FUEL

CONTENTS

E13AA--

GENERAL INFORMATION

E13BAAJ

Petrol-powered vehicles are equipped with either normal carburetors, feedback carburetors (FBC) or ECI-MULTI (MPI).
Carburetor equipped vehicles are provided mechanical diaphragm fuel pumps.
ECI-MULTI equipped vehicles are provided electric fuel pumps.
Diesel-powered vehicles are equipped with distribution type injection pumps.
Normal 2-barrel, down-draft carburetor is applied.
The FBC (Feedback Carburetor) system is a system which functions to regulate the air/fuel mixture ratio. Input signals from the various sensors enable the electronic control unit (ECU) to determine the operating conditions of the engine, and, depending on the operating conditions, the air/fuel mixture ratio is regulated by the two solenoid valves (the feedback solenoid valve and the slow cut-off solenoid valve) equipped at the carburetor.
The ECI-MULTI (MPI: Multi-Point Injector) system determines engine operation by signals from various sensors input into the electronic control unit (ECU), to control the injectors in the intake manifold for the most appropriate air/fuel ratio.
The ECU also controls idle speed and ignition timing.
Fuel tank capacity is as follows.
2WD – 55 liters (14.5 U.S.gal., 12.1 Imp.gal.)
4WD – 60 liters (15.9 U.S.gal., 13.2 Imp.gal.)
Fuel lines consist of main, return and vapor.
Vehicles for Europe P03W are optionally equipped with an Automatic Speed Control System which provides a set speed without requiring use of the accelerator.

SPECIFICATIONS

GENERAL SPECIFICATIONS – Vehicles built up to May 1994

E13CA--

VEHICLES FOR EUROPE
Petrol-powered Vehicles

Items	4G32, 4G63 engine	G63B engine	4G64, G64B engine
Fuel tank capacity lit (U.S.gal., Imp.gal.)			
2WD	55 (14.5, 12.1)	55 (14.5, 12.1)	55 (14.5, 12.1)
4WD	60 (15.9, 13.2)	–	60 (15.9, 13.2)
Fuel pump	Mechanical type with a diaphragm	Mechanical type with a diaphragm	Electrical (in-tank type)
Carburetor			
Type	Conventional carburetor (AISAN type)	Feedback carburetor (FBC)	–
Choke type	Full-automatic choke (wax type)	Full-automatic choke (electrical type)	–
Dash-pot	Equipped	Equipped	–
Idle compensator	Equipped	Not equipped	–
Throttle position sensor (TPS)	Not equipped	Equipped (variable resistance type)	–
Auxiliary acceleration pump	Not equipped	Equipped	–
Injector			
Type	–	–	Electro-magnetic type
Number	–	–	4
TPS type	–	–	Variable resistance type
ISC servo type	–	–	DC motor type (idling switch and MPS are built in)
MPS type	–	–	Variable resistance type

Diesel-powered Vehicles

Items		P05V, P15V	P05W	P25V, P25W
Fuel tank capacity	lit (U.S.gal., Imp.gal.)	55 (14.5, 12.1)	55 (14.5, 12.1)	60 (15.8, 13.2)
Fuel pump		Injection pump	Injection pump	Injection pump
Fuel injection pump				
Type		Distribution type	Distribution type	Distribution type
Governor type		All speeds	Half all speeds	All speeds
Feed pump type		Vane type	Vane type	Vane type
Injection nozzle				
Nozzle type		Throttle type	Throttle type	Throttle type
Holder type		Screwed-in type	Screwed-in type	Screwed-in type

VEHICLES FOR GENERAL EXPORT

Petrol-powered Vehicles

Items		2WD	4WD
Fuel tank capacity	lit (U.S.gal., Imp.gal.)	55 (14.5, 12.1)	60 (15.9, 13.2)
Fuel pump		Mechanical type with a diaphragm	Mechanical type with a diaphragm
Carburetor			
Type		Conventional carburetor (AISAN type)	Conventional carburetor (AISAN type)
Choke type		Manual	Manual
Dash-pot		Not equipped	Not equipped
Idle compensator		Equipped	Equipped

Diesel-powered Vehicles

Items		Specifications
Fuel tank capacity	lit (U.S.gal., Imp.gal.)	55 (14.5, 12.1)
Fuel pump		Injection pump
Fuel injection pump		
Type		Distribution type
Governor type		All speeds
Feed pump type		Vane type
Injection nozzle		
Nozzle type		Throttle type
Holder type		Screwed-in type

VEHICLES FOR HONG KONG built from JULY 1991

Items		4G33 engine	4G64 engine
Fuel tank capacity	lit (U.S.gal., Imp.gal.)	55 (14.5, 12.1)	55 (14.5, 12.1)
Fuel pump		Mechanical type with a diaphragm	Electrical (in-tank type)
Carburetor			
Type		Conventional carburetor (AISAN type)	–

Items	4G33 engine	4G64 engine
Dash-pot	Not equipped	–
Idle compensator	Equipped	–
Throttle position sensor (TPS)	Not equipped	–
Auxiliary acceleration pump	Not equipped	–
Injector		
Type	–	Electro-magnetic type
Number	–	4
TPS type	–	Variable resistance type (built in idle position switch)
ISC servo type	–	DC motor type (built in servo valve position sensor)
Servo valve position sensor type	–	Variable resistance type

VEHICLES FOR AUSTRALIA
Petrol-powered Vehicles

Items	4G63 engine	4G64 engine
Fuel tank capacity lit (U.S.gal., Imp.gal.)		
2WD	55 (14.5, 12.1)	55 (14.5, 12.1)
4WD	–	60 (15.9, 13.2)
Fuel pump	Mechanical type with a diaphragm	Electrical type (in-tank type)
Carburetor		
Type	Conventional carburetor (MIKUNI type)	–
Choke type	Full automatic choke (wax type)	–
Dash-pot	Equipped	–
Idle compensator	Equipped	–
Injector		
Type		Electro-magnetic type
Number	–	4
TPS type	–	Variable resistance type
ISC servo type	–	DC motor type (idling switch and MPS are built in)
MPS type	–	Variable resistance type

Diesel-powered Vehicles

Items	Specifications
Fuel tank capacity lit (U.S.gal., Imp.gal.)	55 (14.5, 12.1)
Fuel pump	Injection pump
Fuel injection pump	
Type	Distribution type
Governor type	All speeds
Feed pump type	Vane type
Injection nozzle	
Nozzle type	Throttle type
Holder type	Screwed-in type

Auto-cruise Control System

Items		Specifications
Auto-cruise control switch (SET, RESUME)		
Rated load	A	0.1–0.3
Voltage drop between terminals	V	0.2 or less
Stop lamp switch		
Rated load		
Relay load	A	0.1–1.5
Voltage drop between terminals	V	0.15 or less
Clutch switch		
Voltage drop between terminals	V	0.15 or less
Electric control unit		
Speed control range	km/h (mph)	40 – 145 (25 – 90)
Set error	km/h (mph)	±1 (±0.6)
Actuator		
Servo type		Diaphragm type
Diaphragm stroke	mm (in.)	40 (1.6)
Effective diameter	mm (in.)	76 (3.0)
Effective area	cm^2 ($in.^2$)	45 (7.0)
Vacuum check valve		
Type		Ball seat type
Vacuum pump		
Type		Diaphragm type
Rated current	A	1.6 or less
Generated negative pressure	mmHg./min. (in.Hg./min.)	150 (5.9) or more
Vacuum switch		
Cut-in negative pressure	mmHg. (in.Hg.)	140–160 (5.5–6.3)
Cut-out negative pressure	mmHg. (in.Hg.)	160–190 (6.3–7.5)
Vacuum pump relay		
Excitation coil rated current	A	0.135–0.215
Maximum contact current capacity	A	22
Voltage drop between terminals	V	0.2 or less

NOTES

GENERAL SPECIFICATIONS – Vehicles built from June 1994

VEHICLES FOR EUROPE

Petrol-powered vehicles

Items	4G63 engine		
Fuel pump	Electrical (in-tank type)	Electrical (in-tank type)	Electrical (in-tank type)
Carburetor			
Type	Conventional carburetor	Feedback carburetor (FBC)	〃
Choke type	Full-automatic (wax type)	Full-automatic (electrical type)	〃
Dash-pot	Not equipped	Equipped	〃
Idle compensator	Equipped*	Not equipped	〃
Throttle position sensor (TPS)	Not equipped	Equipped	〃
Auxiliary acceleration pump	Not equipped	Equipped	〃
Injector			
Type	〃	〃	Electro-magnetic type
Number	〃	〃	4
Throttle position sensor type	〃	〃	Variable resistance type (built in idle position switch)
ISC servo type	〃	〃	Stepper motor type

NOTE
* : Optional

Diesel-powered vehicles

Items	4D56 engine
Fuel pump	Injection pump
Fuel injection pump	
Type	Distribution type
Governor type	All speeds (without EGR), Half all speeds (with EGR)
Feed pump type	Vane type
Injection nozzle	
Nozzle type	Throttle type
Holder type	Screwed-in type

VEHICLES FOR GENERAL EXPORT

Petrol-powered vehicles

Items	4G92 engine		4G63 engine	
Fuel pump	Electrical (in-tank type)	Electrical (in-tank type)	Electrical (in-tank type)	Electrical (in-tank type)
Carburetor				
Type	Conventional carburetor (MIKUNI type)	Feedback carburetor (FBC)	Conventional carburetor (MIKUNI type)	〃
Choke type	Manual	Full-automatic (wax type)	Manual	—
Dash-pot	Not equipped	Not equipped	Not equipped	—
Idle compensator	Equipped	Not equipped	Equipped	—
Throttle position sensor (TPS)	Not equipped	Equipped	Not equipped	〃
Auxiliary acceleration pump	Not equipped	Equipped	Not equipped	—

Items	4G92 engine		4G63 engine	
Injector				
Type	—	—	—	Electro-magnetic type
Number	—	—	—	4
Throttle position sensor type	—	—	—	Variable resistance type (built in idle position switch)
ISC servo type	—	—	—	Stepper motor type

Diesel-powered vehicles

Items	4D56 engine
Fuel pump	Injection pump
Fuel injection pump	
Type	Distribution type
Governor type	All speeds
Feed pump type	Vane type
Injection nozzle	
Nozzle type	Throttle type
Holder type	Screwed-in type

VEHICLES FOR AUSTRALIA

Petrol-powered vehicles

Items	4G63 engine	4G64 engine
Fuel pump	Electrical (in-tank type)	Electrical (in-tank type)
Carburetor		
Type	Conventional carburetor (MIKUNI type)	—
Choke type	Full-automatic (wax type)	—
Dash-pot	Equipped (A/T only)	—
Idle compensator	Equipped	—
Throttle position sensor (TPS)	Equipped	—
Auxiliary acceleration pump	Equipped	—
Injector		
Type	—	Electro-magnetic type
number		4
Throttle position sensor type	—	Variable resistance type (built in idle position switch)
ISC servo type	—	Stepper motor type

Diesel-powered vehicles

Items	4D56 engine
Fuel pump	Injection pump
Fuel injection pump	
Type	Distribution type
Governor type	All speeds
Feed pump type	Vane type
Injection nozzle	
Nozzle type	Throttle type
Holder type	Screwed-in type

SERVICE SPECIFICATIONS – Vehicles built up to May 1994

E13CB..

Items			Specifications
Standard value			
Accelerator cable play		mm (in.)	Approx. 1 (0.04)
Insertion amount of fuel hose		mm (in.)	20 – 25 (0.79 – 0.98)
Actuator solenoid valve resistance Ω	Terminal 1 – 2		18 – 28
	Terminal 1 – 3		25 – 35
	Terminal 1 – 4		45 – 65
Vacuum pump pressure		mmHg (in.Hg)/min.	150 (5.9)
Fast idle opening		mm (in.)	
Vehicles for Europe	4G32 engine		0.60 (0.0236)
	4G63 engine		0.86 (0.0339)
	G63B engine		1.32 (0.0520)
Vehicles for General Export	4G32, 4G33 engines		1.26 (0.0496)
	4G63 engine		1.48 (0.0583)
Vehicles for Australia	4G63 engine with manual transmission		0.71 (0.0280)
	4G63 engine with automatic transmission		0.80 (0.0315)
Choke breaker opening		mm (in.)	
4G32 engine			1.6 – 1.8 (0.063 – 0.071)
4G33 engine for Hong Kong built from July 1991			1.8 – 2.0 (0.071 – 0.079)
4G63 engine for Europe			1.9 – 2.1 (0.075 – 0.083)
4G63 engine for Australia			1.7 – 1.9 (0.067 – 0.075)
G63B engine	1st stage		2.2 – 2.4 (0.087 – 0.094)
	2nd stage		2.9 – 3.1 (0.114 – 0.122)
Unloader opening		mm (in.)	
4G32, 4G63 engine for Europe			1.4 (0.055)
4G63 engine for Australia			1.5 (0.059)
G63B engine			1.9 – 2.1 (0.075 – 0.083)
Fuel cut solenoid valve		Ω	
Solenoid coil resistance (conventional carburettor)[at 20°C (68°F)]			
Vehicles for Europe and General Export			Approx. 90
Vehicles for Australia			Approx. 48 – 60
Engine coolant temperature sensor resistance (FBC, MPI)		kΩ	
At 20°C (68°F)			2.1 - 2.7
At 80°C (176°F)			0.26 - 0.36
Oxygen sensor output voltage (FBC, MPI)		V	0.6 - 1.0
Fuel pressure during idling (MPI)		kPa (kg/cm², psi)	
Vehicles for Europe built up to November 1988 and vehicles for Australia			245 - 165 (2.5 - 2.7, 36 - 38)
Vehicles for Europe built from December 1988 and vehicles for Hong Kong			324 - 343 (3.3 - 3.5, 47 - 50)
Fuel pressure when the vacuum hose is connected to the pressure regulator (MPI)		kPa (kg/cm², psi)	
Vehicles for Europe built up to November 1988 and vehicles for Australia			186 (1.9, 27)
Vehicles for Europe built from December 1988 and vehicles for Hong Kong			265 (2.7, 38)

Items		Specifications
Standard value		
Fuel-pressure solenoid valve [at 20℃(68°F)]	Ω	34 – 46
Basic idle speed (MPI) <Vehicles for Hong Kong>	r/min	750 ± 50
Throttle position sensor (TPS)(MPI)		
Regulated voltage [at curb idle]	V	
Vehicles for Europe and Australia		0.48 – 0.52
Vehicles for Hong Kong		0.4 – 1.0
Resistance	kΩ	3.5 – 6.5
Motor position sensor (MPS) output voltage (MPI)	V	Approx. 0.5 – 5
ISC servo motor coil resistance (MPI)[at 20℃(68°F)]	Ω	5 – 35
Intake air temperature sensor resistance (MPI)	kΩ	
At 20℃(68°F)		2.3 – 3.0
At 80℃(176°F)		0.30 – 0.42
Injector coil resistance (MPI)[at 20℃(68°F)]	Ω	
Vehicles for Europe		
Built up to November 1988 and vehicles for Australia		2 – 3
Built from December 1988 and vehicles for Hong Kong		13 – 16

SERVICE SPECIFICATIONS – Vehicles built from June 1994

Items		Specifications
Standard value		
Accelerator cable play	mm(in.)	Approx. 1(0.04)
Insertion amount of fuel hose	mm(in.)	20 – 25 (0.79 – 0.98)
Choke breaker opening	mm(in.)	
4G63 engine (conventional carburetor)		
Manual transmission		2.1 – 2.3 (0.083 – 0.091)
Automatic transmission		1.9 – 2.1 (0.075 – 0.083)
4G92 engine (FBC)		2.1 – 2.3 (0.083 – 0.091)
4G63 engine (FBC)		
1st stage		1.9 – 2.1 (0.075 – 0.083)
2nd stage		2.9 – 3.1 (0.114 – 0.122)
Unloader opening	mm(in.)	1.5 (0.059)
Fuel cut solenoid valve coil resistance [at 20℃(68°F)]	Ω	48 – 60
Feedback solenoid valve coil resistance [at 20℃(68°F)]	Ω	54 – 66
Engine coolant temperature sensor resistance (FBC, MPI)	kΩ	
At 20℃(68°F)		2.1 – 2.7
At 80℃(176°F)		0.26 – 0.36

Items		Specifications
Standard value		
Throttle position sensor output voltage	mV	
FBC		230 – 270
MPI		400 – 1,000
Throttle position sensor resistance	kΩ	3.5 – 6.5
Oxygen sensor output voltage (FBC, MPI)	V	0.6 – 1.0
Fuel pressure during idling (MPI)	kPa(kg/cm², psi)	324 – 343 (3.3 – 3.5, 47 – 50)
Fuel pressure when the vacuum hose is connected to the pressure regulator (MPI)	kPa(kg/cm², psi)	265 (2.7, 38)
Basic idle speed (MPI)	r/min.	750±50
Intake air temperature sensor resistance (MPI)	kΩ	
At 20°C(68°F)		2.3 – 3.0
At 80°C(176°F)		0.30 – 0.42
ISC servo (stepper motor) coil resistance (MPI)[at 20°C(68°F)]	Ω	28 – 33
Injector coil resistance [at 20°C(68°F)]	Ω	13 – 16

TORQUE SPECIFICATIONS

Items	Nm	kgm	ft.lbs.
Carburetor			
Carburetor mounting bolt			
Vehicles for Europe and General Export built up to May 1994	10 – 13	1.0 – 1.3	7.5 – 9.0
Except vehicles for Europe and General Export built up to May 1994	15 – 20	1.5 – 2.0	11 – 14
Throttle position sensor mounting screw (FBC)	2.5 – 4.5	0.25 – 0.45	1.8 – 3.3
Water temperature sensor	20 – 40	2.0 – 4.0	15 – 29
Oxygen sensor	40 – 50	4.0 – 5.0	29 – 36
MPI (Vehicles built up to May 1994)			
Throttle body to air intake plenum			
Vehicles built up to June 1989	10 – 13	1.0 – 1.3	7 – 9
Vehicles built from July 1989	15 – 22	1.5 – 2.2	11 – 16
Delivery pipe mounting screw	10 – 13	1.0 – 1.3	7.5 – 9.0
Water temperature sensor	20 – 40	2.0 – 4.0	15 – 29
Oxygen sensor	40 – 50	4.0 – 5.0	29 – 36
Throttle position sensor (TPS) mounting screw	1.5 – 2.5	0.15 – 0.25	1.1 – 1.8
Fuel pressure regulator	25 – 35	2.5 – 3.5	18 – 25
Injection pump and nozzle (diesel-powered vehicles)			
Fuel injection pump sprocket to injection pump	80 – 90	8.0 – 9.0	58 – 65
Fuel injection pipe clamp	4 – 6	0.4 – 0.6	3 – 4
Fuel injection pipe	23 – 37	2.3 – 3.7	17 – 26
Fuel injection pump mounting nut	15 – 22	1.5 – 2.2	11 – 16
Fuel injection pump mounting bolt	20 – 27	2.0 – 2.7	15 – 19
Fuel return pipe mounting nut	30 – 40	3.0 – 4.0	22 – 28
Fuel injection nozzle	50 – 60	5.0 – 6.0	36 – 43
Retaining nut to nozzle body	35 – 40	3.5 – 4.0	26 – 28
Fuel tank and fuel line			
Fuel tank	19 – 28	1.9 – 2.8	14 – 20
Fuel pipe assembly	2 – 3	0.2 – 0.3	1 – 2
Fuel gauge unit	2 – 3	0.2 – 0.3	1 – 2
Filler pipe assembly bracket	9 – 14	0.9 – 1.4	7 – 10
Leveling pipe assembly bracket	9 – 14	0.9 – 1.4	7 – 10
Fuel tank bracket	19 – 28	1.9 – 2.8	14 – 20
Canister assembly (petrol-powered vehicles)	4 – 6	0.4 – 0.6	3 – 4
Fuel filter clamp (petrol-powered vehicles with carburetor)	9 – 14	0.9 – 1.4	7 – 10
Fuel hose clip	9 – 14	0.9 – 1.4	7 – 10
Fuel filter to bracket (diesel-powered vehicles)	9 – 14	0.9 – 1.4	7 – 10
Fuel filter bracket (diesel-powered vehicles)	11 – 16	1.1 – 1.6	8 – 12
Fuel pump assembly (vehicles with MPI)	2 – 3	0.2 – 0.3	1 – 2
Main pipe flare nut (vehicles with MPI)	30 – 40	3.0 – 4.0	22 – 29
Fuel filter eye bolt (vehicles with MPI)	25 – 35	2.5 – 3.5	18 – 25
Fuel filter (MPI)	9 – 14	0.9 – 1.4	7 – 10

Items	Nm	kgm	ft.lbs.
Accelerator cable and pedal			
Check valve (vehicles for Europe)	4 – 6	0.4 – 0.6	3 – 4
Control cable stopper ring	3 – 4	0.3 – 0.4	2 – 3
Accelerator cable adjusting nut (vehicles with MPI)	4 – 6	0.4 – 0.6	3 – 4
Accelerator cable adjusting nut (diesel-powered vehicles)	8 – 14	0.8 – 1.4	6 – 10
MPI (Vehicles built from June 1994)			
Throttle body to air intake plenum	15 – 22	1.5 – 2.2	11 – 16
Kick down cable	14 – 18	1.4 – 1.8	10 – 13
Fuel pressure regulator mount bolt	7 – 11	0.7 – 1.1	5 – 8
Resonance tank mount bolt	9 – 14	0.9 – 1.4	7 – 10
Fuel pressure pipe mount bolt	4 – 6	0.4 – 0.6	3 – 4
Air hose clip	3 – 5	0.3 – 0.5	3 – 4

NOTES

LUBRICANTS

E13CD

Items	Specified lubricants	Quantity
Accelerator pedal shaft	Multipurpose grease, SAE J310, NLGI No. 2	As required

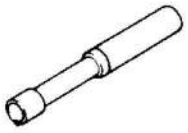
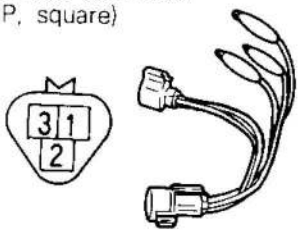
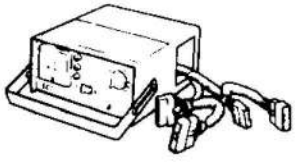
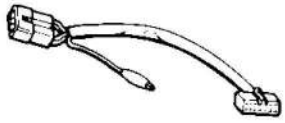
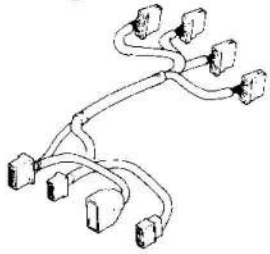
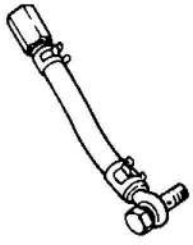
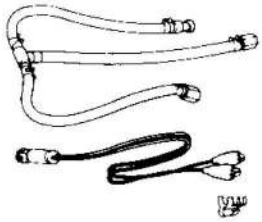
SEALANTS AND ADHESIVES

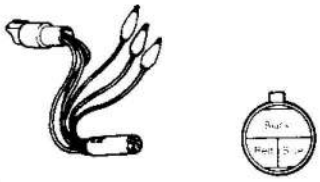
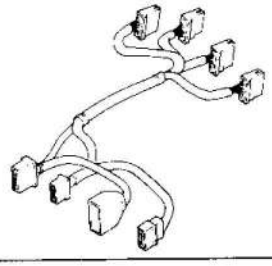
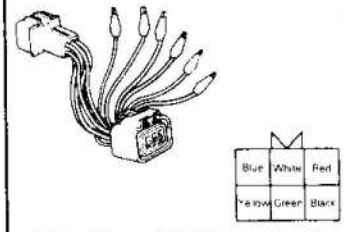
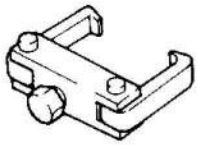
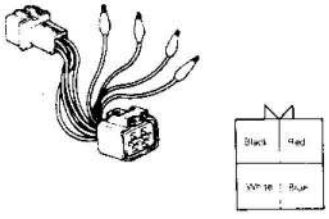
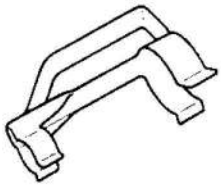
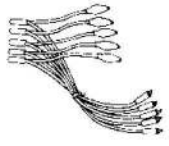
E13CE

Items	Specified sealant and adhesive	Remarks
Thermo valve thread Engine coolant temperature sensor thread	3M Nut Locking Part No.4171 or equivalent	Drying sealant

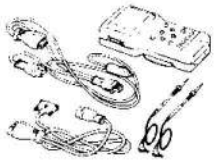
SPECIAL TOOLS – Vehicles built up to May 1994

E13DA

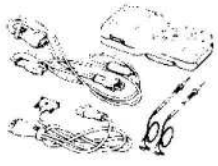
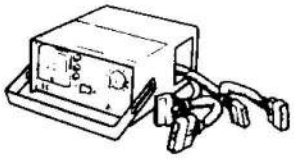
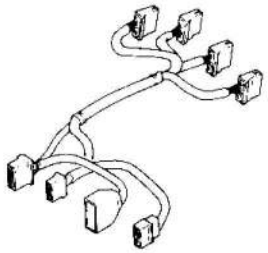
Tool (Number and name)	Use	Tool (Number and name)	Use
MD998299 DRIVER, MAS (4G32, 4G33, 4G63, G63B engines) 	Adjustment of idle mixture and removal and installation of MAS (vehicles for Europe and Gulf Countries)	MD998478 (4G64, G64B engines) Harness connector (3P, square) 	Adjustment of TPS
MD998404 ECI checker (G63B, 4G64, G64B engines) 	Inspection for MPI and FBC system	MB991167 Adapter harness 	Reading diagnosis code
MD998475 Harness connector for FBC (G63B engine) 	Insepction for FBC system use with MD998404	MD998709 (4G64, G64B engines) Adapter hose 	Inspection of fuel pressure
MD998706 Injector test set 	Operation check of injector	MD998432 Harness connector 	Reading diagnosis code

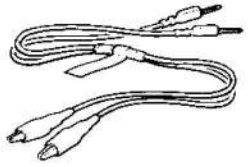
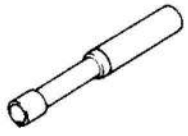
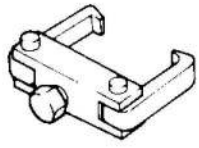
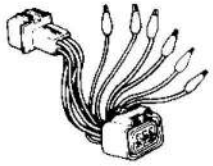
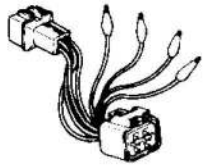
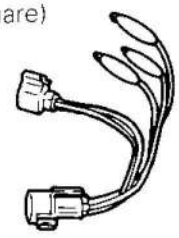
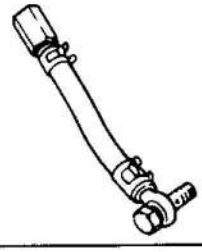
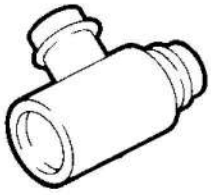
Tool (Number and name)	Use	Tool (Number and name)	Use
MD998459 (G63B engine) Harness connector (3P, round) 	Adjustment of TPS	MD998434 (4G64, G64B engines) Harness connector for MPI 	Inspection for MPI system use with MD998404
MD998463 Harness connector (6P, square) 	Inspection of AFS and atmospheric pressure sensor	MD998388 (4D56 engine) Injection pump sprocket puller 	Removal of sprocket from drive shaft of injection pump
MD998464 Harness connector (4P, square) 	Inspection of TDC of piston in No. 1 cylinder and crank angle sensor Inspection of ISC and MPS	MB991268*1 MB991341*2 Multi-use tester assembly 	Checking of the self-diagnosis output
MD998746*3 Clip 	Checking of the spray condition of injectors	MB991308*1 MB991326*2 MB991360*4 MB991364*5 MB991419*6 MB991408*7 ROM pack 	
		MB991348 Test harness set 	Adjustment of throttle position sensor Checking with an oscilloscope

NOTE
*1 : Vehicles for Europe built from December 1988 up to October 1989.
*2 : Vehicles for Europe built from November 1989.
*3 : Vehicles for Europe built from December 1988.
*4 : Vehicles for Europe and General Export built from July 1990.
*5 : Vehicles for Australia built from July 1990.
*6 : Vehicles for Europe and General Export built from July 1991.
*7 : Vehicles for Australia built from July 1991.

Tool (Number and name)	Use	Tool (Number and name)	Use
MB991341 Multi-use tester sub assembly 	• Reading diagnosis code • Auto-cruise control system inspection	MB991502 MUT-II 	• Reading diagnosis code • Auto-cruise control system inspection
MB991326 ROM pack 		ROM pack 	

SPECIAL TOOLS – Vehicles built from June 1994

Tool (Number and name)	Use	Tool (Number and name)	Use
MB991502 MUT-II 	• Inspection for MPI system • Reading diagnosis code • Auto-cruise control system inspection	MD998404 ECI checker 	Inspection for FBC system
ROM pack 		MD998475 Harness connector 	Inspection for FBC system use with MD998404

Tool (Number and name)	Use	Tool (Number and name)	Use
MB991529 (4G63, 4G64 engines) Diagnosis code check harness 	• Adjustment of basic idle speed • Reading diagnosis code	MB991348 (4G63, 4G64 engines) Test harness set 	• Adjustment of throttle position sensor • Checking with an oscilloscope
MD998299 (4G63 engine) MAS driver 	Adjustment of idle mixture (vehicles for Gulf Countries)	MD998388 (4D56 engine) Injection pump sprocket puller 	Removal of sprocket from drive shaft of injection pump
MD998463 (4G63, 4G64 engines) Harness connector (6P, square) 	• Inspection of AFS and atmospheric pressure sensor • Inspection of ISC servo (stepper motor)	MD998464 (4G63 engine) Harness connector (4P, square) 	Inspection of oxygen sensor
MD998478 (4G92, 4G63 engines) Harness connector (3P, square) 	Adjustment of TPS	MD998709 (4G63, 4G64 engines) Adapter hose 	Inspection of fuel pressure use with MD998742
MD998742 (4G63, 4G64 engines) Hose adapter 	Inspection of fuel pressure use with MD998709		

TROUBLESHOOTING

E13EAAF

FUEL TANK AND FUEL LINE

Symptom	Probable cause	Remedy	Reference page
Engine malfunction through insufficient fuel supply	Bent or twisted fuel line or hose	Repair or replace	13–117
	Clogged fuel line or hose	Clean or replace	13–117
	Clogged fuel filter, in-tank fuel filter	Replace	13–111
	Water in fuel filter (petrol-powered vehicles)	Replace fuel filter Clean fuel tank and fuel line	13–111
	Water in fuel filter (diesel-powered vehicles)	Evacuate water from fuel filter	13–78
	Air in fuel filter (diesel-powered vehicles)	Bleed air from fuel filter	13–77
	Inner fuel tank damaged or rusted	Clean or replace	13–111
	Fuel pump malfunction	Replace	13–105
Fuel vapor exhaustion controller malfunction (Emits sound when fuel tank cap is removed)	Vapor line wrongly connected	Repair	13–117
	Loose vapor line connection	Tighten	13–17
	Broken, bent or clogged vapor line	Repair or replace	13–17
	Defective fuel tank cap	Replace	13–111
	2-way valve malfunction	Replace	13–111
	Purge control valve malfunction	Replace	13–17
	Clogged canister	Clean or replace	13–17

ACCELERATOR CABLE AND ACCELERATOR PEDAL

E13ECAC

Symptom	Probable cause	Remedy	Reference page
Throttle valve will not fully open or close	Misadjusted accelerator cable	Adjust	13–17, 33, 59, 77
	Broken return spring	Replace	13–126, 128
	Throttle lever malfunction	Replace	–
Accelerator pedal operation not smooth (over acceleration)	Accelerator pedal wrongly tightened	Repair	13–126, 128
	Misinstalled accelerator cable	Repair	13–125, 127
	Accelerator cable requires lubrication	Lubricate or replace	13–125, 127

CARBURETOR (CONVENTIONAL CARBURETOR)

E13EFAC

Symptom	Probable cause	Remedy	Reference page
Poor drive ability	Improper fuel mixture (Too rich or lean)	Readjust ignition timing, idle speed and mixture or repair carburetor	GROUP 11
	Loose vacuum hose in heated air intake system	Repair	GROUP 17
	Broken air-control valve or heated air intake system	Repair or replace	GROUP 17
	Disconnected air cleaner snorkel	Repair	–
Rough idle	Improper idle adjustment	Readjust ignition timing, idle speed and mixture	GROUP 11
	Choke valve not opening	Repair	–
	Over-flooded carburetor	Repair	–
	Fuel level improperly (Too high or low)	Adjust fuel level	–
	Leaned inlet air	Clean up or replace air cleaner element	GROUP 11
	Restricted exhaust system	Replace	GROUP 15
Engine will not keep running	Carburetor icing (Loose vacuum hose in heated air intake system)	Repair	–
	Clogged fuel pipe due to foreign material	Clean or replace	13–117
	Clogged fuel hose	Clean or replace	13–117
	Clogged fuel filter (Water in fuel tank Deposit due to improper fuel)	Clean up filter Clean filter and pipe, and refill clean fuel	13–117
Low engine power	Improper idle adjustment	Adjust ignition timing, idle speed and mixture	GROUP 11
	Faulty carburetor	Repair	–
	Broken intake manifold gasket	Replace	GROUP 15
Noise	Loose wing nut on air horn	Retighten	GROUP 15
	Broken air cleaner snorkel	Repair or replace	–
	Broken exhaust pipe	Repair or replace	GROUP 15
Exhaust gas odor	Broken exhaust manifold	Replace	GROUP 15
	Exhaust gas leakage due to loose connections	Retighten	GROUP 15
Engine overspeed when throttle is released	Inadequate idle speed	Reset idle speed	GROUP 11
Fuel leakage	Broken fuel hose or pipe	Replace	13–117
	Loose fuel hose pipe	Retighten or replace	13–117

CARBURETOR (FBC)

E13EFAD

Symptom	Probable cause	Remedy	Reference page
Engine will not start or start to hard (cranks OK)	Carburetor Choke valve remains open-cold engine	Clean choke bore and link	–
	Improper choke breaker operation	Check and adjust choke breaker	13–42
	Electric choke malfunction	Check electric choke body and choke valve operation	13–40
	Needle valve sticking or clogged	Repair and replace	–
	FBC system Engine coolant temperature sensor malfunction	Check by using checker (Check component and replace if faulty)	13–50
	Vacuum hose disconnected or damaged	Repair or replace	–
	Slow-cut solenoid valve malfunction	Check component	13–56
	Feedback solenoid valve malfunction	Check component	13–55
	Vacuum switch malfunction-cold engine	Check component	13–54
	Faulty ECU	Replace	–
	Harness broken/short circuited or connector not connected securely	Repair or replace	–
Rough idle or engine stalls	Carburetor Choke valve malfunction	Clean choke bore and link	–
	Improper fast idle-cold engine	Adjust fast idle speed	13–44
	Improper idle adjustment	Adjust idle speed	GROUP 11
	Electric choke malfunction	Check choke body and choke valve operation	13–42
	Primary pilot jet clogged	Clean up or replace	–
	Dash pot malfunction	Adjust	GROUP 11
	FBC system Slow-cut solenoid valve malfunction	Check drive signal by using checker. Check component	13–50
	Engine coolant temperature sensor malfunction	Check by using checker Check component and replace if faulty	13–50
	Vacuum hose disconnected or damaged	Repair or replace	–
	Throttle position sensor malfunction	Check component and adjust	13–53
	Engine speed sensor malfunction	Check by using checker (Check harnesses for continuity)	13–50
	Throttle opener control system malfunction	Check system. If faulty, check components	13–50
	Harness broken/short-circuited or connector not connected securely	Repair or replace	–
Engine hesitates or poor acceleration	Carburetor Acceleration pump malfunction	Check pump discharge rate	13–45
	Choke valve remains open-cold engine	Clean choke bore and link Check choke valve operation	13–40
	Choke valve remains closed-hot engine		
	Enrichment valve faulty	Repair or replace	–
	Main jet clogged	Clean up	–
	Enrichment jet clogged	Clean up	–
	Secondary valve operation abnormal	Check valve operation	13–38
	Auxiliary acceleration pump malfunction -cold engine	Check pump discharge rate	13–45

Symptom	Probable cause	Remedy	Reference page
Engine hesitates or poor acceleration	FBC system Feedback solenoid valve malfunction	Check drive signal by using checker. Check component	13–50
	Vacuum switch malfunction	Check by using checker (Check component and replace if faulty)	13–50
	Engine coolant temperature sensor malfunction	Check by using checker (Check component and replace if faulty)	13–50
	Throttle position sensor malfunction	Check component and adjust	13–53
	Engine speed sensor malfunction	Check by using checker Check harnesses for continuity	13–54
	Harness broken/short-circuited or connector not connected properly	Repair or replace	–
Engine dieseling (runs after ignition switch is turned off)	Carburetor Engine idle speed too high	Adjust idle speed	GROUP 11
	FBC system Slow cut solenoid valve malfunction	Check component	13–56
Poor fuel mileage	Carburetor Choke valve operation abnormal	Check valve operation	13–40
	Engine idle speed too high	Adjust idle speed	GROUP 11
	Electric choke malfunction	Check choke body and valve operation	13–40
	Enrichment valve kept open	Repair or replace	–
	Auxiliary acceleration pump is in operation -hot engine	Repair or replace	–
	FBC system Engine coolant temperature sensor malfunction	Check by using checker (Check component and replace if faulty)	13–50
	Oxygen sensor malfunction	Check by using checker (Check component and replace if faulty)	13–50
	Feedback solenoid valve malfunction	Check drive signal by using checker Check component	13–50
	Slow-cut solenoid valve malfunction	Check drive signal by using checker Check components	13–50
	Throttle position sensor malfunction	Check component and adjust	13–53
	Engine speed sensor malfunction	Check by using checker Check harnesses for continuity	13–54
	Harness broken/short circuited or connector not connected properly	Repair or replace	–

INJECTOR AND THROTTLE BODY (MPI) – Vehicles for Europe built up to November 1988 and Australia

E13EBAB

Symptom	Probable cause	Remedy	Reference page
Engine will not start or start to hard (Cranks OK)	Malfunction of the fuel pump drive control system	Check the system; if there is a problem, check its component parts	–
	Malfunction of the ignition control system	Check the system; if there is a problem, check its component parts	13 – 67
	Power is not being supplied to the ECU	Check by using the checker	13 – 67
	Malfunction of the control relay	Replace	–
	Vacuum hose disconnected or damaged	Repair or replace	–
	Malfunction of the MPI system	Check for output of diagnosis code	13 – 67
	Malfunction of the injector	• Use the checker to check the drive signals • Check individual parts	13 – 67 13 – 103
	Malfunction of the resistor	Replace	–
	Improper fuel pressure	Check the fuel pressure	13 – 59
	Malfunction of the ECU	Replace	–
	Damaged or disconnected harness, or short-circuit; improper connection of the connector	Repair or replace	–
Rough idle or engine stalls	Malfunction of the MPI system	Check for output of diagnosis code	13 – 67
	Malfunction of the injector	• Use the checker to check the drive signals • Check individual parts	13 – 67 13 – 103
	Malfunction of the idle switch	Check by using the checker (Replace after checking of individual parts)	13 – 67 (13 – 74)
	Vacuum hose disconnected or damaged	Repair or replace	–
	Malfunction of the resistor	Replace	–
	Malfunction of the ISC servo	• Use the checker to the drive signals • Check individual parts	13 – 67 13 – 76
	Improper fuel pressure	Check the fuel pressure	13 – 59
	Malfunction of the fuel pressure control system	Check the system; if there is a problem, check its component parts	13 – 59
	Malfunction of the intake air temperature sensor	Check by using the checker (Replace after checking of individual parts)	13 – 67 (13 – 73)
	Malfunction of the inhibitor switch	Check by using the checker	GROUP 23
	Malfunction of the air conditioner switch	Check by using the checker	–
	Malfunction of the vehicle speed sensor	Check by using the checker	GROUP 54
	Damaged or disconnected harness, or short-circuit; improper connection of the connector	Repair or replace	–
	Malfunction of the air-flow sensor	Check by using the checker	13 – 67
	Malfunction of the coolant temperature sensor	Check by using the checker (Replace after checking of individual parts)	13 – 67 (13 – 73)
	Malfunction of the atmospheric pressure sensor	Check by using the checker	13 – 67
	Malfunction of the motor position sensor	Check by using the checker	13 – 67

Symptom	Probable cause	Remedy	Reference page
Engine hesitates or poor acceleration	Malfunction of the MPI system	Check for output of diagnosis code	13–67
	Malfunction of the injector	• Use the checker to check the drive signals • Check individual parts	13–67 13–103
	Improper fuel pressure	Check the fuel pressure	13–59
	Malfunction of the resistor	Replace	–
	Malfunction of the air conditioner power relay control system	Check the system; if there is a problem, check its component parts	–
	Malfunction of the throttle position sensor	• Check individual parts • Adjust	13–74 13–61
	Malfunction of the intake air temperature sensor	Check by using the checker (Replace after checking of individual parts)	13–67 13–73
	Vacuum hose disconnected or damaged	Repair or replace	–
	Damaged or disconnected harness, or short-circuit; improper connection of the connector	Repair or replace	–
	Malfunction of the air-flow sensor	Check by using the checker	13–67
	Malfunction of the coolant temperature sensor	Check by using the checker (Replace after checking of individual parts)	13–67 (13–73)
	Malfunction of the atmospheric pressure sensor	Check by using the checker	13–67
Poor fuel mileage	Malfunction of the oxygen sensor	Check by using the checker (Replace after checking of individual parts)	13–67 (13–75)
	Malfunction of the injector	• Use the checker to check the drive signals • Check individual parts	13–67 13–103
	Malfunction of the MPI system	Check for output of diagnosis code	13–67
	Malfunction of the resistor	Replace	–
	Improper fuel pressure	Check the fuel pressure	13–59
	Malfunction of the fuel pressure control system	Check the system; if there is a problem, check its component parts	13–59

NOTE
Vehicles for Europe built from December 1988, refer to P. 13-64-1.

FUEL INJECTION SYSTEM (DIESEL-POWERED ENGINE)

E13EGAC

Symptom	Probable cause	Remedy	Reference page
Engine dose not start	No voltage at fuel cut-off solenoid on injection pump	Check for voltage with test light If necessary, replace fuse or faulty wires	–
	Fuel cut-off solenoid on injection pump loose or faulty	Tighten solenoid Check that solenoid clicks when key is turned off and on Replace faulty solenoid	–
	No voltage at glow plug bus	If test light shows no voltage at bus with key at "ON" position, test relay and wiring	–
	Glow plug faulty	Test and, if necessary, replace glow plug	GROUP 16
	Air in fuel system	Bleed fuel system	13–77
	Injection pump not delivering fuel	If no fuel emerges from a loosened injection pipe during cranking, check timing belt and fuel supply from filter	GROUP 11
	Injection pipes misconnected.	Connect pipes in correct location	13–107
	Injection timing incorrect	Adjust injection timing	GROUP 11
	Faulty injection nozzles	Check and, if necessary, repair or replace nozzles	13–79
	Faulty injection pump	Try to start engine with new pump installed If necessary, replace pump permanently	13–109
Idle speed incorrect or idle rough or irregular	Idle speed incorrectly adjusted	Check and, if necessary, adjust the idle speed	GROUP 11
	Accelerator control binding	Check that accelerator lever on pump is not loose, then adjust accelerator cable	13–77
	Loose fuel hose between filter and injection pump	Replace hose or secure with clamps, bleed air from system	13–111
	Air in fuel system	Bleed fuel system	13–77
	Inadequate fuel supply owing to clogged fuel filter, or fuel return line and injection pipes leaking, dirty, kinked, or squeezed at connections	Inspect and, if necessary,replace lines and hoses or replace fuel filter	13–123
	Faulty injection nozzles	Check and, if necessary, repair or replace injection nozzles	13–78
	Injection timing incorrect	Adjust injection timing	GROUP 11
	Faulty injection pump	Try engine at idle with new pump installed If necessary, replace pump permanently	13–109
Smoky exhaust (black, blue or white)	Maximum rpm incorrect	Check and, if necessary, replace injection pump	13–109
	Faulty injection nozzles	Check and, if necessary, repair or replace injection nozzles	13–78
	Injection timing incorrect	Adjust injection timing	GROUP 11
	Faulty injection pump	Observe exhaust with new pump installed If necessary, replace pump permanently	13–109

Symptom	Probable cause	Remedy	Reference page
Poor power output, slow acceleration (speedometer accurate, clutch not slipping)	Injection pump accelerator lever loose or not reaching maximum rpm adjusting screw	Tighten lever, check that accelerator pedal travel is not restricted, then adjust accelerator cable	13–77
	Maximum rpm incorrect	Check and, if necessary, replace injection pump	13–109
	Inadequate fuel supply owing to clogged fuel filter, or fuel return line and injection pipes leaking, dirty, kinked, or squeezed at connections	Inspect and, if necessary, replace lines and hoses, replace fuel filter	13–123
	Air in fuel system	Bleed fuel system	13–77
	Ice or solidified wax in fuel lines (winter time only)	Move car to a warm garage until ice or wax has become liquid, then bleed fuel system	13–77
	Faulty injection nozzles	Check and, if necessary, repair or replace injection nozzles	13–78
	Injection timing incorrect	Adjust injection timing	GROUP 11
	Faulty injection pump	Check acceleration and speed with new pump installed If necessary, replace pump permanently	13–109
Excessive fuel consumption	Fuel leaks	Check and, if necessary, replace or tighten all pipes, hoses and connections	13–123
	Return pipe and hose blocked	Check return line kinks and dents Replace faulty lines If line is clogged blow it out with compressed air, then bleed fuel system	13–123
	Idle speed too fast or maximum rpm too high	Check and, if necessary, adjust idle speed or replace injection pump	GROUP 11 13–109
	Faulty infection nozzles	Check and, if necessary, repair or replace injection nozzles	13–78
	Injection timing incorrect	Adjust injection timing	GROUP 11
	Faulty injection pump	Check fuel consumption with new pump installed If necessary, replace pump permanently	13–109

SERVICE ADJUSTMENT PROCEDURES (CONVENTIONAL CARBURETOR) E13FCAF0

GENERAL INSPECTION

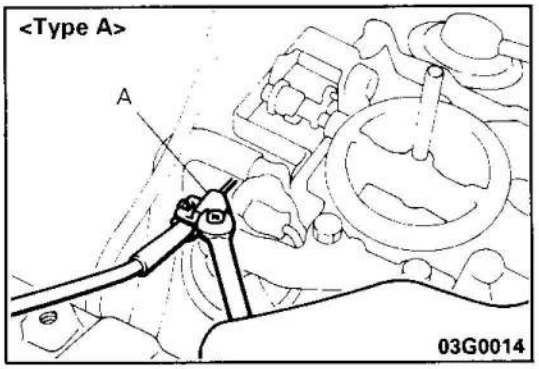
1. INSPECTION AND ADJUSTMENT OF ACCELERATOR CABLE

(1) Turn air-conditioner and lamps OFF.
Inspect and adjust at no load.
(2) Warm engine until stabilized at idle.
(3) Confirm idle rpm is at prescribed rpm.
(4) Stop engine (ignition switch OFF).
Remove air horn.
(5) Confirm there are no sharp bends in accelerator cable.
(6) Check inner cable for correct slack.
(7) If there is too much slack or no slack, adjust play by the following procedures.

<Type A>

① Loosen accelerator cable fixing bolt A. Fully close throttle valve.
② Adjust outer cable so that accelerator cable play is at the standard value and fix with fixing bolt A.

<Type A>



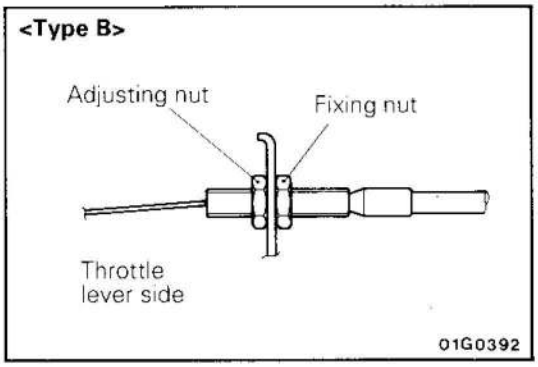
<Type B>

① Loosen accelerator cable fixing nut. Fully close throttle valve.
② Adjust outer cable so that accelerator cable play is at the standard value and fix with fixing nut.

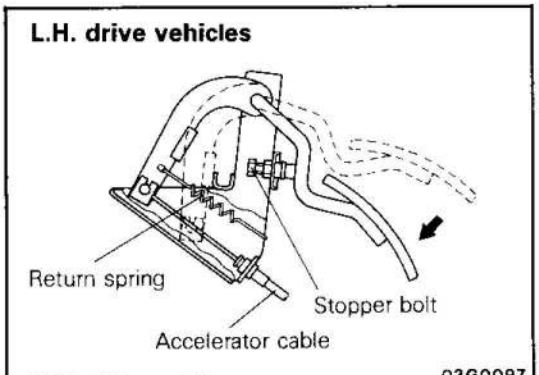
Standard value: Approx. 1mm (0.04 in.)

③ Adjust so that accelerator pedal stopper touches pedal arm when throttle valve is fully opened.
④ After adjusting, confirm that throttle valve fully opens and closes by operating pedal.

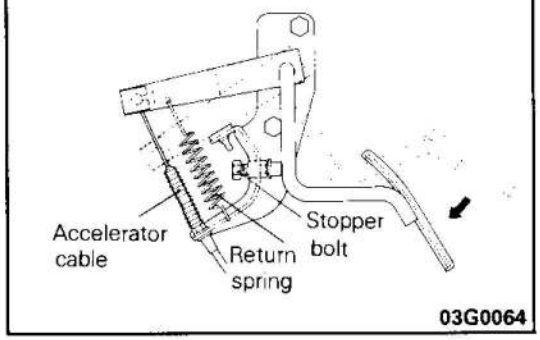
<Type B>

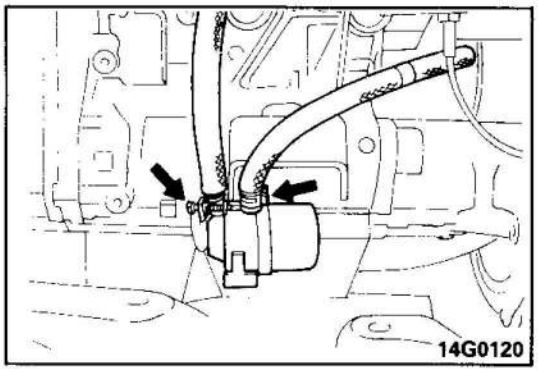


L.H. drive vehicles



R.H. drive vehicles





2. REPLACEMENT OF FUEL FILTER

E13FZAB0

(1) Remove fuel tank cap.
De-pressurize fuel tank.
(2) Remove fuel filter from filter clamp.
(3) Disconnect fuel hose and fuel filter and remove fuel filter.

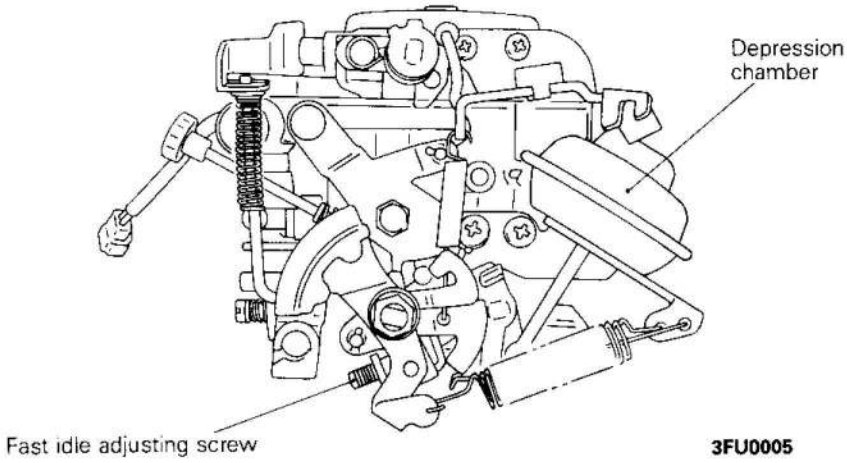
Caution
Cover with rags to avoid gasoline from splashing.

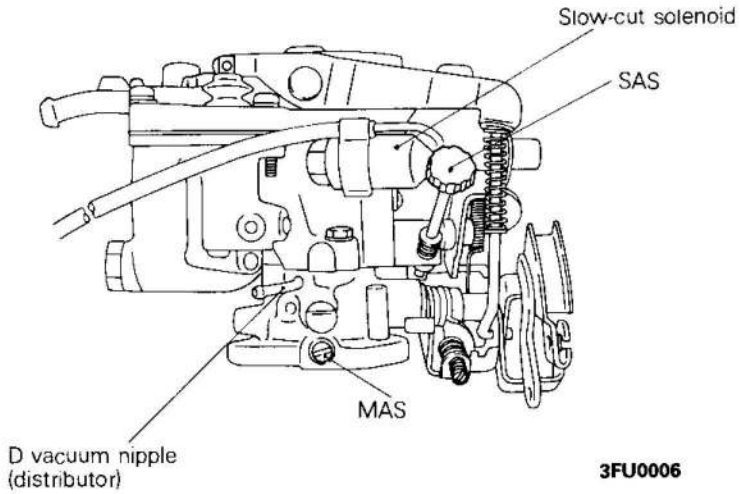
(4) Install fuel filter and start engine.
Check for gasoline leak.

INSPECTION AND ADJUSTMENT OF CARBURETOR (AISAN TYPE)

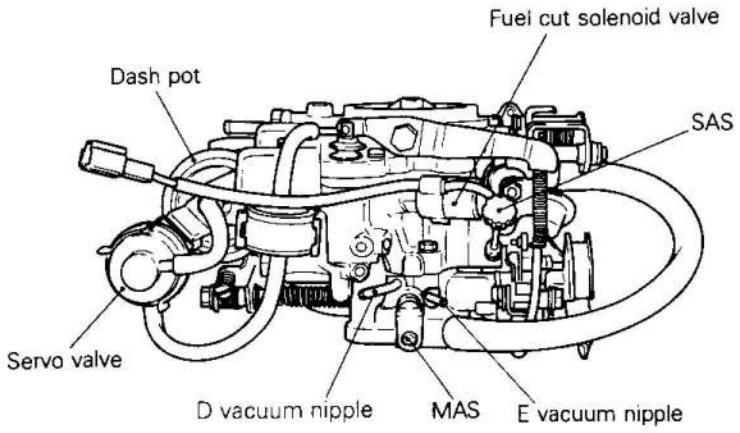
E13FBAC

Vehicles for General Export
(manual choke type)

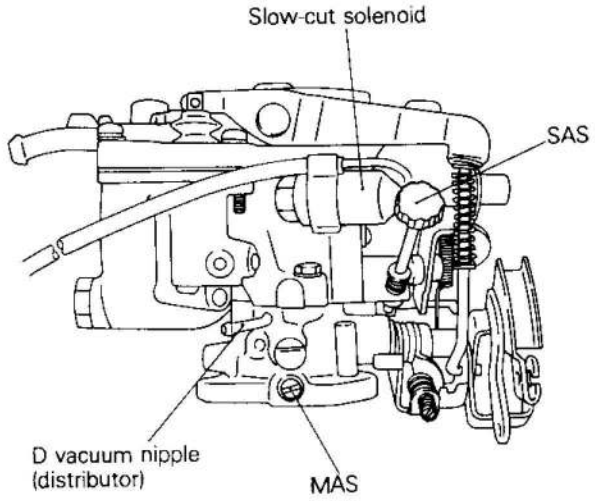




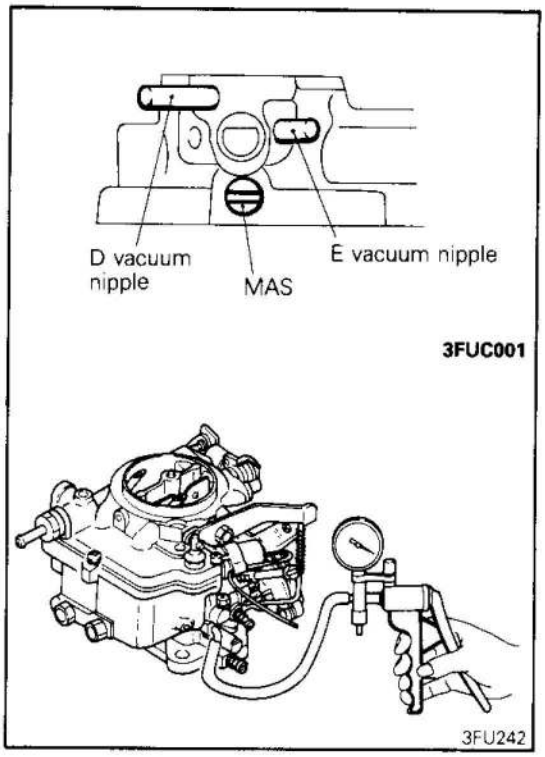
Vehicles for Europe and vehicles for Hong Kong built from July 1991 (auto choke type)



3FU0007



3FU0006

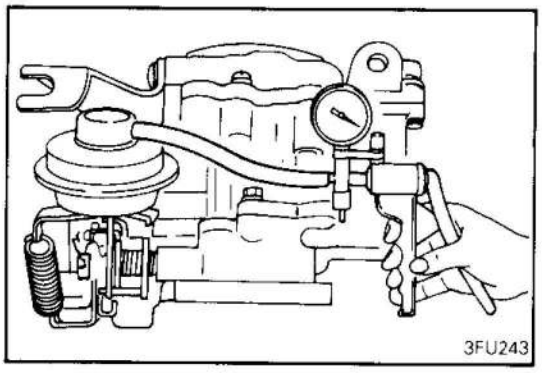


1. INSPECTION OF PORT VACUUM

(1) Start engine.
Warm engine until engine coolant is at 80–90°C (176–194°F).
(2) Disconnect vacuum hose from carburetor nipple D and E. Connect hand vacuum pump to nipples.
(3) Gradually increase engine rpm and check vacuum change.

Vacuum measuring port	Vacuum change with increased rpm.
D (distributor)	Increases with rpm.
E (EGR valve)*	

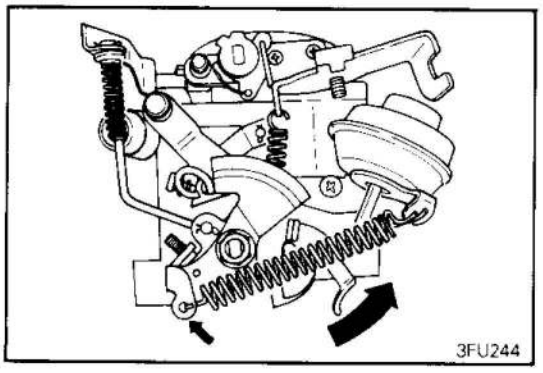
NOTE
* : Vehicles for Europe and Gulf Countries and vehicles for Hong Kong built from July 1991



2. INSPECTION OF SECONDARY VALVE OPERATION

(1) Remove air horn.

(2) Remove vacuum hose, for secondary valve operation, from carburetor main body, and connect hand vacuum pump to vacuum hose.

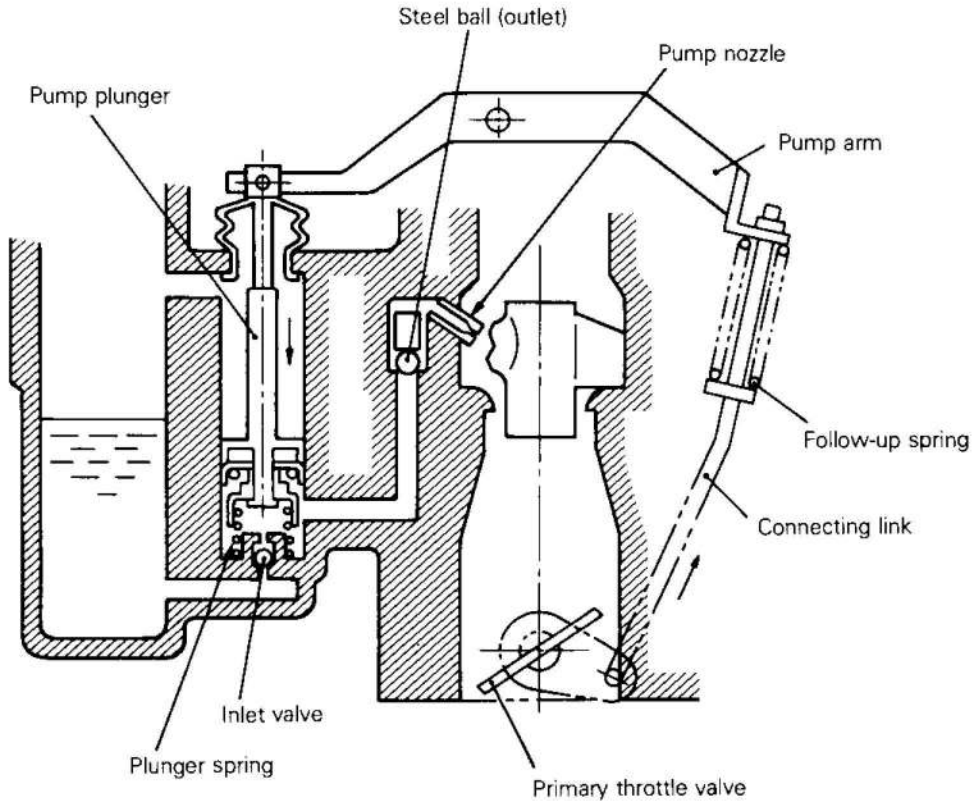


(3) With a vacuum of 100 mmHg (3.94 in.Hg) applied by vacuum pump, open primary throttle valve fully to make sure that secondary throttle valve is fully opened.

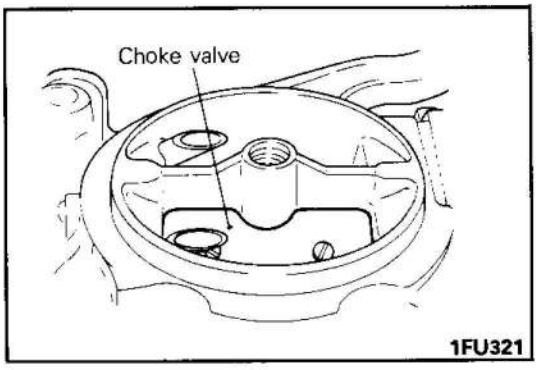
Symptom	Remedy
No vacuum is maintained in depression chamber. (leaky)	Replace depression chamber
Vacuum is maintained but secondary valve does not operate.	Disassemble and inspect carburetor

3. INSPECTION OF ACCELERATOR PUMP

(1) Remove air horn.
(2) While opening the choke valve, open the throttle valve to make sure that fuel is injected from pump nozzle. If fuel is not injected from pump nozzle, clean the carburetor fuel passage.



1FU338



1FU321

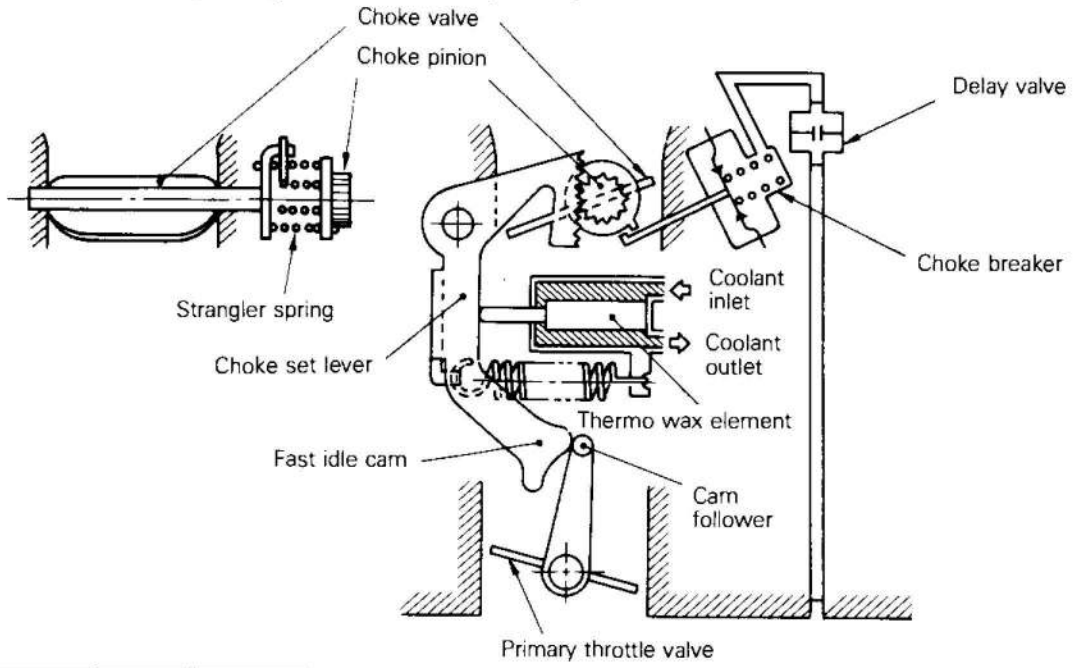
4. INSPECTION OF CHOKE VALVE

(1) Remove air horn.
(2) Pull choke cable all the way out. (Vehicles for General Export)
(3) Make sure that choke valve is fully closed.
(4) Move choke valve with fingers to check for excessive play and malfunction.

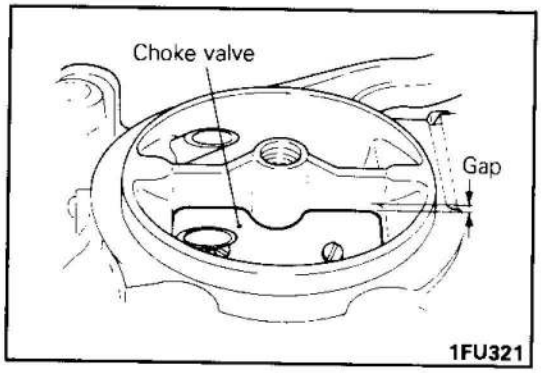
Symptom	Remedy
Excessive play	Replace float chamber cover assembly.
Poor operation (seizure)	Clean the choke valve and apply a small amount of oil to choke shaft.

PWWE8608

5. INSPECTION OF FULL-AUTO-CHOKE (Vehicles for Europe and vehicles for Hong Kong built from July 1991)



1FU478

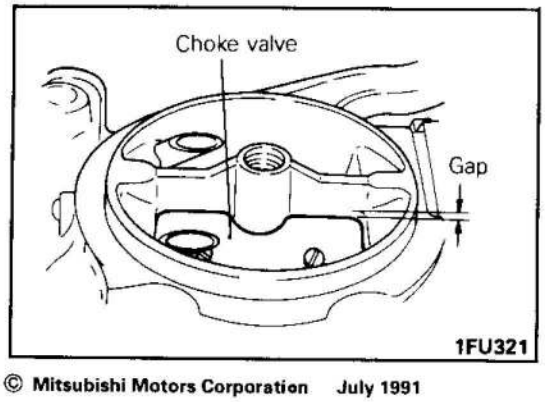


1FU321

(1) Remove air horn.
(2) Confirm engine water temperature is 10°C (50°F) or less. Check choke valve by the following procedures.

Check procedure	Check condition	Choke valve condition
1.	Engine stopped.	Fully closed.
2.	More than 6 seconds after engine is started.	Slightly open. [gap : 4G32 engine 1.6 – 1.8 mm (0.063 – 0.071 in.) 4G33 engine 1.8 – 2.0 mm (0.071 – 0.079 in.) 4G63 engine 1.9 – 2.1 mm (0.075 – 0.083 in.)]
3.	Remove vacuum hose from the choke breaker with engine idling.	Closes [at water temperature of 20°C (68°F) or less.] [Plug vacuum hose end with finger and confirm that intake manifold vacuum can be felt.]
4.	Engine warmed.	Valve opens as water temperature rises.

6. CHOKE BREAKER OPENING ADJUSTMENT (Vehicles for Europe and vehicles for Hong Kong built from July 1991)

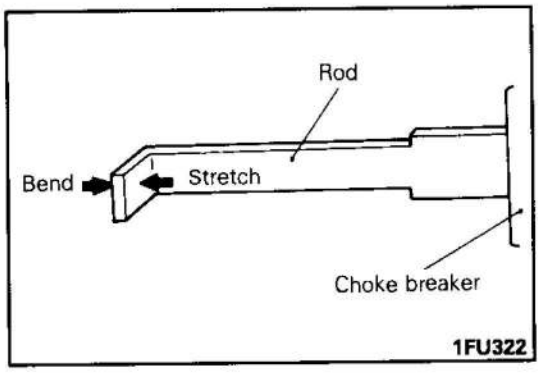


1FU321

(1) Adjust after full-auto-choke inspection.
(2) Close choke valve slowly by the fingers with engine idling. Measure gap between the choke valve and choke bore at the moment the choke valve stops.

Standard value: 4G32 engine1.6 – 1.8 mm (0.063 – 0.071 in.)
4G33 engine1.8 – 2.0 mm (0.071 – 0.079 in.)
4G63 engine1.9 – 2.1 mm (0.075 – 0.083 in.)

REVISED



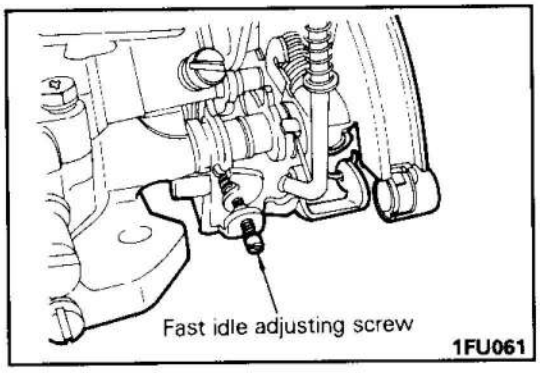
(3) When the gap is not within the standard value, stop engine and adjust the gap by altering the bend at the tip of the rod.
(4) Carry out starting test and re-adjust if required.

Reference

Rod tip	Valve gap	Conditions
Bend	Large	Difficult to start. Tends to stall.
Stretch	Small	Plug tends to smolder.

7. FAST IDLE ADJUSTMENT (Vehicles for General Export)

(1) Warm up engine.
(2) Check idle speed by manipulating choke knob.



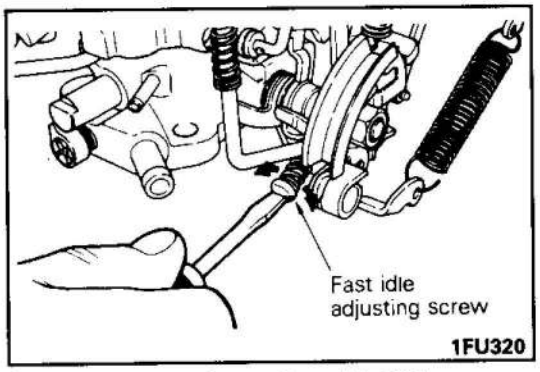
(3) Adjust fast idle adjusting screw if idle speed incorrect.

Reference
Rotation direction of the fast idle adjusting screw and fast idle speed

Adjusting screw	Fast idle speed
Clockwise	High
Counterclockwise	Low

8. FAST IDLE ADJUSTMENT (Vehicles for Europe and vehicles for Hong Kong built from July 1991)

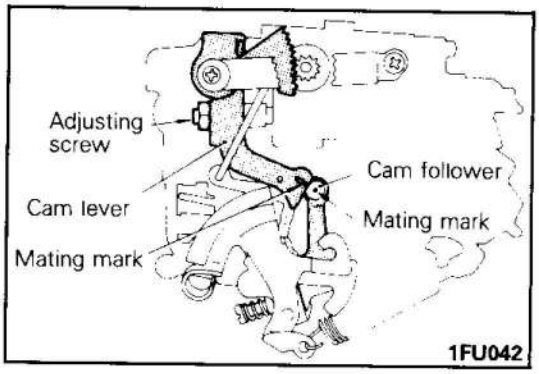
(1) Confirm engine water temperature at 10°C (50°F) or less.
(2) Start engine. Confirm fast idle speed changes smoothly as the engine warms up and engine water temperature rises, and that the speed stabilizes at the standard value.



(3) Adjust idling speed when abnormality detected.

Reference
(1) Fast Idle
Rotation direction of adjusting screw and fast idle speed

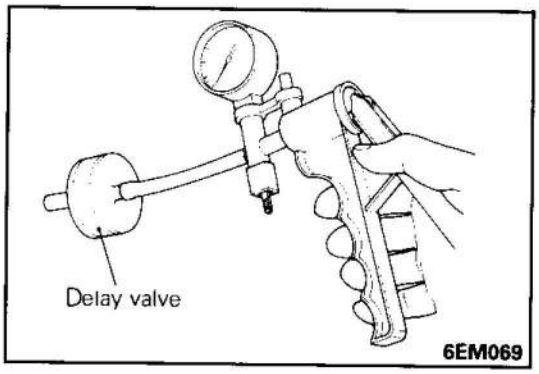
Adjusting Screw	Fast Idle Speed
Clockwise	High
Counterclockwise	Low



(2) The mating mark (notch) on the cam lever and the mating mark of the cam follower (punch mark)

Status of mating marks at the thermo wax element temperature of 23°C (73.4°F)	Fast Idle Speed
Matches	Normal
Does not match	Faulty

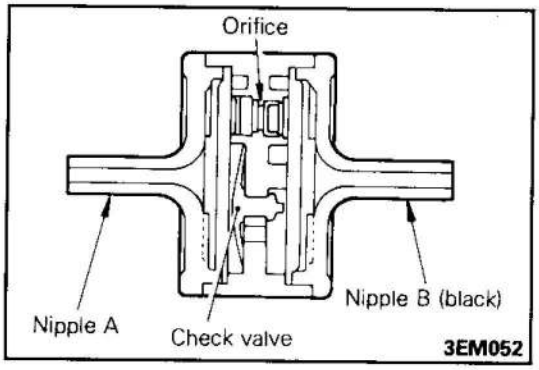
Caution
Mating marks are adjusted in the shop at high precision. Do not normally adjust by the adjusting screw.



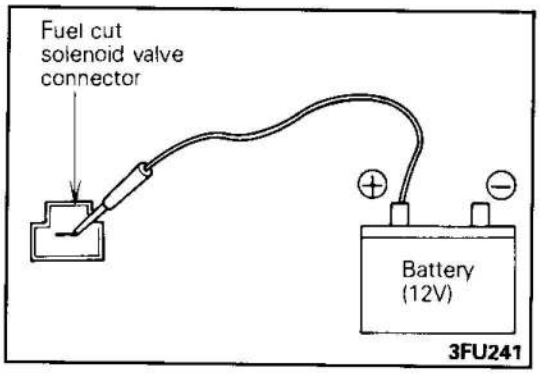
9. INSPECTION OF CHOKE BREAKER DELAY VALVE (4G63 engine for Europe)

(1) Remove delay valve.

NOTE
When removing the delay valve, mark the vacuum hose to enable reconnection in the original position.

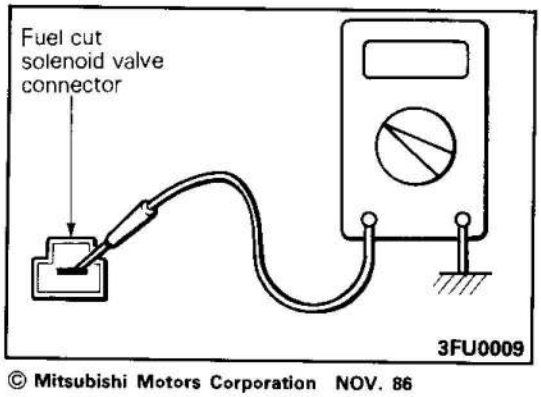


(2) Connect hand vacuum pump to the black nipple. Block the other nipple with a finger to produce vacuum [500 mmHg (19.7 in.Hg)] . Release finger and confirm vacuum leaks gradually.
(3) Connect hand vacuum pump to the nipple opposite the black nipple. Produce vacuum and confirm vacuum leaks.



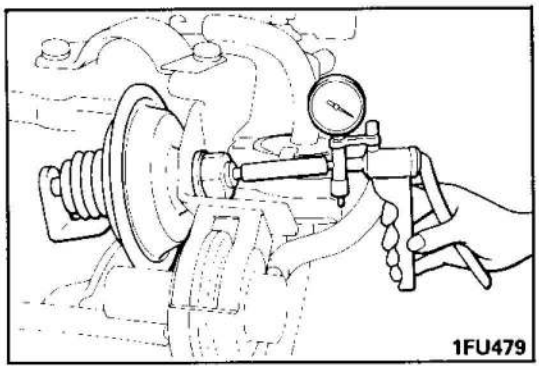
10. SIMPLE INSPECTION OF FUEL CUT SOLENOID VALVE

(1) Disconnect the fuel cut solenoid valve connector.
(2) Apply battery voltage (approx. 12 V) to solenoid valve terminal to check solenoid valve for operating sound (click). If no operating sound is heard, replace solenoid valve.



(3) Measure solenoid coil resistance.

Standard value: approx. 90 Ω [at 20°C (68°F)]


1FU479

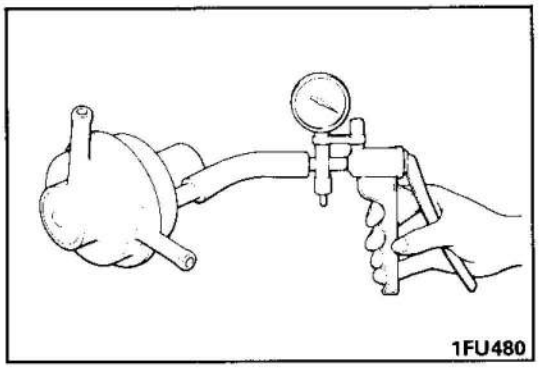
11. INSPECTION OF CONTROL VALVE TYPE DASH POT (Vehicles for Europe)

Dash Pot Assembly Check

(1) Remove the vacuum hose connected to the dash pot.
(2) Connect hand vacuum pump to the dash pot.
(3) Create a 400 mmHg.(15.75 in.Hg.) vacuum, and confirm the seal is maintained.
(4) Open the throttle valve fully and confirm that the rod returns quickly to its original position when the hand vacuum pump is removed (vacuum is removed).

