earth.

TROUBLESHOOTING HINTS

- Hint 1: If unexpected shocks are felt during driving or the engine stalls suddenly during idling, shake the crank angle sensor harness. If this causes the engine to stall, poor contact of the sensor connector is suspected.
- Hint 2: If the crank angle sensor outputs a pulse signal when the ignition switch is turned to ON, (without starting the engine), the crank angle sensor or engine control unit is probably defective.
- Hint 3: If the tachometer reads 0 r/min. when the engine that has failed to start is cranked, faulty crank angle sensor or broken timing belt is suspected.

- Hint 4: If the tachometer reads 0 r/min. when the engine that has failed to start is cranked, the primary current of the ignition coil is not turned on and off. Therefore, troubles in the ignition circuit and ignition coil or faulty power transistor is suspected.

- Hint 5: If the engine can be run at idle even though the crank angle sensor reading is out of specification, troubles are often in other than the crank angle sensor.

[Examples]

- (1) Faulty coolant temperature sensor
- (2) Faulty idle speed control servo
- (3) Poorly adjusted basic idle speed

INSPECTION**Using MUT**

Function	Item No.	Data display	Check condition	Check content	Normal state
Data reading	22	Cranking speed	- Engine cranking - Tachometer connected (Check on and off of primary current of ignition coil by tachometer)	Compare cranking speed and MUT reading	Indicated speed to agree

Function	Item No.	Data display	Check condition	Check content	Standard value
Data reading	22	Idle speed	- Engine: Idling - Idle position switch: ON	-20°C (-4°F)	1,380 – 1,580 r/min.
				0°C (32°F)	1,330 – 1,530 r/min.
				20°C (68°F)	1,250 – 1,450 r/min.
				40°C (104°F)	1,000 – 1,200 r/min.
				80°C (176°F)	700 – 900 r/min.

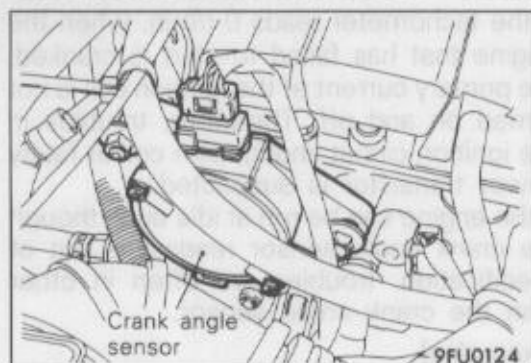
Wave Pattern Inspection Using an Analyzer

Refer to P. 13-123-92.

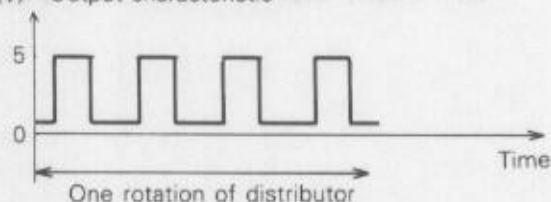
HARNESS INSPECTION

Refer to P. 13-123-97.

CRANK ANGLE SENSOR <DOHC>



(V) Output characteristic



01R0103

Engine control unit connector

61	72
60	71
59	70
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5	16
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2	13
1	12

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INSPECTION

Using MUT

Function	Item No.	Data display	Check condition	Check content	Normal state
Data reading	22	Cranking speed	- Engine cranking - Tachometer connected (Check on and off of primary current of ignition coil by tachometer)	Compare cranking speed and MUT reading	Indicated speed to agree

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				40°C (104°F)	1,000 – 1,200 r/min.
				80°C (176°F)	700 – 900 r/min.

Wave Pattern Inspection Using an Analyzer

Refer to P. 13-123-92.

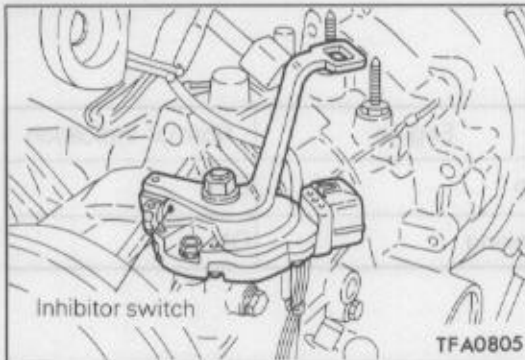
HARNESS INSPECTION

1 Harness side connector Ⓐ Ⓑ Control relay harness side connector 9FU0115	Check for continuity between crank angle sensor and control relay. • Crank angle sensor connector: Disconnected • Control relay connector: Disconnected NOTE Touch the circuit tester probes to both ends of the harness.	OK → 2 ✗ → Repair the harness. (A3 - B2)		
2 Ⓐ Harness side connector 7FU0497	Check for continuity of the earth circuit. • Crank angle sensor connector: Disconnected	OK → 3 ✗ → Repair the harness. (A4 - Earth)		
3 Harness side connector Ⓐ Engine control unit harness side connector 69 7FU1232	Check for open-circuit or short-circuit to earth, between top dead centre sensor and engine control unit. • Engine control unit connector: Disconnected • Crank angle sensor connector: Disconnected	OK → 4 ✗ → Repair the harness. (A2 - 69)		
4 Ⓐ Harness side connector 7FU0489	Measure the impressed voltage. • Crank angle sensor connector: Disconnected • Engine control unit connector: Connected • Ignition switch: ON <table border="1"><thead><tr><th>Voltage (V)</th></tr></thead><tbody><tr><td>4.8-5.2</td></tr></tbody></table>	Voltage (V)	4.8-5.2	OK → STOP ✗ → Replace the engine control unit.
Voltage (V)				
4.8-5.2				

IGNITION SWITCH-ST <M/T>

Refer to P. 13-123-98.

IGNITION SWITCH-ST AND INHIBITOR SWITCH <A/T>



A Equipment side connector



Engine control unit connector

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INSPECTION

Using MUT

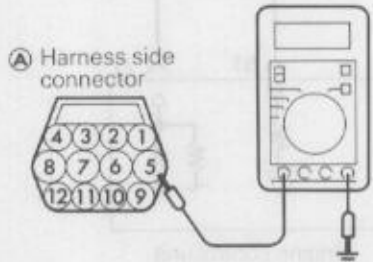
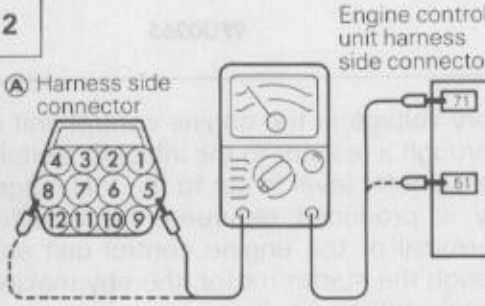
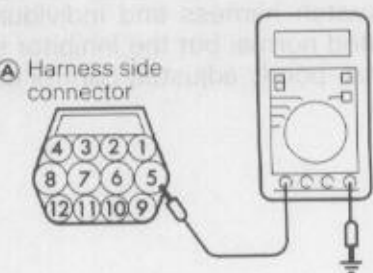
IGNITION SWITCH-ST

Function	Item No.	Data display	Check condition	Engine	Normal indication
Data reading	18	Switch state	Ignition switch: ON	Stop	OFF
				Cranking	ON

INHIBITOR SWITCH

Function	Item No.	Data display	Check condition	Select lever position	Normal indication
Data reading	29	Shift position	Ignition switch: ON	P or N	P or N
				D, 2, L or R	D, 2, L or R

HARNESS INSPECTION

1  ① Harness side connector 9FU0266	Measure the power supply voltage of the inhibitor switch. - Engine control unit connector: Disconnected - Inhibitor switch connector: Disconnected - Ignition switch: START <table border="1"> <tr><td>Voltage (V)</td></tr> <tr><td>SV</td></tr> </table> OK → 2 ✗ → Check the power supply circuit.	Voltage (V)	SV	
Voltage (V)				
SV				
2  ① Harness side connector Engine control unit harness side connector 9FU0267	Check for continuity between inhibitor switch and engine control unit. - Engine control unit connector: Disconnected - Inhibitor switch connector: Disconnected NOTE Touch the circuit tester probes to both ends of the harness. OK → 3 ✗ → Repair the harness. (A) 5 - 71 (A) 8 - 51			
3  ① Harness side connector 9FU0266	Measure the impressed voltage to inhibitor switch terminal. - Engine control unit connector: Disconnected - Inhibitor switch connector: Disconnected - Ignition switch: ON <table border="1"> <tr><td>Voltage (V)</td></tr> <tr><td>SV</td></tr> </table> OK → STOP ✗ → Replace the engine control unit.	Voltage (V)	SV	
Voltage (V)				
SV				

VEHICLE SPEED SENSOR

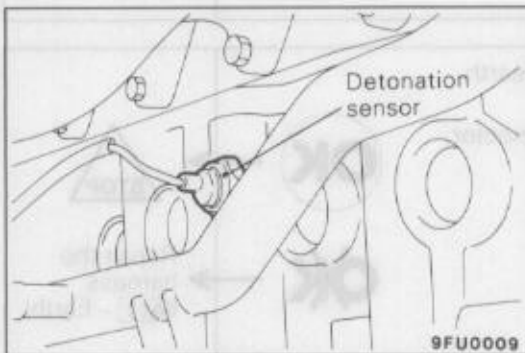
Refer to P. 13-123-99.

POWER STEERING FLUID PRESSURE SWITCH

Refer to P. 13-123-101.

AIR CONDITIONER SWITCH AND POWER RELAY

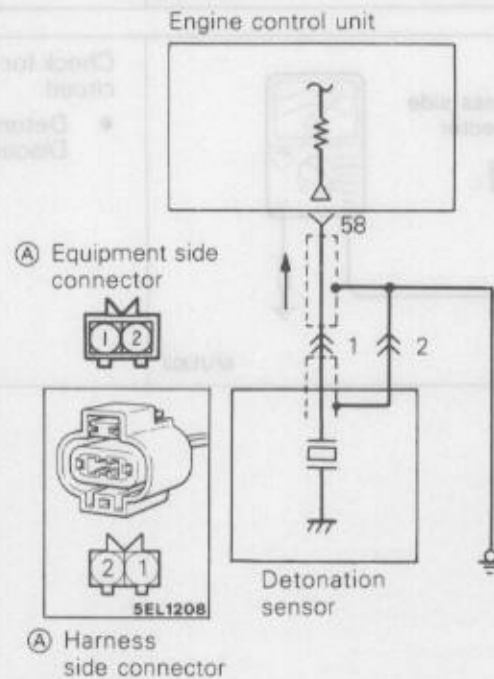
Refer to P. 13-123-103.

DETONATION SENSOR

Engine control unit connector

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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9FU0101

**OPERATION**

- The detonation sensor converts cylinder block vibration caused by detonation into a voltage that is proportional to intensity of vibration and inputs it to the engine control unit, which then provides delay control of the ignition timing based on this signal.

TOUBLESHOOTING HINTS

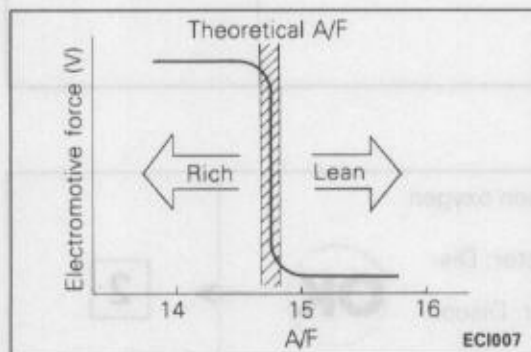
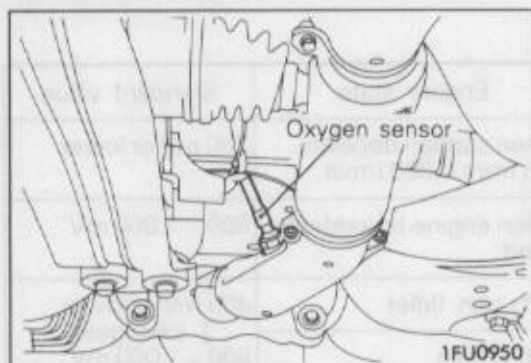
If detonation is caused while driving with high load, following as well as the detonation sensor may be responsible.

- (1) Incorrect heating value of the spark plug
- (2) Use of inadequate fuel
- (3) Poorly adjusted reference ignition timing

HARNESS INSPECTION

1 Harness side connector Engine control unit harness side connector 7FU0906	Check for open-circuit, or short-circuit to earth, between detonation sensor and engine control unit. • Detonation sensor connector: Disconnected • Engine control unit connector: Disconnected OK → 2 ✗ → Repair the harness. (A 1 - 58)	
2 Harness side connector 6FU1302	Check for continuity of the earth circuit. • Detonation sensor connector: Disconnected OK → STOP ✗ → Repair the harness. (A 2 - Earth)	

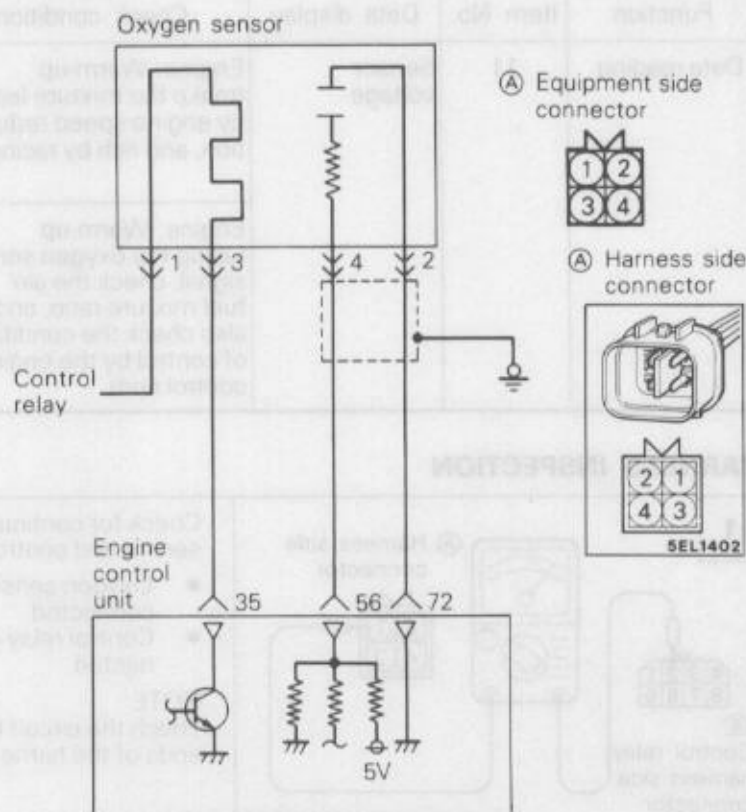
OXYGEN SENSOR — Vehicles for Europe and General Export



Engine control unit connector

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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9FU0101



9FU0190

OPERATION

- The oxygen sensor functions to detect the concentration of oxygen in the exhaust gas; it converts those data to voltage, and inputs the resulting signals to the engine control unit.
- If the air/fuel mixture ratio is richer than the theoretical air/fuel mixture ratio (i.e., if the concentration of oxygen in the exhaust gas is sparse), a voltage of approximately 1V is output; if the air/fuel mixture ratio is leaner than the theoretical air/fuel mixture ratio (i.e., if the concentration is dense), a voltage of approximately 0V is output.
- The engine control unit, based upon those signals, regulates the amount of fuel injection so that the air/fuel mixture ratio becomes the theoretical air/fuel mixture ratio.
- Battery power supply is applied, by way of the control relay, to the oxygen sensor heater. As a result, the sensor element is heated by the heater, so that the oxygen sensor shows excellent response even if the temperature of the exhaust gas is low.

TROUBLESHOOTING HINTS

- Hint 1: The exhaust gas purification performance will worsen if there is a malfunction of the oxygen sensor.
- Hint 2: If the oxygen sensor output voltage deviates from the standard value even though the results of the checking of the oxygen sensor are normal, the cause is probably a malfunction of a component related to air/fuel mixture ratio control.

[Examples]

- (1) Malfunction of an injector.
- (2) Air leakage into the intake manifold from a leaking gasket.
- (3) Malfunction of the air-flow sensor, the intake air temperature sensor, the barometric-pressure sensor, or the coolant temperature sensor.

INSPECTION

Using MUT

Function	Item No.	Data display	Check condition	Engine state	Standard value
Data reading	11	Sensor voltage	Engine: Warm-up (make the mixture lean by engine speed reduction, and rich by racing)	When sudden deceleration from 4,000 r/min.	200 mV or lower
				When engine is suddenly raced	600 – 1,000 mV
			Engine: Warm-up (using the oxygen sensor signal, check the air/fuel mixture ratio, and also check the condition of control by the engine control unit)	800 r/min. (Idle)	400 mV or lower
				2,000 r/min.	↓ (changes) 600 – 1,000 mV

HARNESS INSPECTION

1

1FU0976

Check for continuity between oxygen sensor and control relay.

- Oxygen sensor connector: Disconnected
- Control relay connector: Disconnected

NOTE
Touch the circuit tester probes to both ends of the harness.

OK

✗

→ **2**

Repair the harness.
(A1 – B2)

2

9FU0214

Check for an open-circuit, or a short-circuit to earth, between the engine control unit and the oxygen sensor.

- Oxygen sensor connector: Disconnected
- Engine control unit connector: Disconnected

OK

✗

→ **3**

Repair the harness.
(A3 – 35)
(A4 – 56)

3

1FU0978

Check for continuity of the earth circuit.

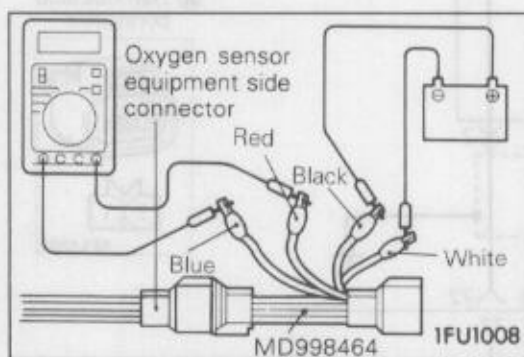
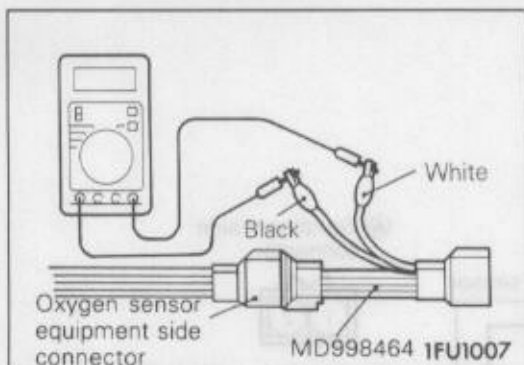
- Oxygen sensor connector: Disconnected

OK

✗

→ **STOP**

Repair the harness.
(A2 – 72)

**SENSOR INSPECTION**

- (1) Disconnect the oxygen sensor connector and connect the special tool (test harness) to the connector on the oxygen sensor side.
- (2) Make sure that there is continuity [Approx. $20\ \Omega$ at 20°C (68°F)] between terminal ① and terminal ③ on the oxygen sensor connector.
- (3) If there is no continuity, replace the oxygen sensor.

- (4) Warm up the engine until engine coolant is 80°C (176°F) or higher.

- (5) Use jumper wires to connect oxygen sensor terminal ① (connect to (+) terminal) and terminal ③ (connect to (-) terminal) with the battery (+) terminal and (-) terminal.

Caution

Be very careful when connecting the jumper wires; incorrect connection can damage the oxygen sensor.

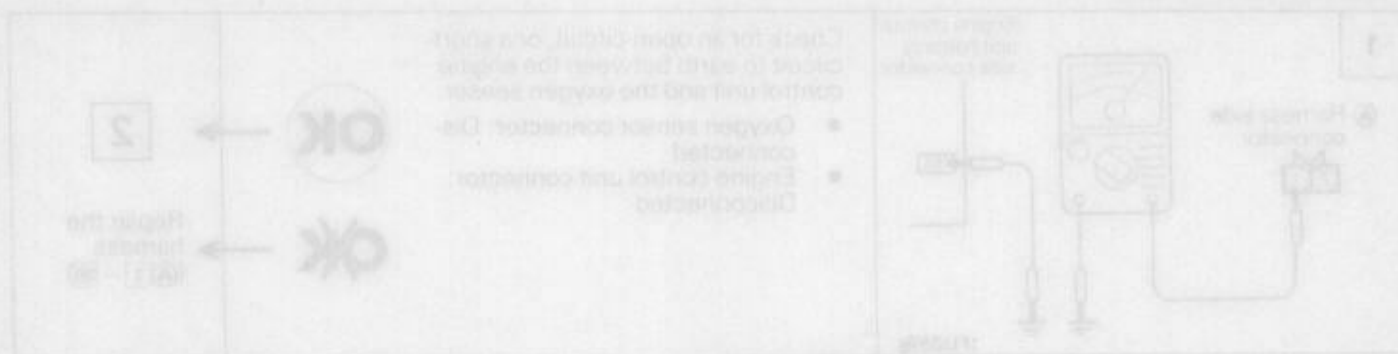
- (6) Connect a digital voltage meter between terminal ② and terminal ④.
- (7) While repeatedly racing the engine, measure the oxygen sensor output voltage.

Engine	Oxygen sensor output voltage	Remarks
When racing engine	0.6 – 1.0 V	If you make the air/fuel ratio rich by racing the engine repeatedly, a normal oxygen sensor will output a voltage of 0.6 – 1.0 V.

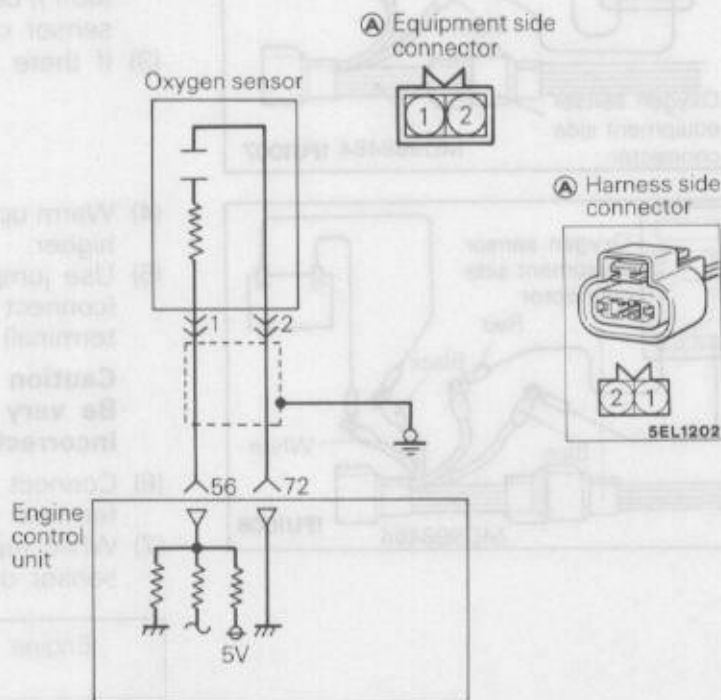
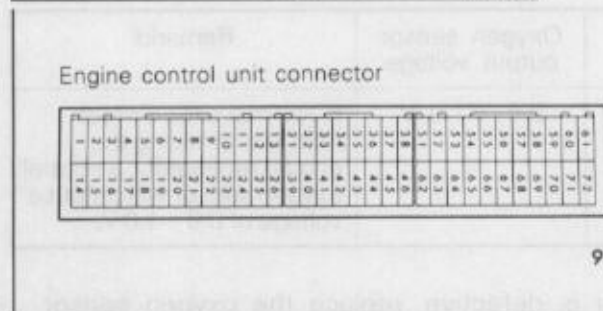
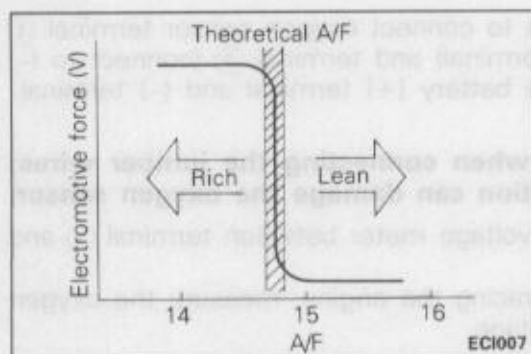
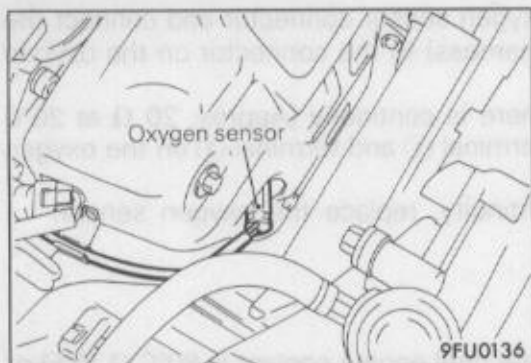
- (8) If the sensor is defective, replace the oxygen sensor.

NOTE

For removal and installation of the oxygen sensor, refer to GROUP 15 – Exhaust Manifold.



OXYGEN SENSOR — Vehicles for Australia



OPERATION

Refer to P. 13-123-105.

TROUBLESHOOTING HINTS

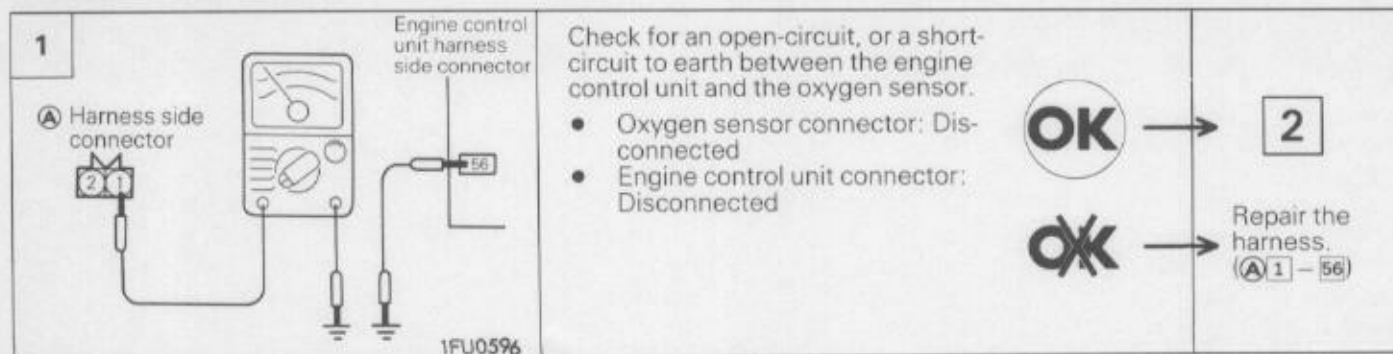
Refer to P. 13-123-105.

INSPECTION

Using MUT

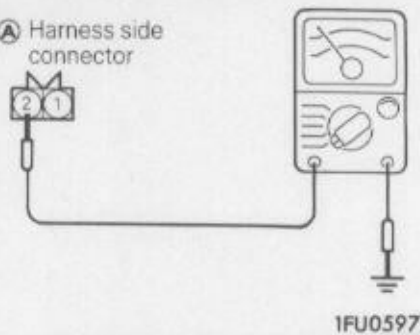
Refer to P. 13-123-106.

HARNESS INSPECTION



2

A Harness side connector



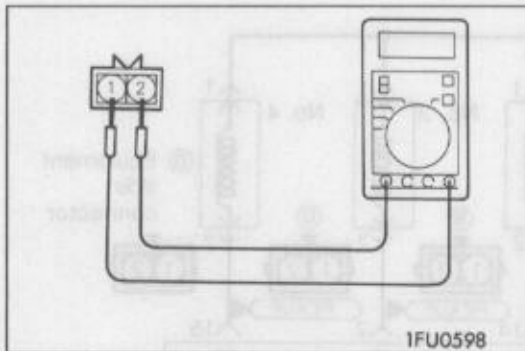
1FU0597

Check for continuity of the earth circuit.