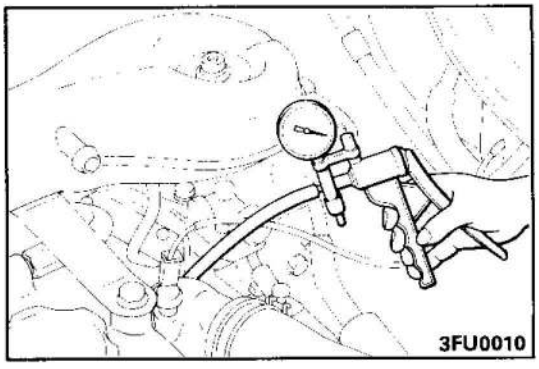
12. INSPECTION OF SERVO VALVE

NOTE
When removing the vacuum hose, mark it so that it may be replaced to its original position.


1FU480

(1) Remove servo valve.
(2) Connect hand vacuum pump to the blue servo valve nipple.
(3) Create an 600 mm Hg (23.62 in.Hg) vacuum, and confirm that seal is maintained.
(4) Blow air in lightly from the black nipple and check air flow.

Hand vacuum pump vacuum	Normal state
570 mmHg (22.44 in.Hg) or less	Air flows through.
600 mmHg (23.62 in.Hg) or more	Air does not flow through.


3FU0010

13. INSPECTION OF IDLE COMPENSATOR

(1) Remove air hose from idle compensator nipple. Connect hand vacuum pump to hose end.
(2) Create vacuum by the hand vacuum pump and check air bleed valve seal.

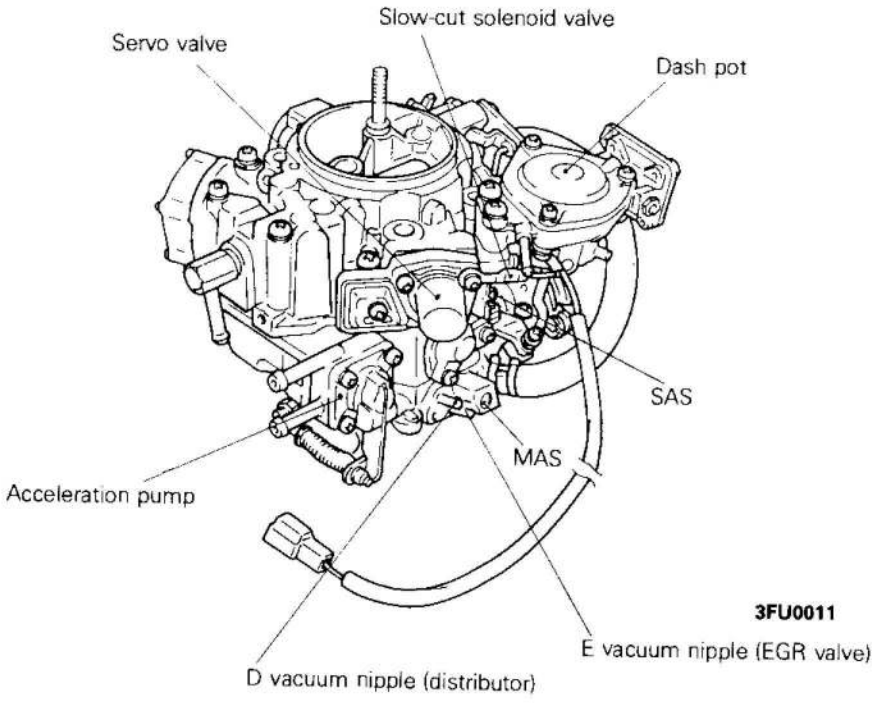
Air bleed valve temperature	Normal state
50°C (122°F) or less	Vacuum maintained.
60°C (140°F) or more	Vacuum leaks.

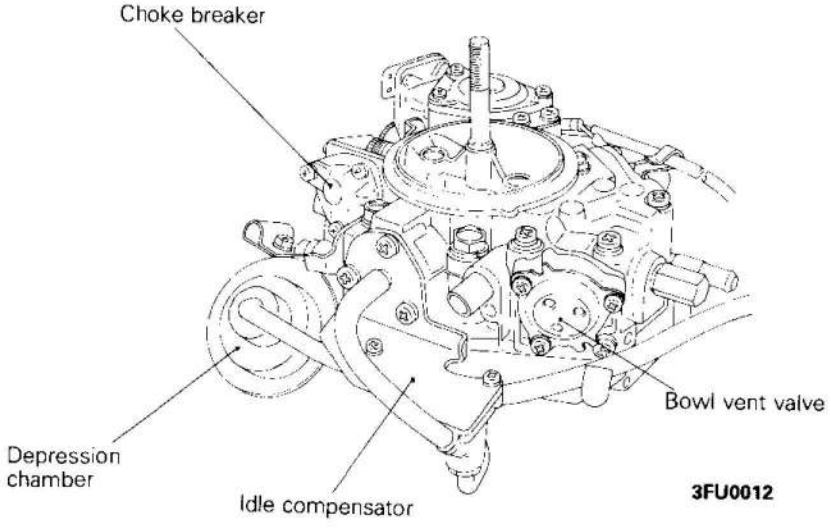
NOTE
If required, cool valve by blowing compressed air or warm it with a hair dryer.

INSPECTION AND ADJUSTMENT OF CARBURETOR (MIKUNI TYPE)

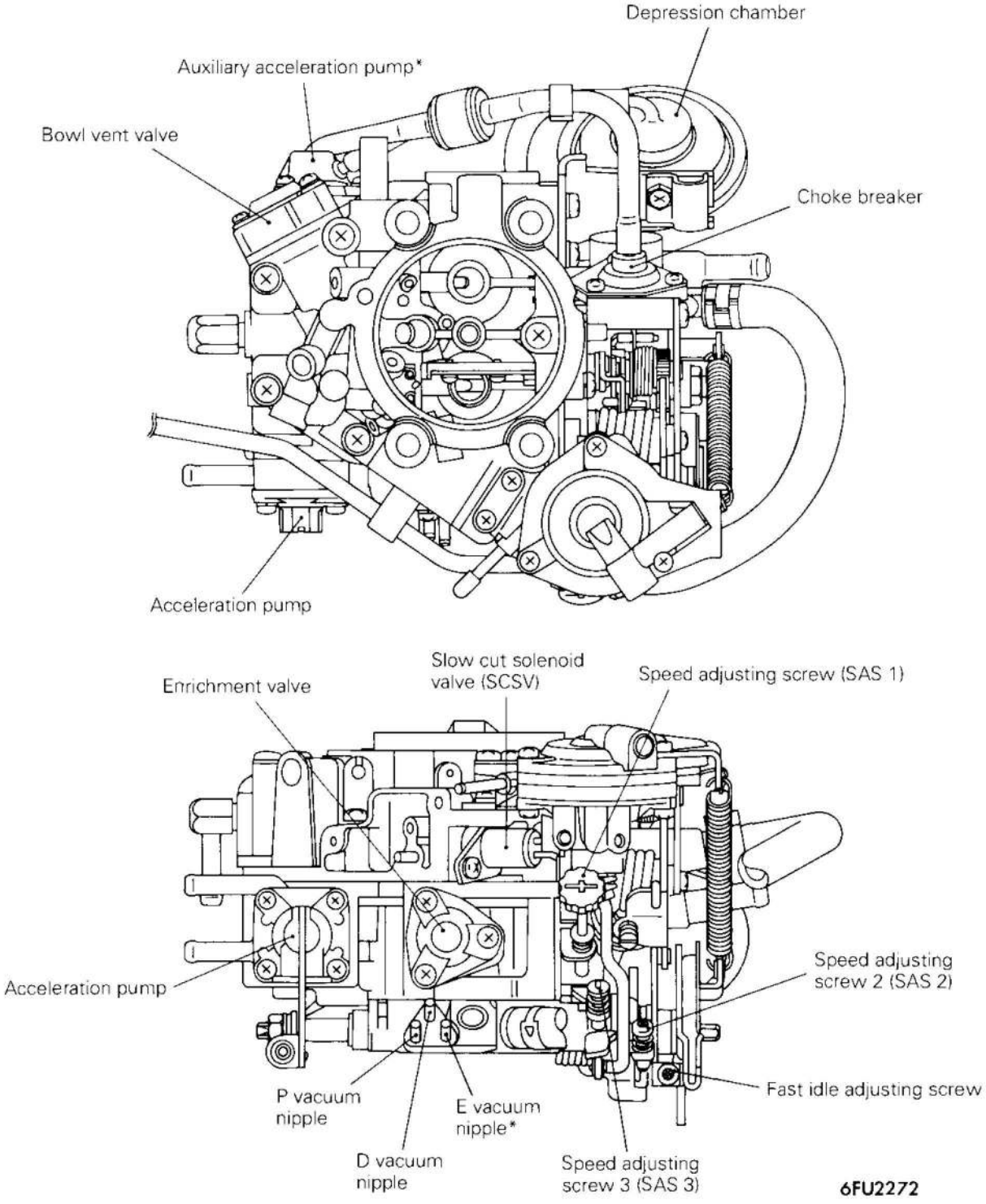
E13FBAD

Vehicles for Australia built up to May 1994
(Auto-choke type)



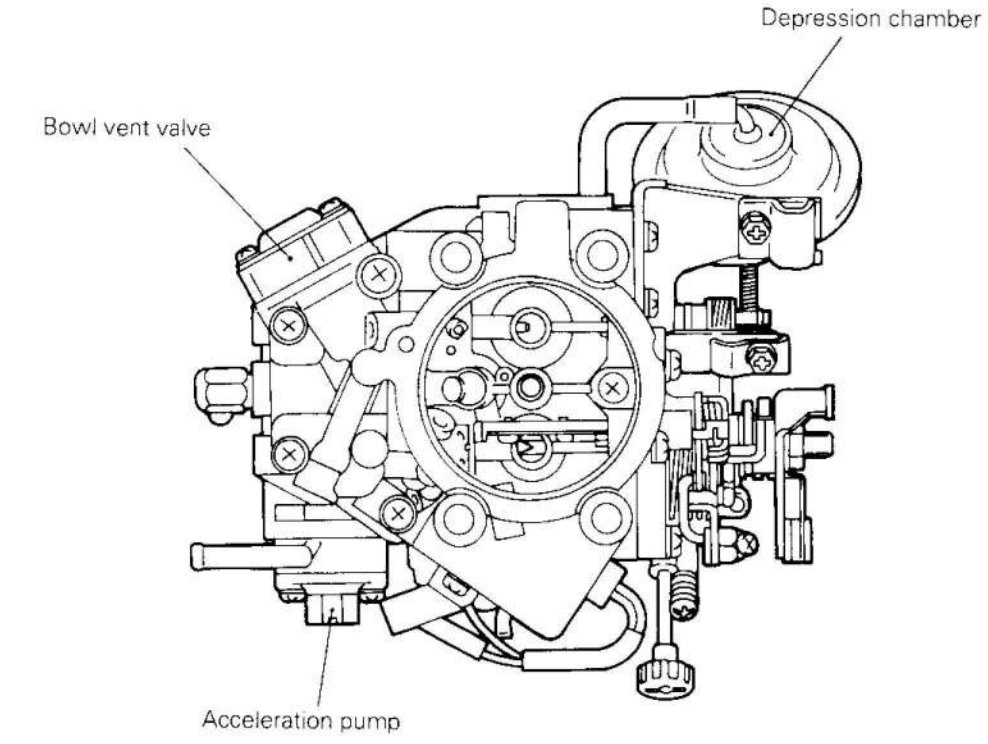


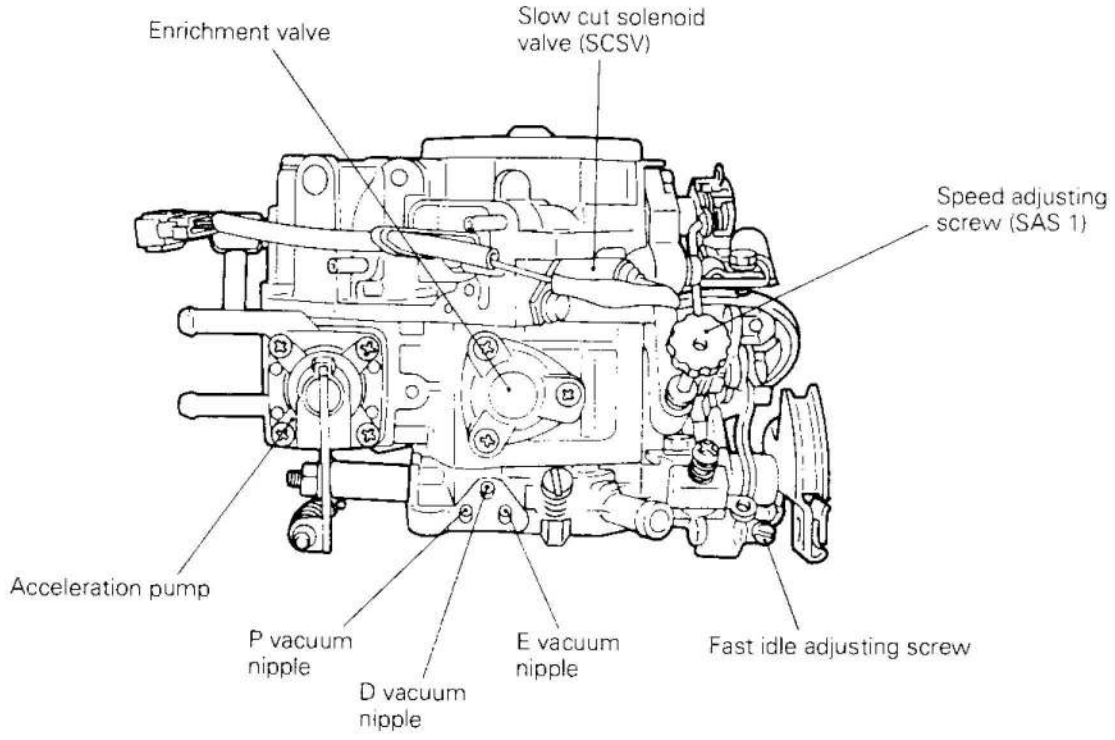
Vehicles for Europe (6B model) and Australia built from June 1994 (Auto-choke type)



NOTE
*: Vehicles for Australia

Vehicles for General Export and Gulf Countries built from June 1994
(Manual choke type)





6FU2297

1. **INSPECTION OF DISTRIBUTOR ADVANCE CONTROL VACUUM (D VACUUM)**

   Refer to P.13 - 35.

2. **INSPECTION OF EGR VALVE CONTROL VACUUM (E VACUUM) – Vehicles for Gulf countries and Australia**

   Refer to P. 13 - 35.

3. **INSPECTION OF VACUUM SWITCH CONTROL VACUUM (F VACUUM) – Vehicles for Australia built from June 1994**

   Refer to P.13 - 36.

4. **INSPECTION OF CARBURETOR SECONDARY VALVE OPERATION**

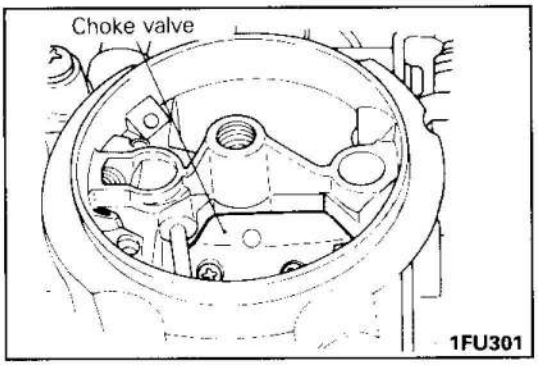
   Refer to P.13 - 38.

5. **INSPECTION OF CARBURETOR ACCELERATION PUMP**

   Refer to P.13 - 39.

6. **INSPECTION OF CHOKE VALVE – Vehicles for General Export and Gulf Countries**

   (1) Remove the air horn.
   (2) Pull the choke knob to full stroke.
   (3) Check to be sure that the choke valve is fully closed.
   (4) Move the choke valve with a finger to check if it moves smoothly without play.

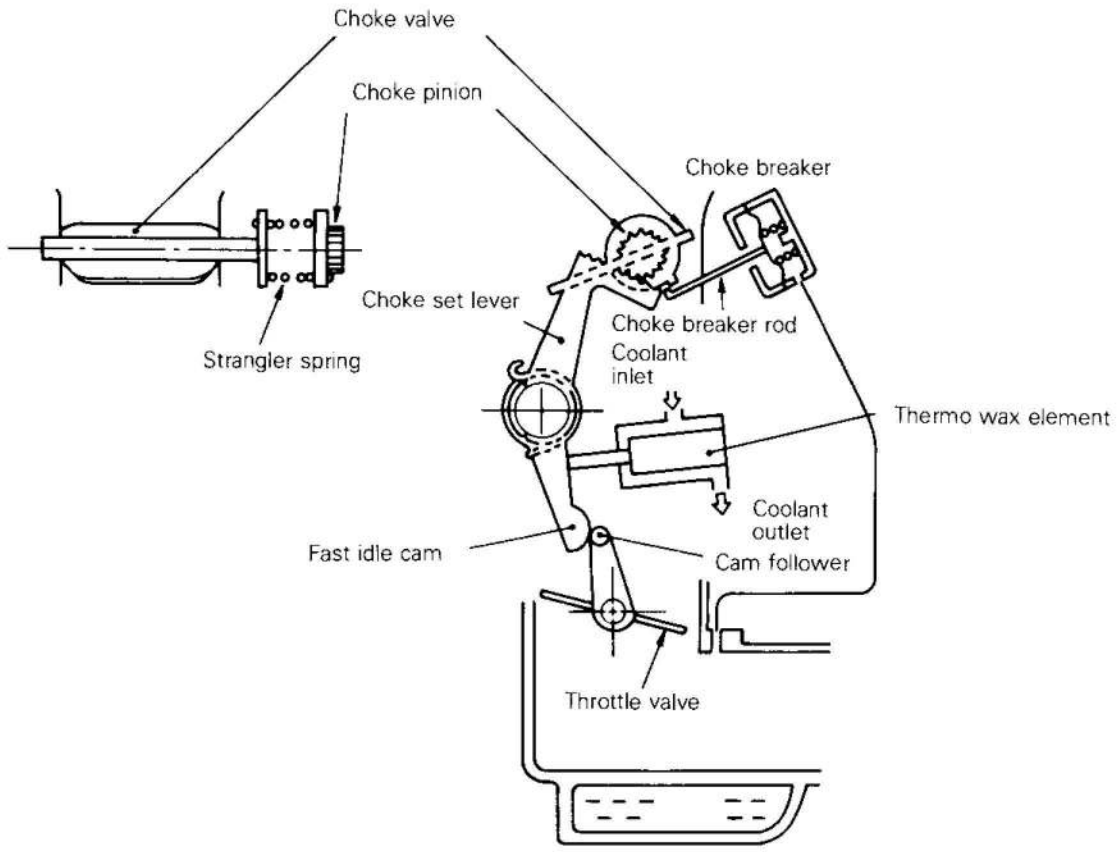


If there is some looseness	Replace the float chamber cover assembly
If operation is defective (doesn't move)	Clean around the choke valve and apply a small amount of oil to the choke shaft

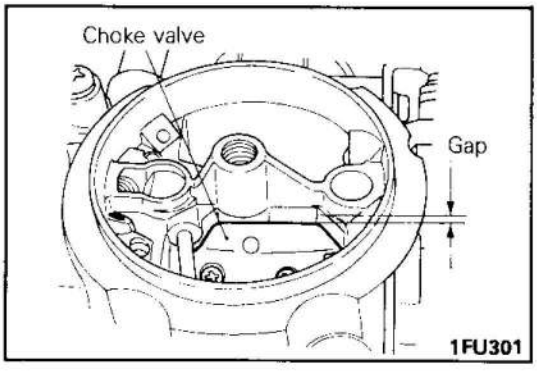
7. **INSPECTION OF CHOKE VALVE – Vehicles for Europe (6B model) built from June 1994 and vehicles for Australia**

   Refer to P.13 - 39.

8. INSPECTION OF FULL-AUTO-CHOKE – Vehicles for Australia built up to May 1994



1FU335



1FU301

(1) Remove air horn.
(2) Confirm engine water temperature is 10°C (50°F) or less.
(3) Check choke valve.

Engine	Choke valve
Stopped	Closed
Warming	Opens as engine coolant temperature rises
Warmed (idling)	Opens fully

(4) If abnormal after above inspections, check and adjust carburetor full-auto choke.

9. INSPECTION OF FULL-AUTO-CHOKE – Vehicles for Europe (6B model) and Australia built from June 1994

Refer to P.13-56-10.

10. CHOKE BREAKER OPENING ADJUSTMENT – Vehicles for Europe (6B model) built from June 1994 and Vehicles for Australia

(1) Adjust after full-auto-choke inspection.
(2) Close choke valve slowly by the fingers with engine idling. Measure gap between the choke valve and choke bore at the moment the choke valve stops.

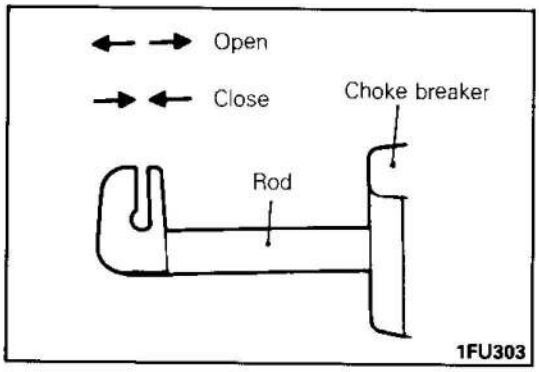
Standard value:

<Vehicles built up to May 1994>

1.7 – 1.9mm (0.067 – 0.075 in.)

<Vehicles built from June 1994>

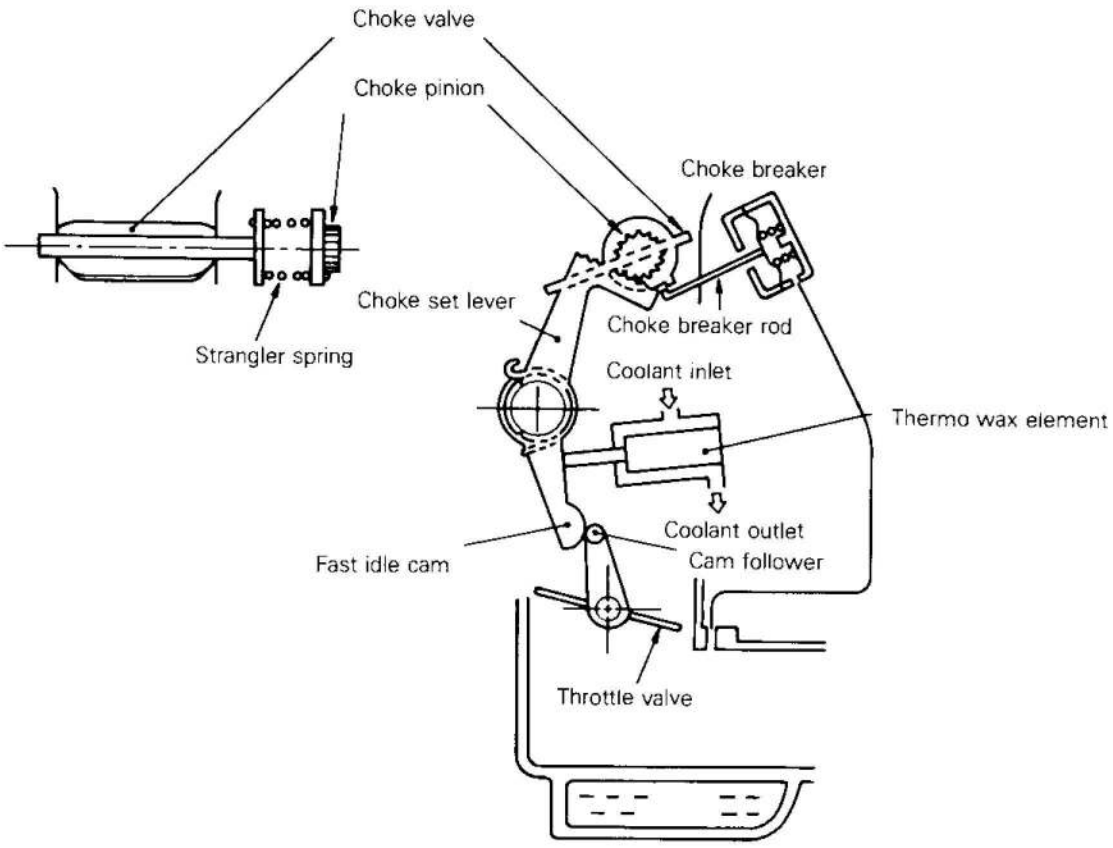
2.1 – 2.3mm (0.083 – 0.091 in) <M/T>
1.9 – 2.1mm (0.075 – 0.083 in) <A/T>

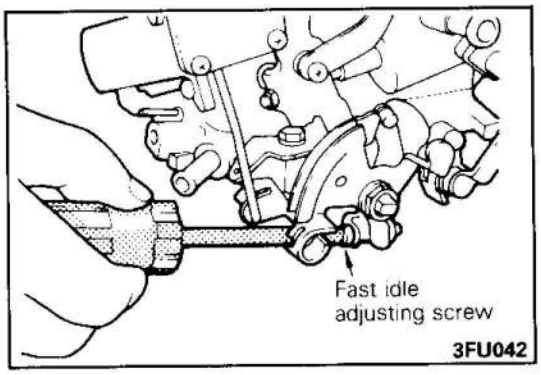


(3) When the gap is not within the standard value, stop engine and adjust the gap by altering the opening at the tip of the rod.
(4) Carry out starting test and re-adjust if required.

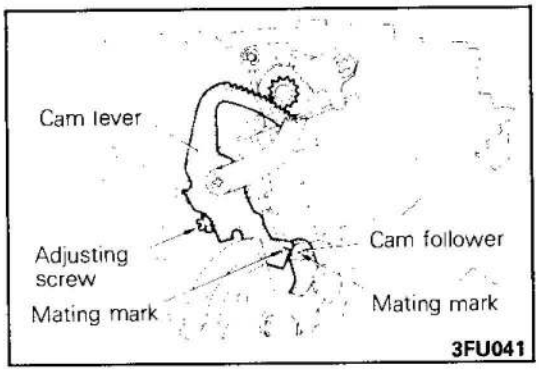
Rod tip	Conditions
Open	Difficult to start. Tends to stall.
Close	

11. FAST IDLE ADJUSTMENT – Vehicles for Australia built up to May 1994





(1) Confirm engine water temperature at 10°C (50°F) or less.
(2) Start engine. Confirm fast idle speed changes smoothly as the engine warms up and engine water temperature rises, and that the speed stabilizes at the standard value.
(3) Adjust idling speed when abnormality detected.



Reference

1 Fast Idle
Rotation direction of adjusting screw and fast idle speed

Adjusting screw	Fast Idle Speed
Clockwise	High
Counterclockwise	Low

2 The mating mark (notch) on the cam lever and the mating mark of the cam follower (punch mark)

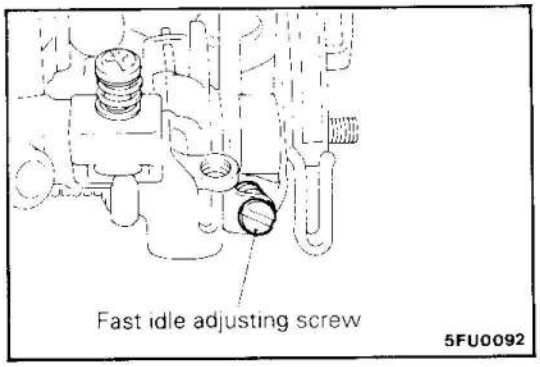
Status of mating marks at the thermo wax element temperature of 23°C (73.4°F)	Fast Idle Speed
Matches	Normal
Does not match	Faulty

Caution
Mating marks are adjusted in the shop at high precision. Do not normally adjust by the adjusting screw.

12. FAST IDLE ADJUSTMENT – Vehicles for Europe (6B model) and Australia built from June 1994

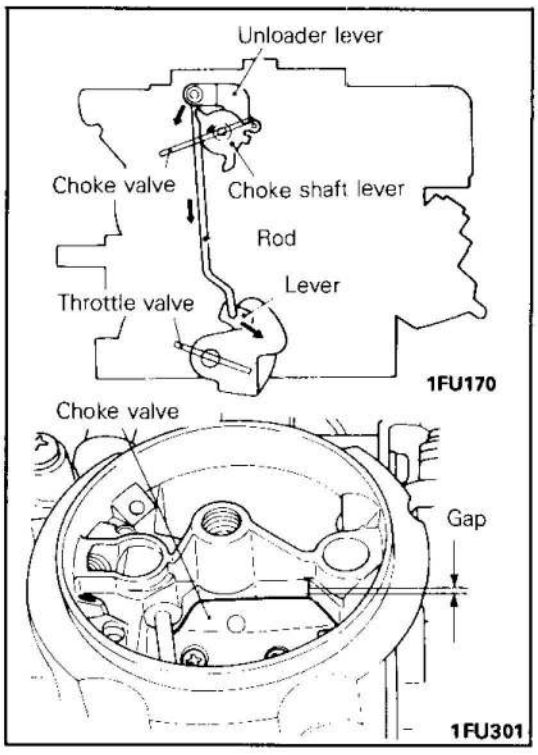
Refer to P.13-56-11.

13. FAST IDLE ADJUSTMENT – Vehicles for General Export and Gulf Countries



(1) Pull out the choke knob fully.
(2) Start the engine and let it warm up.
(3) Check the idle speed while operating the choke knob.
(4) If the idle speed is not correct, adjust it by turning the fast idle adjusting screw.

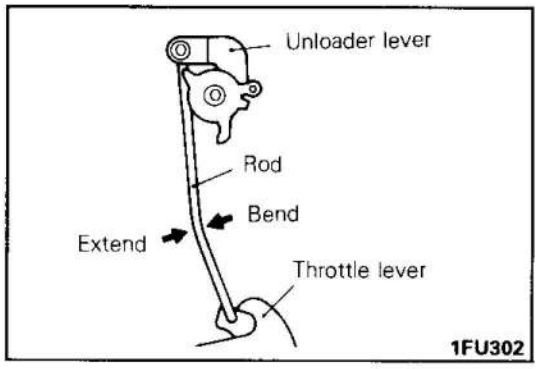
Adjusting screw	Fast idle revolution
Turn clockwise	Increase
Turn counterclockwise	Decrease



14. INSPECTION AND ADJUSTMENT OF UNLOADER OPENING – Vehicles for Europe (6B model) built from June 1994 and Vehicles for Australia

(1) Remove air horn.
(2) Open throttle valve fully.
Gradually close choke valve with finger till valve stops.
Measure gap between choke valve and choke bore.

Standard value: 1.5 mm (0.059 in.)



(3) If the gap is not at standard value, bend (or extend) choke rod and adjust.
Reference

Choke rod	Valve gap	Note
Bend	Large	Knocking
Extend	Small	Insufficient power. Plug tends to smolder.

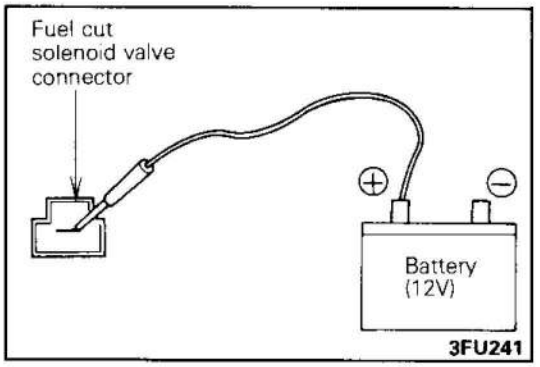
(4) Open and close throttle valve and confirm rod does not interfere and moves smoothly.

15. INSPECTION OF AUXILIARY ACCELERATOR PUMP (AAP) – Vehicles for Europe (6B model) and Australia built from June 1994

Refer to P.13-45.

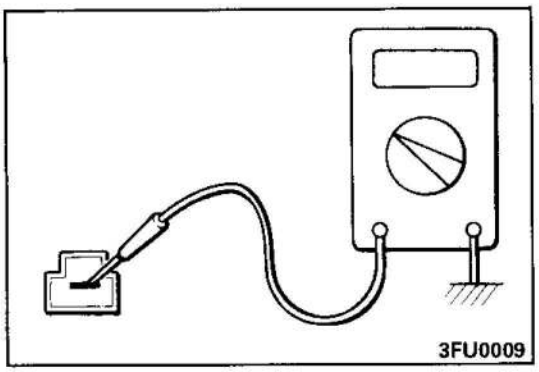
16. INSPECTION OF THERMO VALVE (FOR AAP CONTROL) – Vehicles for Europe (6B model) and Australia built from June 1994

Refer to P.13-56-7.



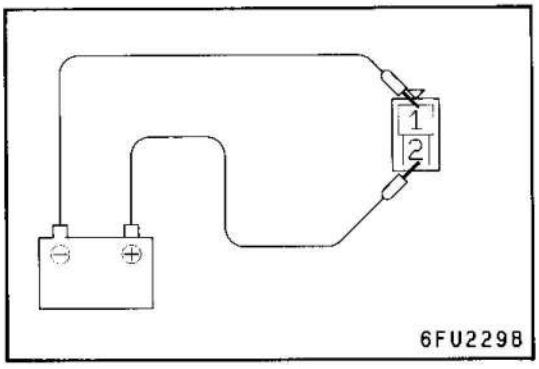
17. SIMPLE INSPECTION OF FUEL CUT SOLENOID VALVE – Except Vehicles for Australia built from June 1994

(1) Disconnect the fuel cut solenoid valve connector.
(2) Apply battery voltage (approx. 12V) to solenoid valve terminal to check solenoid valve for operating sound (click).
If no operating sound is heard, replace solenoid valve.



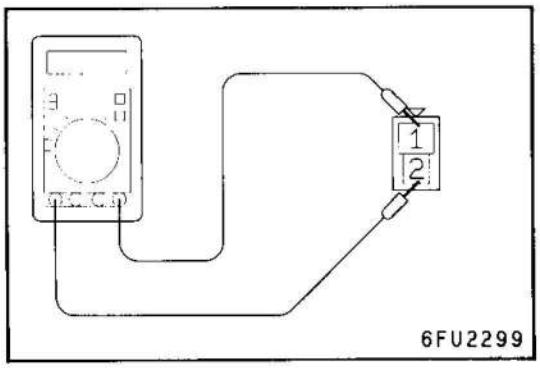
(3) Measure solenoid coil resistance.

Standard value: 48 – 60 Ω
[at 20 – 30°C (68 – 86°F)]



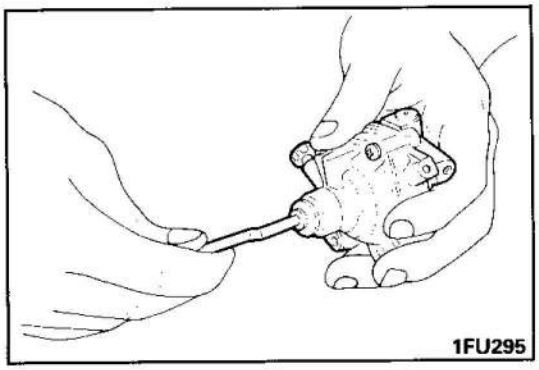
18. SIMPLE INSPECTION OF FUEL CUT SOLENOID VALVE – Vehicles for Australia built from June 1994

(1) Disconnect the slow-cut solenoid valve connector.
(2) Check that a operation sound (click) is heard when a battery voltage is applied between the slow cut solenoid valve terminal 1 (to battery(-)terminal) and terminal 2 (to battery (+) terminal).



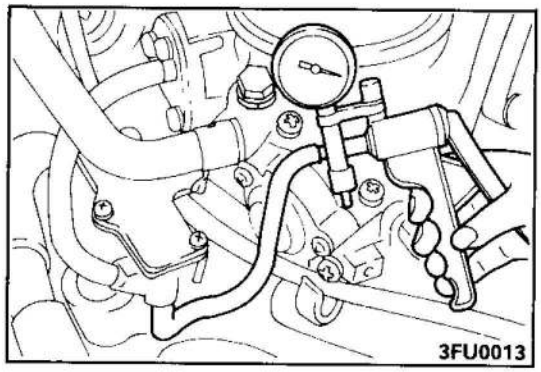
(3) Measure the resistance of the slow cut solenoid valve coil.

Standard value: 48 – 60 Ω [at 20°C (68°F)]



19. INSPECTION OF DASH POT – Vehicles for Australia

(1) Check that the dash pot operates normally.
Resistance must be felt when the dash pot is pulled, and when the dash pot is released, the rod must return quickly to original position. If no resistance is felt when it is pulled, diaphragm or check valve is broken. If the rod returns slowly, the check valve is broken. In either case, replace the dash pot.

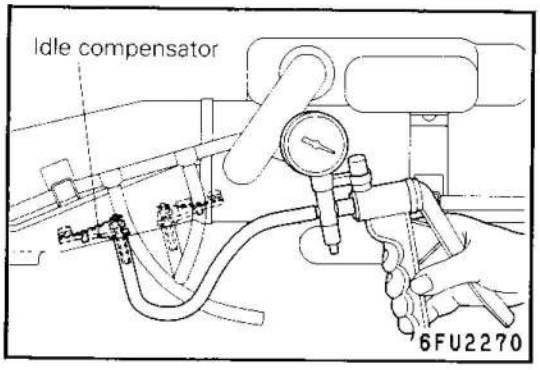


20. INSPECTION OF IDLE COMPENSATOR – Vehicles built up to May 1994

(1) Remove air hose from idle compensator. Connect hand vacuum pump to hose end.
(2) Create vacuum by the hand vacuum pump and check air bleed valve seal.

Air bleed valve temperature	Normal state
50°C(122°F) or less	Vacuum is maintained
60°C(140°F) or more	Vacuum leaks

NOTE
If required, cool valve by blowing compressed air or warm it with a hair dryer.

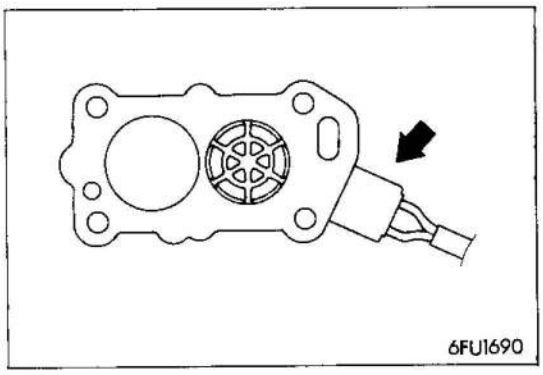


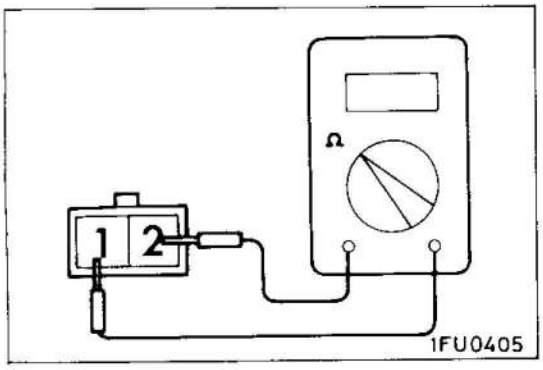
21. INSPECTION OF IDLE COMPENSATOR – Vehicles built from June 1994

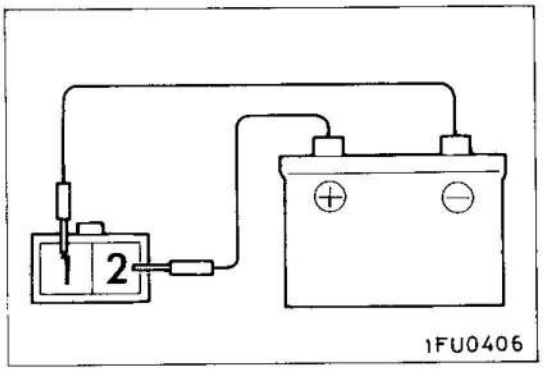
(1) Disconnect air hose from the air horn idle compensator nipple.
(2) Connect a hand vacuum pump to the idle compensator nipple
(3) Apply vacuum by the hand vacuum pump and check air bleed valve seal.

Air bleed valve temperature	Normal state
50°C(122°F) or less	Vacuum is maintained
60°C(140°F) or more	Vacuum leaks

NOTE
If required, remove air cleaner cover and cool valve by blowing compressed air or warm it with a hair dryer.







22. INSPECTION OF COLD MIXTURE HEATER <4G63-Vehicles for Europe and Europe (6B Model) built up to May 1994>

(1) Remove the cold mixture heater.

Caution
(1) When removing the cold-mixture heater, do not hold the rubber cap part shown in the figure, because to do so will cause damage to the terminal.
(2) Do not drop the cold mixture heater from a height of more than 30 cm (11.81 in.).
(3) Never use the dropped cold mixture heater.

(2) Check continuity of the cold mixture heater.

Standard value: Conductive [with approx. 1Ω resistance at 20°C (68°F)]

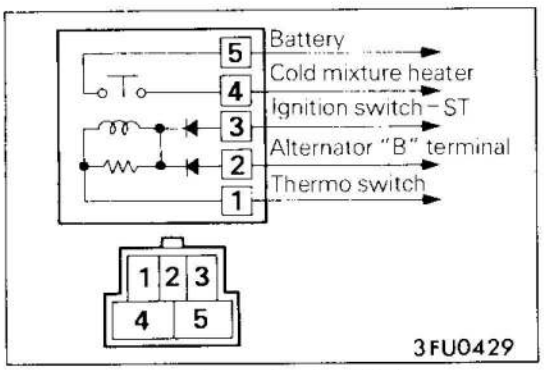
(3) Apply battery voltage directly to the heater terminal and check that the heater becomes hot.

23. INSPECTION OF COLD MIXTURE HEATER RELAY <4G63-Vehicles for Europe and Europe (6B Model) built up to May 1994>

Caution
When applying battery voltage directly to the heater, connect to correct terminals. Incorrect connection can cause damage to relay.

(1) Remove the cold mixture heater relay.

(2) Check continuity between terminals for both when the relay coil is energized and when not.



Description	Checking terminals	Continuity
Not energized	4–5	Non-conductive (with ∞Ω resistance)
Energized 2(+)–1(–) terminals	4–5	Conductive (with 0Ω resistance)
Energized 3(+)–1(–) terminals	4–5	

NOTE
"Energized" means battery voltage directly applied between termianls.

PWWE8608-O

ADDED

SERVICE ADJUSTMENT PROCEDURES (FBC) – Vehicles built up to May 1994

E13FCAF1

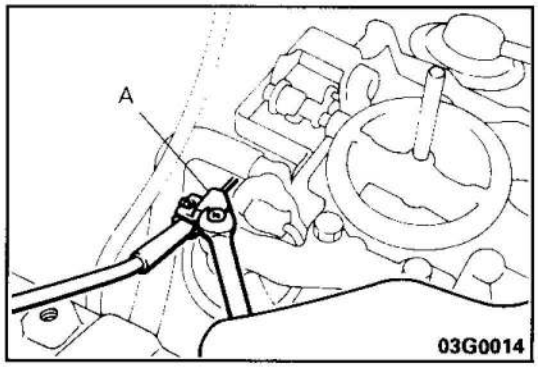
GENERAL INSPECTION

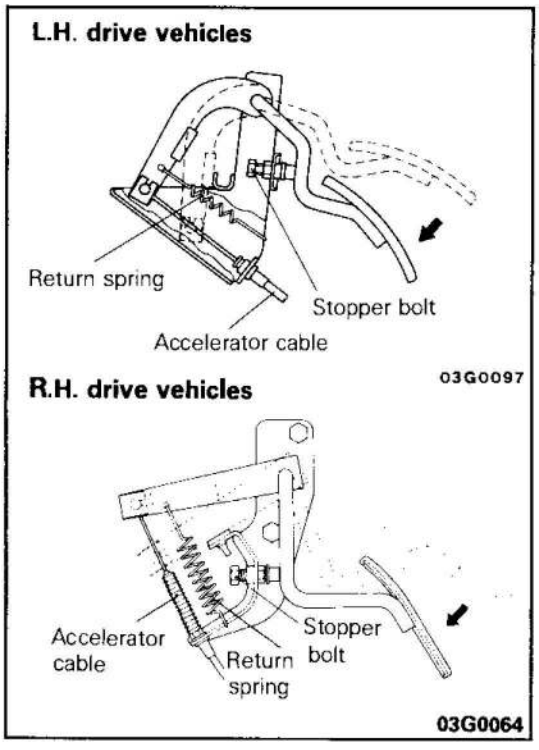
1. INSPECTION AND ADJUSTMENT OF ACCELERATOR CABLE

(1) Turn air-conditioner and lamps OFF
Inspect and adjust at no load.
(2) Warm engine until stabilized at idle.
(3) Confirm idle rpm is at prescribed rpm.
(4) Stop engine (ignition switch OFF).
Remove air horn.
(5) Confirm there are no sharp bends in accelerator cable.
(6) Check inner cable for correct slack.
(7) If there is too much slack or no slack, adjust play by the following procedures.
1. Loosen accelerator cable fixing bolt A. Fully close throttle valve.
2. Adjust outer cable so that accelerator cable play is at the standard value and fix with fixing bolt A.

Standard value: Approx. 1 mm (0.04 In.)

3. Adjust so that accelerator pedal stopper touches pedal arm when throttle valve is fully opened.
4. After adjusting, confirm that throttle valve fully opens and closes by operating pedal.





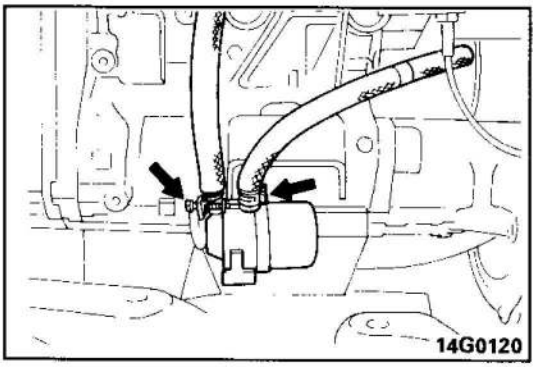
2. REPLACEMENT OF FUEL FILTER

E13FZAB1

(1) Remove fuel tank cap.
De-pressurize fuel tank.
(2) Remove fuel filter from filter clamp.
(3) Disconnect fuel hose and fuel filter and remove fuel filter.

Caution
Cover with rags to avoid gasoline from splashing.

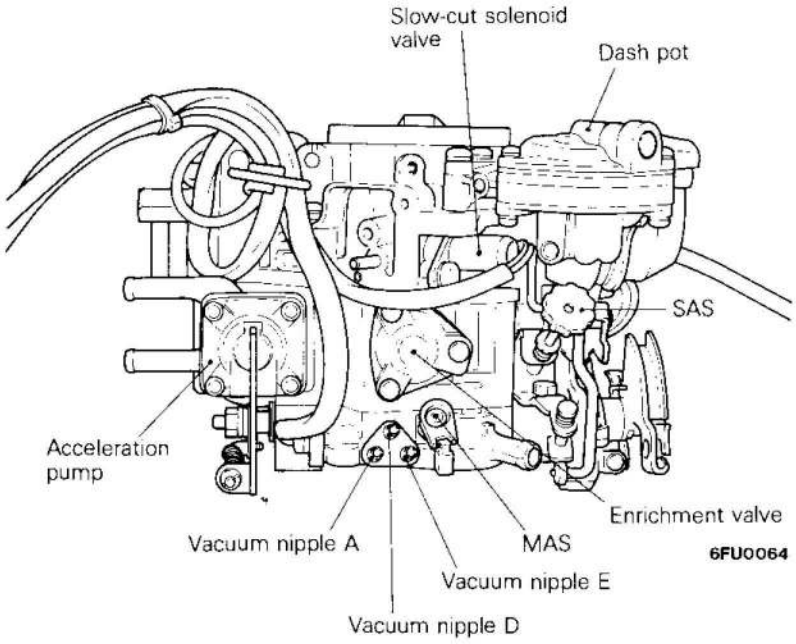
(4) Install fuel filter and start engine.
Check for gasoline leak.



INSPECTION AND ADJUSTMENT OF FEEDBACK CARBURETOR

E13FBBA

CARBURETOR APPEARANCE



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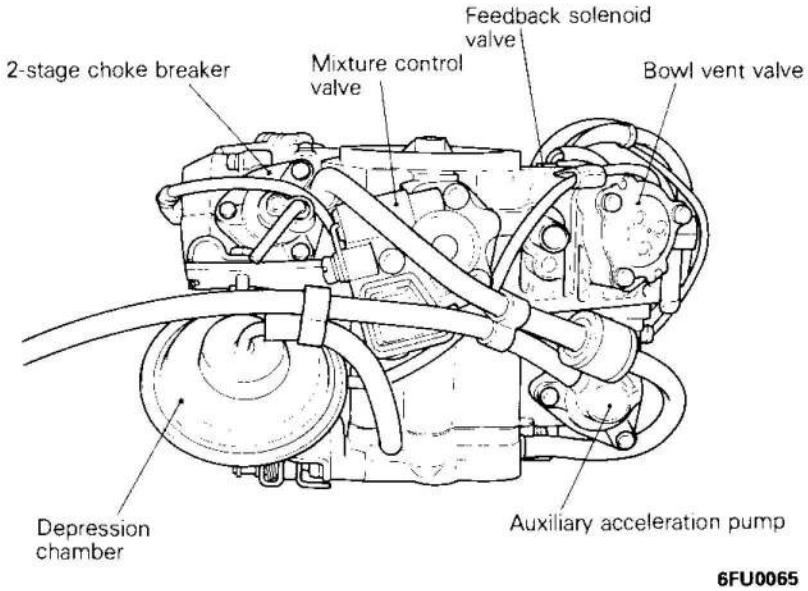
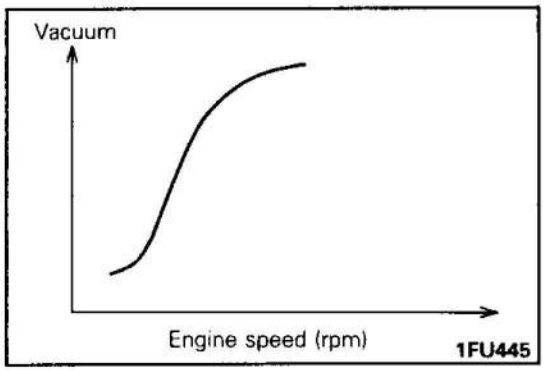


6FU0065

1. INSPECTION OF DISTRIBUTOR ADVANCE CONTROL VACUUM (D VACUUM)

(1) Warm engine until engine coolant is at 85–95°C (185–205°F).
(2) Disconnect the vacuum hose from the carburetor D vacuum nipple and connect a hand vacuum pump to the nipple.

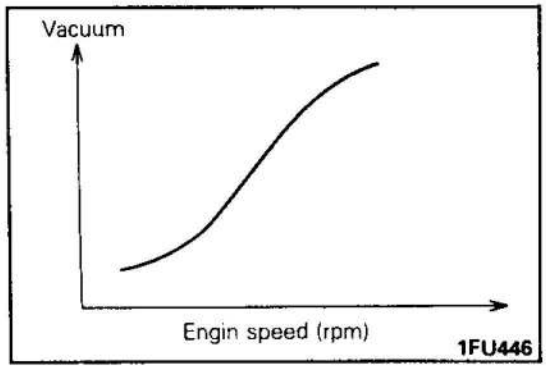


(3) Start and race the engine to make sure that D vacuum increases with the engine speed.

NOTE
If abnormality is found in change of vacuum, blocked carburetor D port is suspected. Therefore, clean the port as necessary.

2. INSPECTION OF EGR VALVE CONTROL VACUUM (E VACUUM)

(1) Warm engine until engine coolant is at 85–95°C (185–205°F).
(2) Disconnect the vacuum hose from the carburetor E vacuum nipple and connect a hand vacuum pump to the nipple.

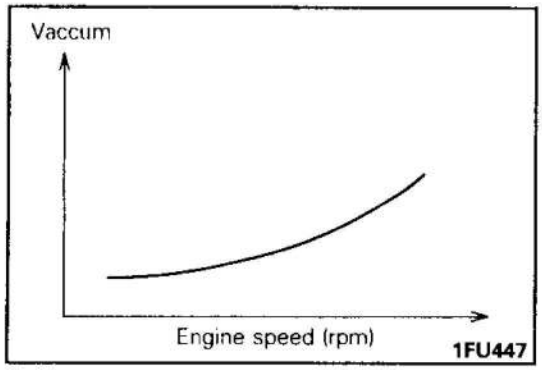


(3) Start and race the engine to make sure that E vacuum increases with the engine speed.

NOTE
If abnormality is found in change of vacuum, blocked carburetor E port is suspected. Therefore, clean the port as necessary.

3. INSPECTION OF VRV CONTROL VACUUM (A VACUUM)

(1) Warm engine until engine coolant is at 85–95°C (185–205°F).
(2) Disconnect the vacuum hose from the carburetor A vacuum nipple and connect a hand vacuum pump to the nipple.

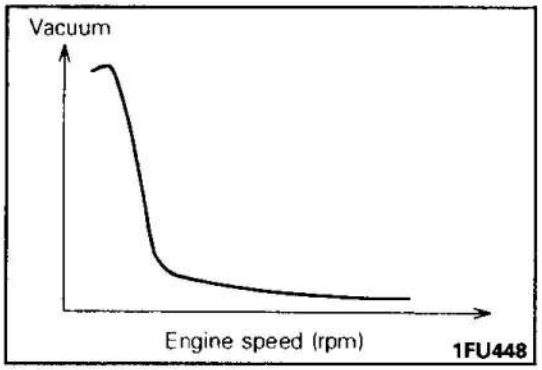


(3) Start and race the engine to make sure that A vacuum increases gradually with the engine speed.

NOTE
If abnormality is found in the change of vacuum, blocked carburetor A port is suspected. Therefore, clean the port as necessary.

4. INSPECTION OF VACUUM SWITCH CONTROL VACUUM (F VACUUM)

(1) Warm engine until engine coolant is 85–95°C (185–205°F).
(2) Disconnect the vacuum hose from the carburetor F vacuum nipple and connect a hand vacuum pump to the nipple.

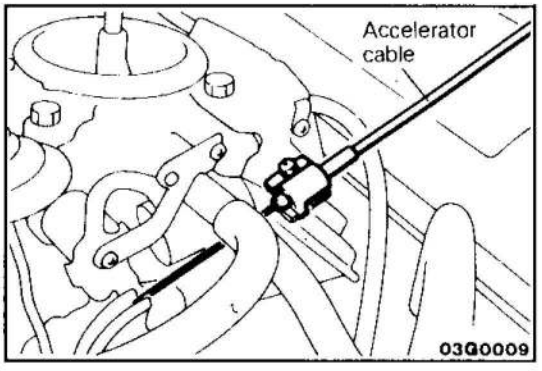


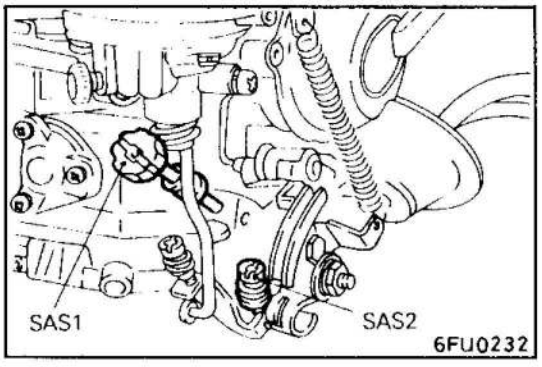
(3) Start and race the engine to make sure that F vacuum drops rapidly.

NOTE
If abnormality is found in the change of the vacuum, blocked carburetor F port and vacuum passage. Therefore, disassemble and check the carburetor.

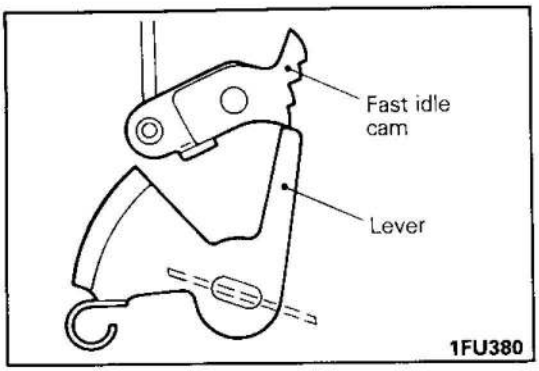
5. THROTTLE POSITION SENSOR (TPS) ADJUSTMENT

(1) Loosen the accelerator cable enough.

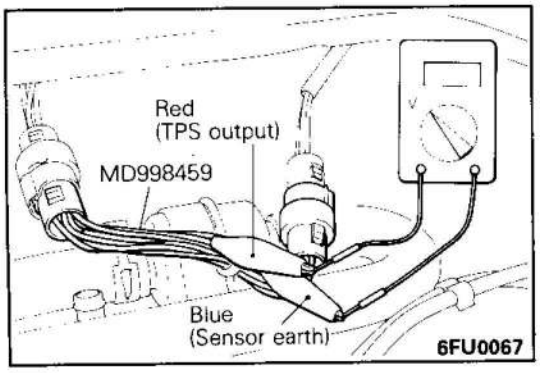




(2) Loosen the speed adjusting screw No. 1 (SAS1) and No. 2 (SAS2) sufficiently to close the throttle valve completely. Record the number of turns loosened.

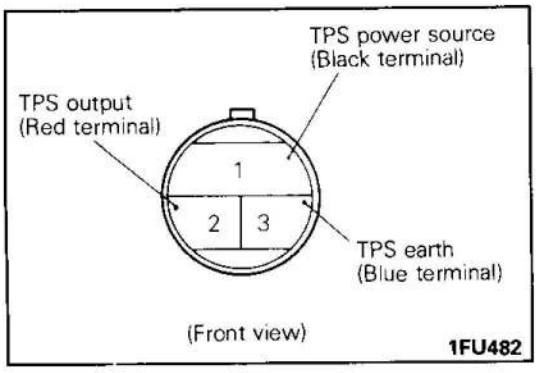


NOTE
1. Turning the screw counter-clockwise closes the valve.
2. At this time, the fast idle control should have been released (the lever not resting on the fast idle cam).



(3) Disconnect the TPS connector.
(4) Connect the HARNESS CONNECTOR (Special Tool MD998459) between female and male of TPS connector.
(5) Connect voltmeter between red clip (sensor output) and blue clip (sensor earth) of the HARNESS CONNECTOR (Special Tool MD998459).

Caution
Use an accurate digital voltmeter.

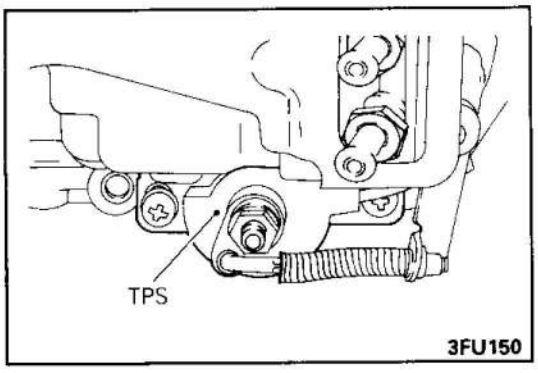


NOTE
Connections between the TPS connectors and the special tool terminals are as follows.

TPS connector	Special tool
Terminal 2 (sensor output) and	Terminal Red
Terminal 3 (sensor earth) and	Terminal Blue

(6) Turn the ignition switch to ON. (Do not start the engine.)
(7) Measure the output voltage of TPS.

Standard value: 0.250 V



(8) If it is out of specification, loosen the TPS attaching screw and adjust by turning the TPS to the standard value.

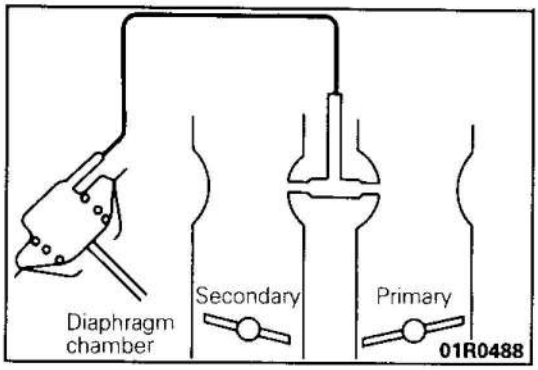
NOTE
Turning the TPS clockwise increases the output voltage.

(9) Turn the ignition switch to OFF.
(10) Tighten the SAS1 and SAS2 for the amount recorded in step (2). (Return to the original position.)
(11) Remove the harness connector (MD998459), voltmeter and then connect the TPS connector.
(12) Adjust play of the accelerator cable.
(13) Start the engine and check that the idle speed is as specified.

Curb idle speed:

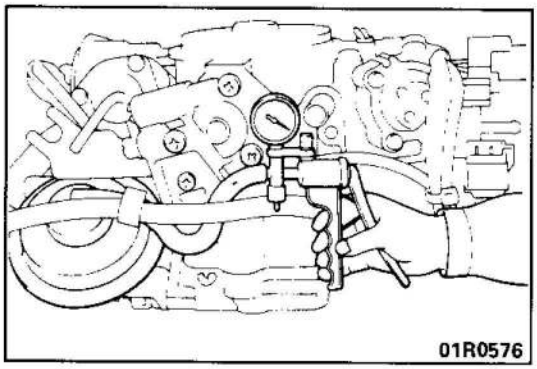
4G63 engine	
For the first 500 km (300 miles):	**750 $^{+150}_{-100}$ r/min**
After 500 km (300 miles):	**800±100 r/min**
G63B engine	
For the first 500 km (300 miles):	**700 $^{+150}_{-100}$ r/min**
After 500 km (300 miles):	**750±100 r/min**

(14) If the SAS-2 has been loosened, paint the SAS-2 (Vehicles for Switzerland built from December 1988).

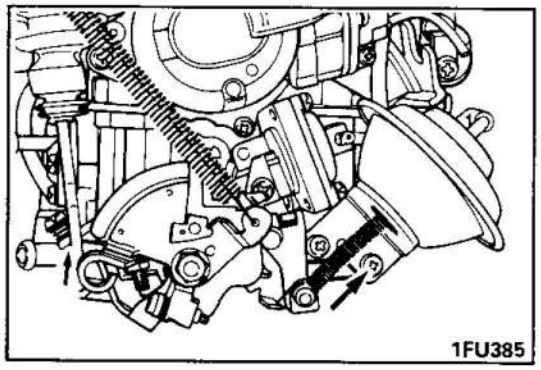


6. INSPECTION OF CARBURETOR SECONDARY VALVE OPERATION

(1) Remove the air horn.



(2) Remove the secondary valve vacuum hose from the carburetor throttle body and connect a hand vacuum pump to the disconnected end of hose.

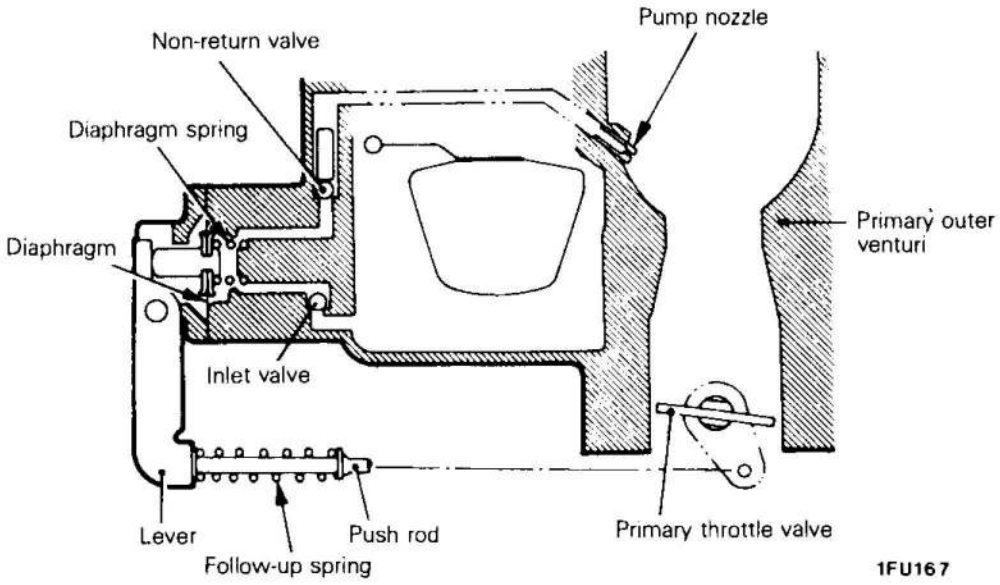


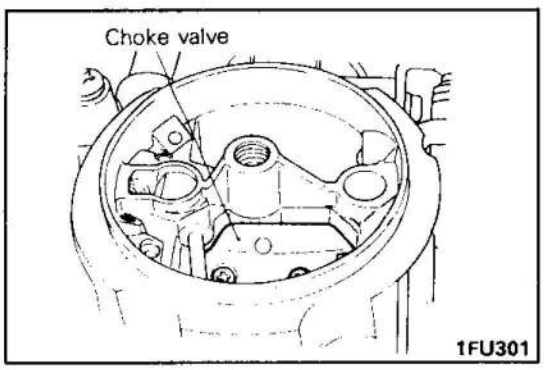
(3) With a vacuum of 100 mmHg (3.9 in.Hg) applied by the vacuum pump, fully open the primary throttle valve and check that the secondary throttle valve also opens fully.

Symptom	Remedy
Vacuum is not held in depression chamber (vacuum leaks)	Replace depression chamber
Vacuum is held but secondary valve does not operate	Clean secondary throttle valve and related parts

7. INSPECTION OF CARBURETOR ACCELERATION PUMP

(1) Remove the air horn.
(2) While opening the choke valve, open the throttle valve and check that fuel is injected from the pump nozzle.
If fuel is not injected, clean the carburetor fuel passage.



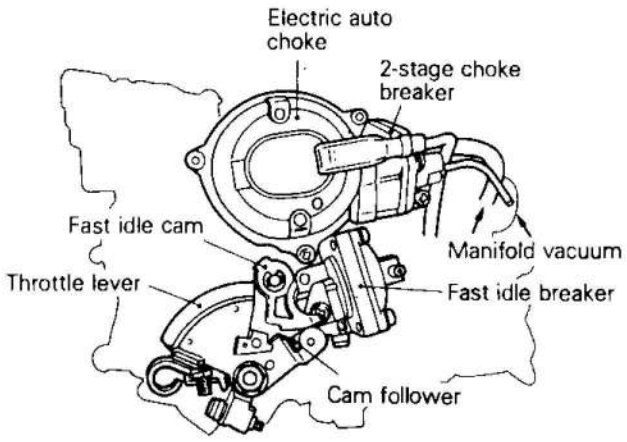


8. INSPECTION OF CHOKE VALVE

(1) Remove the air horn.
(2) Move the choke valve with a finger to check if it moves smoothly without play.

Symptom	Remedy
When there is marked play	Replace the front chamber cover assembly
When there is a malfunction (seized up)	Clean around the choke and apply a small amount of oil to the choke shaft

9. INSPECTION OF ELECTRIC AUTO CHOKE



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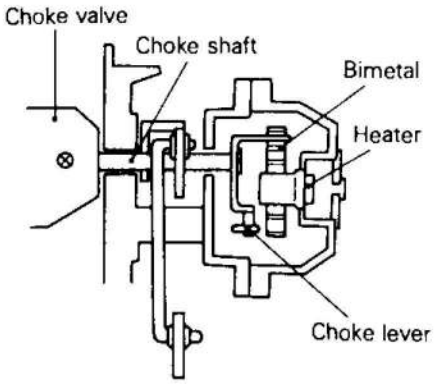
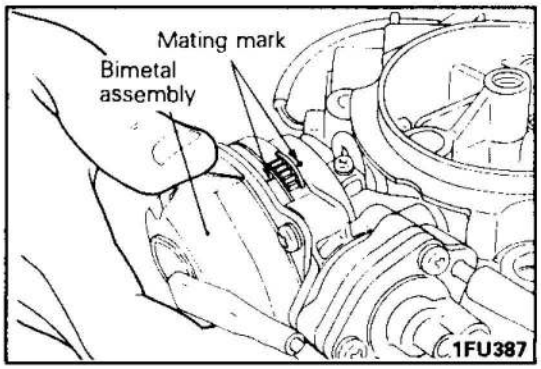


1FU359



(1) Check the mating marks on the electric auto choke body and bimetal assembly to make sure they are matched. If they are not matched, match them.

NOTE
Likely symptoms of mating mark deviation

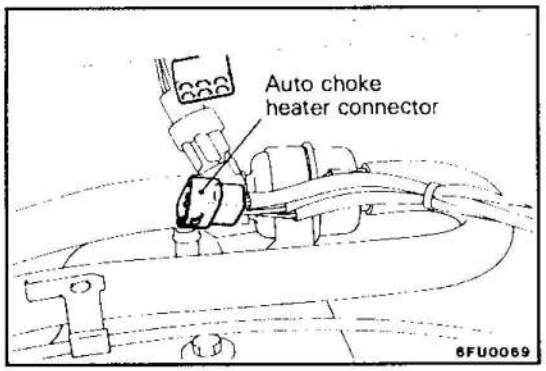
Mating mark	Symptom
Deviates to the right (clockwise)	Startability is good but plugs become sooty easily
Deviates to the left (counterclockwise)	Startability is poor and the engine stalls easily

(2) Check if the engine coolant temperature is 10°C (50°F) or lower.

(3) After starting the engine, check the operation of the choke valve and the fast idle cam while holding onto the electric auto choke body.

Electric auto choke body	Gets hot gradually after the engine is started.
Choke valve	Opens as the temperature of the bimetal assembly rises
Fast idle cam	The fast idle breaker operates when the engine coolant becomes hot, cancelling fast idle

(4) If the electric auto choke body does not become hot after the engine is started, check the electric choke.

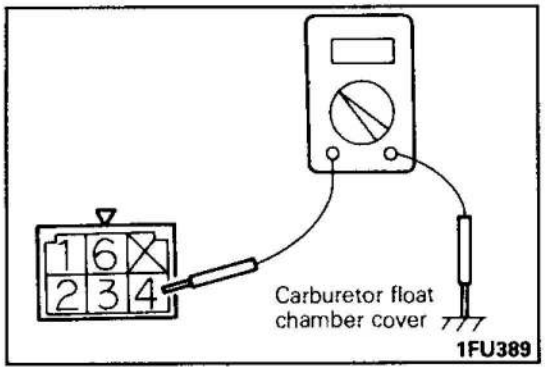


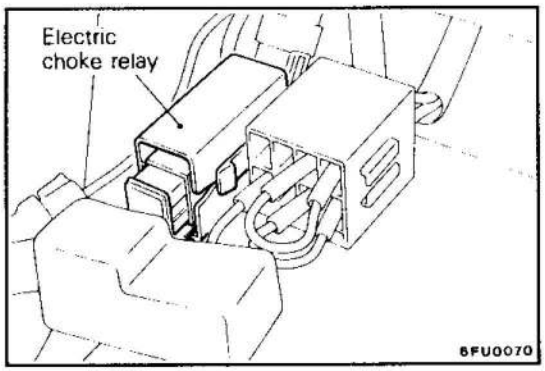
10. INSPECTION OF ELECTRIC CHOKE

(1) Disconnect the electric choke heater connector and check continuity of the heater.

Normal state : Should be conductive
[approx. 6 Ω resistance at 20°C (68°F)]

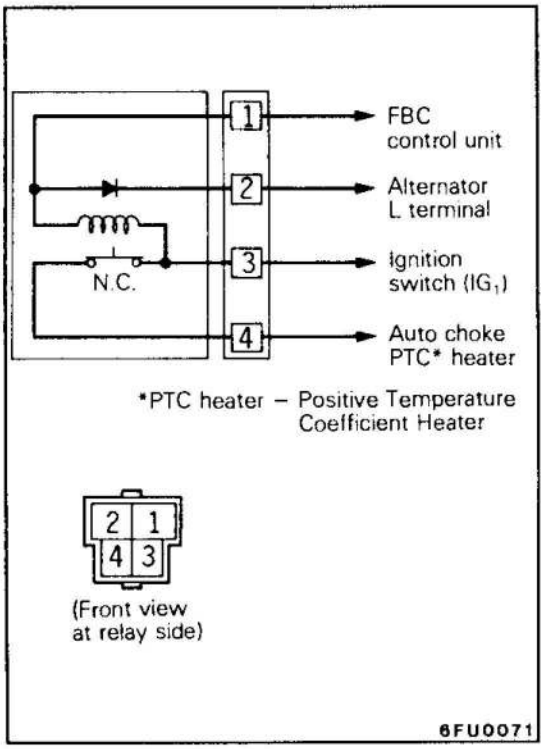
(2) If the heater is not conductive, replace the electric choke body (bimetal assembly).





11. INSPECTION OF ELECTRIC CHOKE RELAY

(1) Remove the electric choke relay.



(2) Check continuity between terminals both when the relay coil is energized and when not.

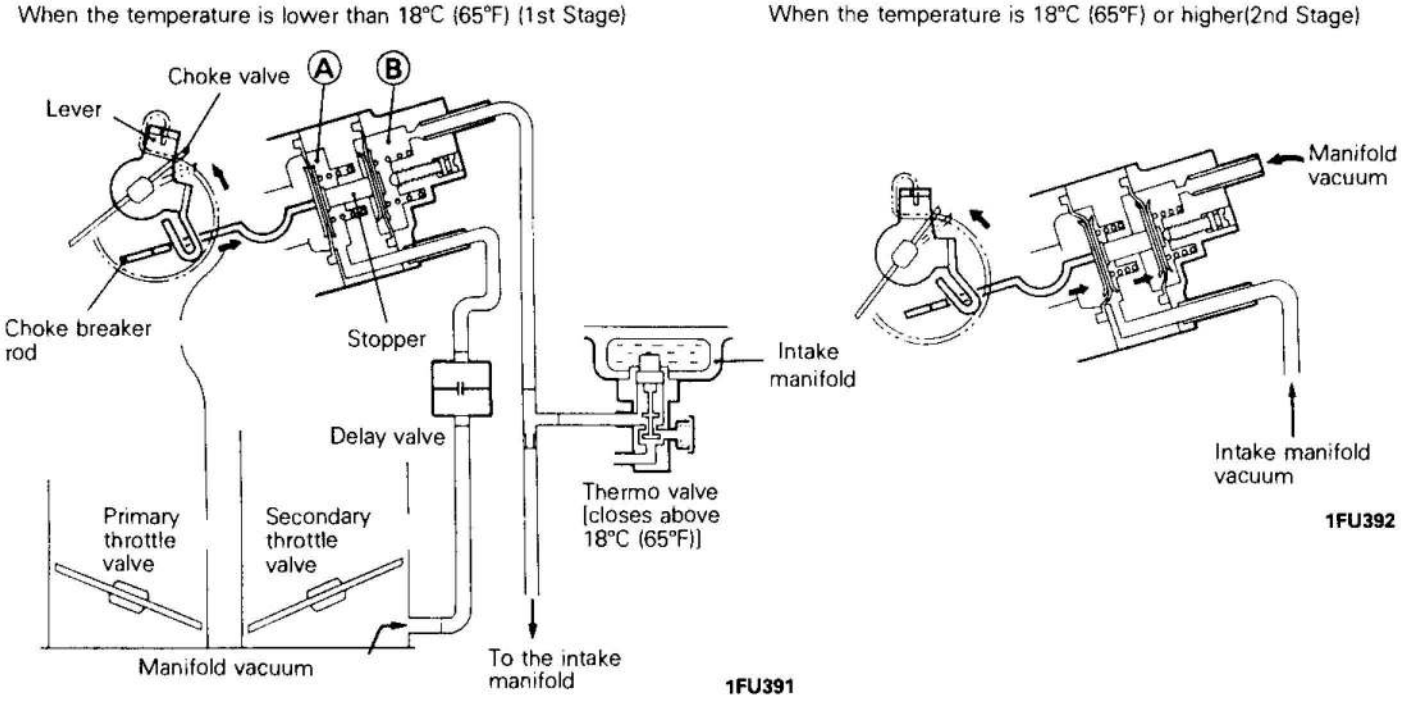
Description	Measuring terminal	Continuity
When de-energized	1 – 2	Conductive (0 Ω)
	1 – 2	Non-conductive (∞ Ω)
	1 – 3	Conductive (approx. 100 Ω)
	3 – 4	Conductive (0 Ω)
When energized	3 – 4	Non-conductive (∞ Ω)

NOTE
1. Use care as application of battery voltage to incorrect terminals can cause damage to the relay.
2. To energize the relay coil, apply battery voltage directly to terminals 1 – 3.

(3) If the continuity test fails, replace the electric choke relay.

NOTE
If the electric choke body remains cool after engine start although the electric choke heater (PTC heater) and electric choke relay are normal, check the vehicle body harness circuit.

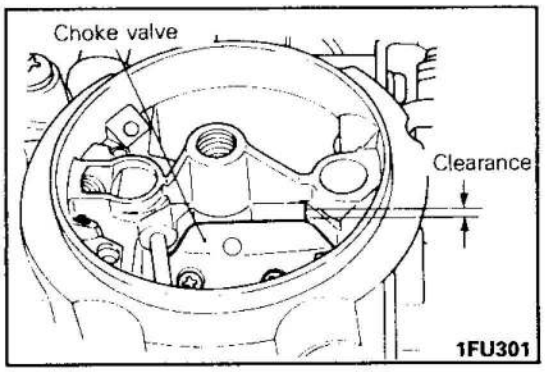
12. INSPECTION OF CHOKE BREAKER SYSTEM

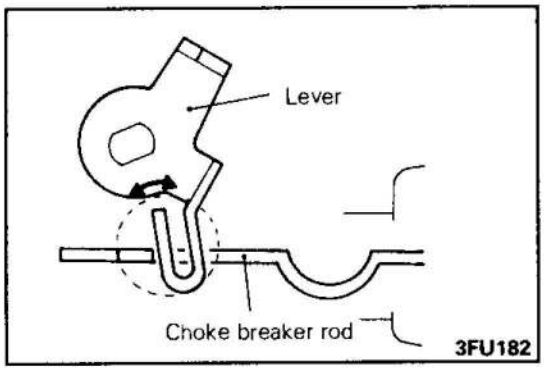


(1) Remove the air horn.
(2) Check conditions of the choke valve according to the procedures given in the table below.