- Oxygen sensor connector: Disconnected



Repair the harness.
(A 2 - 72)



1FU0598

SENSOR INSPECTION

- (1) Warm the engine and check to be sure that the engine coolant temperature is 80 – 95°C (176 – 203°F).
- (2) Disconnect the oxygen sensor connector and connect a digital voltmeter.

Caution

When disconnecting the oxygen sensor connector, do not pull the connector or lead wire too strongly.

- (3) Race the engine repeatedly and measure the oxygen sensor output voltage.

Engine	Sensor output voltage	Remarks
When racing the engine	0.6 – 1.0 V	When the air/fuel mixture ratio is enriched by racing the engine repeatedly, a normal oxygen sensor will output a voltage of 0.6 – 1.0V.

- (4) If the sensor is defective, replace the oxygen sensor.

NOTE

For removal and installation of the oxygen sensor, refer to GROUP 15 – Exhaust Manifold.

INSPECTION**Using MUT**

Function	Item No.	Data display	Check condition	Coolant temperature	Standard value
Data reading	41	Drive time* ¹	Engine: Cranking	0°C (32°F)* ²	Approx. 20 ms* ⁴ 34 ms* ⁵
				20°C (68°F)	Approx. 38 ms* ⁴ 36.5 ms* ⁵
				80°C (176°F)	Approx. 9.3 ms* ⁴ 9.0 ms* ⁵

Function	Item No.	Data display	Check condition	Engine state	Standard value
Data reading	41	Drive time* ³	- Coolant temperature: 80 to 95°C (176 to 203°F) - Lamps, electric cooling fan, accessories: OFF - Transmission: Neutral (P range for A/T)	800 r/min. (Idle)	2.0 – 3.2 ms* ⁴ 2.1 – 3.3 ms* ⁵
				2,000 r/min.	1.7 – 2.9 ms
				When sharp racing is made	To increase

NOTE

- *¹: The injector drive time refers to when the supply voltage is 11V and the cranking speed is less than 250 r/min.
 *²: When coolant temperature is lower than 0°C (32°F), injection is made by four cylinders simultaneously.
 *³: When the vehicle is new [within initial operation of about 500 km (300 miles)], the injector drive time may be about 10% longer.
 *⁴: <SOHC>
 *⁵: <DOHC>

Function	Item No.	Drive content	Check condition	Normal state
Actuator test	01	No. 1 injector shut off	Engine: Idling after warm-up (Shut off the injectors in sequence during after engine warm-up, check the idling condition)	Idle state to change further (Becoming less stable or stalling)
	02	No. 2 injector shut off		
	03	No. 3 injector shut off		
	04	No. 4 injector shut off		

Wave Pattern Inspection Using an Analyzer

Refer to P. 13-123-110.

HARNESS INSPECTION

Refer to P. 13-123-111.

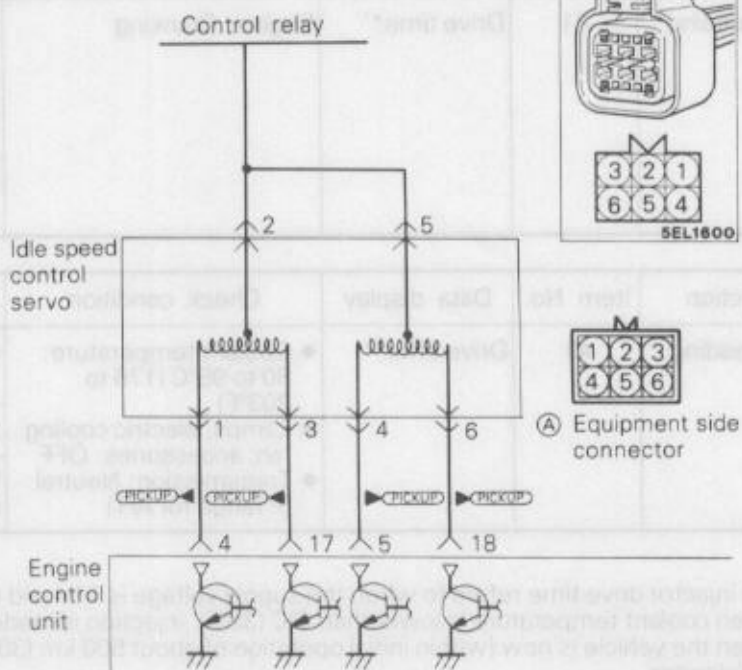
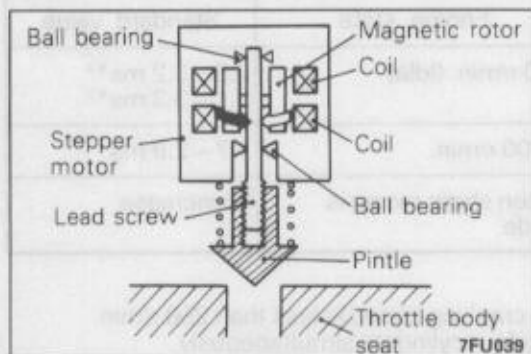
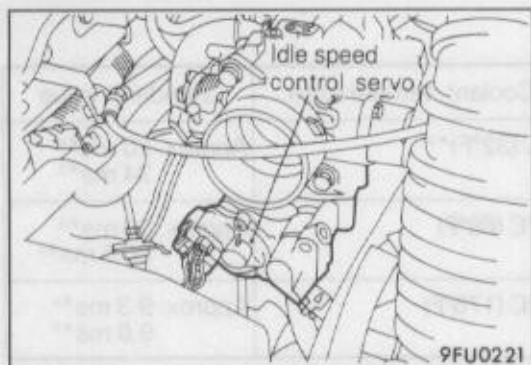
ACTUATOR INSPECTION

Refer to P. 13-123-112.

IDLE SPEED CONTROL SERVO (DC MOTOR) <SOHC>

Refer to P. 13-123-114.

IDLE SPEED CONTROL SERVO (STEPPER MOTOR) <DOHC>



INSPECTION

Using MUT

Function	Item No.	Data display	Check condition	Load state	Standard value
Data reading	45	Stepper motor steps	• Coolant temperature: 80 to 95°C (176 to 203°F) • Lamps, electric cooling fan, accessories: OFF • Transmission: Neutral • Idle position switch: ON • Engine: At idle (Compressor clutch to be operating in case air conditioner switch is ON)	Air conditioner switch: OFF	2–25 step
				Air conditioner switch: Turn from OFF to ON	Increase from 10–70 step
				• Air conditioner switch: OFF • Selector lever: Shift to D range	Increase from 5–50 step

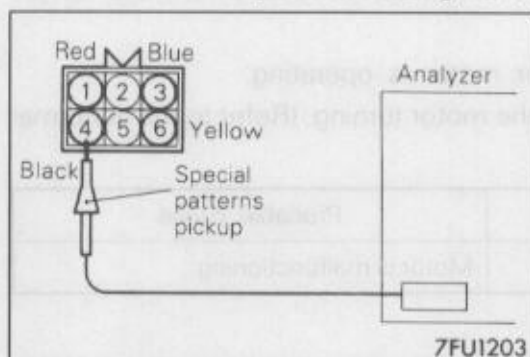
NOTE

In a new vehicle [driven approximately 500 km (300 miles) or less], the stepper motor steps sometimes exceeds the standard value by approximately 30 steps.

Caution

When shifting the selector lever to the D range, apply brake to prevent the vehicle from moving forward.

Wave Pattern Inspection Using an Analyzer

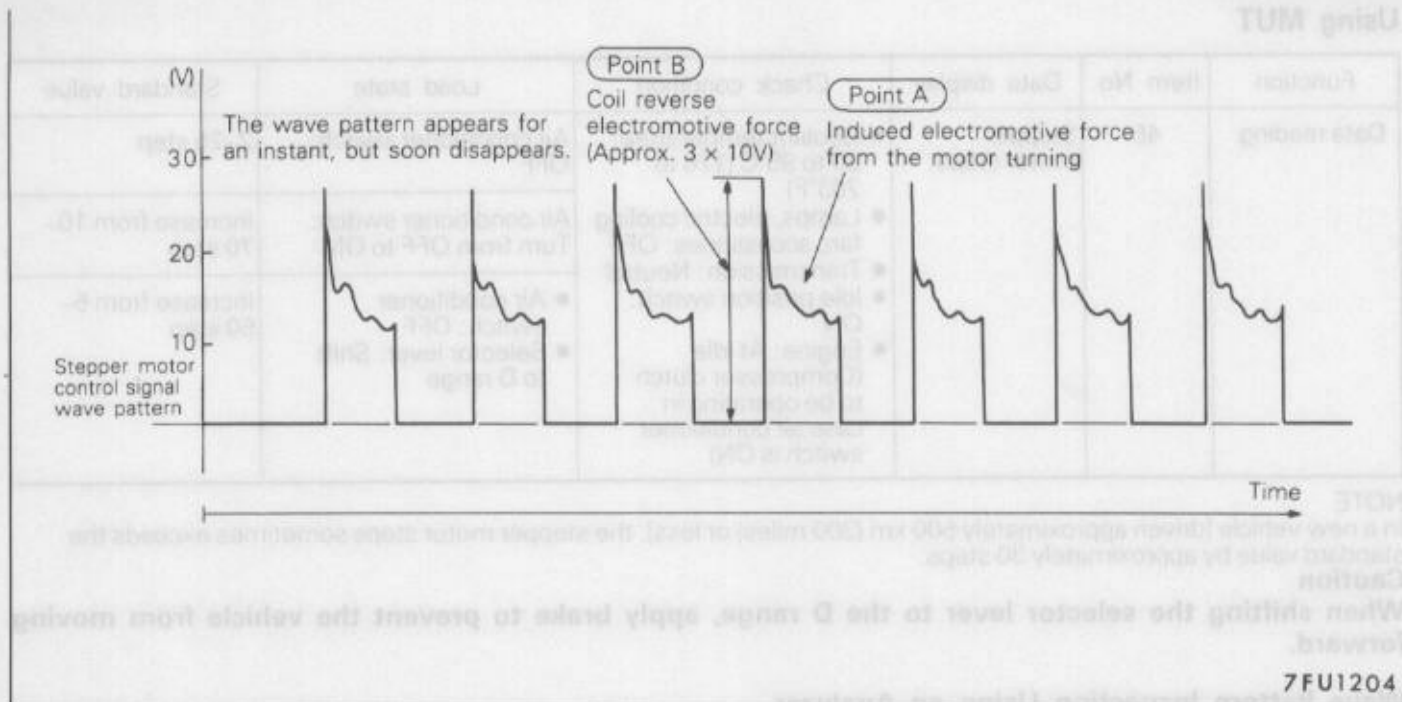
**Measurement method**

- (1) Disconnect the stepper motor connector, and connect the special tool (test harness: MD998463) in between.
- (2) Connect the analyzer special patterns pickup to the stepper motor-side connector terminal ① (red clip on the special tool), terminal ③ (blue clip), terminal ④ (black clip) and terminal ⑥ (yellow clip) respectively.

Standard wave pattern

Observation conditions

Function	Special patterns
Pattern height	High
Pattern selector	Display
Engine condition	When the engine coolant temperature is 20°C (68°F) or below, turn the ignition switch from OFF to ON (without starting the engine).
	While the engine is idling, turn the air conditioner switch to ON.
	Immediately after starting the warm engine (approx. 1 minute).



Wave pattern observation points

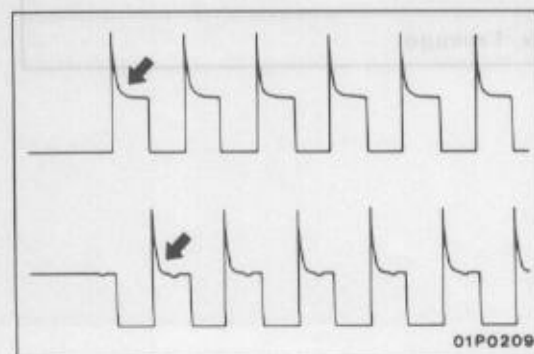
Check that the standard wave pattern appears when the stepper motor is operating.

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

Contrast with standard wave pattern	Probable cause
Induced electromotive force does not appear or is extremely small.	Motor is malfunctioning

Point B: Height of coil reverse 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 pattern

Cause of problem

Motor is malfunctioning. (Motor is not operating.)

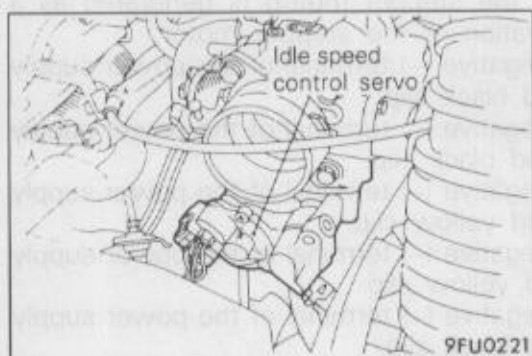
Wave pattern characteristics

Induced electromotive force from the motor turning does not appear.

HARNESS INSPECTION

1 Harness side connector (A) Control relay harness side connector (B) 9FU0215	Check for continuity between idle speed control servo and control relay. - Idle speed control servo connector: Disconnected - Control relay connector: Disconnected NOTE Touch the circuit tester probes to both ends of the harness. OK → 2 ✗ → Repair the harness. (A) 2 - (B) 2 (A) 5 - (B) 2
--	--

2 Harness side connector (A) Engine control unit harness side connector 01L0397	Check for open-circuit, or a short-circuit to earth between the engine control unit and the idle speed control servo. - Engine control unit connector: Disconnected - Idle speed control servo connector: Disconnected OK → STOP ✗ → Repair the harness. (A) 1 - 4 (A) 3 - 17 (A) 4 - 5 (A) 6 - 18
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ACTUATOR INSPECTION

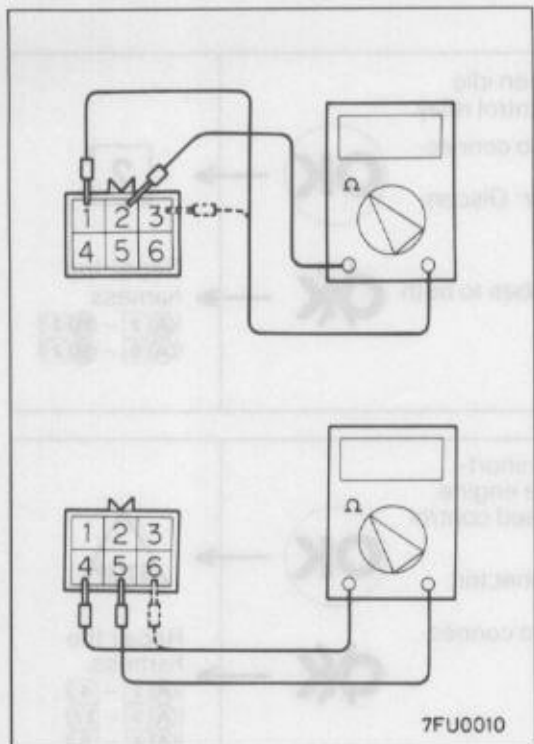
Checking the Operation Sound

- (1) Check to be sure that the engine coolant temperature is 20°C (68°F) or below.

NOTE

Disconnecting the coolant temperature sensor connector and connecting the harness-side of the connector to another coolant temperature sensor that is at 20°C (68°F) or below is also okay.

- (2) Check that the operation sound of the stepper motor can be heard after the ignition is switched ON (but without starting the motor).
- (3) If the operation sound cannot be heard, check the stepper motor's activation circuit.
If the circuit is normal, it is probable that there is a malfunction of the stepper motor or of the engine control unit.



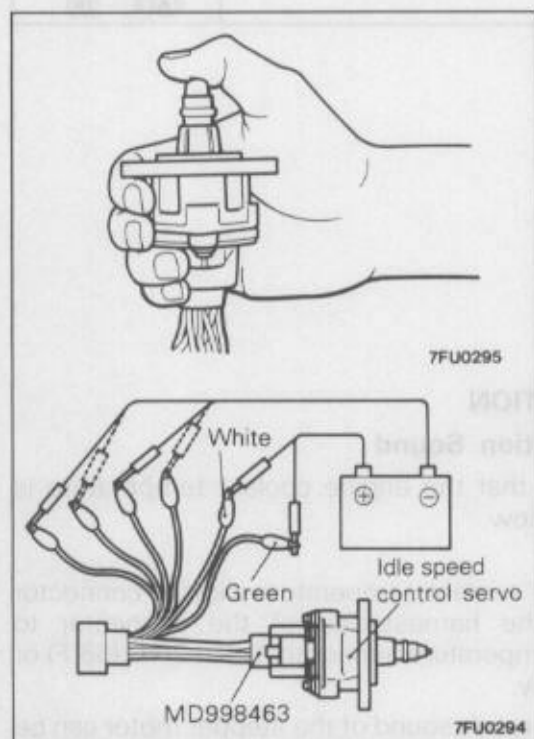
Checking the Coil Resistance

- (1) Disconnect the idle speed control servo connector and connect the special tool (test harness).
- (2) Measure the resistance between terminal ② (white clip of the special tool) and either terminal ① (red clip) or terminal ③ (blue clip) of the connector at the idle speed control servo side.

Standard value: 28 – 33 Ω at 20°C (68°F)

- (3) Measure the resistance between terminal ⑤ (green clip of the special tool) and either terminal ⑥ (yellow clip) or terminal ④ (black clip) of the connector at the idle speed control servo side.

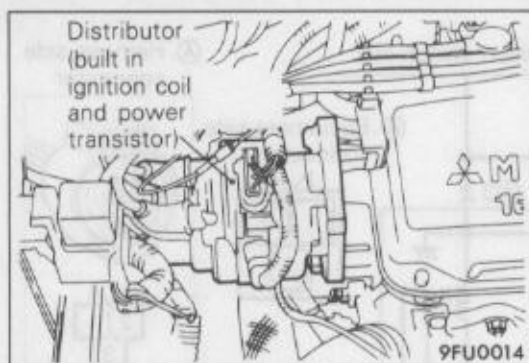
Standard value: 28 – 33 Ω at 20°C (68°F)



Operational Check

- (1) Remove the throttle body.
 - (2) Remove the stepper motor.
 - (3) Connect the special tool (test harness) to the idle speed control servo connector.
 - (4) Connect the positive (+) terminal of a power supply (approx. 6V) to the white clip and the green clip.
 - (5) With the idle speed control servo as shown in the illustration, connect the negative (–) terminal of the power supply to each clip as described in the following steps, and check whether or not a vibrating feeling (a feeling of very slight vibration of the stepper motor) is generated as a result of the activation of the stepper motor.
- ① Connect the negative (–) terminal of the power supply to the red and black clip.
 - ② Connect the negative (–) terminal of the power supply to the blue and black clip.
 - ③ Connect the negative (–) terminal of the power supply to the blue and yellow clip.
 - ④ Connect the negative (–) terminal of the power supply to the red and yellow clip.
 - ⑤ Connect the negative (–) terminal of the power supply to the red and black clip.
 - ⑥ Repeat the tests in sequence from (5) to (1).
- (6) If, as a result of these tests, vibration is detected, the stepper motor can be considered to be normal.

IGNITION COIL AND POWER TRANSISTOR <SOHC>



② Equipment side connector



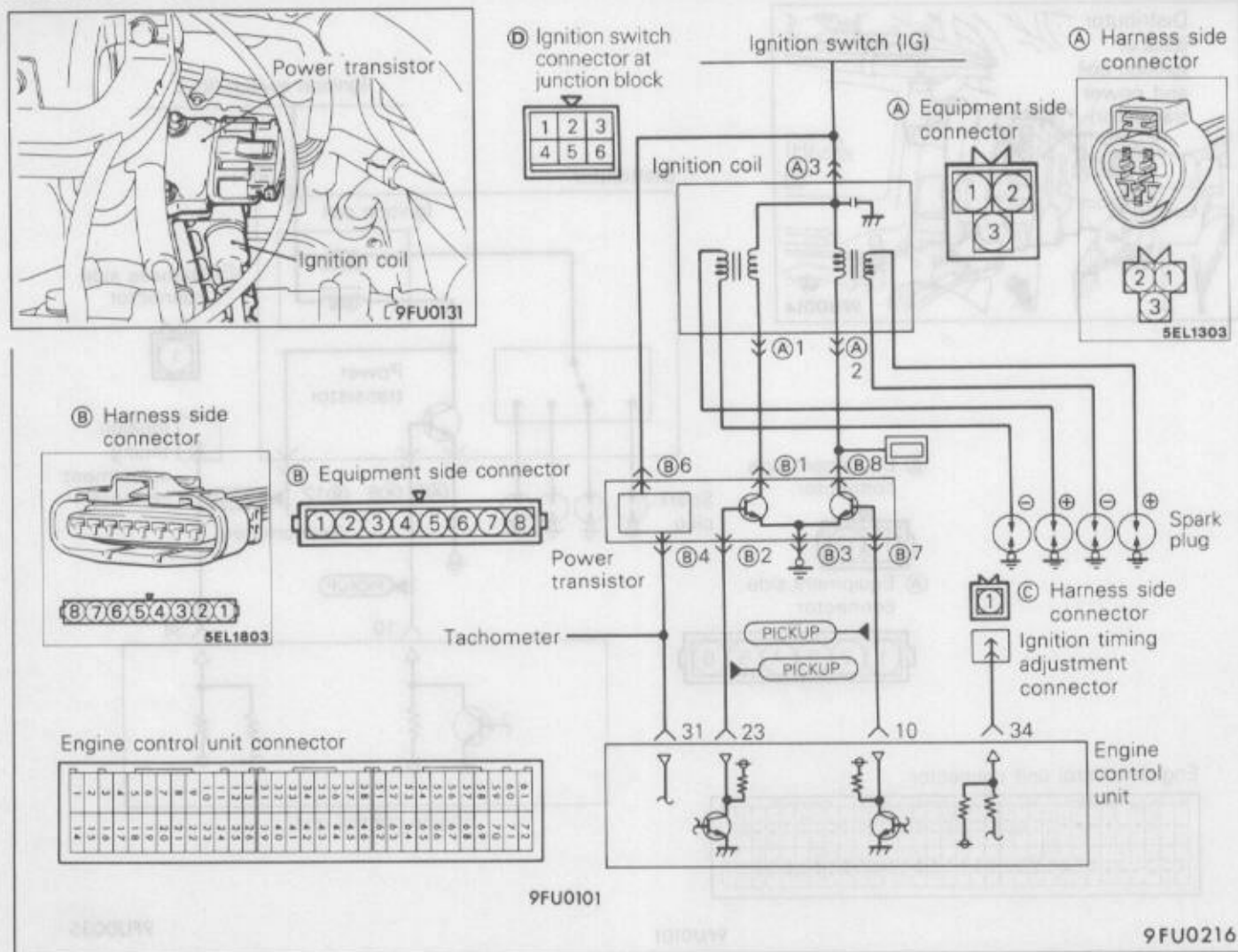
① Equipment side connector



Engine control unit connector

61	72
60	71
59	70
58	69
57	68
56	67
55	66
54	65
53	64
52	63
51	62
50	61
49	60
48	59
47	58
46	57
45	56
44	55
43	54
42	53
41	52
40	51
39	50
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8	19
7	18
6	17
5	16
4	15
3	14
2	13
1	12
0	11
0	10
0	9
0	8
0	7
0	6
0	5
0	4
0	3
0	2
0	1
0	0

IGNITION COIL AND POWER TRANSISTOR <DOCH>



OPERATION

- When the power transistor unit A is turned ON by the signal from the engine control unit, primary current flows to the ignition coil unit A. When the power transistor unit A is turned OFF, primary current is shut off and a high voltage is induced in the secondary coil unit A, causing the spark plugs of No. 1 and No. 4 cylinders to spark. When the power transistor unit B is turned OFF, the spark plugs of No. 2 and No. 3 cylinders spark.

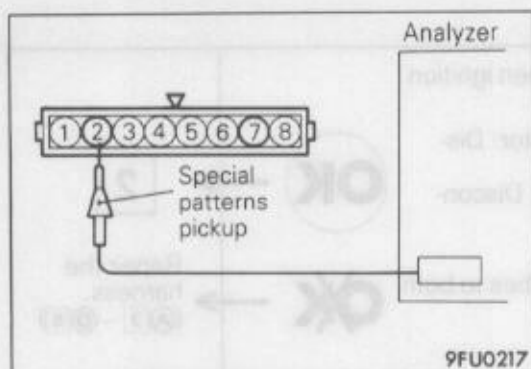
- When the engine control unit turns OFF the transistor in the unit, the battery voltage in the unit is applied to the power transistor unit to turn it ON. When the engine control unit turns ON the transistor in the unit, the power transistor unit is turned OFF.

INSPECTION

Using MUT

Spark advance value

Function	Item No.	Data display	Check condition	Engine state	Standard value
Data reading	44	Ignition advance	- Engine: Warming up - Timing lamp: Set (set timing lamp to check actual ignition timing)	800 r/min. (Idle)	0-16°BTDC
				2,000 r/min.	20-40°BTDC



Wave Pattern Inspection Using an Analyzer

- Ignition coil primary signal
Refer to GROUP 16 – Ignition System.
- Power transistor control signal

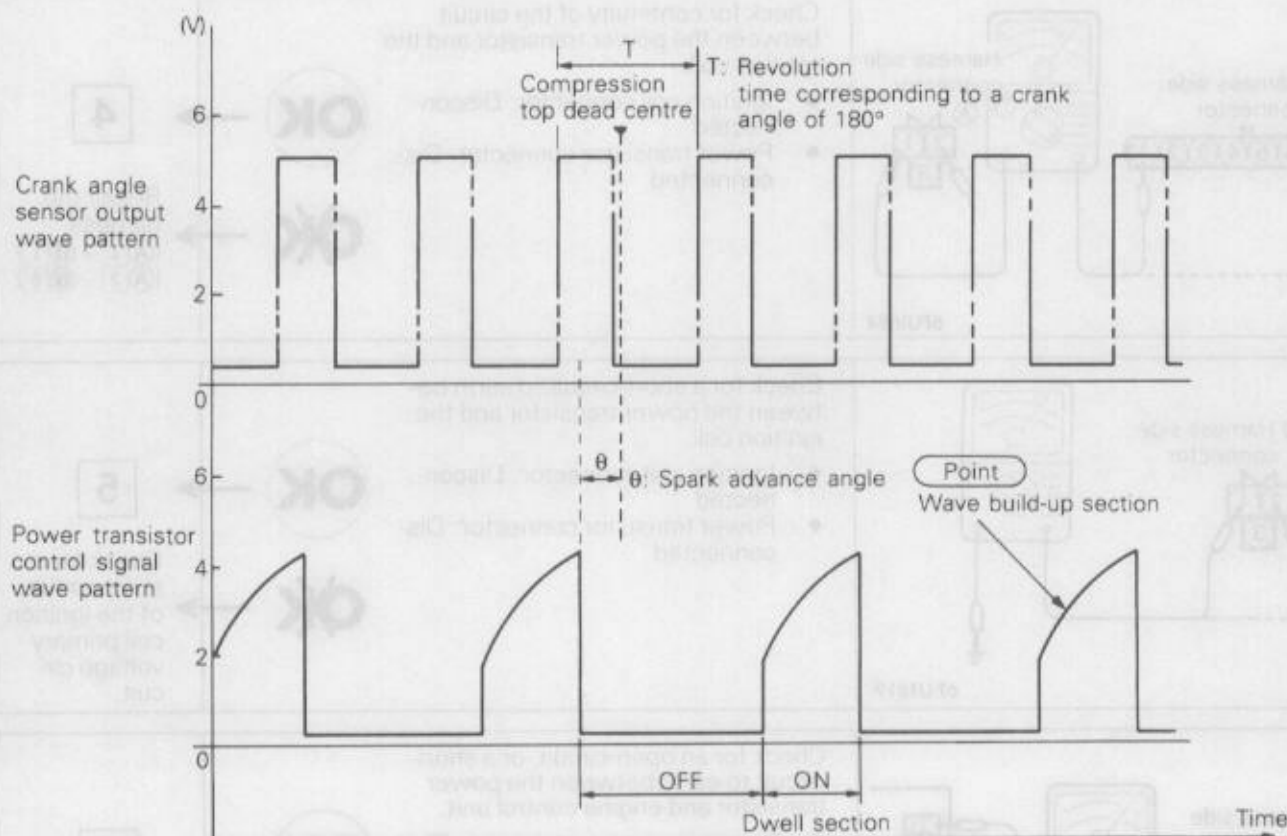
Measurement method

- (1) Disconnect the power transistor connector, and connect the special tool (test harness: MB991348) in between. (All terminals should be connected.)
- (2) Connect the analyzer special patterns pickup to the power transistor connector terminal ② (No. 2 – No. 3) and terminal ⑦ (No. 1 – No. 4) respectively.

Standard wave pattern

Observation condition

Function	Special patterns
Pattern height	Low
Pattern selector	Display
Engine r/min.	Approx. 2,000 r/min.



9FU0218

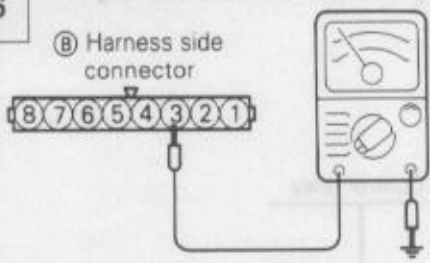
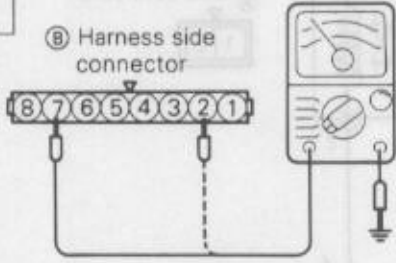
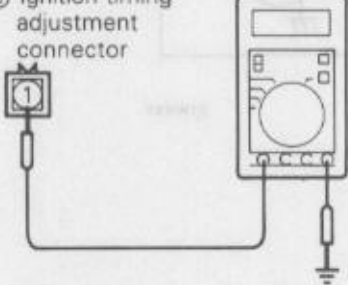
Wave pattern observation points

Examples of abnormal wave patterns

Refer to P. 13-123-118.

HARNESS INSPECTION

1 Ⓒ Ignition switch connector at junction block Ⓐ Harness side connector 9FU0309	Check for continuity between ignition coil and ignition switch. - Ignition switch connector: Disconnected - Ignition coil connector: Disconnected NOTE Touch the circuit tester probes to both ends of the harness. OK → 2 ✗ → Repair the harness. (A 3 - D 6)	
2 Ⓑ Harness side connector Ⓐ Harness side connector 6FU1817	Check for continuity between ignition coil and power transistor. - Ignition coil connector: Disconnected - Power transistor connector: Disconnected OK → 3 ✗ → Repair the harness. (A 3 - B 6)	
3 Ⓑ Harness side connector Ⓐ Harness side connector 6FU1684	Check for continuity of the circuit between the power transistor and the ignition coil. - Ignition coil connector: Disconnected - Power transistor connector: Disconnected OK → 4 ✗ → Repair the harness. (A 1 - B 1) (A 2 - B 8)	
4 Ⓐ Harness side connector 6FU1819	Check for a short-circuit to earth between the power transistor and the ignition coil. - Ignition coil connector: Disconnected - Power transistor connector: Disconnected OK → 5 ✗ → Check for a short-circuit of the ignition coil primary voltage circuit.	
5 Ⓑ Harness side connector Engine control unit harness side connector 6FU1818	Check for an open-circuit, or a short-circuit to earth between the power transistor and engine control unit. - Power transistor connector: Disconnected - Engine control unit connector: Disconnected OK → 6 ✗ → Repair the harness. (B 7 - 10) (B 2 - 23) (B 4 - 31)	

6 Ⓑ Harness side connector  6FU1685	Check for continuity of the earth circuit of the power transistor. Power transistor connector: Dis-connected OK → 7 ✗ → Repair the harness. (Ⓑ 3 – Earth)			
7 Ⓑ Harness side connector  6FU1686	Measure the power transistor control signal voltage. - Power transistor connector: Dis-connected - Ignition switch: START <table border="1"> <tr> <td>Voltage (V)</td> </tr> <tr> <td>0.5–4.0</td> </tr> </table> OK → 8 ✗ → Repair the harness. (Ⓑ 7 – 10) (Ⓑ 2 – 23)	Voltage (V)	0.5–4.0	
Voltage (V)				
0.5–4.0				
8 Ⓒ Ignition timing adjustment connector  7FU1060	Measure the voltage of the ignition timing adjustment terminal. Ignition switch: ON <table border="1"> <tr> <td>Voltage (V)</td> </tr> <tr> <td>4.0–5.2</td> </tr> </table> OK → STOP ✗ → Repair the harness. (Ⓒ 1 – 34)	Voltage (V)	4.0–5.2	
Voltage (V)				
4.0–5.2				

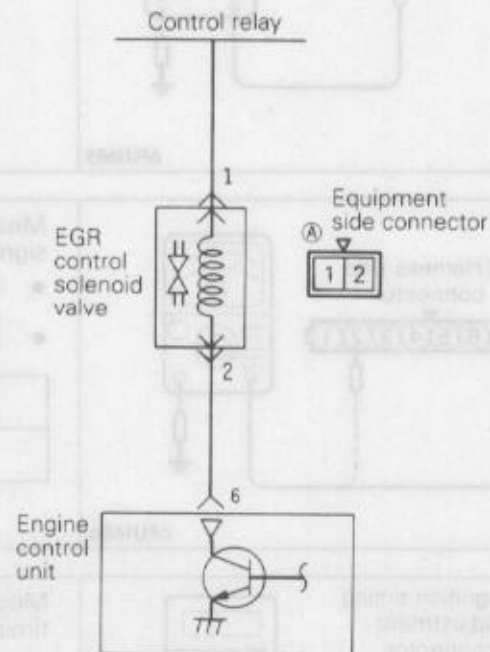
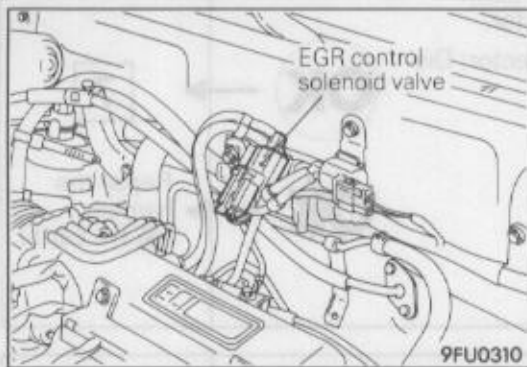
ACTUATOR INSPECTION

Refer to GROUP 16 – Ignition System.

PURGE CONTROL SOLENOID VALVE – Vehicles for Europe and General Export

Refer to P. 13-123-120.

EGR CONTROL SOLENOID VALVE – Vehicles for Europe and General Export



Engine control unit connector

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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9FU0101

OPERATION

- The EGR control solenoid valve is ON-OFF type solenoid valve. It makes control by leaking EGR valve operating negative pressure to the throttle body A port.
- Power supply from the battery is sent through the control relay to the EGR control solenoid valve. When the engine control unit turns off the power transistor inside the unit, current no more flows through the coil and EGR valve operating vacuum leaks.

INSPECTION**Using MUT**

Function	Item No.	Drive content	Check condition	Normal state
Actuator test	10	Change solenoid valve from OFF to ON state	Ignition switch: ON	Operating sound is heard when driven

HARNESS INSPECTION

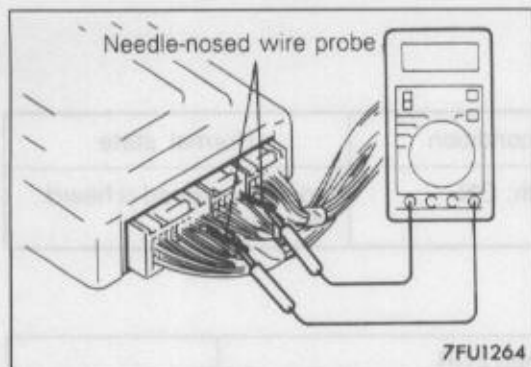
1 Control relay harness side connector (B) Harness side connector (A) 9FU0053	Check for continuity between EGR control solenoid valve and control relay. - EGR control solenoid valve connector: Disconnected - Control relay connector: Disconnected NOTE Touch the circuit tester probes to both ends of the harness.	OK → 2 ✗ → Repair the harness. (A1 - B2)
2 Harness side connector (A) Engine control unit harness side connector 01A0525	Check for an open-circuit, or a short-circuit to earth, between the EGR control solenoid valve and the engine control unit. - EGR control solenoid valve connector: Disconnected - Engine control unit connector: Disconnected	OK → STOP ✗ → Repair the harness. (A2 - 6)

ACTUATOR INSPECTION

Refer to GROUP 17 – Exhaust Gas Recirculation (EGR) System.

FUEL PRESSURE TEST

Refer to P. 13-123-122.



ENGINE CONTROL UNIT TERMINAL VOLTAGE CHECK

- (1) Connect a needle-nosed wire probe (test harness: MB991223 or paper clip) to a voltmeter probe.
- (2) Insert the needle-nosed wire probe into each of the engine control unit connector terminals from the wire side, and measure the voltage while referring to the check chart.

NOTE

1. Make the voltage measurement with the engine control unit connectors connected.
2. Make the voltage measurement between terminal No. 26 (earth terminal) and each terminal.
3. You may find it convenient to pull out the engine control unit to make it easier to reach the connector terminals.
4. The checks can be carried out off the order given in the chart.

Caution

Short-circuiting the positive (+) probe between a connector terminal and earth could damage the vehicle wiring, the sensor, engine control unit, or all there. Use care to prevent this!

- (3) If voltmeter shows any division from standard value, check the corresponding sensor, actuator and related electrical wiring, then repair or replace.
- (4) After repair or replacement, recheck with the voltmeter to confirm that the repair has corrected the problem.

TERMINAL VOLTAGE CHECK CHART

Engine Control Unit Terminal Arrangement

Engine control unit connector

61	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
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9FU0101

NOTE

*1: SOHC only

*2: DOHC only

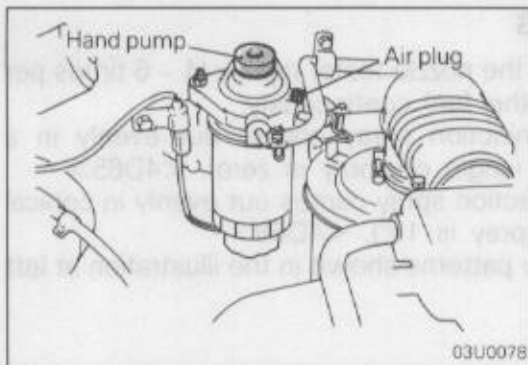
*3: Vehicles for Europe and General Export

Terminal No.	Check item	Check condition (Engine condition)		Standard value
60	Backup power supply	Ignition switch: OFF		SV
12	Power supply	Ignition switch: ON		SV
25				
62*2	Ignition switch-IG	Ignition switch: ON		SV
38*2	Control relay (Power supply)	Ignition switch: OFF		SV
		Ignition switch: ON		0-3V
8	Control relay (Fuel pump)	Ignition switch: ON		SV
		Engine: Idle speed		0-3V
61	Sensor impressed voltage	Ignition switch: ON		4.5-5.5V
70	Air flow sensor	Engine: Idle speed		2.2-3.2V
		Engine r/min.: 2,000 r/min.		
19	Air flow sensor reset signal	Engine: Idle speed		0-1V
		Engine r/min.: 3,000 r/min.		6-9V
52	Intake air temperature sensor	Ignition switch: ON	When intake air temperature is 0°C (32°F)	3.2-3.8V
			When intake air temperature is 20°C (68°F)	2.3-2.9V
			When intake air temperature is 40°C (104°F)	1.5-2.1V
			When intake air temperature is 80°C (176°F)	0.4-1.0V
65	Barometric pressure sensor	Ignition switch: ON	When altitude is 0 m	3.7-4.3V
			When altitude is 1,200 m (3,937 ft.)	3.2-3.8V

Terminal No.	Check item	Check condition (Engine condition)		Standard value
63	Coolant temperature sensor	Ignition switch: ON	When coolant temperature is 0°C (32°F)	3.2–3.8V
			When coolant temperature is 20°C (68°F)	2.3–2.9V
			When coolant temperature is 40°C (104°F)	1.3–1.9V
			When coolant temperature is 80°C (176°F)	0.3–0.9V
64	Throttle position sensor	Ignition switch: ON	Set throttle valve to idle position	0.3–1.0V
			Fully open throttle valve	4.5–5.5V
67	Idle position switch	Ignition switch: ON	Set throttle valve to idle position	0–1V
			Slightly open throttle valve	4V or more
68	Top dead centre sensor	Engine: Cranking		0.2–3.0V
		Engine: Idle speed		
69	Crank angle sensor	Engine: Cranking		0.2–3.0V
		Engine: Idle speed		
51	Ignition switch-ST	Engine: Cranking		8V or more
71	Inhibitor switch	Ignition switch: ON	Set selector lever to P or N.	0–3V
			Set selector lever to D, 2, L or R.	8–14V
66	Vehicle speed sensor	Ignition switch: ON Move the vehicle slowly forward		0↔5V (Changes repeatedly)
37	Power steering fluid pressure switch	Engine: Idling after warming up	When steering wheel is stationary	SV
			When steering wheel is turned	0–3V
45	Air conditioner switch	Engine: Idle speed	Turn the air conditioner switch OFF	0–3V
			Turn the air conditioner switch ON (Air conditioner compressor is operating)	SV
22	Air conditioner relay	Engine: Idle speed Air conditioner switch: OFF→ON Turn the air conditioner switch ON (Air conditioner compressor is operating)		SV or temporarily 6V or more ↓ 0–3V

Terminal No.	Check item	Check condition (Engine condition)		Standard value
56	Oxygen sensor	Engine: Running at 2,000 r/min. after having warmed up. (Check using a digital type voltmeter.)		0↔0.8V (Changes repeatedly)
1	No. 1 injector	While engine is idling after having warmed up, suddenly depress the accelerator pedal		From 11–14V, momentarily drops slightly
14	No. 2 injector			
2	No. 3 injector			
15	No. 4 injector			
4*2	Stepper motor coil <A1>	Engine: Soon after the warmed up engine is started		SV ↑ 0–6V (Repeat the variation.) ↓
17*2	Stepper motor coil <A2>			
5*2	Stepper motor coil <B1>			
18*2	Stepper motor coil <B2>			
10*1	Power transistor unit	Engine r/min.: 3,000 r/min.		0.3–3.0V
10*2	Power transistor unit A	Engine r/min.: 3,000 r/min.		0.3–3.0V
23*2	Power transistor unit B			
9*3	Purge control solenoid valve	Ignition switch: ON		SV
		Running at 3,000 r/min., while engine is warming up after having been started.		0–3V
31*2	Engine ignition signal	Engine r/min.: 3,000 r/min.		0.3–3.0V
34	Ignition timing adjustment terminal	Ignition switch: ON	Earth the ignition timing adjustment terminal	0–1V
			Remove the earth connection from the ignition timing adjustment terminal.	4.0–5.5V
36	Engine warning lamp	Ignition switch: OFF→ON		0–3V ↓ 9–13V (After several seconds have elapsed)
6*3	EGR control solenoid valve	Ignition switch: ON		SV
		Engine: Idling with engine coolant temperature 60°C (140°F) or lower		0–3V
35*3	Oxygen sensor heater	Engine: Idling after warming up		0–3V
		Engine r/min.: 5,000 r/min.		SV

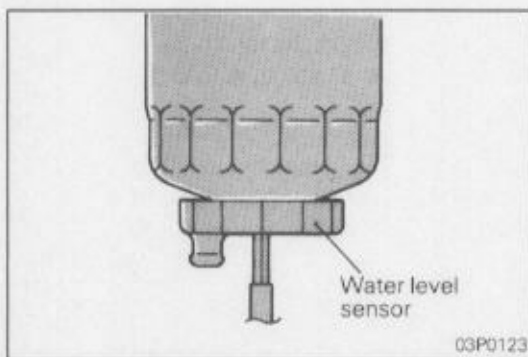
Terminal No.	Check item	Check condition (Engine condition)	Standard value
5*1	Idle speed control servo valve position sensor No. 1	Ignition switch: Immediately after turning ON	1.5–4V (Momentarily) ↓ 0–1V or 4.5–5.5V
18*1	Idle speed control servo valve position sensor No. 2	Ignition switch: Immediately after turning ON	1.5–4V (Momentarily) ↓ 0–1V or 4.5–5.5V
4*1	Idle speed control motor (closed)	Ignition switch: Immediately after turning ON	2V or more (Momentarily) ↓ 0–1V
17*1	Idle speed control motor (open)	Ignition switch: Immediately after turning ON	4V or more (Momentarily) ↓ 0–1V

**AIR BLEED FROM FUEL LINE**

E13FSAC

Remove air after performing the following operations:

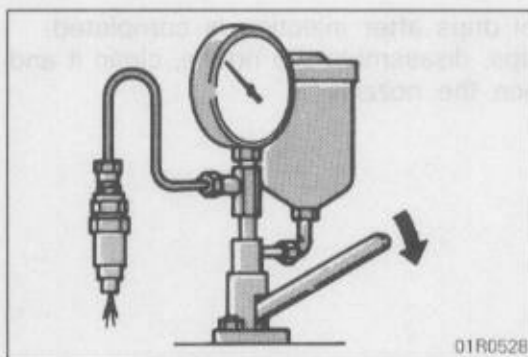
- When fuel is drained and refilled.
 - When the fuel filter is replaced.
 - When the main fuel line is removed.
- (1) Loosen the fuel filter air plug.
 - (2) Place shop towels around air plug hole. Operate the hand pump repeatedly until no bubbles come from the plug hole. Tighten the air plug.
 - (3) Repeat until the hand pump operation becomes stiff.

**WATER BLEED FROM FUEL FILTER**

E13FVAC

Water is in the filter when the fuel filter indicator lights up. Drain water by the following procedures.

- (1) Loosen water level sensor.
- (2) Place shop towels around the water level sensor. Drain the water with a hand pump. Finger-tighten the water level sensor.

**INJECTION NOZZLE INSPECTION AND ADJUSTMENT**

E13FOAH

Caution

Never touch the spray that is injected from the nozzle.

BREAKING PRESSURE TESTING AND ADJUSTMENT

- (1) Set injection nozzle in nozzle tester.
- (2) Inject fuel 2 – 3 times to bleed the air.
- (3) Gently press down the lever of the nozzle tester, and take a reading of the maximum indication value (fuel injection initial pressure) on the pressure gauge.

Standard value: 12,000 – 13,000 kPa

(120 – 130 kg/cm², 1,707 – 1,849 psi)

- (4) If the fuel injection initial pressure is outside the standard value, disassemble the nozzle holder to clean it, and then change the thickness of the shim to adjust the fuel injection initial pressure.

NOTE

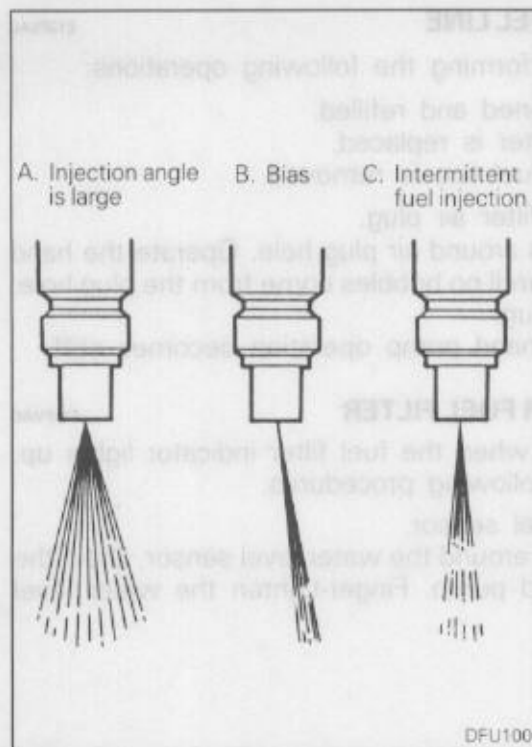
1. For disassembly and reassembly of the nozzle holder, refer to the Engine Workshop Manual (Pub. No. PWEE9079).
2. There are 11 shims for adjustment, with thicknesses in the range 1.20 – 1.70 mm (0.0472 – 0.0669 in.).
3. When the shim thickness is increased by 0.1 mm (0.004 in.), the fuel injection initial pressure increases as follows.

4D65 engine:

2,400 kPa (24 kg/cm², 341 psi)

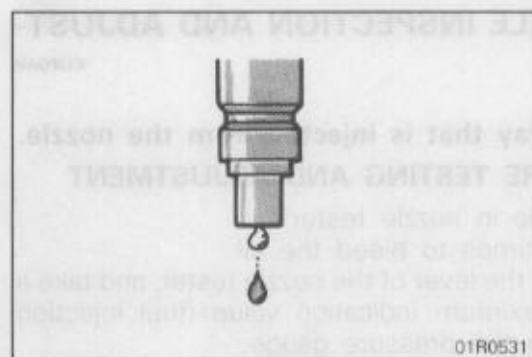
4D68 engine:

1,500 kPa (15 kg/cm², 213 psi)

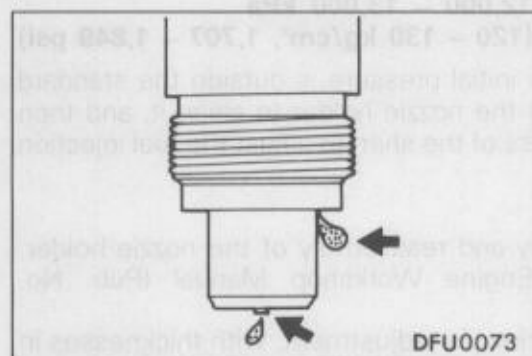


INJECTION TESTING

- (1) Move the lever of the nozzle tester rapidly (4 – 6 times per second) to eject the fuel continuously.
- (2) Check that the injection spray comes out evenly in a straight, thin line (angle of spray is zero). <4D65>
Check that the injection spray comes out evenly in conical shape (angle of spray is 15°). <4D68>
The injection spray patterns shown in the illustration at left are wrong.

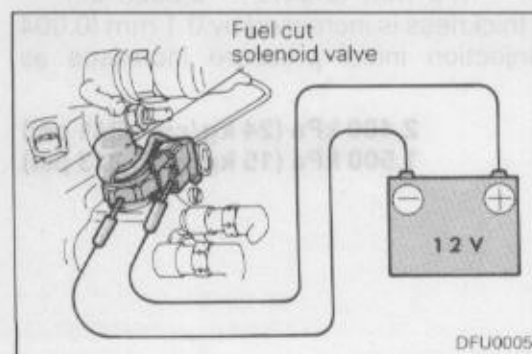


- (3) Check that no fuel drips after injection is completed.
- (4) If there are any drips, disassemble the nozzle, clean it and reinspect, or replace the nozzle.



LEAKAGE TESTING

- (1) Gently press down the lever of the nozzle tester until the pressure inside the nozzle becomes 10,000 – 11,000 kPa (100 – 110 kg/cm², 1,422 – 1,565 psi), and after holding this pressure for approximately 10 seconds, check that there are no fuel leaks from the nozzle.
- (2) If there are any drips, disassemble the nozzle, clean it and reinspect, or replace the nozzle.

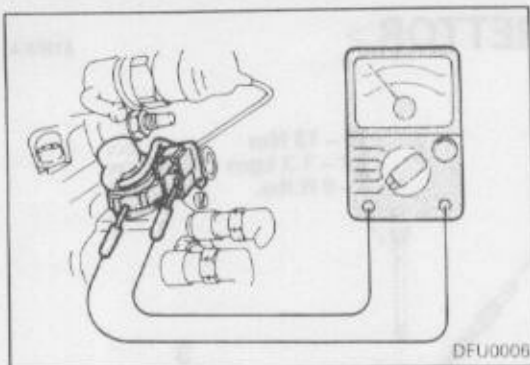


FUEL CUT SOLENOID VALVE INSPECTION

- (1) Apply battery voltage directly to the fuel cut solenoid valve terminals.

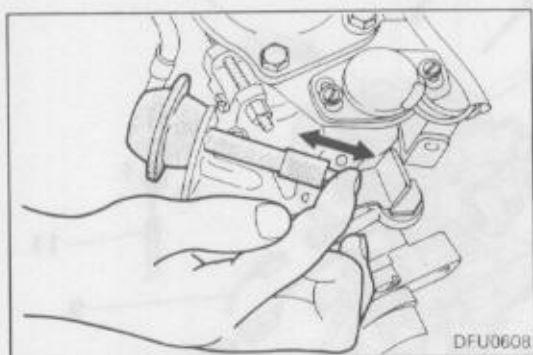
Caution**Take care not to cause a short circuit.**

- (2) Check that a click is heard when the battery voltage is applied.



- (3) Using a circuit tester, measure the resistance between the fuel cut solenoid terminals.

Standard value range: 9 – 12 Ω [at 20°C (68°F)]



DASH POT INSPECTION

- (1) Remove the dash pot.
- (2) Push dash pot rod in lightly and confirm that there is resistance.

NOTE

1. Resistance increases as the rod is pushed harder.
2. If the rod can be pushed in with no resistance, either the diaphragm or check valve is faulty.

- (3) Release the finger and confirm that the rod returns to its original position.

NOTE

If rod returns more slowly, the check valve is faulty.

CARBURETTOR <CONVENTIONAL CARBURETTOR>

REMOVAL AND INSTALLATION

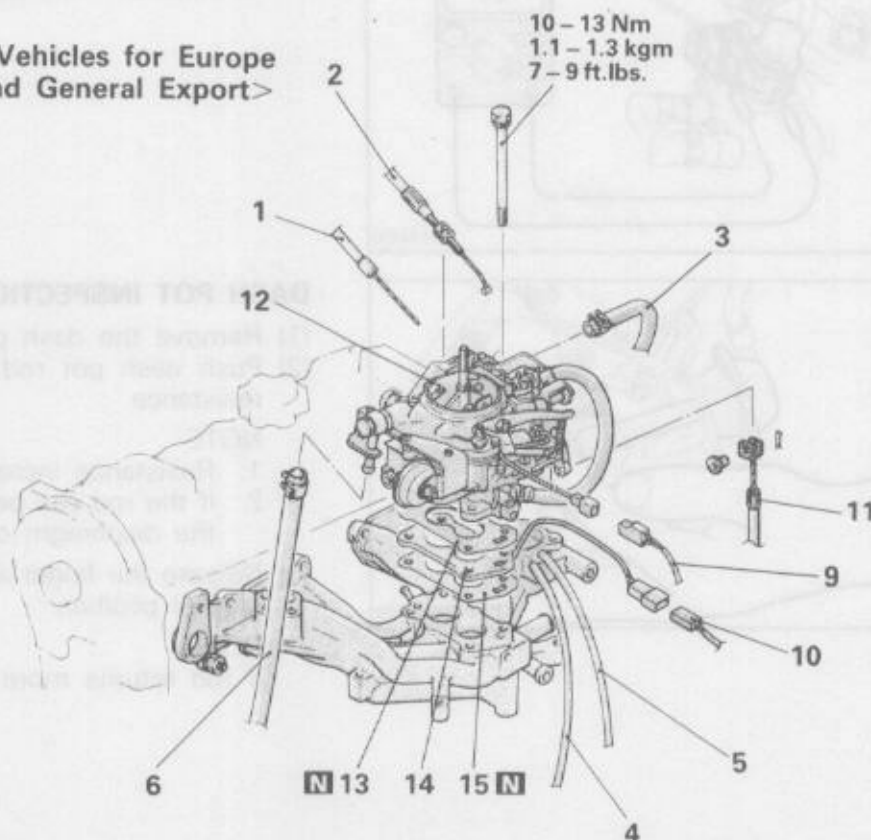
Pre-removal Operation

- Removal of Air Cleaner
(Refer to GROUP 15 – Air Cleaner.)
- Draining the Engine Coolant
(Refer to GROUP 14 – Service Adjustment Procedures.)