Step	Engine coolant temperature	Checking condition	Normal choke valve operation	Probable cause of trouble
1	Lower than 10°C (50°F)	Before starting the engine	Closes fully	Defective bimetal assembly Linkage operational defective
2	Lower than 10°C (50°F)	Start engine and run idle (fully depress approx. accelerator pedal and then start)	Opens slowly and slightly (immediately after starting) [gap approx. 2.3 mm (0.091 in.)]	• Clogged delay valve • Broken diaphragm (chamber A)
3	Lower than 10°C (50°F)	Disconnect vacuum hose (yellow stripe) from choke breaker during idling.	Stationary valve	• Faulty thermo valve
4	Higher than 25°C (77°F)	Connect vacuum hose (yellow stripe) and run engine idle.	When the choke valve is closed lightly with finger, stops at larger opening than step 2 [gap approx. 3 mm (0.12 in.)]	• Faulty thermo valve • Broken diaphragm (chamber B)

NOTE : For the inspection of thermo valve, refer to EMISSION CONTROL.





13. INSPECTION AND ADJUSTMENT OF CHOKE BREAKER OPENING

(1) After inspection of the choke breaker system, disconnect the vacuum hose (yellow stripe) from the choke breaker and make the following check.

(2) With the engine idling, close the choke valve lightly with a finger until the choke valve stops. Then, measure the choke valve to choke bore clearance.

Standard value: 2.2–2.4 mm (0.087–0.094 in.)

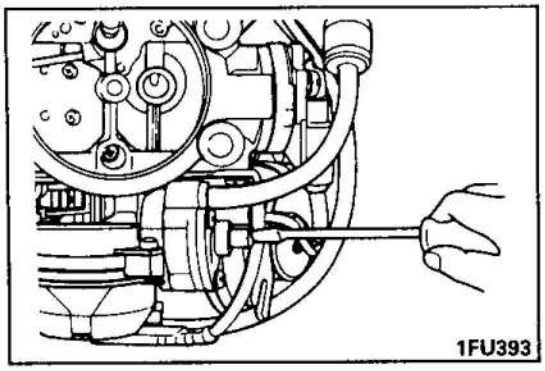
(3) If the clearance is not as specified, stop the engine, remove the bimetal assembly and adjust the rod end opening for standard clearance.

NOTE
When removing the bimetal assembly, put a mark on the electric choke body.

Reference

- Bimetal assembly

Rod end	Valve clearance	Expected result
Open	Large	Poorer startability and stall more likely
Close	Small	Plug likely to get sooty



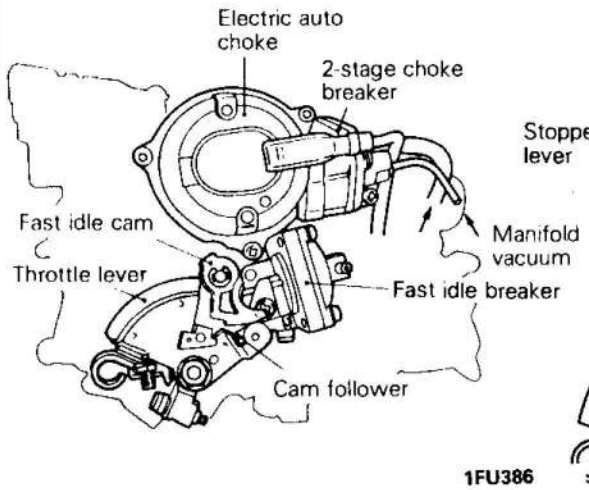
(4) Reconnect the removed yellow stripe vacuum hose and measure the choke valve to choke bore clearance as in step (2).

Standard value: 2.9–3.1 mm (0.114–0.122 in.)

(5) If the clearance is out of specification, adjust by the adjusting screw.
Reference
Adjusting screw turning direction and valve clearance

Adjusting screw turning direction	Valve clearance	Expected result
Clockwise	Small	Better startability but plug more likely to get sooty
Counterclockwise	Large	Poor startability and stall more likely

14. INSPECTION AND ADJUSTMENT OF FAST IDLE



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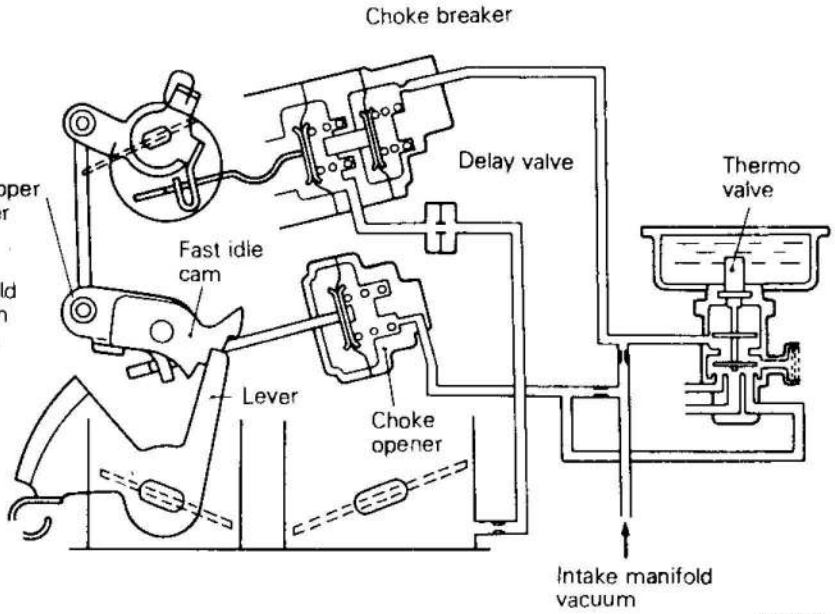
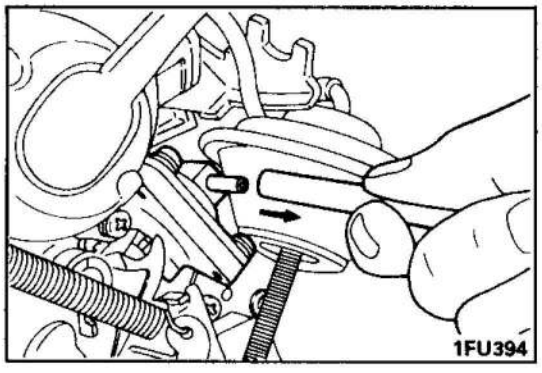


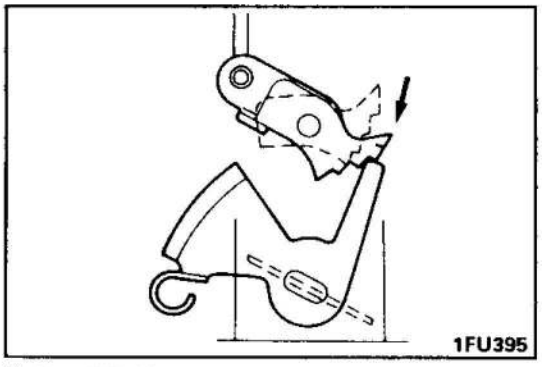
1FU360

(1) Before inspection and adjustment set vehicle in the following condition:
- Engine coolant temperature: 85–95°C (185–205°F)
- Lights, electric cooling fan and accessories: Set to OFF
- Transmission: Neutral
- Air cleaner: Removed
- Tachometer: Installed



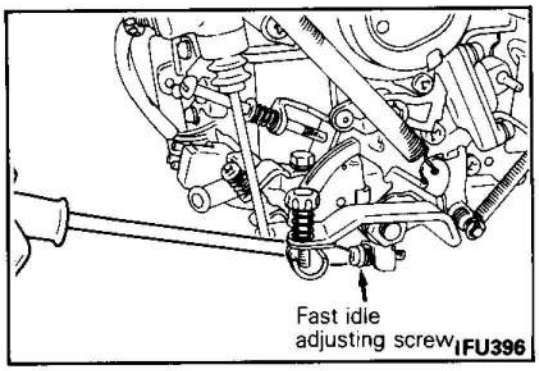
1FU394

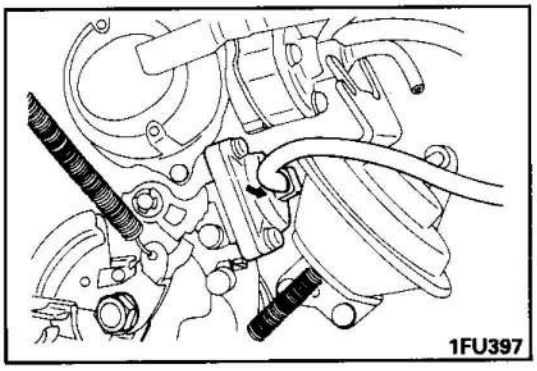
(2) Disconnect the vacuum hose (white stripe) from the choke opener.

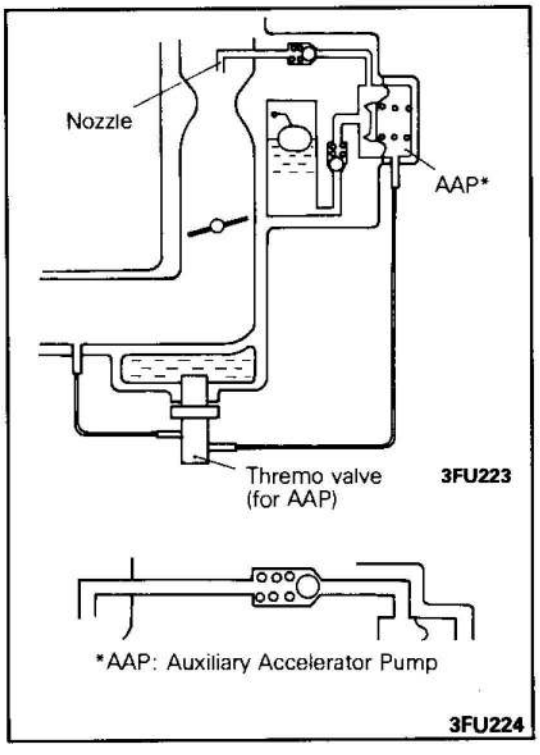


1FU395

(3) Set the lever on the second highest detent of fast idle cam.







(4) Start the engine and check the fast idle speed.
Standard value: 2,500 rpm

(5) If the fast idle speed is out of specification, adjust with the fast idle adjusting screw.
Reference
Adjusting screw turning direction and fast idle speed

Adjusting screw turning direction	Valve clearance	Fast idle speed
Clockwise	Large	Increases
Counterclockwise	Small	Decreases

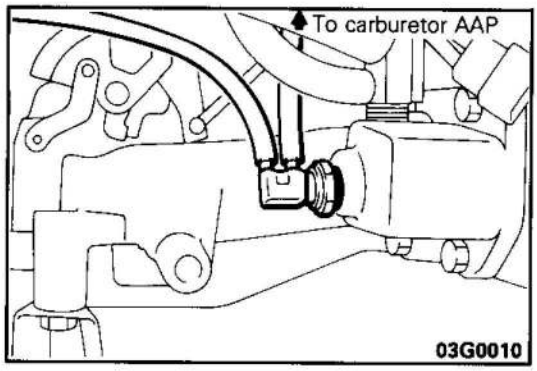
(6) Connect the vacuum hose removed in step 2 to the choke opener and check that the choke opener cancels fast idle.
(7) If the fast idle adjustment has been made, paint the fast idle adjusting screw (Vehicles for Switzerland built from December 1988).

15. INSPECTION OF AUXILIARY ACCELERATOR PUMP(AAP)

(1) Remove the air horn.
(2) Check to be sure that the engine coolant temperature is 30°C (86°F) or lower, and then check according to the steps in the table below.

Step	Check conditions	Vacuum hose negative pressure	Pump nozzle
1	With the engine idling, disconnect the black vacuum hose from the carburettor AAP.	Negative pressure is felt when the hose end is covered by a finger.	Fuel is sprayed from the nozzle when the hose is disconnected.
2	Warm-up the engine until the temperature of the engine coolant reaches 70°C (158°F) or higher.	Negative pressure cannot be felt by the finger.	–

(3) If the change of the vacuum negative pressure is incorrect, check the thermo valve for the AAP. If the negative pressure is normal but fuel is not sprayed from the nozzle, clean the carburettor's fuel passage.



16. INSPECTION OF THERMO VALVE (FOR AAP CONTROL)

(1) Disconnect the vacuum hose (connecting carburetor AAP) from the thermo valve and connect a manual vacuum pump to the thermo valve.

(2) Apply a negative pressure of 500mmHg (19.7in. Hg) to the thermo valve.

When engine is cold [coolant temperature 30 ℃ (86 F) or lower]	Negative presssure is not applied (leakage).
After engine warm-up [coolant temperature 70 ℃ (158 F) or higher]	Negative pressure is applied(no leakage).

(3) If incorrect, replace the thermo valve.

Caution

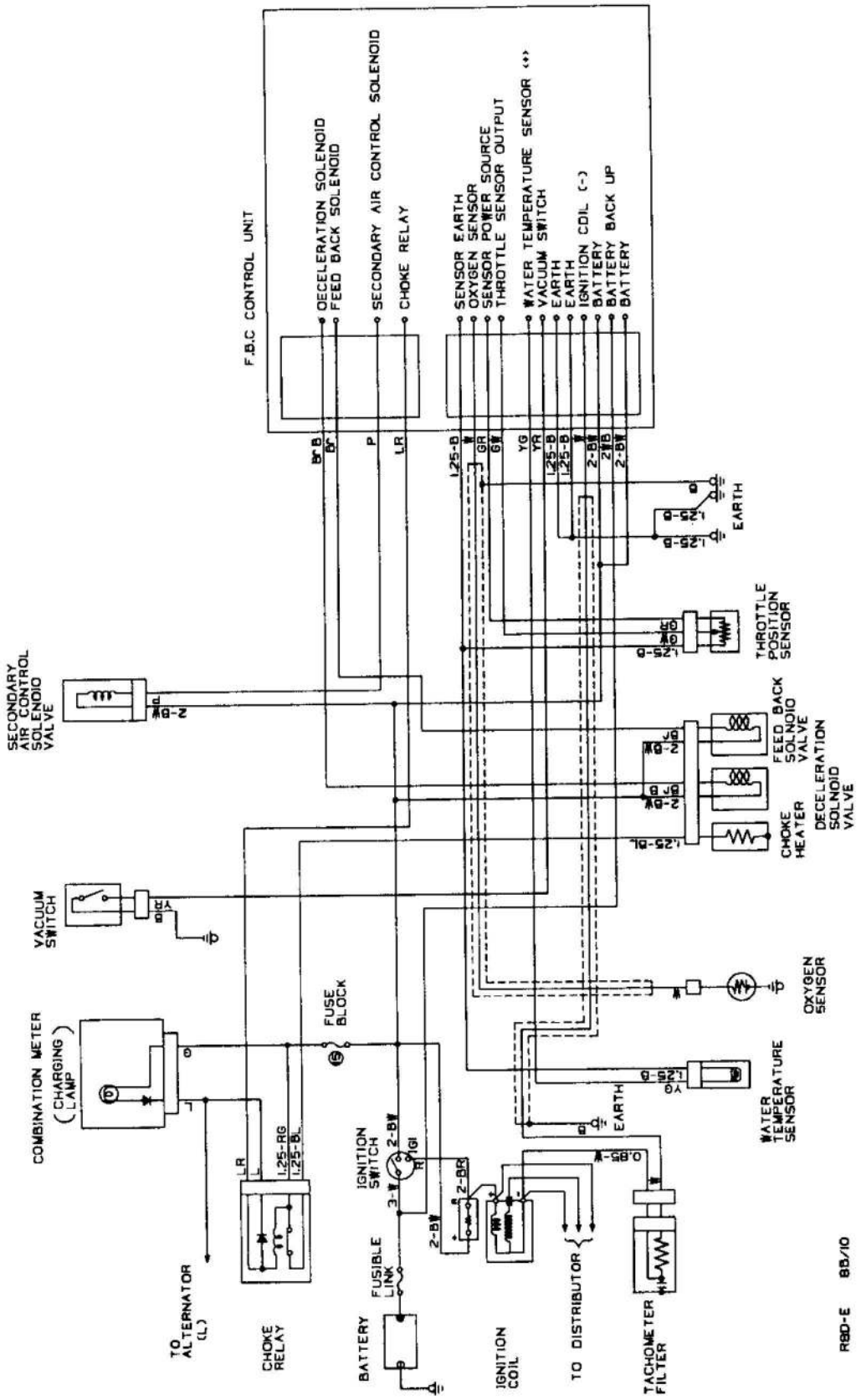
1. Do not use a wrench or similar tool at the resin part when removing or installing the thermo valve.

2. When installing, apply a coating 3M Nut Locking Part, No.4171 or equivalent sealant to the threaded part and then tighten at a torque of 20−40 Nm (2−4 kgm, 14.5−28.9 ft. lbs.)

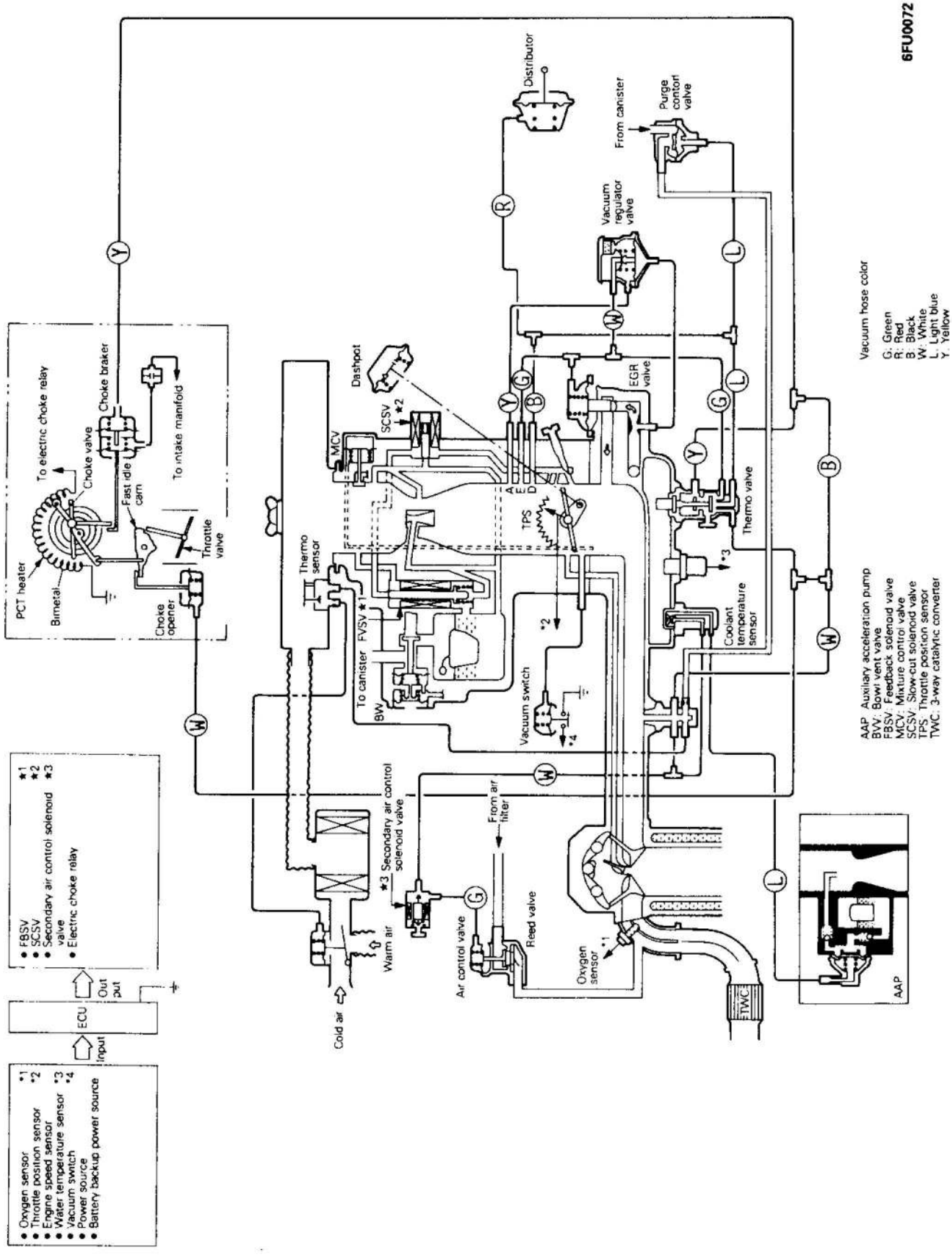
INSPECTION OF FBC SYSTEM

E13FBCA

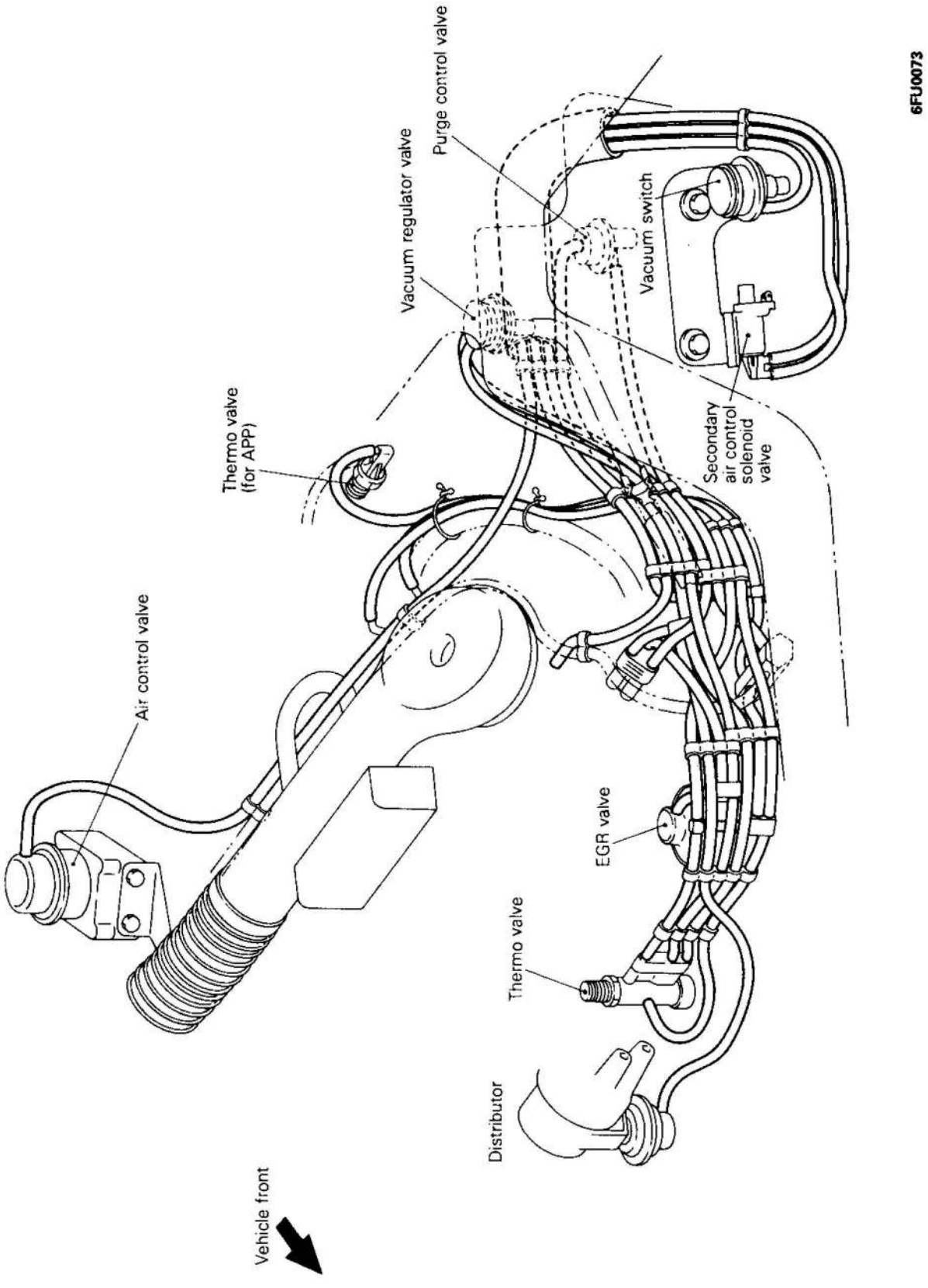
1. CONTROL CIRCUIT DIAGRAM



2. FBC SYSTEM DIAGRAM



3. VACUUM HOSE LAYOUT DIAGRAM



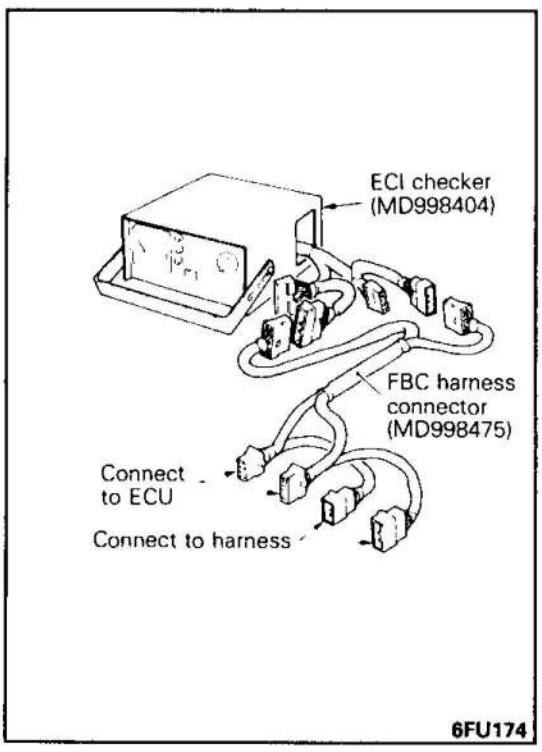
4. CAUTIONS OF INSPECTION

1. Before removing or installing a part, disconnect the battery ⊖ terminal.
2. Before disconnecting battery terminals, turn off the ignition switch. Removal or connection of battery terminals during engine operation or with the ignition switch ON could cause erroneous operation of the ECU or damage to semiconductors.
3. The control harnesses between ECU and ignition coil (⊖ terminal) and between ECU and oxygen sensor are shielded wires with shield earthed to the vehicle body in order to prevent ignition noises and radio interference. When the shielded wire is faulty, therefore, the control harness must be replaced.
4. When ECI checker is handled, pay attention to the following points.
   - Avoid rough operation of switches.
   - Do not subject ECI checker to shock and other external forces, heat, etc.
   - Keep away water and oil.
   - Store ECI checker in a moisture- and dust-free place and take steps to protect the checker from heat and vibration.

5. CHECK PROCEDURE OF FBC FUEL CONTROL SYSTEM (METHOD USING ECI CHECKER)

Using the special tools (Harness Connector and ECI Checker), perform the inspection by the following procedure.

(1) Turn ignition switch to "Lock".
(2) Remove the harness large connector and small harness connector from the ECU.
(3) Set check switch of the ECI checker to OFF.
(4) Set select switch of the ECI checker to A.
(5) Connect the FBC HARNESS CONNECTOR to the connectors of the ECI checker, and then connect the FBC HARNESS CONNECTOR to the ECU and the harness connectors.
(6) Perform checks according to the FBC System Check Procedure chart.
(7) If checker shows any variance from specifications, check the corresponding sensor and related electrical wiring, then repair or replacement.
(8) After repair or replacement, recheck with the ECI checker to confirm that the repair has corrected the problem.
(9) Set check switch of the ECI checker to OFF.
(10) Set ignition switch to "Lock".
(11) Disconnect connectors of the ECI checker and the FBC HARNESS CONNECTOR from the ECU and the body side harness connectors.
(12) Connect the body side harness connectors to the ECU.
(13) After completion of the above test, make certain that the trouble has been eliminated on the road test.



6. FBC SYSTEM CHECK PROCEDURE CHART (Use FBC Harness Connector–MD998475)

ECI Checker Operation		Check Item	ECU Terminal No. Checked	Condition		Test Specification
Select Switch	Check Switch					
Set to "A"	1	Power supply	7	Ignition switch "LOCK → ON"		11V to 13V
	2	Ignition pulse	10	Ignition switch "LOCK → START"		2V to 8V
	3	Throttle position sensor	13	Ignition switch "LOCK → ON" (warm engine)	Accelerator fully closed	0.4V to 0.7V
					Accelerator fully opened	4.5V to 5.5V
	4	Vacuum switch for idle position	5	Ignition switch "LOCK → ON"		9V to 13V
				Idling (warm engine)		0V to 0.6V
	5	Electric choke relay	56	Ignition switch "LOCK → ON"		0V to 0.6V
				Idling		13V to 15V
	6					
	7					
	8					
	9					
	10					

ECU Terminal

(Large)

1	13	12		11	10	9	
2	3	4	5	6	7	8	

(Small)

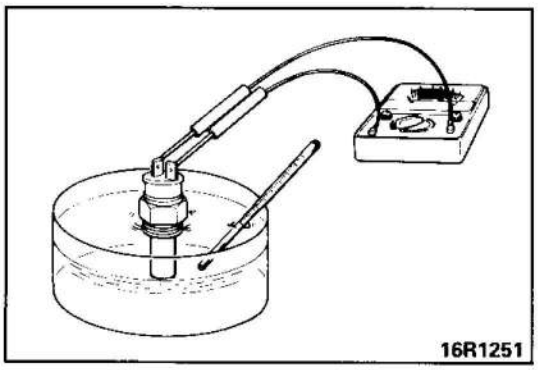
51	59		58	57	
52	53	54	55	56	

View from front as installed in ECU

1FU466

ECI Checker Operation		Check Item	ECU Terminal No Checked	Condition		Test Specification
Select Switch	Check Switch					
	1					
	2	Idle up control solenoid valve	54	Idling	A/C switch ON *1 or Lighting switch ON	0V to 0.6V
				2000 rpm		9V to 15V
	3					
	4	A/C cutoff relay	57	Ignition switch "LOCK → ON" and A/C switch ON *2	Accelerator fully closed	0V to 0.6V
					Accelerator fully opened	0V to 0.6V
						*2 11V to 13V
Set to "B"	5	Coolant temperature sensor	12	Ignition switch "LOCK → ON"	0°C (32°F)	3.4V to 3.6V
					20°C (68°F)	2.4V to 2.7V
					40°C (104°F)	1.5V to 1.8V
					80°C (176°F)	0.5V to 0.7V
	6	Feed back solenoid valve (FBS)	59	Ignition switch "LOCK → ON"		11V to 13V
				Idling (warm engine)		2V to 12V
	7	Slow cutoff solenoid valve (SCS)	53	Idling		0V to 0.6V
				Quick deceleration from above 4000 rpm to idling with "N" position		Momentarily 13V to 15V
	8	Oxygen sensor	1	Hold rpm constant above 1300, 70 seconds after start of warm engine		0V to 1V ↑ (pulsates) ↓ 2V to 3V *2
	9	Secondary air control solenoid valve	55	Idling, 70 seconds after start of warm engine		0V to 0.6V then 13V to 15V
				Quick deceleration from above 2000 rpm to idling with "N" position		Momentarily drop
	10	Power supply for sensor	3	Ignition switch "LOCK → ON"		4.5V to 5.5V

NOTE *1 ON means compressor clutch engaged
*2 Since specifications may differ, check the other air-fuel ratio related components when components other than the oxygen sensor are defective.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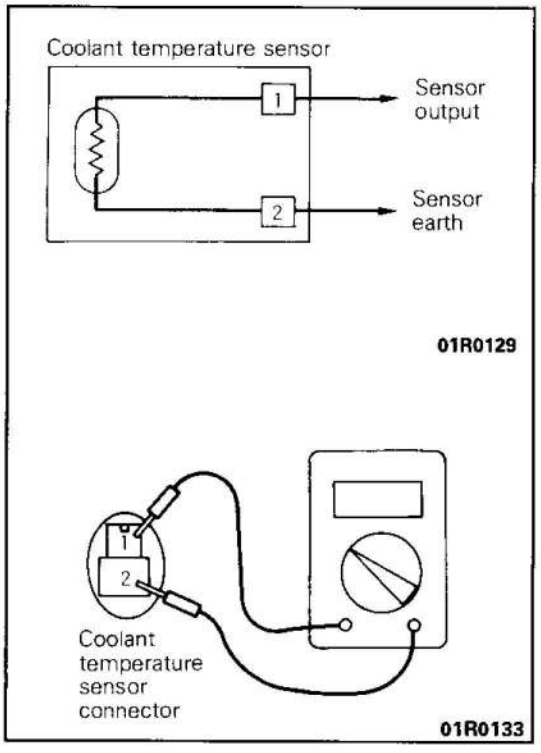
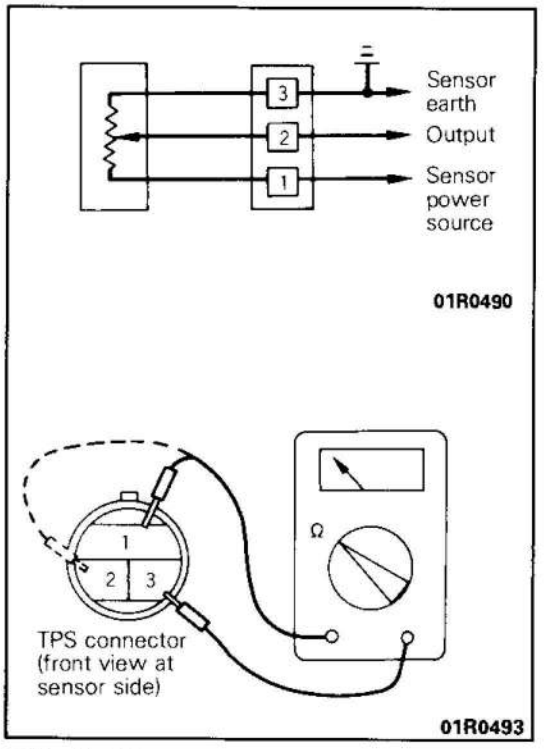




INSPECTION OF SENSORS AND SWITCHES

1. INSPECTION OF ENGINE COOLANT TEMPERATURE SENSOR

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

(2) With temperature sensing portion of engine coolant temperature sensor immersed in hot water, check electrical resistance. The sensor should be held with its housing 3mm (0.12in.) away from the surface of the hot water.

Standard value: 2.1 - 2.7kΩ [at 20℃ (68° F)]
0.26 - 0.36kΩ [at 80℃ (176° F)]

(3) If the resistance deviates greatly from the standard value, replace the engine coolant temperature sensor.

(4) Apply specified sealant to the sensor threaded portion.

Specified sealant: 3M Nut Locking Part No.4171 or equivalent

(5) Install engine coolant temperature sensor and tighten it to specified torque.

Sensor tightening torque:
20–30 Nm (2.0–3.0 kgm, 15–30 ft.lbs.)

(6) Fasten harness connectors securely.

2. INSPECTION OF THROTTLE POSITION SENSOR (TPS)

(1) Separate the throttle position sensor connector.

(2) Measure resistance between terminal 1 (sensor power) and terminal 3 (sensor earth).

Standard value: 3.5–6.5 kΩ

(3) Connect an ohmmeter (pointer type) between terminal 3 (sensor earth) and terminal 2 (sensor output).

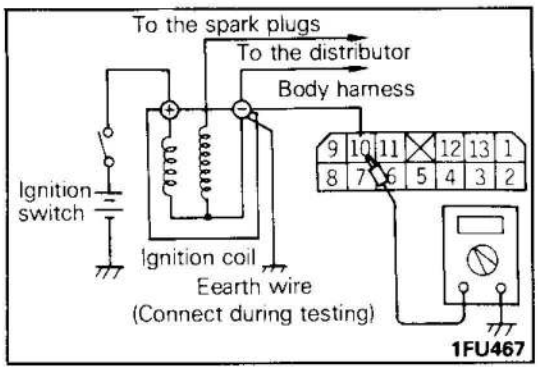
(4) Operate the throttle valve slowly from idle position to the full open position and check that the resistance makes a smooth change proportionaly with the throttle valve opening.

NOTE
The resistance changes within the range from approx. 0.5 kΩ to the value measured at step 2.

(5) If the resistance is out of specification or fails to change smoothly, replace the TPS.

TPS installation torque:
2.5–4.5 Nm (0.25–0.45 kgm, 1.8–3.3 ft.lbs.)

NOTE
For adjustment procedures of the throttle position sensor, refer to P. 13–36.



3. INSPECTION OF ENGINE SPEED SENSOR (IGNITION COIL ⊖ TERMINAL)

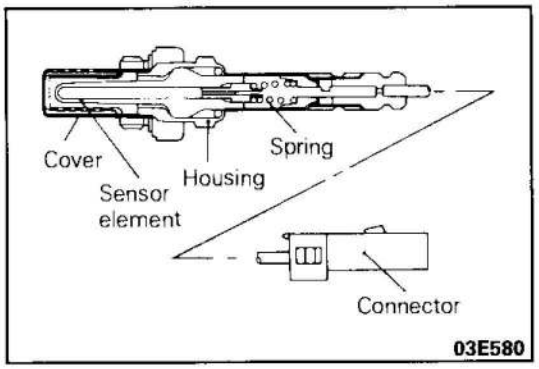
Check that there is continuity between the ignition coil – terminal and the electronic control unit (ECU) terminal No.10

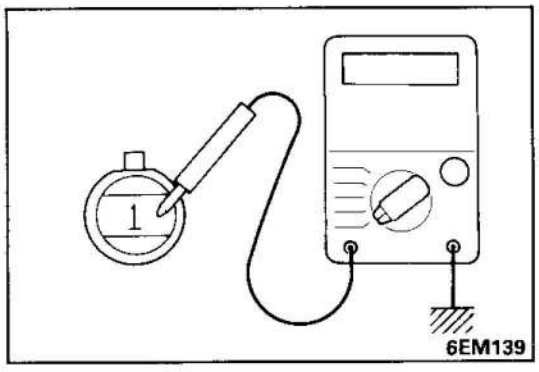
NOTE
Shake the harness connector to check for lurking open circuit.

4. INSPECTION OF OXYGEN SENSOR

Caution

1. **Before checking, warm up the engine until engine coolant temperature reaches 85 to 95°C (185 to 205°F).**
2. **Use an accurate digital voltmeter.**



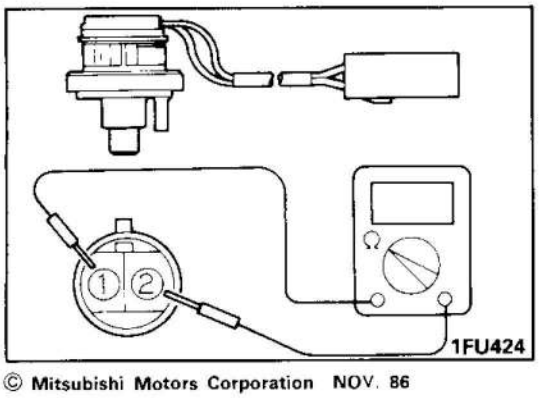


(1) Separate the oxygen sensor connector and connect a voltmeter to the oxygen sensor connector.
(2) While repeating engine racing, measure the oxygen sensor output voltage.

Engine	Oxygen sensor output voltage	Remarks
Racing	Approx.1 V	Make air-fuel mixture richer by accelerator operation

NOTE
For removal and installation of oxygen sensor, refor to GROUP 15–INTAKE AND EXHAUST.

Oxygen sensor installation torque:
40–50 Nm (4.0–5.0 kgm, 30–36 ft.lbs.)



5. INSPECTION OF VACUUM SWITCH

(1) Disconnect the vacuum switch connector.
(2) Using a vacuum pump, apply vacuum to the vacuum hose nipple of vacuum switch and check continuity between switch terminals.

Vacuum gauge	Measuring terminals	Continuity
27 kPa (0.27 kg/cm², 3.9 psi) or less	1 – 2	Non-conductive (∞ Ω)
41 kPa (0.41 kg/cm², 5.8 psi) or more	1 – 2	Conductive (0 Ω)

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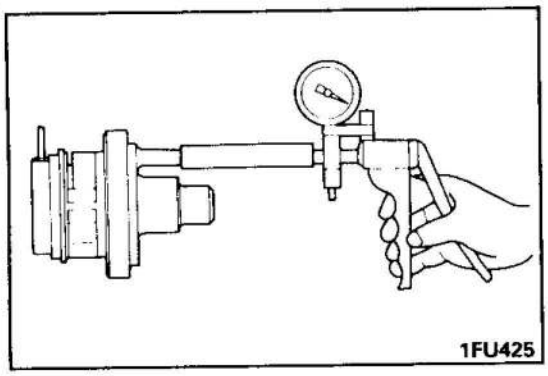
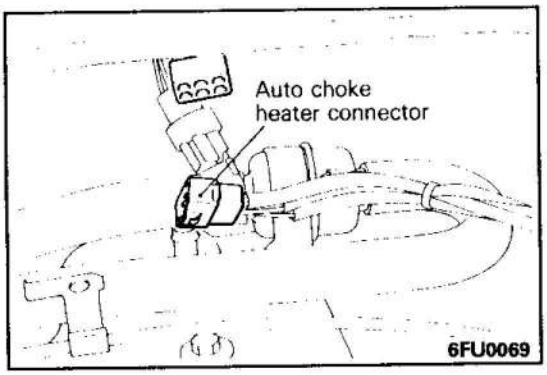
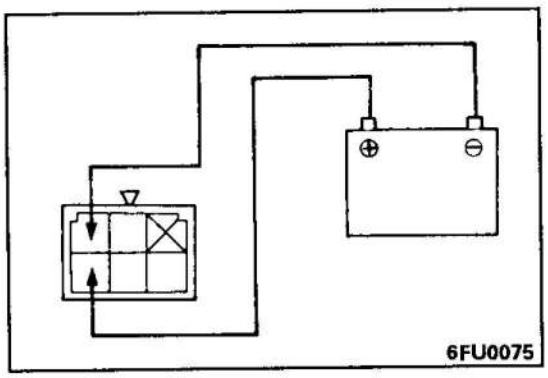


(3) If the check result is otherwise than specified, replace the vacuum switch assembly.

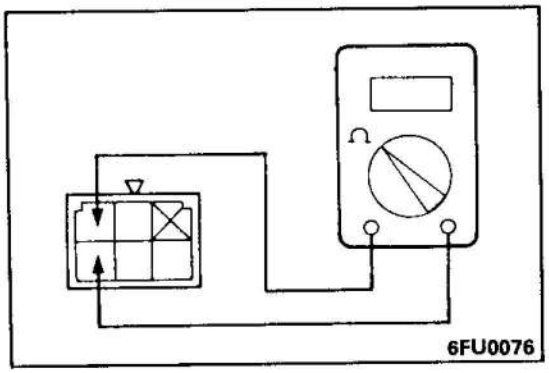


6. SIMPLE INSPECTION OF FEEDBACK SOLENOID VALVE (FBSV)

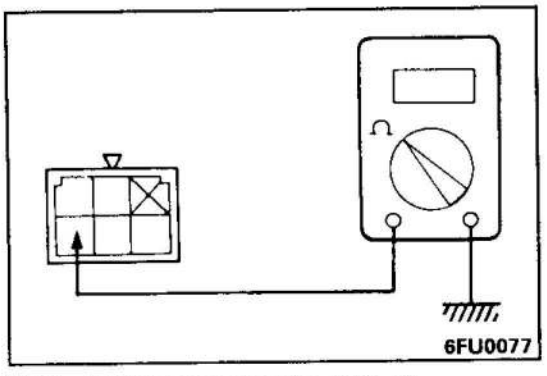
(1) Disconnect the feedback solenoid valve connector connected from vehicle body side.



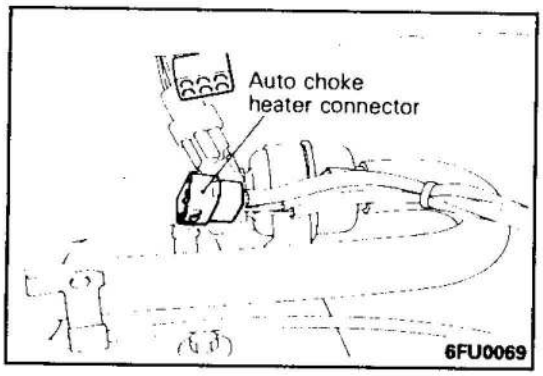
(2) Apply battery voltage (approx. 12V) between the feedback solenoid valve terminals and check that the solenoid valve operates with a click.
If no click is heard, replace the solenoid valve.



(3) Measure the resistance of the solenoid coil.
Standard value: 54–66 Ω [at 20°C (68°F)]

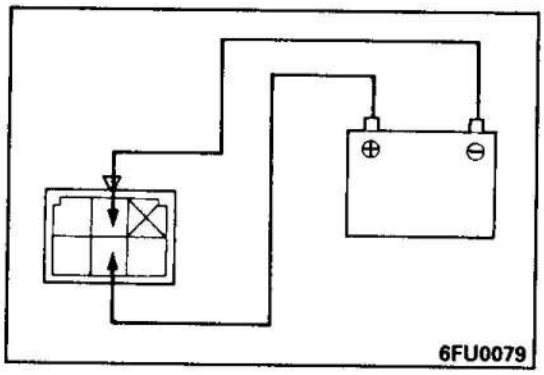


(4) Ensure that there is no conductivity between the solenoid coil and the body earth.

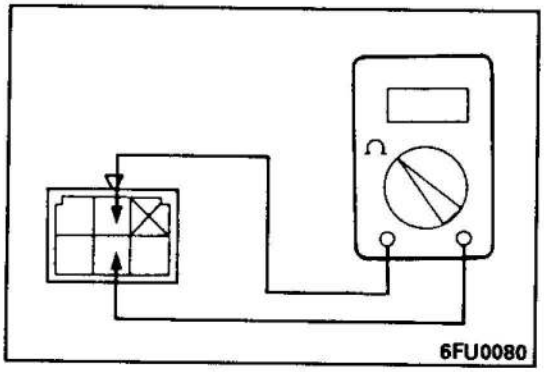


7. SIMPLE INSPECTION OF SLOW-CUT SOLENOID VALVE

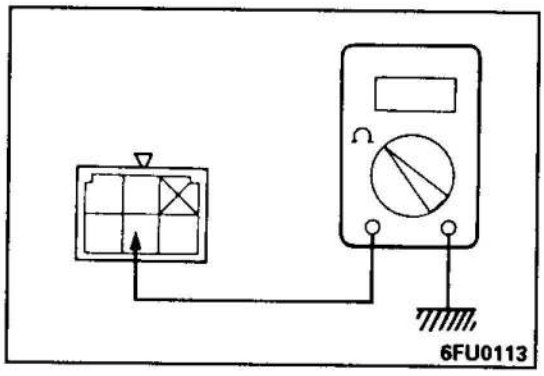
(1) Disconnect the slow-cut solenoid valve connector connected from vehicle body side.



(2) Apply battery voltage (approx. 12V) between the slow-cut solenoid valve terminals and check that the solenoid valve operates with a click.
If no click is heard, replace the solenoid valve.



(3) Measure the resistance of the solenoid coil.
Standard value: 48—60 Ω [at 20°C (68°F)]



(4) Ensure that there is no conductivity between the solenoid coil and the body earth.

SERVICE ADJUSTMENT PROCEDURES (FBC) – Vehicles built from June 1994

E13FCAF1

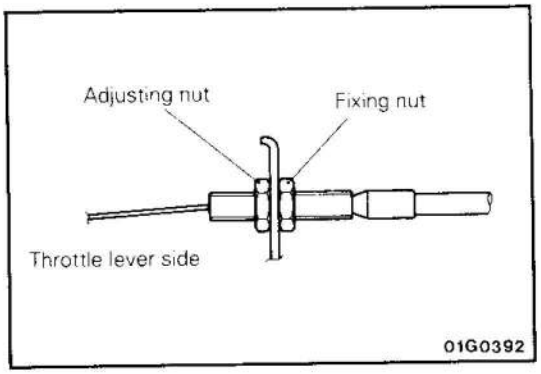
GENERAL INSPECTION

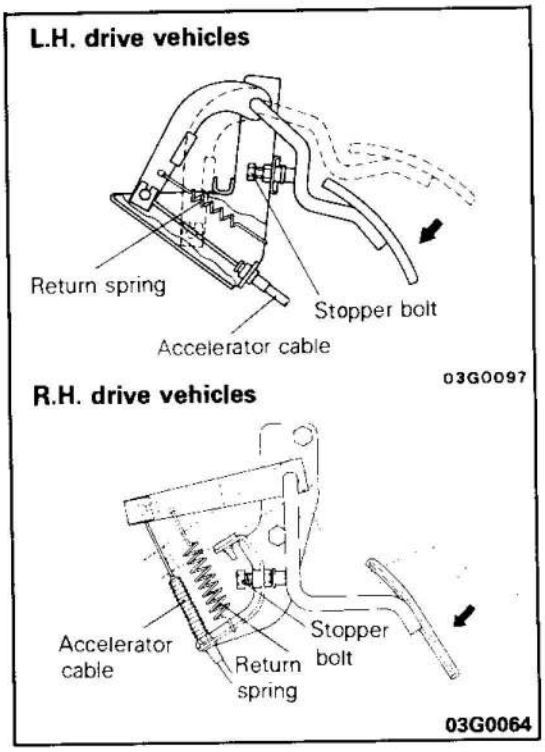
1. INSPECTION AND ADJUSTMENT OF ACCELERATOR CABLE

(1) Turn air-conditioner and lamps OFF
Inspect and adjust at no load.
(2) Warm engine until stabilized at idle.
(3) Confirm idle rpm is at prescribed rpm.
(4) Stop engine (ignition switch OFF).
Remove air horn.
(5) Confirm there are no sharp bends in accelerator cable.
(6) Check inner cable for correct slack.
(7) If there is too much slack or no slack, adjust play by the following procedures.
1. Loosen accelerator cable fixing nut. Fully close throttle valve.
2. Adjust outer cable so that accelerator cable play is at the standard value and fix with fixing nut.

Standard value: Approx. 1 mm (0.04 in.)

3. Adjust so that accelerator pedal stopper touches pedal arm when throttle valve is fully opened.
4. After adjusting, confirm that throttle valve fully opens and closes by operating pedal.





2. REPLACEMENT OF FUEL FILTER

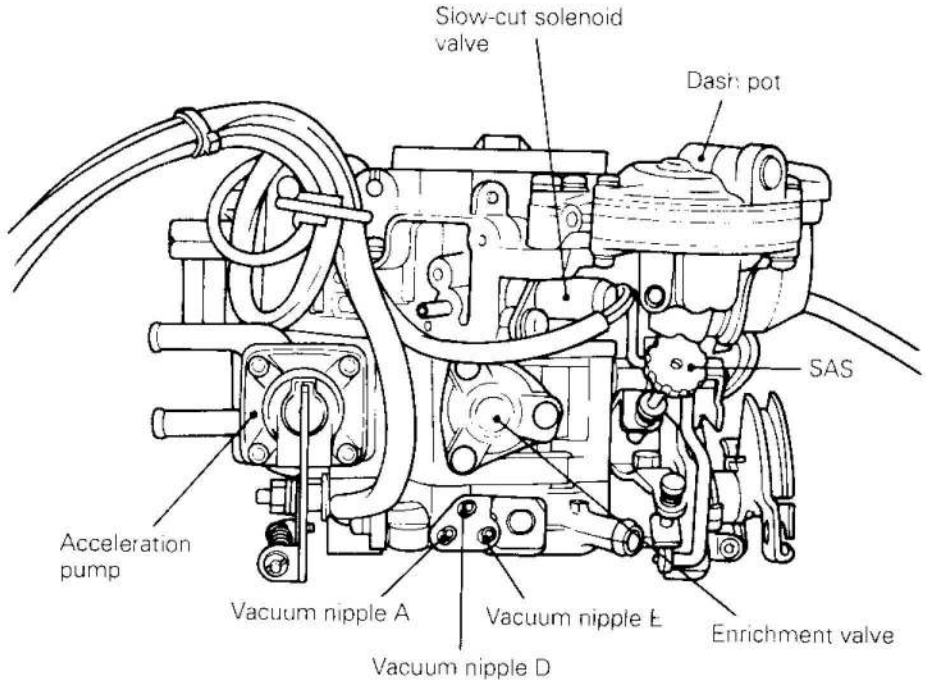
E13FZAB1

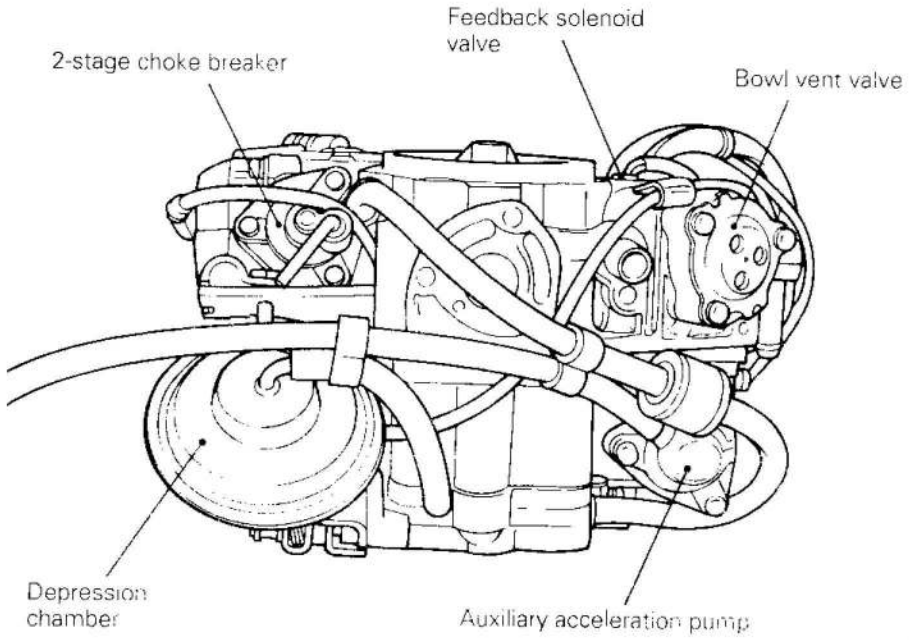
Refer to P.13-18.

ADDED

INSPECTION AND ADJUSTMENT OF FEEDBACK CARBURETOR (ELECTRICAL CHOKE TYPE – VEHICLES FOR EUROPE)

CARBURETOR APPEARANCE





6FU2190

1. INSPECTION OF DISTRIBUTOR ADVANCE CONTROL VACUUM (D VACUUM)

Refe to P.13-35.

2. INSPECTION OF EGR VALVE CONTROL VACUUM (E VACUUM)

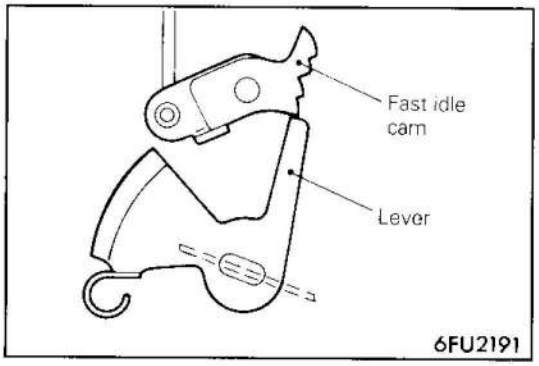
Refer to P.13-35.

3. INSPECTION OF VRV CONTROL VACUUM (A VACUUM)

Refer to P.13-35.

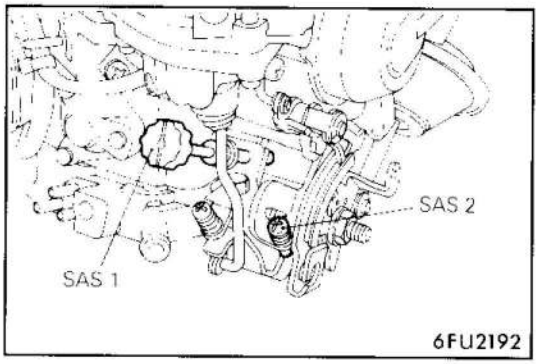
4. INSPECTION OF VACUUM SWITCH CONTROL VACUUM (F VACUUM)

Refer to P.13-36.



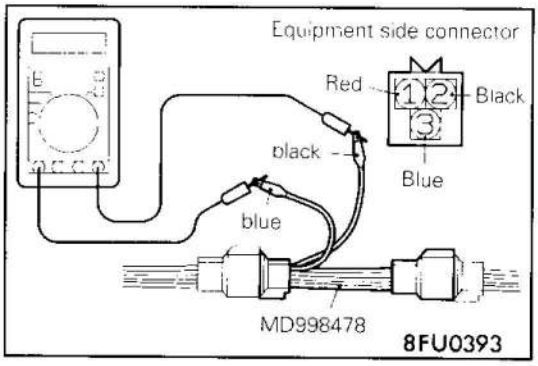
5. THROTTLE POSITION SENSOR (TPS) ADJUSTMENT

(1) Release the fast idle operation. (Disengage the lever from the fast idle cam.)
(2) Remove the air horn.
(3) Loosen the accelerator cable tension sufficiently.



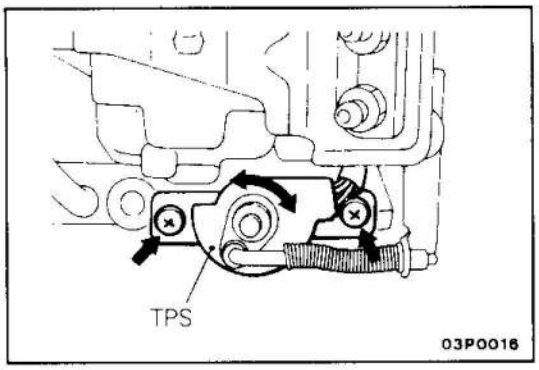
(4) After backing out the speed adjusting screw 1 (SAS 1) sufficiently, check that the throttle valve is fully closed.
(5) If the throttle valve is not fully closed, back out the speed adjusting screw 2 (SAS 2) and the air conditioner throttle opener adjusting screw sufficiently to securely set the throttle valve to the closed position.

NOTE
At this time, make a note of how many turns the screws were backed out.



(6) Disconnect the throttle position sensor connector and connect the special tool (test harness) between the disconnected connector.
(7) Connect a digital type voltmeter between the throttle position sensor terminal 3 (blue clip:sensor output) and terminal 2 (black clip:sensor earth).
(8) Turn the ignition switch to "ON" (Do not start the engine.)
(9) Inspect the throttle position sensor output voltage.

Standard valve: 230 – 270mV



(10)If the voltage is outside the standard value, adjust by loosening the throttle position sensor mounting screws and turning the throttle position sensor body. After adjusting, securely tighten the screws.
(11)Turn the ignition switch to "OFF".
(12)Turn in the screws that were backed out in step 5 until they are at their original positions.
(13)Adjust the accelerator cable tension.
(14)Adjust the idle speed.

6. INSPECTION OF CARBURETOR SECONDARY VALVE OPERATION

Refer to P.13-38.

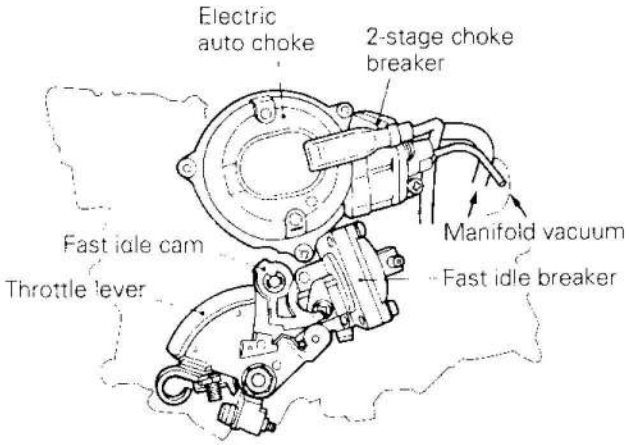
7. INSPECTION OF CARBURETOR ACCELERATION PUMP

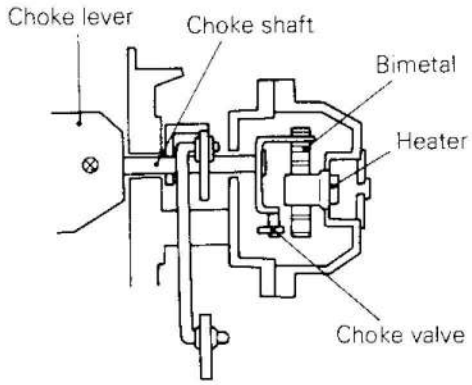
Refer to P.13-39.

8. INSPECTION OF CHOKE VALVE

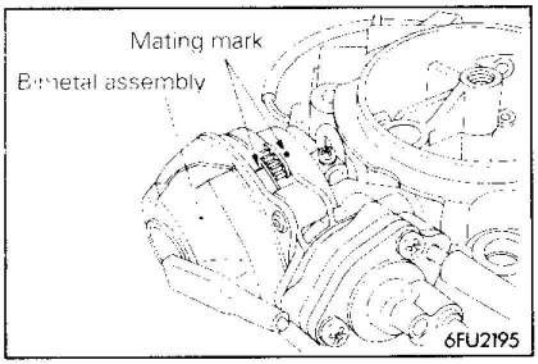
Refer to P.13-39.

9. INSPECTION OF ELECTRIC AUTO CHOKE





6FU2194



(1) Check the mating marks on the electric auto choke body and bimetal assembly to make sure they are matched. If they are not matched, match them.

NOTE
1. For information concerning the disassembly and reassembly of the bimetal assembly, refer to the Engine Workshop Manual.
2. Likely symptoms of mating mark deviation.

Mating mark	Symptom
Deviates to the right (clockwise)	Startability is good but plugs become sooty easily
Deviates to the left (counterclockwise)	Startability is poor and the engine stalls easily

ADDED

(2) Check if the engine coolant temperature is 30℃(86°F) or lower.
(3) After starting the engine, check the operation of the choke valve and the fast idle cam while holding onto the electric auto choke body.

Electric auto choke body	Gets hot gradually after the engine is started.
Choke valve	Opens as the temperature of the bimetal assembly rises.
Fast idle cam	The fast idle breaker operates when the engine coolant becomes hot, cancelling fast idle

(4) If the electric auto choke body does not become hot after the engine is started, check the electric choke.

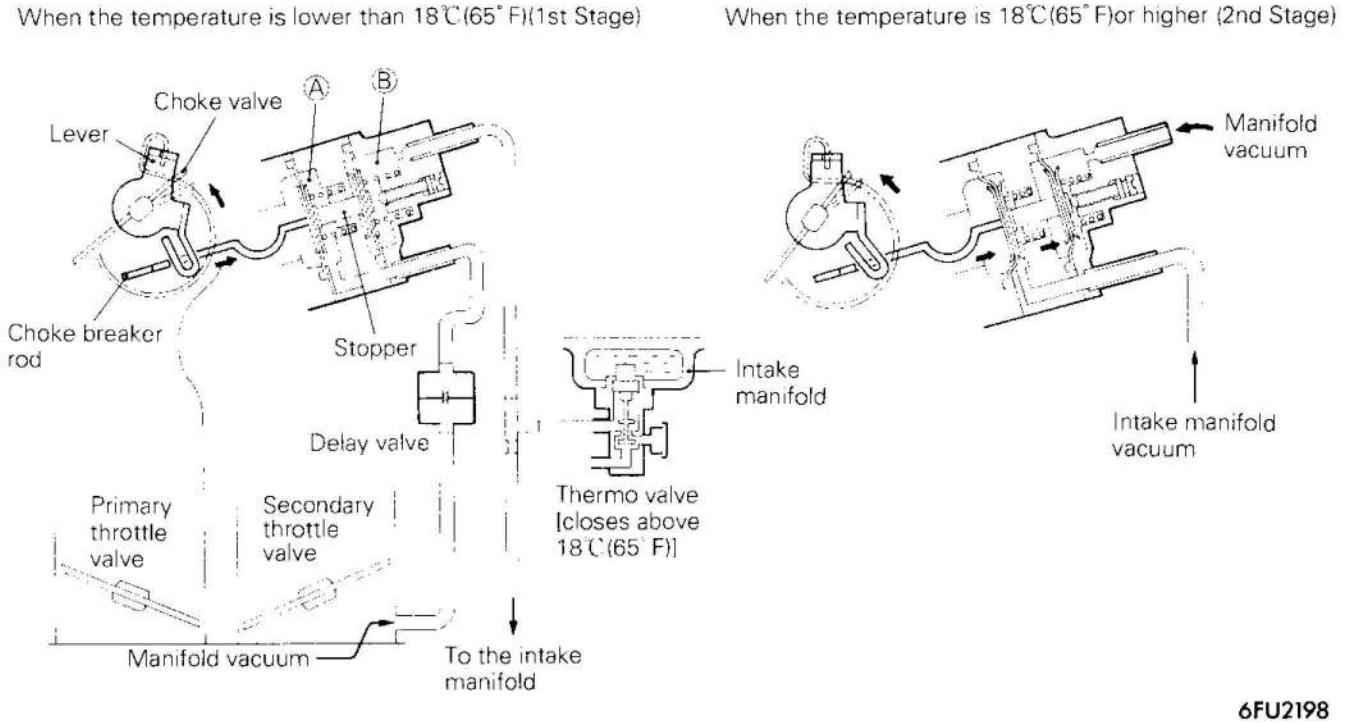
10. INSPECTION OF ELECTRIC CHOKE

Refer to P.13-41.

11. INSPECTION OF ELECTRIC CHOKE RELAY

Refer to P.13-41.

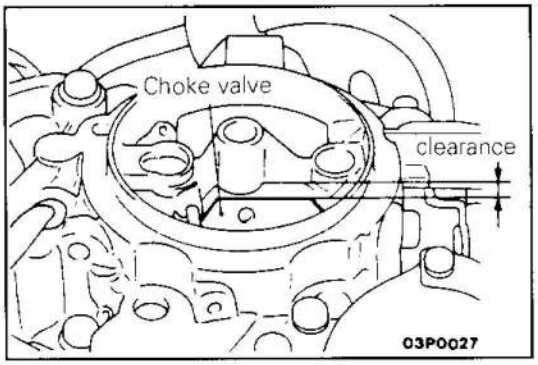
12. INSPECTION OF CHOKE BREAKER SYSTEM

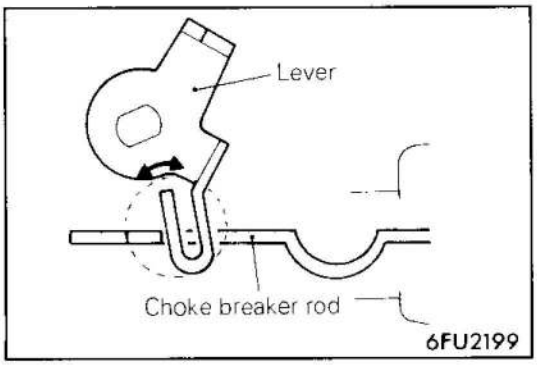


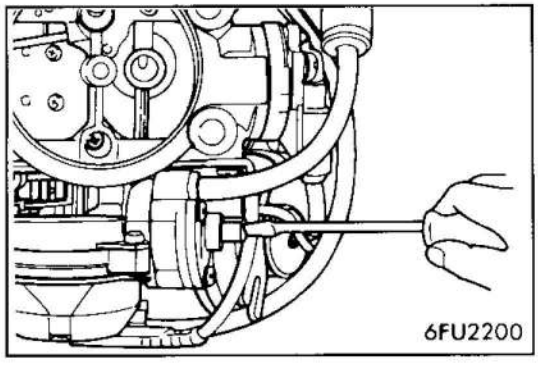
(1) Remove the air horn.
(2) Check conditions of the choke valve according to the procedures given in the table below.

Step	Check condition	Normal choke valve condition	Probable cause when a malfunction occurs
1	Before starting engine Engine coolant temperature:Lower than 10℃(50°F)	Fully closed	Defective bimetal assembly Link malfunction
2	After starting engine Engine coolant temperature: Lower than 10℃(50°F)	Slightly opened [clearance: 2.0mm(0.079 in.)]	Delay valve clogged Diaphram broken (chamber A)
3	Engine: idle Disconnect the red-striped vacuum hose from the choke breaker Engine coolant temperature: Lower than 10℃(50°F)	Does not move	Thermo valve malfunction
4	Engine: idle Connect the red-striped vacuum hose to the choke breaker. Engine coolant temperature: Lower than 25℃(77°F)	Opens wider than in the step 2 and stops when it is pluged by a finger. [clearance: 3.0mm(0.118 in.)]	Thermo valve malfunction Diaphram broken (chamber B)

NOTE
For the inspection of thermo valve, refer to GROUP 17-Service Adjustment Procedures.







13. INSPECTION AND ADJUSTMENT OF CHOKE BREAKER OPENING

NOTE
After inspection of the choke breaker system.

(1) Disconnect the vacuum hose (red stripe) from the choke breaker.
(2) With the engine idling, close the choke valve lightly with a finger until the choke valve stops. Then, measure the choke valve to choke bore clearance.

Standard value: 1.9 – 2.1 mm (0.075 – 0.083 in.)

(3) If the clearance is not as specified, stop the engine, remove the bimetal assembly and adjust the rod end opening for standard clearance.

Caution
When removing the bimetal assembly, put a mark on the electric choke body.

NOTE
For information concerning the disassembly and reassembly of the bimetal assembly, refer to the Engine Workshop Manual.

(4) Reconnect the red-striped vacuum hose disconnected in the step 1.
(5) Measure the choke valve to choke bore clearance by the same way as the step 2.

Standard value: 2.9 – 3.1 mm (0.114 – 0.122 in.)

(6) If it is not within the standard value, stop the engine and adjust the clearance by turning the adjusting screw.

Adjusting screw	Valve clearance	Note
Turn clockwise	decreases	The plug is difficult to ignite.
Turn anticlockwise	increases	Engine is hard to start and easy to stall.

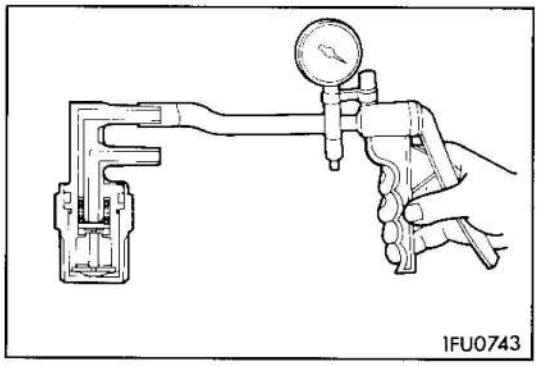
14. INSPECTION AND ADJUSTMENT OF FAST IDLE

Refer to P.13-44.

NOTE
The fast idle adjusting screw is a Torx screw (M4).

15. INSPECTION OF AUXILIARY ACCELERATOR PUMP (AAP)

Refer to P.13-45.



16. INSPECTION OF THERMO VALVE (FOR AAP CONTROL)

Caution
When removing and installing, do not apply the spanner to the resin section of the thermo valve.

(1) Disconnect the vacuum hoses (white striped, black) and connect a hand vacuum pump to the nipple of thermo valve.

(2) Apply a vacuum to check the thermo valve.

Engine coolant temperature	Normal state
20℃(68°F) or less	Vacuum leaks
60℃(140°F) or more	Vacuum is maintained

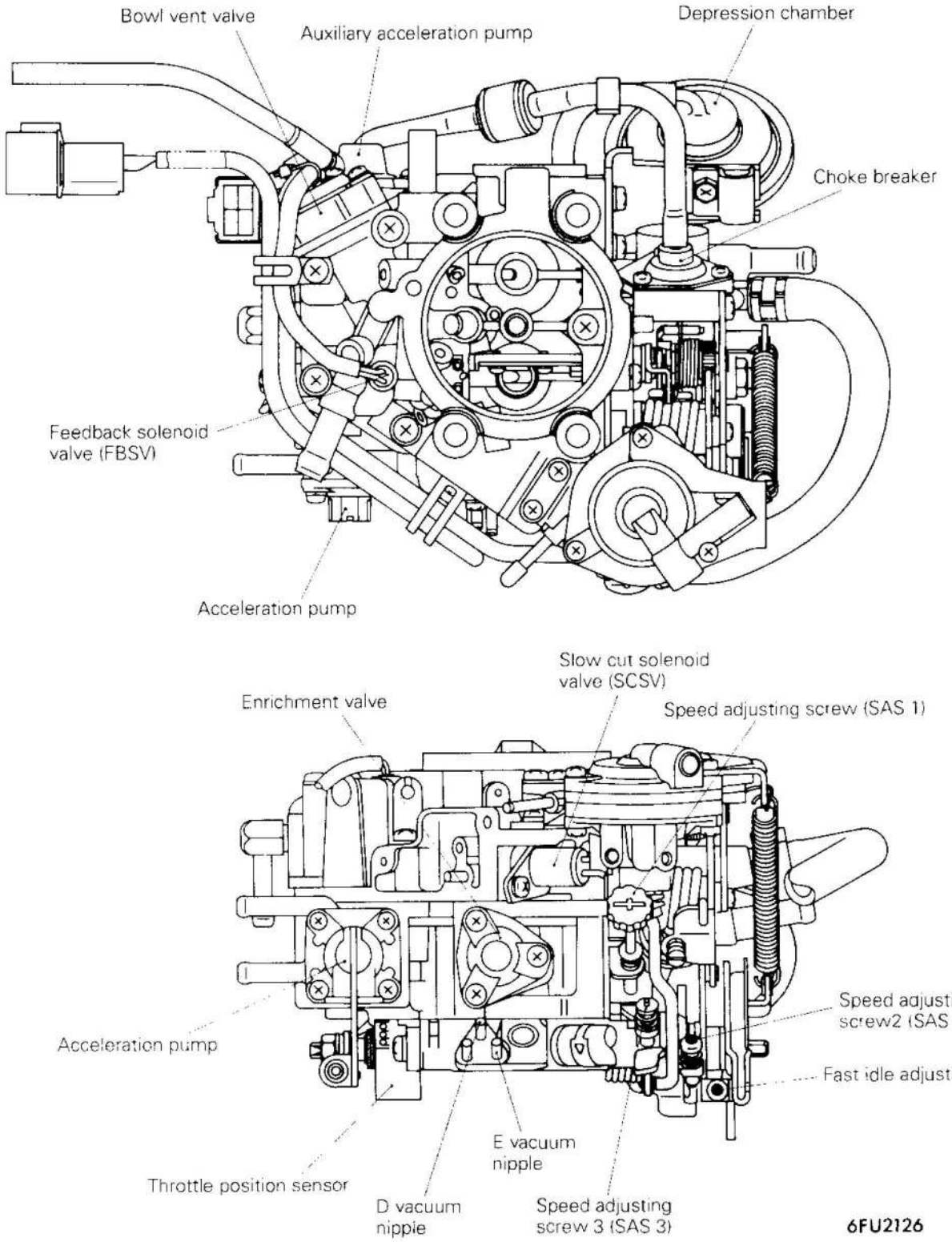
(3) After applying specified sealant to the thread section, tighten to the specified torque.

Specified sealant: 3M NUT Locking No.4171 or equivalent

Specified torque: 27 Nm (2.8 kgm, 20 ft.lbs.)

INSPECTION AND ADJUSTMENT OF FEEDBACK CARBURETOR (WAX CHOKE TYPE – Vehicles for Hong Kong, Singapore, Macao)

CARBURETOR APPEARANCE



1. INSPECTION OF DISTRIBUTOR ADVANCE CONTROL VACUUM (D VACUUM)

Refer to P.13-35.

2. INSPECTION OF EGR VALVE CONTROL VACUUM (E VACUUM)

Refer to P.13-35.

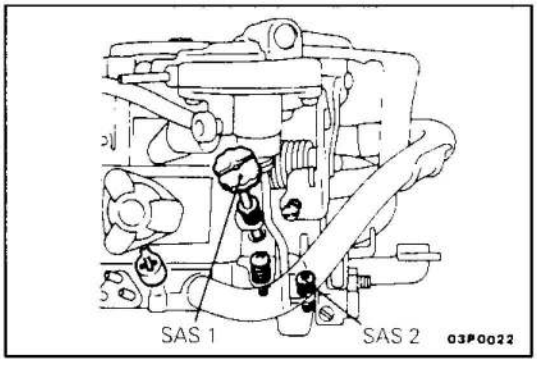
3. INSPECTION OF VACUUM SWITCH CONTROL VACUUM (F VACUUM)

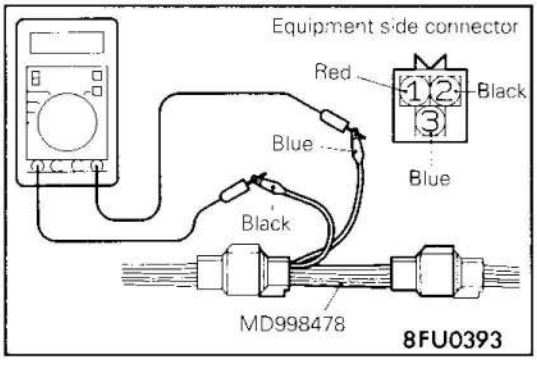
Refer to P.13-36.

4. THROTTLE POSITION SENSOR (TPS) ADJUSTMENT

(1) Warm up the engine until the engine coolant temperature increases to 80℃(176°F) or more to release the fast idle.
(2) Remove the air horn.
(3) Loosen the accelerator cable tension sufficiently.
(4) After backing out the speed adjusting screw 1 (SAS 1) sufficiently, check that the throttle valve is fully closed.
(5) If the throttle valve is not fully closed, back out the speed adjusting screw 2 (SAS 2) and the air conditioner throttle opener adjusting screw sufficiently to securely set the throttle valve to the fully closed position.

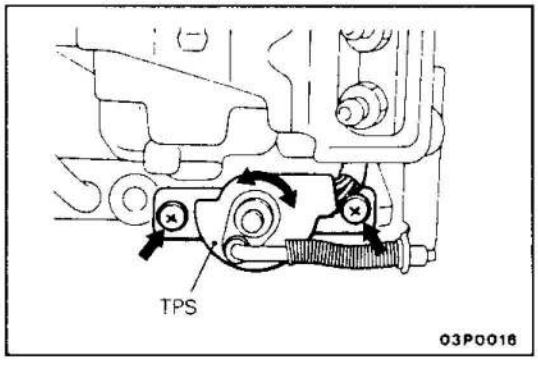
NOTE
At this time, make a note of how many turns the screws were backed out.





(6) Disconnect the throttle position sensor connector and connect the special tool (test harness) between the disconnected connector.
(7) Connect a digital type voltmeter between the throttle position sensor terminal 3 (blue clip: sensor output) and terminal 2 (black clip: sensor earth).
(8) Turn the ignition switch to "ON" (Do not start the engine.)
(9) Inspect the throttle position sensor output voltage.

Standard value: 230 – 270mV



(10) If the voltage is outside the standard value, adjust by loosening the throttle position sensor mounting screws and turning the throttle position sensor body. After adjusting, securely tighten the screws.
(11) Turn the ignition switch to "OFF".
(12) Turn in the screws that were backed out in step (5) until they are at their original positions.
(13) Adjust the accelerator cable tension.
(14) Adjust the idle speed.

5. INSPECTION OF CARBURETOR SECONDARY VALVE OPERATION

Refer to P.13-38.

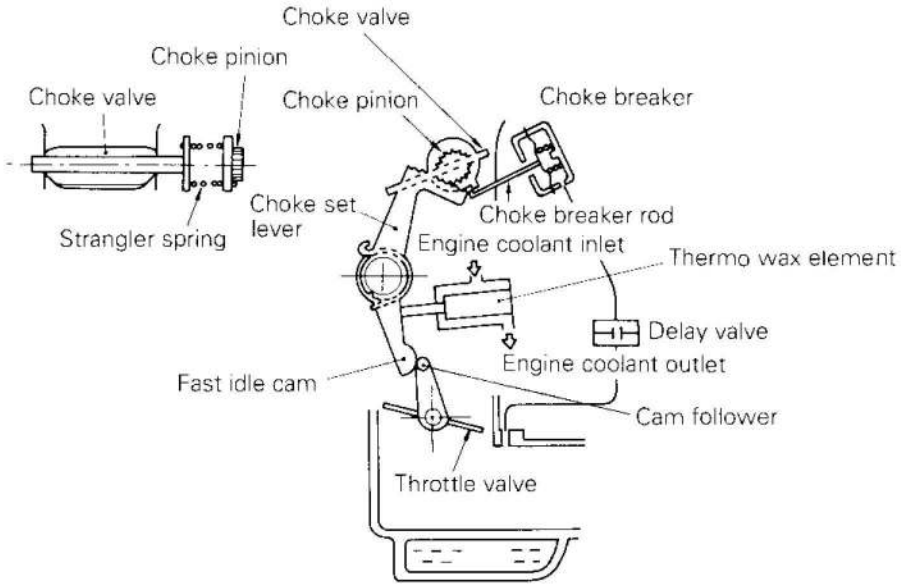
6. INSPECTION OF CARBURETOR ACCELERATION PUMP

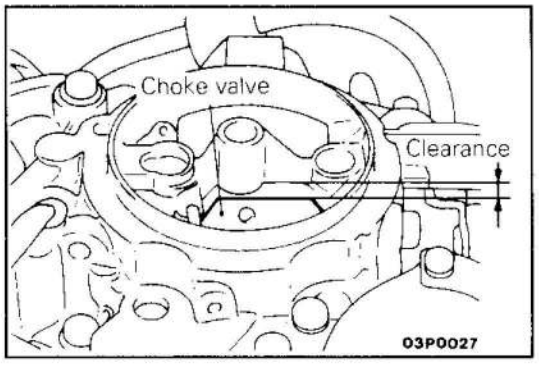
Refer to P.13-39.

7. INSPECTION OF CHOKE VALVE

Refer to P.13-39.

8. INSPECTION OF FULL-AUTO CHOKE





(1) Remove the air horn.
(2) Make sure that the engine coolant temperature is below 10℃(50°F).
(3) Inspect the condition of the choke valve according to the procedure in the table below.

Procedure	Inspection conditions	Normal choke valve condition
1	Before engine is started	Fully closed
2	After engine is started (After approx.6 seconds or more)	Slightly open (Choke breaker opening)
3	While engine is warming up	Opens in line with the increase in engine coolant temperature
4	After engine has warmed up	Fully open

9. CHOKE BREAKER OPENING ADJUSTMENT

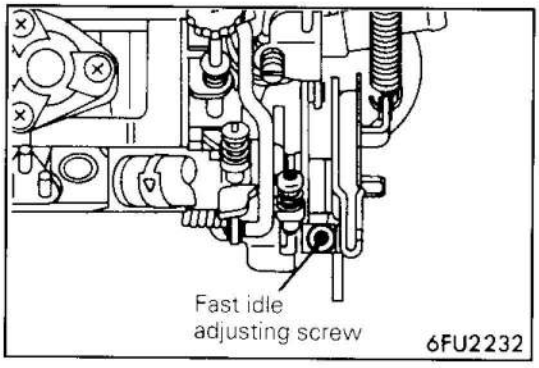
Refer to P.13-29.

Standard value: 2.1 – 2.3 mm (0.083 – 0.091 in.)

10. INSPECTION AND ADJUSTMENT OF FAST IDLE

(1) Make sure that the engine coolant temperature is below 10°C(50°F).

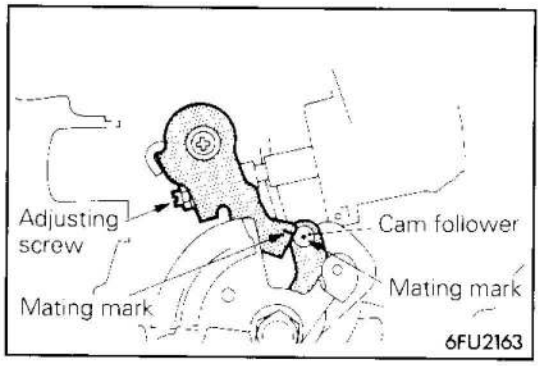
(2) Start the engine. Make sure that the engine idling speed during the warm-up period changes smoothly according to increase of the engine coolant temperature and becomes stable at the standard speed.



(3) If anything abnormal is detected in the above check, adjust the fast idle speed.

Adjusting screw turning direction	Fast idle speed
Clockwise	Increase
Counterclockwise	Decreases

NOTE
The fast idle adjusting screw is a Torx screw (M4).



(4) If the fast idle speed does not return to normal even when adjustment is made with the fast idle adjusting screw, carry out the following inspection.

1. Check if the cam lever mating mark (embossed line) and the cam follower mating mark (punched mark) are aligned when the thermo wax element temperature is 23°C(73.4°F).
   The mating marks correctly aligned at the factory, so they should not be moved unnecessarily.

Mating marks the thermo wax element temperature is 23°C(73.4°F)	Fast idle speed
Aligned	Normal
No aligned	Defective

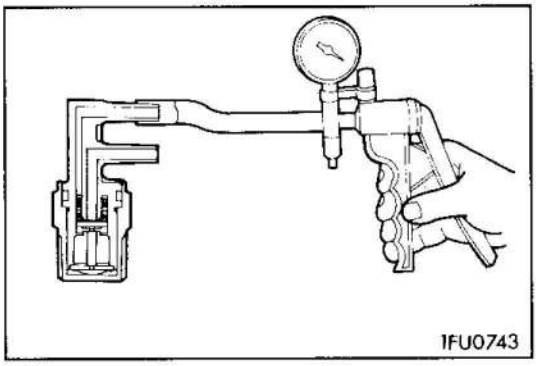
2. If the mating marks are not aligned, adjust using the adjusting screw.

11. INSPECTION AND ADJUSTMENT OF UNLOADER OPENING

Refer to P.13-31.

12. INSPECTION OF AUXILIARY ACCELERATOR PUMP (AAP)

Refer to P.13-45.



13. INSPECTION OF THERMO VALVE (FOR AAP CONTROL)

Caution
When removing and installing, do not apply the spanner to the resin section of the thermo valve.

(1) Disconnect the vacuum hoses (white striped, black) and connect a hand vacuum pump to the nipple of thermo valve.
(2) Apply a vacuum to check the thermo valve.

Engine coolant temperature	Normal state
40℃(104°F) or less	Vacuum leaks
80℃(176°F) or more	Vacuum is maintained

(3) After applying specified sealant to the thread section, tighten to the specified torque.

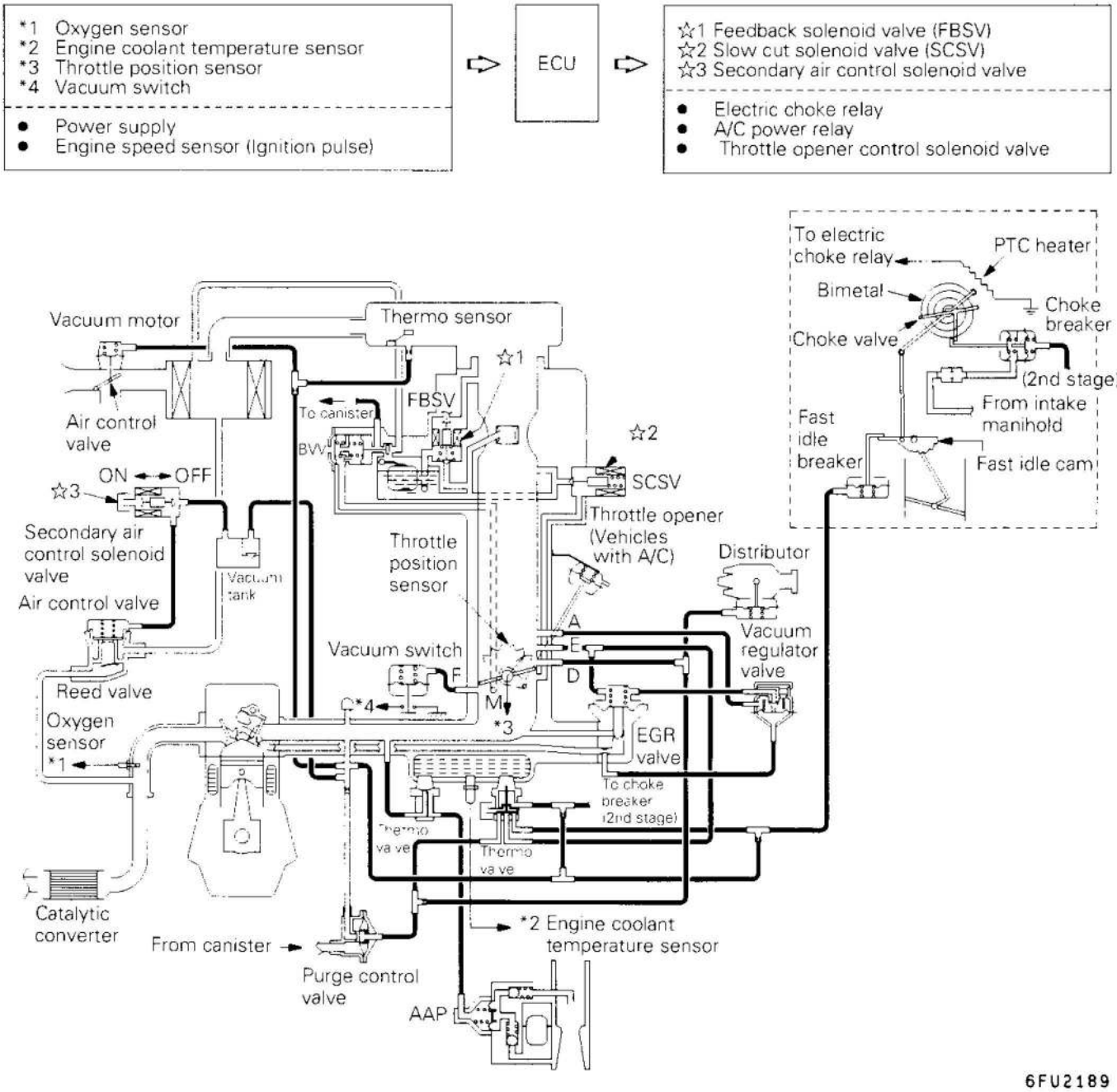
Specified sealant: 3M NUT Locking No.4171 or equivalent

Specified torque: 27 Nm (2.8 kgm, 20 ft.lbs.)

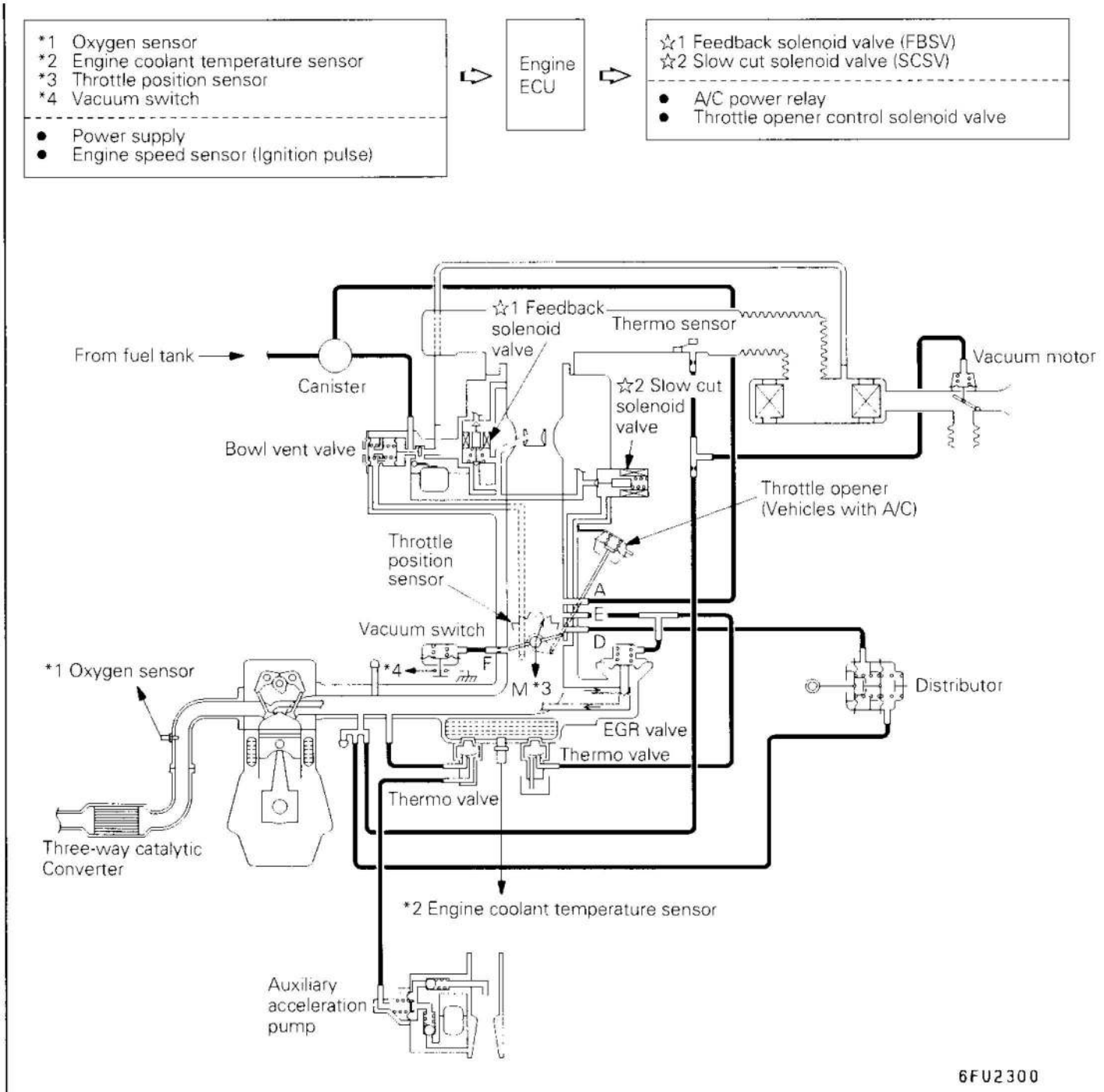
INSPECTION OF FBC SYSTEM

1. FBC SYSTEM DIAGRAM

<Electrical choke type>



<Wax choke type>



2. CAUTIONS OF INSPECTION

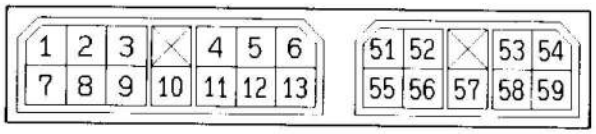
Refer to P.13-50.

3. CHECK PROCEDURE OF FBC FUEL CONTROL SYSTEM (METHOD USING ECI CHECKER)

Refer to P.13-50.

4. FBC SYSTEM CHECK PROCEDURE CHART (Use FBC Harnsee Connector - MD998475)

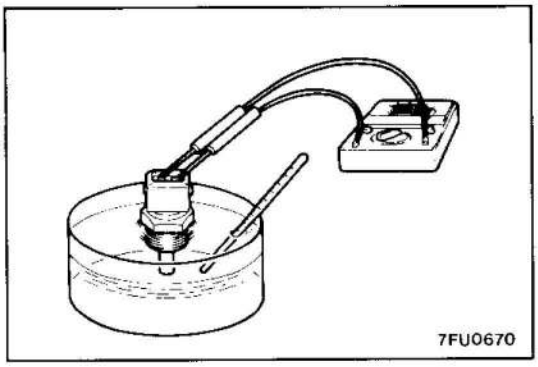
ECU Terminal

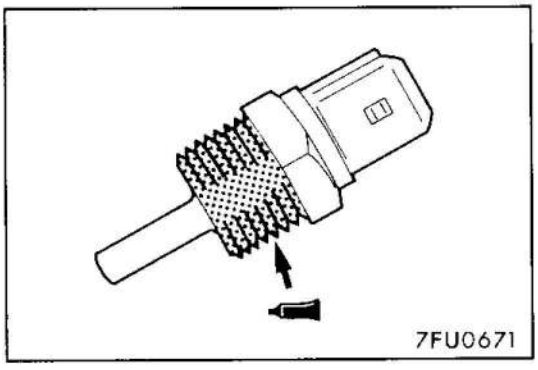


6FU2326

ECI checker operation		Check item	ECU terminal No.	Check condition		Normal condition
Select switch	Check switch					
A	1	Power supply	12	Ignition switch : ON		11 – 13V
	2	Engine speed sensor	5	Engine : Idling		4 – 10V
	3	Throttle position sensor	2	Ignition switch : ON	Set throttle valve to idle position	0.2 – 0.7V
					Fully open throttle valve	4.5 – 5.5V
	4	Vacuum switch	10	Engine : Idling	Set throttle valve to idle position	0 – 1V
					Slightly open throttle valve	11 – 13V
	5 *1	Electric choke relay	59	Ignition switch : ON		0 – 1V
				Engine : Idling		11 – 13V
B	1 *2	Ignition switch-ST	55	Engine : Cranking		8V or more
	2	Idle up control solenoid valve	57	A/C switch : ON (A/C compressor is operation)	Engine : Idling	0 – 1V
					Engine : 2000 r/min.	11 – 13V
	4	A/C power relay	54	· Engine : Idling · A/C switch : ON	Set throttle valve to idle position	0 – 1V
					Fully open throttle valve	11 – 13V (after approx. 5 seconds) ↓ 0 – 1V
	5	Engine coolant temperature sensor	3	Ignition switch : ON	0°C (32°F)	3.2 – 3.8V
					20°C (68°F)	2.3 – 2.9V
					40°C (104°F)	1.3 – 1.9V
					80°C (176°F)	0.3 – 0.9V
	6	Feedback solenoid valve	52	Ignition switch : ON		11 – 13V
				Engine : Idling after warming up		2 – 12V
	7	Slow cut solenoid valve	56	Engine : Idling after warming up		0 – 1V
				Decrease the engine speed from 4000 r/min. to the idle speed		Momentarily 11 – 13V
	8	Oxygen sensor	1	Engine : Run at 2000 r/min. after warming up (After 5 minutes have passed since engine warmed up)		0 – 1V ↑ (Changes repeatedly) ↓ 2 – 3V
	9 *1	Secondary air control solenoid valve	58	Engine : Idling, 70 seconds after start of warm engine		0 – 1V ↓ 11 – 13V
				Decrease the engine speed from 2000 r/min. to the idle speed		Momentarily drop
	10	Sensor impressed voltage	8	Ignition switch : ON		4.5 – 5.5V

NOTE
*1:Electrical choke type only
*2:Wax choke type only


7FU0670


7FU0671

INSPECTION OF SENSORS AND SWITCHES

1. INSPECTION OF ENGINE COOLANT TEMPERATURE SENSOR

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

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

Standard value : 2.1 – 2.7 kΩ [at 20°C (68° F)]
0.26 – 0.36 kΩ [at 80°C (176° F)]

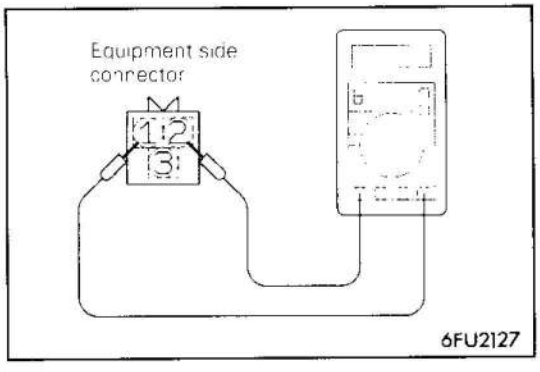
(3) If the resistance deviates from the standard value greatly, replace the sensor.
(4) Apply sealant threaded portion.

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

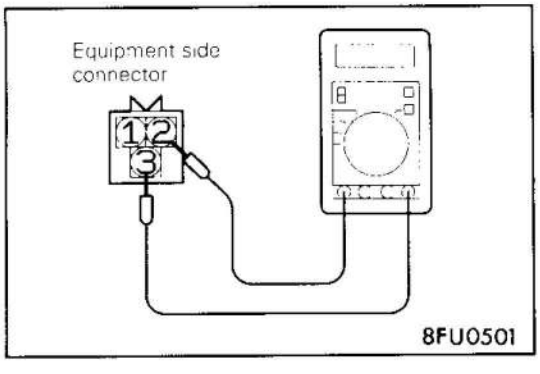
(5) Install engine coolant temperature sensor and tighten it to specified torque.

Sensor tightening torque: 30 Nm(3.0 kgm, 22 ft.lbs.)

(6) Fasten harness connectors securely.



6FU2127



8FU0501

2. INSPECTION OF THROTTLE POSITION SENSOR

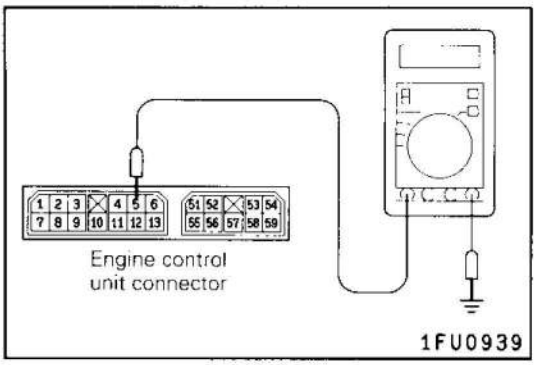
(1) Disconnect the throttle position sensor connector
(2) Measure the resistance between the throttle position sensor terminal 1 and terminal 2.

Standard value: 3.5 – 6.5 kΩ

(3) Measure the resistance between the throttle position sensor terminal 3 and terminal 2.

Throttle valve slowly opens until fully open from the idle position	Changes smoothly in proportion to the opening angle of the throttle valve

(4) If the resistance is outside the standard value, or if it doesn't change smoothly, replace the throttle position sensor.



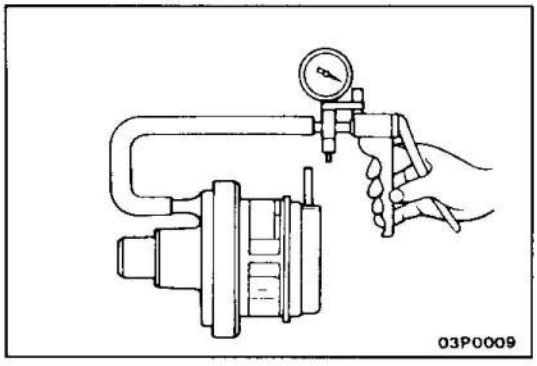
3. INSPECTION OF ENGINE SPEED SENSOR (IGNITION COIL⊖TERMINAL)

Check that there is continuity between the ignition coil (–) terminal and the engine control unit terminal No.5.

NOTE
Shake the harness connector to check for a lurking open circuit.

4. INSPECTION OF OXYGEN SENSOR

Refer to the section for 4G64 engine on P.13-76-66.

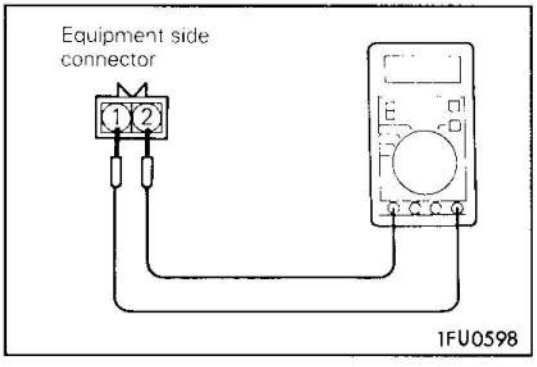


5. INSPECTION OF VACUUM SWITCH

(1) Disconnect the vacuum switch connector.

(2) Connect a hand vacuum pump to the nipple of vacuum switch.

(3) Apply a vacuum of 500 mmHg (20 in.Hg) and check that vacuum is maintained.



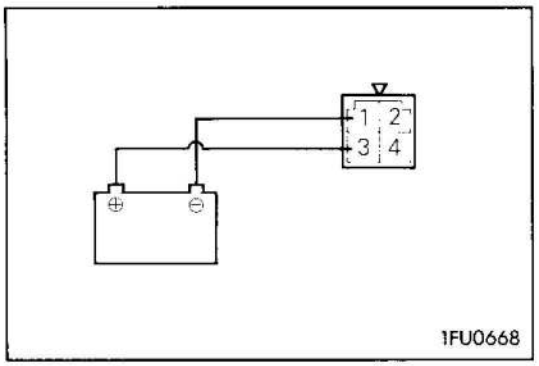
(4) Check continuity between the vacuum switch terminals.

Vacuum	Continuity
200 mmHg(7.9 in.Hg) or less	No continuity
350 mmHg(14 in.Hg) or more	Continuity

(5) If defective, replace the vacuum switch.

6. SIMPLE INSPECTION OF FEEDBACK SOLENOID VALVE (FBSV) – Electrical choke type

Refer to P.13-55.



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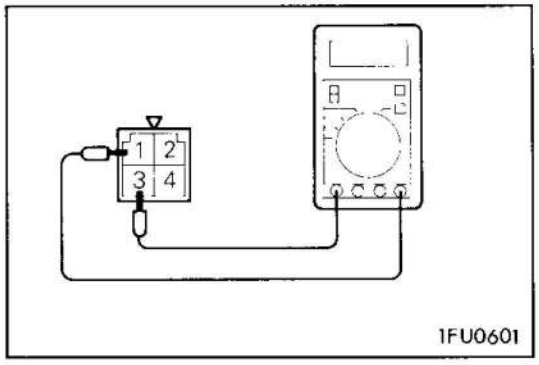


1FU0601

7. SIMPLE INSPECTION OF FEEDBACK SOLENOID VALVE (FBSV) – Wax choke type

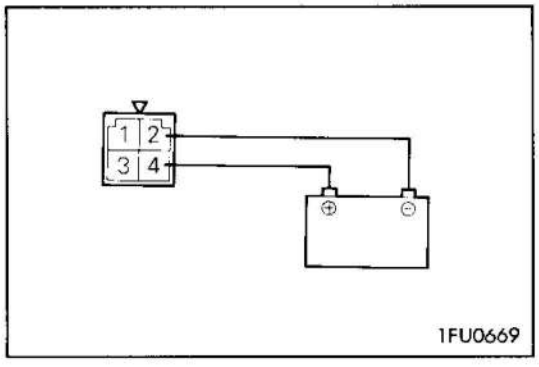
(1) Disconnect the feedback solenoid valve connector.
(2) Check that a operation sound (click) is heard when a battery voltage is applied between the feedback solenoid valve terminal 1 (to battery (–) terminal) and terminal 3 (to battery (+) terminal).

(3) Measure the resistance of the feedback solenoid valve coil.

Standard value: 54 – 66 Ω [at 20°C (68° F)]

8. SIMPLE INSPECTION OF SLOW CUT SOLENOID VALVE (SCSV) – Electrical choke type

Refer to P.13-56.



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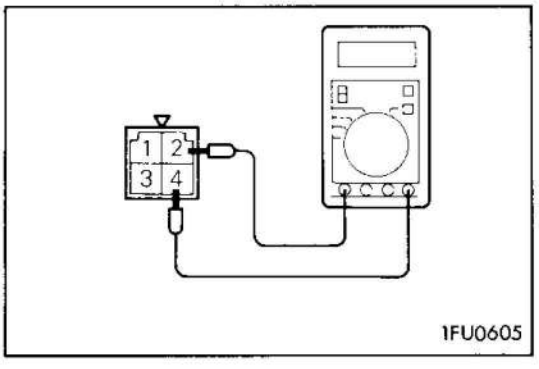


1FU0605

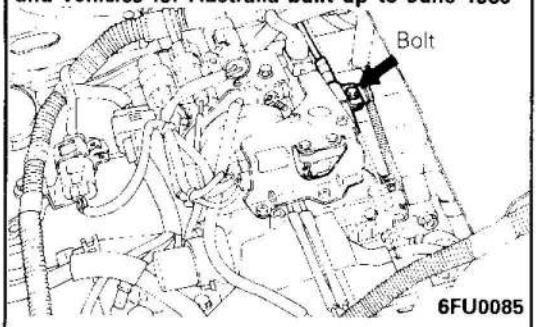
9. SIMPLE INSPECTION OF FLOW CUT SOLENOID VALVE (SCSV) – Wax choke type

(1) Disconnect the slow-cut solenoid valve connector.
(2) Check that an operation sound (click) is heard when a battery voltage is applied between the slow cut solenoid valve terminal 2 (to battery (–) terminal) and 4 (to battery (+) terminal).

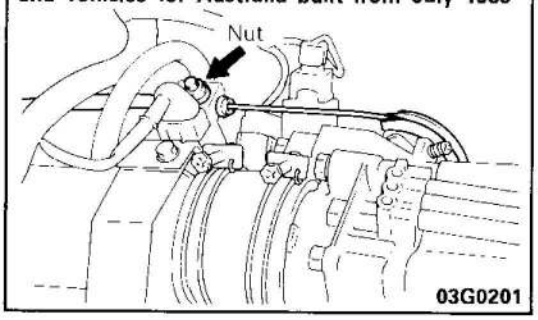
(3) Measure the resistance of the slow cut solenoid valve coil.

Standard value: 48 – 60 Ω [at 20°C (68° F)]

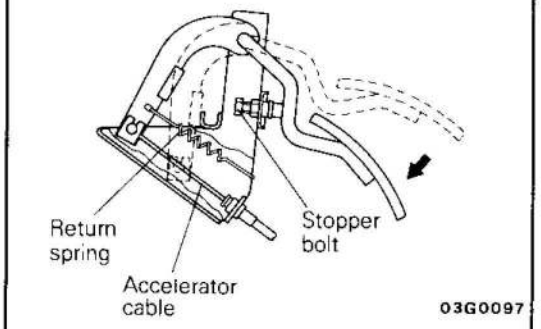
Vehicles for Europe built up to October 1989 and vehicles for Australia built up to June 1989



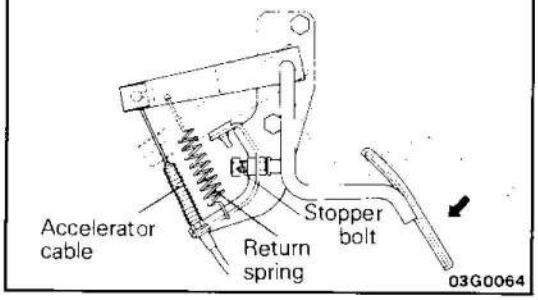
Vehicles for Europe built from November 1989 and vehicles for Australia built from July 1989

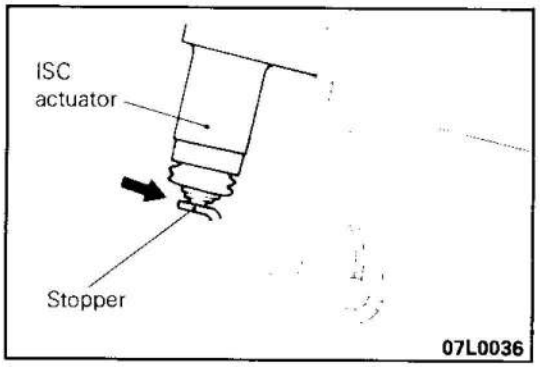


L.H. drive vehicles



R.H. drive vehicles





SERVICE ADJUSTMENT PROCEDURES (MPI) – Vehicles built up to May 1994

E13FCAG

GENERAL INSPECTION

1. INSPECTION AND ADJUSTMENT OF ACCELERATOR CABLE

(1) Turn air-conditioner and lamps OFF.
Inspect and adjust at no load.
(2) Warm engine until stabilized at idle.
(3) Confirm idle rpm is at prescribed rpm.
(4) Stop engine (ignition switch OFF).
(5) Confirm there are no sharp bends in accelerator cable.
(6) Check inner cable for correct slack.
(7) If there is too much slack or no slack, adjust play by the following procedures.
① Loosen accelerator cable fixing bolt (or nut). Fully close throttle valve.
② Adjust outer cable so that accelerator cable play is at the standard value and fix with fixing bolt A.

Standard value: Approx. 1 mm (0.04 in.)

③ Adjust so that accelerator pedal stopper touches pedal arm when throttle valve is fully opened.

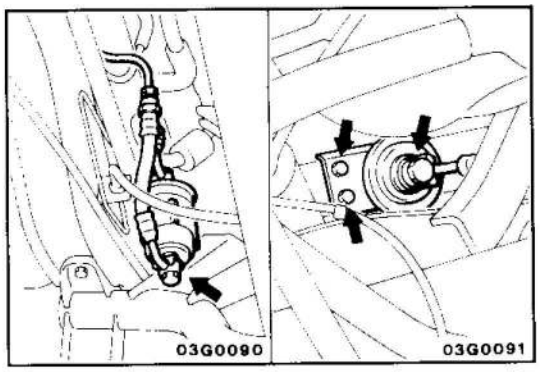
(8) After adjusting, confirm that throttle valve fully opens and closes by operating pedal.

(9) Adjust accelerator cable play and confirm throttle cable stopper touches ISC actuator.

Caution
The above inspection should be done after turning ignition switch ON (engine stopped) and leaving it in that condition for 15 seconds.

2. REPLACEMENT OF FUEL FILTER E13FZAC

(1) Reduce inner pressure of fuel line and hose. (Refer to P. 13–59.)

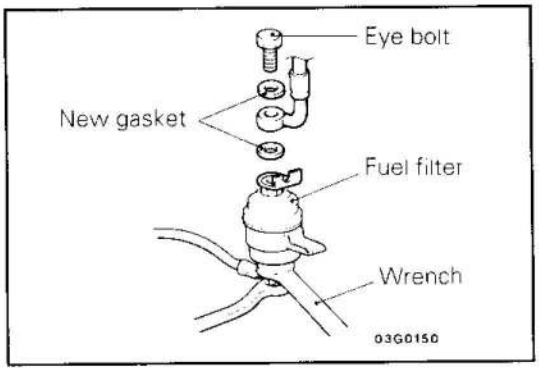


(2) Disconnect the high-pressure hose from the fuel filter and then, remove the fuel filter.

Caution
Plug the hose end with a cloth because the fuel may gush owing to remaining pressure in the fuel main line.

(3) Install a new gasket and fuel filter.
(4) Hold the fuel filter with a wrench and tighten the eye bolt to the specified torque.

Caution
Always use a wrench to tighten the eye bolt, or the fuel filter will be deformed.

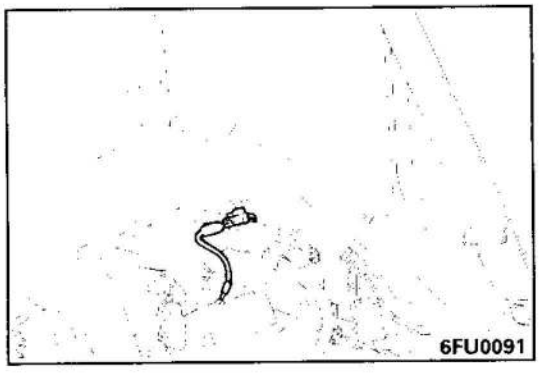


(5) Start the engine and check that there are no leaks at the connection between the fuel filter and high -pressure hose.

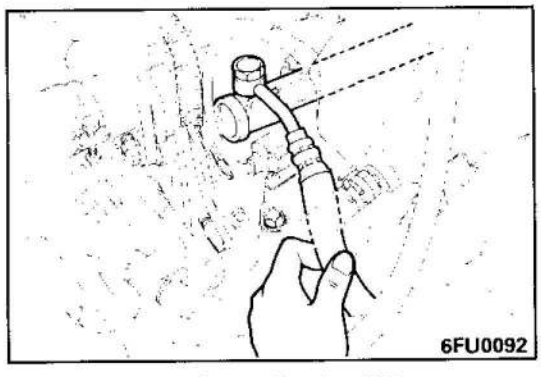
3. FUEL PUMP OPERATION CHECK E13FGCA

(1) Turn the ignition switch to OFF.
(2) Apply battery voltage to the fuel pump connector to check that the pump operates with a turning sound.

NOTE
The fuel pump is in-tank type and its operating sound is hard to hear without removing the fuel filter cap.

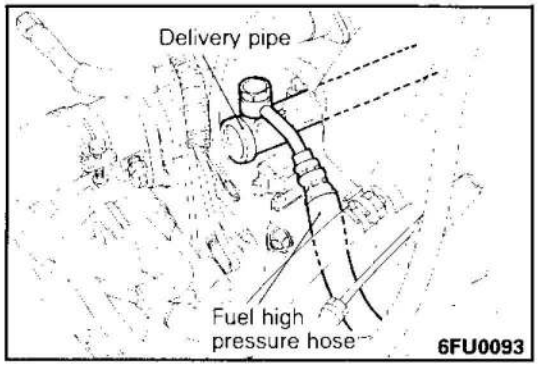


(3) Pinch the fuel hose with fingers to check that fuel pressure is felt.



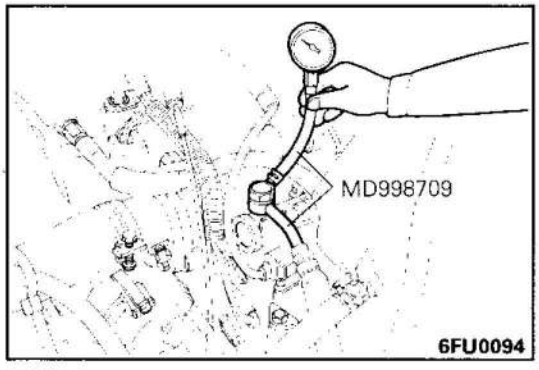
4. MEASUREMENT OF FUEL PRESSURE E13FIAB

(1) Make the following operations to release the pressure remaining in fuel pipe line so that fuel will not flow out.
① Disconnect the fuel pump harness connector at the fuel tank.
② Start the engine and after it stops by itself, turn the ignition switch to OFF.
③ Disconnect the battery (−) terminal.
④ Connect the fuel pump harness connector.

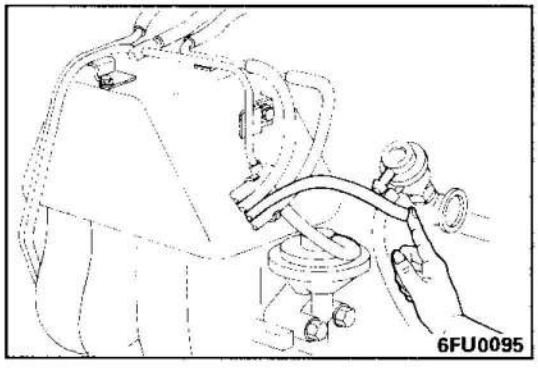


(2) Disconnect the fuel high pressure hose from the delivery pipe.

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.



(3) Using the special tool, install the fuel pressure gauge to the delivery pipe. Tighten the bolt at a torque of 25−35 Nm (2.5−3.5 kgm, 18−25 ft.lbs.).
(4) Connect the battery's negative (−) terminal.
(5) Apply battery voltage to the terminal for fuel pump drive and activate the fuel pump; then, with fuel pressure thus applied, check to be sure that there is no fuel leakage from the fuel pressure gauge or the special tool connection part.

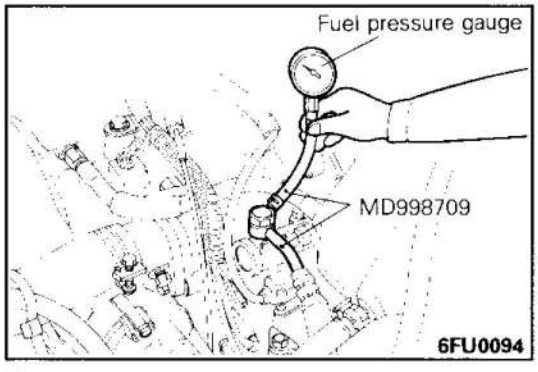


(6) Disconnect the vacuum hose from the pressure regulator and clog the vacuum hose tip. Measure the fuel pressure during idling.

Standard value:

Vehicles for Europe built up to November 1988 and Australia 245 – 265 kPa (2.5 – 2.7 kg/cm², 36 – 38 psi)

Vehicles for Europe built from December 1988 and Hong Kong 324 – 343 kPa (3.3 – 3.5 kg/cm², 47 – 50 psi)



(7) Measure the fuel pressure when the vacuum hose is connected to the pressure regulator.

Standard value:

Vehicles for Europe built up to November 1988 and Australia 186 kPa (1.9 kg/cm², 27 psi)

Vehicles for Europe built from December 1988 and Hong Kong 265 kPa (2.7 kg/cm², 38 psi)

(8) If the results of the measurements made in steps (6) and (7) above are not within the standard value, use the table below to determine the probable cause, and then make the necessary repair.

Fuel pressure	Probable cause	Remedy
Lower than specified	a. Clogged fuel strainer	a. Replace fuel strainer
	b. Faulty pressure regulator (regulator inside valve open)	b. Replace pressure regulator
	c. Faulty fuel pump	c. Replace fuel pump
Higher than specified	a. Faulty pressure regulator (regulator inside valve binding)	a. Replace pressure regulator
	b. Clogged fuel return hose or pipe.	b. Clean or replace hose or pipe.

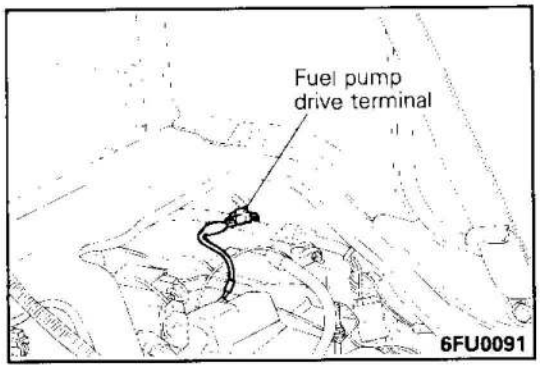
(9) Stop the engine and check change of fuel pressure gauge indication, which should not drop.
If the gauge indication drops, observe the rate of drop and determine and remove the causes according to the following table.

Fuel pressure	Probable cause	Remedy
Fuel pressure drops slowly after engine is stopped	a. Faulty injector (leaks due to trapped foreign matter)	a. Replace injector
Fuel pressure drops sharply immediately after engine is stopped	a. Faulty fuel pump (pump inside check valve binding)	a. Replace fuel pump
	b. Faulty pressure regulator (regulator inside valve fails to close)	b. Replace pressure regulator

(10) Release residual pressure from the fuel pipe line.
(11) Disconnect the fuel pressure gauge from the delivery pipe.

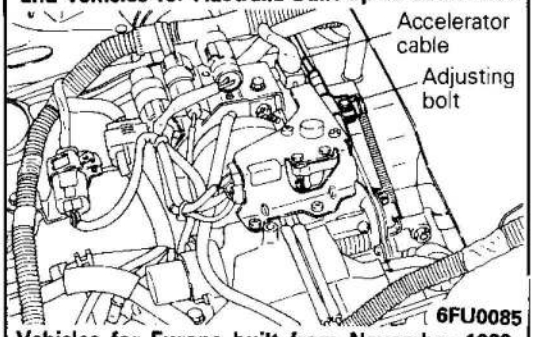
Caution
Cover the hose connection with rags to prevent splash of fuel that could be caused by some residual pressure in the fuel pipe line.

(12) Using a new gasket, connect the fuel high-pressure hose, and tighten at the specified torque.

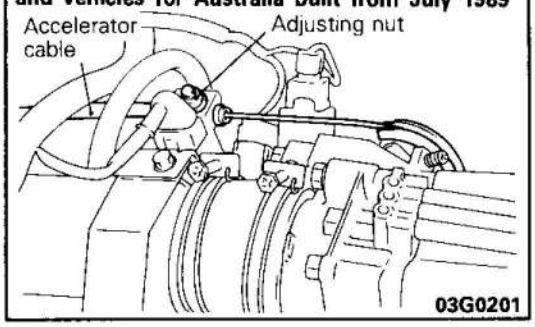


(13) Check for fuel leaks.
① Apply battery voltage to the fuel pump terminal to operate the fuel pump.
② With fuel pressure acting, check the fuel line for leaks.

Vehicles for Europe built up to October 1989 and vehicles for Australia built up to June 1989



Vehicles for Europe built from November 1989 and vehicles for Australia built from July 1989



5. IDLE SPEED CONTROL AND THROTTLE POSITION SENSOR ADJUSTMENT (Vehicles for Europe and Australia)

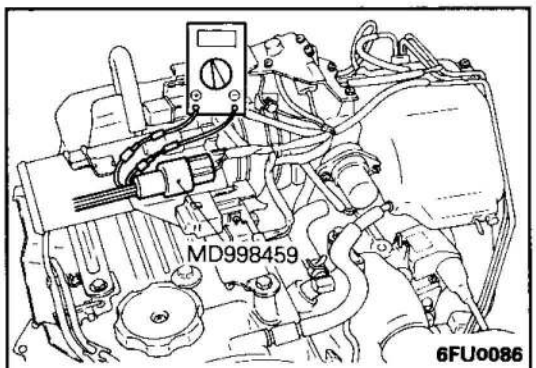
E13FWAD

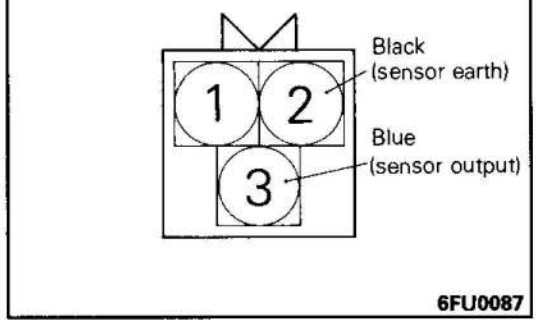
(1) Before inspection and adjustment set vehicle in the following condition:
- Engine coolant temperature: 80 – 90°C (176 – 194°F)
- Lights and accessories: Set to OFF
- Transmission: Neutral position ("P" position for vehicles with automatic transmission)

(2) Loosen accelerator cable to ensure sufficient slack.

(3) When using a multi-use tester (MUT) or MUT-II, connect it to the diagnosis connector.

NOTE
The output of the throttle position sensor of vehicles built up to December of 1988 may be read with the MUT or MUT-II.





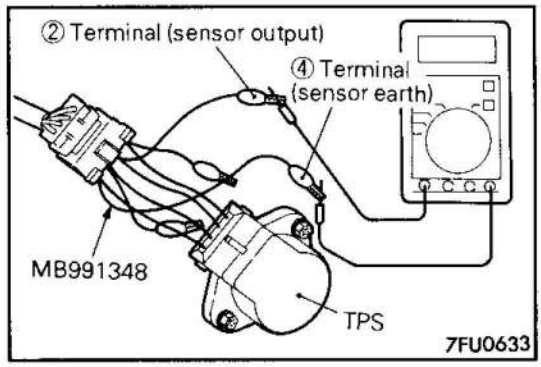
(4) When MUT or MUT-II is not used, perform the following tasks.

(Vehicles for Europe built up to October 1989 and vehicles for Australia built up to June 1989)

1 Disconnect the throttle position sensor connector.
2 Connect the special tool (harness connector) between the disconnected connectors.
3 Connect a digital type between the terminal ③ (sensor output) and the terminal ② (sensor earth) of the throttle position sensor connector.

NOTE
The connection of the throttle position sensor connector and special tool terminal should be as shown below.

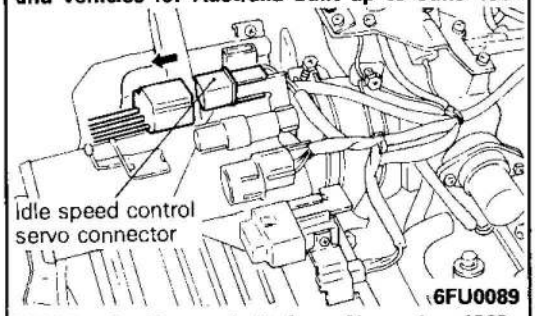
Throttle position sensor connector	Special tool
Terminal ③ (sensor output) and	Terminal Blue
Terminal ② (sensor earth) and	Terminal Black



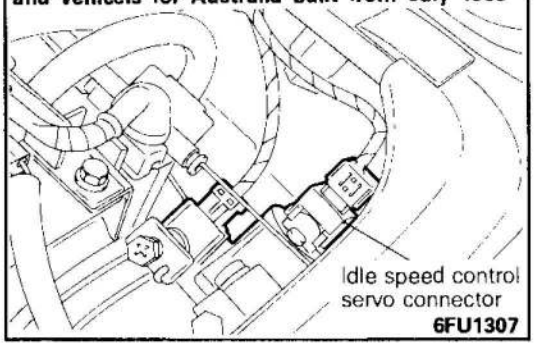
(Vehicles for Europe built from November 1989 and vehicles for Australia built from July 1989)

1 Disconnect the connector of the throttle position sensor and connect special tools (test harness set) between the disconnected connectors.
2 Connect a digital voltmeter between the ② terminal (sensor output) of the throttle position sensor and the ④ terminal (sensor earth).

Vehicles for Europe built up to October 1989 and vehicles for Australia built up to June 1989



Vehicles for Europe built from November 1989 and vehicels for Australia built from July 1989

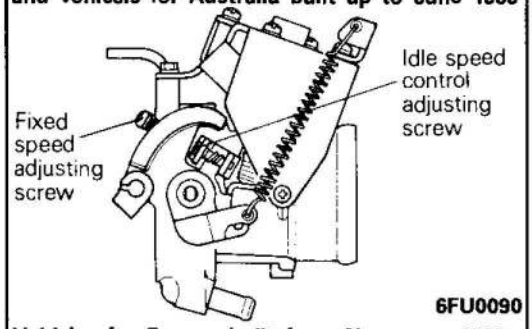


(5) Turn the ignition switch to ON (do not start the engine) and hold the switch in that position for 15 seconds or more to check that the idle speed control servo is set at the initial position (idle point).

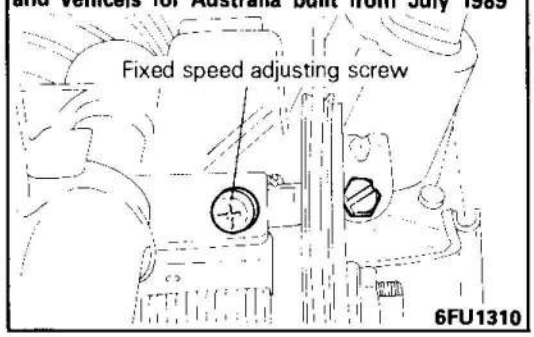
NOTE
When the ignition switch is turned to ON, the idle speed control servo extends to the fast idle position opening and in 15 seconds, it retracts and stops at the initial position.
Initial position: Position corresponding to idle opening, about 0.9 V motor position sensor output voltage.

(6) Turn the ignition switch "OFF".
(7) Disconnect the idle speed control servo connector and fix the idle speed control servo at the initial position.

Vehicles for Europe built up to October 1989 and vehicels for Australia built up to June 1989



Vehicles for Europe built from Novemver 1989 and vehicels for Australia built from July 1989



(8) In order to prevent binding of the throttle valve, open the throttle valve by hand to a half or more opening two or three times and then release it to allow to return with a snap. Then, loosen the fixed SAS enough.
(9) Start the engine and run idle.
(10) Check that the engine speed is as specified.

Standard value: Vehicles for Europe 750±50 r/min
Vehicles for Australia 800±50 r/min

Caution

1. **The engine speed may be 20 – 100 r/min lower on a new vehicle [driven about 500 km (300 miles) or less], but adjustment is not necessary.**
2. **If engine stalling occurs or the engine speed is low even though the vehicle has been driven about 500 km (300 miles) or more, it is probable that there are deposits adhering to the throttle valve, so it should be cleaned.**

NOTE
If MUT or MUT-II is used, enter code number 22 and read the idle speed on the display.

(11)If the engine speed is not as specified, adjust by the idle speed control adjusting screw for the standard rpm.

Caution
When turning the idle speed control adjusting screw, use hexagon wrench whenever possible. To prevent the screw from becoming loose due to backlash of the screw, make the adjustment only when it is turned in the tightening direction.

(12)Tighten the fixed SAS until the engine speed starts to increase. Then, loose it until the engine speed ceases to drop (touch point) and then loose a half turn from the touch point.

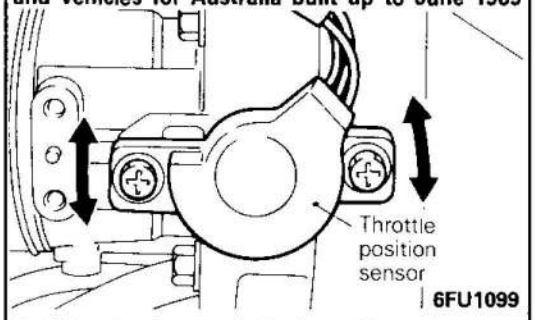
(13)Stop the engine.

(14)Turn the ignition switch to ON (engine does not start) and check that the throttle position sensor output voltage is as specified.

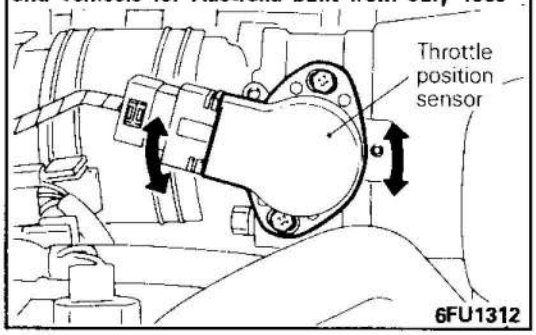
Standard value: 0.48 – 0.52 V

NOTE
If MUT or MUT-II is used, enter code number 14 and read the throttle position sensor output voltage on display.

Vehicles for Europe built up to October 1989 and vehicles for Australia built up to June 1989



Vehicles for Europe built from November 1989 and vehicels for Australia built from July 1989



(15)If it is out of specification, loose throttle position sensor mounting screws and adjust by turning the throttle position sensor.

Caution
Tighten the screws securely after adjustment.

(16)Turn ignition switch to OFF.

(17)Adjust the accelerator cable play.

(18)Connect the idle speed control servo connector.

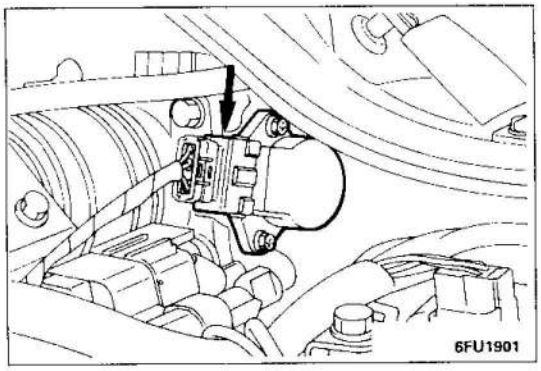
(19)Disconnect the special tool (harness connector) and voltmeter, and connect the throttle position sensor connector.

(20)Start the engine and check to be sure that the idling speed is correct.

Standard value: Vehicles for Europe 750±100 r/min
Vehicles for Australia 800±100 r/min

(21)Turn the ignition switch to OFF and disconnect the battery terminal for 15 seconds or more and then reconnect. (This erases the data stored in diagnosis memory during the idle speed control adjustment.)

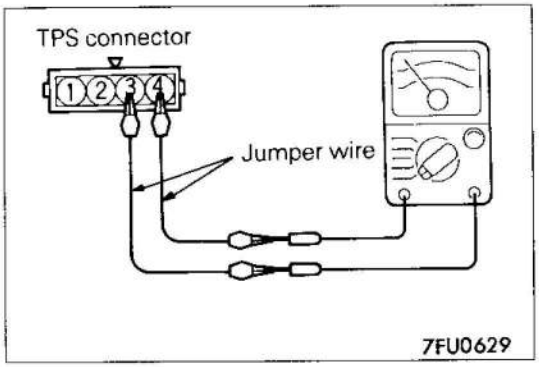
(22)Start the engine once again and let it idle for about 5 minutes. Check that the idling condition is normal.



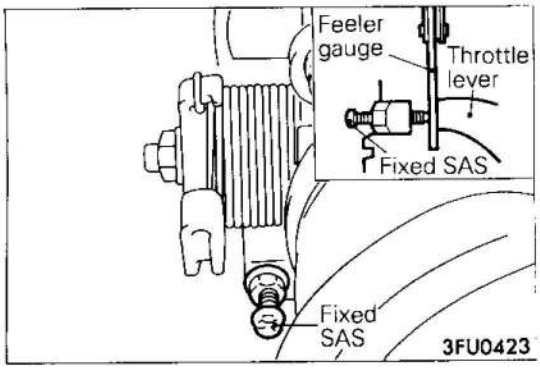
6. IDLE POSITION SWITCH AND THROTTLE POSITION SENSOR ADJUSTMENT (Vehicles for Hong Kong)

E13HAKD2

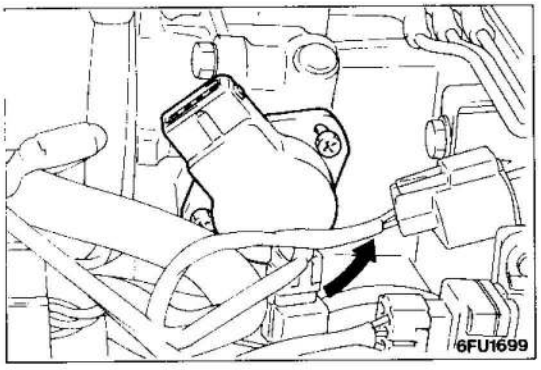
(1) Disconnect the connector of the throttle position sensor.



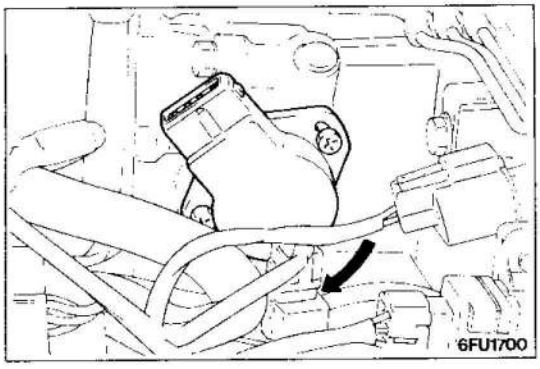
(2) Using jumper wires, connect an ohmmeter across terminal ③ (idle position switch) and terminal ④ (sensor earth) of the throttle position sensor.



(3) Insert a 0.65 mm (0.0256 in.) thick feeler gauge between the fixed SAS and throttle lever.



(4) Loosen the throttle position sensor mounting bolts and turn the throttle position sensor body fully counterclockwise.
(5) In this condition, check that there is continuity across terminals ③ and ④.

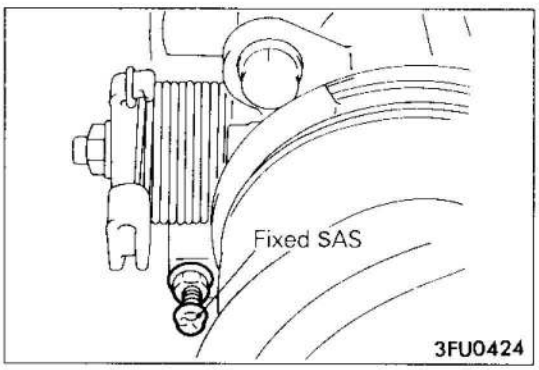


(6) Slowly turn the throttle position sensor clockwise until you find a point at which there is no continuity across terminals ③ and ④. Then, tighten the throttle position sensor mounting bolt securely.
(7) Connect the throttle position sensor connector.

(8) Connect the multi use tester (MUT) or MUT-II to the diagnosis connector.
(9) Turn the ignition switch ON (but do not start the engine).
(10) Using the MUT, select item No. 14 and read the throttle position sensor output voltage.

Standard value: 400 – 1,000 mV

(11) If the voltage is out of specification, check the throttle position sensor and associated harnesses.
(12) Remove the feeler gauge.
(13) Turn the ignition switch OFF.



7. FIXED SAS ADJUSTMENT (Vehicles for Hong Kong) E13HAMC2

NOTE
1. The fixed SAS has been factory-adjusted. Never attempt to move it.
2. Should it be out of proper adjustment, adjust by following the procedure given below.

(1) Sufficiently slacken the accelerator cable.
(2) Loosen the lock nut on the fixed SAS.
(3) Sufficiently loosen the fixed SAS by turning it counter-clockwise to fully close the throttle valve.
(4) Tighten the fixed SAS slowly to find a point at which it contacts the throttle lever (where the throttle valve starts opening). From that point, tighten the fixed SAS further 1 1/4 turns.
(5) Holding the fixed SAS to prevent it from turning, tighten the lock nut securely.
(6) Adjust the accelerator cable tension. (Refer to P.13-57.)
(7) Adjust the basic idle speed. (Refer to P.13-61.)
(8) Adjust the idle position switch and throttle position sensor (TPS). (Refer to P.13-61.)

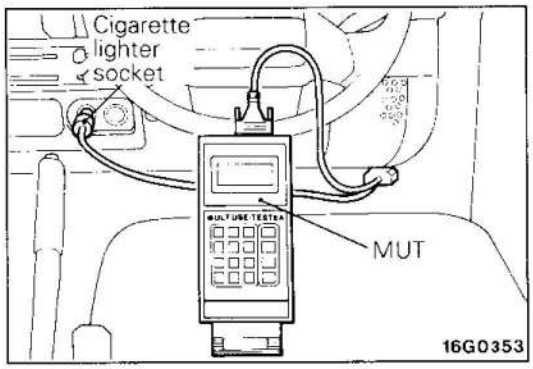
8. BASIC IDLE SPEED ADJUSTMENT (Vehicles for Hong Kong) E13HANE

NOTE
1. The basic idle speed has been factory-adjusted with the speed adjusting screw (SAS) and does not normally require adjustment.
2. If the adjustment is required, first check that the ignition plug, injector, ISC servo, and compression pressure are normal.

(1) Before starting the inspection and adjustment procedures, set the vehicle in the following conditions:
- Engine coolant temperature: 80 to 90°C (176 to 194°F)
- Lights, electric cooling fan, accessories: OFF
- Transmission: P range
- Steering wheel: Straightforward position

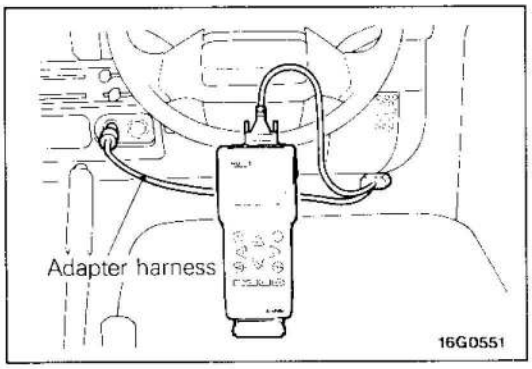
(2) Connect the multi-use tester (MUT) or MUT-II a primary voltage detection-type tachometer to the diagnosis connector.

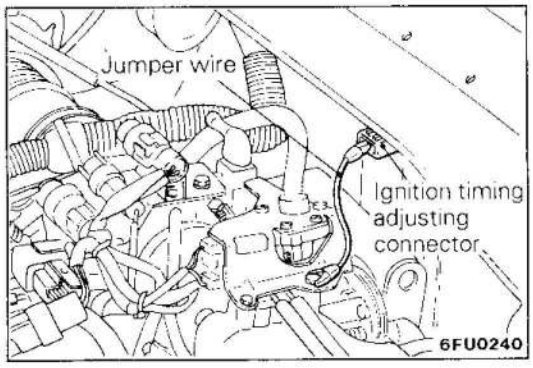
NOTE
When the MUT or MUT-II is connected, the diagnosis control terminal will be earthed.



(3) Remove the waterproof female connector from the ignition timing adjusting connector (brown).

(4) Using a jumper wire, earth the ignition timing adjusting terminal.



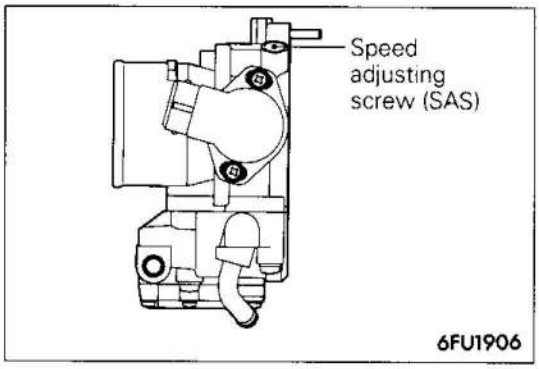


(5) Start the engine and run at idle.

(6) Check the basic idle speed.
Using the MUT or MUT-II, select item No. 22 and read the idle speed.

Standard value: 750 ±50 r/min.

NOTE
1. The engine speed may be low by 20 to 100 r/min. while the vehicle is new [distance driven approx. 500 km (300 miles) or less], but no adjustment is necessary.
2. If the engine stalls or speed is low despite a sufficient distance driven [approx. 500 km (300 miles) or more], it is probably due to deposits on the throttle valve. In this case, clean the throttle valve. (Refer to P.13-63.)



(7) If the basic idle speed is out of specification, adjust by turning the speed adjusting screw (SAS).

NOTE
If the idle speed is higher than the standard value even with SAS fully tightened, check to see if there is evidence of the fixed SAS being moved. If the fixed SAS seems to have been moved, adjust it. If it does not seem to have been moved, there may be a leak caused by deteriorated fast idle air valve (FIAV). In such a case, replace the throttle body.

(8) Turn the ignition switch OFF.
(9) Remove the jumper wire from the ignition timing adjusting terminal and replace the connector back again.
(10) Start the engine again and run at idle for 10 minutes to make sure that the engine runs at proper idle speed.

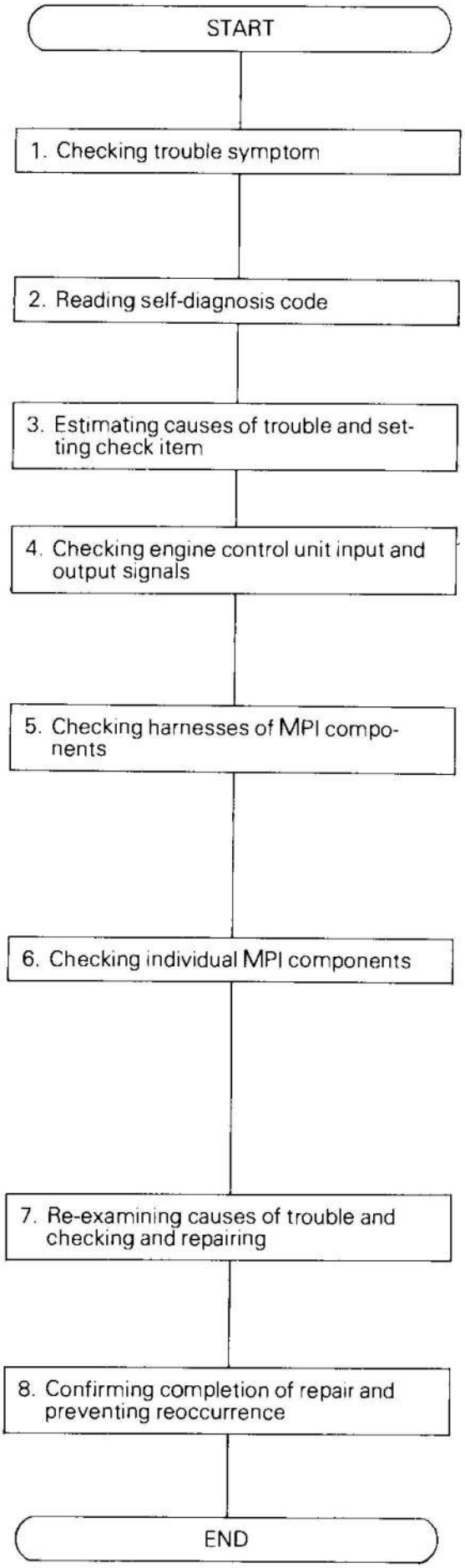
THROTTLE BODY (THROTTLE VALVE AREA) CLEANING

E13FGDO

1. Start the engine and warm it up until the temperature of the engine coolant reaches 80°C (176°F) or higher; then stop the engine.
2. Disconnect the air intake hose at the throttle body side.
3. Spray cleaning liquid (from the intake port of the throttle body) onto the valve, and then leave as is for about 5 minutes.
4. Start the engine and race it a few times; then let it run at idle speed for about 1 minute.

   NOTE
   If the engine idling speed is unstable (or the engine stalls), let the engine run with the throttle valve slightly open.

5. If deposits are not removed from the throttle valve, repeat steps (3) and (4).
6. Connect the air intake hose.
7. Disconnect the battery's earth cable for 10 seconds or longer and then reconnect it.
8. Adjust the basic idle speed. (Refer to P.13-61.)
9. Make the adjustment of the throttle-position sensor. (Refer to P.13-61.)

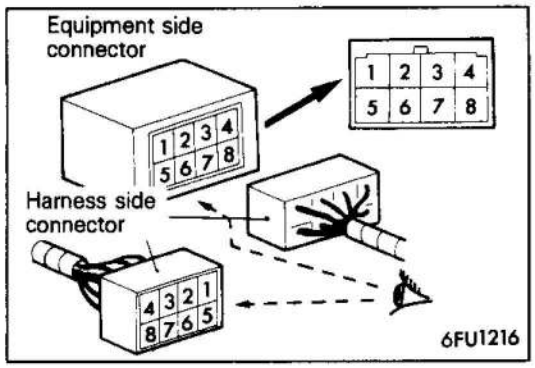


TROUBLESHOOTING – Vehicles for Europe built from December 1988 and vehicles for Hong Kong E13EHAB

EXPLANATION OF TROUBLESHOOTING PROCEDURES

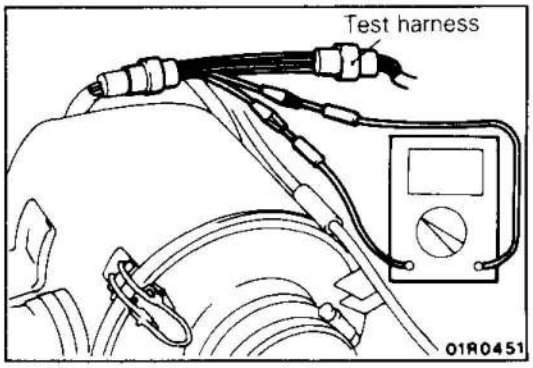
The effective troubleshooting procedures for troubles of the MPI system are explained in the following.

1. Checking trouble symptom
   - Reproduce the problem symptom and check the contents of the trouble and the conditions under which the symptom occurs (engine condition, operating state, etc.).
2. Reading self-diagnosis code
   - Read the self-diagnosis code and when a fault code is output, correct the fault referring to the diagnostic chart.
3. Estimating causes of trouble and setting check item
   - Referring to CHECK CHART CLASSIFIED BY PROBLEM SYMPTOMS, determine the check items and procedures to be followed.
4. Checking engine control unit input and output signals
   - Using a multi-use tester or oscilloscope, check the input and output signals of the engine control unit.
   - If the input and output signals are normal, the sensor input/actuator control is judged as normal. Then, check the input and output signals of the next check item.
5. Checking harnesses of MPI components
   - If the input and output signals of the engine control unit are not normal, check the body harnesses of the MPI components and repair as necessary.
   - After repair, check the input and output signals of the engine control unit again. If they are normal this time, check the input and output signals of the next check item.
6. Checking individual MPI components
   - If the body harnesses are normal but the input and output signals of the engine control unit are abnormal, check the MPI components individually and repair or replace as necessary.
   - After repair or replacement, check the input and output signals of the engine control unit again. If they are normal this time, check the input and output signals of the next check item.
7. Re-examining causes of trouble and checking and repairing
   - If the harness check and individual component check have resulted normal but the input and output signals of the engine control unit are abnormal, re-examine the causes of trouble referring to the troubleshooting hints. Then, check and repair including other groups.
8. Confirming completion of repair and preventing reoccurrence
   - Try to reproduce the problem symptom to make sure that the symptom will not occur again.
   - Remove the true cause of the trouble to prevent its reoccurrence.

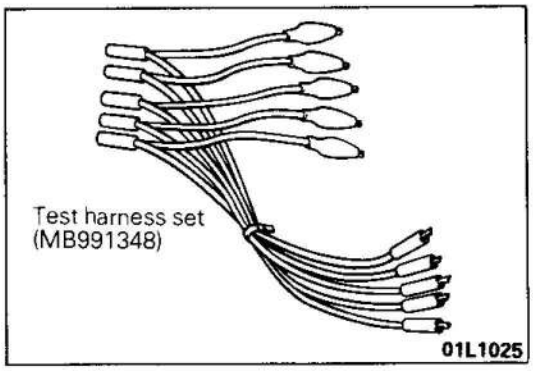


EXPLANATION AND CAUTIONS ABOUT HARNESS CHECK

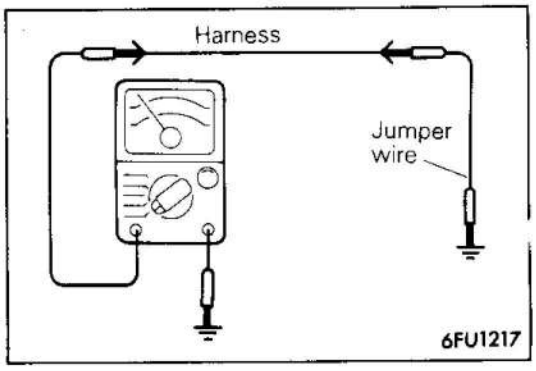
- The connector symbols show the pin arrangement as seen from the terminal end of the connector actually mounted in the vehicle.



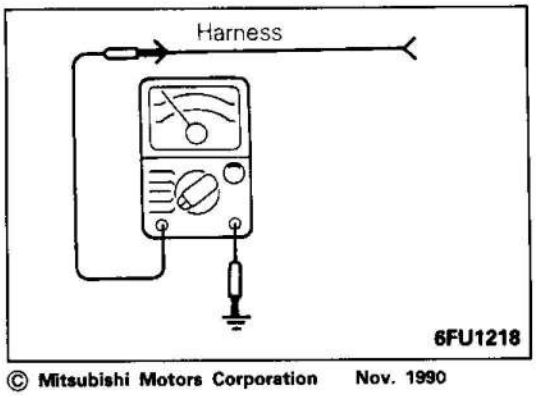
- When checking a waterproof connector with the circuit in live state, be sure to use the test harness (special tool). Inserting the test probe from the harness side will adversely affect waterproof performance, which may lead to corrosion. Never do so, therefore.



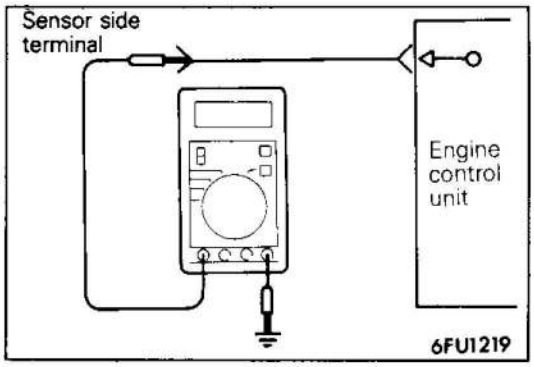
- If the appropriate test harness for the particular connector is not available, the use of the Test Harness Set (MB991348) which can be connected directly between the terminals is recommended.
- When checking the terminal voltage with the connector disconnected, do not insert the test probe if the check terminal is female.
  If the test probe is forced into the terminal, poor contact may be caused.

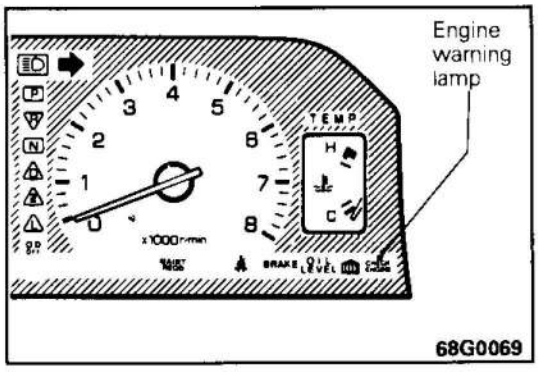


- When checking for open circuit of a harness with both ends fairly separated physically, use a jumper wire to earth one end and check continuity between the other end and earth. This allows to check if the harness has an open circuit. If there is no continuity, repair the harness.



- When checking a harness for short-circuit to earth, open one end of the harness and check continuity between the other end and earth. If there is continuity, the harness is short-circuited to earth. Then, repair the harness.





- If the power supply voltage to the sensor is not normal, repair the harness. If the voltage is still abnormal, replace the engine control unit and check the voltage again.

ENGINE WARNING LAMP (CHECK ENGINE LAMP)

Among the self-diagnosis items, a engine warning lamp comes on to notify the driver of the emission control items when an irregularity is detected.
However, when an irregular signal returns to normal and the engine control unit judges that it has returned to normal, the engine warning lamp goes out.
Moreover, when the ignition swtich is turned off, the lamp goes out. Even if the ignition switch is turned on again, the lamp does not come on until the irregularity is detected.
Here, immediately after the ignition switch is turned on, the engine warning lamp is lit for 5 seconds to indicate that the warning lamp operates normally.

ITEMS INDICATED BY ENGINE WARNING LAMP

Engine control unit	Motor position sensor (Vehicles for Europe)
Oxygen sensor	Crank angle sensor
Air-flow sensor	Top dead center sensor
Intake air temperature sensor	Barometric pressure sensor
Throttle position sensor	Injector
Engine coolant temperature sensor	Fuel pump
	Ignition timing adjustment signal (Vehicles for Hong Kong)

Caution – Vehicles for Hong Kong
Engine warning lamp will come on when the line of terminal for ignition timing adjustment is short-circuited. Therefore, the lamp will come on even when the terminal for ignition timing adjustment is earthed at the time of adjusting ignition timing. In this case, however, it is not abnormal.