Post-installation Operation

- Supplying of Engine Coolant
(Refer to GROUP 14 – Service Adjustment Procedures.)
- Installation of Air Cleaner
(Refer to GROUP 15 – Air Cleaner.)

<Vehicles for Europe and General Export>



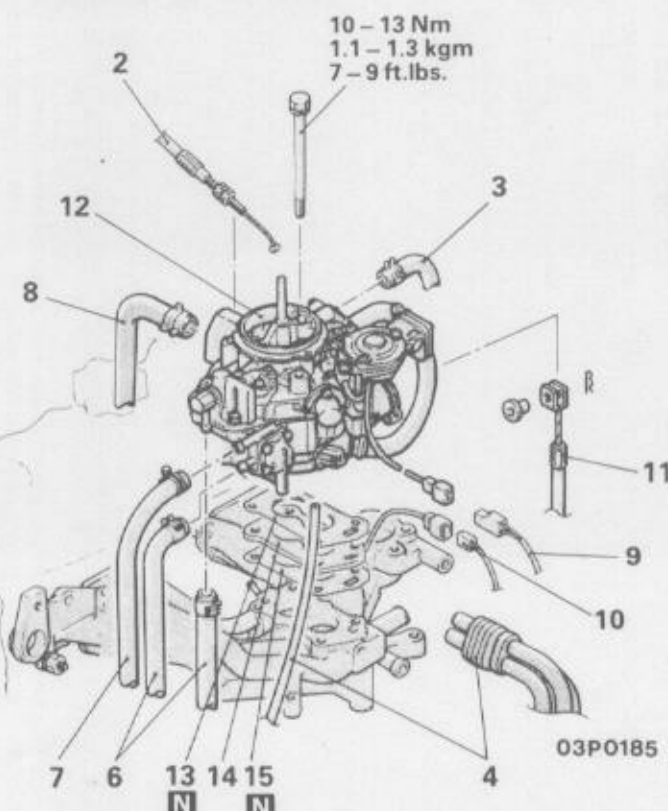
03P0184

Removal steps

1. Connection for choke cable
<Vehicles for General Export with manual choke>
- ♦♦ 2. Connection for accelerator cable
3. Connection for water hose
4. Connection for vacuum hose
5. Connection for vacuum hose <A/T for Europe>
6. Connection for fuel main hose
7. Connection for fuel return hose
8. Connection for fuel vapor hose
9. Connection for fuel cut solenoid valve
10. Cold mixture heater connector
<Vehicles for Europe and Australia>

- ♦♦ 11. Throttle control cable <A/T>
- ♦♦ 12. Carburettor assembly
- ♦♦ 13. Gasket
- ♦♦ 14. Cold mixture heater
<Vehicles for Europe and Australia>
- ♦♦ 15. Gasket

<Vehicles for Australia>



03P0185

NOTE

- (1) Reverse the removal procedures to reinstall.
- (2) ♦♦: Refer to "Service Points of Removal".
- (3) ♦♦: Refer to "Service Points of Installation".
- (4) [N]: Non-reusable parts

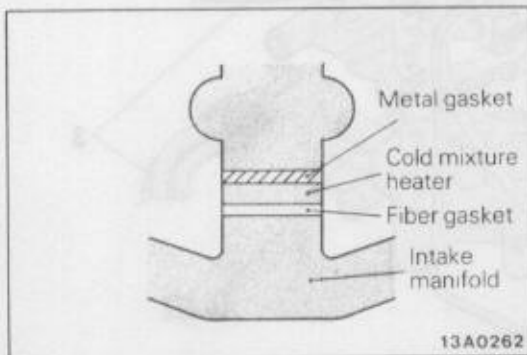
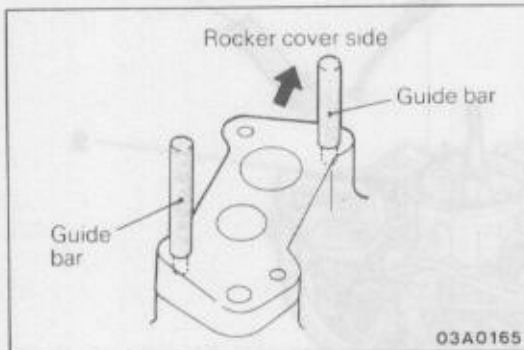
E13PBAB

SERVICE POINTS OF REMOVAL**12. REMOVAL OF CARBURETTOR ASSEMBLY**

Remove the carburettor from the intake manifold, holding it horizontal and taking care not to spill fuel from the fuel bowl.

14. REMOVAL OF COLD MIXTURE HEATER**Caution**

When removing the cold mixture heater, be careful not to pull the harness up and down or apply excessive force to the terminal.

**SERVICE POINTS OF INSTALLATION**

E13PDAC

15. INSTALLATION OF GASKET / 14. COLD MIXTURE HEATER / 13. GASKET / 12. CARBURETTOR ASSEMBLY <VEHICLES FOR AUSTRALIA>

To ensure correct installation of the metal gasket, observe the following installation procedure.

- (1) Use carburettor mounting bolt holes in the intake manifold to install two guide bars diagonally as illustrated at left.
- (2) Slide the carburettor gasket and carburettor along the guide bars to set them on the intake manifold.

NOTE

After setting, do not move the carburettor.

- (3) Install the carburettor mounting bolts in other two bolt holes where no guide bars are present and loosely tighten these bolts.
- (4) Remove the guide bars, install the remaining carburettor mounting bolts and loosely tighten these bolts.
- (5) Tighten the four carburettor mounting bolts specified torque.

11. THROTTLE CONTROL CABLE ADJUSTMENT

Refer to GROUP 23 – Service Adjustment Procedures.

2. ACCELERATOR CABLE ADJUSTMENT

Refer to P.13-15.

CARBURETTOR <FBC>

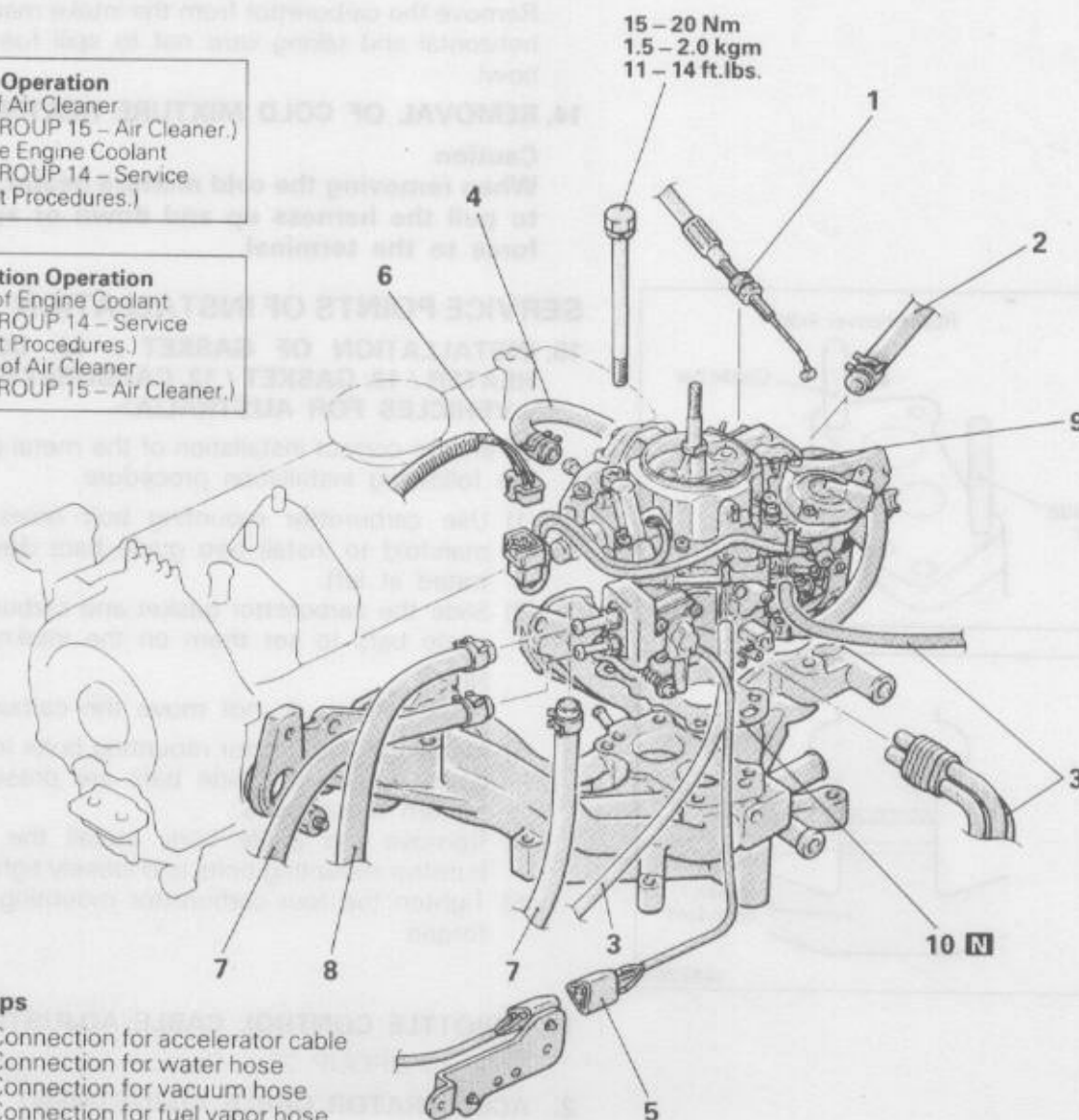
REMOVAL AND INSTALLATION

Pre-removal Operation

- Removal of Air Cleaner (Refer to GROUP 15 – Air Cleaner.)
- Draining the Engine Coolant (Refer to GROUP 14 – Service Adjustment Procedures.)

Post-installation Operation

- Supplying of Engine Coolant (Refer to GROUP 14 – Service Adjustment Procedures.)
- Installation of Air Cleaner (Refer to GROUP 15 – Air Cleaner.)

**Removal steps**

- ◆◆ 1. Connection for accelerator cable
2. Connection for water hose
3. Connection for vacuum hose
4. Connection for fuel vapor hose
5. Connection for throttle position sensor
6. Connection for feedback solenoid valve, slow cut solenoid valve
7. Connection for fuel main hose
8. Connection for fuel return hose
- ◆◆ 9. Carburettor assembly
10. Gasket

03P0182

NOTE

- (1) Reverse the removal procedures to reinstall.
- (2) ◆◆ Refer to "Service Points of Removal".
- (3) ◆◆ Refer to "Service Points of Installation".
- (4) **N**: Non-reusable parts

SERVICE POINT OF REMOVAL

E13PBAC

9. REMOVAL OF CARBURETTOR ASSEMBLY

Refer to P.13-129.

SERVICE POINT OF INSTALLATION

E13PDAB

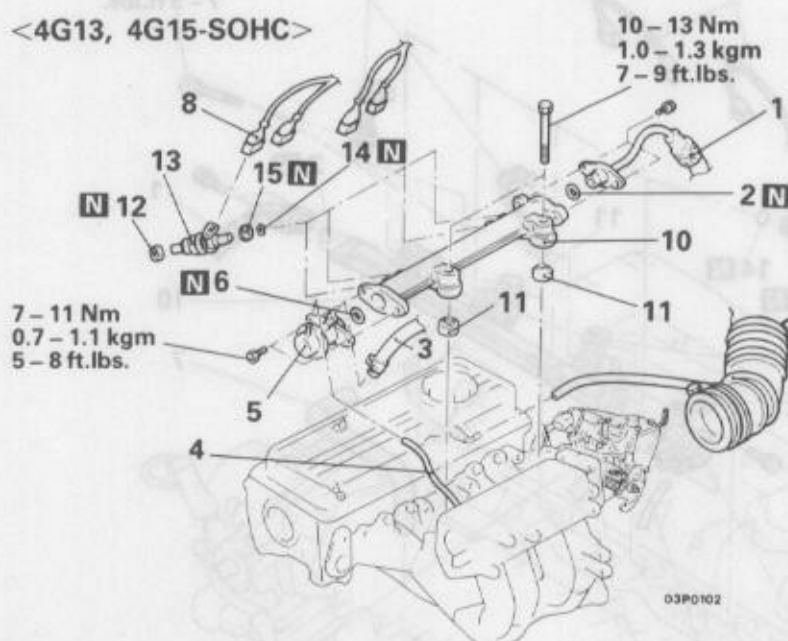
1. ACCELERATOR CABLE ADJUSTMENT

Refer to P.13-32 for adjustment procedures.

INJECTOR <MPI>

REMOVAL AND INSTALLATION

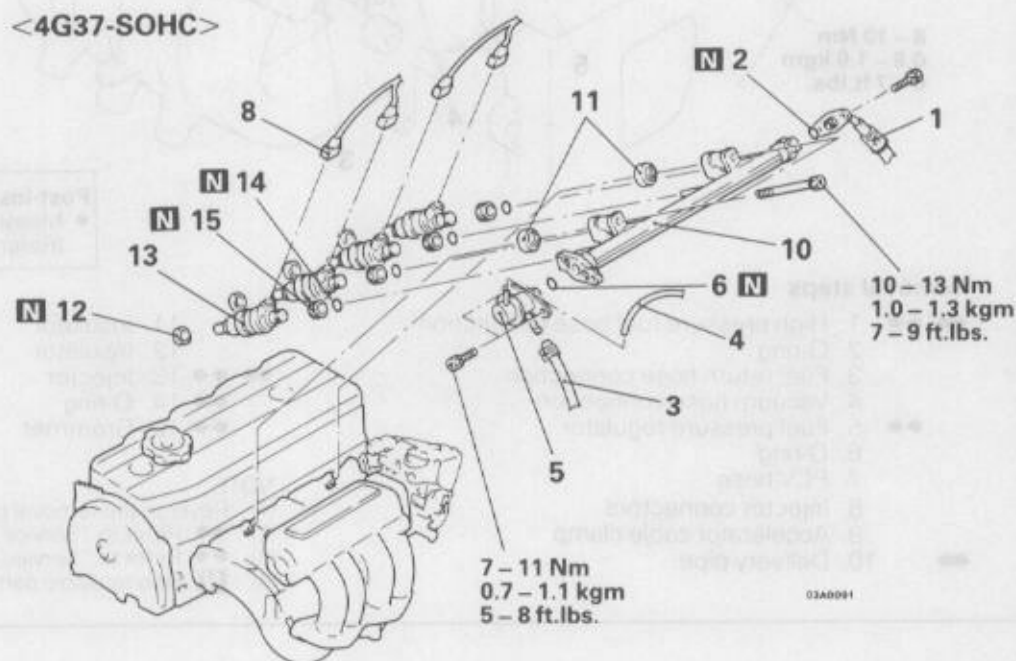
<4G13, 4G15-SOHC>



Post-installation Operation

- Measurement of Fuel Pressure (Refer to P.13-86-65.)

<4G37-SOHC>



Removal steps

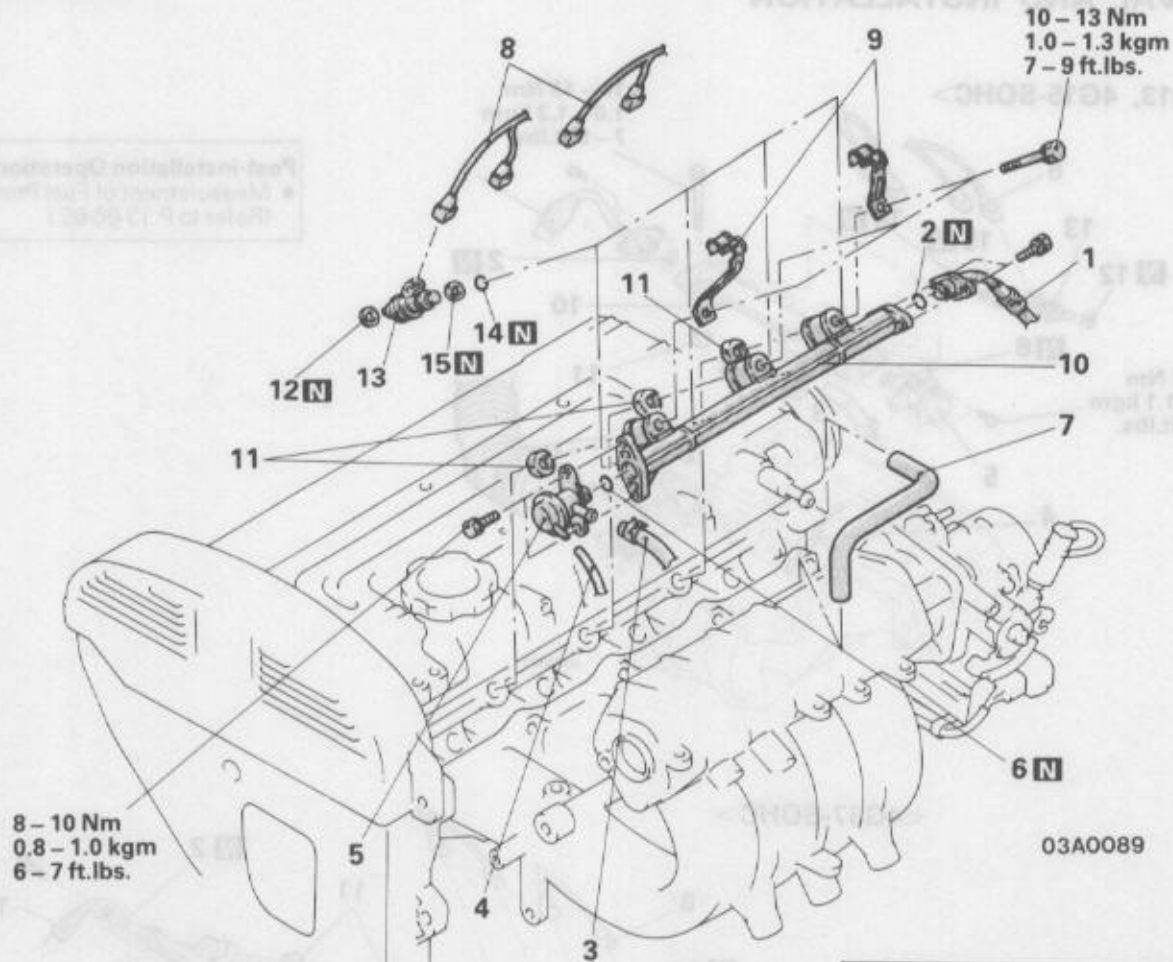
- ◆◆◆ 1. High pressure fuel hose connection
- ◆◆ 2. O-ring
- ◆◆ 3. Fuel return hose connection
- ◆◆ 4. Vacuum hose connection
- ◆◆ 5. Fuel pressure regulator
- ◆◆ 6. O-ring
- ◆◆ 8. Injector connectors
- ◆◆ 10. Delivery pipe
- ◆◆ 11. Insulator

- ◆◆◆ 12. Insulator
- ◆◆◆ 13. Injector
- ◆◆ 14. O-ring
- ◆◆ 15. Grommet

NOTE

- (1) Reverse the removal procedures to reinstall.
- (2) ◆◆◆: Refer to "Service Points of Removal".
- (3) ◆◆◆: Refer to "Service Points of Installation".
- (4) [N] Non-reusable parts

<4G61-DOHC>



03A0089

Removal steps

- ◆◆ ◆◆ 1. High pressure fuel hose connection
- ◆◆ 2. O-ring
- ◆◆ 3. Fuel return hose connection
- ◆◆ 4. Vacuum hose connection
- ◆◆ 5. Fuel pressure regulator
- ◆◆ 6. O-ring
- ◆◆ 7. PCV hose
- ◆◆ 8. Injector connectors
- ◆◆ 9. Accelerator cable clamp
- ◆◆ 10. Delivery pipe

- ◆◆ 11. Insulator
- ◆◆ 12. Insulator
- ◆◆ 13. Injector
- ◆◆ 14. O-ring
- ◆◆ 15. Grommet

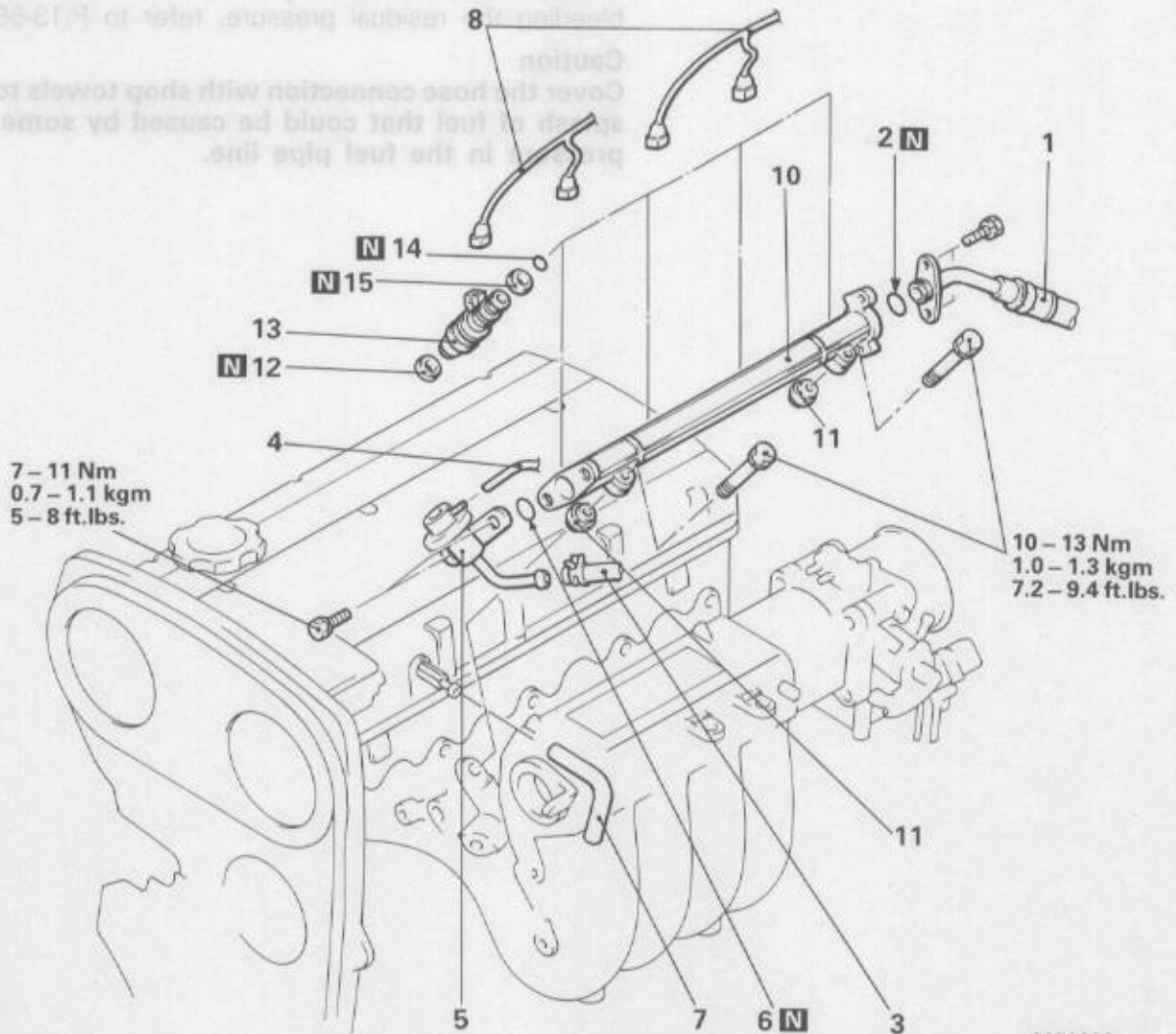
NOTE

- (1) Reverse the removal procedures to reinstall.
- (2) ◆◆ Refer to "Service Points of Removal".
- (3) ◆◆ Refer to "Service Points of Installation".
- (4) **N** Non-reusable parts.

Post-installation Operation

- ◆ Measurement of Fuel Pressure (Refer to P.13-123-40.)

<4G92, 4G93>



03P0268

Removal steps

- ◆◆ ◆◆ 1. High-pressure fuel hose connection
- ◆◆ 2. O-ring
- ◆◆ 3. Return hose connection
- ◆◆ 4. Vacuum hose connection
- ◆◆ 5. Fuel pressure regulator
- ◆◆ 6. O-ring
- ◆◆ 7. PCV hose
- ◆◆ 8. Injector connector
- ◆◆ 10. Delivery pipe
- ◆◆ 11. Insulator
- ◆◆ 12. Insulator
- ◆◆ ◆◆ 13. Injector
- ◆◆ ◆◆ 14. O-ring
- ◆◆ ◆◆ 15. Grommet

NOTE

- (1) Reverse the removal procedures to reinstall.
- (2) ◆◆: Refer to "Service Points of Removal".
- (3) ◆◆: Refer to "Service Points of Installation".
- (4) [N]: Non-reusable parts

SERVICE POINTS OF REMOVAL

E13JBAC

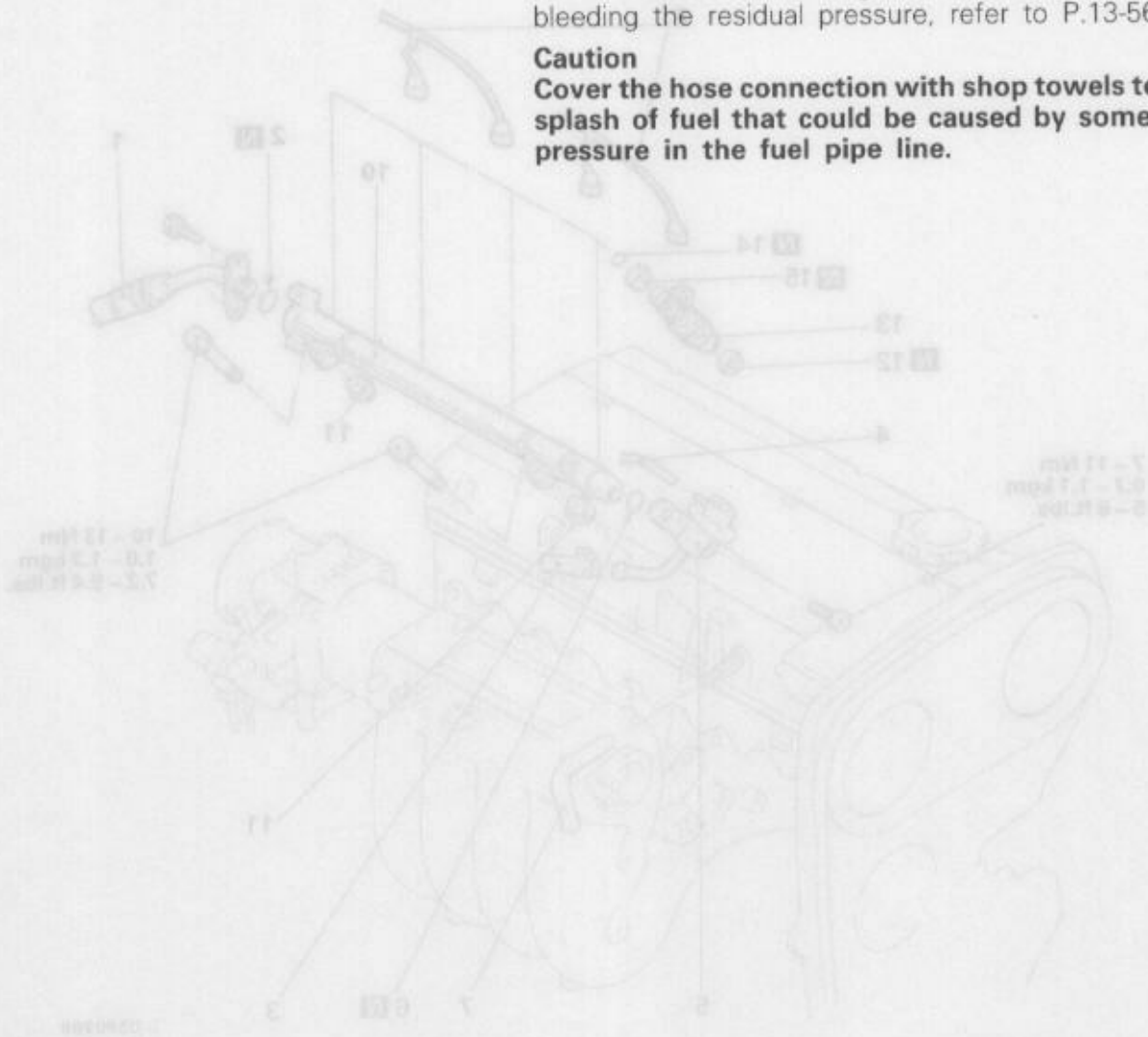
1. DISCONNECTION OF HIGH PRESSURE FUEL HOSE

Bleed the residual pressure within the fuel pipe line so as to prevent the flow of fuel.