ENGINE WARNING LAMP INSPECTION

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

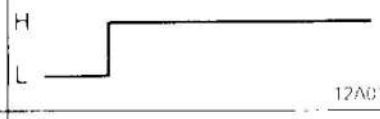
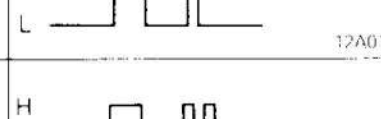
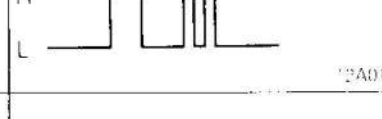
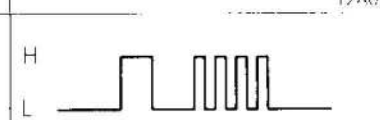
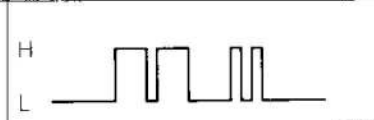
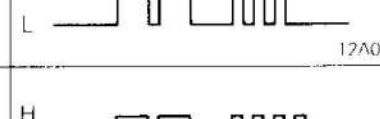
SELF-DIAGNOSIS – Vehicles for Europe built from December 1988, and vehicles for Hong Kong

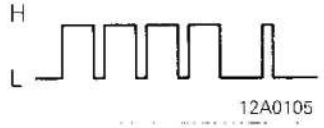
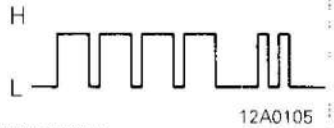
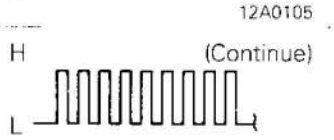
The engine control unit monitors the input/output signals (some signals at all times and the others under specified conditions) of the engine control unit.
When it is noticed that an irregularity has continued for a specified time or longer from when the irregular signal is initially monitored, passing 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 14 diagnosis items and the diagnosis results can be read out with a voltmeter or multi-use tester.
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.

Caution
If the sensor connector is disconnected with the ignition switch turned on, the diagnosis code is memorized. In this case, disconnect the battery terminal (–) for 10 seconds or more, and the diagnosis memory will be erased.

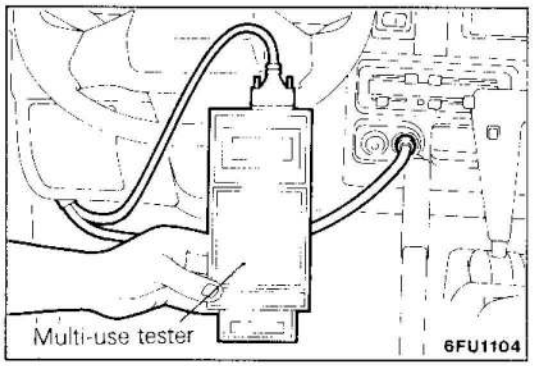
The 14 disgnosis items are provided as follwing pages, and if plural items are activated, they are all indicated sequentially from the smallest code nember.

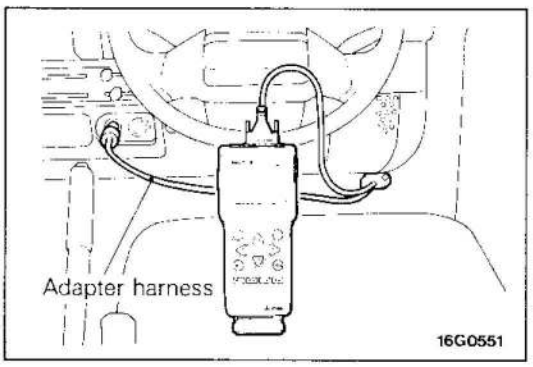
DIAGNOSIS CHART

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	Motor position sensor (Vehicles for Europe)	 12A0104	15	Retained	• Harness and connector • Motor position sensor
7	Engine coolant temperature sensor	 12A0107	21	Retained	• Harness and connector • Engine coolant temperature sensor
8	Crank angle sensor	 12A0107	22	Retained	• Harness and connector (If harness and connector are normal, replace distributor assembly.)
9	No. 1 cylinder top dead centre sensor	 12A0107	23	Retained	• Harness and connector (If harness and connector are normal, replace distributor assembly.)
10	Vehicle speed sensor (reed switch)	 12A0107	24	Retained	• Harness and connector • Vehicle speed sensor (reed switch)
11	Barometric pressure sensor	 12A0107	25	Retained	• Harness and connector (If harness and connector are normal, replace barometric pressure sensor assembly.)
12	Ignition timing adjustment signal (Vehicles for Hong Kong)	 12A0107	36	–	• Harness and connector

Output preference order	Diagnosis item	Malfunction code: Output signal pattern	Malfunction code: No.	Memory	Check item (Remedy)
13	Injector	 12A0105	41	Retained	• Harness and connector • Injector coil resistance
14	Fuel pump	 12A0105	42	Retained	• Harness and connector • Control relay
15	Servo valve position sensor (Vehicles for Hong Kong)	 12A0105	55	Retained	• Harness and connector • ISC servo (If harness and connector are normal, replace ISC servo assembly.)
16	Normal state	 (Continue) 12A0104	–	–	–

NOTE
Replace the engine control unit if a malfunction code is output although the inspection reveals that there is no problem with the check items.





READING/ERASING THE MALFUNCTION CODES

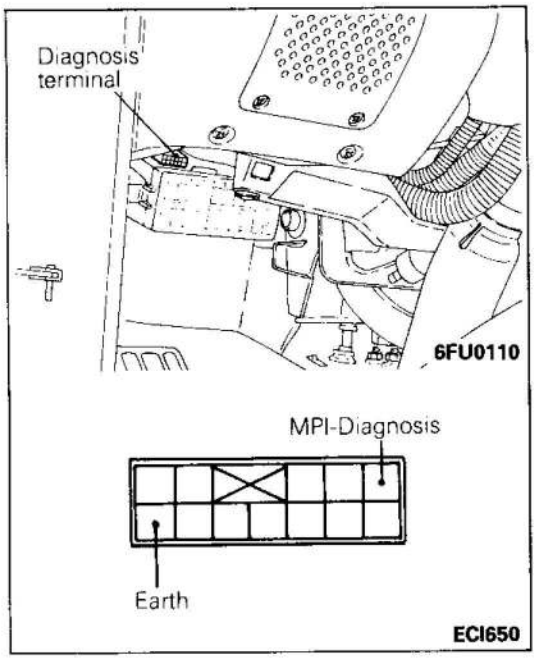
When Using The Multi-use Tester (MUT) or MUT-II

Caution
Connection and disconnection of the MUT or MUT-II should always be made with the ignition switch in the OFF position.

(1) Connect the MUT or MUT-II to the self-diagnosis connector.

NOTE
When connecting the MUT-II, use the adapter harness which is supplied as an accessory to the MUT-II sub-assembly.

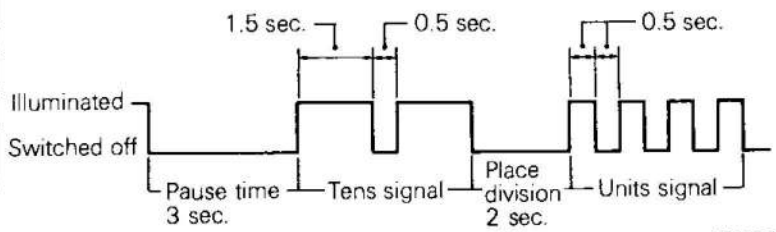
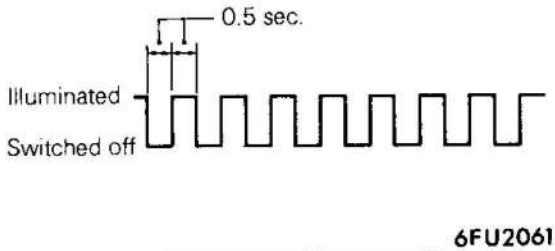
(2) Take a reading of the self-diagnosis output.
(3) Repair the problem location, referring to the diagnosis chart.
(4) After turning the ignition switch once to OFF, turn it back to ON.
(5) Erase the malfunction code.
(6) Recheck to be sure that the condition is normal.



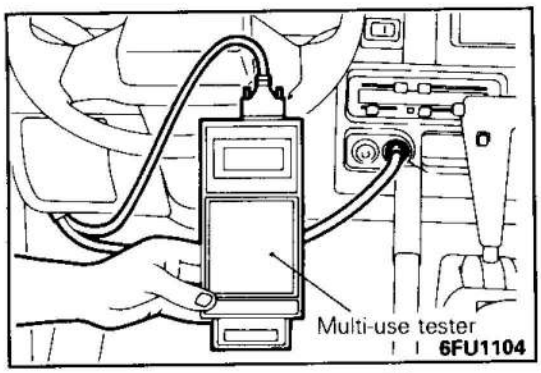
When Using The Voltmeter

(1) Connect an analog-type voltmeter to the self-diagnosis output terminal (terminal ①) and the earth terminal (terminal ⑫) of the self-diagnosis connector (white).
(2) Take a reading of the self-diagnosis output from the movement of the needle of the voltmeter.
(3) Repair the problem location, referring to the diagnosis chart.
(4) Erase the malfunction code by the following procedure.
  ① Turn the ignition switch to OFF.
  ② After removing the battery cable from the battery terminals for 10 seconds or more, reconnect the cable.
  ③ After the engine has warmed up, run it at idle for about 15 minutes.
  ④ Turn the ignition switch to ON and take a reading of the self-diagnosis output to check if a normal code is output.

Diagnosis result display method when using the voltmeter

Example of voltage waveform when a diagnosis code is output	Voltage waveform when normal
For diagnosis code No. 24  6FU2060	 6FU2061

NOTE
Other diagnosis codes also are output as voltage patterns corresponding to the same code numbers as when using the MUT or the MUT-II.



INSPECTION PROCEDURE USING THE MULTI-USE TESTER (MUT)

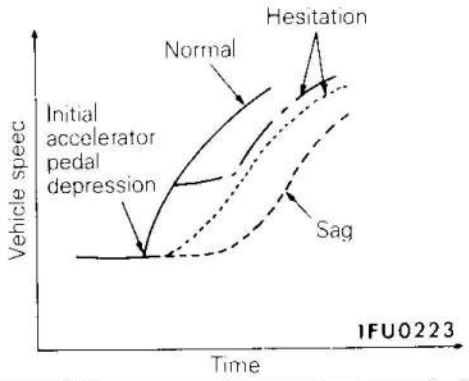
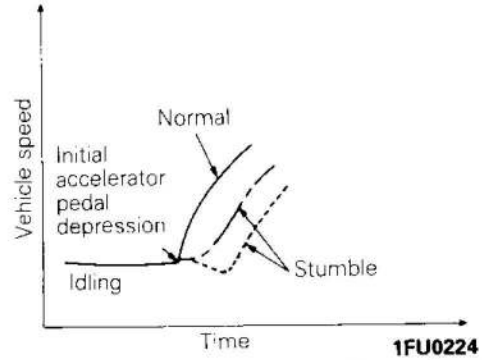
(1) Connect the multi-use tester to the diagnosis connector (white).
(2) Check by the service data and actuator test function. If any abnormality is found, check the body harness, components, etc. and repair as necessary.
(3) After repair, check again with the multi-use tester to make sure that the input and output signals are now normal.
(4) Erase the self-diagnosis trouble code in memory.
(5) Disconnect the multi-use tester.
(6) Start the engine and perform running test, etc. to make sure that the troubles have been corrected.

CHECK CHART CLASSIFIED BY PROBLEM SYMPTOMS

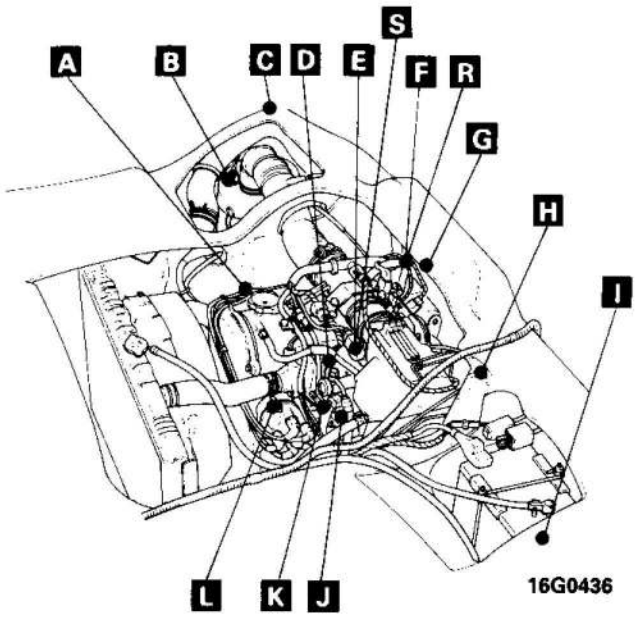
Problem Symptoms / Check Items	Starting		Idling stability			Driving						Reference page
	Will not start	Starting problem	Idling instability (Rough idling)	Incorrect idling speed	Improper idling continuity	Hesitation, sag	Poor acceleration	Stumble	Shock	Surge	Knocking	
Power Supply	① [1]											13-64-12
Engine Control Unit Power Earth	② [2]											13-64-14
Fuel Pump	③ [3] ① [1]				① [1]	① [1]	① [1]					13-64-15
Air Flow Sensor		⑨ [10]			⑪ [10]	⑦ [7]		③ [3]	③ [3]		③ [3]	13-64-18
Intake Air Temperature Sensor			①			③ [3]	③ [3]				① [1]	13-64-20
Barometric Pressure Sensor			③			⑥ [6]	⑤ [5]				② [2]	13-64-22
Engine Coolant Temperature Sensor		[4]	② [1]	① [1]	④ [4]	⑤ [5]	④ [4]	② [2]		② [2]		13-64-24
Throttle Position Sensor						④ [4]		① [1]				13-64-26 13-64-28
Idle Position Switch		④ [5]	④ [2]	② [2]	③ [3]					③ [3]		13-64-30 13-64-31
Motor Position Sensor			⑧ [4]	⑤ [3]	⑤ [5]				⑤			13-64-32 13-64-34
Top Dead Center Sensor	⑤ [5]	⑦ [8]			⑨ [8]				① [1]			13-64-36
Crank Angle Sensor	⑥ [6]	⑧ [9]			⑩ [9]				② [2]			13-64-38
Ignition Switch – ST	④ [4]	③ [3]		④								13-64-41
Vehicle Speed Sensor					⑧				⑥			13-64-42
Air Conditioner Switch and Power Relay				③								13-64-44
Oxygen Sensor			⑥									13-64-46
Injectors	⑧ [8]	⑥ [7]	⑦ [3]		⑦ [7]	⑧ [8]	⑥ [6]	④ [4]		④ [4]		13-64-48 13-64-51
Idle Speed Control Servo (DC Motor)		⑤ [6]	⑨ [5]	⑥ [4]	⑥ [6]				⑦			13-64-52 13-64-53
Ignition Coil and Power Transistor	⑦ [7]						⑦ [7]		④ [4]		④ [4]	13-64-54
Purge Control Solenoid Valve			⑤									13-64-57
Fuel Pressure		② [2]	⑩ [6]		② [2]	② [2]	② [2]			① [1]		13-59

○: Warm engine (Figures inside the ○ indicate the checking sequence.)
□: Cold engine (Figures inside the □ indicate the checking sequence.)

PROBLEM SYMPTOMS TABLE (FOR YOUR INFORMATION)

Items		Symptom
Starting	Won't start (no initial combustion)	The starter is used to crank the engine, but there is no combustion within the cylinders, and the engine won't start.
	Starting problem (initial combustion, then stall)	There is combustion within the cylinders, but then the engine soon stalls.
	(Starting takes a long time.)	Engine won't start quickly.
Idling stability	Idling instability (Rough idling)	Engine speed doesn't remain constant; changes during idling. Usually, a judgement can be based upon the movement of the tachometer pointer, and the vibration transmitted to the steering wheel, shift lever, body, etc. This is called rough idling.
	Incorrect idling speed	The engine doesn't idle at the usual correct speed.
	Improper idling continuity Die out Pass out	This non-continuity of idling includes the following elements. (1) Die out ..... The engine stalls when the foot is taken from the accelerator pedal, regardless of whether the vehicle is moving or not. (2) Pass out ..... The engine stalls when the accelerator pedal is depressed or while it is being used.
Driving	Hesitation Sag	"Hesitation" is the delay in response of the vehicle speed (engine rpm) that occurs when the accelerator is depressed in order to accelerate from the speed at which the vehicle is now traveling, or a temporary drop in vehicle speed (engine rpm) during such acceleration. Serious hesitation is called "sag". 
	Poor acceleration	Poor acceleration is inability to obtain an acceleration corresponding to the degree of throttle opening, even though acceleration is smooth, or the inability to reach maximum speed.
	Stumble	Engine rpm response is delayed when the accelerator pedal is initially depressed for acceleration from the stopped condition. 
	Shock	The feeling of a comparatively large impact or vibration when the engine is accelerated or decelerated.
	Surge	This is repeated surging ahead during constant speed travel or during variable speed travel.
	Knocking	A sharp sound like a hammer striking the cylinder walls during driving and which adversely affects driving.

COMPONENTS LOCATION



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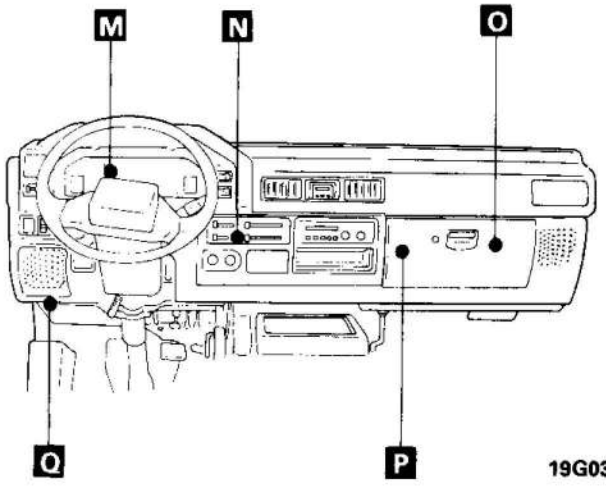
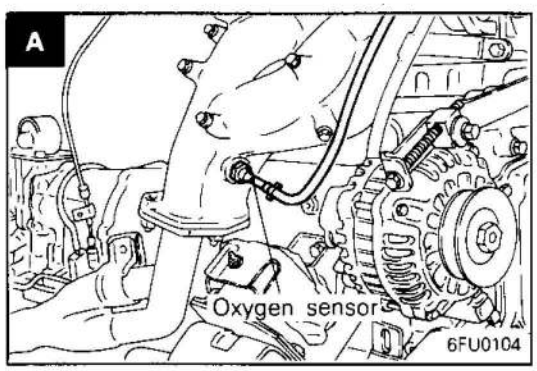
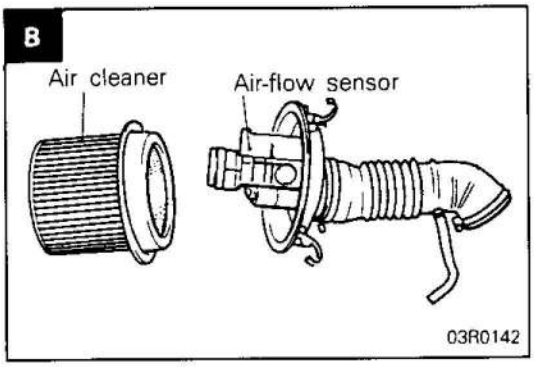


19G0361

Name	Symbol	Name	Symbol
Air conditioner power relay	P	Idle speed control servo (servo valve position sensor) – Vehicles for Hong Kong	R
Air conditioner switch	N		
Air-flow sensor (incorporating intake air temperature sensor and barometric pressure sensor)	B	Ignition coil (power transistor)	J
		Ignition timing adjustment terminal	G
Control relay	O	Injector	D
Crank angle sensor and No. 1 cylinder top dead center sensor	L	Oxygen sensor	A
		Purge control solenoid valve	H
Engine coolant temperature sensor	K	Self-diagnosis terminal	Q
Engine control unit	C	Throttle position sensor – Vehicles for Europe	E
Fuel pump check terminal	I	Throttle position sensor (Idle position switch) – Vehicles for Hong Kong	S
Idle speed control servo (idle position switch, motor position sensor) – Vehicles for Europe	F	Vehicles-speed sensor (reed switch)	M





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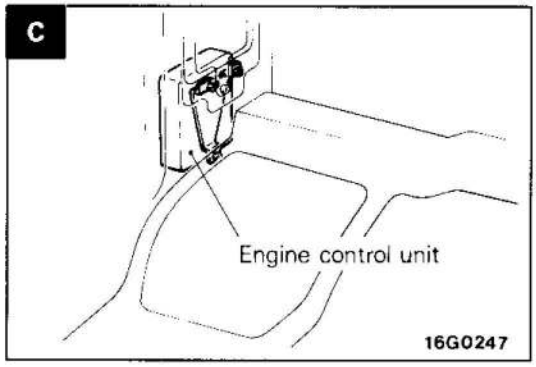
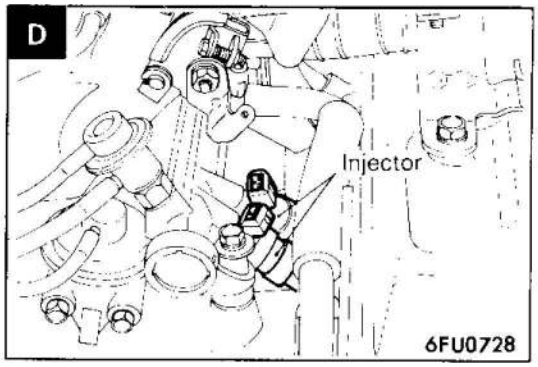
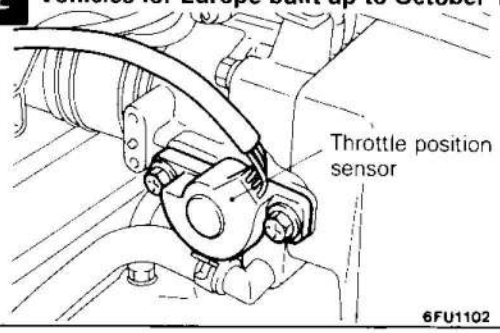


D

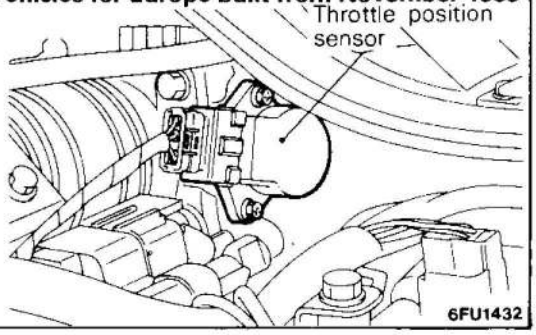


E

Vehicles for Europe built up to October 1989



Vehicles for Europe built from November 1989



F

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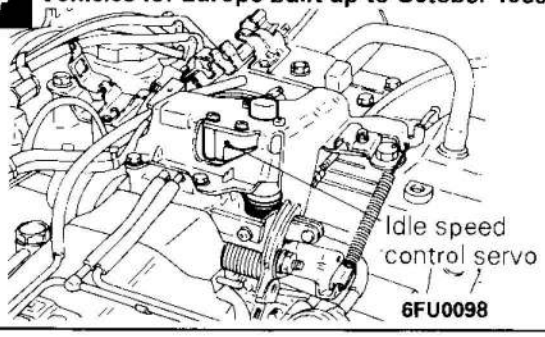
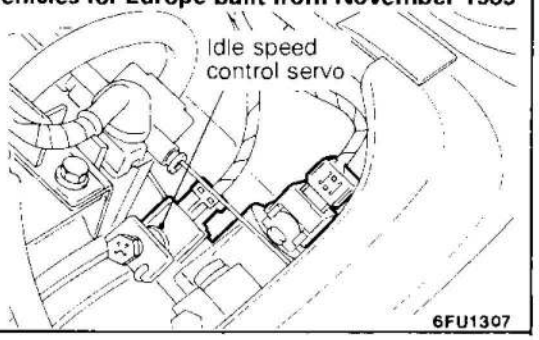


Vehicles for Europe built from November 1989



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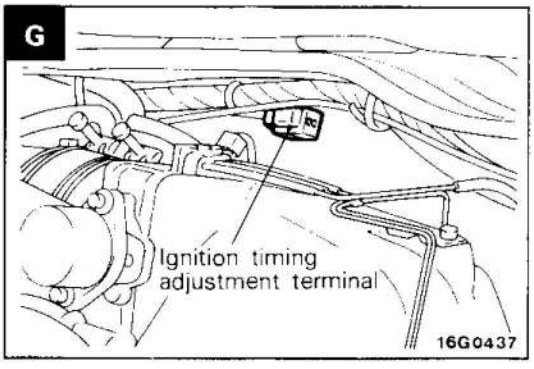

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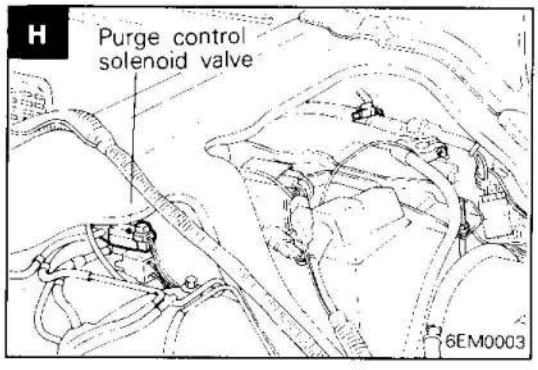

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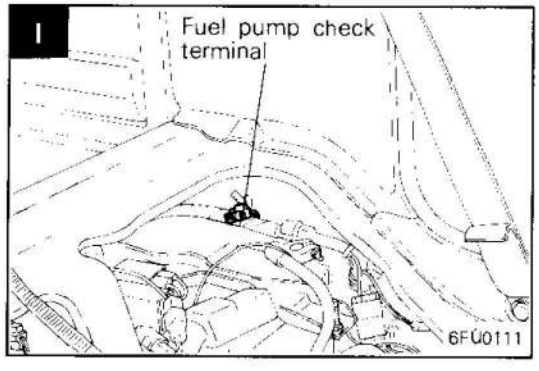
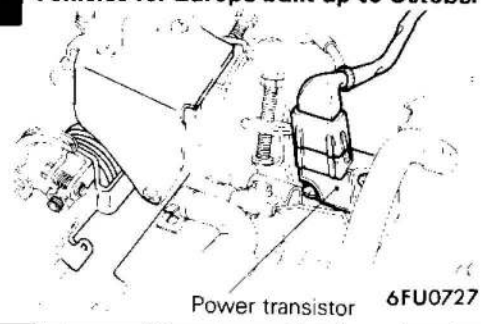
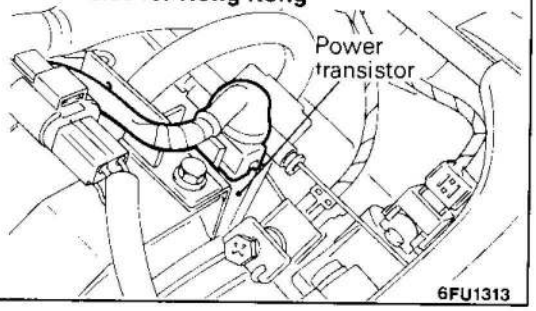


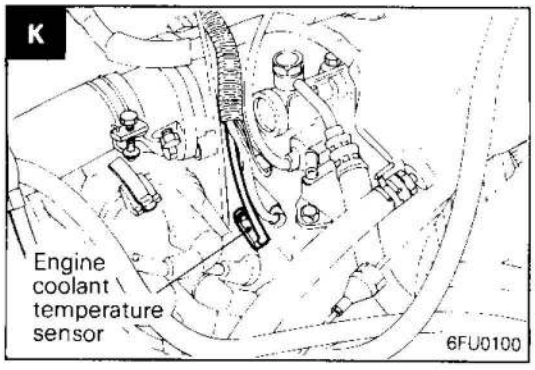
J **Vehicles for Europe built up to October 1989**



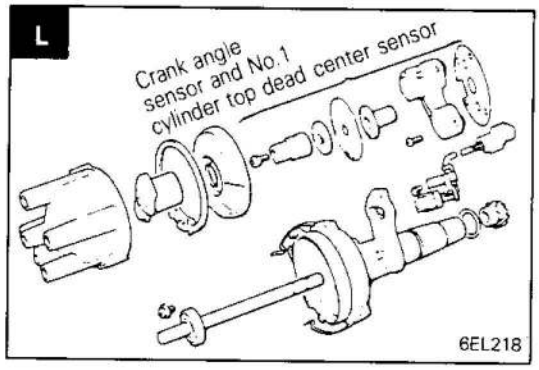
Vehicles for Europe built from November 1989 and vehicles for Hong Kong



K



L



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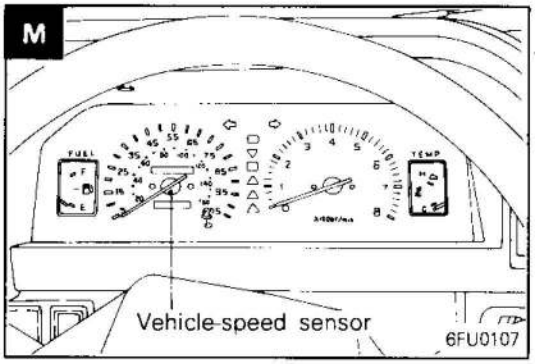

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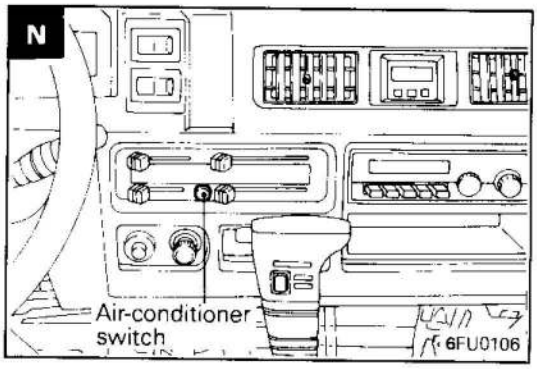
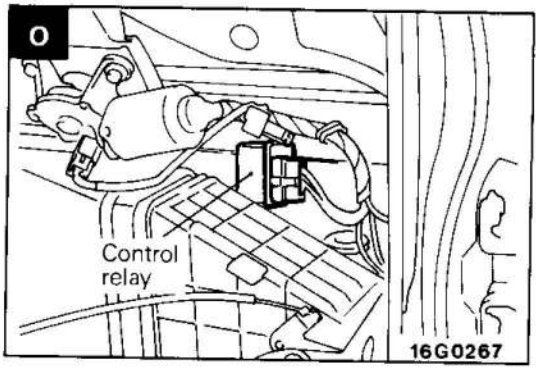


O



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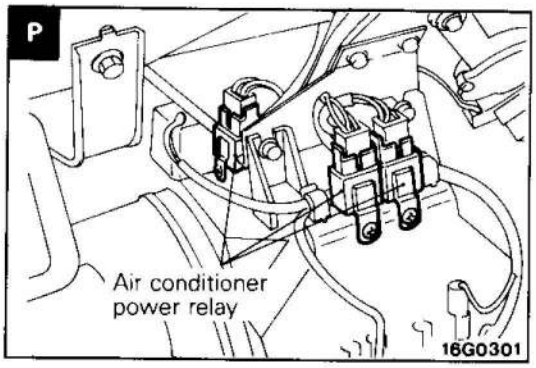

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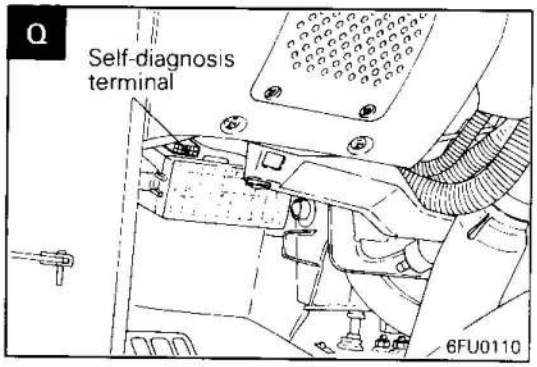

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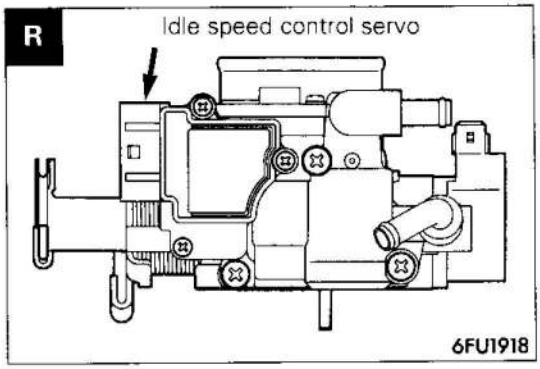
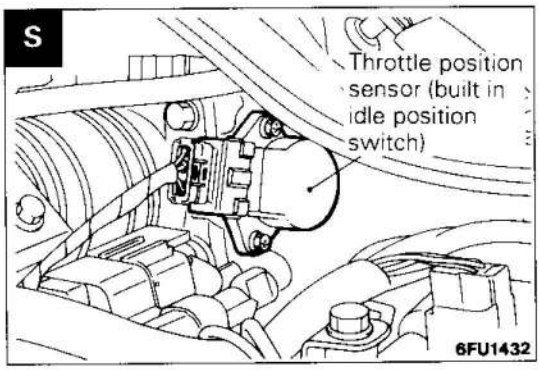
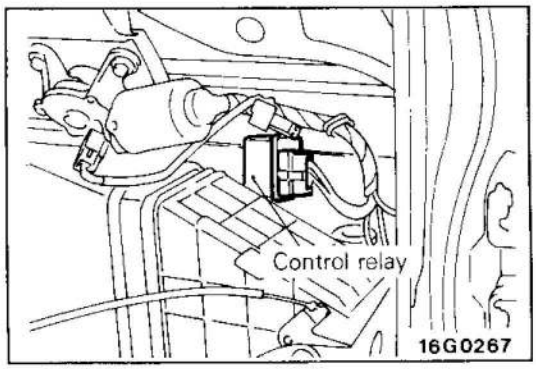

Idle speed control servo
6FU1918

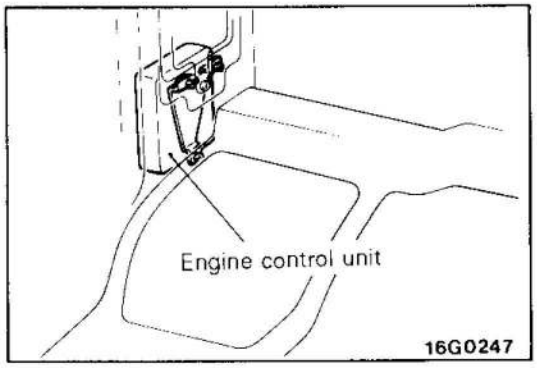
S

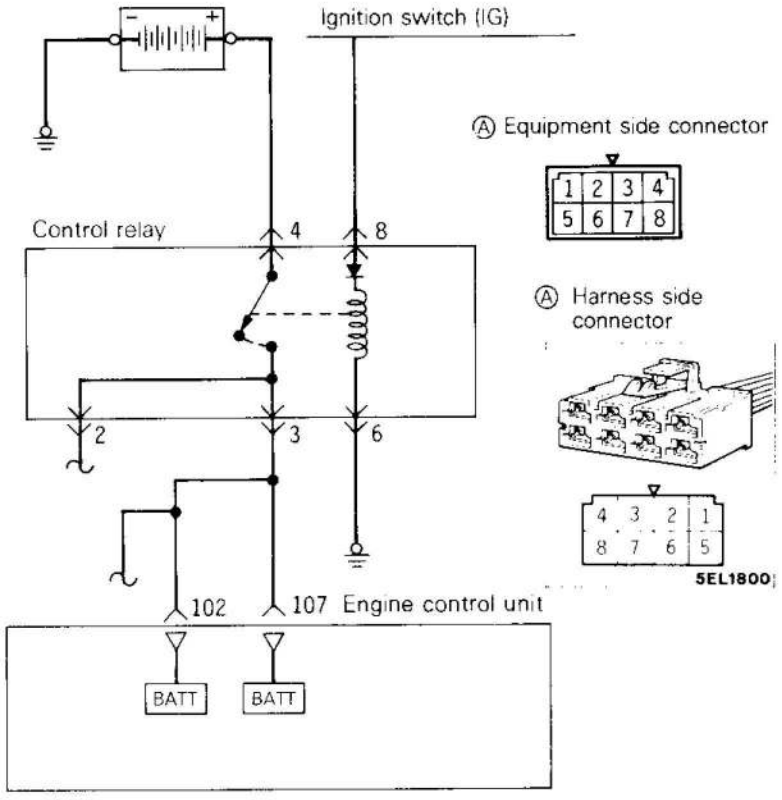

Throttle position sensor (built in idle position switch)
6FU1432

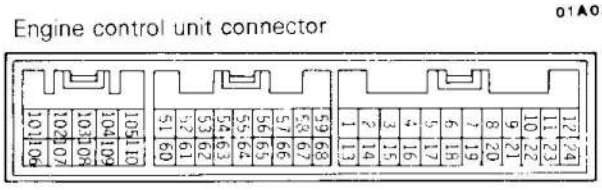
NOTE

POWER SUPPLY









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, current flows from the ignition switch through the control relay coil to earth. This turns on the control relay switch and power is supplied from the battery through the control relay switch to the engine control unit.

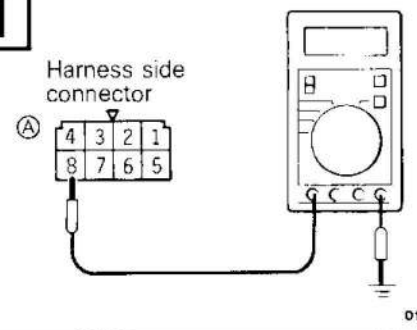
INSPECTION

Using Multi-use Tester (MUT) or MUT-II

Function	Item No.	Data display	Check condition	Standard value
Data reading	16	Engine control unit power voltage	Ignition switch: ON	11–13V

HARNESS INSPECTION

1



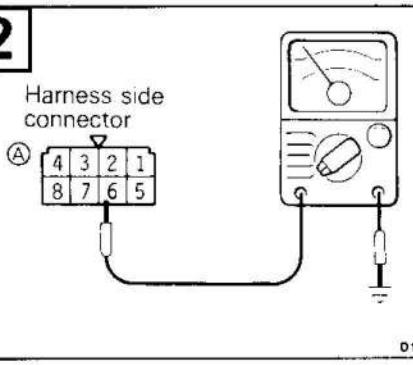
Measure the power supply voltage of the control relay.
- Control relay connector: Disconnected
- Ignition switch: ON

Voltage (V)
11 – 13

OK → 2

NG → Repair the harness. (Ignition switch-Ⓐ8)

2

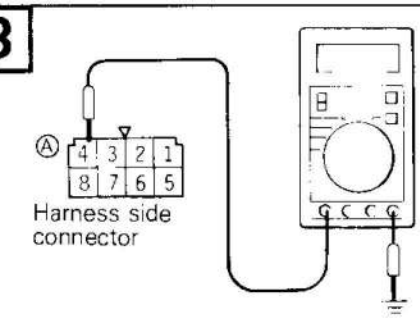


Check for continuity of the earth circuit.
- Control relay connector: Disconnected

OK → 3

NG → Repair the harness. (Ⓐ6-Earth)

3



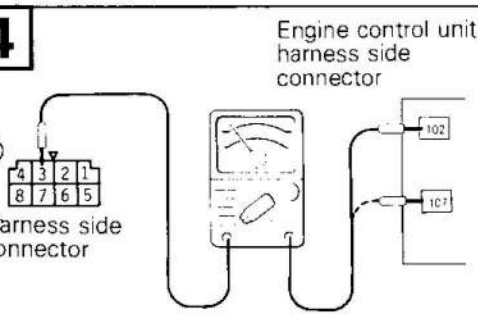
Measure the power supply voltage of the control relay.
- Control relay connector: Disconnected

Voltage (V)
11 – 13

OK → 4

NG → Repair the harness. (Battery-Ⓐ4)

4



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

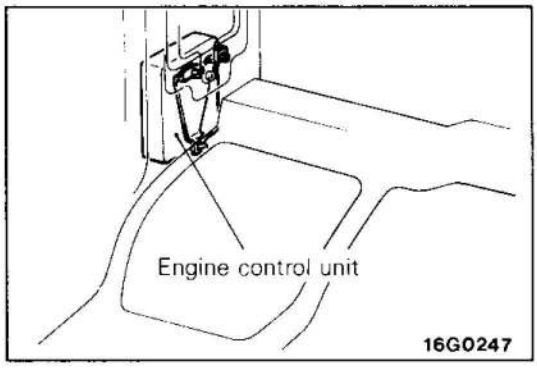
OK → STOP

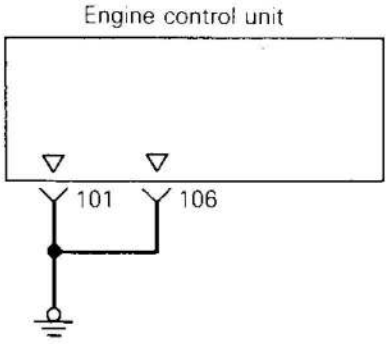
NG → Repair the harness. (102-Ⓐ3) (107-Ⓐ3)

CONTROL RELAY INSPECTION

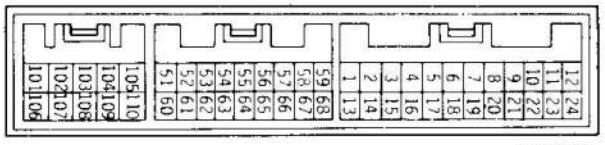
Refer to P. 13-76-2.

ENGINE CONTROL UNIT POWER EARTH





Engine control unit connector



OPERATION

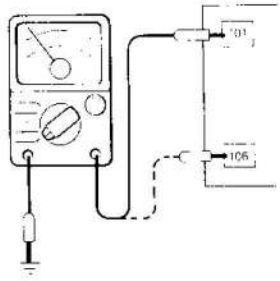
Grounds the engine control unit

TROUBLESHOOTING HINTS

If the earth wire of the engine control unit is not connected securely to earth, the unit will not operate correctly.

HARNESS INSPECTION

1 Engine control unit harness side connector



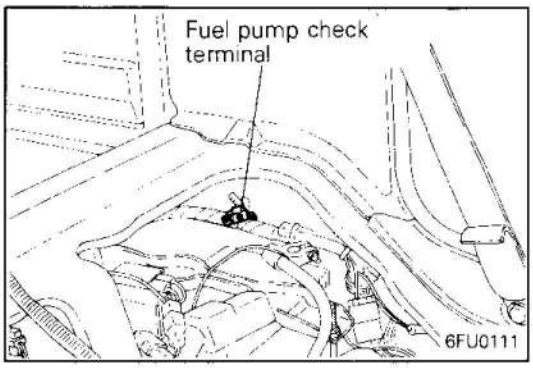
Check for continuity of the earth circuit.

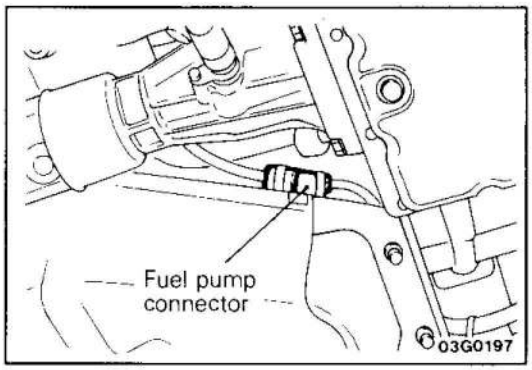
- Engine control unit connector: Disconnected

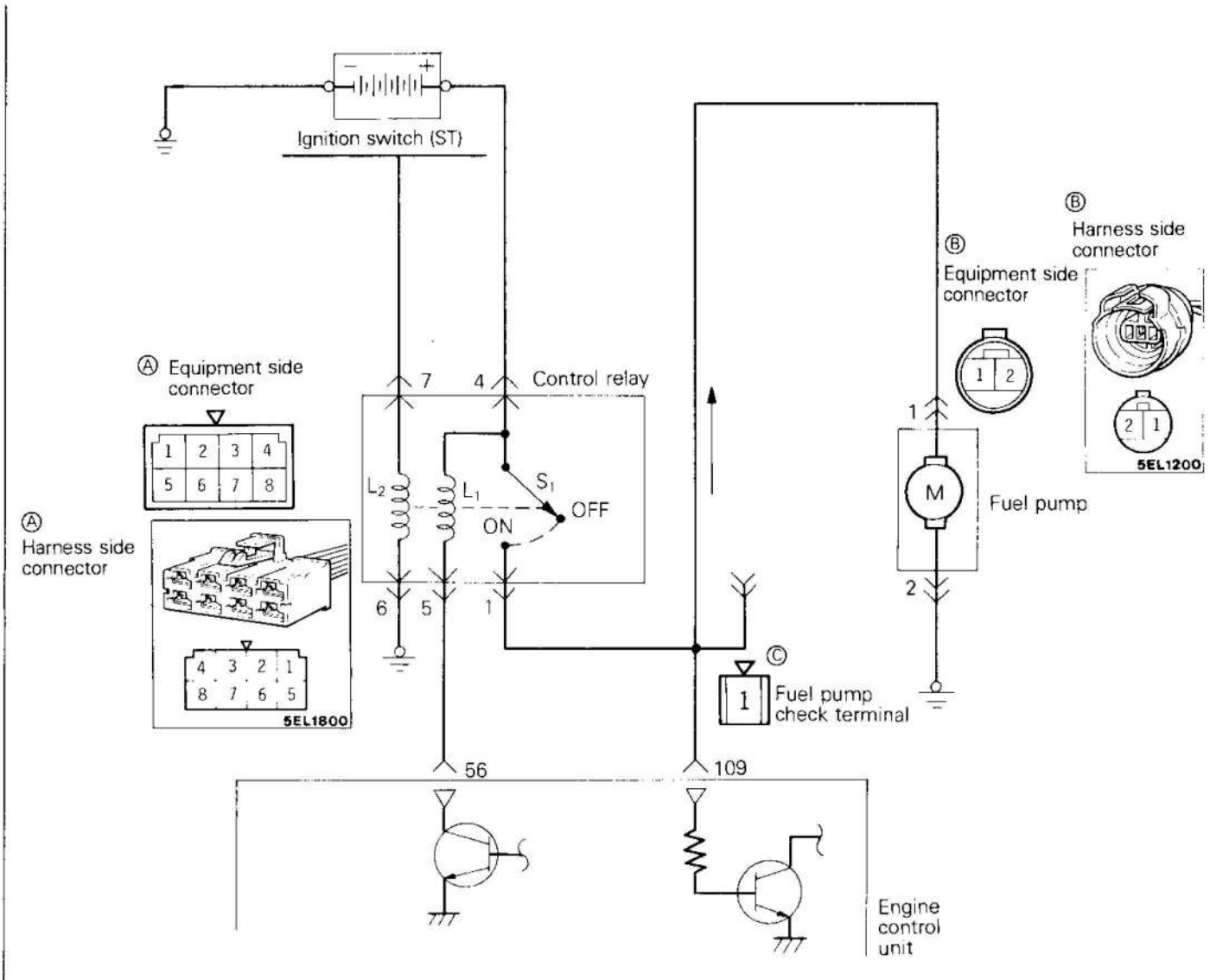
OK → STOP

NG → Repair the harness. (101 – Earth, 106 – Earth)

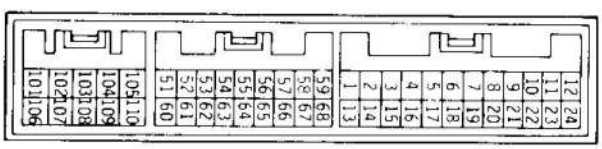
FUEL PUMP







Engine control unit connector



OPERATION

- Drives the fuel pump during cranking and engine operation.
- When the ignition switch is set to START, current flows from the ignition switch through the control relay coil to earth. This turns on the control relay switch and drive current flows from the battery through the control relay switch to the fuel pump.
- While the engine is running, the engine control unit keeps the power transistor on and energizes the control relay coil so that drive power is supplied to the fuel pump.
- When the control relay switch is turned on, battery voltage is also applied to the engine control unit so that the control unit detects supply of drive power to the fuel pump.

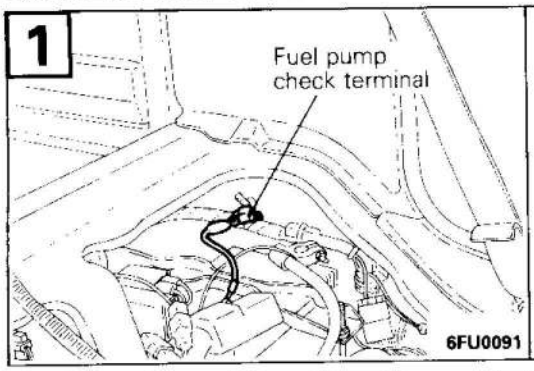
INSPECTION

Using Multi-use Tester (MUT) or MUT-II

Function	Item No.	Drive	Check condition	Check content	Normal state
Actuator test	07	Fuel pump is driven to circulate fuel	• Engine cranking • Forced drive of fuel pump Check is made for above two conditions	Hold return hose with fingers to feel pulsation indicating fuel flow	Pulsation is felt
				Listen to pump operating sound near fuel tank	Operating sound is heard

HARNESS INSPECTION

1

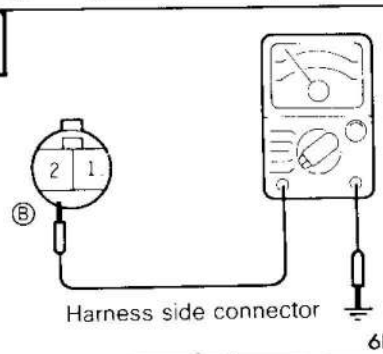


Check the fuel pump.
- Apply battery voltage to the checking terminal and operate the pump.

OK → 4

NO → 2

2

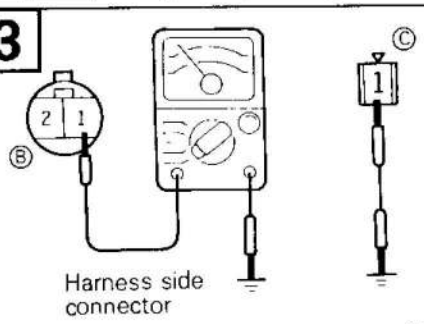


- Check for continuity of the earth circuit.
- Fuel pump connector: Disconnected

OK → 3

NO → Repair the harness. (Ⓑ2 – Earth)

3

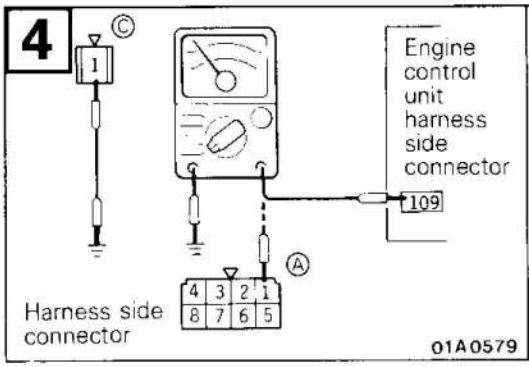


Check for continuity between the fuel pump and the checking terminal.
- Fuel pump connector: Disconnected

OK → 4

NO → Repair the harness. (Ⓑ1 – Ⓒ1)

4

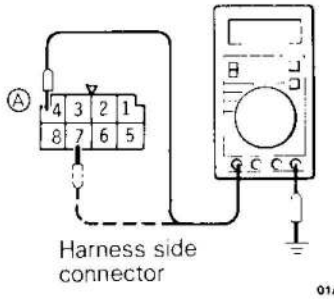


Check for continuity between the checking terminal and the engine control unit, and between the control relay terminals.
- Control relay connector: Disconnected
- Engine control unit connector: Disconnected
- Fuel pump connector: Disconnected

OK → **5**

NO → Repair the harness. (Ⓐ1 – Ⓒ1) (Ⓒ1 – 109)

5



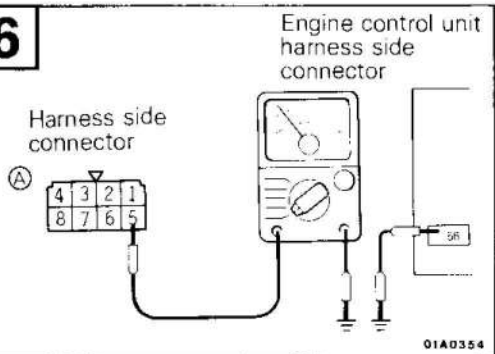
Measure the power supply voltage of the control relay.
- Control relay connector: Disconnected
- Ignition switch: START (when Ⓐ7 checked)

Voltage (V)
8 or more

OK → **6**

NO → Repair the harness. (Ⓐ4 – Battery) (Ⓐ7 – Ignition switch)

6

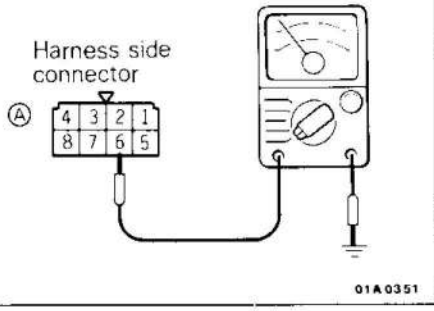


Check for an open-circuit, or a short-circuit to earth between the control relay and the engine control unit.
- Control relay connector: Disconnected
- Engien control unit connector: Disconnected

OK → **7**

NO → Repair the harness. (Ⓐ5 – 56)

7

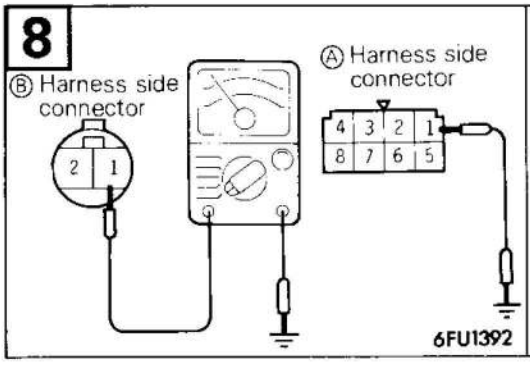


Check for continuity of the earth circuit.
- Control relay connector: Disconnected

OK → **8**

NO → Repair the harness. (Ⓐ6 – Earth)

8



Check for an open-circuit, or a short-circuit to earth between the control relay and the fuel pump.
- Control relay connector: Disconnected
- Fuel pump connector: Disconnected

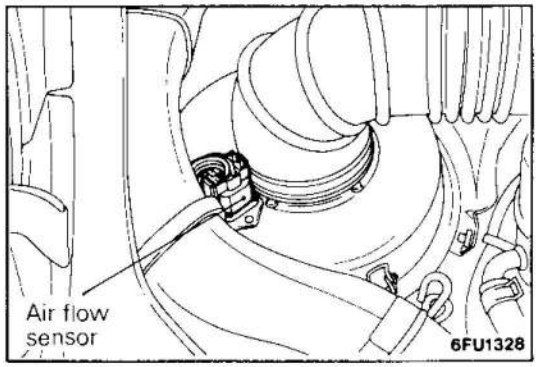
OK → STOP

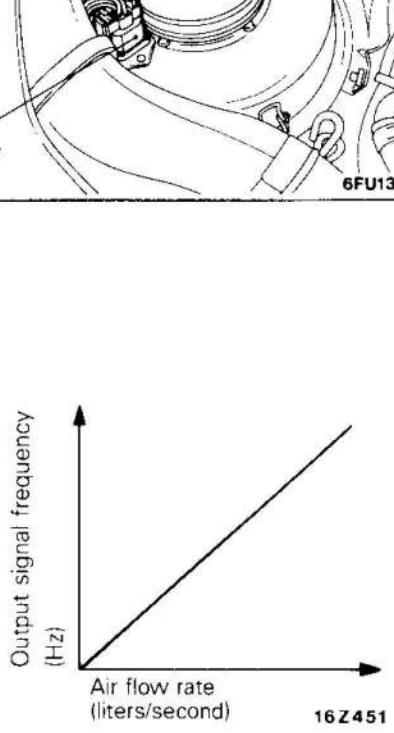
NO → Repair the harness. (Ⓐ1 – Ⓑ1)

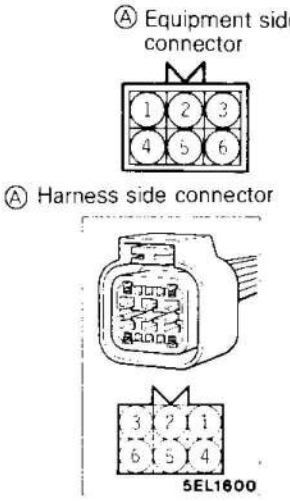
CONTROL RELAY INSPECTION

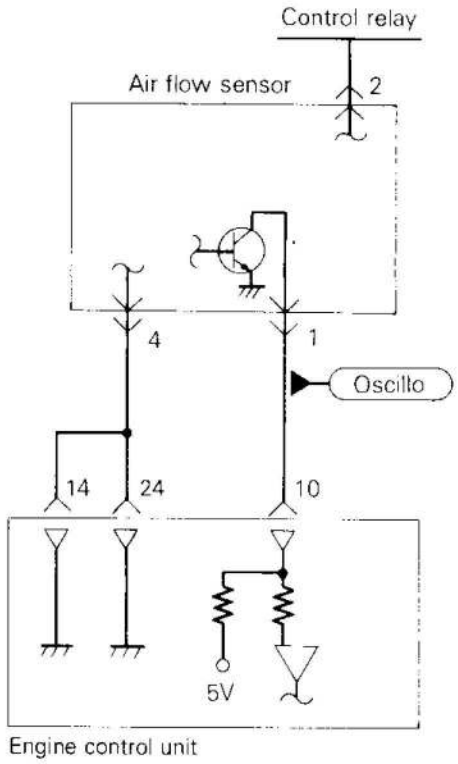
Refer to P. 13-76-2.

AIR FLOW SENSOR









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 grounded by the engine control unit. The air flow sensor generates a pulse signal as it repeatedly connects and disconnects between the 5 V 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]

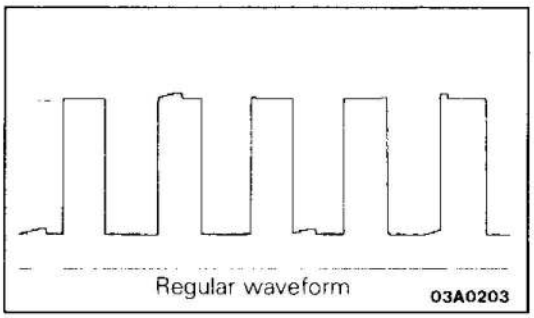
(1) Disturbed air flow in the air flow sensor (Disconnected air duct, clogged air cleaner element)
(2) Poor combustion in the cylinder (Faulty ignition plug, ignition coil, injector, incorrect compression pressure, etc.)
(3) Air leaking into the intake manifold through gap of gasket, etc.
(4) Loose EGR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

INSPECTION

Using Multi-use Tester (MUT) or MUT-II

Function	Item No.	Data display	Check conditions	Engine conditions	Standard value
Data reading	12	Sensor detection air flow (frequency)	• Engine coolant temperature: 80 – 90°C (176 – 194°F) • Lights and accessories: OFF • Transmission: Neutral (P range for vehicles with A/T) • Steering wheel: Neutral	750 r/min. (idling)	40 – 60 Hz
				2,000 r/min.	120 – 140 Hz
				Racing	Frequency increases by racing.

NOTE
When the vehicle is new [driven approximately 500 km (300 miles) or less], the air-flow sensor output frequency may be approximately 10% higher than indicated above.

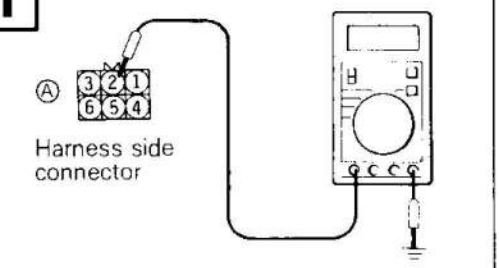


Using Oscilloscope

(1) Run the engine at idle speed.
(2) Connect the probe to the oscilloscope pick-up point as shown in the circuit diagram and check the waveform.

HARNESS INSPECTION

1

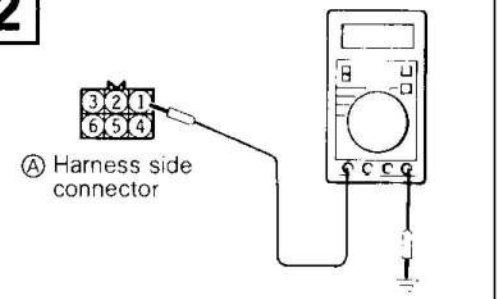


Measure the power supply voltage.
- Connector: Disconnected
- Ignition switch: ON

Voltage (V)
11 – 13

OK → 2
NG → Repair the harness. (Ⓐ2 – Control relay) or check the control relay

2

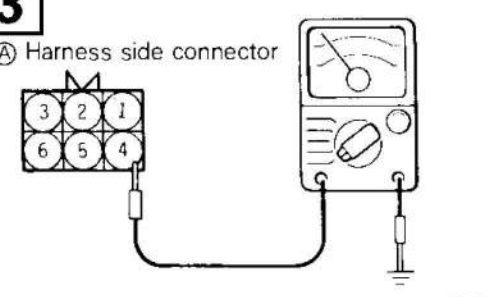


Measure the terminal voltage.
- Connector: Disconnected
- Ignition switch: ON

Voltage (V)
4.8 – 5.2

OK → 3
NG → Repair the harness. (Ⓐ1 – 10)

3



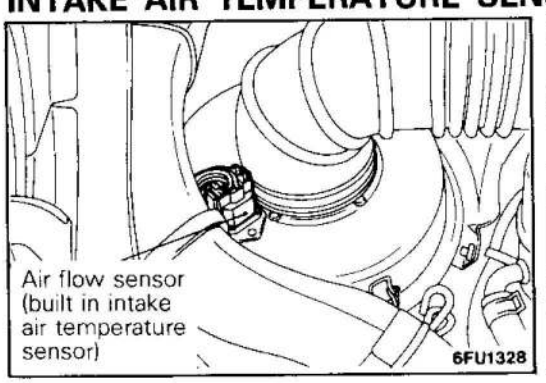
Check for continuity of the earth circuit.
- Connector: Disconnected

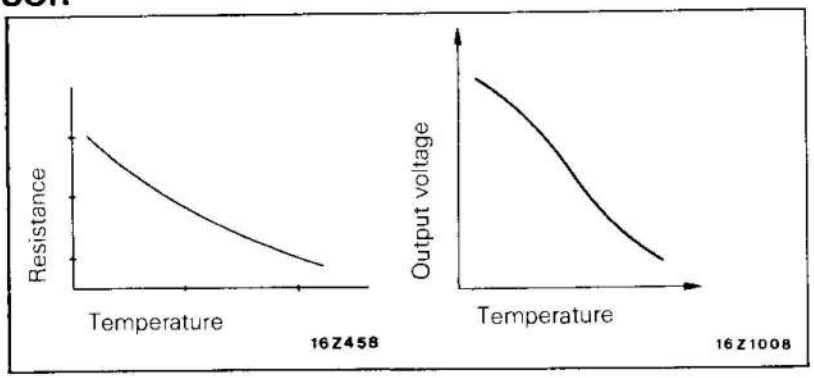
OK → STOP
NG → Repair the harness. (Ⓐ4 – 17, 24)

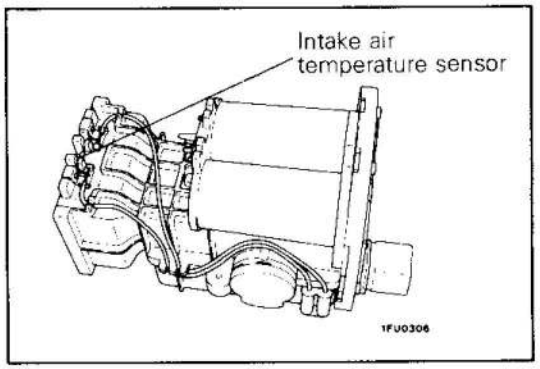
SENSOR INSPECTION

Refer to P. 13-72.

INTAKE AIR TEMPERATURE SENSOR

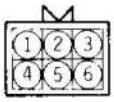




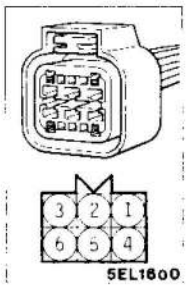


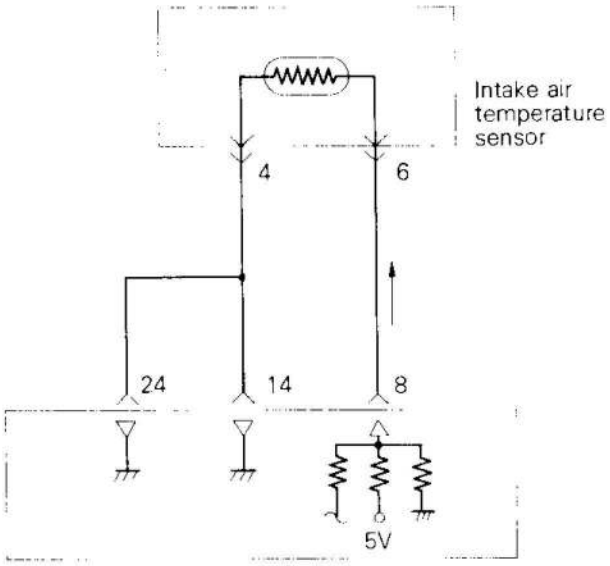
Air flow sensor connector

Ⓐ Equipment side connector



Ⓐ Harness side connector





OPERATION

- The intake air temperature sensor converts the engine intake air temperature 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 5 V power in the engine control unit is supplied via a resistor in the unit to the intake air temperature sensor. Via the sensor which is a kind of resistor, it is then grounded in the engine control unit. The intake air temperature sensor resistor has such characteristic that its resistance decreases as the intake air temperature rises.
- The intake air temperature sensor terminal voltage increases or decreases as the sensor resistance increases or decreases. Therefore, the intake air temperature sensor terminal voltage changes with the intake air temperature, decreasing as the temperature rises.

TROUBLESHOOTING HINTS

The intake air temperature sensor senses the intake air temperature in the air cleaner so that it may indicate a temperature different from outside temperature depending on engine operating state.

INSPECTION

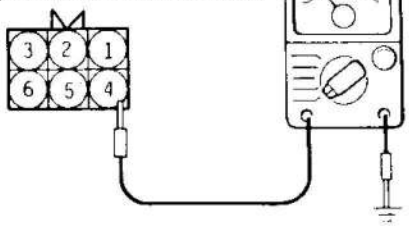
Using Multi-use Tester (MUT) or MUT-II

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

Ⓐ Harness side connector



01R0262

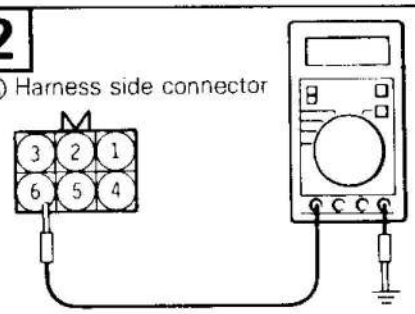
Check for continuity of the earth circuit.
- Connector: Disconnected

OK → 2

NG → Repair the harness. (Ⓐ4 – 14, 24)

2

Ⓐ Harness side connector



01R0261

Measure the power supply voltage.
- Connector: Disconnected
- Ignition switch: ON

Voltage (V)
4.5 – 4.9

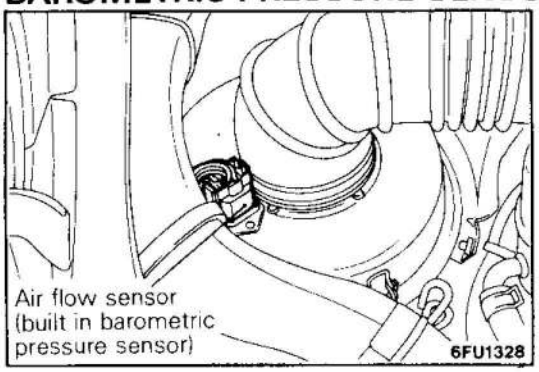
OK → STOP

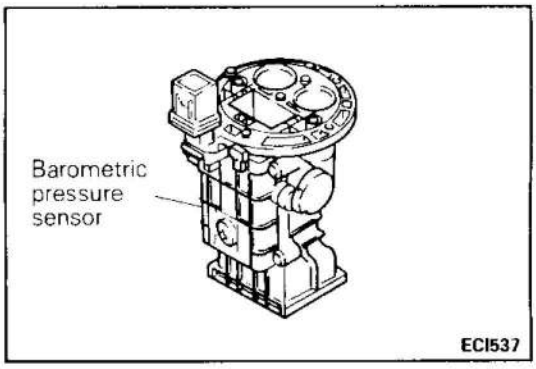
NG → Repair the harness. (Ⓐ6 – 8)

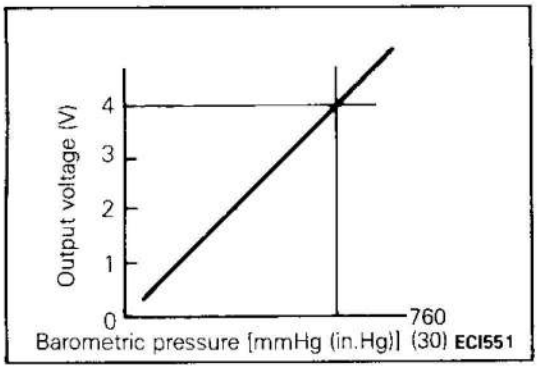
SENSOR INSPECTION

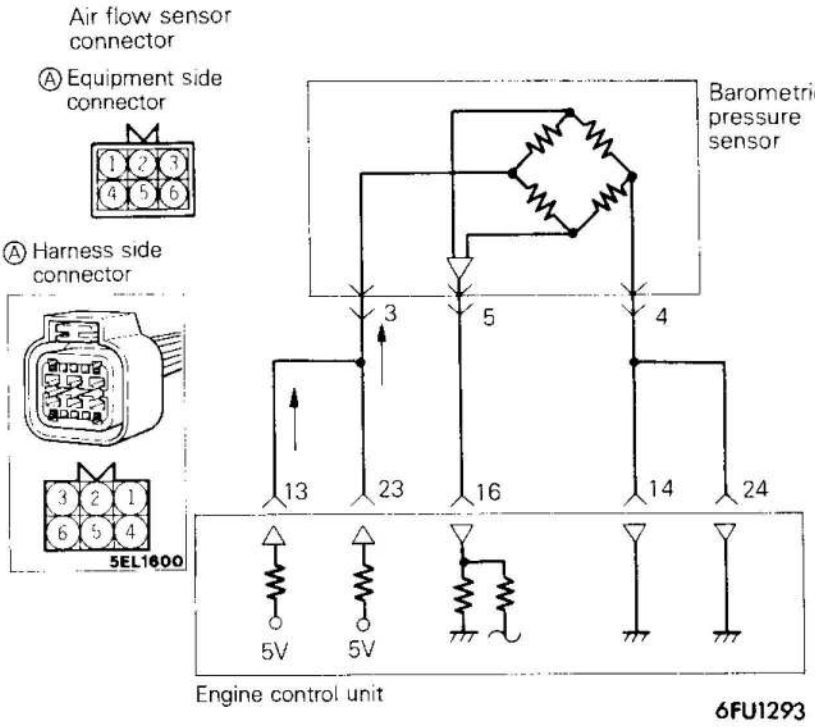
Refer to P. 13 – 73.

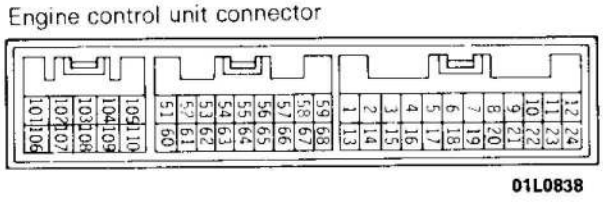
BAROMETRIC PRESSURE SENSOR











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 5 V power in the engine control unit is supplied to the barometric pressure sensor. It flows through the circuit in the sensor and is then grounded 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.

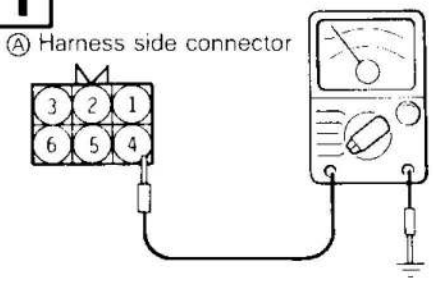
INSPECTION

Using Multi-use Tester (MUT) or MUT-II

Function	Item No.	Data display	Check condition	Altitude	Standard value
Data reading	25	Sensor pressure	Ignition switch: ON	0 m (0 ft.)	101 kPa (760 mmHg)
				600 m (1,969 ft.)	95 kPa (710 mmHg)
				1,200 m (3,937 ft.)	88 kPa (660 mmHg)
				1,800 m (5,906 ft.)	81 kPa (610 mmHg)

HARNESS INSPECTION

1

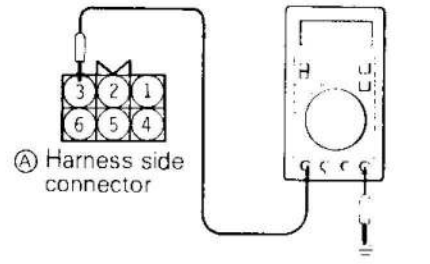


Check for continuity of the earth circuit.
- Connector: Disconnected

OK → 2

NG → Repair the harness. (Ⓐ4 – 14, 24)

2



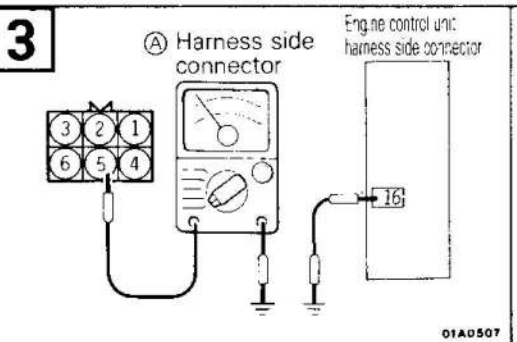
Measure the power supply voltage of the barometric pressure sensor.
- Connector: Disconnected
- Ignition switch: ON

Voltage (V)
4.8–5.2

OK → 3

NG → Repair the harness. (Ⓐ3 – 13, 23)

3



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

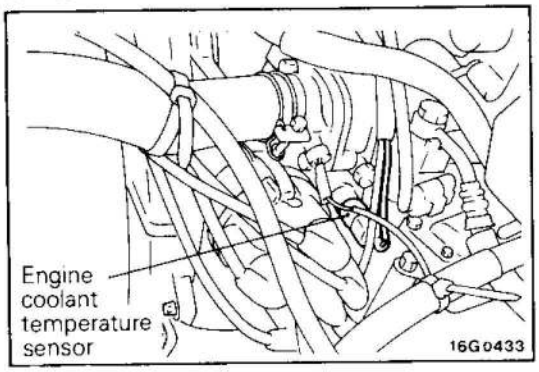
OK → STOP

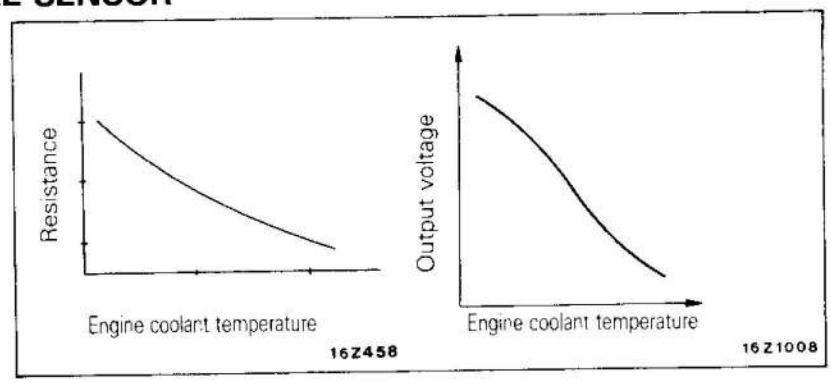
NG → Repair the harness. (Ⓐ5 – 16)

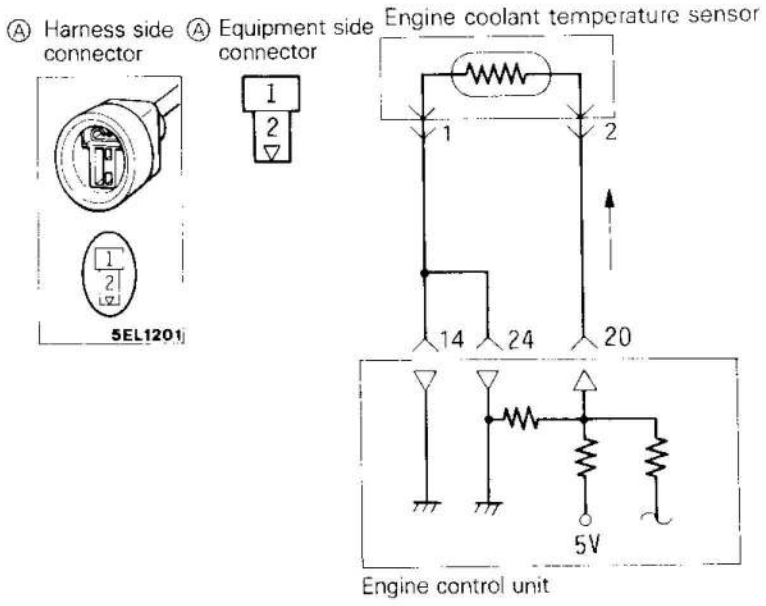
SENSOR INSPECTION

Refer to P. 13-72

ENGINE COOLANT TEMPERATURE SENSOR







OPERATION

- The engine coolant temperature sensor converts the engine coolant temperature into a voltage and inputs it to the engine control unit, which then controls the fuel injection rate and fast idle speed when the engine is cold, based on the input signal.
- The 5 V power in the engine control unit is supplied via a resistor in the unit to the engine coolant temperature sensor. Via the sensor which is a kind of resistor, it is then grounded in the engine control unit. The engine coolant temperature sensor resistor has such characteristic that its resistance decreases as the engine coolant temperature rises.
- The engine coolant temperature sensor terminal voltage increases or decreases as the sensor resistance increases or decreases. Therefore, the coolant temperature sensor terminal voltage changes with the engine coolant temperature, decreasing as the temperature rises.