For information concerning the method to be followed for bleeding the residual pressure, refer to P.13-56.

Caution

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.



Removal steps	
1. High-pressure fuel hose disconnection	10-11 min
2. O-ring	0.5-1.5 min
3. Fuel rail disconnection	0-5 min
4. Vacuum hose disconnection	
5. Fuel pressure regulator	
6. O-ring	
7. PCV hose	
8. Injector disconnection	
9. Delivery pipe	
10. Fuel rail	
11. Injector	
12. Injector	
13. Injector	
14. O-ring	
15. O-ring	
16. O-ring	

NOTE

(1) Perform the removal procedure in order.

(2) Refer to "Service Points of Removal".

(3) Refer to "Service Points of Removal".

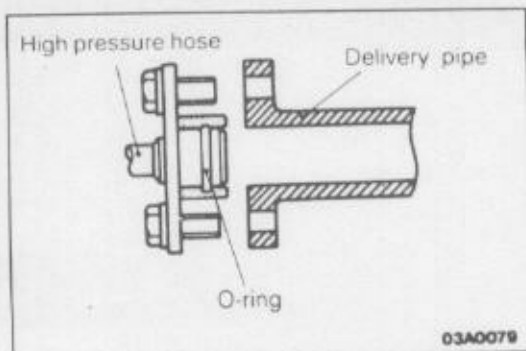
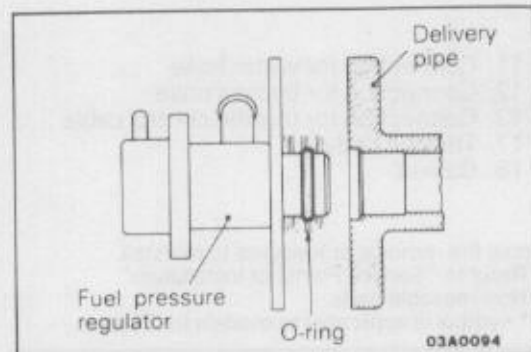
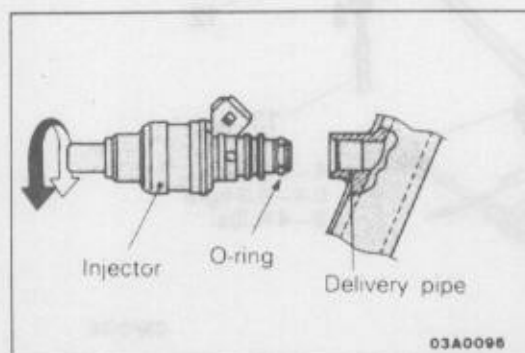
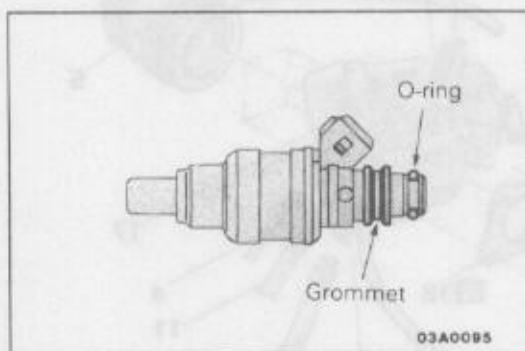
(4) Non-removable part.

10. REMOVAL OF DELIVERY PIPE / 13. INJECTOR

Remove the delivery pipe (with the injectors attached to it).

Caution

Care must be taken when removing the delivery pipe not to drop the injector.

**SERVICE POINTS OF INSTALLATION**

E13JDACa

15. INSTALLATION OF GROMMET / 14. O-RING / 13. INJECTOR

- (1) After installation of the grommet and O-ring (in that sequence) to the injector, apply spindle oil or petrol to the O-ring.

- (2) While turning the injector to the left and right, install it on the delivery pipe.
- (3) Check to be sure that the injector turns smoothly.

Caution

If it does not turn smoothly, the O-ring may be trapped. Remove the injector and then re-insert it into the delivery pipe, and check once again.

5. INSTALLATION OF FUEL PRESSURE REGULATOR

When connecting the fuel pressure regulator to the delivery pipe, apply spindle oil or petrol to the O-ring, and then insert it, being careful not to damage the O-ring.

1. CONNECTION OF HIGH PRESSURE FUEL HOSE

When connecting the high pressure fuel hose to the delivery pipe, apply petrol to the hose union, and then insert it, being careful not to damage the O-ring.

THROTTLE BODY <MPI>

REMOVAL AND INSTALLATION

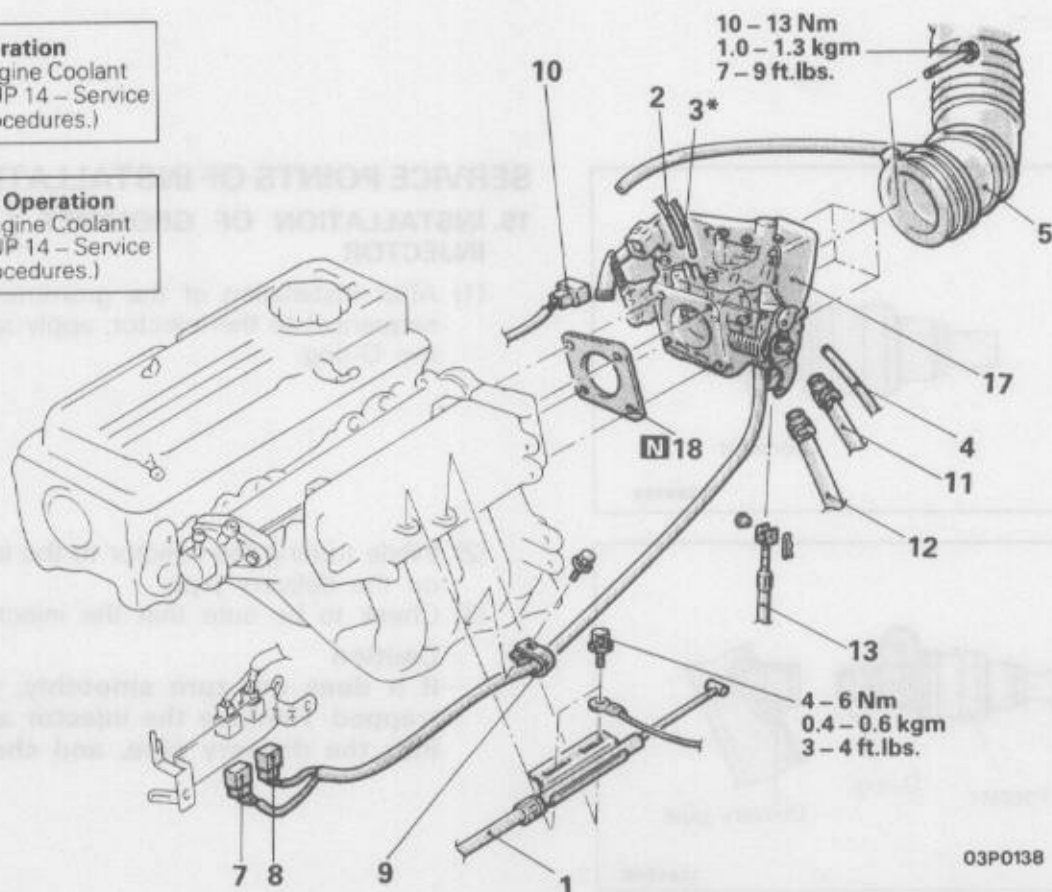
<4G15-SOHC>

Pre-removal Operation

- Draining the Engine Coolant (Refer to GROUP 14 – Service Adjustment Procedures.)

Post-installation Operation

- Supplying of Engine Coolant (Refer to GROUP 14 – Service Adjustment Procedures.)

**Removal steps**

- ◆◆ 1. Accelerator cable
2. Connection for EGR vacuum hose
3. Connection for purge control valve vacuum hose
4. Connection for vacuum hose
5. Connection for air intake hose
7. Connection for motor position sensor
8. Connection for throttle position sensor
9. Harness clamp
10. Connection for idle speed control servo

11. Connection for water hose
12. Connection for bypass hose
- ◆◆ 13. Connection for throttle control cable
17. Throttle body
18. Gasket

NOTE

- (1) Reverse the removal procedures to reinstall.
- (2) ◆◆: Refer to "Service Points of Installation".
- (3) **N**: Non-reusable parts
- (4) The * symbol is applicable to models for Europe.

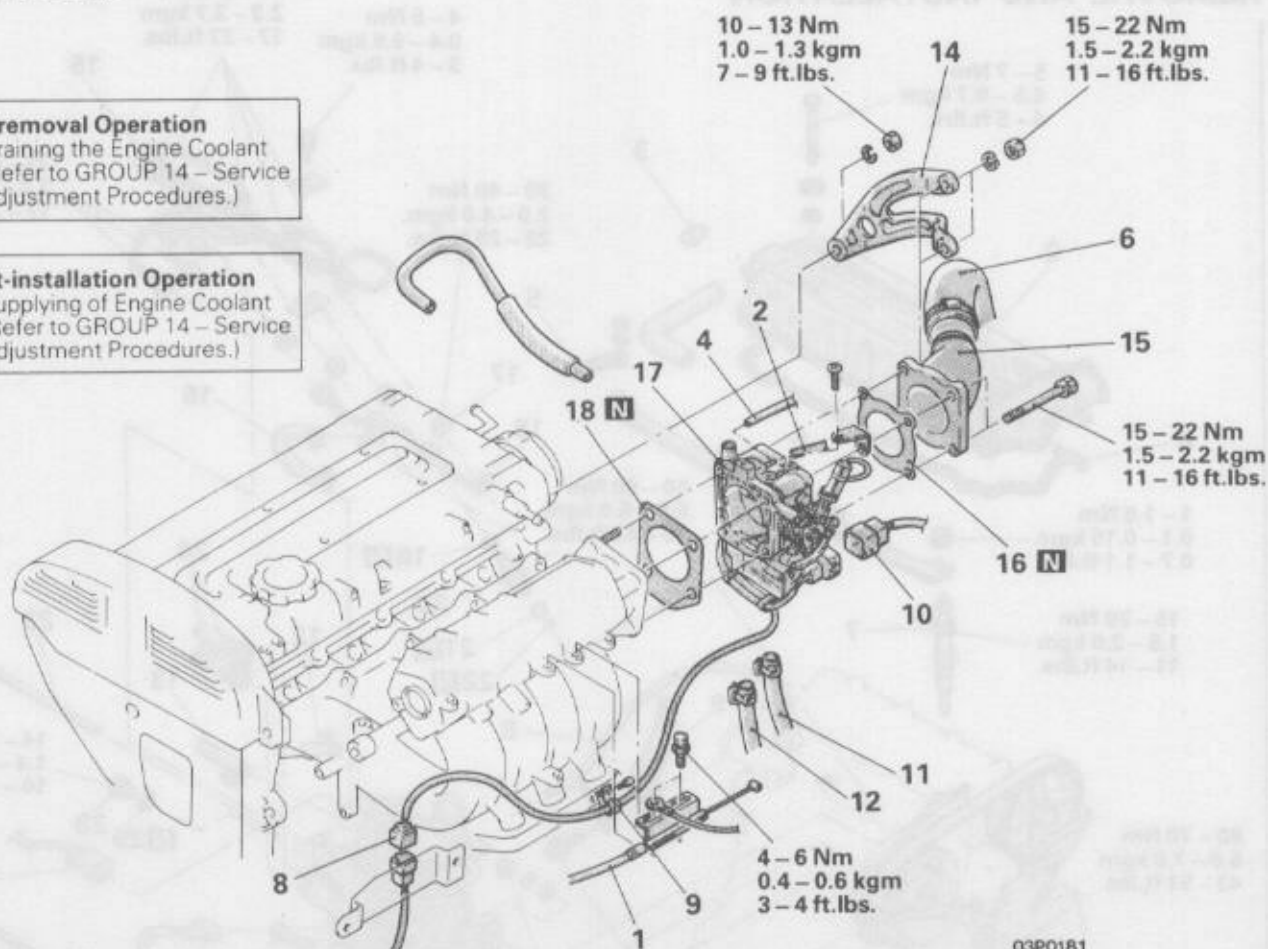
<4G61-DOHC>

Pre-removal Operation

- Draining the Engine Coolant (Refer to GROUP 14 – Service Adjustment Procedures.)

Post-installation Operation

- Supplying of Engine Coolant (Refer to GROUP 14 – Service Adjustment Procedures.)



03P0181

Removal steps

- ◆◆ 1. Accelerator cable
2. Connection for EGR vacuum hose
4. Connection for vacuum hose
6. Connection for air hose E
8. Connection for throttle position sensor
9. Harness clamp
10. Connection for idle speed control servo
11. Connection for water hose
12. Connection for bypass hose
14. Throttle body stay

15. Air fitting
16. Gasket
17. Throttle body
18. Gasket

NOTE

- (1) Reverse the removal procedures to reinstall.
- (2) ◆◆: Refer to "Service Points of Installation".
- (3) **N**: Non-reusable parts

SERVICE POINTS OF INSTALLATION

E13JBAE

13. THROTTLE CONTROL CABLE ADJUSTMENT

For information concerning adjustment of the throttle control cable, refer to GROUP 21 – Service Adjustment Procedures.

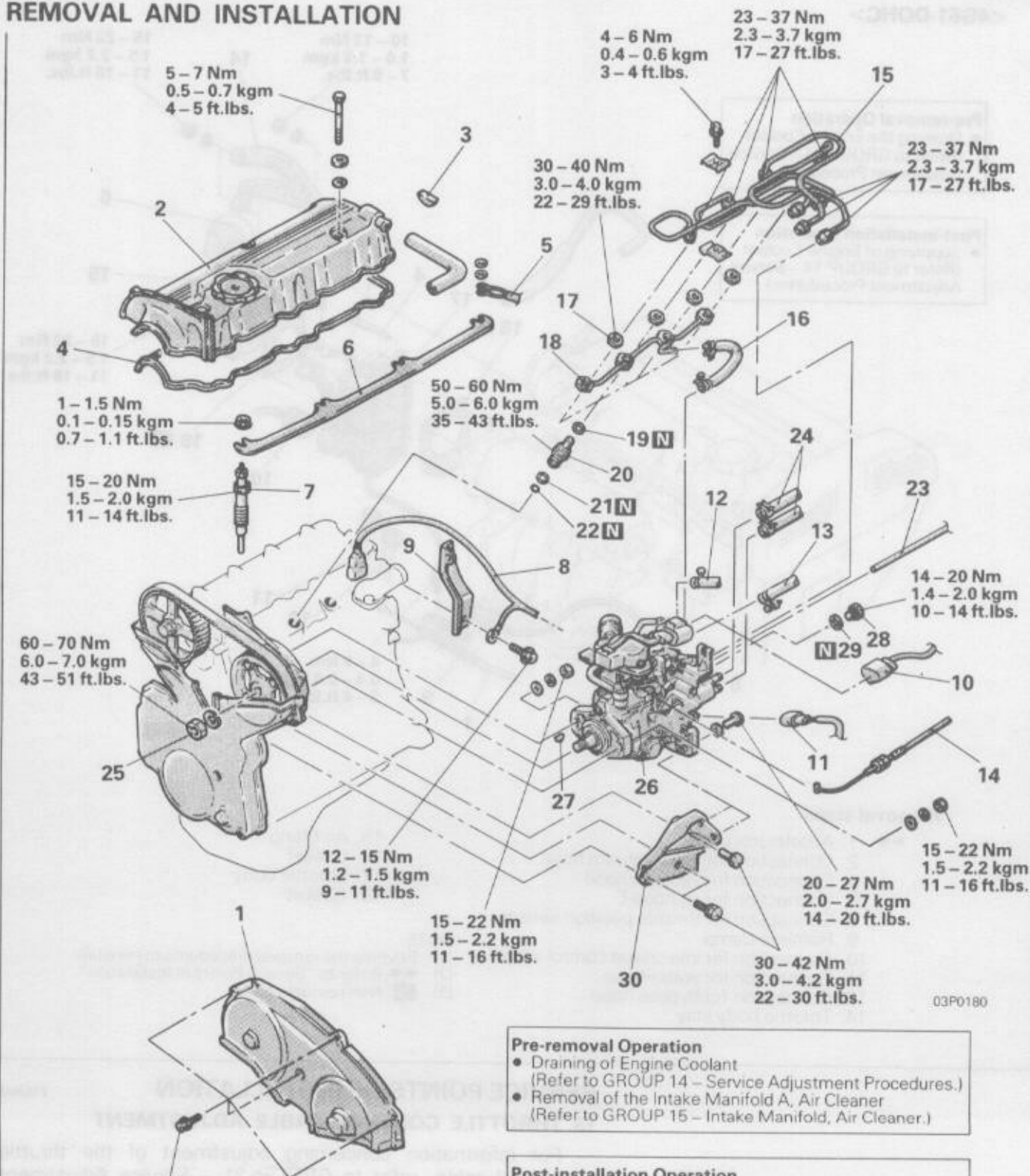
1. ACCELERATOR CABLE ADJUSTMENT

For information concerning adjustment of the accelerator cable, refer to P.13-56.

FUEL INJECTION PUMP <DIESEL ENGINE>

E13MA

REMOVAL AND INSTALLATION

**Pre-removal Operation**

- Draining of Engine Coolant
(Refer to GROUP 14 – Service Adjustment Procedures.)
- Removal of the Intake Manifold A, Air Cleaner
(Refer to GROUP 15 – Intake Manifold, Air Cleaner.)

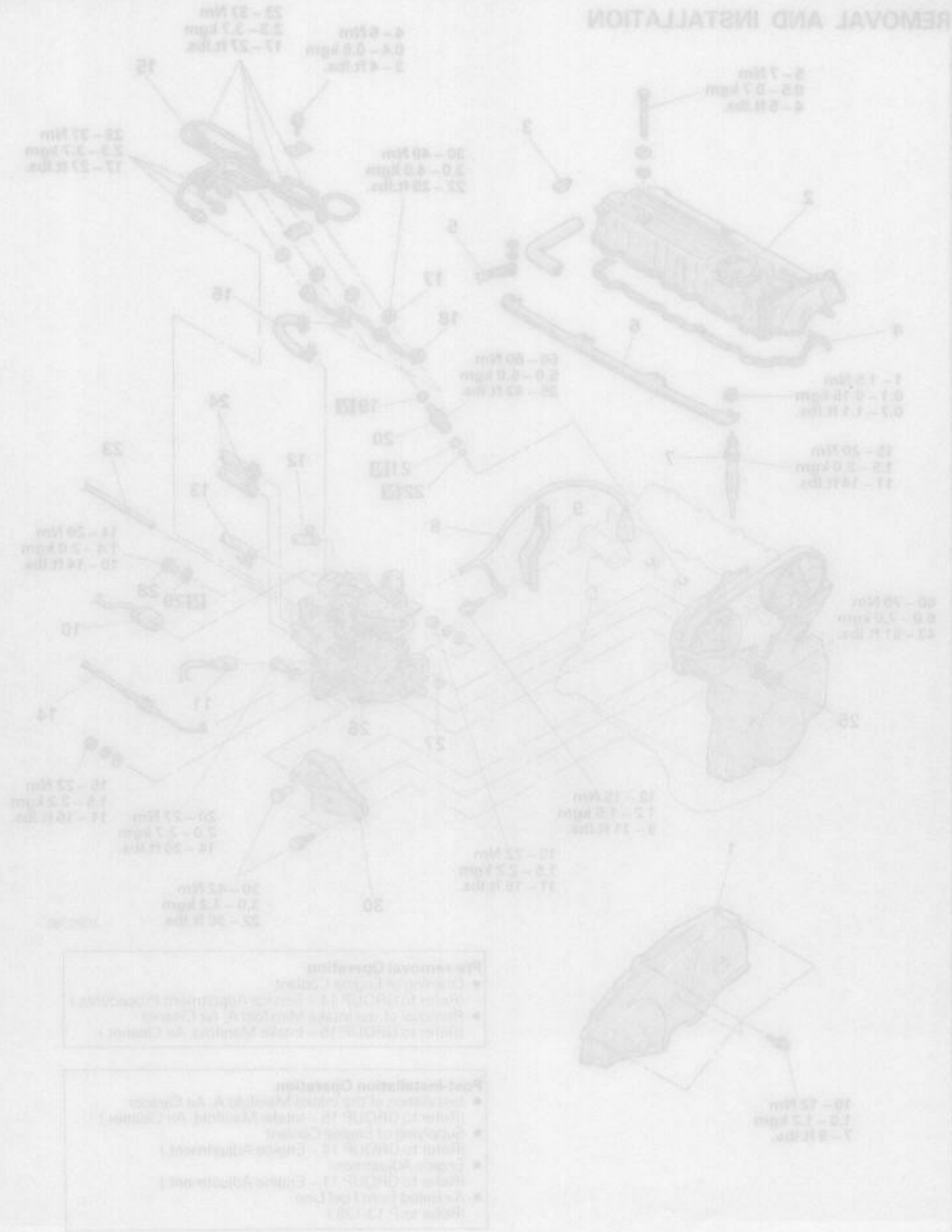
Post-installation Operation

- Installation of the Intake Manifold A, Air Cleaner
(Refer to GROUP 15 – Intake Manifold, Air Cleaner.)
- Supplying of Engine Coolant
(Refer to GROUP 14 – Engine Adjustment.)
- Engine Adjustment
(Refer to GROUP 11 – Engine Adjustment.)
- Air Bleed from Fuel Line
(Refer to P.13-125.)

NOTES

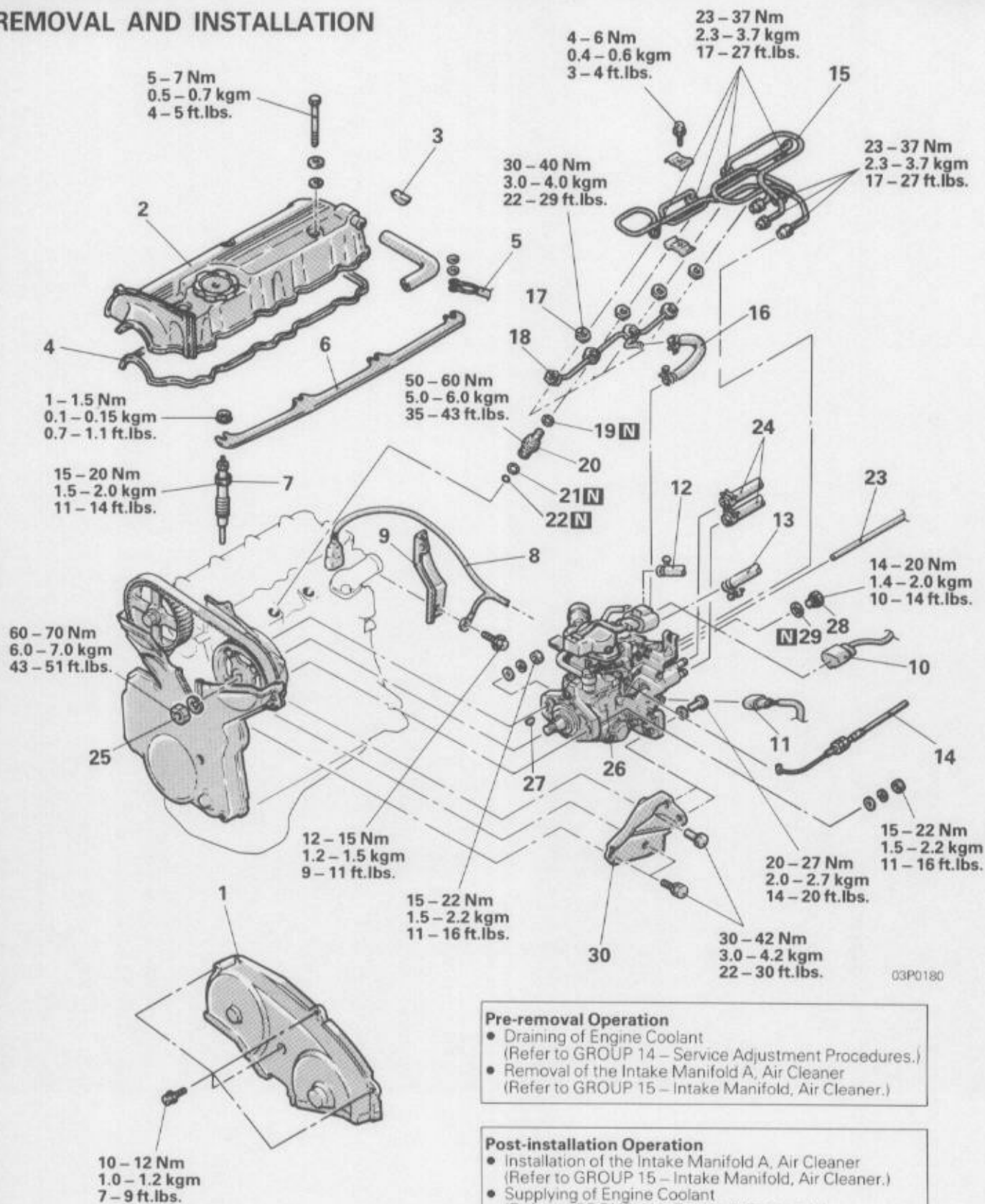
FUEL INJECTION PUMP > DIESEL ENGINE (MDS)

REMOVAL AND INSTALLATION



FUEL INJECTION PUMP <DIESEL ENGINE (4D65)>

REMOVAL AND INSTALLATION



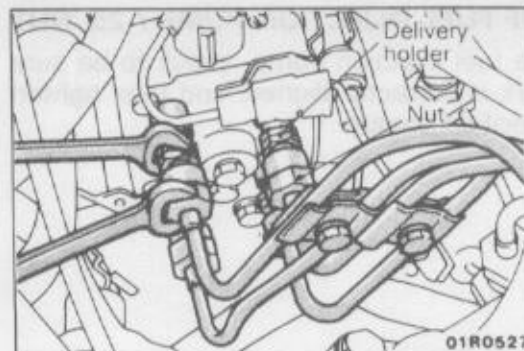
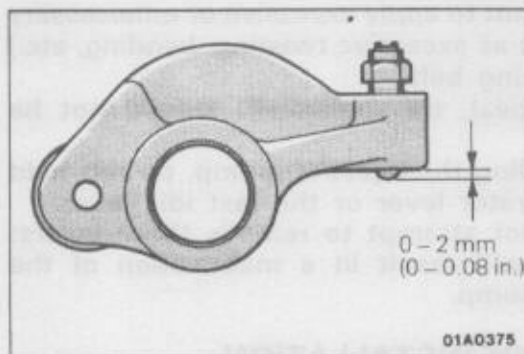
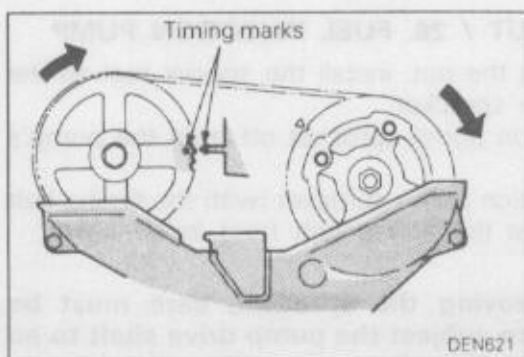
03P0180

Removal steps

- | | | |
|-------|--|--|
| ◆◆ | 1. Timing belt front upper cover | 19. Fuel return pipe gasket |
| ◆◆ | 2. Rocker cover | ◆◆ ◆◆ 20. Fuel injection nozzle |
| ◆◆ | 3. Semi-circular packing | ◆◆ 21. Holder gasket |
| | 4. Rocker cover gasket | ◆◆ 22. Nozzle gasket |
| | 5. Connection for control harness | 23. Connection for vacuum hose
(Air conditioner solenoid valve) |
| | 6. Glow plug plate | 24. Water hose |
| ◆◆ ◆◆ | 7. Glow plug | ◆◆ ◆◆ 25. Nut |
| | 8. Connection for fuel injection
pump harness | ◆◆ ◆◆ 26. Fuel injection pump |
| | 9. Intake manifold bracket B | 27. Key |
| | 10. Connection for lever position
sensor <Vehicles with EGR system> | 28. Timing check plug |
| | 11. Connection for control harness | 29. Gasket |
| | 12. Connection for fuel main hose | 30. Fuel pump bracket |
| | 13. Connection for fuel return hose | |
| ◆◆ | 14. Connection for accelerator cable | |
| ◆◆ ◆◆ | 15. Fuel injection pipes | |
| | 16. Fuel return hose | |
| ◆◆ ◆◆ | 17. Nut | |
| ◆◆ ◆◆ | 18. Fuel return pipe | |

NOTE

- (1) Reverse the removal procedures to reinstall.
- (2) ◆◆ Refer to "Service Points of Removal".
- (3) ◆◆ Refer to "Service Points of Installation".
- (4) **N** Non-reusable parts



SERVICE POINTS OF REMOVAL

E13MBAD

1. REMOVAL OF TIMING BELT FRONT UPPER COVER

Turn the crankshaft clockwise and align the timing marks.