TROUBLESHOOTING HINTS

If the fast idle speed is inadequate or the engine emits dark smoke during engine warm up operation, the engine coolant temperature sensor is often faulty.

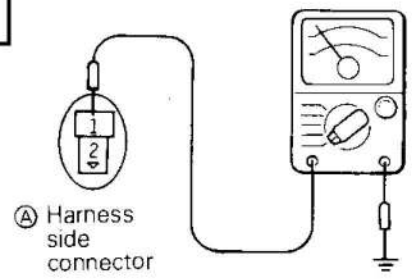
INSPECTION

Using Multi-use Tester (MUT) or MUT-II

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

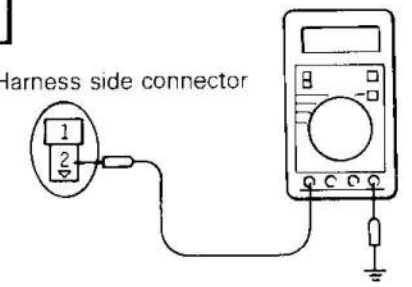


Check for continuity of the earth circuit.
- Connector: Disconnected

OK → 2

NO → Repair the harness. (Ⓐ1 – 14, 24)

2



Measure the power supply voltage.
- Connector: Disconnected
- Ignition switch: ON

Voltage (V)
4.5 – 4.9

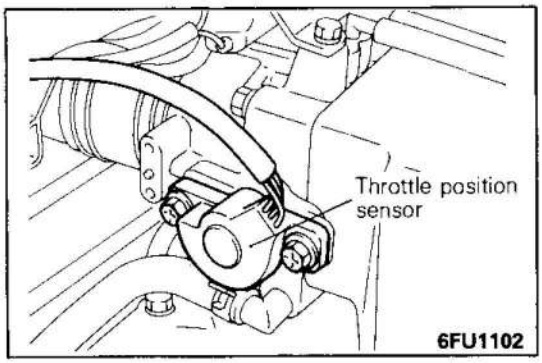
OK → STOP

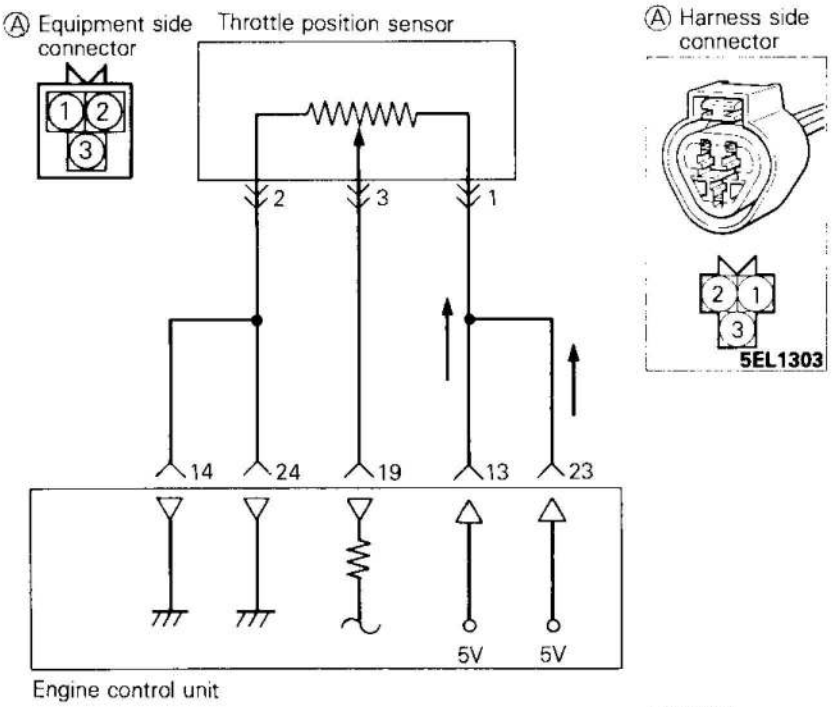
NO → Repair the harness. (Ⓐ2 – 20)

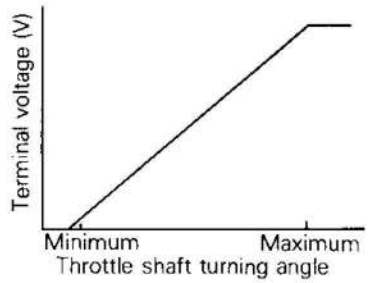
SENSOR INSPECTION

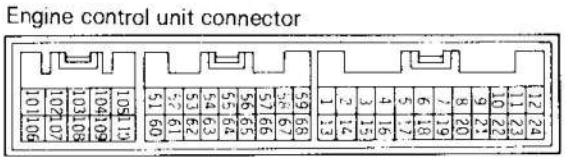
Refer to P. 13-73.

THROTTLE POSITION SENSOR – Vehicles for Europe built up to October 1989









OPERATION

- The throttle position sensor converts the throttle position opening into a voltage and inputs it to the engine control unit, which then controls the fuel injection, based on the input signal.
- The 5 V power in the engine control unit is supplied to the throttle position sensor. It flows through the resistor in the sensor and is then grounded in the engine control unit.
- As the throttle valve shaft rotates from the idle position to wide open position, the resistance between the variable resistor terminal of the throttle position sensor and the earth terminal increases. As a result, the voltage at the throttle position sensor variabvle resistance terminal also increases.

TROUBLE SHOOTING HINTS

Hint 1: The throttle position sensor signal is more important in the control of automatic transmission than in the engine control. Shifting shock and other troubles will be caused if this sensor is faulty.

Hint 2: If the output voltage of the throttle position sensor is out of specification, adjust the sensor and check the voltage again.

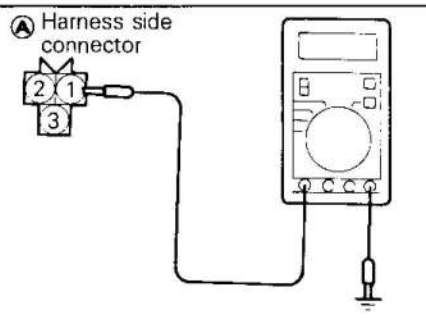
INSPECTION

Using Multi-use Tester (MUT) or MUT-II

Function	Item No.	Data display	Check condition	Throttle valve	Standard value
Data reading	14	Sensor voltage	Ignition switch: Held ON for 15 sec. or more	At idle position	450 – 550 mV
				Open slowly	Increases with valve opening
				Open widely	4,500 – 5,500 mV

HARNESS INSPECTION

1



Measure the power supply voltage of the throttle position sensor.

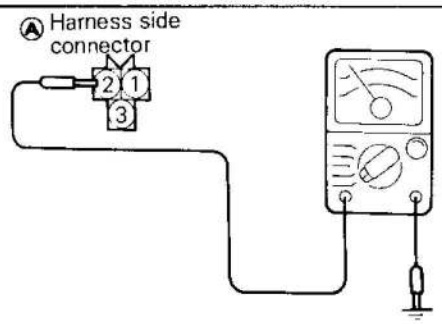
- Connector: Disconnected
- Ignition switch: ON

Voltage (V)
4.8 – 5.2

OK → 2

NG → Repair the harness. (Ⓐ 1 – 13, 23)

2



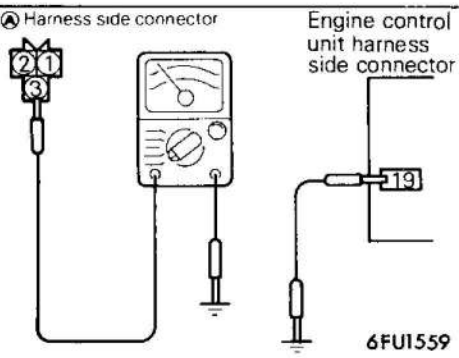
Check for continuity of the earth circuit.

- Connector: Disconnected

OK → 3

NG → Repair the harness. (Ⓐ 2 – 14, 24)

3



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

- Throttle position sensor connector: Disconnected
- Engine control unit connector: Disconnected

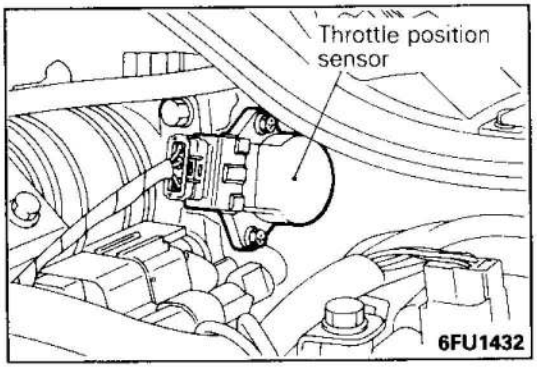
OK → STOP

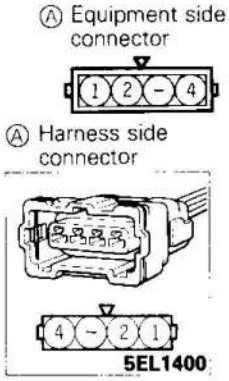
NG → Repair the harness. (Ⓐ 3 – 19)

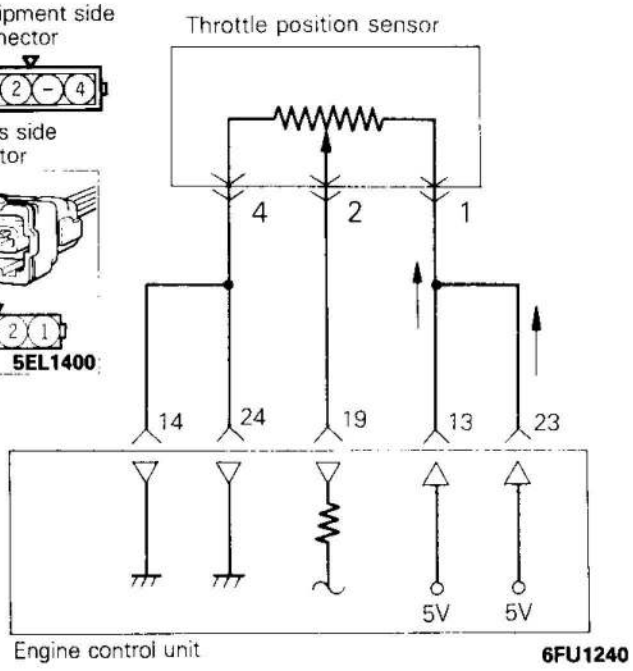
SENSOR INSPECTION

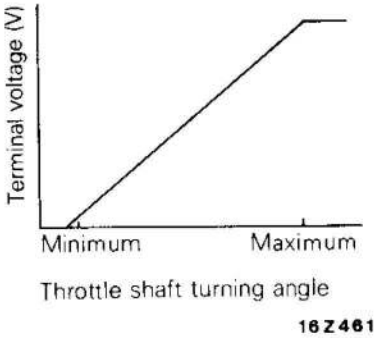
Refer to P. 13-74.

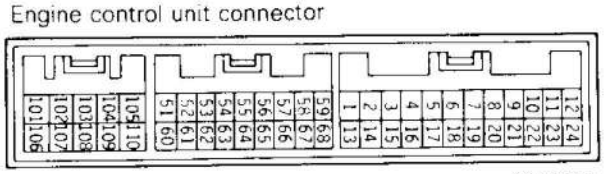
THROTTLE POSITION SENSOR – Vehicles for Europe built from November 1989











OPERATION

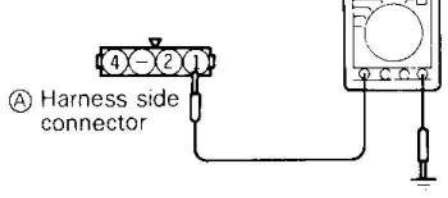
TROBLESHOOTING HINTS

INSPECTION – Using Multi-use Tester (MUT) or MUT-II

Refer to P. 13-64-26.

HARNESS INSPECTION

1



Measure the power supply voltage of the throttle position sensor.
- Connector: Disconnected
- Ignition switch: ON

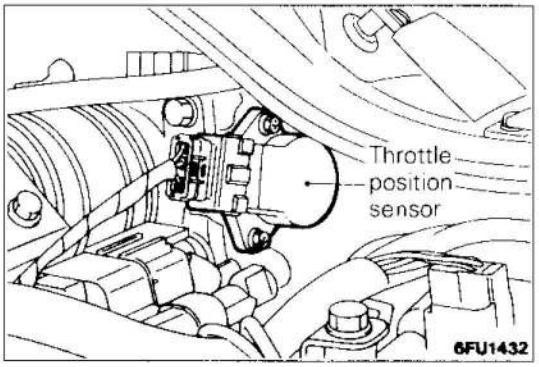
Voltage (V)
4.8–5.2

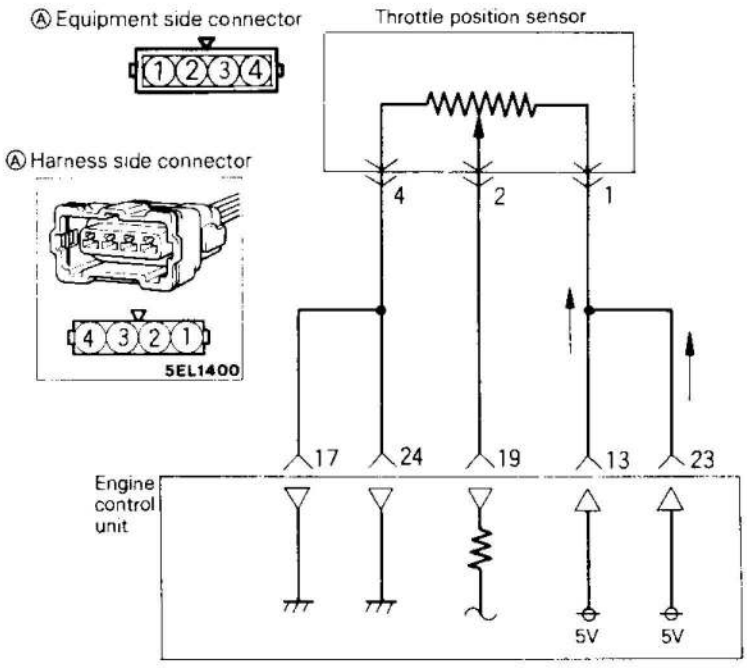
OK → **2**

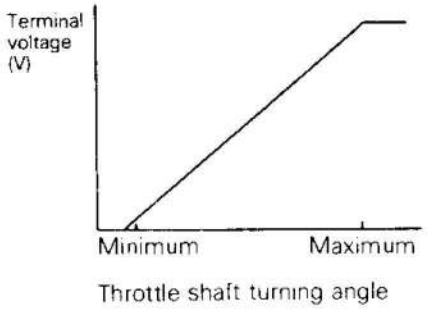
NG → Repair the harness. (Ⓐ1 – 13, 23)

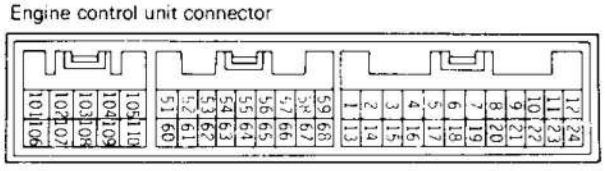
THROTTLE POSITION SENSOR – Vehicles for Hong Kong

M13YJAB









OPERATION

TROUBLESHOOTING HINTS

Refer to 13-64-26.

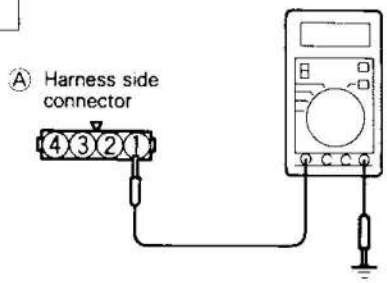
INSPECTION

Using Multi-use Tester (MUT) or MUT-II

Function	Item No.	Data display	Check conditions	Throttle valve	Standard value mV
Data reading	14	Sensor detection voltage	Ignition switch: left ON for 15 secondes or more	Set to idling position.	300 – 1,000
				Open gradually.	Becomes higher proportionally to valve opening
				Open fully.	4,500 – 5,500

HARNESS INSPECTION

1



6FU1241

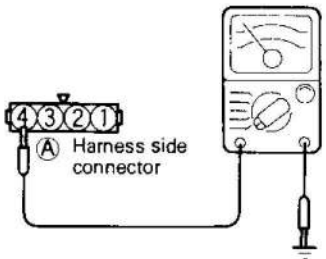
Measure the power supply voltage of the throttle position sensor.
- Connector: Disconnected
- Ignition switch: ON

Voltage (V)
4.8 – 5.2

OK → 2

NG → Repair the harness (Ⓐ 4 – 17 24)

2



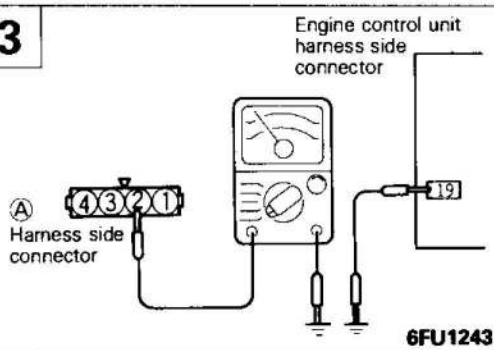
6FU1242

Check for continuity of the earth circuit.
- Connector: Disconnected

OK → 3

NG → Repair the harness (Ⓐ 4 – 17 24)

3

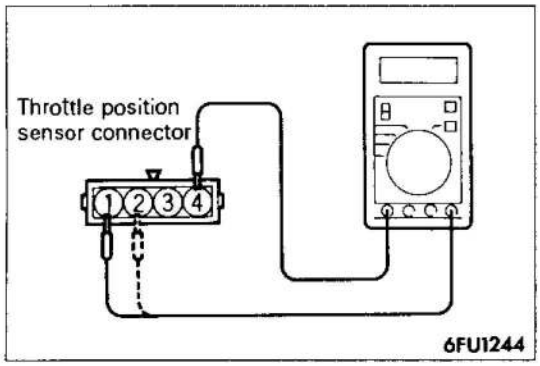


6FU1243

Check for an open-circuit, or a short-circuit to earth, between the engine control unit and the throttle position sensor.
- Throttle position sensor connector: Disconnected
- Engine control unit connector: Disconnected

OK → STOP

NG → Repair the harness (Ⓐ 2 – 19)



6FU1244

SENSOR INSPECTION

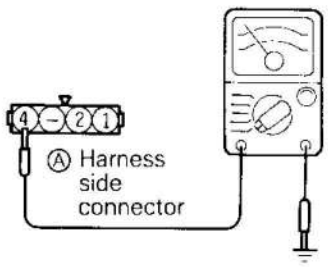
(1) Disconnect the throttle position sensor connector.
(2) Measure resistance between terminal ④ (sensor earth) and terminal ① (sensor power).

Standard value: 3.5 – 6.5 kΩ

(3) Connect a pointer type ohmmeter between terminal ④ (sensor earth) and terminal ② (sensor output).
(4) Operate the throttle, valve slowly from the idle position to the full open position and check that the resistance changes smoothly in proportion with the throttle valve opening angle.
(5) If the resistance is out of specification, or fails to change smoothly, replace the throttle position sensor.

TPS installation torque: 2.0 Nm (0.2 kgm, 1.5 ft.lbs.)

2

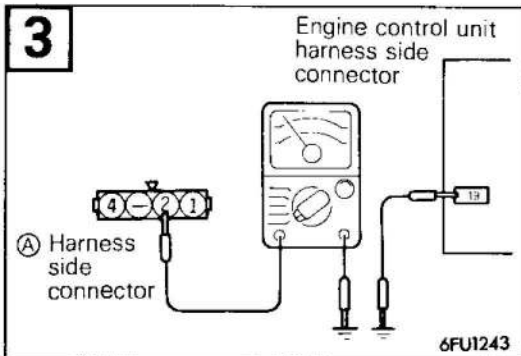


Check for continuity of the earth circuit.
- Connector: Disconnected

OK → 3

NO → Repair the harness. (Ⓐ4 – 14, 24)

3



Check for an open-circuit, or a short-circuit to earth between the engine control unit and the throttle position sensor.
- Throttle position sensor connector: Disconnected
- Engine control unit connector: Disconnected

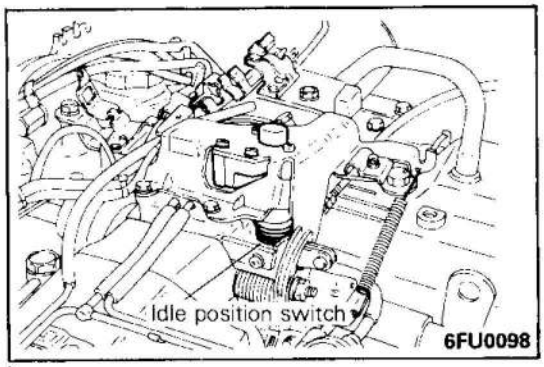
OK → STOP

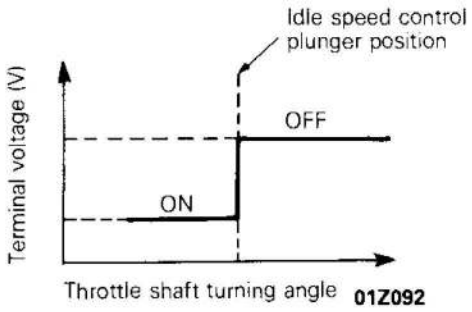
NO → Repair the harness. (Ⓐ2 – 19)

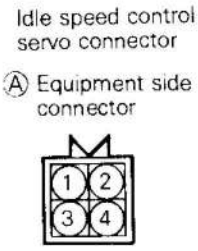
SENSOR INSPECTION

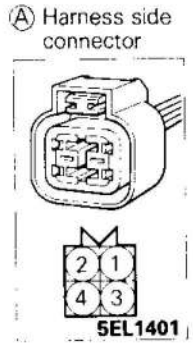
Refer to P. 13-74.

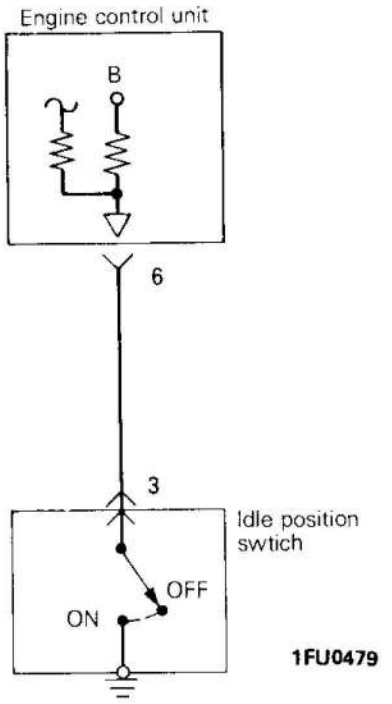
IDLE POSITION SWITCH – Vehicles for Europe built up to October 1989











OPERATION

- The idle position switch senses whether the accelerator pedal is depressed or not, converts it into high/low voltage and inputs the voltage to the engine control unit, which then contols the idle speed control servo based on the input signal.
- A voltage is applied to the idle position switch from the engine control unit. When the accelerator pedal is released, the idle position switch is turned on to conduct the voltage to earth. This causes the idle position switch terminal voltage to go low from high.

TROUBLESHOOTING HINTS

If the idle position switch harness and individual check results are normal but the idle position switch output is abnormal, the following troubles are suspected.
(1) Poorly adjusted accelerator calbe
(2) Poorly adjusted fixed SAS

INSPECTION

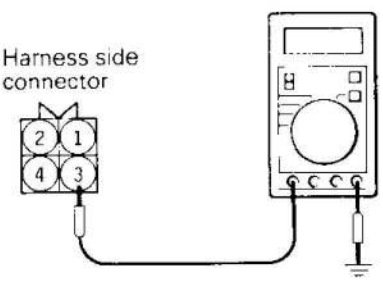
Using Multi-use Tester (MUT) or MUT-II

Function	Item No.	Data display	Check condition	Throttle valve	Normal indication
Data reading	26	Switch state	Ignition switch: ON (check by operating accelerator pedal repeatedly)	At idle position	ON
				Open a little	OFF

HARNESS INSPECTION

1

Ⓐ Harness side connector



Measure the power supply voltage of the idle position switch.

- Connector: Disconnected
- Ignition switch: ON

Voltage (V)
4 or more

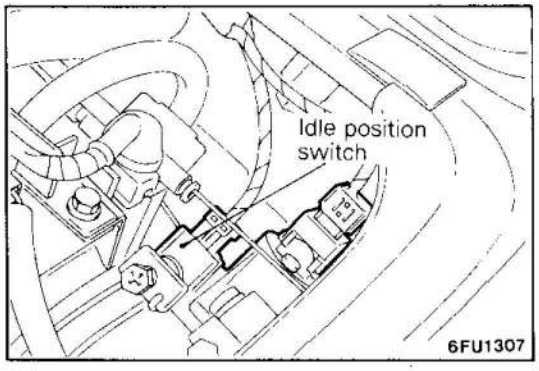
OK → STOP

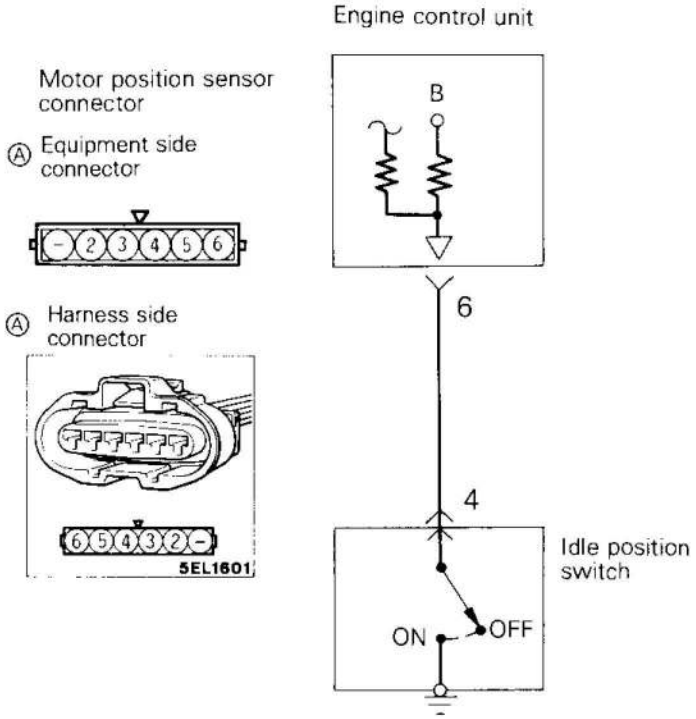
NG → Repair the harness. (Ⓐ 3 - 6)

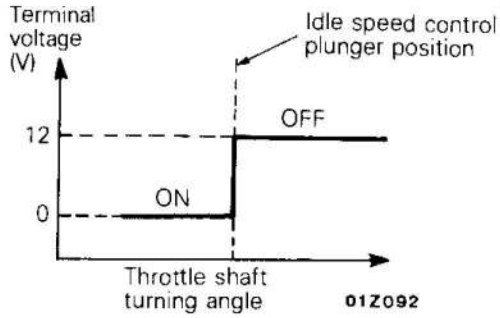
SERNSOR INSPECTION

Refer to P. 13-74.

IDLE POSITION SWITCH – Vehicles for Europe built from November 1989







OPERATION

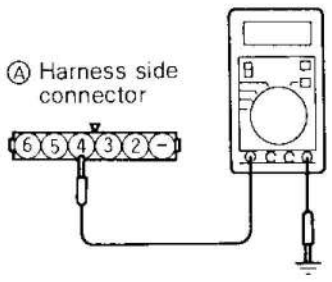
TROUBLESHOOTING HINTS

INSPECTION – Using Multi-use Tester (MUT) or MUT-II

Refer to P. 13-64-30.

HARNESS INSPECTION

1



Measure the power supply voltage of the idle position switch.
- Connector: Disconnected
- Ignition switch: ON

Voltage (V)
4 or more

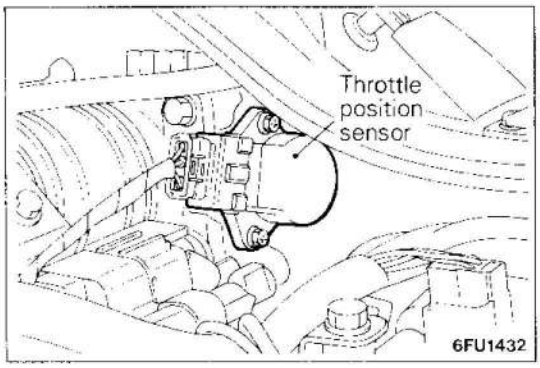
OK → STOP

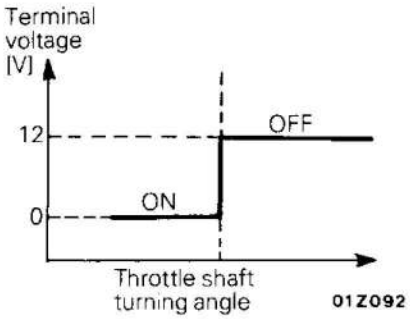
NOT OK → Repair the harness. (Ⓐ4 – 6)

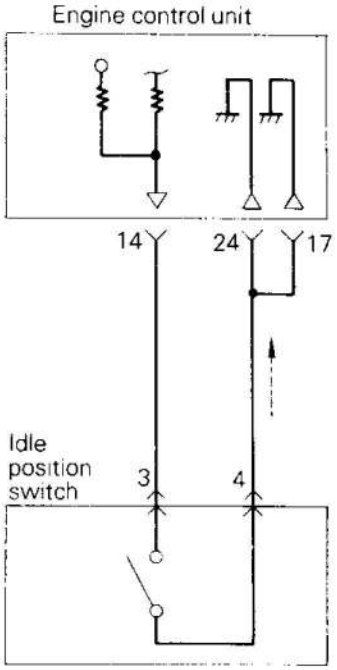
SENSOR INSPECTION

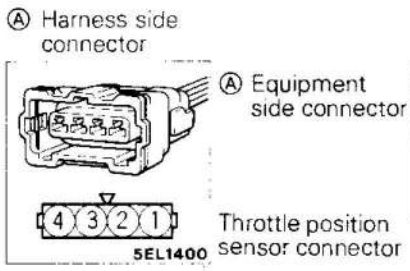
Refer to P. 13-74.

IDLE POSITION SWITCH – Vehicles for Hong Kong









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OPERATION

TROUBLESHOOTING HINTS

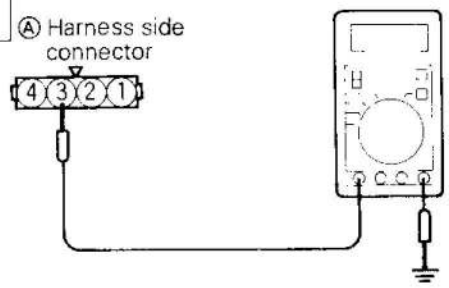
INSPECTION

Using Multi-use Tester (MUT) or MUT-II

Refer to 13-64-30.

HARNESS INSPECTION

1



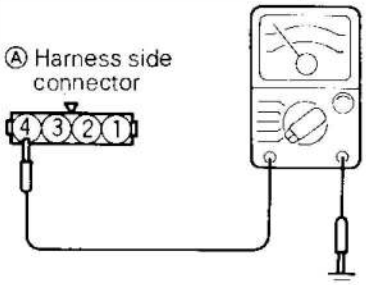
Measure the power supply voltage of the idle position switch.
- Connector: Disconnected
- Ignition switch: ON

Voltage (V)
4 or higher

OK → 2

NG → Repair the harness (Ⓐ 3 – 14)

2



Check for continuity of the earth circuit.
- Connector: Disconnected

OK → STOP

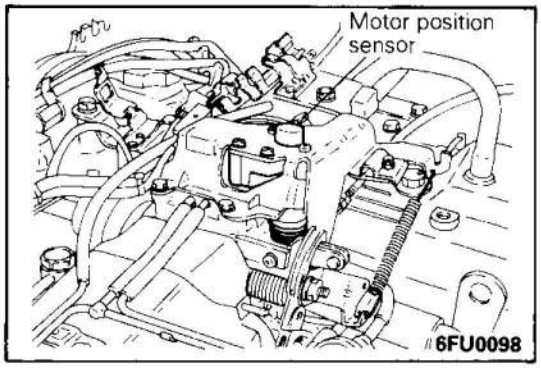
NG → Repair the harness (Ⓐ 4 – 17 24)

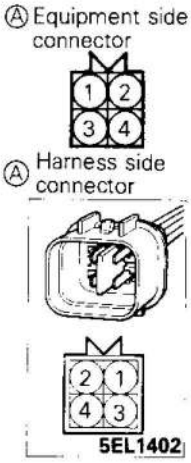
SENSOR INSPECTION

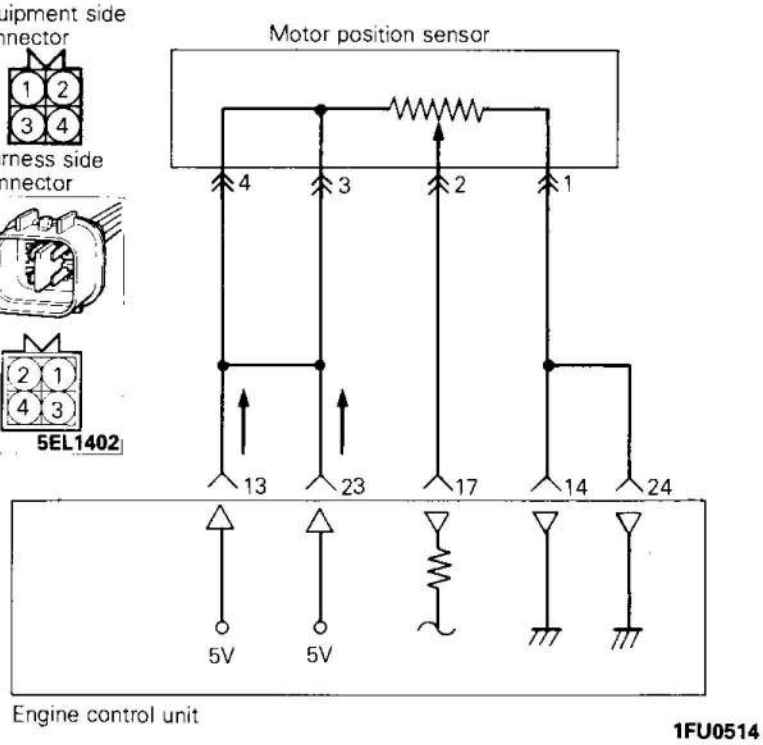
Refer to 13-74-2.

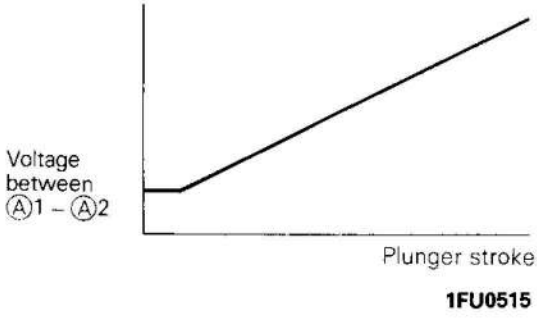
NOTE

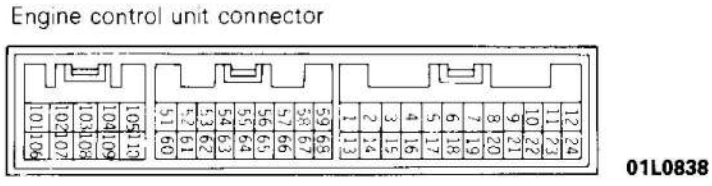
MOTOR POSITION SENSOR – Vehicles for Europe built up to October 1989











OPERATION

- The motor position sensor converts the plunger position in the idle speed control servo into a voltage and inputs it to the engine control unit, which then controls the idle speed control servo based on the input signal.
- The 5 V power in the engine control unit is supplied to the motor position sensor. It flows through the resistor in the sensor and is then grounded in the engine control unit.
- As the plunger in the idle speed control servo that has been retracted extends, the resistance between the variable resistor terminal of the motor position sensor and the earth terminal increases. As a result, the voltage at the motor position sensor variable resistance terminal also increases.

TROUBLESHOOTING HINTS

Hint 1: The motor position sensor signal is the most important sensor in the control of idle speed. If troubles are caused when the air conditioner switch is turned on or off during idling or the engine load is changed, this sensor is often faulty.

Hint 2: If the motor position sensor harness and individual part check have resulted normal but the output voltage of the motor position sensor is out of specification, the following faults are suspected.

(1) Poorly adjusted reference idle speed
(2) Deposit on the throttle valve
(3) Air leaking into the intake manifold through gasket gap, etc.
(4) Loose EGR valve seating
(5) Poor combustion in the cylinder (faulty ignition plug, ignition coil, injector, compression pressure, etc.)

INSPECTION

Using Multi-use Tester (MUT) or MUT-II

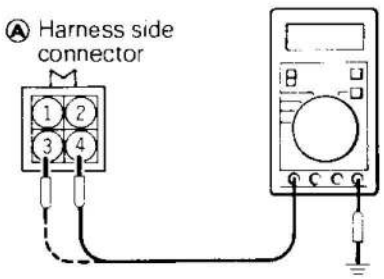
Function	Item No.	Data display	Check condition	Load state	Standard value
Data reading	15	Sensor voltage	• Engine coolant temperature: 80 to 90°C (176 to 194°F) • Lamps, electric cooling fan, accessory units: All off • Transmission: Neutral • Steering wheel: Neutral • Idle position switch: ON (Compressor clutch to be operating in case air conditioner switch is ON) • Engine: At idle	Air conditioner swtich: OFF	500 – 1,300 mV
				Air conditioner switch: ON	800 – 1,800 mV

NOTE
When the vehicle is new [within initial operation of about 500 km (300 miles)], the motor position sensor output voltage may be about 500 mV higher.

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

HARNESS INSPECTION

1



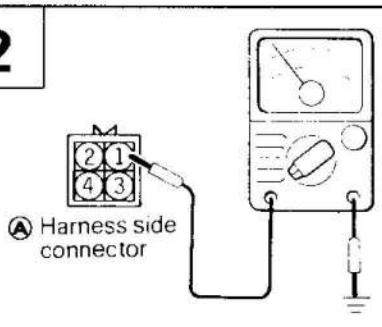
Measure the power supply voltage of the motor position sensor.
- Connector: Disconnected
- Ignition switch: ON

Voltage (V)
4.8 – 5.2

OK → 2

NG → Repair the harness. (Ⓐ 3 4 – 13, 23)

2

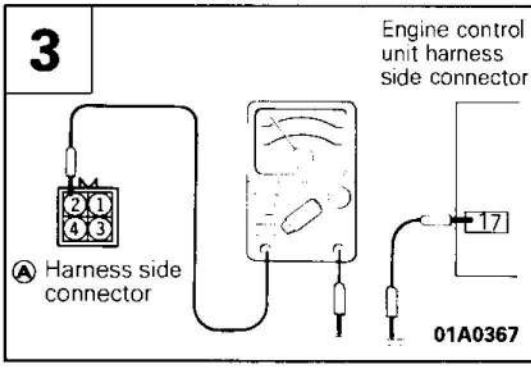


Check for continuity of the earth circuit.
- Connector: Disconnected

OK → 3

NG → Repair the harness. (Ⓐ 1 – 14, 24)

3



Check for an open-circuit, or a short-circuit to earth between the engine control unit and the motor position sensor.
- Engine control unit connector: Disconnected
- Motor position sensor connector: Disconnected

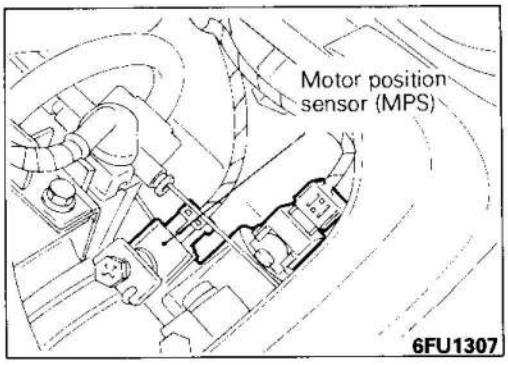
OK → STOP

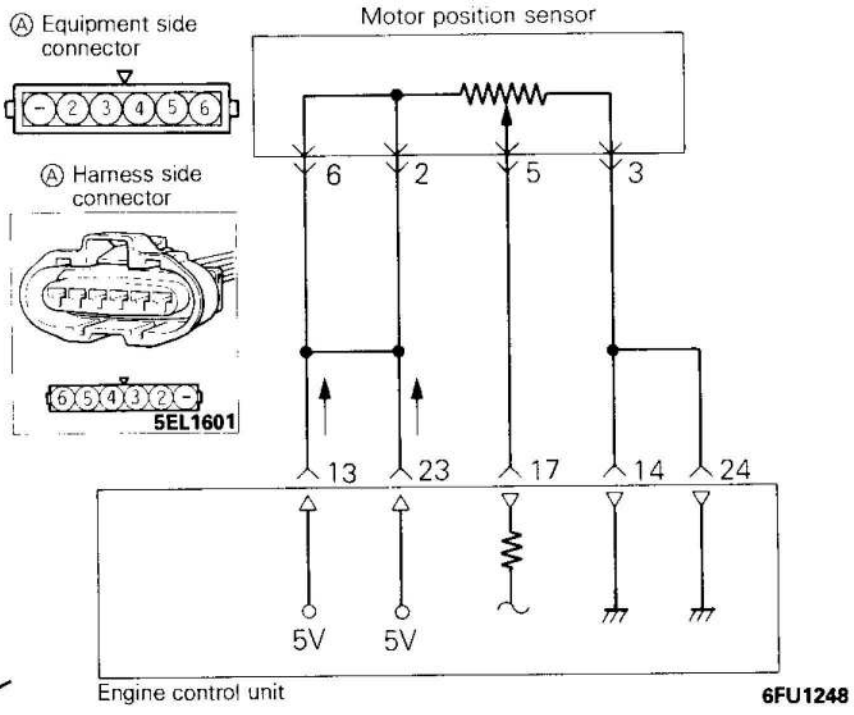
NG → Repair the harness. (Ⓐ 2 – 17)

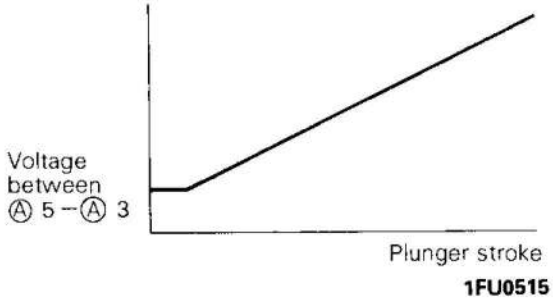
SENSOR INSPECTION

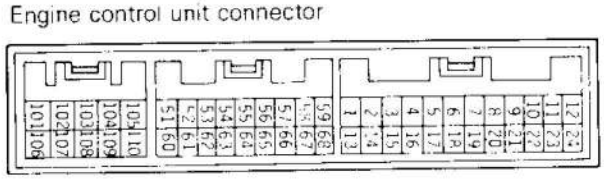
Refer to P. 13-75.

MOTOR POSITION SENSOR – Vehicles for Europe built from November 1989









OPERATION

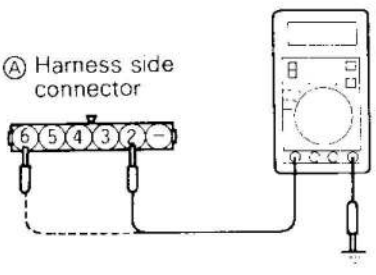
TROUBLESHOOTING HINTS

INSPECTION – Using Multi-use Tester (MUT) or MUT-II

Refer to P. 13-64-33.

HARNESS INSPECTION

1



Measure the power supply voltage of the motor position sensor.
- Connector: Disconnected
- Ignition switch: ON

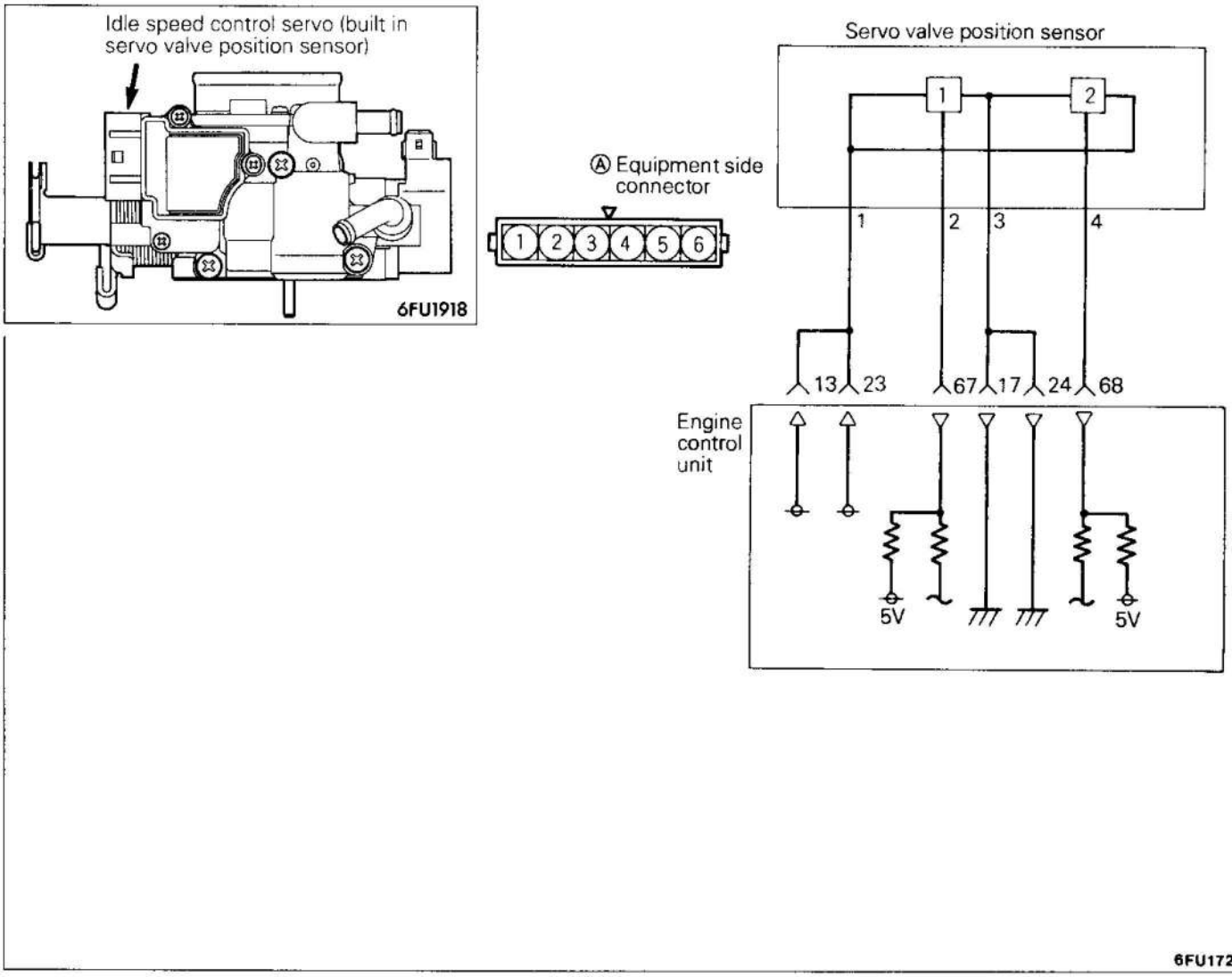
Voltage (V)
4.8 – 5.2

OK → **2**

NO → Repair the harness. (Ⓐ 2 6 – 13, 23)

SERVO VALVE POSITION SENSOR – Vehicles for Hong Kong

M13YJAB



OPERATION

- The servo valve position sensor converts the changes (increase or decrease) in the valve position of the engine idling speed control servo (ISC) into pulse signals and inputs these signals to the engine control unit. The engine control unit determines the valve position from these signals, and controls the engine idling speed control servo.
- 5V power is supplied to the servo valve position sensor from the engine control unit, and the earth connection is made from the engine control unit.
- 5V power is applied to the two servo valve position sensor output terminals. When the servo valve position is changed (increased or decreased) by the DC motor inside the servo, the servo valve position sensor generates a signal from the opening and closing between the output terminal and the earth.

TROUBLESHOOTING

The servo valve position sensor is the most important sensor for controlling the engine idling speed. If a malfunction develops when the engine is idling and the electrical load is varied by turning the air conditioner switch to ON and OFF, etc., this sensor is probably defective.

INSPECTION

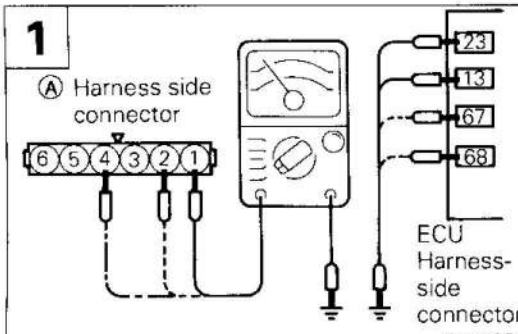
Using Multi-use Tester (MUT) or MUT-II

Function	Item No.	Data display	Check conditions	Load conditions	Standard value
Data reading	55	Servo valve position steps	• Engine coolant temperature: 80–95°C (176–203°F) • Lights and accessories: OFF • Transmission: P range • Steering wheel: neutral position • Idle-position switch: ON (The compressor clutch should be activated when the air conditioner switch is switched ON.) • Engine: idling	• Air conditioner switch: OFF	2 – 20 STP
				• Air conditioner switch: ON	8 – 50 STP Increases
				• Air conditioner switch: OFF • Selector lever: shift to D range	3 – 40 STP Increases

NOTE
When the vehicle is new [driven approximately 500 km (300 miles) or less] the number of steps may be about 30 steps greater than the standard value indicated above.

HARNESS INSPECTION

1

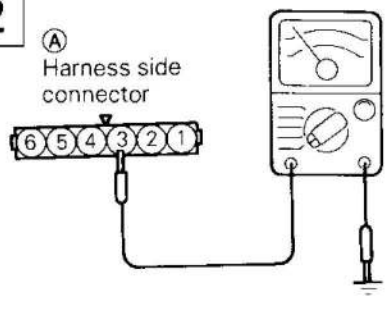


Check for open or short circuit to earth between the servo valve position sensor and the ECU.
- ECU connector: Disconnected
- Servo valve position sensor connector: Disconnected

OK → 2

NO → Repair the harness (Ⓐ 1 – 13 23) (Ⓐ 2 – 67) (Ⓐ 4 – 68)

2

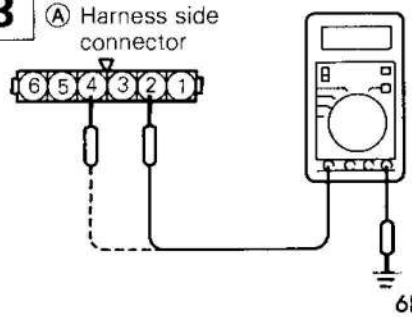


Check for continuity in the earth circuit.
- Servo valve position sensor connector: Disconnected

OK → 3

NO → Repair the harness (Ⓐ 4 – 17 24)

3



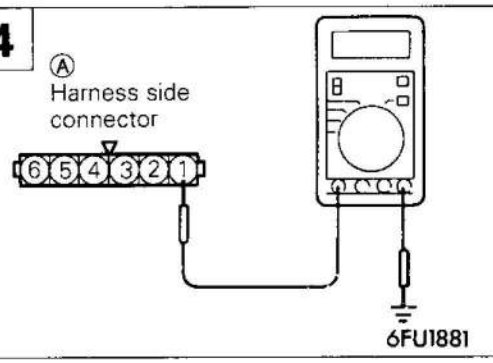
Measure the impressed voltage.
- Servo valve position sensor connector: Disconnected
- ECU connector: Connected
- Ignition switch: ON

Voltage (V)
4.8 – 5.2

OK → 4

NO → Replace the ECU.

4



Measure the impressed voltage.

- Servo valve position sensor connector: Disconnected
- ECU connector: Connected
- Ignition switch: ON

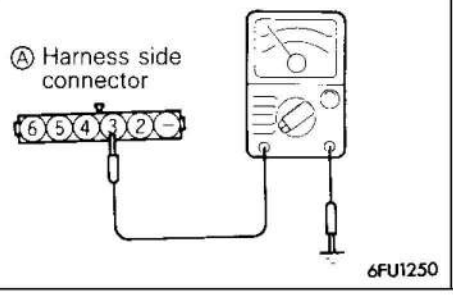
Voltage (V)
4.8 – 5.2

OK → STOP

NG → Replace the ECU.

NOTE

2

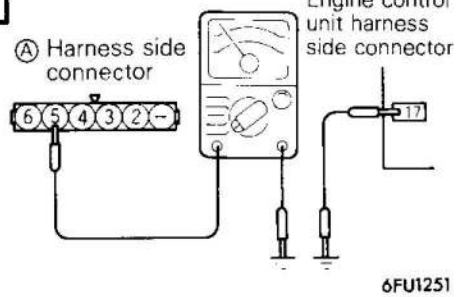


Check for continuity of the earth circuit.
- Connector: Disconnected

OK → 3

NG → Repair the harness. (Ⓐ3 – 14, 24)

3



Check for an open-circuit or a short-circuit to earth, between the engine control unit and the motor position sensor.
- Engine control unit connector: Disconnected
- Motor position sensor connector: Disconnected

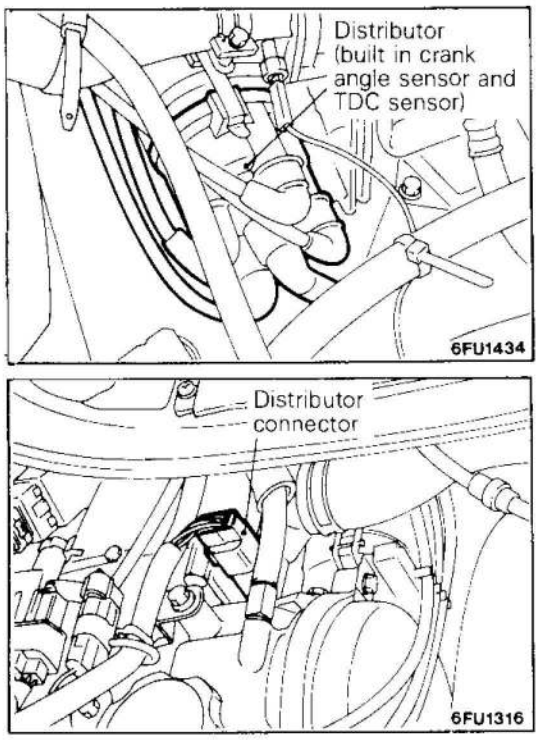
OK → STOP

NG → Repair the harness. (Ⓐ5 – 17)

SENSOR INSPECTION

Refer to P.13-75.

TOP DEAD CENTER SENSOR

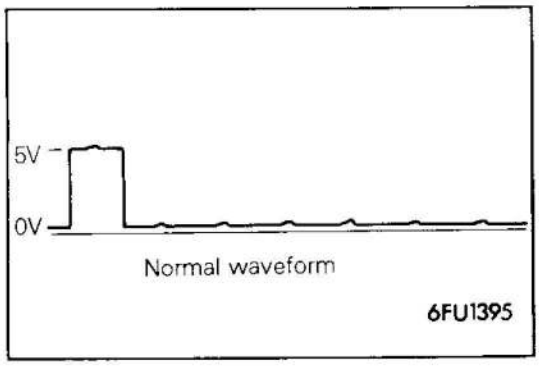


OPERATION

- The top dead center sensor senses the top dead center on compression stroke of the No. 1 cylinder, converts it into a pulse signal and inputs it to the engine control unit, which then computes the fuel injection sequence, etc. based on the input signal.
- Power to the top dead center sensor is supplied from the ignition switch (IG) and is grounded to the body. The top dead center sensor generates a pulse signal as it repeatedly connects and disconnects between 5 V voltage supplied from the engine control unit and earth.

TROUBLESHOOTING HINTS

If the top dead center sensor does not function correctly, correct sequential injection is not made so that the engine may stall, run irregularly at idle or fail to accelerate normally.



INSPECTION

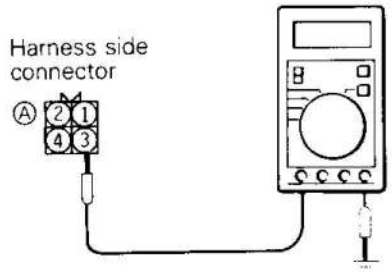
Using Oscilloscope

(1) Run the engine at the idle speed.
(2) Connect the probe to the oscilloscope pick-up point in the circuit diagram, and check the waveform.

ADDED

HARNESS INSPECTION

1



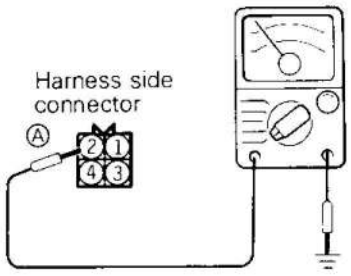
Measure the power supply voltage.
- Connector: Disconnected
- Ignition switch: ON

Voltage (V)
11 – 13

OK → 2

NG → Repair the harness. (Ⓐ3 – Ignition switch)

2

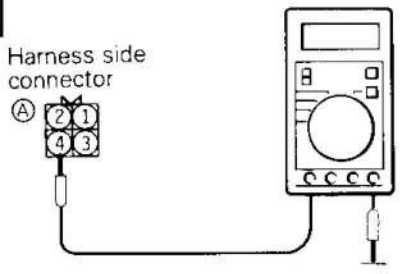


Check for continuity of the earth circuit.
- Connector: Disconnected

OK → 3

NG → Repair the harness. (Ⓐ2 – Earth)

3



Check the voltage of the output circuit.
- Connector: Disconnected
- Ignition switch: ON

Voltage (V)
4.8–5.2

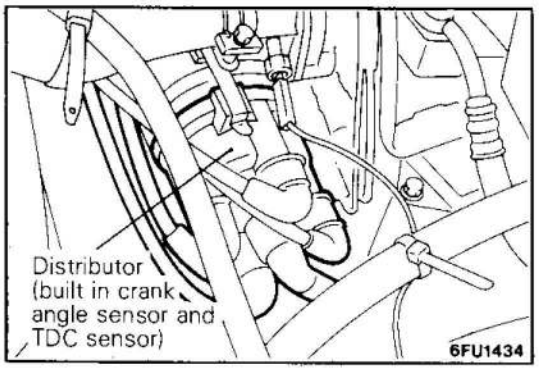
OK → STOP

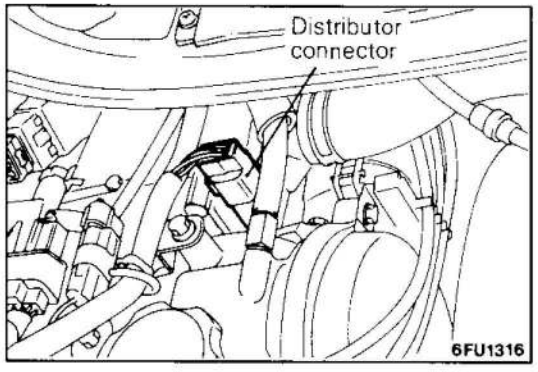
NG → Repair the harness. (Ⓐ4 – 22)

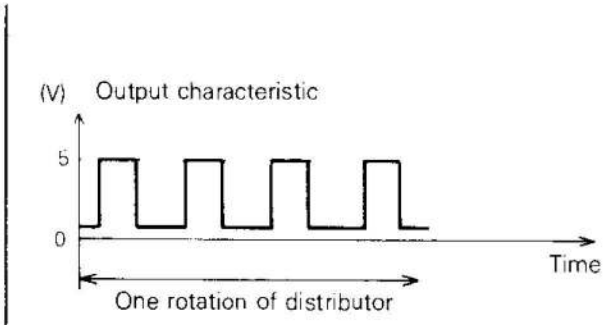
SENSOR INSPECTION

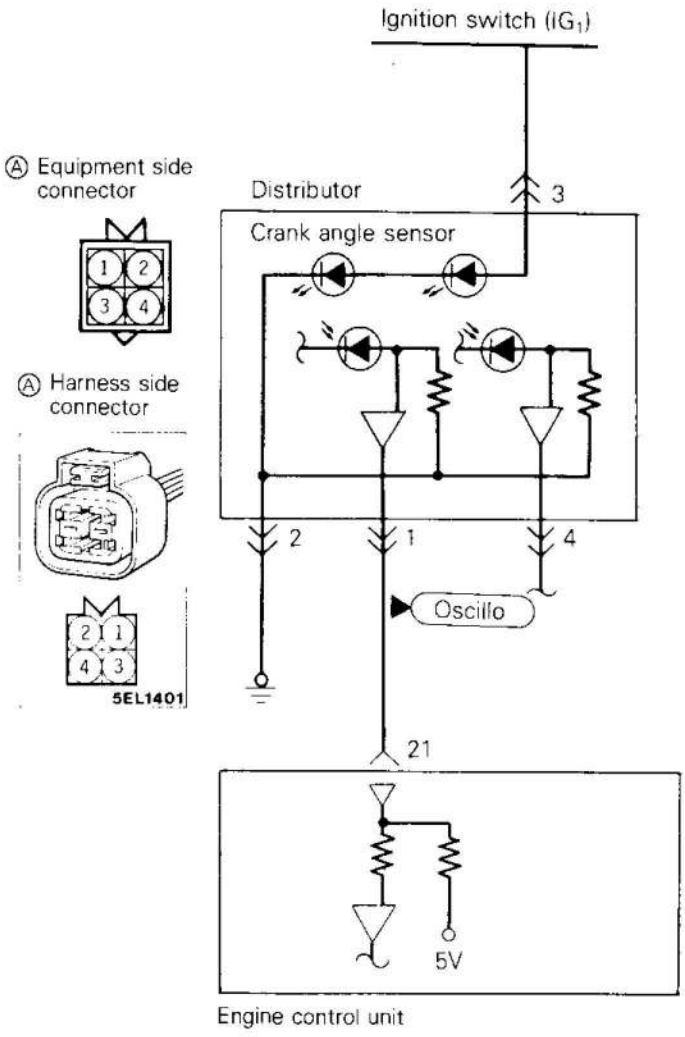
Refer to P. 13 – 75.

CRANK ANGLE SENSOR









OPERATION

- The crank angle sensor senses the crank angle (piston position) of each cylinder, converts it into a pulse signal and inputs it to the engine control unit, which then computes the engine speed and controls the fuel injection timing and ignition timing based on the input signal.
- Power to the crank angle sensor is supplied from the ignition switch (IG) and is grounded to the body. The crank angle sensor generates a pulse signal as it repeatedly connects and disconnects between 5 V voltage supplied from the engine control unit and 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 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 3: 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 4: 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.

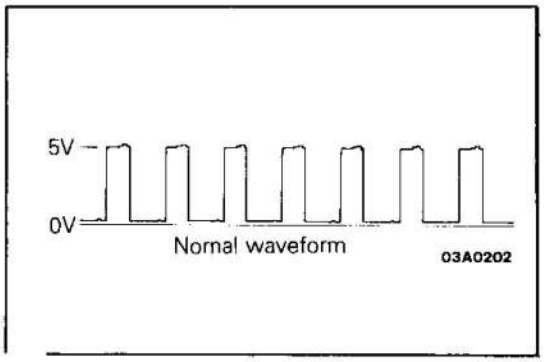
[Examples]
(1) Faulty water temperature sensor
(2) Faulty idle speed control servo
(3) Poorly adjusted reference idle speed

INSPECTION

Using Multi-use Tester (MUT) or MUT-II

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 or MUT-II reading	Indicated speed to agree

Function	Item No.	Data display	Check condition	Coolant temperature	Standard value
Data reading	22	Idle speed	• Engine: Running at idle • Idle position switch: ON	– 20°C (– 4°F)	1,620 – 1,820 r/min.
				0°C (32°F)	1,450 – 1,650 r/min.
				20°C (68°F)	1,300 – 1,500 r/min.
				40°C (104°F)	1,020 – 1,220 r/min.
				80°C (176°F)	650 – 850 r/min.

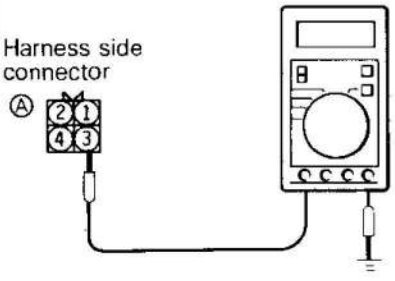


Using Oscilloscope

(1) Run the engine at idle speed.
(2) Connect the probe to the oscilloscope pick-up point as shown in the circuit diagram, and check the waveform.

HARNESS INSPECTION

1



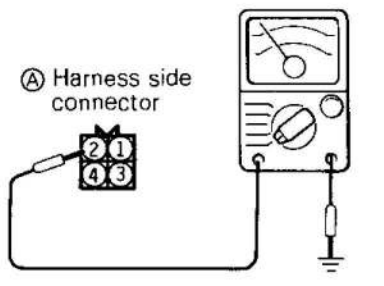
Measure the power supply voltage.
- Connector: Disconnected
- Ignition switch: ON

Voltage (V)
11 – 13

OK → **2**

NG → Repair the harness. (Ⓐ3 – Ignition switch)

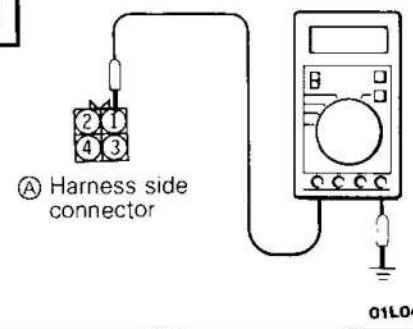
2



Check for continuity of the earth circuit.
- Connector: Disconnected

OK → **3**

NG → Repair the harness. (Ⓐ2 – Earth)

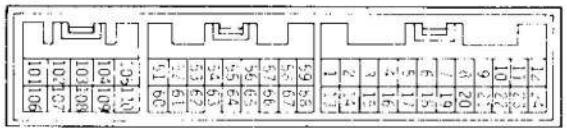
3		Check the voltage of the output circuit. • Connector: Disconnected • Ignition switch: ON Voltage (V): 4.8–5.2	OK → STOP NOT OK → Repair the harness. (Ⓐ1–21)

SENSOR INSPECTION

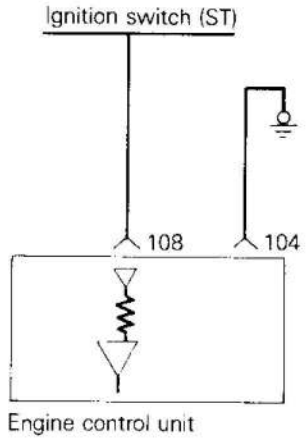
Refer to P. 13-75.

IGNITION SWITCH – ST

Engine control unit connector



01L0838



6FU1257

OPERATION

- The ignition switch-ST inputs a high signal to the engine control unit while the engine is cranking. The engine control unit provides fuel injection control, etc., at engine startup based on this signal.
- When the ignition switch is set to START, the battery voltage at cranking is applied through the ignition switch to the engine control unit, which detects that the engine is cranking.

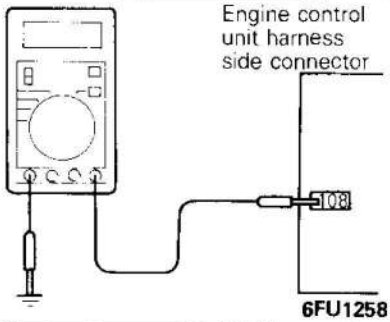
INSPECTION

Using Multi-use Tester (MUT) or MUT-II

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

HARNESS INSPECTION

1



6FU1258

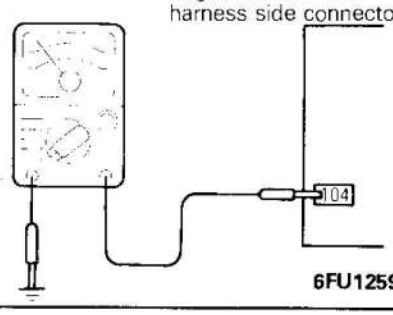
Measure the input voltage to the engine control unit.
- Engine control unit connector: Disconnected
- Ignition switch: START

Voltage (V)
8 or more

OK → 2

NO → Repair the harness (108 – Ignition switch)

2



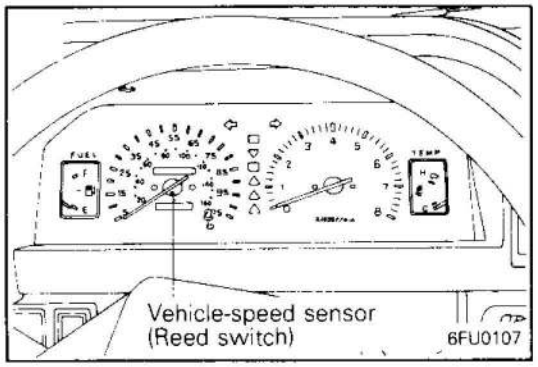
6FU1259

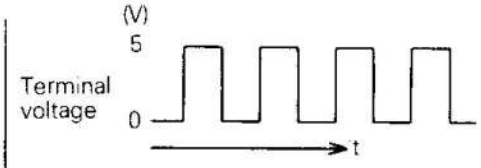
Check for continuity of the earth circuit.
- Engine control unti connector: Disconnected

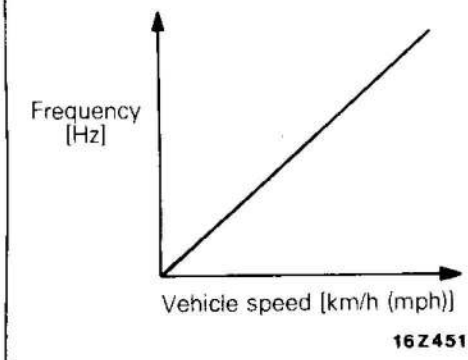
OK → STOP

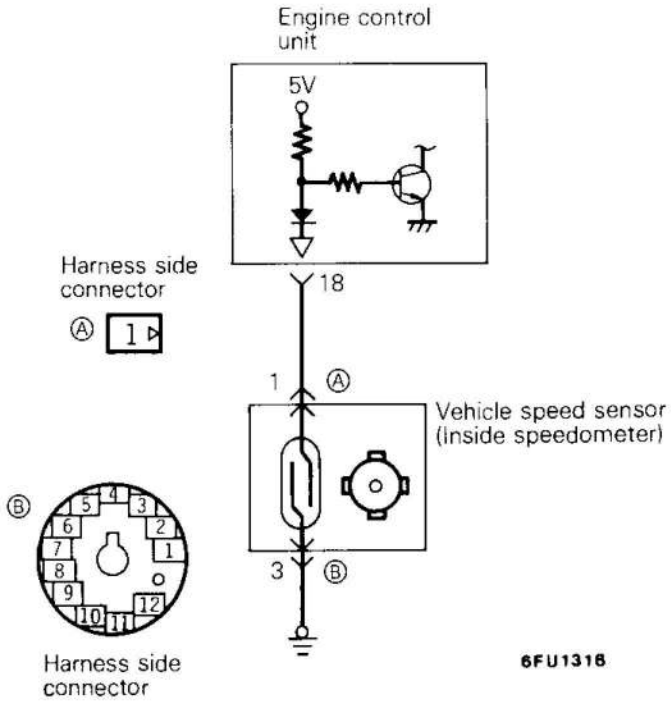
NO → Repair the harness (104 – Earth)

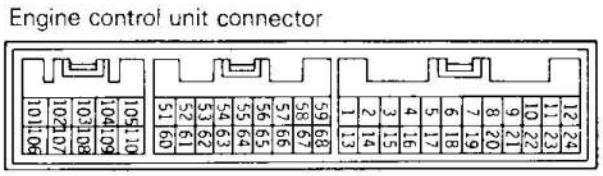
VEHICLE SPEED SENSOR











OPERATION

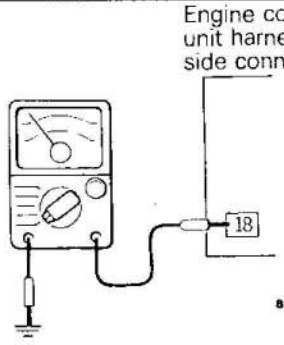
- The vehicle speed sensor which is located in the speedometer converts the vehicle speed into a pulse signal and inputs it to the the engine control unit, which then provides the idle speed control, etc. based on this signal.
- The vehicle speed sensor generates the vehicle speed signal by repeatedly opening and closing between the voltage of about 5 V applied from the engine control unit and earth using a reed switch.

TROUBLESHOOTING HINTS

If there is an open or short circuit in the vehicle speed sensor signal circuit, the engine may stall when the vehicle is decelerated to stop.

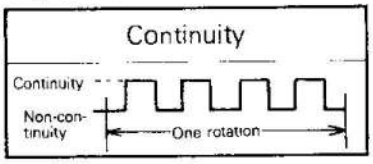
HARNESS INSPECTION

1



Check the vehicle speed sensor output circuit for continuity.

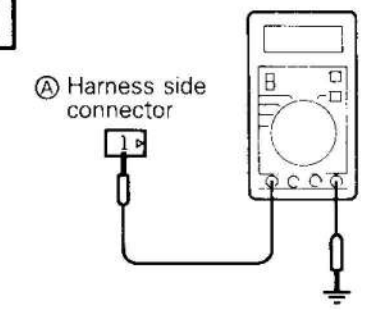
- Engine control unit connector: Disconnected
- Move the vehicle.



OK → STOP

OK → 2

2



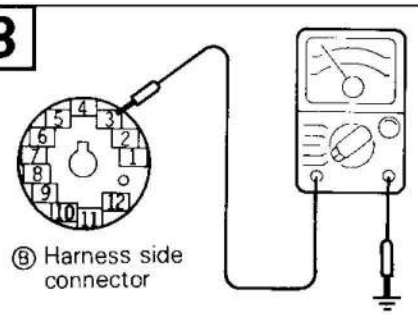
Measure the power supply voltage of the vehicle speed sensor.
- Connector: Disconnected
- Ignition switch: ON

Voltage (V)
4.5–4.9

OK → 3

NG → Repair the harness. (Ⓐ1 – 18)

3



Check for continuity of the earth circuit.
- Connector: Disconnected

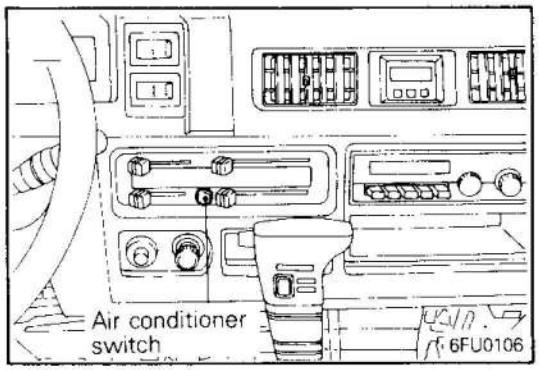
OK → STOP

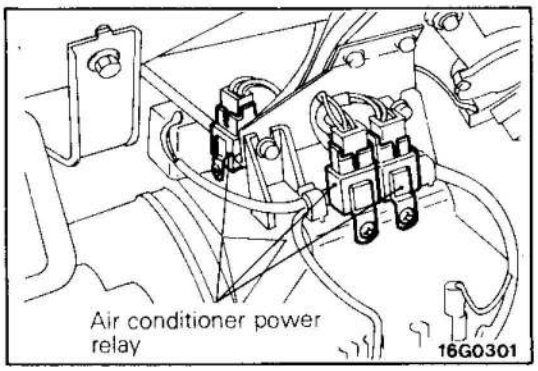
NG → Repair the harness. (Ⓑ3 – Earth)

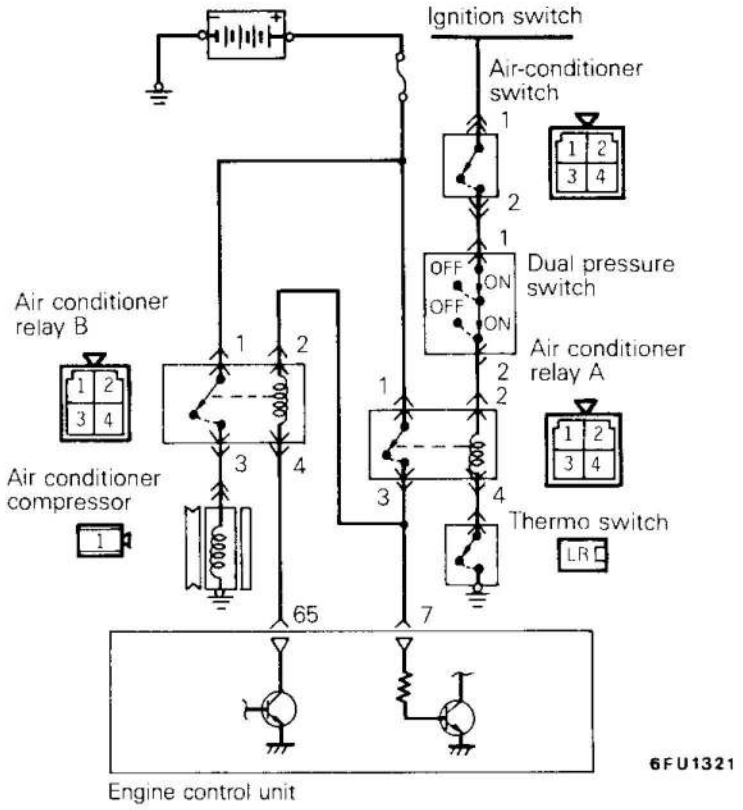
SENSOR INSPECTION

Refer to Group 54 – Meters and Gauges.

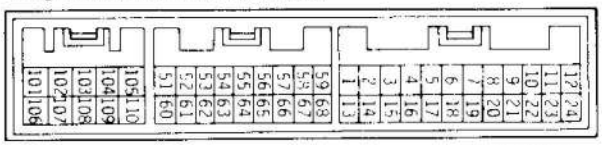
AIR CONDITIONER SWITCH AND POWER RELAY







Engine control unit connector



OPERATION

- The air conditioner switch applies battery voltage to the engine control unit when the air conditioner is switched ON.
- When the air conditioner signals are input, the engine control unit activates the idle-speed control servo, and also switches ON the power transistor. As a result, current flows to the power relay coil and the relay switch is switched ON, the air conditioner compressor's magnetic clutch is activated.