Caution

The crankshaft must always be turned clockwise.

2. REMOVAL OF ROCKER COVER

Loosen all rocker arm adjustment screws so that the amount of tip projection (see illustration) is 0 – 2 mm (0 – 0.08 in.).

7. REMOVAL OF GLOW PLUG

Caution

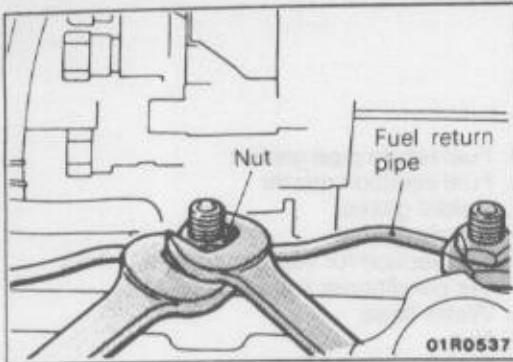
1. Be sure to leave one thread engaged when loosening the glow plug with a tool. Always finish removing the plug by hand.
2. Never reuse the glow plug if it has been dropped 10 cm (4 in.) or more.

15. REMOVAL OF FUEL INJECTION PIPES

When loosening the nuts at both ends of the fuel injection pipe, use a spanner or similar tool to hold the connected component: the delivery holder (at the pump end) or the nozzle holder (at the nozzle end).

Caution

After disconnecting the injection pipe, be sure to plug it so that foreign material, etc. does not get into the pump.

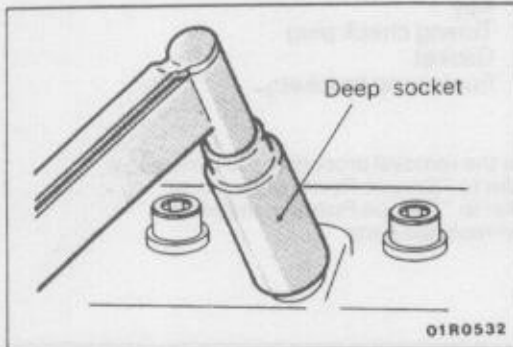
**17. REMOVAL OF NUT / 18. FUEL RETURN PIPE**

- (1) While using a spanner or similar tool to hold the hexagonal nut of the fuel return pipe, remove the nut.

Caution

If an attempt is made to loosen the nut without first holding the fuel return pipe, the pipe may get broken or otherwise damaged.

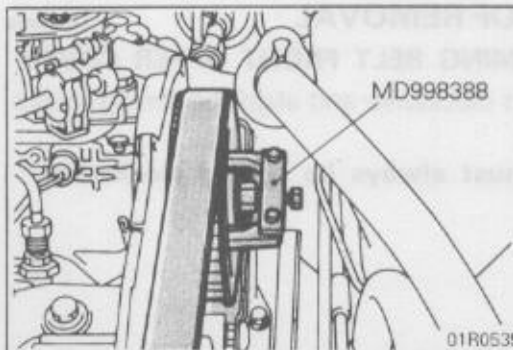
- (2) Disconnect the fuel return pipe.

**20. REMOVAL OF FUEL INJECTION NOZZLE**

Using a deep socket wrench, remove the injection nozzle.

Caution

1. Make a mark on the removed injection nozzle (the cylinder No.).
2. Use a cap to prevent foreign material, etc. from entering the injection nozzle hole.

**25. REMOVAL OF NUT / 26. FUEL INJECTION PUMP**

- (1) After removing the nut, install the special tool on the injection pump sprocket.
- (2) Pull the injection pump sprocket off from the pump's drive shaft.
- (3) Place the injection pump sprocket (with the timing belt attached) inside the timing belt front lower cover.

Caution

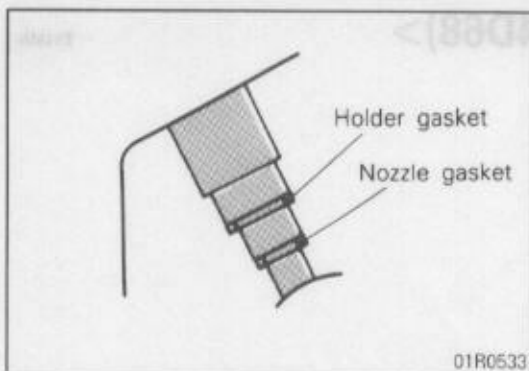
1. When removing the sprocket, care must be taken not to subject the pump drive shaft to an impact.
2. Take care not to apply excessive or unnecessary force (such as excessive twisting, bending, etc.) to the timing belt.
3. After removal, the crankshaft should not be turned.
4. When holding the injection pump, do not hold the accelerator lever or the fast idle lever. Also, do not attempt to remove these levers: doing so will result in a malfunction of the injection pump.

SERVICE POINTS OF INSTALLATION

E13MDAD

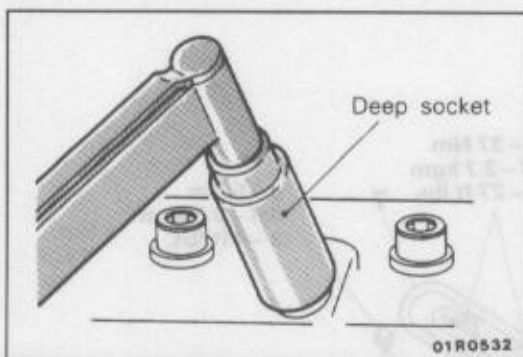
26. INSTALLATION OF FUEL INJECTION PUMP / 25. NUT

When installing the fuel injection pump, check to be sure that the timing mark is correctly aligned, and then tighten the nut to the specified torque.



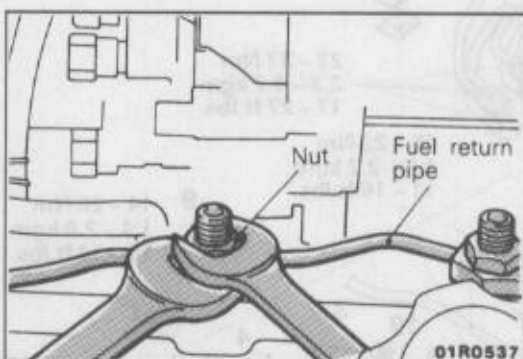
22. INSTALLATION OF NOZZLE GASKET / 21. HOLDER GASKET

Clean the cylinder head's injection nozzle hole, and insert a new gasket.



20. INSTALLATION OF FUEL INJECTION NOZZLE

Using a deep socket wrench, tighten the fuel injection nozzle to the specified torque.

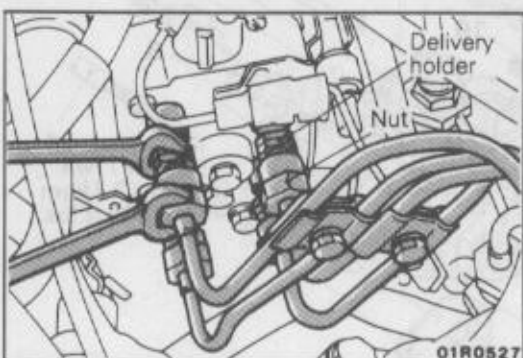


18. INSTALLATION OF FUEL RETURN PIPE / 17. NUT

While holding the hexagonal nut of the fuel return pipe with a spanner or similar tool, tighten the nut to the specified torque.

Caution

If an attempt is made to tighten the nut without first holding the fuel return pipe, the pipe may get broken or otherwise damaged.



15. INSTALLATION OF FUEL INJECTION PIPES

When tightening the nuts at both ends of the fuel injection pipe, use a spanner or similar tool to hold the connected component: the delivery holder (at the pump end) or the nozzle holder (at the nozzle end), and tighten to the specified torque.

14. ACCELERATOR CABLE ADJUSTMENT

Refer to P.13-124 for adjustment procedures.

7. INSTALLATION OF GLOW PLUG

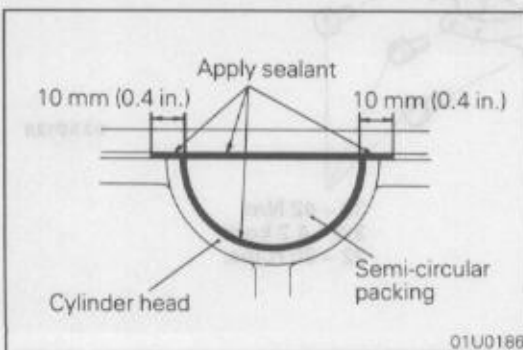
Caution

Always first engage one thread of the glow plug by hand before tightening it with a tool to the specified torque.

3. INSTALLATION OF SEMI-CIRCULAR PACKING

Install the semi-circular packing on the cylinder head, and apply the specified sealant to the sections indicated in the illustration.

Specified sealant: 3M ART Part No. 8660 or equivalent



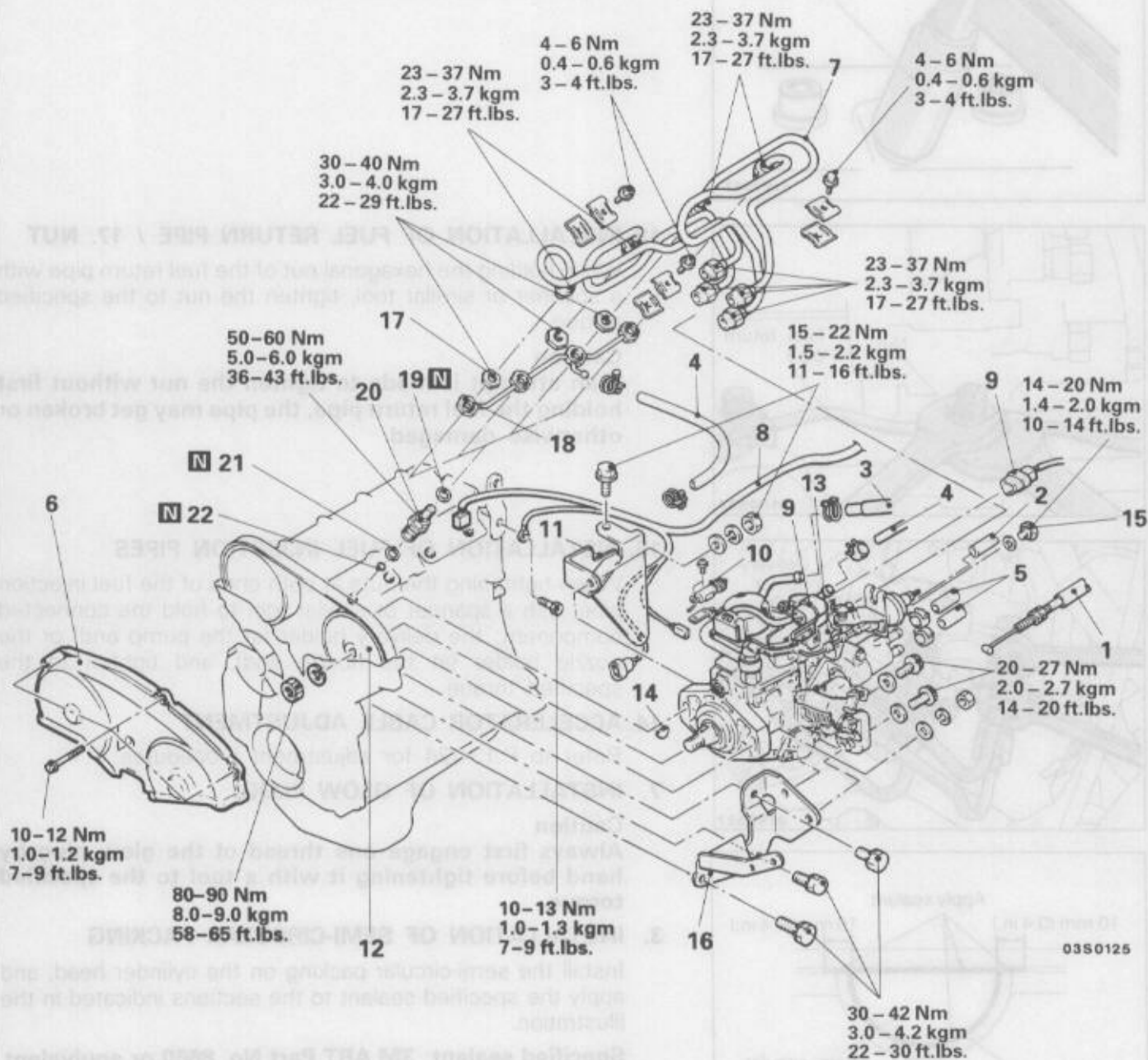
FUEL INJECTION PUMP <DIESEL ENGINE (4D68)>

E13MA-

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation

- Draining and Supplying of Coolant (Refer to GROUP 14 – Service Adjustment Procedures.)
- Removal and Installation of Glow Plugs (Refer to GROUP 16 – Glow Plug.)
- Removal and Installation of Engine Mount Bracket (Refer to GROUP 32 – Engine Mounting.)



03S0125

Fuel injection pump removal steps

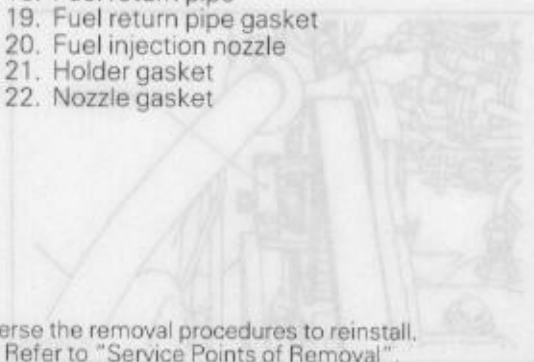
- Accelerator cable adjustment (Refer to P. 13-124.)
- 1. Accelerator cable connection
- 2. Vacuum hose connection
- 3. Fuel main hose connection
- 4. Fuel return hose connection
- 5. Water hose connection
- 6. Timing belt front upper cover
- ◆◆ ◆◆ 7. Fuel injection pipe
- 8. Fuel injection pump wiring harness
- 9. Lever position sensor connector
- 10. Lever position switch
<Vehicles with automatic transmission and air conditioner>
- ◆◆ 11. Fuel injection pump stay
- ◆◆ 12. Fuel injection pump sprocket
- 13. Fuel injection pump
- 14. Key
- 15. Timing check plug
- 16. Fuel injection pump under bracket

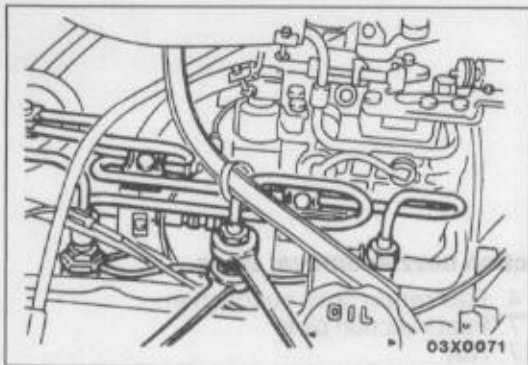
Fuel injection nozzle removal steps

- ◆◆ ◆◆ 4. Fuel return hose connection
- ◆◆ ◆◆ 7. Fuel injection pipe
- ◆◆ ◆◆ 17. Nut
- ◆◆ ◆◆ 18. Fuel return pipe
- ◆◆ ◆◆ 19. Fuel return pipe gasket
- ◆◆ ◆◆ 20. Fuel injection nozzle
- ◆◆ 21. Holder gasket
- ◆◆ 22. Nozzle gasket

NOTE

- (1) Reverse the removal procedures to reinstall.
- (2) ◆◆ Refer to "Service Points of Removal".
- (3) ◆◆ Refer to "Service Points of Installation".
- (4) **N**: Non-reusable parts





SERVICE POINTS OF REMOVAL

7. REMOVAL OF FUEL INJECTION PIPE

When loosening the nuts at both ends of the fuel injection pipe, use a spanner or similar tool to hold the connected component: the delivery holder (at the pump end) and the hexagonal nut of the fuel return pipe.

Caution

After disconnecting the injection pipe, be sure to use a plug so that foreign material, etc. does not get into the pump.

12. REMOVAL OF FUEL INJECTION PUMP SPROCKET / 13. FUEL INJECTION PUMP

- (1) After removing the nut, install the special tool to the injection pump sprocket.
- (2) Turn crankshaft clockwise to bring No. 1 cylinder piston to top dead centre on compression stroke.
- (3) Pull the injection pump sprocket off from the pump's drive shaft.
- (4) Place the injection pump sprocket (with the timing belt attached) inside the timing belt front lower cover.

Caution

1. When removing the sprocket, care must be taken not to subject the pump drive shaft to an impact.
2. Take care not to apply excessive or unnecessary force (such as excessive twisting, bending, etc.) to the timing belt.
3. After removal, the crankshaft should not be turned.

- (5) Remove the fuel injection pump.

Caution

When holding the injection pump, do not hold the accelerator lever or the fast idle lever.

Also, do not attempt to remove these levers, because to do so will result in a malfunction of the performance of the injection pump.

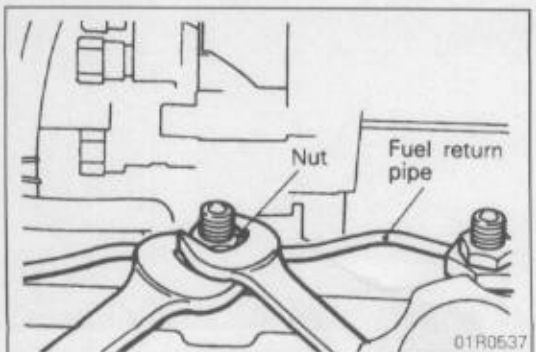
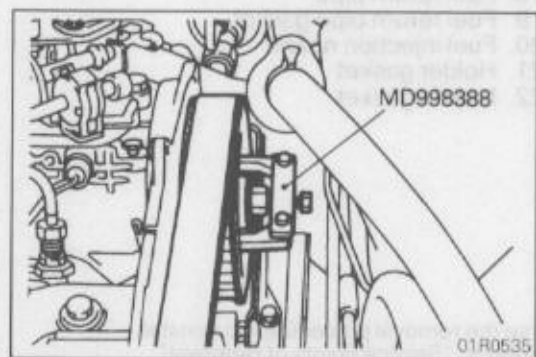
17. REMOVAL OF NUT / 18. FUEL RETURN PIPE

- (1) While using a spanner or similar tool to hold the hexagonal nut of the fuel return pipe, remove the nut.

Caution

If an attempt is made to loosen the nut without first holding the fuel return pipe, the pipe may be broken or otherwise damaged.

- (2) Disconnect the fuel return pipe.

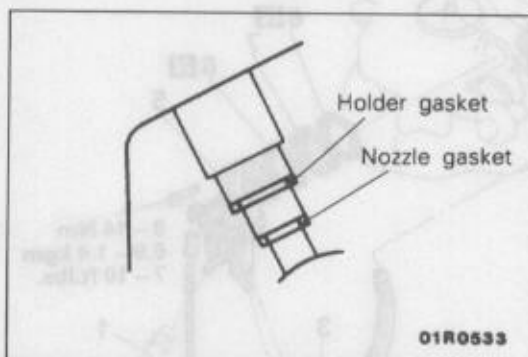


**20. REMOVAL OF FUEL INJECTION NOZZLE**

Using a deep socket wrench, remove the injection nozzle.

Caution

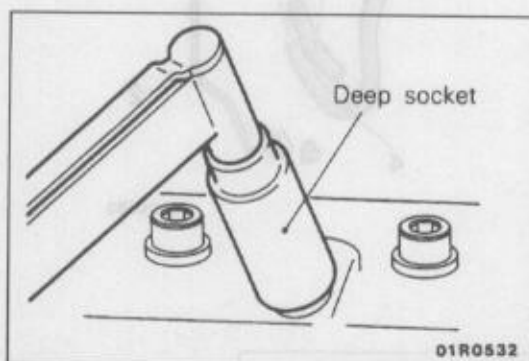
1. Make a mark on the removed injection nozzle (the cylinder No.).
2. Use a cap to prevent foreign material, etc. from entering the injection nozzle hole.

**SERVICE POINTS OF INSTALLATION**

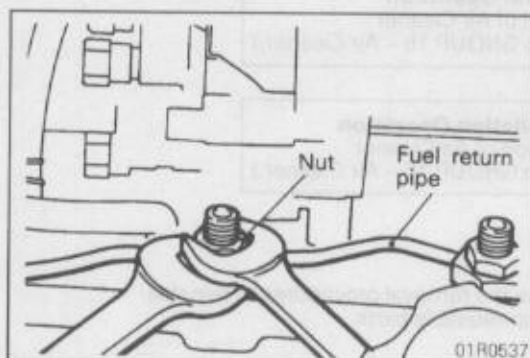
E13MDAC

22. INSTALLATION OF NOZZLE GASKET / 21. HOLDER GASKET

Clean the cylinder head's injection nozzle hole, and insert a new gasket.

**20. INSTALLATION OF FUEL INJECTION NOZZLE**

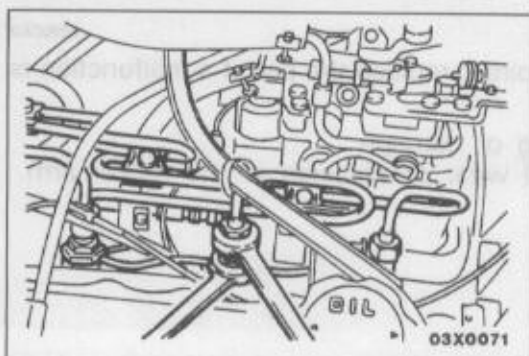
Using a deep-socket wrench, tighten the fuel injection nozzle at the specified torque.

**18. INSTALLATION OF FUEL RETURN PIPE / 17. NUT**

While holding the hexagonal nut of the fuel return pipe with a spanner or similar tool, tighten the nut at the specified torque.

Caution

If an attempt is made to tighten the nut without first holding the fuel return pipe, the pipe may be broken or otherwise damaged.

**7. INSTALLATION OF FUEL INJECTION PIPE**

When tightening the nuts at both ends of the fuel injection pipe, use a spanner or similar tool to hold the connected component: the delivery holder (at the pump end) and the hexagonal nut of the fuel return pipe, and tighten at the specified torque.

FUEL PUMP <VEHICLES WITH CARBURETTOR>

E13LA

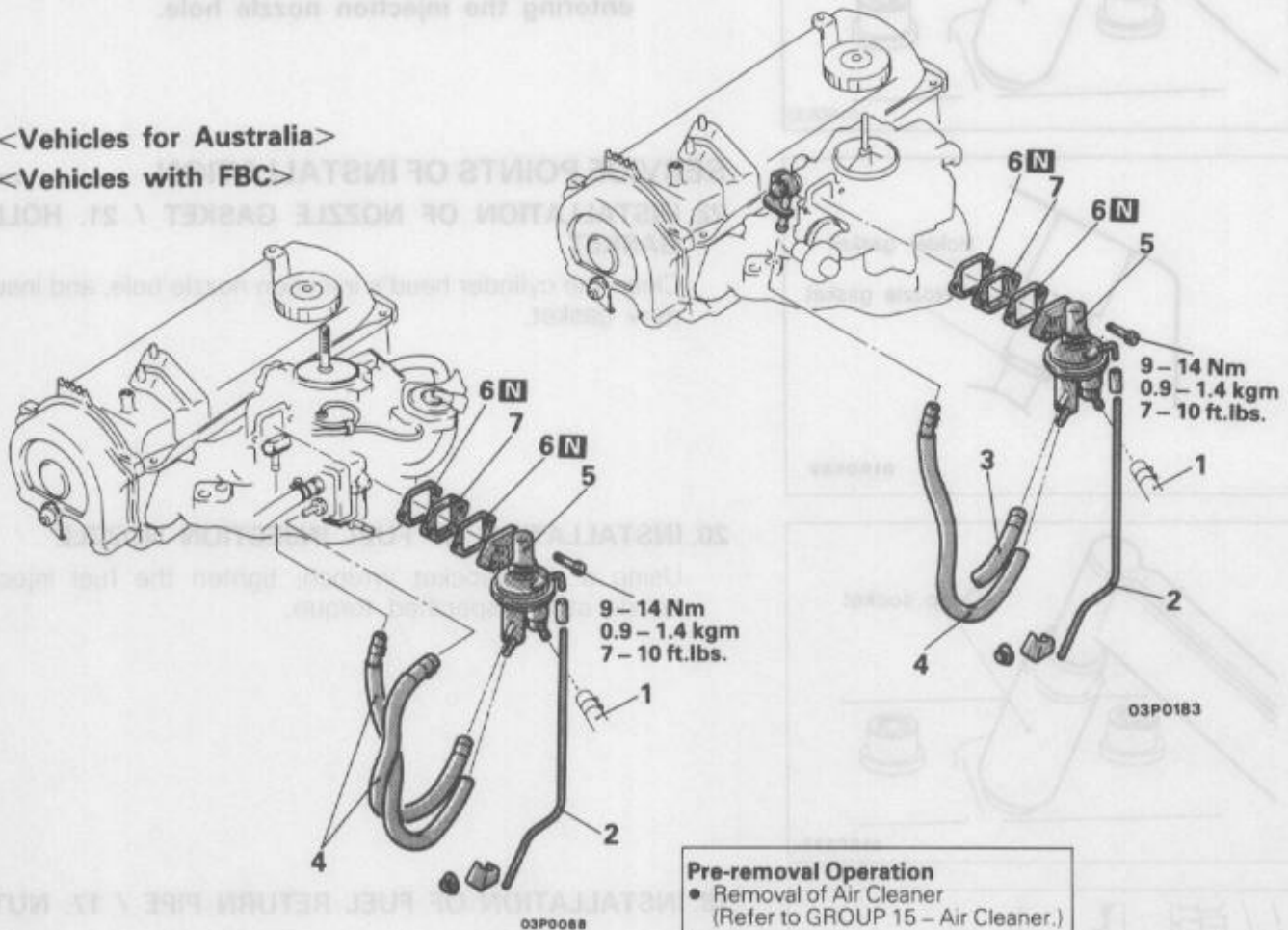
Vehicles built up to May 1990 <excluding 1.2L Engine>

REMOVAL AND INSTALLATION

<Vehicles with conventional carburettor except for Australia>

<Vehicles for Australia>

<Vehicles with FBC>

**Removal steps**

1. Connection for fuel main hose
2. Connection for breather tube
3. Connection for fuel return hose
4. Connection for fuel hose
5. Fuel pump
6. Gasket
7. Insulator

Pre-removal Operation

- Removal of Air Cleaner
(Refer to GROUP 15 – Air Cleaner.)