TROUBLESHOOTING HINTS

If the air conditioner compressor's magnetic clutch is not activated when the air conditioner switch is switched ON during idling, it is probable that the cause is a malfunction of the air conditioner control system.

INSPECTION

Using Multi-use Tester (MUT) or MUT-II

AIR CONDITIONER SWITCH

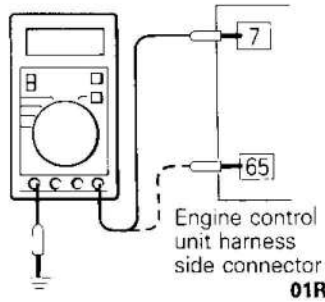
Function	Item No.	Data display	Check conditions	Air conditioner switch	Normal display
Data reading	28	Switch status	Engine idling (The air conditioner compressor should be activated when the air conditioner switch is switched ON.)	OFF	OFF
				ON	ON

AIR CONDITIONER POWER RELAY

Function	Item No.	Data display	Check conditions	Air conditioner switch	Normal display
Data reading	49	Air conditioner power relay status	Engine: idling after warm up	OFF	OFF (Compressor clutch non-activation)
				ON	ON (Compressor clutch activation)

HARNESS INSPECTION

1



Measure the power supply voltage of the air conditioner circuit.
- Engine control unit connector: Disconnected
- Ignition switch: ON
- Air conditioner switch: ON

Voltage (V)
11 – 13

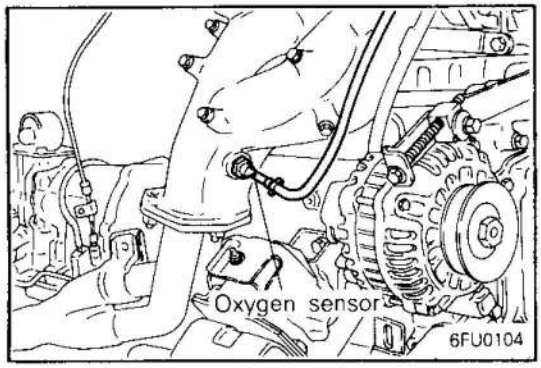
OK → STOP

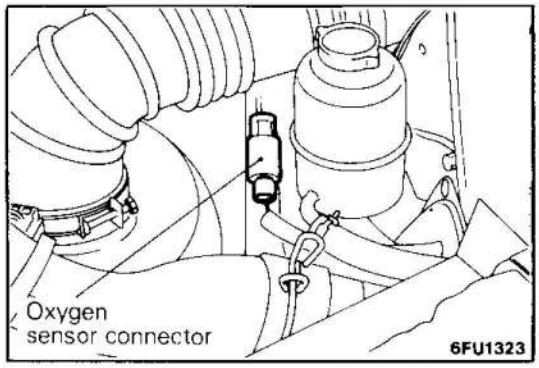
NG → Check the air conditioner circuit

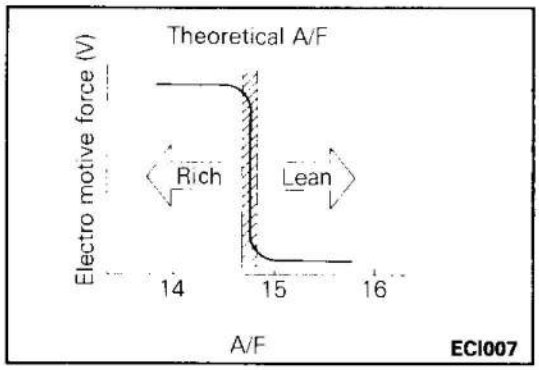
AIR CONDITIONER INSPECTION

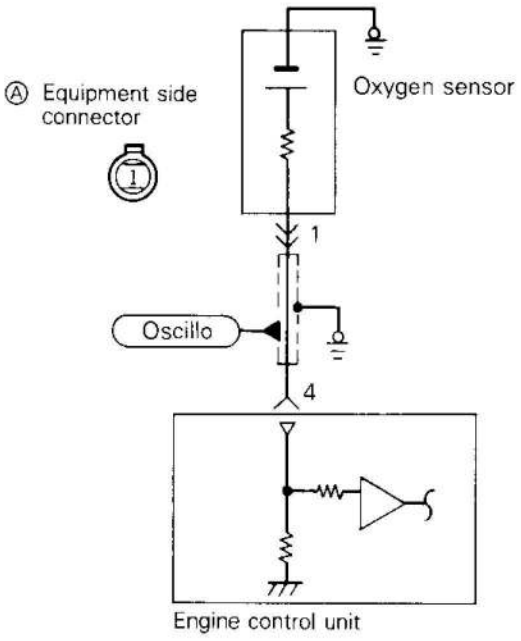
Refer to Group 55 – Service Adjustment Procedures.

OXYGEN SENSOR

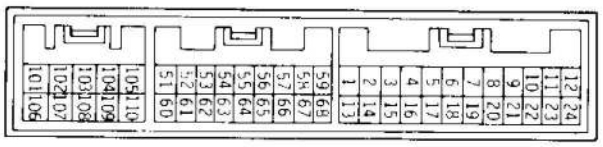








Engine control unit connector



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.

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.

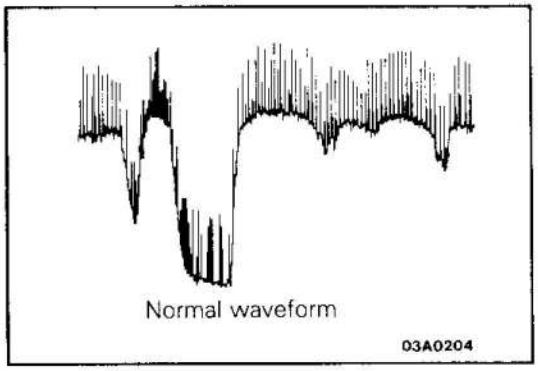
Examples:

(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 Multi-use Tester (MUT) or MUT-II

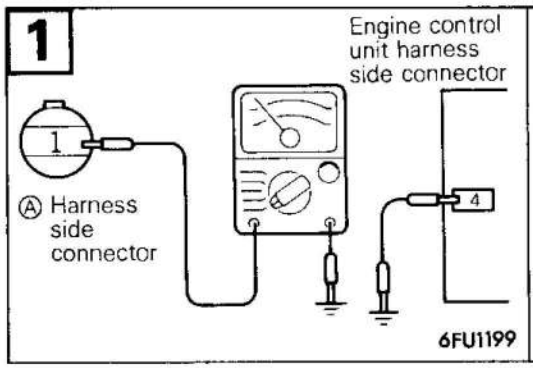
Function	Item No.	Data display	Check conditions	Engine condition	Standard value
Data reading	11	Sensor detection voltage	Engine: warm-up (Make the mixture lean by engine speed reduction, and rich by racing)	When sudden deceleration from 4,000 r/min.	200 mV or lower
				When engine is suddenly raced	600–1,000 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)	750 r/min. (idling)	400 mV or lower
				2,000 r/min.	↕ (changes) 600–1,000 mV



Using Oscilloscope

(1) Connect the probe to the oscilloscope pick-up point as shown in the circuit diagram.
(2) After the engine is warmed up, keep the engine running at 2,000 r/min., and check the waveform.

HARNESS INSPECTION



Check for an open-circuit or a short-circuit to ground, between the engine control unit and the oxygen sensor.
- Oxygen sensor connector: Disconnected
- Engine control unit connector: Disconnected

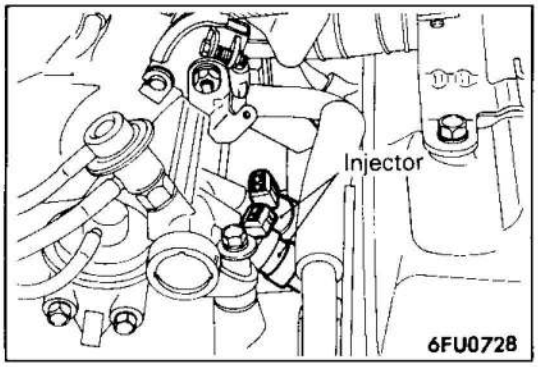
OK → STOP

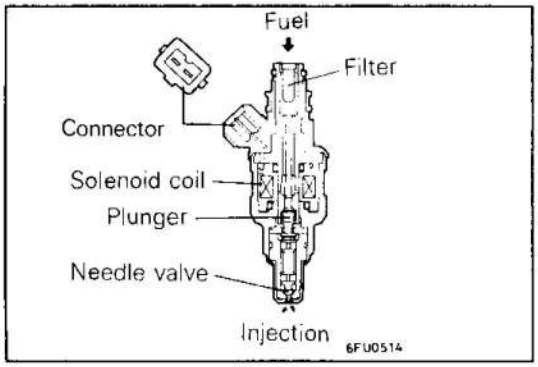
NG → Repair the harness. (Ⓐ1–4)

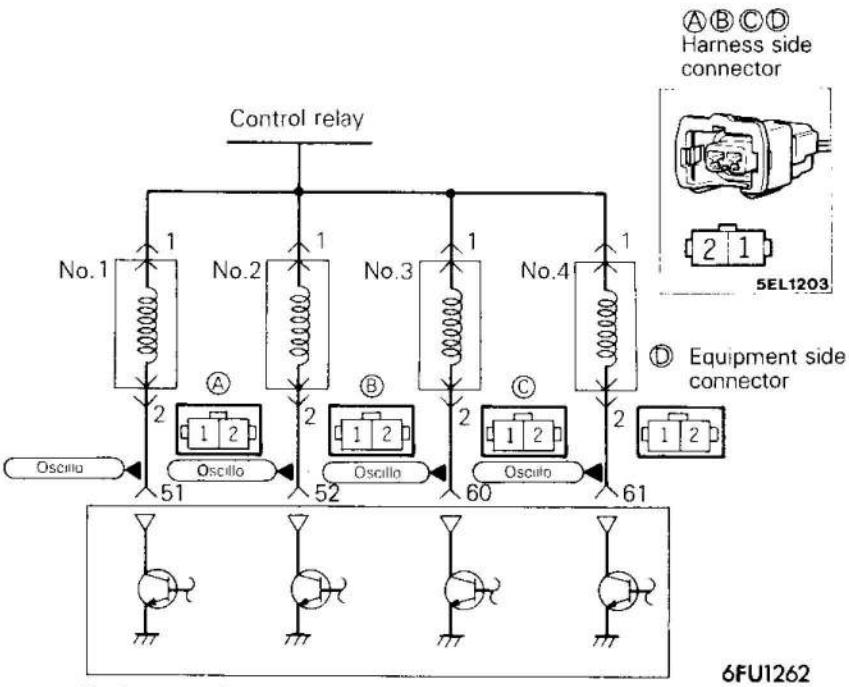
SENSOR INSPECTION

Refer to P. 13-75-1.

INJECTORS – Vehicles for Europe built up to October 1989

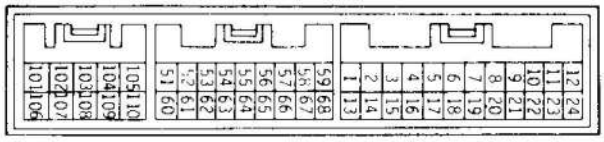






Engine control unit

Engine control unit connector



OPERATION

- The injector is an injection nozzle with a solenoid valve which injects fuel according to the injection signal coming from the engine control unit.
- The injector has a fixed nozzle opening area and the fuel pressure against manifold inside pressure is regulated to a fixed level. Therefore, the volume of fuel injected by the injector is determined by the time during which the needle valve is open, namely, by the time during which the solenoid coil is energized.
- The battery voltage is applied through the control relay to this injector. When the engine control unit turns ON the power transistor in the unit, the solenoid coil is energized to open the injector valve, which then injects fuel.

TROUBLESHOOTING HINTS

Hint 1: If the engine is hard to start when hot, check fuel pressure and check the injector for leaks.

Hint 2: If the injector does not when the engine that is hard to start is cranked, the following as well as the injector itself may be responsible.
- (1) Faulty power supply circuit to the engine control unit, faulty earth circuit
- (2) Faulty control relay
- (3) Faulty crank angle sensor, top dead center sensor

Hint 3: If there is any cylinder whose idle state remains unchanged when the fuel injection of injectors is cut one after another during idling, make following checks about such cylinder.
- (1) Injector and harness check
- (2) Ignition plug and high tension cable check
- (3) Compression pressure check

Hint 4: If the injector harness and individual part checks have resulted normal but the injector drive time is out of specification, the following troubles are suspected.
- (1) Poor combustion in the cylinder (faulty ignition plug, ignition coil, compression presure, etc.)
- (2) Loose EGR valve seating
- (3) High engine resistance

INSPECTION

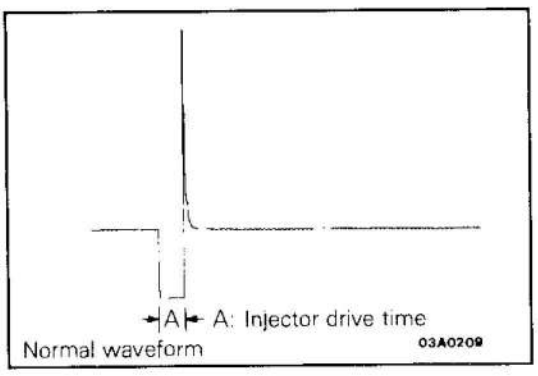
Using Multi-use Tester (MUT) or MUT-II

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. 19 ms
				20°C (68°F)	Approx. 41 ms
				80°C (176°F)	Approx. 11 ms

Function	Item No.	Data display	Check conditions	Engine state	Standard value
Data reading	41	Drive time *3	• Engine coolant temperature: 80 to 90°C (176 to 194°F) • Lamps, electric cooling fan, accessory units: All off • Transmission: Neutral (P range for vehicles with A/T) • Steering wheel: Neutral	700 r/min. (Idle)	2,9 – 3,5 ms
				2,000 r/min.	2,9 – 3,5 ms
				When sharp racing is made	To increase

NOTE
*1: The injector drive time refers to when the supply voltage is 11 V 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.

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		

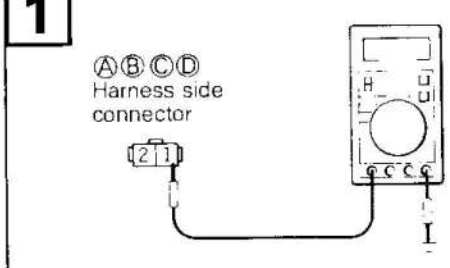


Using Oscilloscope

(1) Run the engine at idle speed.
(2) Connect the probe to the oscilloscope pick-up point as shown in the circuit diagram, and check the waveform at the drive side of each injector.

HARNESS INSPECTION

1

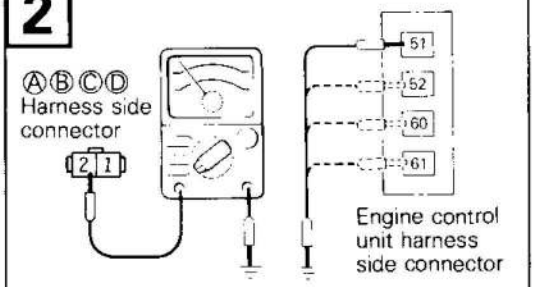


Measure the power supply voltage of the injector.
- Connector: Disconnected
- Ignition switch: ON

Voltage (V)
11 – 13

OK → **2** Repair the harness. (ABCD 1 – Control relay) Check the power supply.

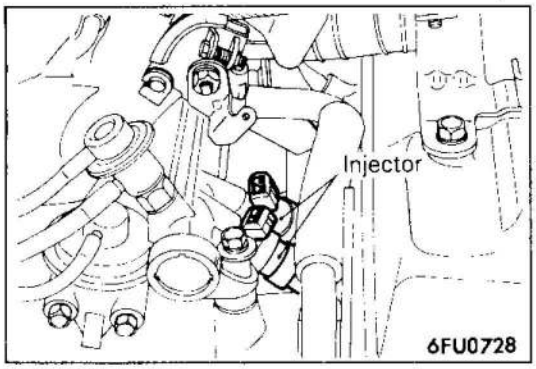
NG →

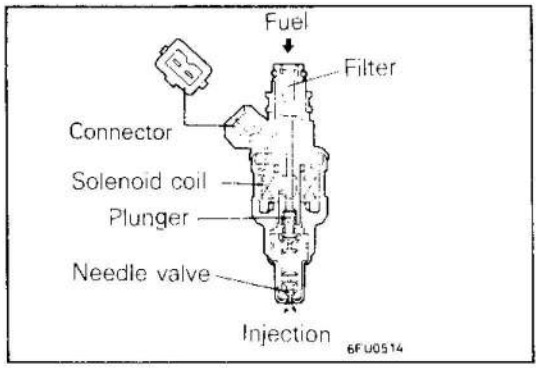
2  01A0234	Check for an open-circuit, or a short-circuit to earth between the engine control unit and the injector • Engine control unit connector: Disconnected • Injector connector: Disconnected	OK →	STOP Repair the harness. (ⒶⒷⒸⒹ 2 – 51 52 60 61)
		NG →	

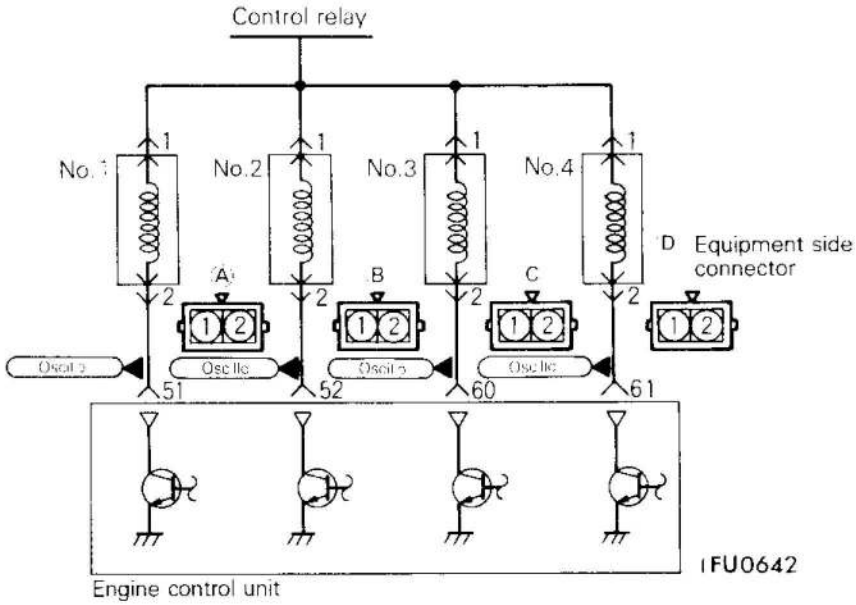
ACTUATOR INSPECTION

Refer to P. 13-76.

INJECTORS – Vehicles for Europe built from November 1989 and vehicles for Hong Kong

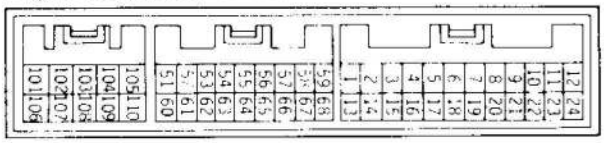






Engine control unit

Engine control unit connector



OPERATION

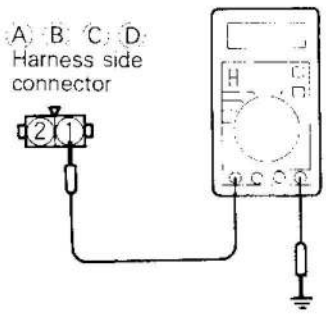
TROUBLESHOOTING HINTS

INSPECTION – Using Multi-use Tester (MUT) or MUT-II

Refer to P. 13-64-48.

HARNESS INSPECTION

1



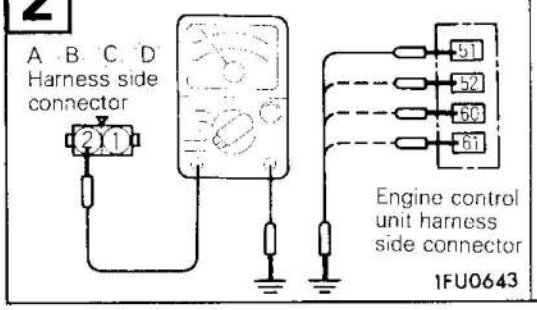
Measure the power supply voltage of the injector.
- Connector: Disconnected
- Ignition switch: ON

Voltage (V)
11 – 13

OK → **2**

NG → Repair the harness (Ⓐ Ⓑ Ⓒ Ⓓ [1] – Control relay) Check the power supply

2



Check for an open-circuit, or a short-circuit to earth between the engine control unit and the injector
- Engine control unit connector: Disconnected
- Injector connector: Disconnected

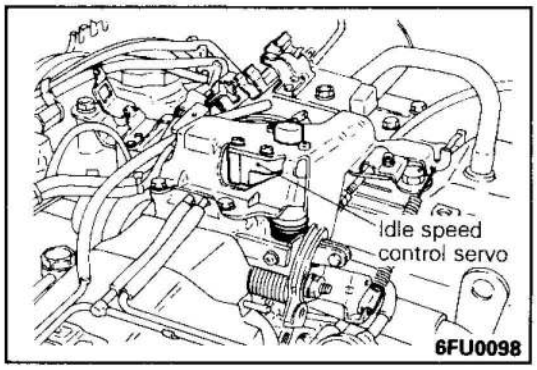
OK → STOP

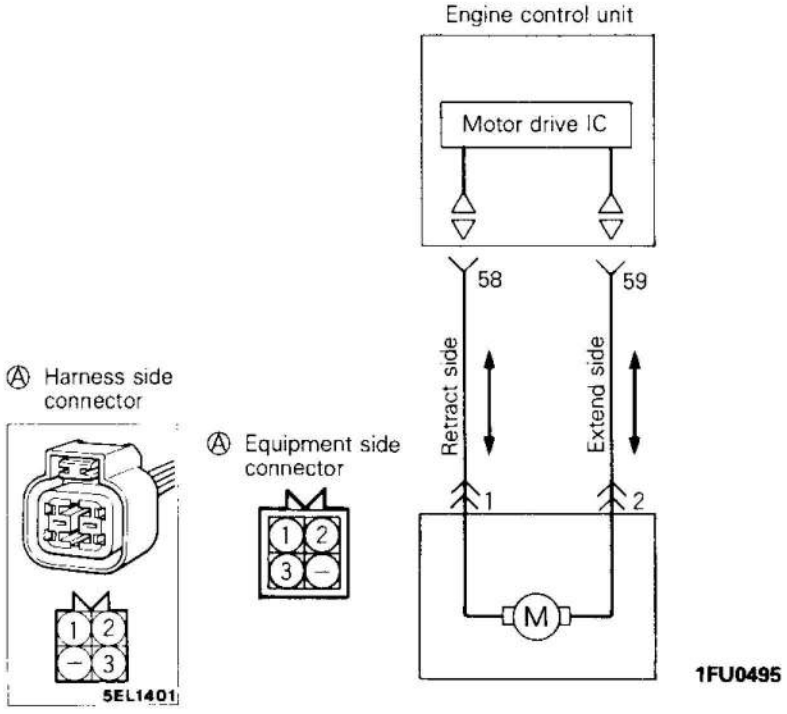
NG → Repair the harness (Ⓐ Ⓑ Ⓒ Ⓓ [2] – [51], [52], [60], [61])

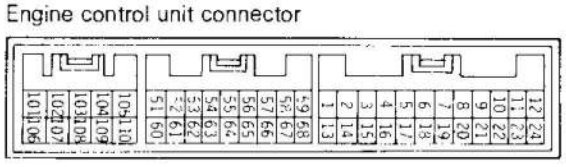
ACTUATOR INSPECTION

Refer to P. 13-76.

IDLE SPEED CONTROL SERVO (DC MOTOR) – Vehicles for Europe built up to October 1989







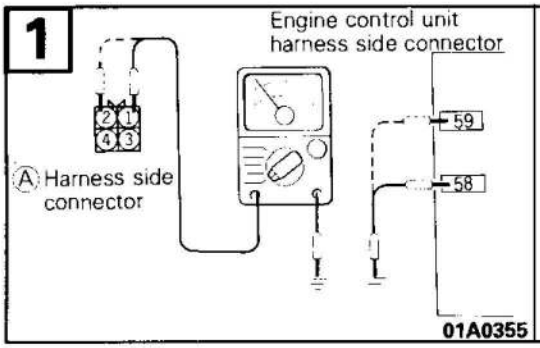
OPERATION

- The servo plunger extends or retracts to open or close the throttle valve, thereby controlling the intake air volume during idling.
- The servo plunger extends or retracts as the direction of rotation of the DC motor in the idle speed control servo is switched.
- The DC motor is driven in normal or reverse direction as the current flow to it is switched by the motor dirve IC in the engine control unit.

TROUBLESHOOTING HINTS

In case irregular idling or engine stall is caused but the causes cannot be determined, turn ON the ignition switch for 15 seconds or more. Then disconnect the servo connector. This facilitates troubleshooting. If necessary, turn the idle speed control adjusting screw to adjust the engine.

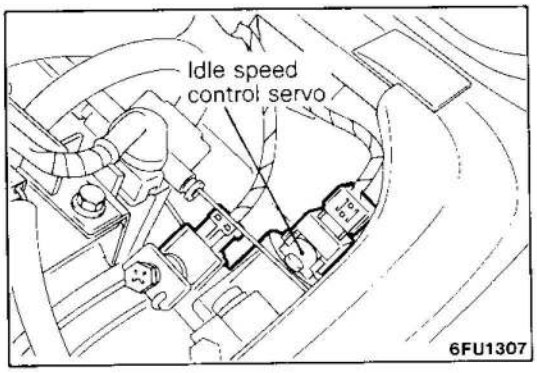
HARNESS INSPECTION

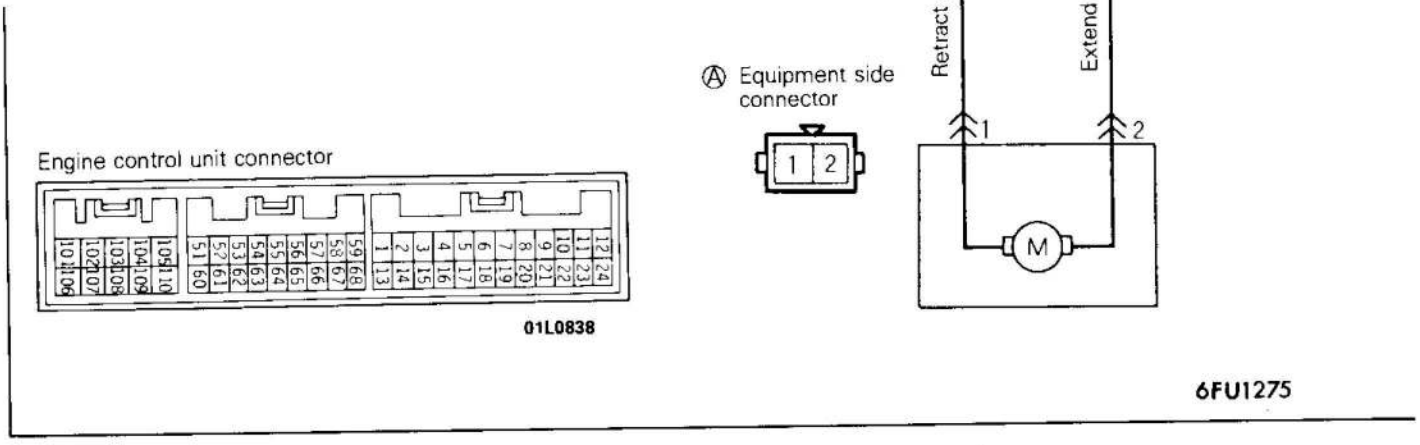
1		Check for an open-circuit, or a short-circuit to earth between the engine control unit and the idle speed control servo.	OK → STOP NG → Repair the harness (Ⓐ 1 – 58) (Ⓐ 2 – 59)

ACTUATOR INSPECTION

Refer to P. 13-76-1.

IDLE SPEED CONTROL SERVO (DC MOTOR) – Vehicles for Europe built from November 1989



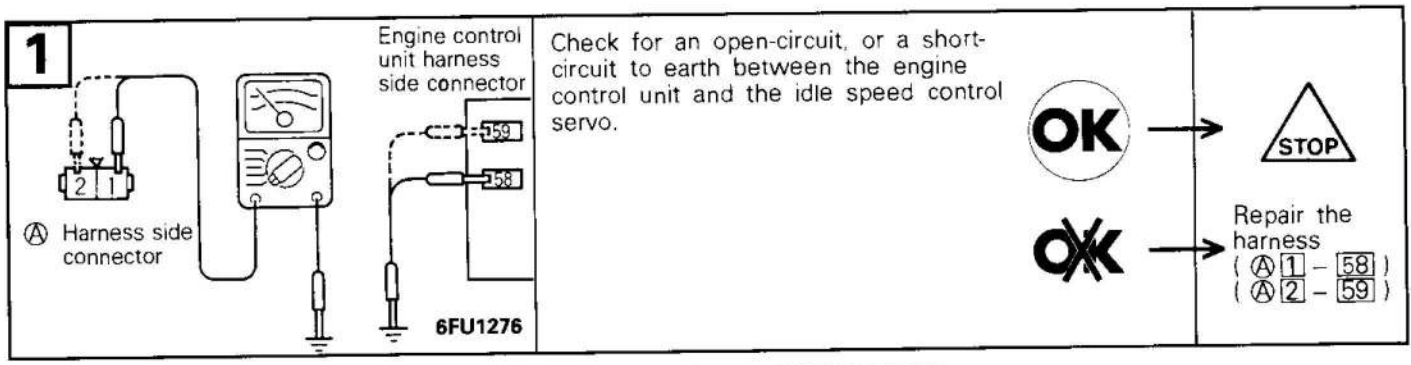


OPERATION

TROUBLESHOOTING HINTS

Refer to P. 13-64-52.

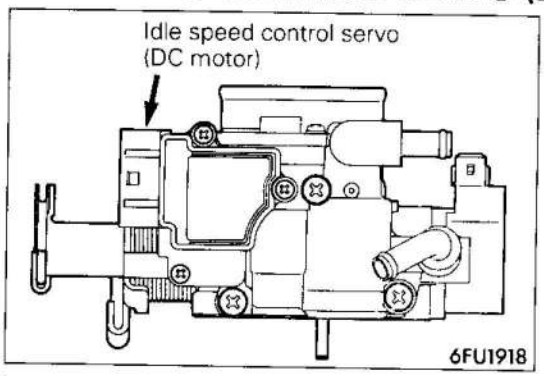
HARNESS INSPECTION

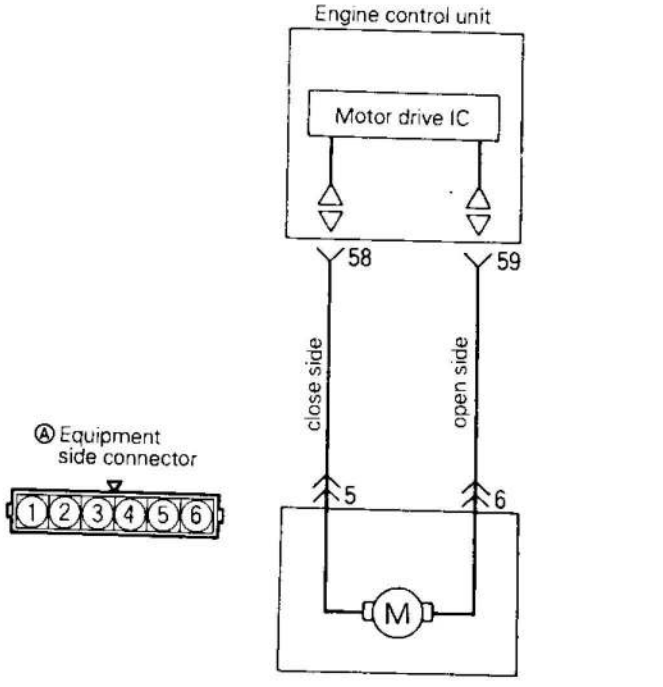


ACTUATOR INSPECTION

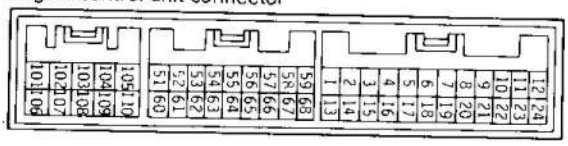
Refer to P. 13-76-1.

IDLE SPEED CONTROL SERVO (DC MOTOR) – Vehicles for Hong Kong





Engine control unit connector



OPERATION

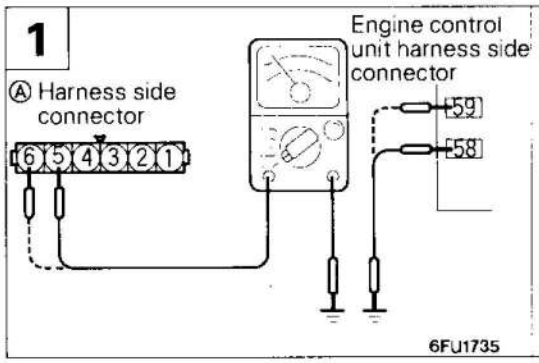
- The volume of intake air during engine idling is controlled by the opening and closing of the servo valve for bypassing the throttle valve, located at the air intake port.
- The servo valve opens and closes depending on whether the DC motor inside the engine idling speed control servo is turning clockwise or anti-clockwise.
- The DC motor turns clockwise or anti-clockwise according to the change in the direction of current in the motor drive IC inside the engine control unit.

TROUBLESHOOTING HINTS

Hint 1: While the engine is idling, if the engine idling speed and servo valve position (step) change when the air conditioner switch is turned to ON and OFF, it can be assumed that the engine idling speed control servo and the servo valve position sensor are operating normally.

Hint 2: If the servo valve position (step) is outside the standard position, the malfunction is probably one of the following:
(1) Basic engine idling speed adjustment is wrong.
(2) Some deposit is adhering to the throttle valve.
(3) Air is being drawn into the air intake manifold through a defective gasket seal.
(4) Fuel injection malfunction inside a cylinder.
(Spark plug, ignition coil, injector or compression pressure is defective.)

HARNESS INSPECTION



Check for an open-circuit, or a short-circuit to earth, between the engine control unit and the idle speed control servo.

OK → STOP

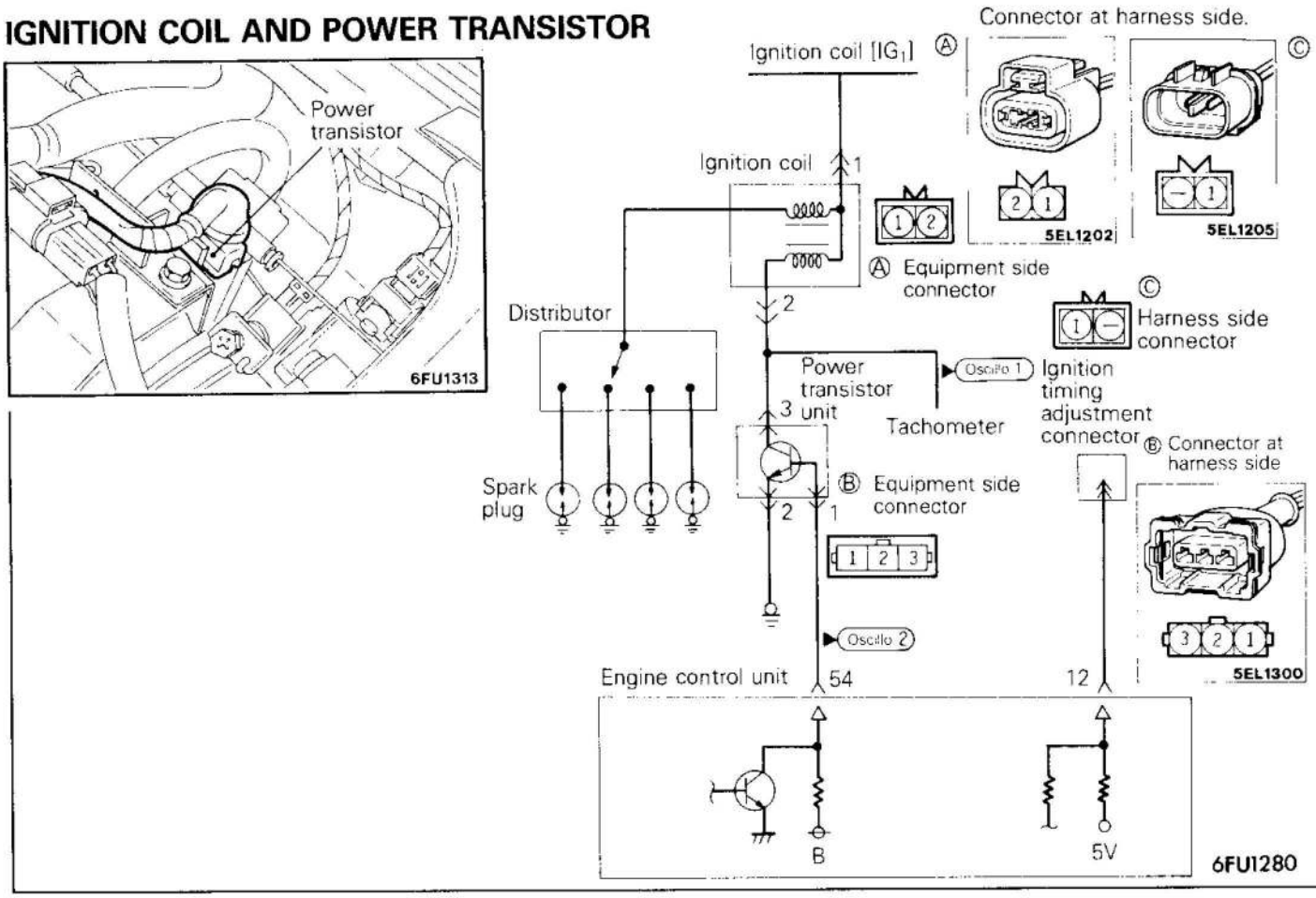
NG → Repair the harness (Ⓐ 5 – 58, Ⓐ 6 – 59)

ACTUATOR INSPECTION

Use a sound scope to check if the sound of the ISC servo operating can be heard immediately after the ignition switch is turned to "ON".

NOTE
If the sound of the servo operating cannot be heard, inspect the motor drive circuit and the ISC servo motor.

IGNITION COIL AND POWER TRANSISTOR



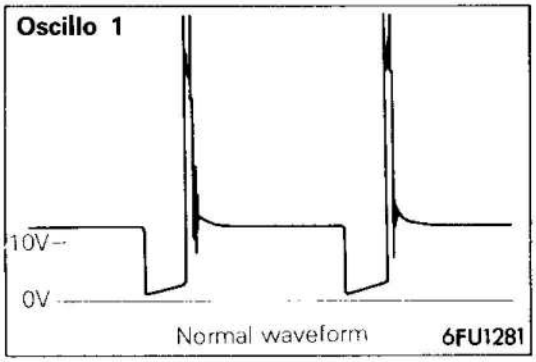
OPERATION

- When the power transistor is turned ON by the signal from the engine control unit, primary current flows to the ignition coil. When the power transistor is turned OFF, primary current is shut off and a high voltage is induced in the secondary coil.
- When the engine control unit turns OFF the power 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 power transistor in the unit, the power transistor unit is turned OFF.

INSPECTION

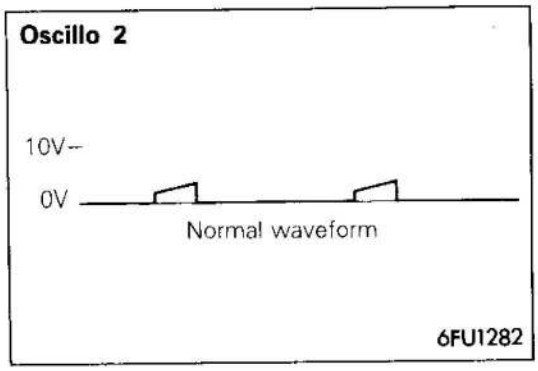
Using Multi-use Tester (MUT) or MUT-II

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)	750 r/min. (Idle)	5 – 15°BTDC
				2,000 r/min.	35 – 43°BTDC



Using Oscilloscope

1. Primary signal of ignition coil
   (1) Run the engine at an idle revolution speed.
   (2) Connect the probe to oscilloscope pick-up point 1 as shown in the circuit diagram, and check the primary signal of the ignition coil.

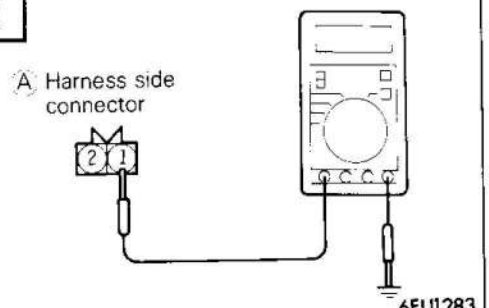


2. Control signal of power transistor

Connect the probe to oscilloscope pick-up point 2 as shown in the circuit diagram, and check the control signal of the power transistor.

HARNESS INSPECTION

1



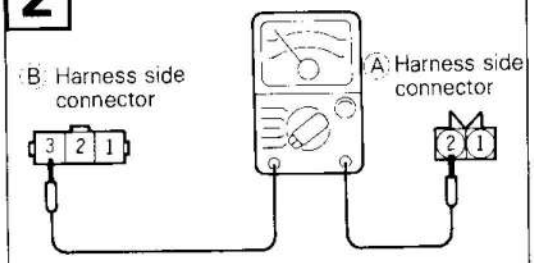
Measure the power supply voltage of the ignition coil.
- Connector: Disconnected
- Ignition switch: ON

Voltage (V)
11 – 13

OK → 2

NO → Repair the harness. (A1 – Ignition switch)

2

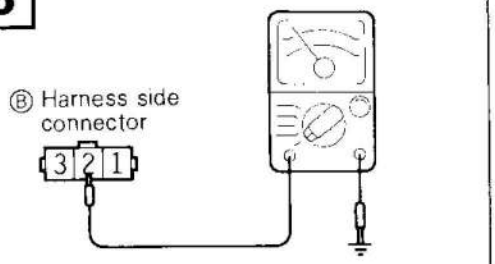


Check for an open-circuit, or a short-circuit to earth between the power transistor and the ignition coil.
- Ignition coil connector: Disconnected
- Power transistor connector: Disconnected

OK → 3

NO → Repair the harness. (A2 – B3)

3

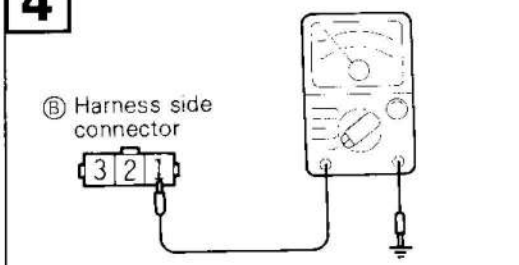


Check for continuity of the earth circuit.
- Connector: Disconnected

OK → 4

NO → Repair the harness. (B2 – Earth)

4



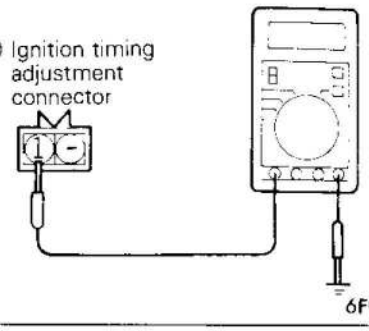
Measure the voltage of the control signal circuit of the power transistor.
- Connector: Disconnected
- Ignition switch: START

Voltage (V)
2 – 6

OK → 5

NO → Repair the harness. (B1 – 54)

5



Measure the voltage of the ignition timing adjustment terminal.
- Ignition switch: ON

Voltage (V)
4.0–5.2

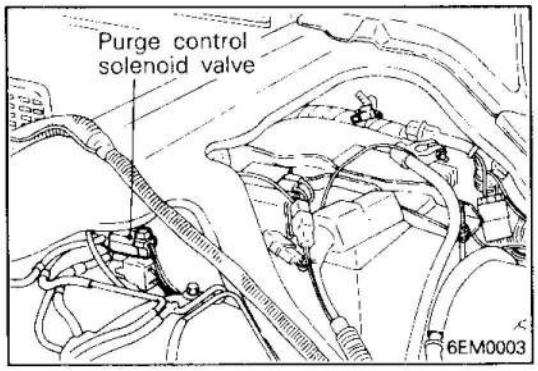
OK → STOP

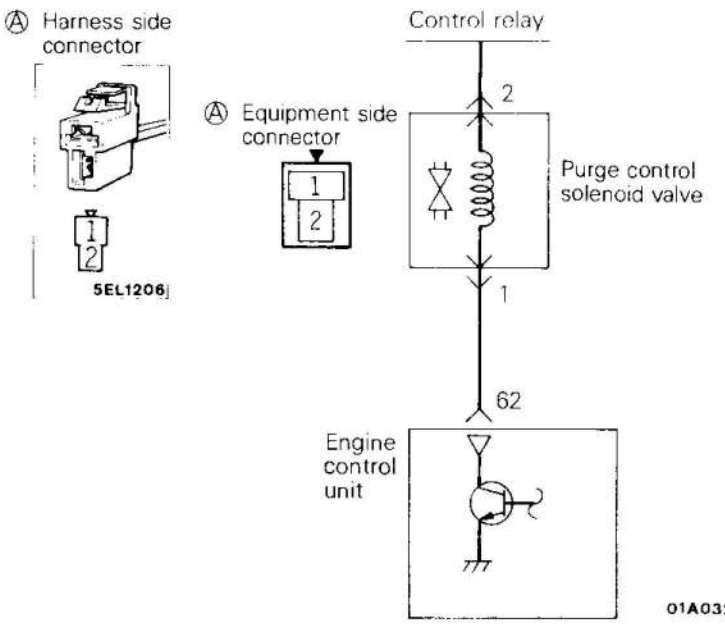
NO → Repair the harness. (©[1]–[12])

ACTUATOR INSPECTION

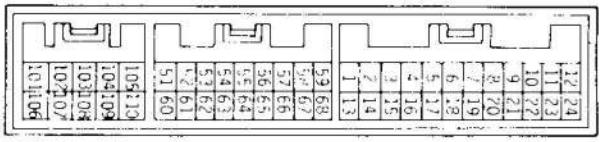
Refer to Group 16 – Ignition System.

PURGE CONTROL SOLENOID VALVE – Vehicles for Europe





Engine control unit connector



OPERATION

- The purge control solenoid valve is an ON-OFF type one which controls introduction of purge air from the canister into the intake air plenum.
- The battery power is supplied to the purge control valve through the control relay. When the engine control unit turns ON the power transistor in the unit, current flows to the coil, introducing purge air.

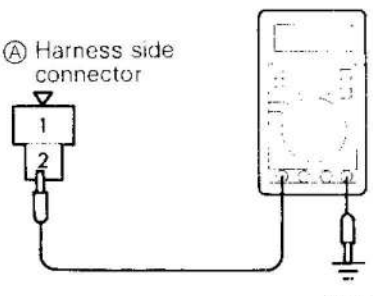
INSPECTION

Using Multi-use Tester (MUT) or MUT-II

Function	Item No.	Drive content	Check condition	Normal state
Actuator test	08	Solenoid valve from OFF to ON	Ignition switch: ON	Operating sound is heard when driven

HARNESS INSPECTION

1

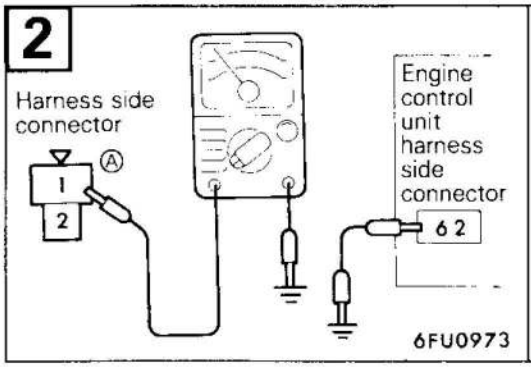


Measure the power supply voltage.
- Connector: Disconnected
- Ignition switch: ON

Voltage (V)
11 – 13

OK → 2

NG → Repair the harness. (Control relay – Ⓐ[2])

2  	Check for an open-circuit, or a short-circuit to earth between the purge control solenoid valve and the engine control unit. • Engine control unit connector: Disconnected • Purge control solenoid valve connector: Disconnected	OK →	STOP
		NG →	Repair the harness. (Ⓐ1 – 62)

ACTUATOR INSPECTION

Refer to GROUP 17 – Service Adjustment Procedures.

FUEL PRESSURE TEST

Refer to P. 13-59.

SELF-DIAGNOSIS – Vehicles for Europe built up to November 1988 and Australia

Self-diagnosis is a system in which the input signal from each sensor is monitored by the computer (ECU) and, should any abnormality happen in the input signal, the abnormal item is memorized by the computer. The diagnosis items are 9 items including that for normal condition and can be confirmed using a volt meter.

The abnormality-diagnosis memory is kept by direct power supply from the battery. Therefore, the memory of diagnosis result is not erased by turning off the ignition switch. However it is erased if the back-up power supply is turned off by disconnection of battery cable of ECU connector.

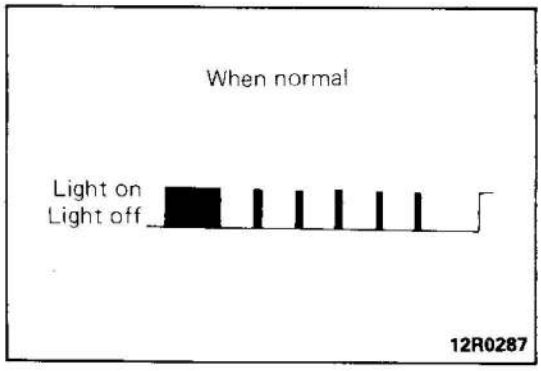
Diagnosis Item

The abnormality-diagnosis items are the following 8 items. If there are two or more items found abnormal, they are indicated in the order of increasing code numbers.

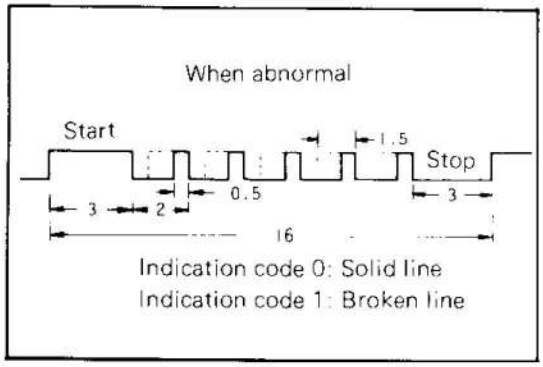
Malfunction No.	Diagnosis item
1	Oxygen sensor
2	Crankshaft angle sensor
3	Air flow sensor (AFS)
4	Barometric pressure sensor
5	Throttle position sensor (TPS)
6	Motor position sensor (MPS)
7	Coolant temperature sensor
8	No. 1 cylinder TDC sensor

INDICATION METHOD

Indication is made by deflection of the pointer of voltmeter.
Connect a voltmeter to the connector for self-diagnosis in the glove box, and the following indication will be made.



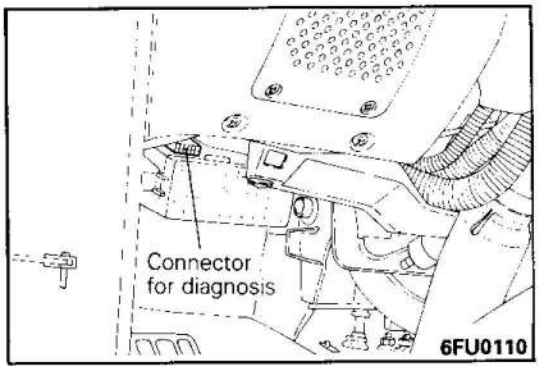
① Normal
As indicated by the pattern at left.

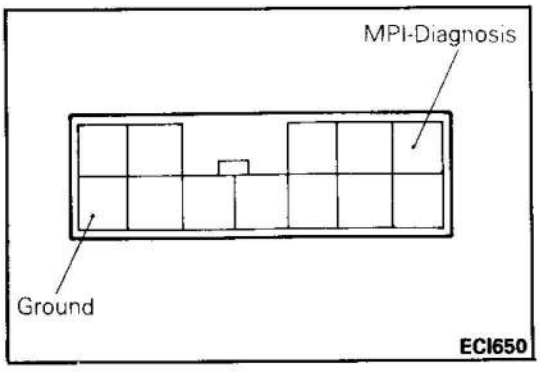


② When there is a malfunction
The light should go on for 3 seconds and, then illuminates at 2 second intervals. When the light illuminates for only 1.5 seconds, a "1," and for only 0.5 seconds, a "0," is indicated, the malfunction being indicated by a code group of five "1's" and "0's".

1. PRECAUTIONS FOR OPERATION (SELF-DIAGNOSIS)

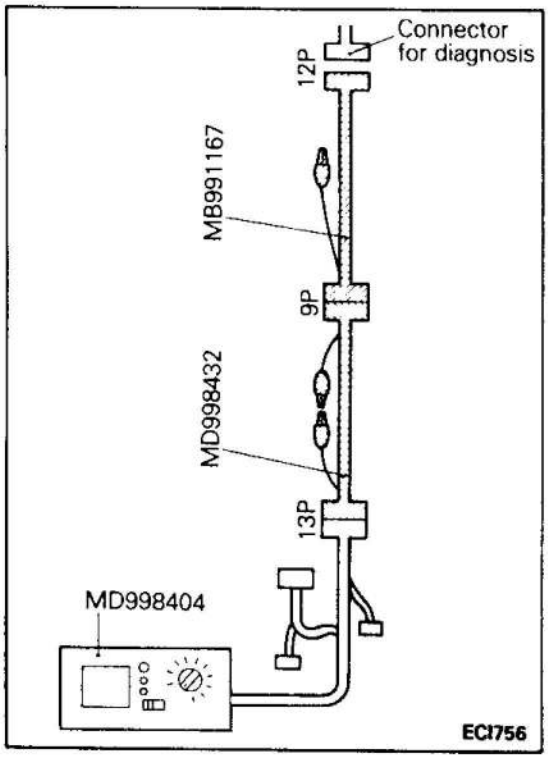
(1) When battery voltage is low, no detection of abnormality is made. Be sure to check the battery for conditions before starting the test.
(2) Diagnosis item is erased if power supply from battery or the ECU connector is disconnected. Do not disconnect power supply from battery before the diagnosis result is completely read.
(3) Warm up engine and drive a good distance before oxygen sensor is diagnosed. Do not set ignition switch to OFF after driving. If ignition switch is set to OFF, the result detected by diagnosis is erased.
(4) After check and correction are over, disconnect earth cable for 15 seconds or more from negative terminal of battery and connect it again to make sure that abnormal code is erased.





2. INSPECTION OF FUEL CONTROL SYSTEM (SELF-DIAGNOSIS)

(1) Turn ignition switch to OFF.
(2) Connect a volt meter between terminal for "MPI" and terminal for earth.
(3) Turn ignition switch to ON, and indication of ECU memory contents will immediately start. If the system is in normal condition, pointer of volt meter indicates normal pattern. If any abnormality is in memory, the pointer of volt meter will deflect, indicating abnormal item as described in "Indication Method". Abnormal item can be known from voltage waveform, that is, long/short pulse shown in the "Diagnosis Chart".
After recording the abnormal item, check and repair each part according to the check items in "Diagnosis Chart".
(4) Turn ignition switch to OFF.
(5) If the defective parts have been repaired, disconnect earth cable for 15 seconds or more from negative terminal of battery and connect it again to make sure that abnormal code has been erased.



Inspection Procedure

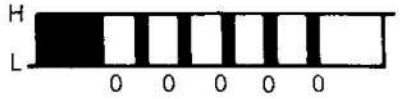
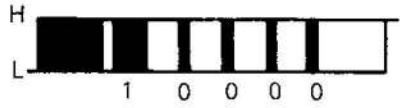
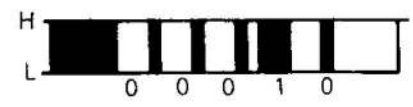
(1) Turn ignition switch to OFF.
(2) Using Harness connectors for Self-diagnosis (MD998432 and MB991167), connect ECI Checker (MD998404) to connector for diagnosis.
(3) Set select switch of ECI checker to "B".
(4) Set check switch of ECI checker to "6".

(5) Turn ignition switch to ON, and indication of ECU memory contents will immediately start. If the system is in normal condition, pointer of checkmeter constantly indicates 12 V. If any abnormality is in memory, the pointer of checkmeter will deflect, indicating abnormal item as described in "Indication Method". Abnormal item can be known from voltage waveform, that is, the number of pointer deflections shown in the "Diagnosis Chart".
After recording the abnormal item, check and repair each part according to the check items in "Diagnosis Chart".

(6) Turn ignition switch to OFF.

(7) If the defective parts have been repaired, disconnect earth cable for 15 seconds or more from negative terminal of battery and connect it again to make sure that abnormal code has been erased.

Diagnosis Chart

Malfunction No.	Diagnosis item	Self-diagnosis output pattern and output code	Problem	Check item
0	Normal		None of malfunctions are present.	
1	Oxygen sensor		(1) When engine stalls, and for 15 seconds after start (2) Until output voltage reaches 0.6V or higher (3) When oxygen sensor signal doesn't change for 20 seconds or longer during urban driving mode	• Harness and connector • Oxygen sensor
2	Crank angle sensor		Ignition switch (ST) ON (continuous) and, moreover, there is no crank angle signal input for three seconds or longer	• Harness and connector • Crank angle sensor
3	AFS		(1) AFS output of 10 Hz or less, with engine rpm 500 rpm or higher (2) AFS output 100 Hz or more, at time of engine stall	• Harness and connector • AFS
4	Atmospheric pressure sensor		(1) Atmospheric pressure sensor output voltage 4.5V (equivalent to 855 mmHg) or higher (2) Atmospheric pressure sensor output voltage 0.2V or lower	• Harness and connector • Atmospheric pressure sensor
5	TPS		(1) TPS output voltage 4V or higher continuously for one seconds or longer, with idling switch ON (2) TPS output voltage 0.2V or lower	• Harness and connector • TPS
6	MPS		(1) MPS output voltage 4.8V or higher (2) MPS output voltage 0.2V or lower	• Harness and connector • MPS
7	Coolant temperature sensor		(1) Coolant temperature sensor thermistor resistance value 45kΩ or higher (2) Coolant temperature sensor thermistor resistance value 50Ω or lower	• Harness and connector • Coolant temperature sensor
8	No. 1 cylinder TDC sensor		Absolutely no input of No. 1 cylinder TDC sensor signal during eight ignitions after ignition switch turned to ON or after input of No. 1 cylinder TDC signal	• Harness and connector • No. 1 cylinder TDC sensor

4. INSPECTION OF FUEL CONTROL SYSTEM (USING ECI CHECKER)

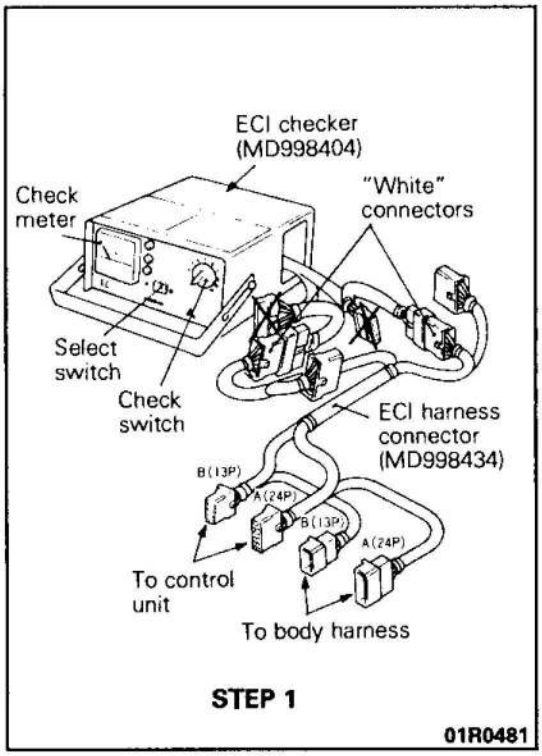
Using the special tools (harness connector and ECI checker), perform the MPI system checks by the following procedure.

STEP 1

(1) Turn ignition switch to LOCK.
(2) Remove the large harness connector and small harness connector from the ECU.
(3) Set check switch of the ECI checker to OFF.
(4) Set select switch of the ECI checker to A.
(5) Connect white color connectors, with labeled "CHECKER", of the harness connector to the ECI checker.Then connect harness connectors to the ECU connectors.
(6) Perform checks according to the "MPI System Check Procedure Chart-Step 1."

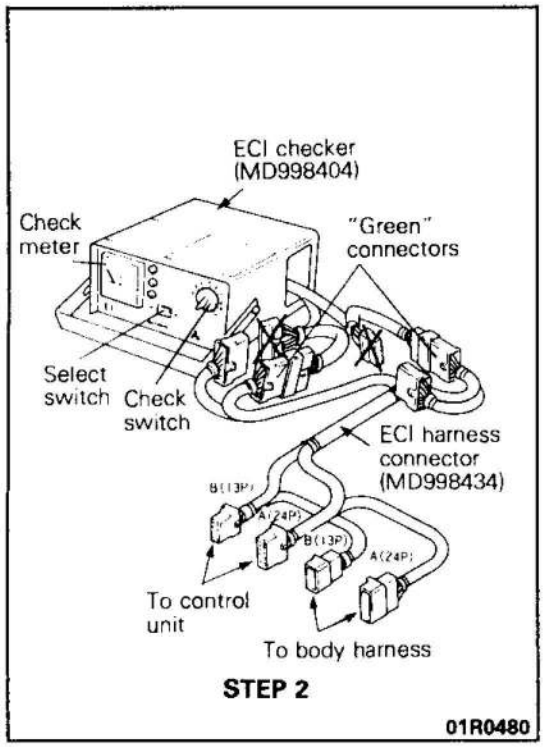
STEP 2

(7) Turn ignition switch to LOCK.
(8) Set check switch of the ECI checker to OFF.



STEP 1

01R0481



STEP 2

01R0480

(9) Disconnect white color connectors, with labeled "CHECKER", of the harness connector from the ECI checker. Then connect green color connectors, with labeled "CHECKER", of the harness connector to the connectors of ECI checker.
(10) Perform checks according to the "MPI System Check Procedure Chart-Step 2".
(11) If checker shows any deviation from specifications, check the corresponding sensor and related electrical wiring. Repair or replace if necessary.
(12) After repair or replacement, recheck with the ECI checker to confirm that the repair has corrected the problem.
(13) Set the ignition switch to LOCK.
(14) Set the check switch of the ECI checker to OFF.
(15) Disconnect the connectors of the ECI checker and harness connector from the ECU and body side harness connectors. Make certain that the power supply has been removed from ECU for at least 15 seconds. This will erase the memory.
(16) Connect the body side harness connector to the ECU.
(17) After completion of the above test, perform a road test to be sure that the trouble has been eliminated.

MPI SYSTEM CHECK PROCEDURE CHART
(Use ECI Harness Connector–MD998434)

STEP 1. (Connect white color connectors, with labeled "CHECKER" of ECI harness connector to ECI Checker)

ECI Checker Operation		Check Item	ECU Terminal No.	Condition		Test Specification
Select Switch	Check Switch					
Set to "A"	1	Power supply	51	Ignition switch "LOCK → ON"		11V to 13V
	2	Crank angle sensor	1	Ignition switch "LOCK → START"		1.8V to 2.5V
				3000 rpm		
	3					
	4	Intake air temperature sensor	5	Ignition switch "LOCK → ON"	0°C (32°F)	3.4V to 3.6V
					20°C (68°F)	2.5V to 2.7V
					40°C (104°F)	1.7V to 1.9V
					80°C (176°F)	0.6V to 0.8V
	5	Purge control solenoid valve	17	Idling (warm engine)		12V to 15V
				Hold engine over 3000 rpm		0V to 0.6V
	6	Coolant temperature sensor	6	Ignition switch "LOCK → ON"	0°C (32°F)	3.4V to 3.6V
					20°C (68°F)	2.5V to 2.7V
					40°C (104°F)	1.5V to 1.7V
					80°C (176°F)	0.5V to 0.7V
	7	Throttle position sensor	15	Ignition switch "LOCK → ON" (warm engine)	Accelerator fully closed	0.4V to 0.7V
					Accelerator fully opened	4.5V to 5.5V
	8					
	9					
	10					

MPI SYSTEM CHECK PROCEDURE CHART

ECI Checker Operation		Check Item	ECU Terminal No.	Condition		Test Specification
Select Switch	Check Switch					
Set to "B"	1	Idle position switch	7	Ignition switch "LOCK → ON"	Accelerator fully closed	0V to 0.6V
					Accelerator fully opened	8V to 13V
	2	Reed switch for vehicle speed	19	Start engine, transmission in first or drive and operate vehicle slowly		0V to 0.6V ↑ (pulsates) ↓ Over 2V
	3					
	4	A/C Switch	56	Ignition switch "LOCK → ON"	A/C Switch OFF	0V to 0.6V
					A/C Switch ON *1	11V to 13V
	5	Air flow sensor	2	Idling		2.2V to 3.2V
				3000 rpm		
	6	Fuel pressure exchange solenoid valve	8	Ignition switch "LOCK → START"	Coolant temp. less than 90°C (194°F) or air temp. less than 50°C (122°F)	Over 8V
					Coolant temp. more than 90°C (194°F) and air temp. more than 50°C (122°F)	0V to 0.6V
	7	Inhibitor Switch	58	Ignition switch "LOCK → ON"	Transmission in "P" or "N"	0V to 0.6V
					Transmission in "D"	11V to 13V
	8	Oxygen sensor	11	Hold rpm constant above 1300, 30 seconds after start of warm engine		0V to 0.6V ↑ (Pulsates) ↓ 2V to 3V
	9	Cranking signal	55	Ignition switch "LOCK → START"		Over 8V
	10					

NOTE: *1 On means compressor clutch engaged

MPI SYSTEM CHECK PROCEDURE CHART

STEP 2. (Connect green color connectors, with labeled "CHECKER" of ECI harness connector to ECI Checker)

ECI Checker Operation		Check Item	ECU Terminal No.	Condition	Test Specification
Select Switch	Check Switch				
Set to "A"	1				
	2	A/C cutoff relay	24	Idling A/C Switch OFF → ON *1	Over 12V, then 0V to 0.6V
	3	Ignition control signal	54	Idling	0.3V to 0.8V
				3000 rpm	1.0V to 2V
	4	ISC motor for extension	23	Idling	0V to 2V
				Quick acceleration from idling to above 3000 rpm with "N" or "P" position	Momentarily over 3V
	5	ISC motor for retraction	12	Idling	0V to 2V
				Quick acceleration from idling to above 3000 rpm with "N" or "P" position	Momentarily over 3V
	6	Control relay	22	Ignition switch "LOCK → ON"	11V to 13V
				Idling	0V to 0.6V
	7	Motor position sensor	3	Ignition switch "LOCK → ON" After 15 seconds	0.8V to 1.2V
	8				
	9				
	10				
Set to "B"	1	Injector No.3 pulse	61	Idling	12V to 14V
				Quick acceleration from idling to above 2000 rpm with "N" or "P" position	Slight drop
	2	Injector No.4 pulse	62	Idling	12V to 14V
				Quick acceleration from idling to above 2000 rpm with "N" or "P" position	Slight drop
	3				
	4	No.1 cylinder sensor	13	Ignition switch "LOCK → START"	0.2V to 1.5V (oscillating)
				3000 rpm	0.8V to 1.2V
	5				
	6	Injector No.1 pulse	59	Idling	12V to 14V
				Quick acceleration from idling to above 2000 rpm with "N" or "P" position	Slight drop
	7	Injector No.2 pulse	60	Idling	12V to 14V
				Quick acceleration from idling to above 2000 rpm with "N" or "P" position	Slight drop
	8				
	9	Power supply for sensor	10	Ignition switch "LOCK → ON"	4.5V to 5.5V
	10				

NOTE: *1 On means compressor clutch engaged

MPI SYSTEM CHECK PROCEDURE CHART
(Use Voltmeter)

Check Item	ECU Terminal No.	Condition	Test Specification
Atmospheric pressure sensor	20	Ignition switch at sea level "LOCK → ON"	3.8V to 4.2V
		Idling	

ECU Terminal

(Large)

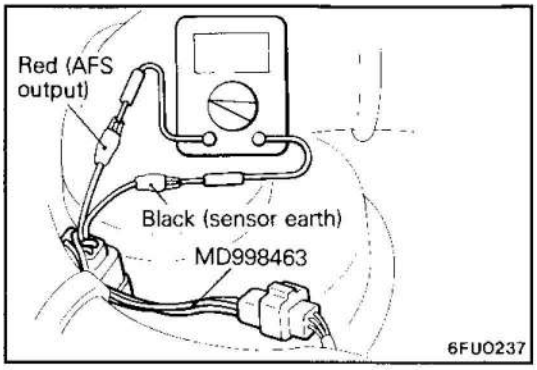
12	11	10	9	8	7	6	5	4	3	2	1
24	23	22	21	20	19	18	17	16	15	14	13

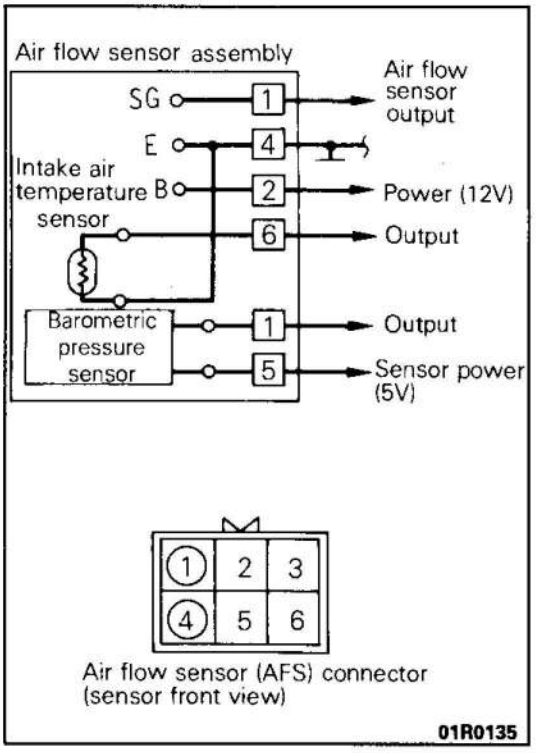
(Small)

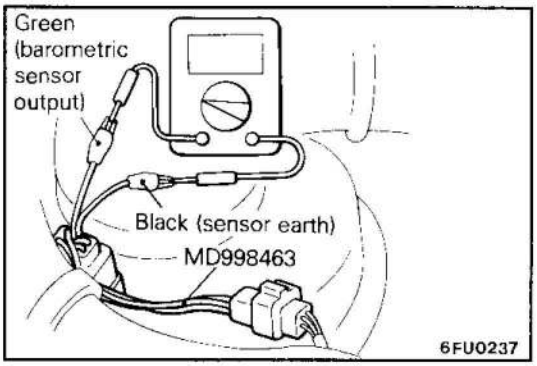
56	55	54		53	52	51
63	62	61	60	59	58	57

View from front as installed in ECU

ECI739







INSPECTION OF SENSORS AND SWITCHES

1. INSPECTION OF AIR FLOW SENSOR (AFS)

NOTE
If the air flow sensor fails, the intake air volume cannot be measured and as a result, normal fuel injection control is no longer available. The vehicle can be run, however, by the backup function.

(1) Disconnect the air flow sensor connector.
(2) Attach the specila tool (harness connector) between the unattached connectors.
(3) Warm the engine and bring it to a normal idle.
(4) Measure the voltage of terminals ① (red, AFS output) and ④ (black, sensor earth).

Engine speed (r/min.)	Output voltage (V)
Idling	2.2 – 3.2
3,000	

2. INSPECTION OF BAROMETRIC PRESSURE SENSOR

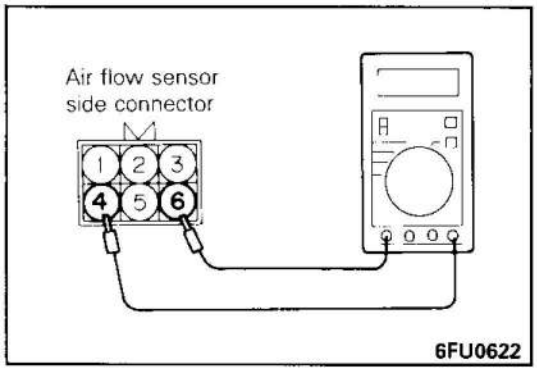
(1) Disconnect the air flow sensor connector.
(2) Attach the special tool (adapter harness) between the unattached connectors.
(3) Warm the engine and bring it to a normal idle.
(4) Connect a voltmeter between the terminals ⑤ (green, barometric sensor output) and ④ (black, sensor earth).
(5) Slowly cover about half of the air cleaner air intake, watching the change in voltage.

Pressure	Voltage
Fall (covered)	Fall

Reference

Pressure kPa (kg/cm², psi)	20 (0.20, 2.9)	49 (0.49, 6.9)	103 (1.0, 14.7)
Central voltage	0.79	1.84	4.00

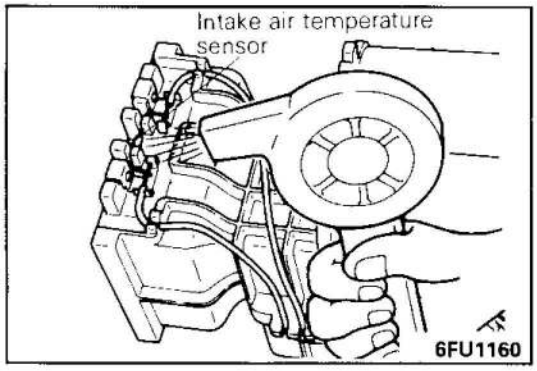
(6) If no good, replace the air flow sensor assembly.



3. INSPECTION OF INTAKE AIR TEMPERATURE SENSOR

(1) Disconnect the air flow sensor connectors.
(2) Measure resistance between terminals ④ and ⑥.

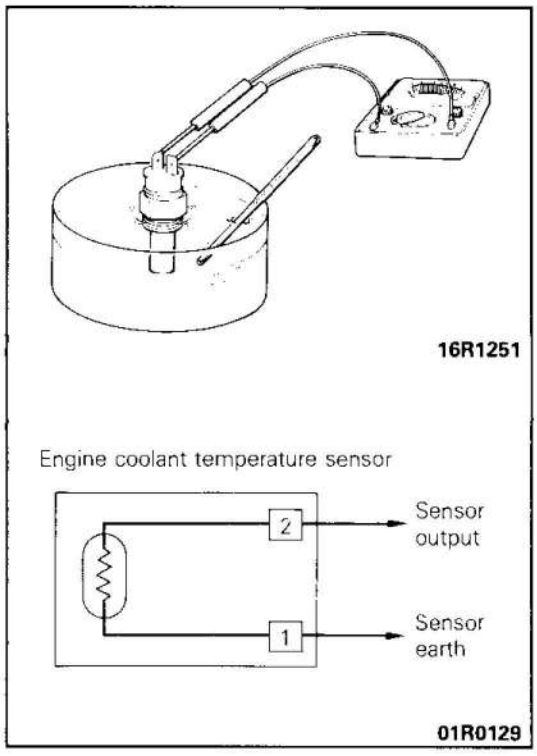
Standard value : 2.3 – 3.0 kΩ [at 20°C (68° F)]
0.30 – 0.42 kΩ [at 80°C (176° F)]



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

Temperature	Resistance
Higher	Smaller

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

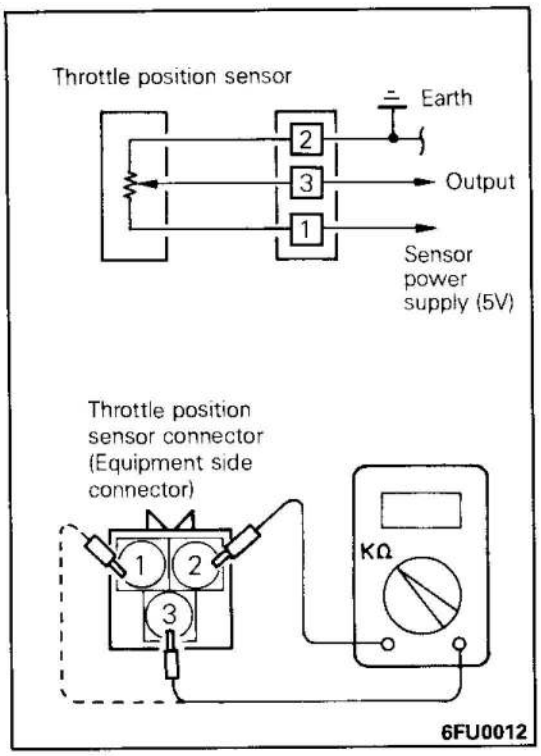


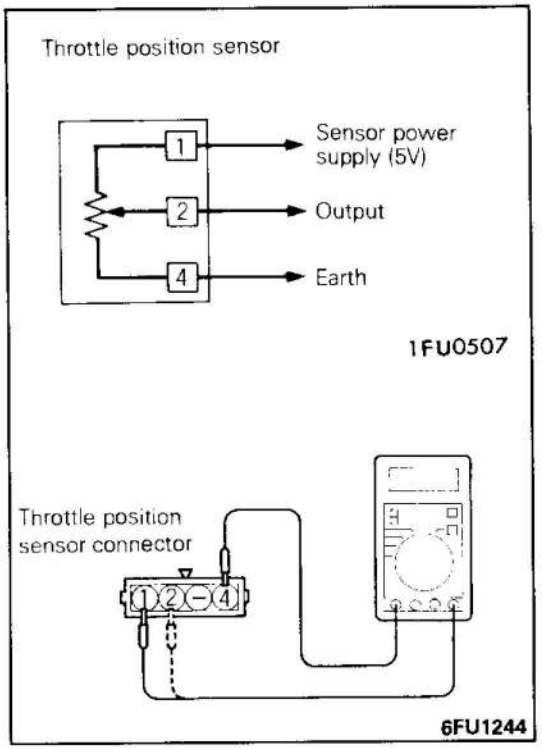
4. INSPECTION OF ENGINE COOLANT TEMPERATURE SENSOR

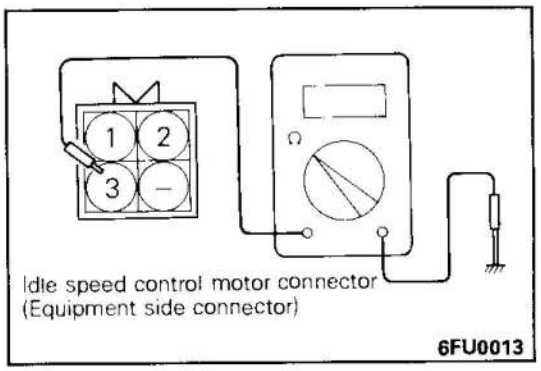
(1) Remove engine coolant temperature sensor from the intake manifold.
(2) With temperature sensing portion of engine coolant temperature sensor immersed in hot water, check resistance.
The sensor should be held with its housing 3mm (0.12in.) away from the surface of the hot water.