Post-installation Operation

- Installation of Air Cleaner
(Refer to GROUP 15 – Air Cleaner.)

NOTE

- (1) Reverse the removal procedures to reinstall.
- (2) **N**: Non-reusable parts

INSPECTION

E13LCAD

Check the following points; replace the part if a malfunction is found.

- Check for cracking or damage.
- Check for unusual wear or abrasion of the rocker arm.

FUEL TANK

E13GA

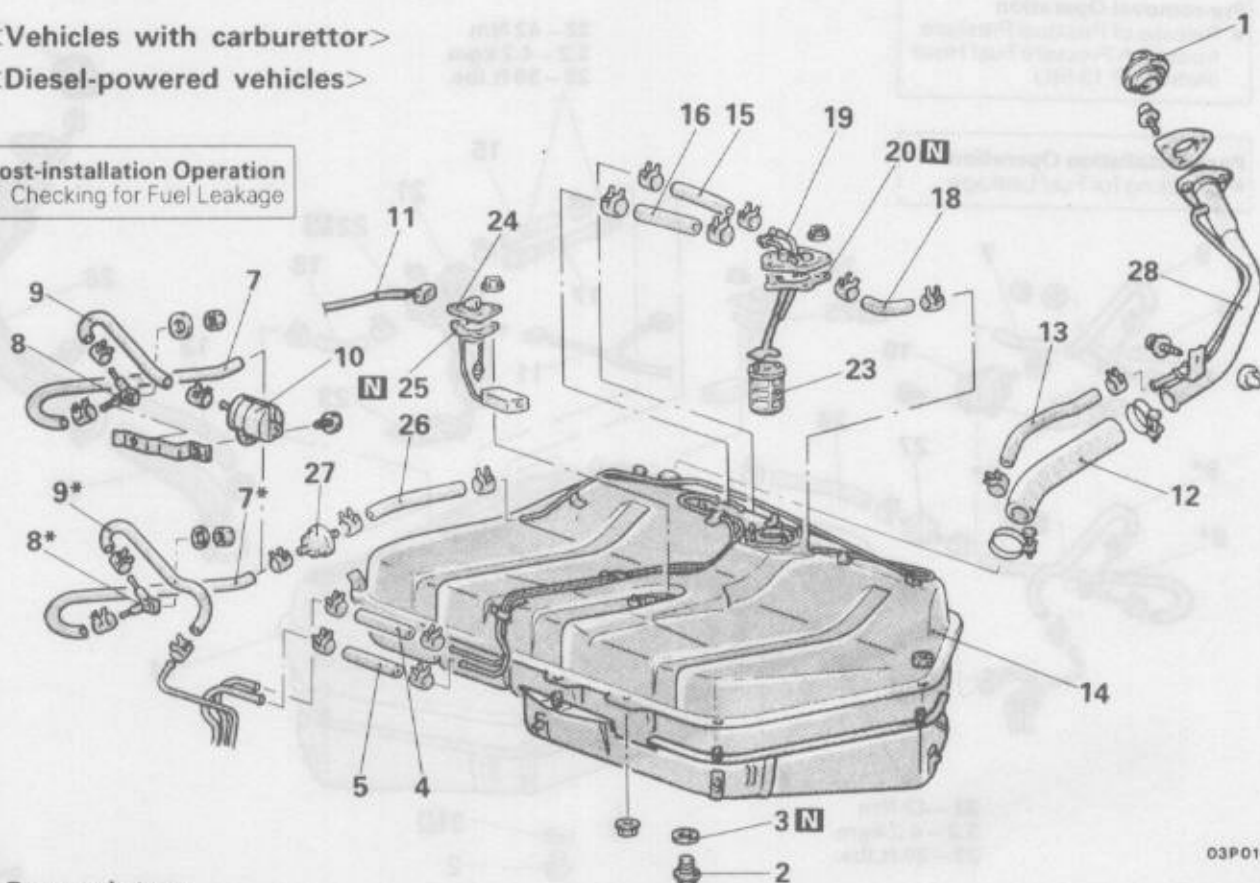
REMOVAL AND INSTALLATION

<Vehicles with carburettor>

<Diesel-powered vehicles>

Post-installation Operation

- Checking for Fuel Leakage



Removal steps

1. Fuel tank cap
2. Drain plug
3. Packing
4. Return hose
5. Main hose
6. Vapor hose
7. Check valve
8. Breather case
9. Fuel tank harness connection
10. Filler hose
11. Breather hose
12. Fuel tank
13. Return hose
14. Main hose

15. Vapor hose
16. Fuel pipe assembly
17. Packing
18. In-tank fuel filter
19. Fuel gauge unit
20. Packing
21. Vapor hose
22. Two-way valve
23. Filler neck

NOTE

- (1) Reverse the removal procedures to reinstall.
- (2) ♦♦♦ Refer to "Service Points of Removal".
- (3) ♦♦♦ Refer to "Service Points of Installation".
- (4) The * symbol is applicable to models for Europe equipped with a catalytic converter for Australia and for GCC.

03P0142

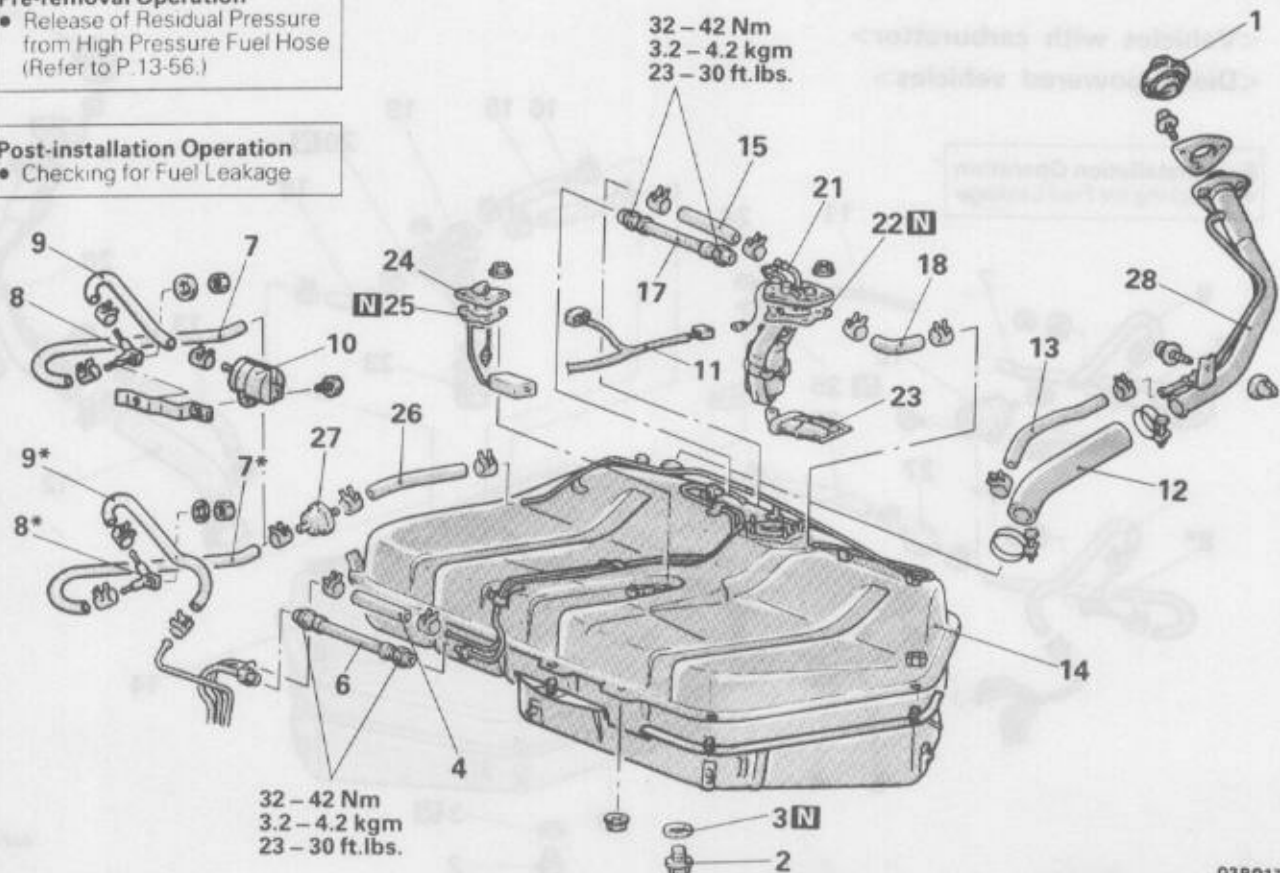
<Vehicles with MPI>

Pre-removal Operation

- Release of Residual Pressure from High Pressure Fuel Hose (Refer to P.13-56.)

Post-installation Operation

- Checking for Fuel Leakage



03P0171

Removal steps

- ◆◆ 1. Fuel tank cap
- ◆◆ 2. Drain plug
- ◆◆ 3. Packing
- ◆◆ 4. Return hose
- ◆◆ 6. High pressure fuel hose
- ◆◆ 7. Vapor hose
- ◆◆ 8. Check valve <Vehicles for Europe>
- ◆◆ 9. Vapor hose
- ◆◆ 10. Breather case
- ◆◆ 11. Fuel tank harness connection
- ◆◆ 12. Filler hose
- ◆◆ 13. Breather hose
- ◆◆ 14. Fuel tank
- ◆◆ 15. Return hose
- ◆◆ 17. High pressure fuel hose

- ◆◆ 18. Vapor hose
- ◆◆ 21. Fuel pump
- ◆◆ 22. Packing
- ◆◆ 23. In-tank fuel filter
- ◆◆ 24. Fuel gauge unit
- ◆◆ 25. Packing
- ◆◆ 26. Vapor hose
- ◆◆ 27. Two-way valve
- ◆◆ 28. Filler neck

NOTE

- (1) Reverse the removal procedures to reinstall.
- (2) ◆◆: Refer to "Service Points of Removal".
- (3) ◆◆: Refer to "Service Points of Installation".
- (4) [N]: Non-reusable parts
- (5) The * symbol is applicable to models for Europe equipped with a catalytic converter for GCC.

SERVICE POINT OF REMOVAL

E13GBAI

2. REMOVAL OF DRAIN PLUG

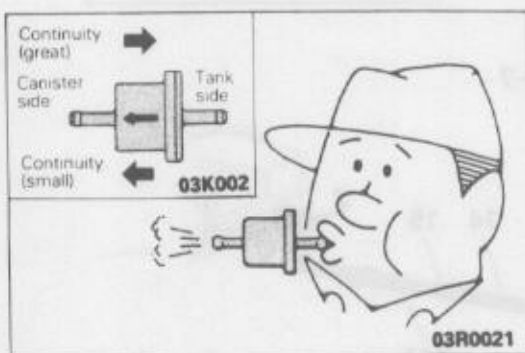
Remove the drain plug and drain the fuel.

INSPECTION

E13GCAG

- Check the hoses and pipes for cracks or damage.
- Check the fuel tank cap for malfunction.
- Check the fuel tank for deformation, corrosion or crack.

- Check the fuel tank for dust or foreign material.
- NOTE
If the inside of the fuel tank is to be cleaned, use any one of the following:
- (1) Kerosene
 - (2) Trichloroethylene
 - (3) A neutral emulsion type detergent
- Check the in-tank fuel filter for damage or clogging.
 - Check the check valve for malfunction.



TWO-WAY VALVE CHECK

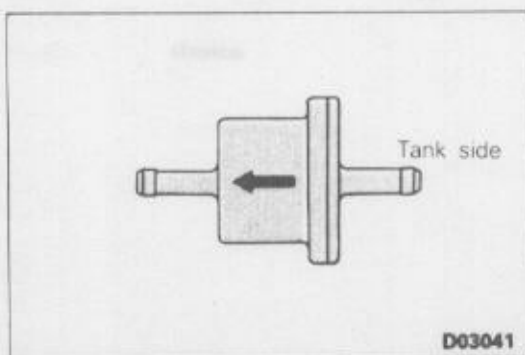
Lightly breathe into the inlet and outlet. If the air passes through after slight resistance, then the valve may be considered good.

SERVICE POINTS OF INSTALLATION

E13GDAQ

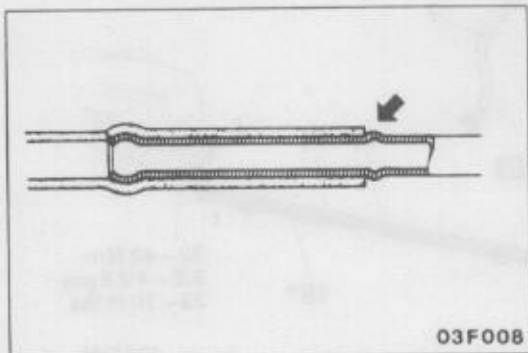
27. INSTALLATION OF TWO-WAY VALVE

Install so that the two-way valve is facing in the direction shown in the illustration.



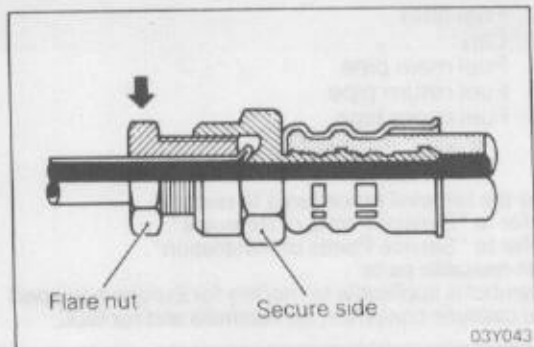
26. 18. 7. CONNECTION OF VAPOR HOSE / 16. MAIN HOSE / 15. 4. RETURN HOSE

When attaching the fuel hose to the pipe, be sure that the hose is attached all the way up to the bulge as shown in the illustration.

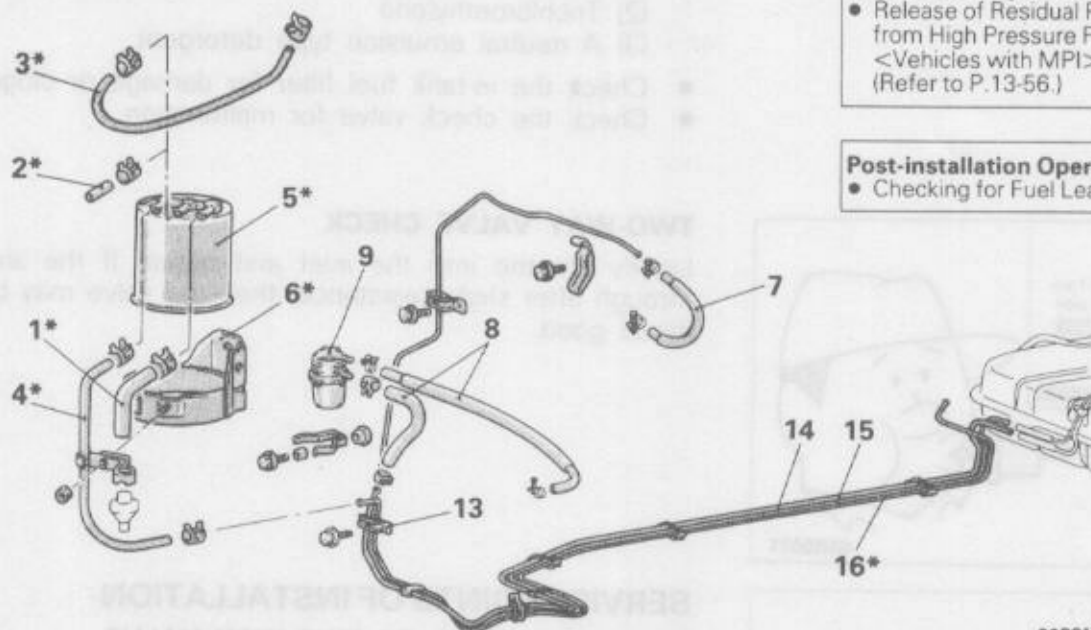


17. 6. CONNECTION OF HIGH PRESSURE FUEL HOSE

Temporarily tighten the flare nut by hand, and then tighten it to the specified torque, being careful that the fuel hose does not become twisted.



<Vehicles with carburettor>

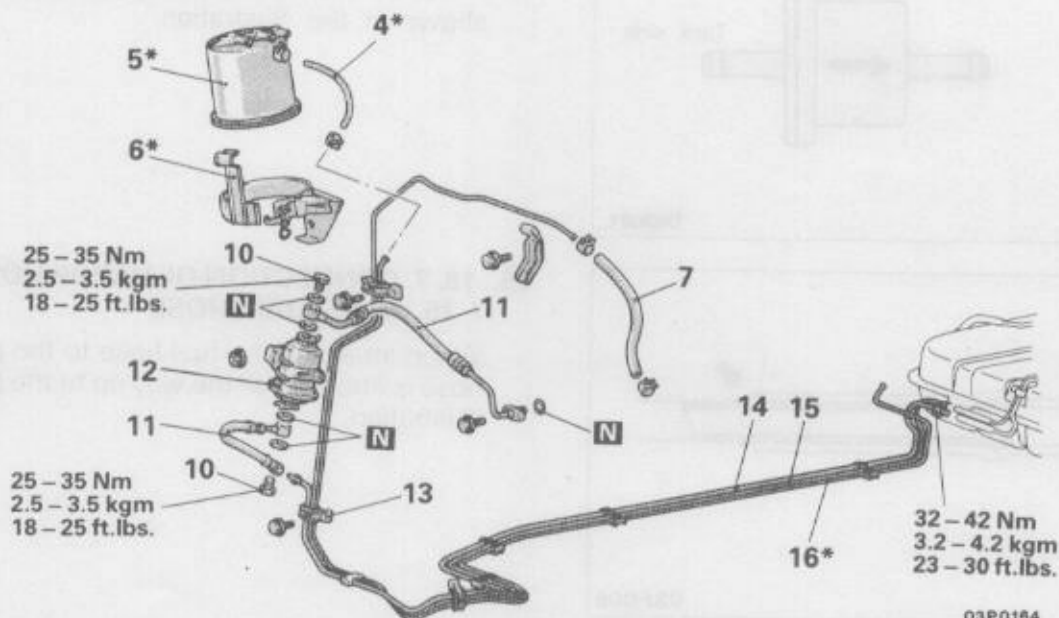


- Release of Residual Pressure from High Pressure Fuel Hose <Vehicles with MPI>
(Refer to P.13-56.)

- Checking for Fuel Leakage

03P0174

<Vehicles with MPI>



03P0164

Removal steps

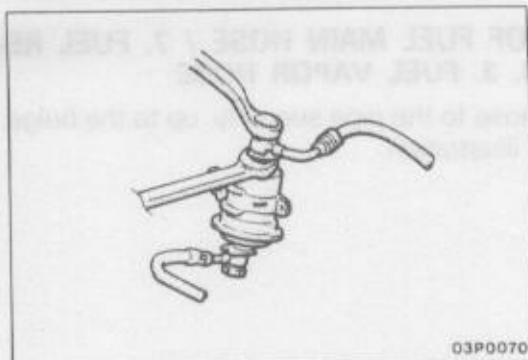
- 1. Vapor hose
- 2. Cap <Vehicles for GCC>
- ◆◆ 3. Fuel vapor hose
 <Vehicles for Europe and Australia>
- ◆◆ 4. Fuel vapor hose
- 5. Canister
- 6. Canister holder
- ◆◆ 7. Fuel return hose
- ◆◆ 8. Fuel main hose
- 9. Fuel filter
- ◆◆ ◆◆ 10. Eye bolt
- ◆◆ 11. High pressure fuel hose

12. Fuel filter
13. Clip
14. Fuel main pipe
15. Fuel return pipe
16. Fuel vapor pipe

NOTE

- (1) Reverse the removal procedures to reinstall.
(2) ♦♦: Refer to "Service Points of Removal".
(3) ♦♦: Refer to "Service Points of Installation".
(4) **N**: Non-reusable parts
(5) The * symbol is applicable to models for Europe equipped with the catalytic converter, for Australia and for GCC.

E13KBAH

**SERVICE POINTS OF REMOVAL****10. REMOVAL OF EYE BOLT**

Remove the eye bolt while holding the fuel filter nut securely.

Caution

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

13. REMOVAL OF CLIP

After removing the steering gear box, remove the clip. (Refer to GROUP 37 – Steering Gear Box.)

INSPECTION

E13KCAP

- Check the hoses and pipes for cracks, bends, deformation and clogging.
- Check the canister for clogging.
- Check the fuel filter for clogging and damage.

SERVICE POINTS OF INSTALLATION

E13KDAO

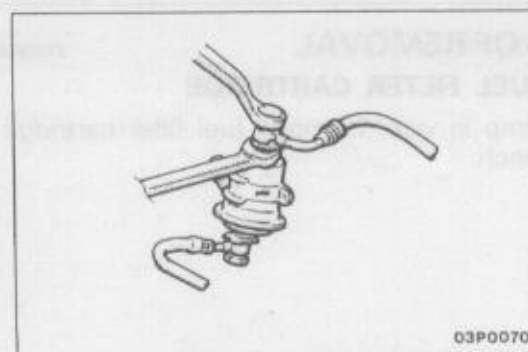
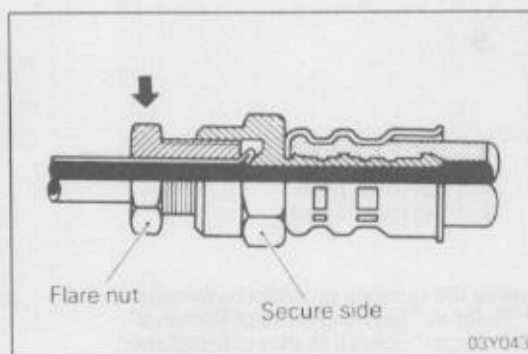
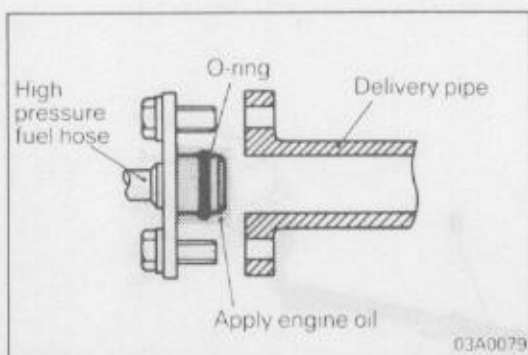
11. INSTALLATION OF HIGH PRESSURE FUEL HOSE

- (1) Apply engine oil to the hose union. Insert the hose, being careful not to damage the O-ring, and tighten securely.

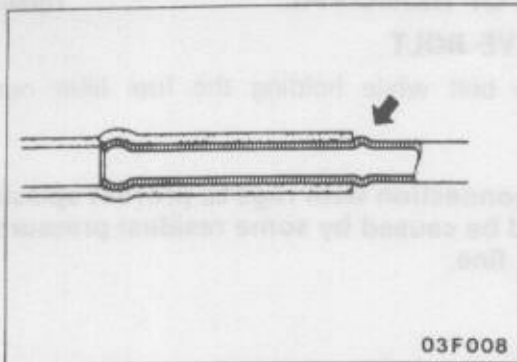
Caution

Because there is high pressure applied between the fuel pump and the injection mixer, be especially sure that there is no fuel leakage in this area.

- (2) Temporarily tighten the flare nut by hand, and then tighten it to the specified torque, being careful that the fuel hose does not become twisted.

**10. INSTALLATION OF EYE BOLT**

While holding the fuel filter with a wrench, tighten the eye bolt to the specified torque.

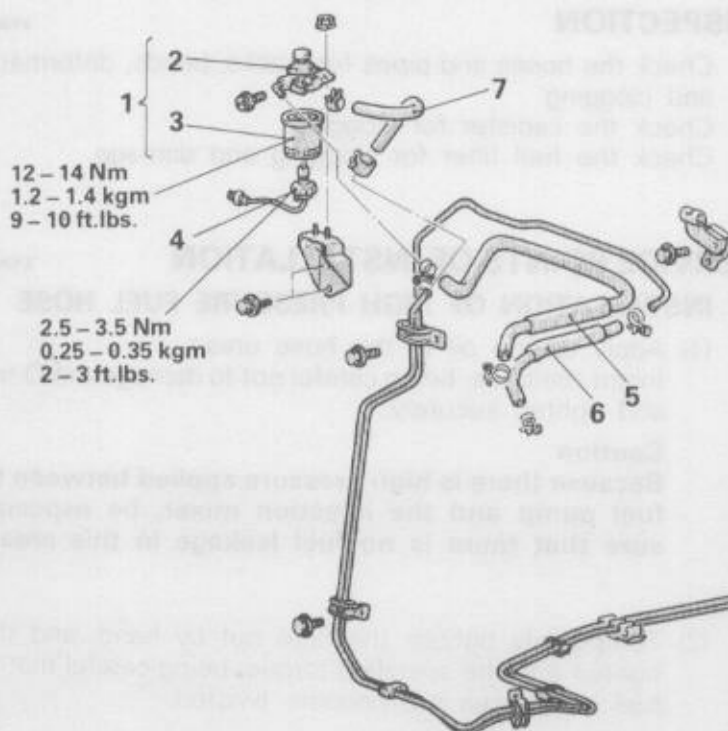


8. INSTALLATION OF FUEL MAIN HOSE / 7. FUEL RETURN HOSE / 4. 3. FUEL VAPOR HOSE

Connect the fuel hose to the pipe securely, up to the bulge, as shown in the illustration.

FUEL LINE AND VAPOR LINE <DIESEL ENGINE> REMOVAL AND INSTALLATION

E13KA-B



Post-installation Operation

- Checking for Fuel Leakage

Removal steps

1. Fuel filter assembly
2. Fuel filter body
3. Fuel filter cartridge
4. Water level sensor
5. Fuel main hose
6. Fuel return hose
7. Fuel main hose

8. Fuel main pipe
9. Fuel return pipe

03P0115

NOTE

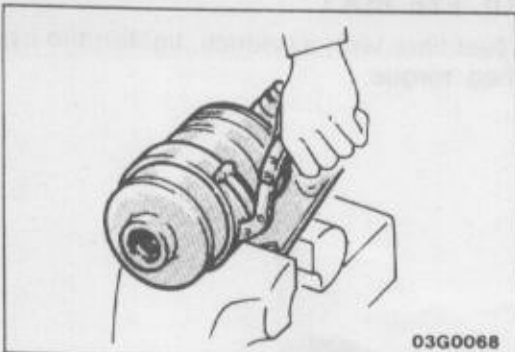
- (1) Reverse the removal procedures to reinstall.
- (2) ♦♦♦: Refer to "Service Points of Removal".
- (3) ♦♦♦: Refer to "Service Points of Installation".

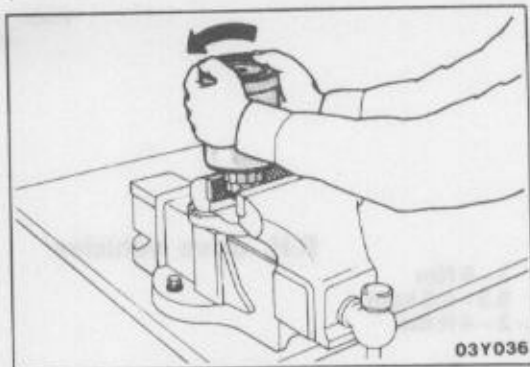
SERVICE POINTS OF REMOVAL

E13KBAI

3. REMOVAL OF FUEL FILTER CARTRIDGE

Hold fuel filter pump in vice. Remove fuel filter cartridge with oil filter wrench.





4. REMOVAL OF WATER LEVEL SENSOR

Hold water level sensor in vice. Remove fuel filter cartridge by hand.

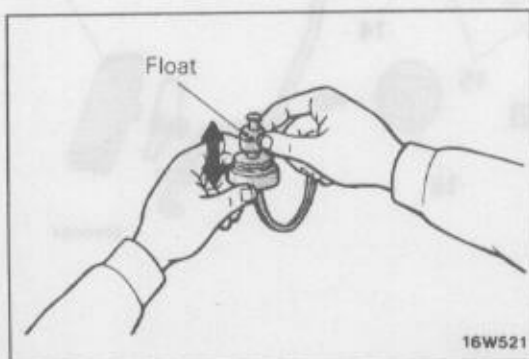
Caution

Never grip the water level sensor with too great a force in the vice; the water level sensor is a plastic part.

INSPECTION

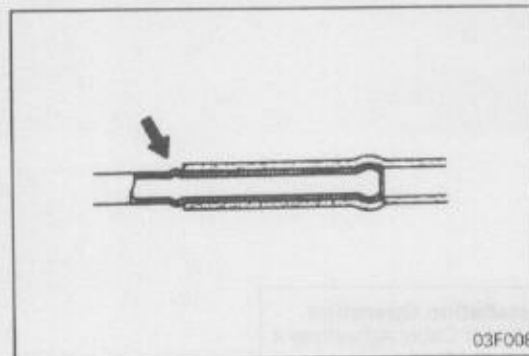
- Check hoses and lines for cracks, bends, deterioration or clogging.
- Check the fuel filter for clogging or damage.

E13KCAN



INSPECTION OF WATER LEVEL SENSOR OPERATION

Connect the circuit tester to the water level sensor connector. The water level sensor is operating correctly if there is continuity when the float is raised and no continuity when it is lowered.

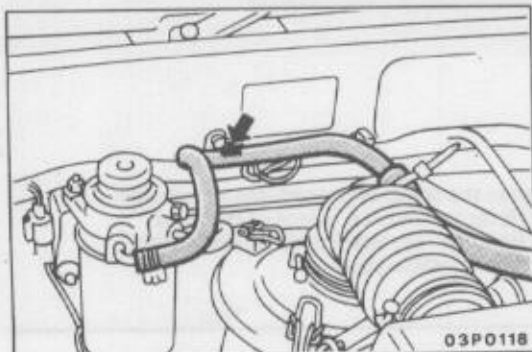


SERVICE POINTS OF INSTALLATION

E13KDAP

7. 5. INSTALLATION OF FUEL MAIN HOSE / 6. FUEL RETURN HOSE

- (1) If the fuel pipe has a stepped part, connect the fuel hose to the pipe securely all the way up to the stepped part, as shown in the illustration.
- (2) Install the fuel main hose with the white marking facing up as shown, and secure the hose with the clip at the centre of the marking.



ACCELERATOR CABLE AND PEDAL

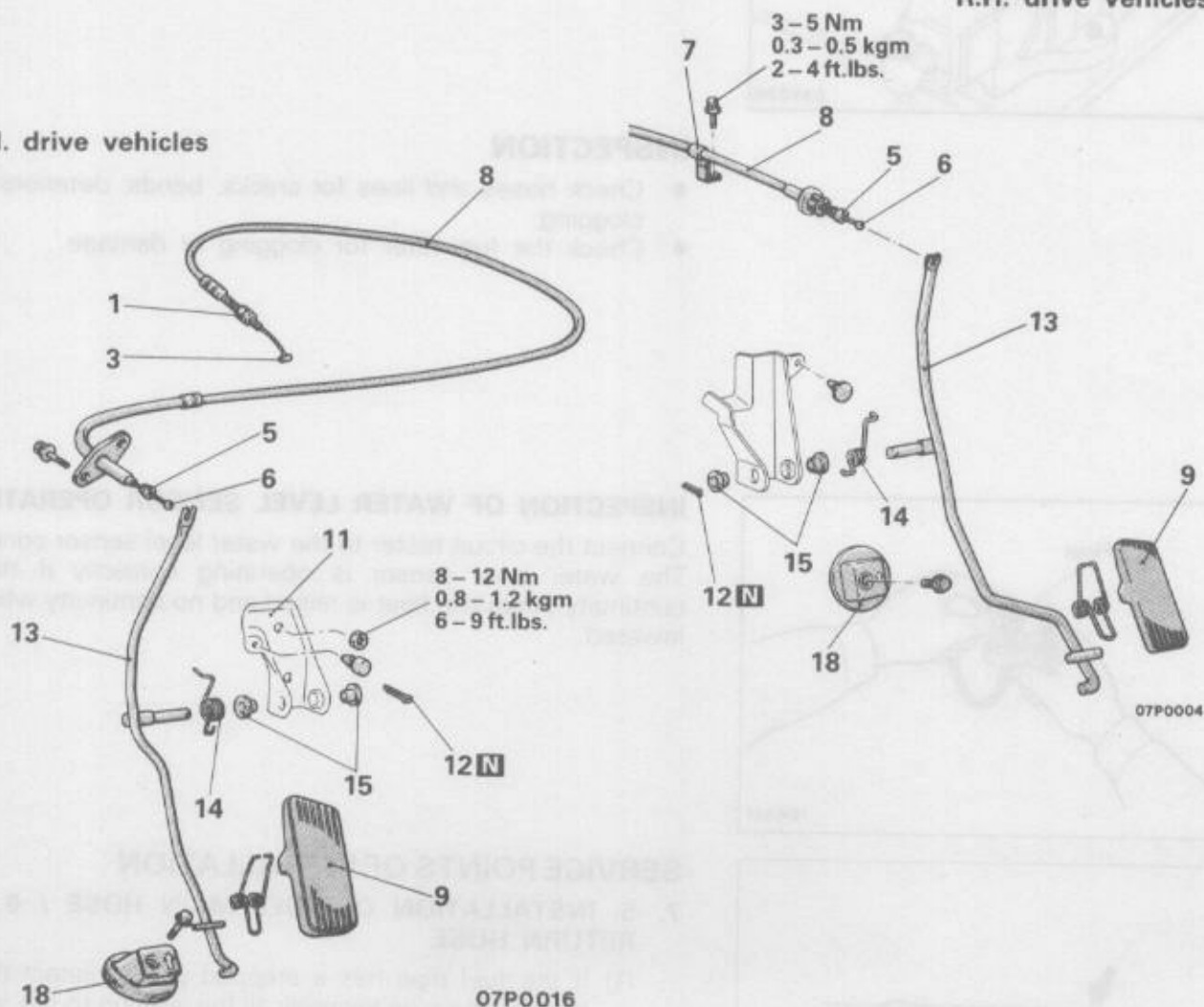
REMOVAL AND INSTALLATION

E130A-

<Vehicles with carburettor>

R.H. drive vehicles

L.H. drive vehicles



Removal steps

1. Adjusting nut
3. Carburettor side inner cable
5. Bushing
6. Accelerator arm side inner cable
7. Accelerator cable clamp
8. Accelerator cable
9. Accelerator pedal
11. Accelerator arm bracket
12. Split pin
13. Accelerator arm
14. Return spring
15. Bushing
18. Accelerator pedal stopper

Post-installation Operation

- Accelerator Cable Adjustment (Refer to P.13-15.)

NOTE

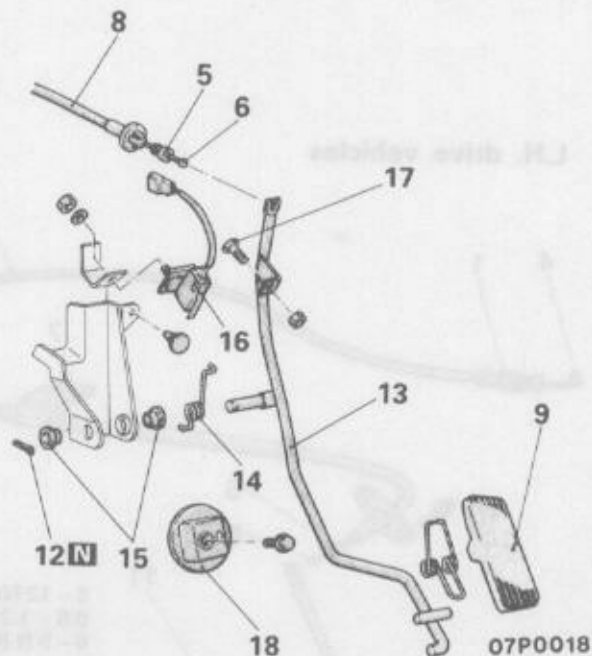
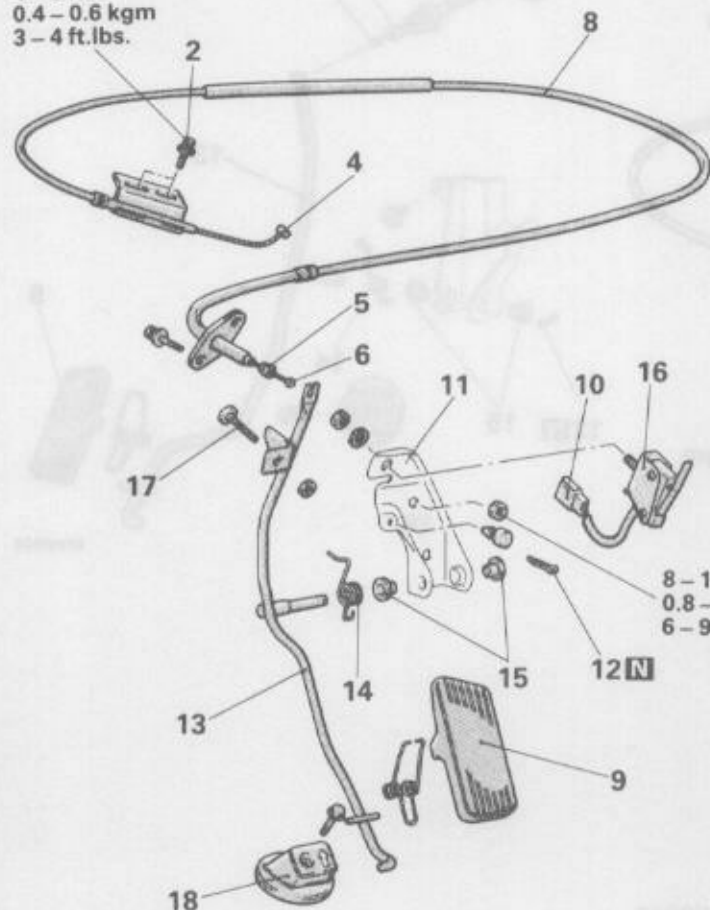
- (1) Reverse the removal procedures to reinstall.
- (2) ♦♦: Refer to "Service Points of Removal".
- (3) ♦♦: Refer to "Service Points of Installation".
- (4) N: Non-reusable parts

<Vehicles with MPI>

R.H. drive vehicles

L.H. drive vehicles

4 – 6 Nm
0.4 – 0.6 kgm
3 – 4 ft. lbs.



8 – 12 Nm
0.8 – 1.2 kgm
6 – 9 ft. lbs.

Removal steps

2. Adjusting bolt
4. Throttle body side inner cable
- ◆◆ 5. Bushing
- ◆◆ 6. Accelerator arm side inner cable
- ◆◆ 8. Accelerator cable
- ◆◆ 9. Accelerator pedal
- ◆◆ 10. Accelerator switch connector <A/T>
11. Accelerator arm bracket
12. Split pin
- ◆◆ 13. Accelerator arm
- ◆◆ 14. Return spring
15. Bushing
- ◆◆ 16. Accelerator switch <A/T>
- ◆◆ 17. Bolt <A/T>
- ◆◆ 18. Accelerator pedal stopper

Post-installation Operation

- Accelerator Cable Adjustment
(Refer to P.13-56.)
- Accelerator Switch Adjustment
(Refer to P.13-57.)

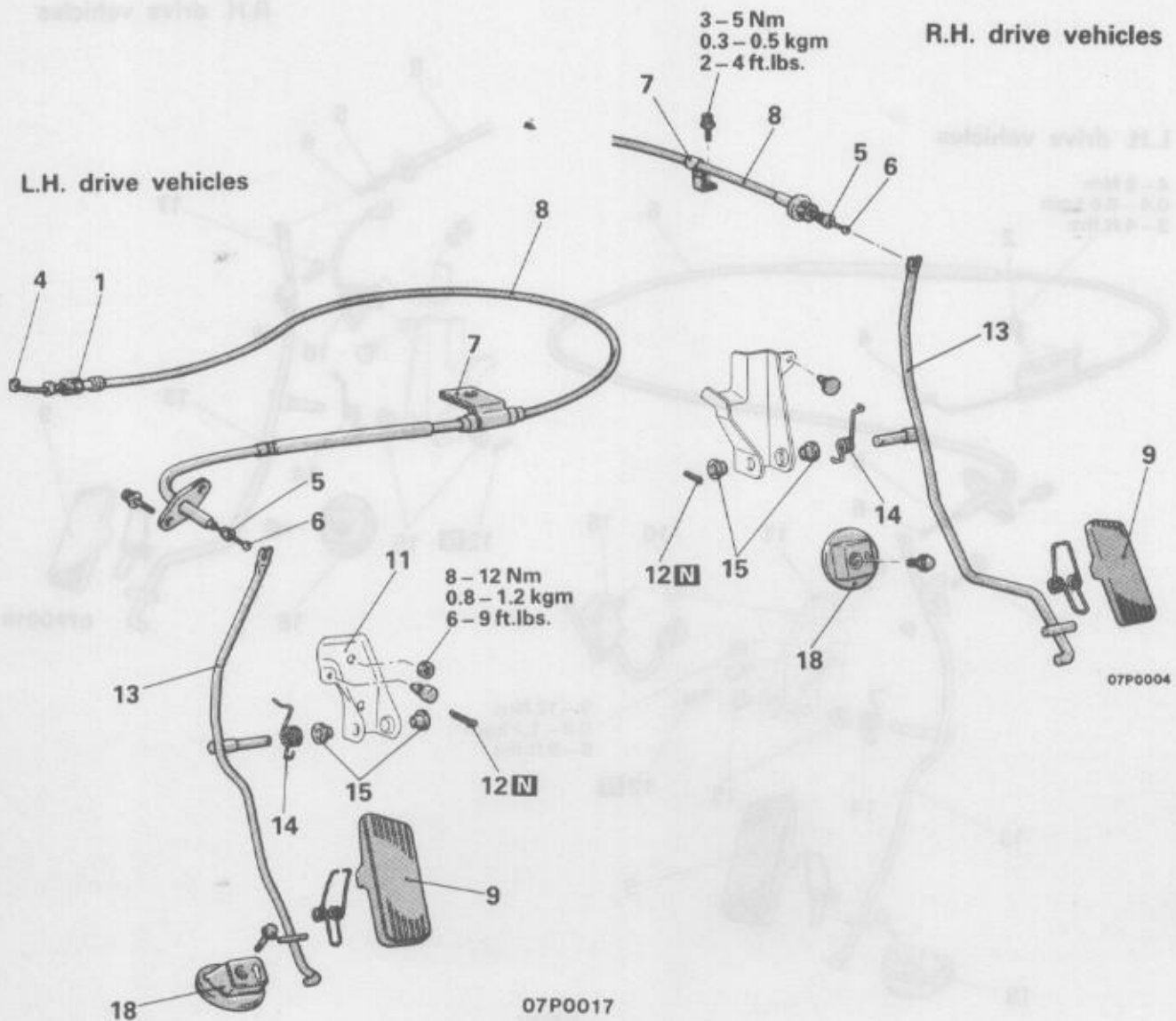
NOTE

- (1) Reverse the removal procedures to reinstall
- (2) ◆◆ Refer to "Service Points of Removal"
- (3) ◆◆ Refer to "Service Points of Installation"
- (4) **N**: Non-reusable parts

<Diesel-powered vehicles>

R.H. drive vehicles

L.H. drive vehicles



Removal steps

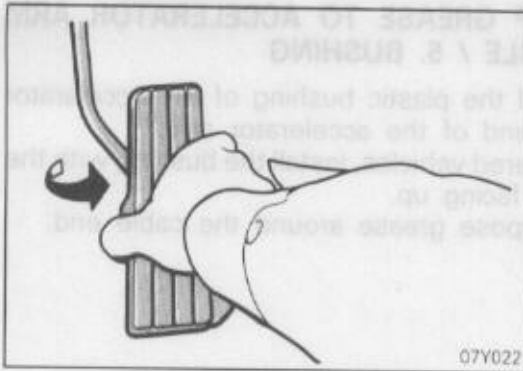
1. Adjusting nut
4. Throttle body side inner cable
- ◆◆ 5. Bushing
- ◆◆ 6. Accelerator arm side inner cable
7. Accelerator cable clamp
8. Accelerator cable
- ◆◆ 9. Accelerator pedal
- ◆◆ 11. Accelerator arm bracket
12. Split pin
- ◆◆ 13. Accelerator arm
- ◆◆ 14. Return spring
15. Bushing
- ◆◆ 18. Accelerator pedal stopper

Post-installation Operation

- Accelerator Cable Adjustment
(Refer to P.13-124.)

NOTE

- (1) Reverse the removal procedures to reinstall.
- (2) ◆◆: Refer to "Service Points of Removal".
- (3) ◆◆: Refer to "Service Points of Installation".
- (4) **N**: Non-reusable parts



07Y022

SERVICE POINT OF REMOVAL

E130BAC

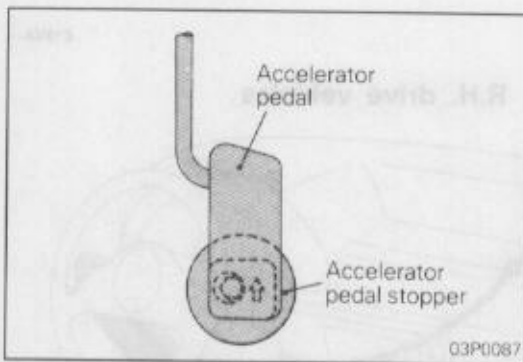
9. REMOVAL OF ACCELERATOR PEDAL

Pull the left side of the accelerator pedal toward you, and then remove the accelerator pedal from the accelerator arm.

INSPECTION

E130CAJ

- Check the inner and outer cable for damage.
- Check the cable for smooth movement.
- Check the accelerator arm for bending.
- Check the return spring for deterioration.
- Check the connection of bushing to end metal fitting.
- Check the accelerator pedal switch for correct ON-OFF operation. <4-A/T>



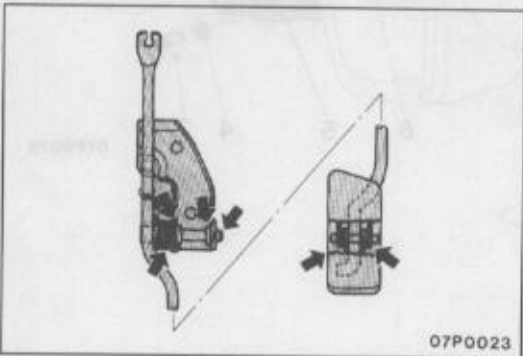
03P0087

SERVICE POINTS OF INSTALLATION

E130DAM

18. INSTALLATION OF ACCELERATOR PEDAL STOPPER

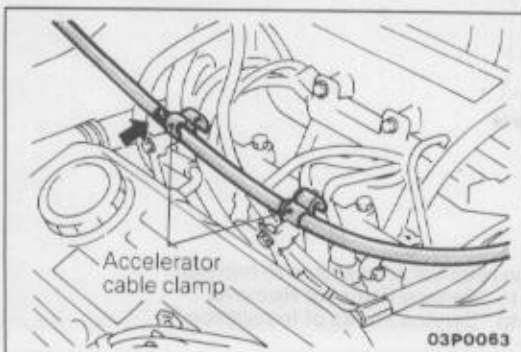
Install the stopper in the direction indicated in the illustration.



07P0023

14. APPLICATION OF GREASE TO RETURN SPRING / 13. ACCELERATOR ARM

Apply multipurpose grease around the each moving point of the accelerator arm.



03P0063

8. INSTALLATION OF ACCELERATOR CABLE

<Vehicles built up to May 1992>

On vehicles with MPI, secure the accelerator cable with the identification mark at the illustrated position.

<Vehicles built from June 1992>

On vehicles with MPI, secure the accelerator cable with a caulking tool at the illustrated position.

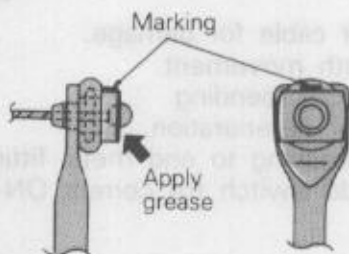
<Vehicles with carburettor and MPI>

Apply grease



07P0001

<Diesel-powered vehicles>



07P0005

6. APPLICATION OF GREASE TO ACCELERATOR ARM SIDE INNER CABLE / 5. BUSHING

- (1) Securely install the plastic bushing of the accelerator cable on the end of the accelerator arm.
On diesel-powered vehicles, install the bushing with the marking on it facing up.
- (2) Apply multipurpose grease around the cable end.

CHOKE CABLE

REMOVAL AND INSTALLATION

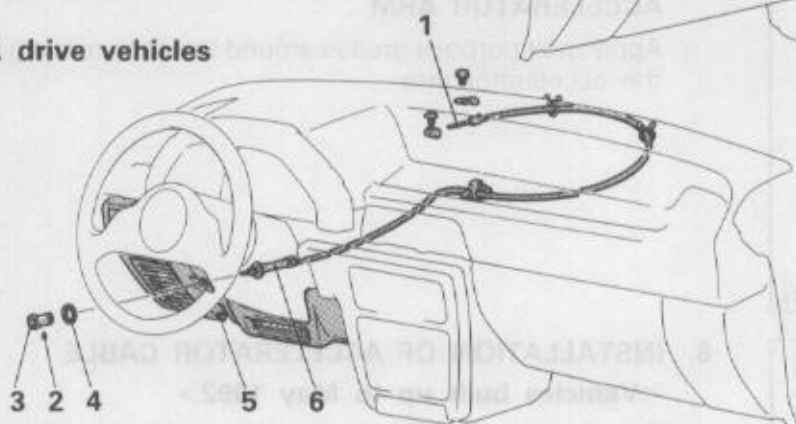
Pre-removal Operation

- Removal of Air Cleaner
(Refer to GROUP 15 – Air Cleaner.)

Post-installation Operation

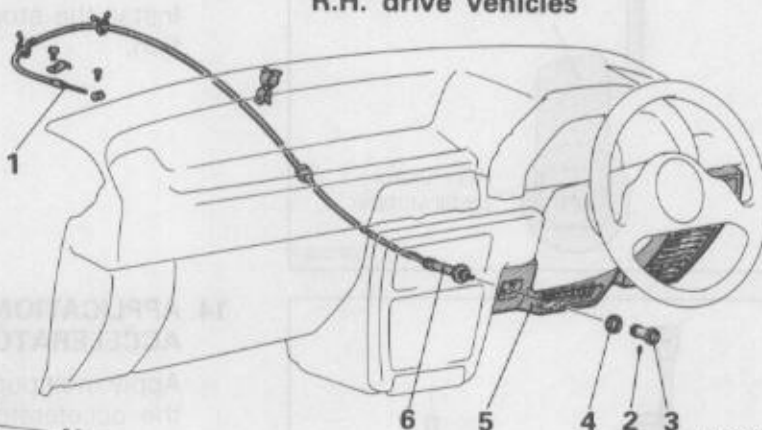
- Installation of Air Cleaner
(Refer to GROUP 15 – Air Cleaner.)

L.H. drive vehicles



07P0034

R.H. drive vehicles



07P0035

Removal steps

1. Carburettor side inner cable
2. Screw
3. Choke knob
4. Lock nut
5. Lower panel assembly
6. Choke cable



NOTE

- (1) Reverse the removal procedures to reinstall.
- (2) ♦♦♦: Refer to "Service Points of Removal".
- (3) ♦♦♦: Refer to "Service Points of Installation".

SERVICE POINTS OF REMOVAL

E13VBAC

5. REMOVAL OF LOWER PANEL ASSEMBLY

Refer to GROUP 52 – Instrument Panel.

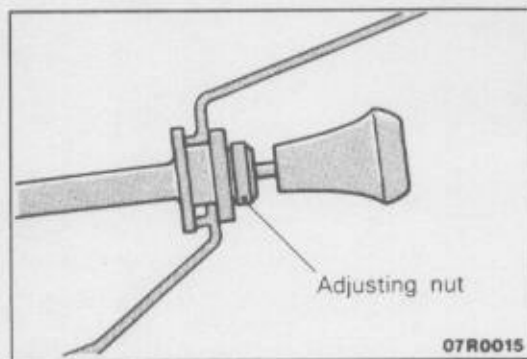
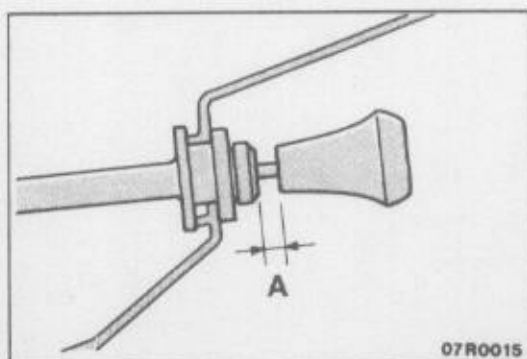
6. REMOVAL OF CHOKE CABLE**Caution**

Be careful not to damage the toeboard grommet when pulling out the choke cable.

INSPECTION

E13VCAB

- Check inner cable for damage.
- Check outer cable for damage.
- Check sliding condition of cable.

**SERVICE POINTS OF INSTALLATION**

E13VDAC

6. INSTALLATION OF CHOKE CABLE

- (1) Adjust the cable by the following procedure.
 - ① Temporarily secure the inner cable to the choke lever of carburettor at the proper position.
 - ② Operate the choke knob to ensure that the choke valve moves a full stroke.
If the lever does not move a full stroke, change the fastened position of the cable and repeat the above step.
 - ③ Secure the inner cable in such a way that the free play (A) of the choke cable will have the standard value.

Standard value (A): 2 – 3 mm (0.08 – 0.12 in.)

- (2) Check to be sure that the choke cable operates smoothly.
- (3) If the choke cable does not smoothly move, adjust the sliding resistance by the adjusting nut.

Caution

Do not confuse the increased sliding resistance due to excessive tightening of the adjusting nut with that caused by a rusted or bent cable.

If the latter causes are suspected, remove the choke cable, apply oil, correct the bend, and check operation of the cable.

5. INSTALLATION OF LOWER PANEL ASSEMBLY

Refer to GROUP 52 – Instrument Panel.

SERVICE POINTS OF REMOVAL

2. REMOVAL OF LOWER PANEL ASSEMBLY

Refer to GROUP 25 - Instrument Panel

3. REMOVAL OF CHOKE CABLE

Caution

Be careful not to damage the instrument gauges when pulling out the choke cable.

INSPECTION

- Check choke cable for damage
- Check choke cable for damage
- Check steering condition of cable

SERVICE POINTS OF INSTALLATION

2. INSTALLATION OF CHOKE CABLE

1. Refer to the cable by the following part number.
 2. Refer to the cable by the following part number.
 3. Refer to the cable by the following part number.
 4. Refer to the cable by the following part number.
 5. Refer to the cable by the following part number.

If the cable is damaged, it should be replaced.
 If the cable is damaged, it should be replaced.

Refer to the cable by the following part number.
 Refer to the cable by the following part number.

Standard value (A) 2 - 3 mm (0.05 - 0.12 in.)

1. Check the cable for damage and replace if necessary.

2. Check the cable for damage and replace if necessary.

Caution

Do not confuse the instrument panel assembly with the choke cable.

1. Refer to the cable by the following part number.
 2. Refer to the cable by the following part number.

3. Refer to the cable by the following part number.

2. INSTALLATION OF LOWER PANEL ASSEMBLY

Refer to GROUP 25 - Instrument Panel