Standard value : 2.1 – 2.7 kΩ [at 20°C (68° F)]
0.26 – 0.36 kΩ [at 80°C (176° F)]

(3) If the resistance deviates from the standard value greatly, replace the sensor.
(4) Apply specified sealant to the sensor threaded portion.
Specified sealant: 3M Nut Locking Part No. 4171 or equivalent
(5) Install engine coolant temperature sensor and tighten it to specified torque.
Sensor tightening torque: 20–40 Nm (2.0–4.0kgm, 15–29ft. lbs.)
(6) Fasten harness connectors securely.







5. INSPECTION OF THROTTLE POSITION SENSOR

(Vehicles for Europe built up to October 1989 and vehicles for Australia built up to June 1989)

(1) Disconnect the throttle position sensor connector.
(2) Measure resistance between terminal ② (sensor earth) and terminal ① (sensor power).

Standard value: 3.5 – 6.5 kΩ

(3) Connect a pointer type ohmmeter between terminal ② (sensor earth terminal) and terminal ③ (sensor output terminal).

(4) Operate the throttle valve slowly from the idle position to the full open position and check that the resistance changes smoothly in proportion with the throttle valve opening angle.

NOTE
The resistance changes within the range from approx. 0.5 kΩ to the value measured at step 2.

(5) If the resistance is out of specification, or fails to change smoothly, relpace the throttle position sensor.

Throttle position sensor installation torque:
1.5 – 2.5 Nm (0.15 – 0.25 kgm, 1.1 – 1.8 ft.lbs.)

(Vehicles for Europe built from November 1989 and vehicles for Australia built from July 1989 and vehicles for Hong Kong)

(1) Disconnect the throttle position sensor connector.
(2) Measure resistance between terminal ④ (sensor earth) and terminal ① (sensor power).

Standard value: 3.5 – 6.5 kΩ

(3) Connect a pointer type ohmmeter between terminal ④ (sensor earth) and terminal ② (sensor output terminal).
(4) Operate the throttle valve slowly from the idle position to the full open position and check that the resistance changes smoothly in proportion with the throttle valve opening angle.
(5) If the resistance is out of specification, or fails to change smoothly, relpace the throttle position sensor.

Throttle position sensor installation torque:
1.5 – 2.5 Nm (0.15 – 0.25 kgm 1.1 – 1.8 ft.lbs.)

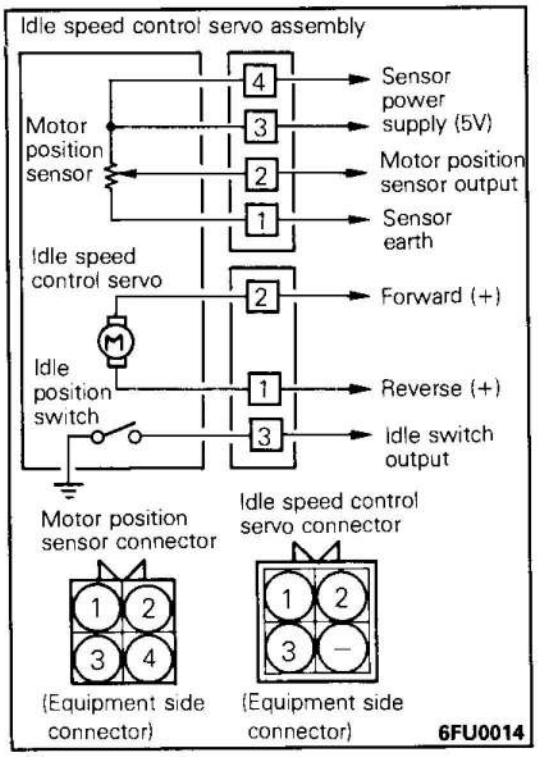
6. INSPECTION OF IDLE POSITION SWITCH

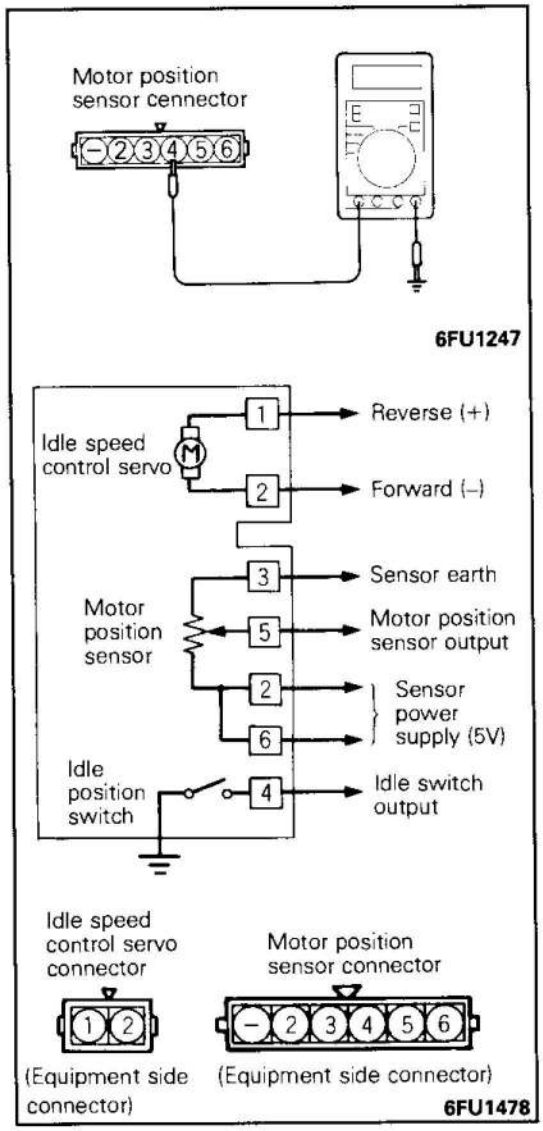
(Vehicles for Europe built up to October 1989 and for Australia built up to June 1989)

(1) Disconnect the idle speed control servo connector.
(2) Check the conductivity between terminal ② and the body earth.

Accelerator pedal	Circuit
Depressed	Incomplete (∞Ω)
Released	Complete (0Ω)

(3) If no good, replace the idle speed control servo assembly.



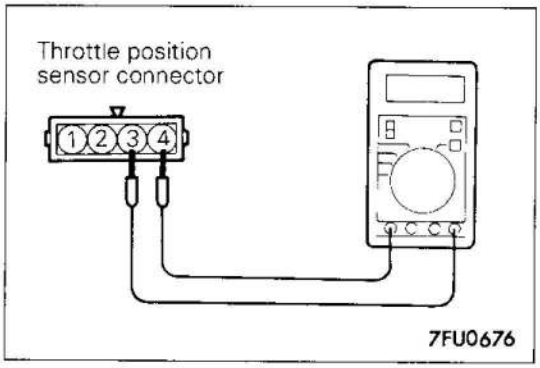


(Vehicles for Europe built from November 1989 and vehicles for Australia built from July 1989)

(1) Disconnect the motor position sensor connector.
(2) Check the continuity between terminal ④ and body earth.

Accelerator pedal	Continuity
Depressed	Non-conductive (∞Ω)
Released	Conductive (0Ω)

(3) If out of specification, replace the idle speed control servo assembly.



(Vehicles for Hong Kong)

(1) Disconnect the throttle position sensor connector.

(2) Check the continuity between the throttle position sensor connector terminal ③ and terminal ④.

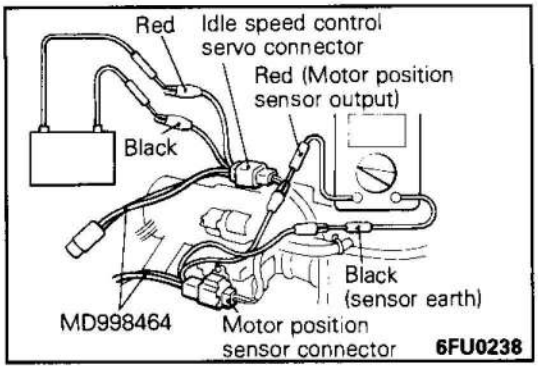
Accelerator pedal	Continuity
Depressed	Non-continuity
Released	Continuity

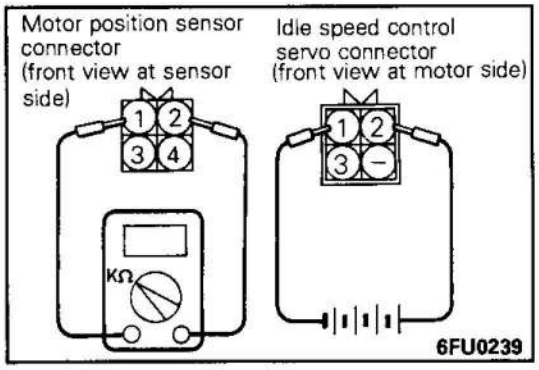
(3) If there is a malfunction, replace the throttle position sensor.

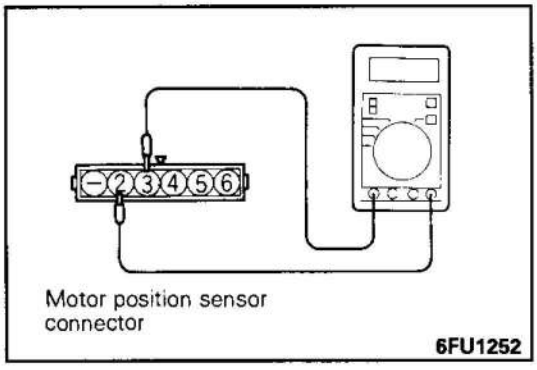
NOTE

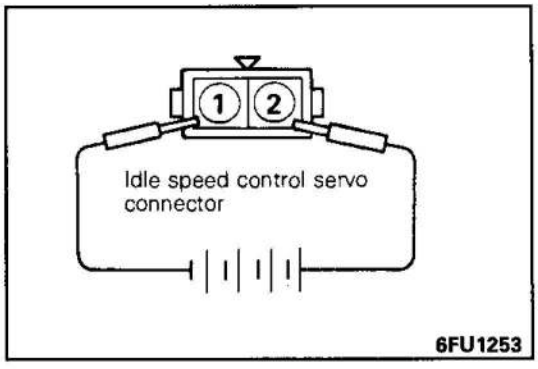
- After replacement, the idle position switch and throttle position sensor should be adjusted. (Refer to P. 13-61.)

NOTE









7. INSPECTION OF MOTOR POSITION SENSOR

(Vehicles for Europe built up to October 1989 and vehicles for Australia built up to June 1989)

(1) Disconnect the motor position sensor connector.
(2) Connect the special tool (harness connector) to the disconnected motor position sensor connector.
(3) Disconnect the idle speed control servo connector.
(4) Connect the special tool (harness connector) to the disconnected connector's idle speed control servo end.

Caution
Be sure not to connect the harness (ECU) connector.

(5) Measure the resistance between terminals ③ (white sensor power) and ① (black, sensor earth) of the motor position sensor connector.

Standard value: 4 – 6 kΩ

(6) Attach a resistance gauge between terminals ② (red, motor position sensor output) and ① (black, sensor earth) of the motor position sensor connector.
(7) Cennect DC 6V batteries (4 dry batteries) between terminals ② (red) and ① (black) of the idle speed control servo connector and check to see that resistance changes smoothly when the idle speed conrtol servo is activated.
(8) If the standard value is not achieved, or a smooth change is not obtained, replace the idle speed control servo assembly.

(Vehicles for Europe built from November 1989 and vehicles for Australia built from July 1989)

(1) Disconnect the motor position sensor connector.
(2) Measure the resistance between terminals ② and ③.

Standard value: 4 – 6 kΩ

(3) Disconnect the idle speed control servo connector.
(4) Connect DC 6V between terminals ① and ② of the idle speed control servo connector, and then measure the resistance between terminals ③ and ⑤ of the motor position sensor connector when the idle speed control servo is activeted (caused to expand and contract).

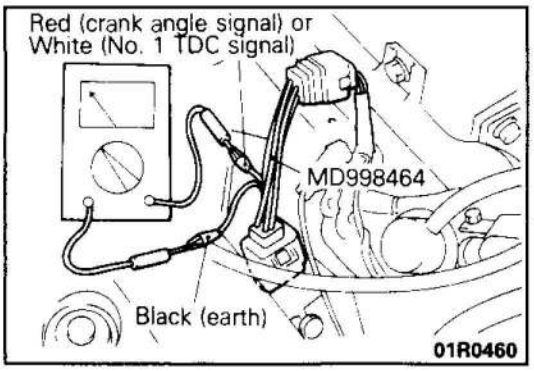
Standard value: It should increase and decrease smoothly in accordance with the expansion and contraction of the idle speed control servo plunger.

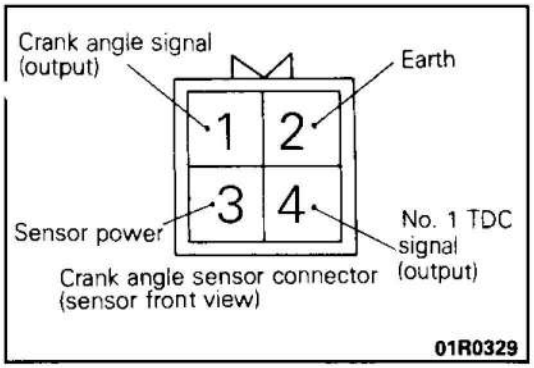
Caution
Apply only a 6V DC or lower voltage. Application of high voltage could cause locking of the servo gears.

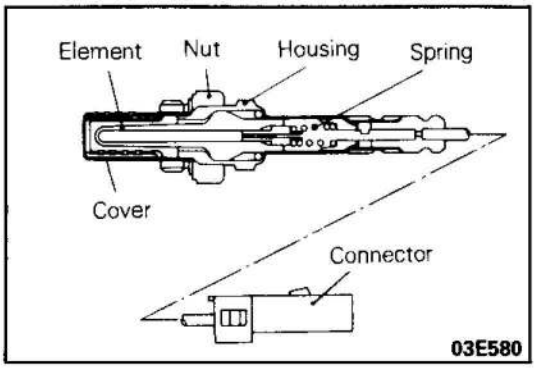
(5) If there is a deviation from the standard value, or if the change is not smooth, replace the idle speed control servo assembly.

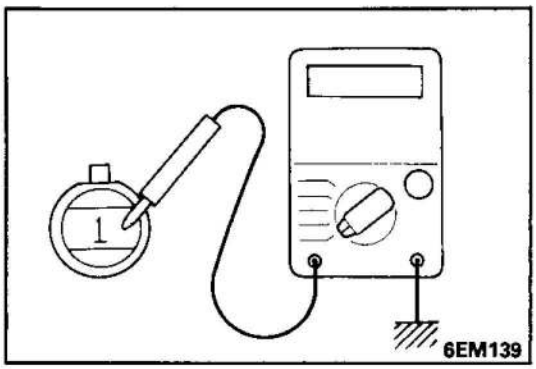
8. INSPECTION OF NO.1 CYLINDER TDC SENSOR AND CRANK ANGLE SENSOR

(1) Disconnect the spark plug wires from the ignition coil.
(2) Disconnect the crankshaft angle sensor connector.
(3) Connect the special tool (harness connector) between the disconnected connectors.









(4) Measure the output voltage between terminals ② and ① (crank angle signal) and ④ and ② (No. 1 TDC signal) while cranking the engine.

Sensor	Terminal	Voltage
No. 1 cylinder TDC sensor	(+) – 1 (earth)	0.5 – 1 V (The needle wavers)
Crankshaft angle sensor	(+) – 1 (earth)	2 – 2.5 V

(5) When the voltage is abnormal, check the sensor power and earth circuit, and where nothing unusual is found here, disassemble the distributor and check it.

9. INSPECTION OF OXYGEN SENSOR

Caution

1. **Before checking, warm up the engine until engine coolant temperature reaches 80 to 90°C (176 to 194°F).**
2. **Use an accurate digital voltmeter.**

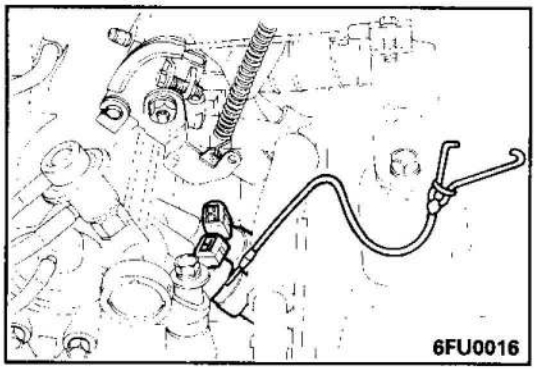
(1) Disconnect the oxygen sensor connector and connect a voltmeter to the oxygen sensor connector.
(2) While repeating engine racing, measure the oxygen sensor output voltage.

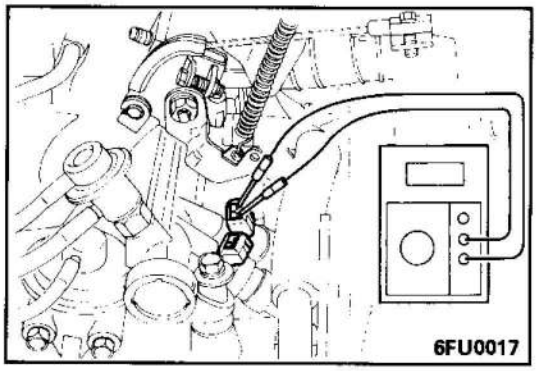
Engine	Oxygen sensor output voltage	Remarks
Race	Approx. 1V	Make air-fuel mixture rich by accelerator operation

NOTE
1. For removal and installation of oxygen sensor, refer to GROUP 15 – Intake and Exhaust.
2. Oxygen sensor tightening torque: 40 – 50 Nm (4 – 5 kgm, 30 – 36 ft.lbs.)

10. INSPECTION OF INHIBITOR SWITCH – Vehicles with an automatic transmission

Refer to GROUP 23 – Automatic Transmission





11. INSPECTION OF INJECTORS

Operation Sound Check

Using a sound scope, check operation sound (tick, tick). Check that the sound is produced at shorter intervals as the engine speed increases.

Caution

Check carefully. Other injectors may produce sound as they operate even if the injector under checking does not operate.

Measurement of Resistance Between Terminals

(1) Disconnect the injector connector.
(2) Measure resistance between terminals.

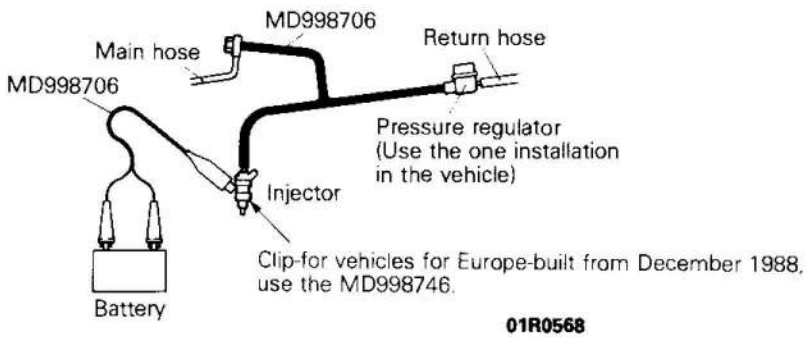
Standard value: [at 20°C (68°F)]

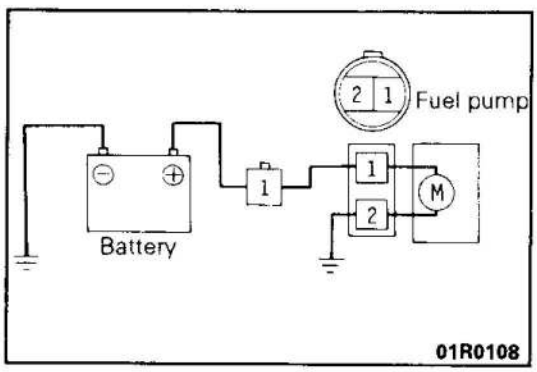
Vehicles for Europe	
Built up to November 1988	**2 – 3 Ω**
Built from December 1988	**13 – 16 Ω**
Vehicles for Hong Kong	**13 – 16 Ω**
Vehicles for Australia	**2 – 3 Ω**

(3) Install the injector connector.

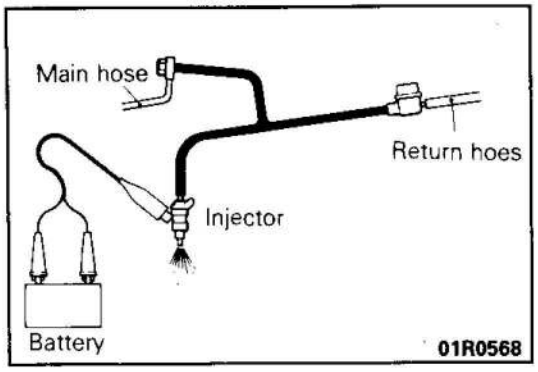
Injection check

(1) Perform the following bleeding the remaining pressure from the fuel pipe line to prevent the fuel from flowing out.
   1 Remove the fuel pump connector from the fuel tank.
   2 Start the engine. When it dies, turn the ignition switch off.
   3 Disconnect the battery negative terminal.
   4 Connect the fuel pump connector.
(2) Separate the injector from the pressure regulator.
(3) Set the special tool (injector test set) as shown in the figure below.

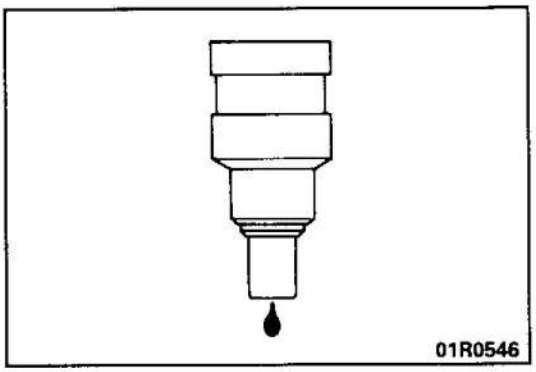




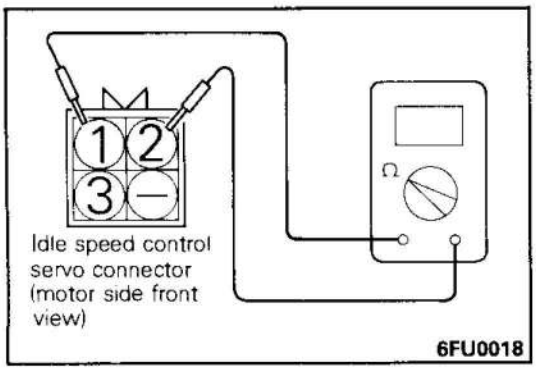
(4) Connect the fuel pump connector.
(5) Apply the battery voltage at the fuel pump check terminal and activate the fuel pump.



(6) Activate the injector and check the fuel spray. Unless the quality of the spray is extremely poor, consider it sufficient and leave it as is.



(7) Stop the injector and check for leaks from the injector nozzle.
(8) Without operating the fuel pump, work the injector; if this produces no spray of fuel from the injector, remove the special tool and install the injector.

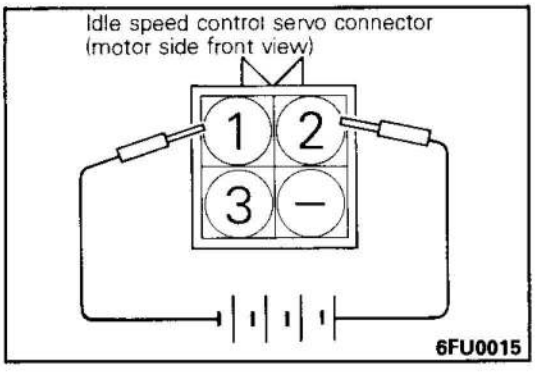


12. INSPECTION OF IDLE SPEED CONTROL SERVO (DC MOTOR)

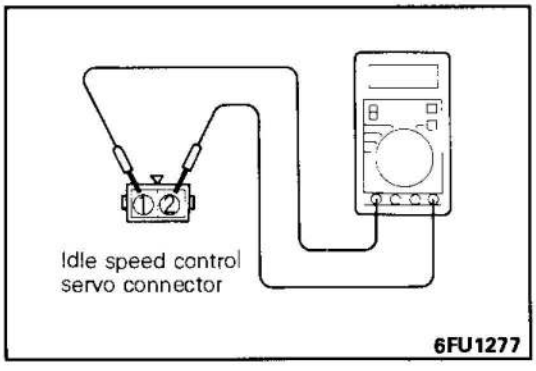
(Vehicles for Europe built up to October 1989 and vehicles for Australia built up to June 1989)

(1) Disconnect the idle speed control servo connector.
(2) Check idle speed control servo coil continuity.

Measured terminal	Continuity
① and ②	Complete [5 – 35 Ω at 20°C (68°F)]



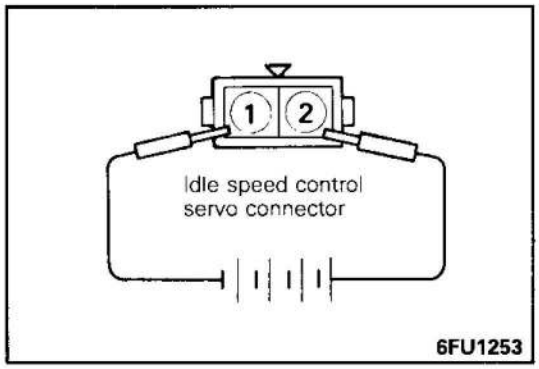
(3) Connect DC 6V (4 batteries) between idle speed control servo connector terminals ① and ②.
Confirm idle speed control operation.
(4) If no good, replace the idle speed control servo assembly.



(Vehicles for Europe built from November 1989 and vehicles for Australia built from July 1989)

(1) Disconnect the idle speed control servo connector.
(2) Check continuity of the idle speed control servo coil.

Measuring terminals	Continuity
① – ② Conductive	5 to 35 Ω resistance at 20°C (68°F)

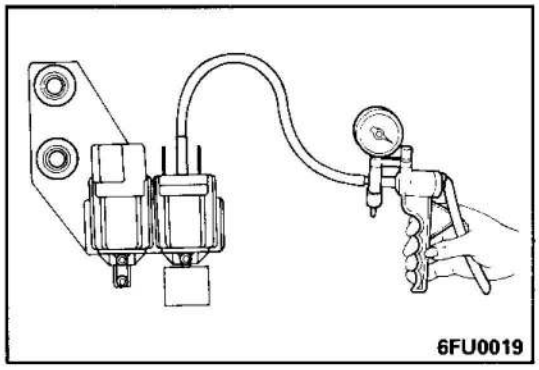


6FU1253

(3) Connect 6V DC between terminal ① and terminal ② of the idle speed control servo connector, and check to be sure that the idle speed control servo operates.

Caution
Apply only a 6V DC or lower voltage. Application of higher voltage could cause locking of the servo gears.

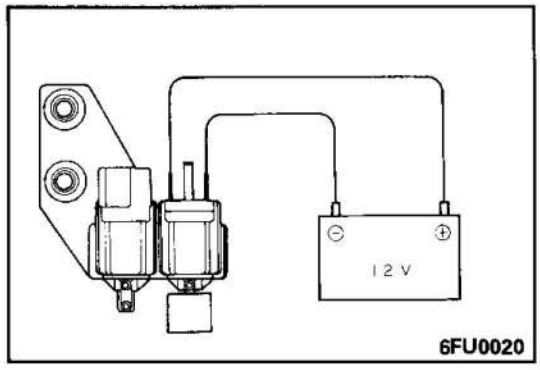
(4) If not, replace idle speed control servo as an assembly.


6FU0019

13. INSPECTION OF FUEL-PRESSURE SOLENOID VALVE

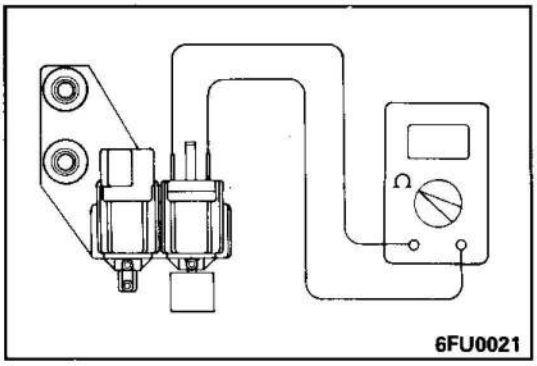
NOTE
When disconnecting vacuum hoses, make a mark on them so that later re-connections are to the correct original place.

(1) Disconnect the vacuum hose (black with blue stripe) from the solenoid valve.
(2) Detach the harness connector.
(3) Connect a manual vacuum pump to the nipple to which the black vacuum hose was connected.
(4) Apply negative pressure (vacuum) so as to check airtightness when voltage is applied from the battery directly to the solenoid valve terminal, and when the voltage is discontinued.



6FU0020

Battery voltage	Other nipple of solenoid valve	Normal reaction
When discontinued	Open	Negative pressure leaks
	Covered by finger	Negative pressure is maintained
When applied	Open	Negative pressure is maintained



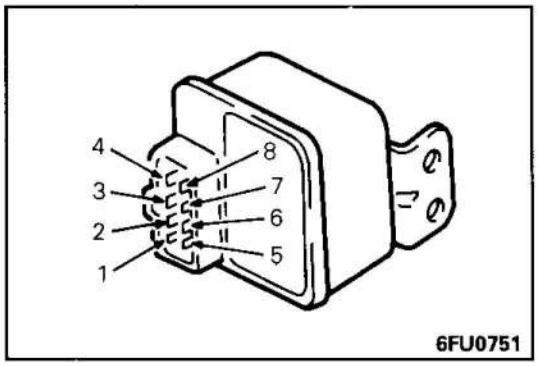
6FU0021

(5) Measure the resistance of the solenoid coil.
Standard value: 36 – 46 Ω [at 20°C (68°F)]

14. INSPECTION OF CONTROL RELAY

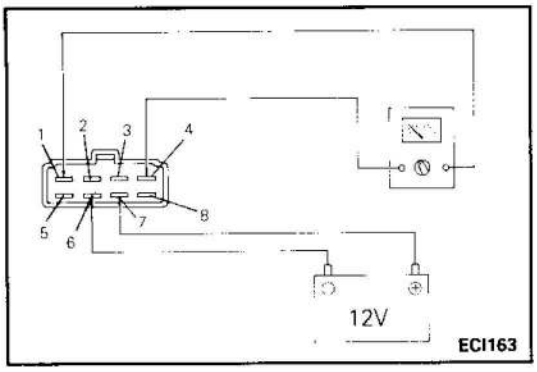
Caution
When applying battery voltage directly, make sure that it is applied to correct terminal. Otherwise, the relay could be damaged.

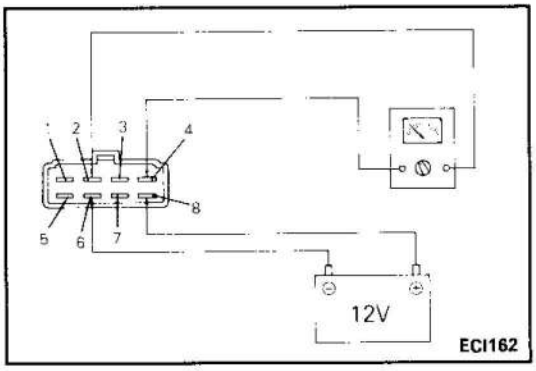
(1) Check continuity of the control relay coil.



6FU0751

Measuring terminal	Continuity
③–⑤	Yes (approx. 95Ω)
②–⑤	
⑥–⑦	Yes (approx. 35Ω)
⑥–⑧	Yes, in one direction only





(2) Check continuity of relay contacts between terminals ① and ④.

Relay coil (between terminals ⑥ and ⑦)	Continuity
When de-energized	No. (∞Ω)
When energized	Yes (0Ω)

(3) Check continuity of relay contacts between terminals ② and ④.

Relay coil (between terminals ⑧ and ⑥)	Continuity
When de-energized	No (∞Ω)
When energized	Yes (0Ω)

(4) If faulty, replace the control relay.

NOTES

SERVICE ADJUSTMENT PROCEDURES (MPI) – Vehicles built from June 1994

E13FCAG

GENERAL INSPECTION

1. INSPECTION AND ADJUSTMENT OF ACCELERATOR CABLE

Refer to P.13-56-1.

2. REPLACEMENT OF FUEL FILTER

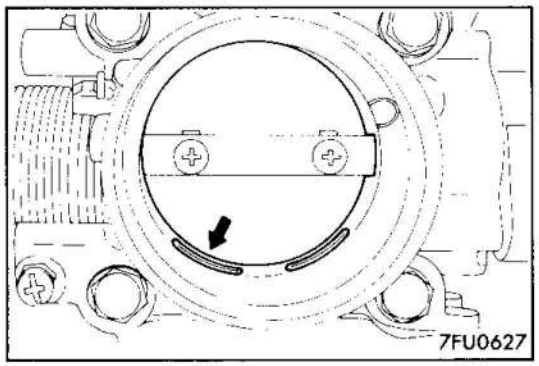
Refer to P.13-58.

3. FUEL PUMP OPERATION CHECK

Refer to P.13-58.

4. THROTTLE BODY (THROTTLE VALVE AREA) CLEANING

(1) Start the engine and warm it up until the coolant is heated to 80°C (176°F) or higher and then stop the engine.
(2) Remove the air intake hose from the throttle body.

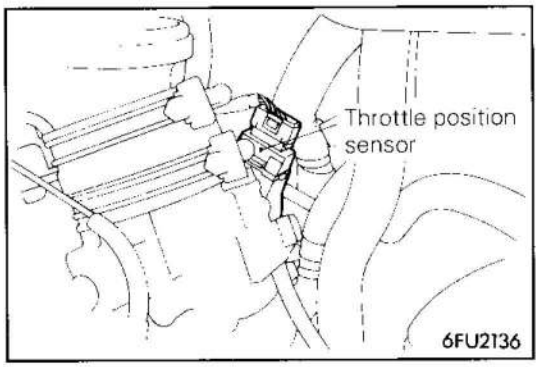


(3) Plug the bypass passage inlet of the throttle body.

Caution
Do not allow cleaning solvent to enter the bypass passage.

(4) Spray cleaning solvent into the valve through the throttle body intake port and leave it for about 5 minutes.
(5) Start the engine, race it several times and idle it for about 1 minute. If the idling speed becomes unstable (or if the engine stalls) due to the bypass passage being plugged, slightly open the throttle valve to keep the engine running.
(6) If the throttle valve deposits are not removed, repeat steps 4 and 5.
(7) Unplug the bypass passage inlet.
(8) Attach the air intake hose.
(9) Use the MUT-II to erase the self-diagnosis code.
(10) Adjust the basic idle speed. (Refer to P.13-76-8.)

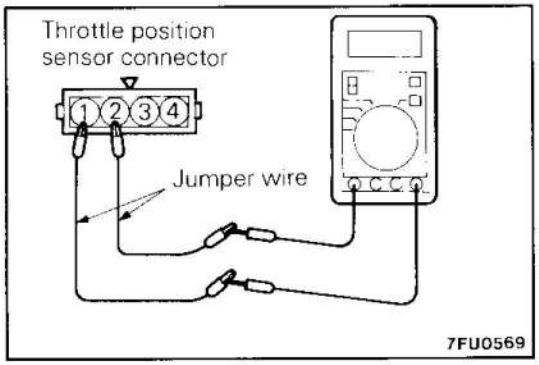
NOTE
If the engine hunts while idling after adjustment of the basic idle speed, disconnect the (–) cable from the battery for 10 seconds or more, and then reconnect it and run the engine at idle for about 10 minutes.

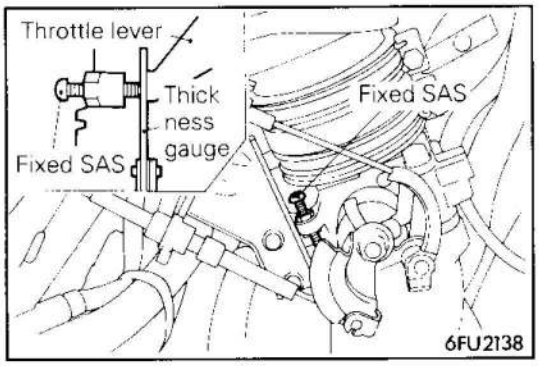


5. IDLE POSITION SWITCH AND THROTTLE POSITION SENSOR ADJUSTMENT

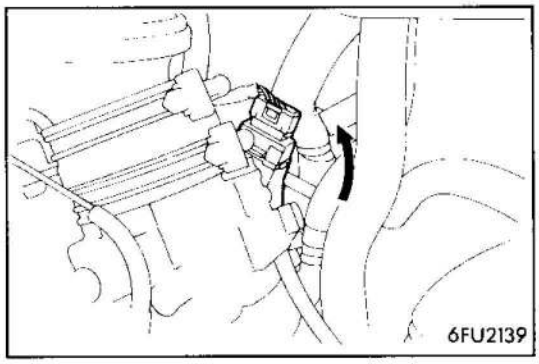
NOTE
The illustration is that for the 4G64 engine. The illustration angle of the throttle position sensor varies depending on the engine.

(1) Connect the MUT-II to the diagnosis connector (16-pin.)
When not using the MUT-II, proceed as follows;
1. Disconnect the connector of the throttle position sensor.
2. Connect an ohmmeter between terminal 2 (idle position switch) and terminal 1 (sensor earth) by using the jumper wires.

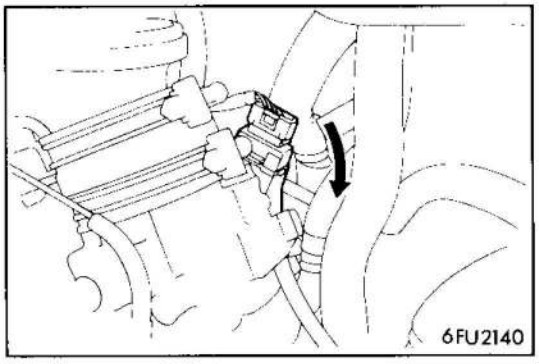




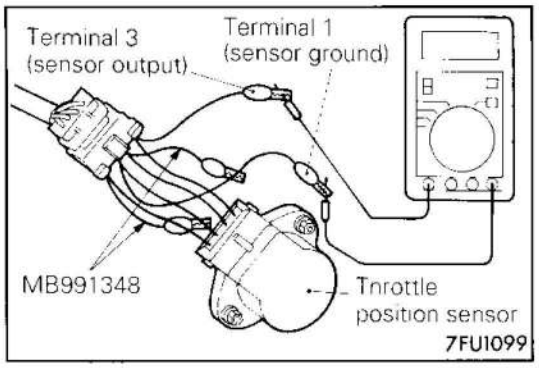
(2) Insert a thickness gauge with a thickness of 0.45 mm (0.0177 in) between the fixed SAS and the throttle lever.
(3) When the MUT-II is used, turn the ignition switch to ON. (but never start the engine.)
(4) Loosen the bolts securing the throttle position sensor with a Allen key (4 mm).



(5) Turn the throttle position sensor anticlockwise as far as it will go.
(6) Check that the service data output for the idle position switch is on (there is continuity between terminals (1) and (2)).



(7) Slowly turn the throttle position sensor clockwise and find the point where the service data output for the idle position switch changes from on to off (no continuity between terminals (1) and (2)).
Use the 4-mm Allen key to securely tighten the throttle position sensor mounting bolt at this point.
(8) Connect the connector of the throttle position sensor.

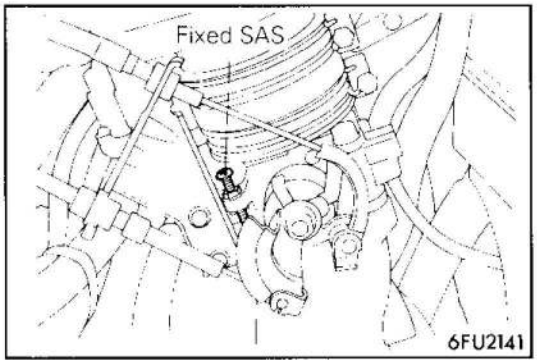


(9) When not using the MUT-II, proceed as follows:
1. Disconnect the throttle position sensor connector, and connect the special tool (test harness:MB991348) in between.
(All terminals should be connected.)
2. Connect a digital voltmeter between terminal 3 (sensor output) and terminal 1 (sensor earth).
3. Turn the ignition switch ON.
(but do not start the engine.)

(10)Check the throttle position sensor output voltage.

Standard value: 400 – 100 mV

(11)If there is a deviation from the standard value, check the throttle position sensor and the related harness.
(12)Remove the thickness gauge.
(13)Turn the ignition switch to OFF.



6. FIXED SAS ADJUSTMENT

E13AF04AA

NOTE
1. The fixed SAS should not be moved unnecessarily; it has been precisely adjusted by the manufacturer.
2. If the adjustment for any reason is disturbed, readjust as follows.

(1) Loosen the tension of the accelerator cable sufficiently.
(2) Back out the fixed SAS lock nut.
(3) Turn the fixed SAS counterclockwise until it is sufficiently backed out, and fully close the throttle valve.
(4) Tighten the fixed SAS until the point where the throttle lever is touched (i.e., the point at which the throttle valve begins to open) is found.
From that point, tighten the fixed SAS 1-1/4 turn.
(5) While holding the fixed SAS so that it doesn't move, tighten the lock nut securely.
(6) Adjust the tension of the accelerator cable.
(7) Adjust the basic idling speed.
(8) Adjust the idle position switch and the throttle position sensor (Refer to P.13-76-6.)

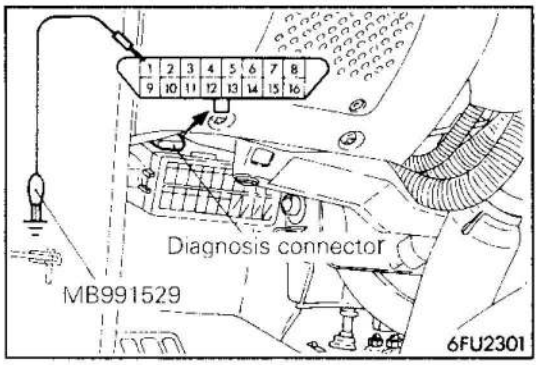
7. BASIC IDLE SPEED ADJUSTMENT E13AF05AA

NOTE
1. The standard idling speed has been adjusted, by the speed adjusting screw (SAS), by the manufacturer, and there should usually be no need for readjustment.
2. The adjustment, if made, should be made after first confirming that the spark plugs, the injectors, the idle speed control servo, the compression pressure, etc., are all normal.

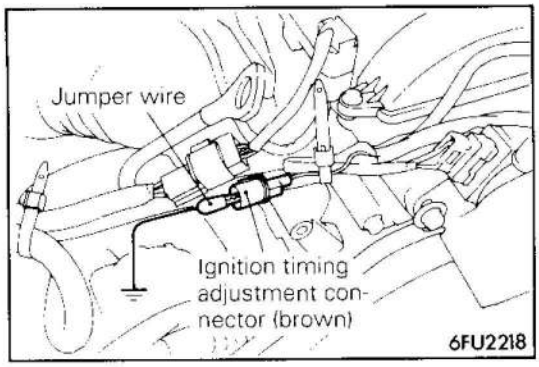
(1) The vehicle should be prepared as follows before the inspection and adjustment.
- Engine coolant temperature: 80 – 95 °C (176° – 203° F)
- Lamps and accessories: OFF
- Transmission: Neutral (A/T for P range)

(2) Connect the MUT-II to the diagnosis connector (16-pin).

NOTE
When the MUT-II is connected, the diagnosis control terminal should be earthed.



(3) When not using the MUT-II, proceed as follows:
1. Insert a paper clip into the engine speed detection connector (blue).
2. Connect a primary-voltage-detection type of tachometer to the paper clip.
3. Use the special tool (diagnosis code check harness) to earth the diagnosis control terminal (terminal 1) of the diagnosis connector (16-pin).



(4) Remove the waterproof female connector from the ignition timing adjustment connector.
(5) Use a jumper wire to earth the ignition timing adjustment terminal.
(6) Start the engine and run at idle.
(7) Check the idle speed.

Standard value: 750 ± 50 r/min.

NOTE
1. The engine speed may be 20 to 100 r/min. lower than indicated above for a new vehicle [driven approximately 500 km or less], but no adjustment is necessary.
2. If the engine stalls or the rpm is low even though the vehicle has been driven approximately 500 km or more it is probable that deposits are adhered to the throttle valve, so clean it. (Refer to P.13-76-5)

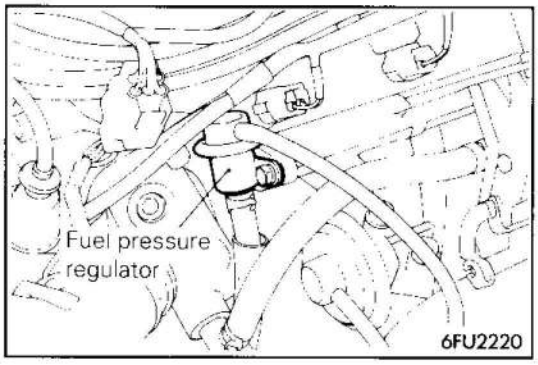
(8) If not within the standard value range, turn the speed adjusting screw (SAS) to make the necessary adjustment.

NOTE
If the idling speed is higher than the standard value range even when the SAS is fully closed, check whether or not there is any indication that the fixed SAS has been moved. If there is an indication that it has been moved, adjust the fixed SAS.

(9) Turn the ignition switch to OFF.
(10) Disconnect the jumper wire from the ignition timing adjustment terminal and return the connector to its original condition.
(11) Start the engine again and let it run at idle speed for about 10 minutes; check to be sure that the idling condition is normal.

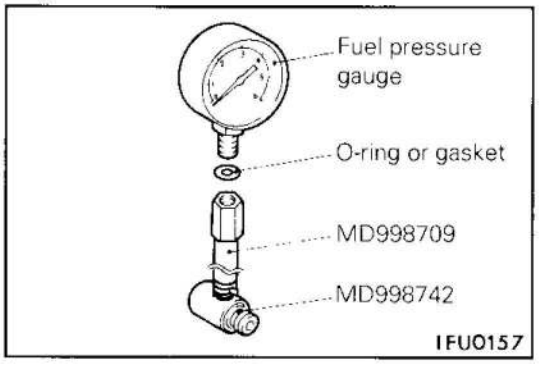
8. FUEL PRESSURE TEST

(1) Make the following operations to release the pressure remaining in fuel pipe line so that fuel will not flow out.
① Disconnect the fuel pump harness connector at the fuel tank.
② Start the engine and after it stops by itself, turn the ignition switch to OFF.
③ Disconnect the battery (–) terminal.
④ Connect the fuel pump harness connector.

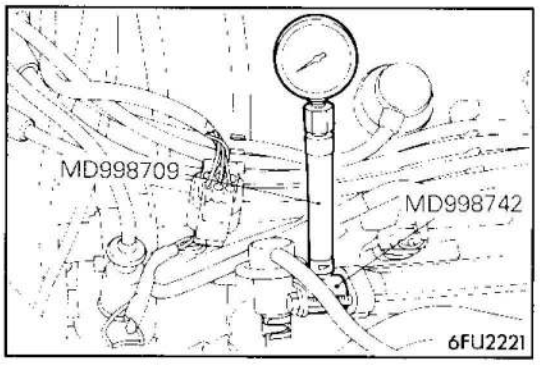


(2) Remove the fuel pressure regulator.

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

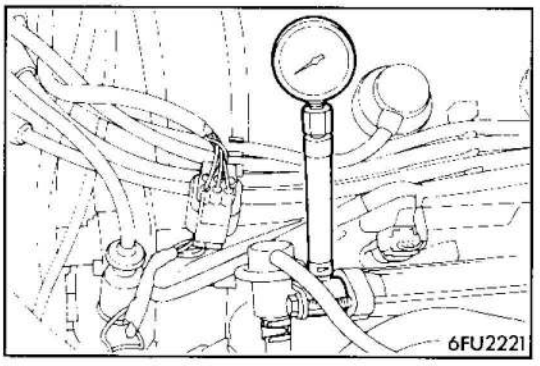


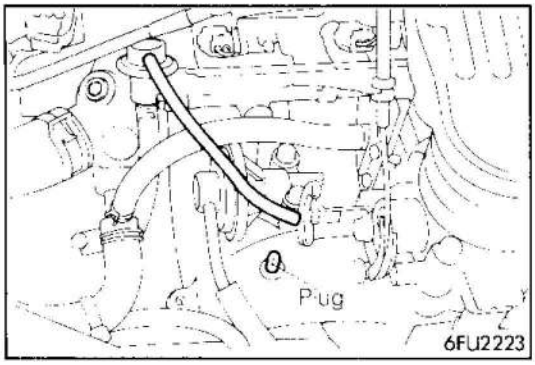
(3) Remove the union joint and bolt from the special tool (adapter hose MD998709) and instead attach the special tool (hose adapter MD998742) to the adapter hose.
(4) Install a fuel pressure gauge on the adapter hose that was set up in step 3.
Use a suitable O-ring or gasket between the fuel pressure gauge and the special tool so as to seal in order to prevent fuel leakage at this time.



(5) Install the special tool, which was set in place in steps 3 and 4 between the delivery pipe and the fuel pressure regulator.
(6) Connect the battery (–) terminal.
(7) Connect the fuel pump drive terminal with the battery (+) terminal using a jumper wire and drive the fuel pump.
Under fuel pressure, check the fuel pressure gauge and special tool connections for leaks.
(8) Disconnect the jumper wire from the fuel pump drive terminal to stop the fuel pump.
(9) Start the engine and run at idle.
(10) Measure fuel pressure while the engine is running at idle.

Standard value: Approx. 265 kPa (2.7 kg/cm², 38 psi)





(11)Disconnect the vacuum hose (blue stripe) from the intake manifold and plug the nipple.
Measure the fuel pressure in this condition.

Standard value: 324 – 343 kPa
(3.3 – 3.5 kg/cm², 47 – 50 psi)

(12)Check to see that fuel pressure at idle does not drop even after the engine has been raced several times.

(13)Racing the engine repeatedly, hold the fuel return hose lightly with fingers to feel that fuel pressure is present in the return hose.

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

(14)If any of fuel pressure measured in steps 10 to 13 is out of specification, troubleshoot and repair according to the table below.

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

(15)Stop the engine and check change of fuel pressure gauge reading. Normal if the reading does not drop within 2 minutes. If it does, observe the rate of drop and troubleshoot and repair according to the table below.

Symptom	Probable cause	Remedy
Fuel pressure drops gradually after engine is stopped	Leaky injector	Replace injector
	Leaky fuel regulator valve seat	Replace fuel pressure regulator
Fuel pressure drops sharply immediately after engine is stopped	Check valve in fuel pump is held open	Replace fuel pump

(16)Release residual pressure from the fuel pipe line. (Refer to P.13-76-10)

(17)Remove the fuel pressure gauge and special tool from the delivery pipe.

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

(18)Replace the O-ring at the end of the fuel pressure regulator with a new one.
(19)Install the fuel pressure regulator and then tighten the bolt to the specified torque.

Tightening torque: 7 – 11 Nm
(0.7 – 1.1 kgm, 5 – 8 f.lbs.)

(20)Check for fuel leaks.
1. Apply the battery voltage to the fuel pump drive terminal to drive the fuel pump.
2. Under fuel pressure, check the fuel line for leaks.

TROUBLESHOOTING

1. EXPLANATION OF TROUBLESHOOTING PROCEDURES

Refer to P.13-64-1.

2. EXPLANATION AND CAUTIONS ABOUT HARNESS CHECK

Refer to P.13-64-2.

3. ENGINE WARNING LAMP (CHECK ENGINE LAMP)

Refer to P.13-64-3.

ITEMS INDICATED BY ENGINE WARNING LAMP

Engine control unit
Oxygen sensor
Air flow sensor
Intake air temperature sensor
Throttle position sensor
Engine coolant temperature sensor
Crank angle sensor
Top dead centre sensor (No.1 cylinder top dead centre)
Barometric pressure sensor
Ignition timing adjustment signal
Injector

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.

4. ENGINE WARNING LAMP INSPECTION

Refer to P.13-64-3.

5. 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 13 diagnosis items, including the normal state, and the diagnosis results can be read out with a MUT-II.

Moreover, since memorization of the malfunction codes is backed up directly by the battety, 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-II 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-II to the engine control unit and the diagnosis memory will be erased.

The 13 diagnosis items are provided as follows, and if plural items are activated, they are all indicated sequentially from the smallest code number.

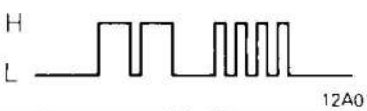
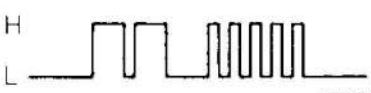
Caution

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-curcuited 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	H L 12A0104	–	–	(Replace engine control unit)
2	Oxygen sensor	H L 12A0104	11	Retained	• Harness and connector • Fuel pressure • Injectors (Replace if defective.) • Intake air leaks • Oxygen sensor
3	Air flow sensor	H L 12A0104	12	Retained	• Harness and connector (If harness and connector are normal, replace air flow sensor assembly.)
4	Intake air temperature sensor	H L 12A0104	13	Retained	• Harness and connector • Intake air temperature sensor
5	Throttle position sensor	H L 12A0104	14	Retained	• Harness and connector • Throttle position sensor • Idle position switch
6	Engine coolant temperature sensor	H L 12A0107	21	Retained	• Harness and connector • Engine coolant temperature sensor

ADDED

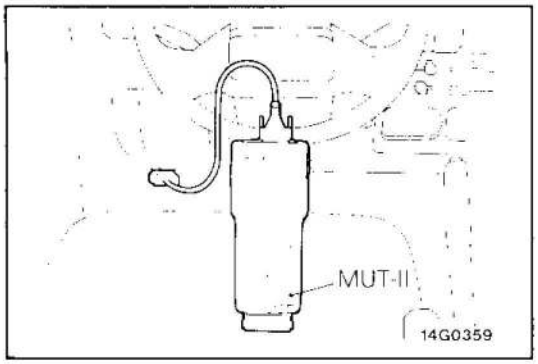
Output preference order	Diagnosis item	Malfunction code			Check item (Remedy)
		Output signal pattern	No.	Memory	
7	Crank angle sensor	 12A0107	22	Retained	• Harness and connector (If harness and connector are normal, replace distributor assembly.)
8	No.1 cylinder top dead centre sensor	 12A0107	23	Retained	• Harness and connector (If harness and connector are normal, replace distributor 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	Ignition timing adjustment signal	 12A0107	36	–	• Harness and connector
12	Injector	 12A0105	41	Retained	• Harness and connector • Injector coil resistance
13	Normal state	 (Continue) 12A0104	–	–	–

NOTE
Replace the engine control unit if a malfunction code is output although the inspection reveals that there is no problem with the check items

6. METHOD OF READING AND ERASING DIAGNOSIS CODES

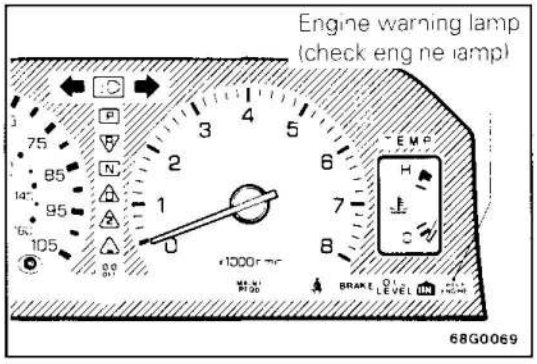
Caution

1. **If battery voltage is low, diagnosis codes will not be output. Accordingly, be sure to check the battery before carrying out inspection.**
2. **If the battery is disconnected or if the engine control unit connector is disconnected, the diagnosis code memory will be erased. Accordingly, the battery should not be disconnected until reading of the diagnosis codes has been completed.**
3. **Connection and disconnection of the MUT-II should always be carried out with the ignition switch in the OFF position.**



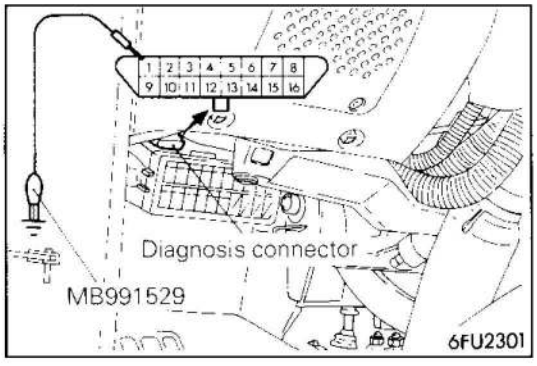
When using the MUT-II

(1) Connect the MUT-II to the diagnosis connector (16-pin).
(2) Turn the ignition switch ON.
(3) Take a reading of the self-diagnosis output.
(4) Repair the problem location, referring to the diagnosis chart.
(5) After turning the ignition switch once to OFF, turn it back ON.
(6) Erase the malfunction code.
(7) Recheck to be sure that the condition is normal.

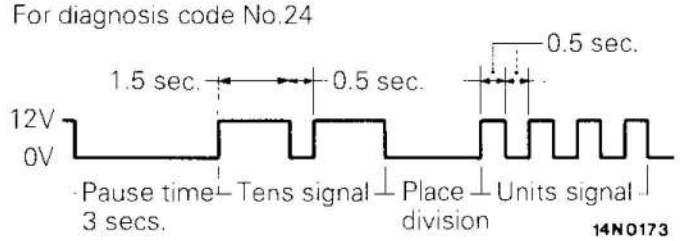
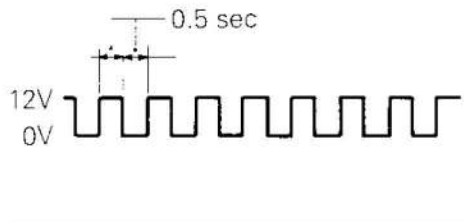


When using the engine warning lamp (CHECK ENGINE LAMP)

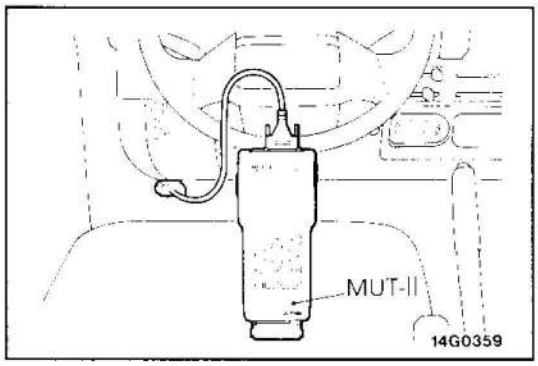
(1) Use the special tool (diagnosis code check harness) to earth terminal (1) of the diagnosis connector (16-pin).
(2) Take a reading of the diagnosis code from the flashing of the engine warning lamp.
(3) Repair the malfunction location while referring to the Inspection chart for Diagnostic Trouble codes.
(4) After disconnecting the battery cable from the battery (–) terminal for 10 seconds or more, reconnect the cable.
(5) After the engine has warmed up, run it at idle for about 10 minutes.



Diagnosis result display method when using the engine warning lamp

Example of flashing when a diagnosis code is output	Flashing when normal
For diagnosis code No.24  	

NOTE
• Other diagnosis codes also are output as the same code numbers as when using the MUT-II.



7. INSPECTION USING MUT-II SERVICE DATA AND ACTUATOR TESTING

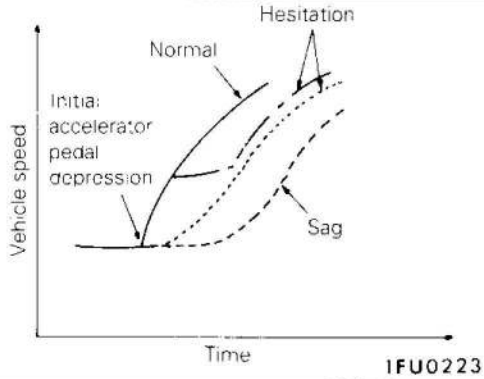
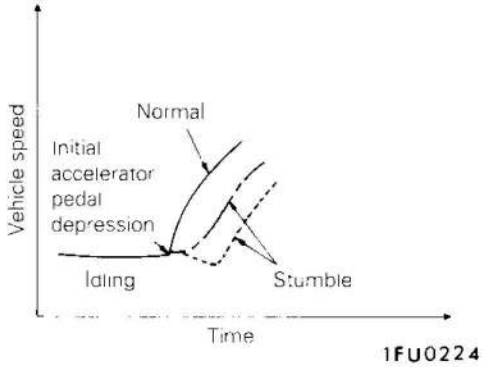
(1) Carry out inspection by means of the data list and the actuator test function.
If there is an abnormality, check and repair the chassis harnesses and components.
(2) After repairing, re-check using the MUT-II and check to be sure that the abnormal input and output have returned to normal as a result of the repairs.
(3) Erase the malfunction code memory.
(4) Remove the MUT-II.
(5) Start the engine again and carry out a road test to confirm that the problem has disappeared.

CHECK CHART CLASSIFIED BY PROBLEM SYMPTOMS

Problem symptoms / Check items	Starting		Idling stability			Driving						Stopping
	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 and ignition switch-IG	① 1											
Engine control unit power earth	② 2											
Fuel pump	③ 3	① 1			① 1	① 1	① 1					
Air flow sensor					⑪ 10	⑨ 9		⑤ 5	⑤ 5		③ 3	
Intake air temperature sensor			⑤			⑤ 5	④ 4				① 1	
Barometric pressure sensor			⑦			⑧ 8	⑥ 6				② 2	
Engine coolant temperature sensor		3	⑥ 5	① 1	⑤ 5	⑦ 7	⑤ 5	④ 4		③ 3		
Throttle position sensor						⑥ 6		③ 3	④ 4			
Idle position switch			③ 3	② 2	④ 4							
No.1 cylinder top dead centre sensor	⑤ 5	⑥ 7			⑧ 7				② 2			
Crank angle sensor	⑥ 6	⑦ 8			⑨ 8				③ 3			
Ignition switch-ST <M/T>	④ 4	③ 4										
Ignition switch-ST and Inhibitor switch <A/T>	④ 4	③ 4		⑤								
Vehicle speed sensor					⑥				⑥			
Power steering fluid pressure switch				③								
Air conditioner switch and power relay				④								
Oxygen sensor			⑨									
Injector	⑧ 8	② 2	② 2		③ 3	② 2	② 2	① 1		① 1		①
Idle speed control servo		④ 5	① 1	⑥ 3	② 2				⑦ 6			
Ignition coil and power transistor unit	⑦ 7				⑩ 9		⑦ 7		① 1		④ 4	
Purge control solenoid valve			⑧									
EGR control solenoid valve						④ 4		⑥ 6		④ 4		
Fuel pressure		⑤ 6	④ 4		⑦ 6	③ 3	③ 3	② 2		② 2		

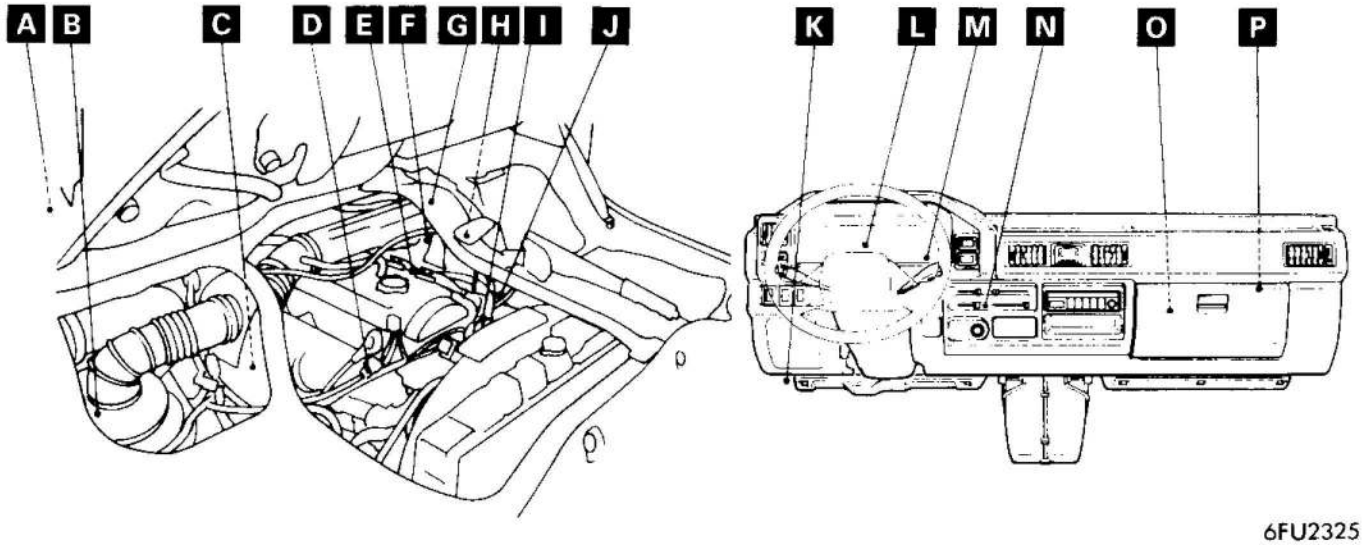
○: Warm engine (number inside indicates check order)
□: Cold engine (number inside indicates check order)

PROBLEM SYMPTOM TABLE (FOR YOUR INFORMATION)

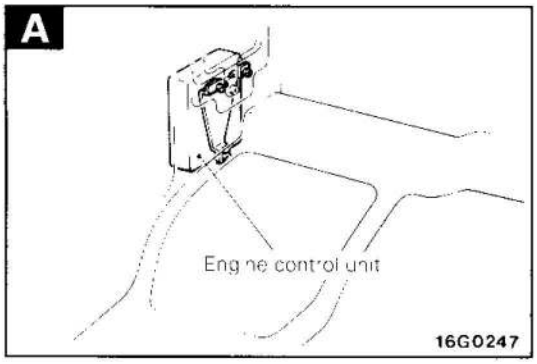
	Items	Symptom
Starting	Won't start (No initial combustion)	The starter is used to crank the engine, but there is no combustion within the cylinders, and the engine won't start
	Starting problem (Initial combustion, then stall)	There is combustion within the cylinders, but then the engine soon stalls
	(Starting takes a long time.)	Engine won't start quickly
Idling stability	Idling instability (Rough idling)	Engine speed doesn't remain constant; changes during idling. Usually, a judgement can be based upon the movement of the tachometer pointer, and the vibration transmitted to the steering wheel, shift lever, body, etc. This is called rough idling.
	Incorrect idling speed	The engine doesn't idle at the usual correct speed.
	Improper idling continuity Die out Pass out	This non-continuity of idling includes the following elements. (1) Die out....The engine stalls when the foot is taken from the accelerator pedal, regardless of whether the vehicle is moving or not. (2) Pass out..The engine stalls when the accelerator pedal is depressed or while it is being used.
Driving	Hesitation Sag	"Hesitation" is the delay in response of the vehicle (engine r/min.) that occurs when the accelerator is depressed in order to accelerate from the speed at which the vehicle is now traveling, or a temporary drop in vehicle speed (engine r/min.) during such acceleration. Serious hesitation is called "sag".  1FU0223
	Poor acceleration	Poor acceleration is inability to obtain an acceleration corresponding to the degree of throttle opening, even though acceleration is smooth, or the inability to reach maximum speed.
	Stumble	Engine rpm response is delayed when the accelerator pedal is initially depressed for acceleration from the stopped condition.  1FU0224
	Shock	The feeling of a comparatively large impact or vibration when the engine is accelerated or decelerated.
	Surge	This is repeated surging ahead during constant speed travel or during variable speed travel.
	Knocking	A sharp sound like a hammer striking the cylinder walls during driving and which adversely affects driving.
Stopping	Run on ("Dieseling")	The condition in which the engine continues to run after the ignition switch is turned to OFF. Also called "Dieseling".

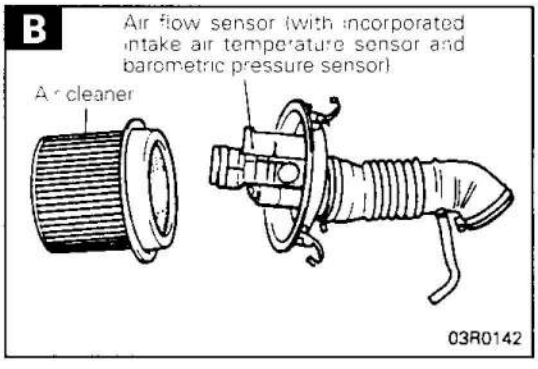
COMPONENT LOCATION

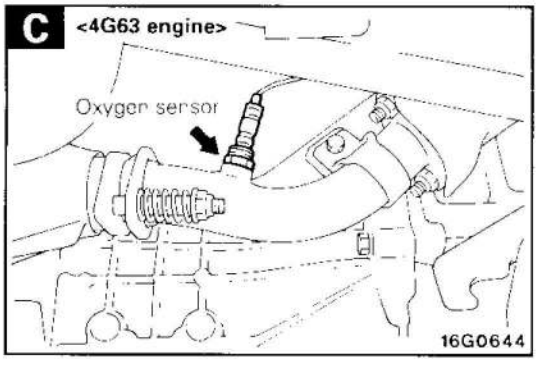
Name	Symbol	Name	Symbol
Air conditioner power relay	O	Engine warning lamp (check engine lamp)	M
Air conditioner switch	N	Idle speed control (ISC) servo	F
Air flow sensor (with incorporated intake air temperature sensor and barometric pressure sensor)	B	Ignition coil and Power transistor unit	I
		Inhibitor switch	Q
		Injector	E
Control relay	P	Oxygen sensor	C
Diagnosis connector	K	Power steering fluid pressure switch	D
Distributor (with incorporated crank angle sensor and top dead centre sensor)	I	Purge control solenoid valve <4G63 engine>	H
		Throttle position sensor (with idle position switch)	G
EGR control solenoid valve <4G63 engine>	H		
Engine coolant temperature sensor	J	Vehicle speed sensor	L
Engine control unit	A		

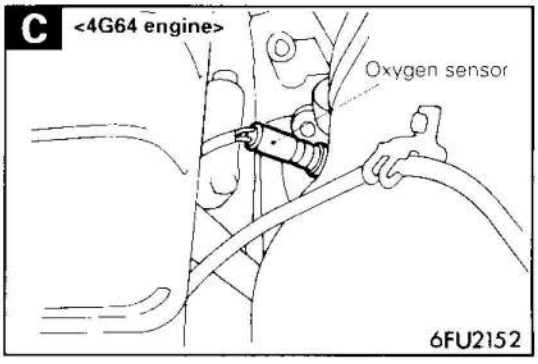


6FU2325

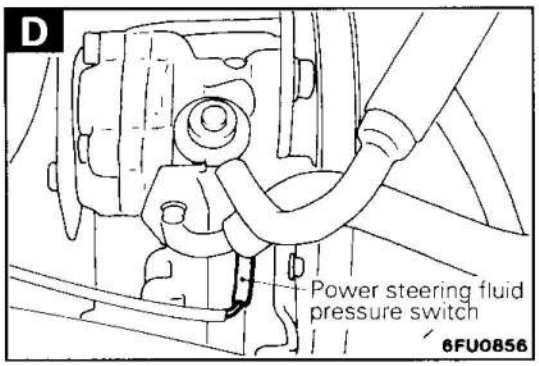




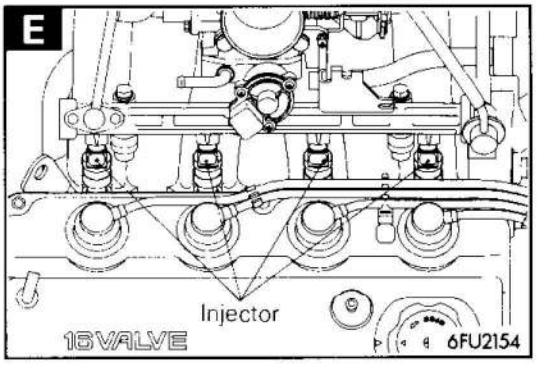




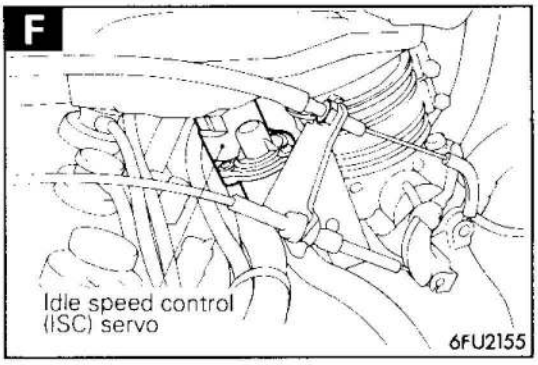
D


Power steering fluid pressure switch
6FU0856

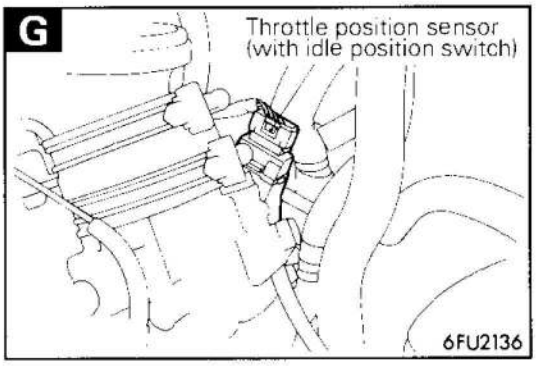
E


Injector
16VALVE
6FU2154

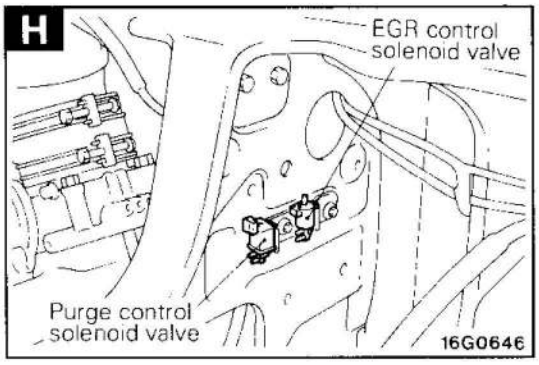
F


Idle speed control (ISC) servo
6FU2155

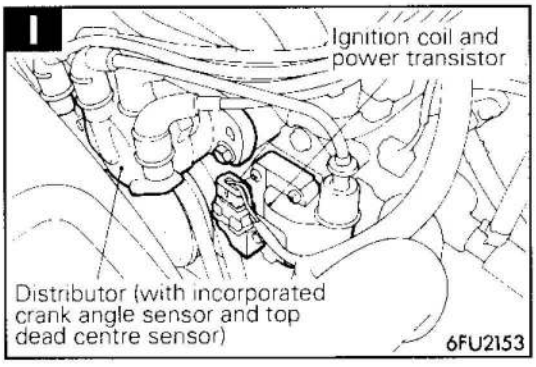
G


Throttle position sensor (with idle position switch)
6FU2136

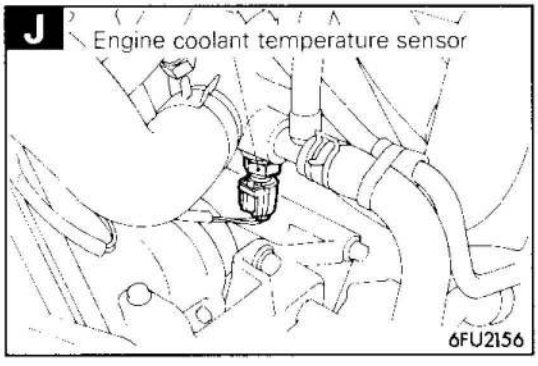
H


EGR control solenoid valve
Purge control solenoid valve
16G0646

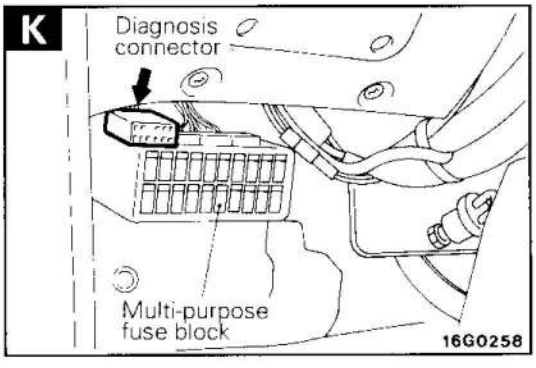
I


Ignition coil and power transistor
Distributor (with incorporated crank angle sensor and top dead centre sensor)
6FU2153

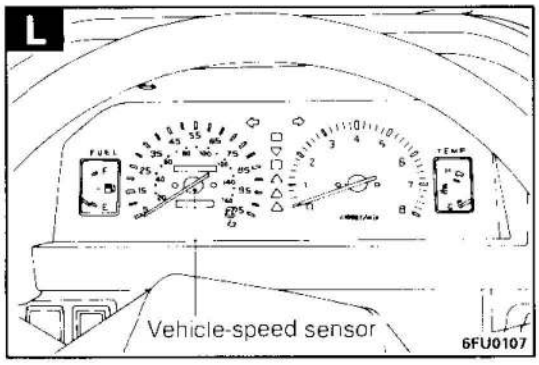
J


Engine coolant temperature sensor
6FU2156

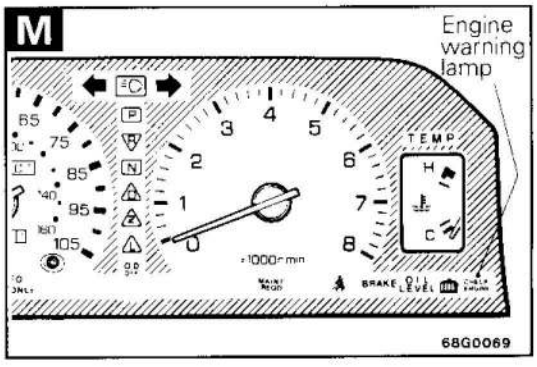
K


Diagnosis connector
Multi-purpose fuse block
16G0258

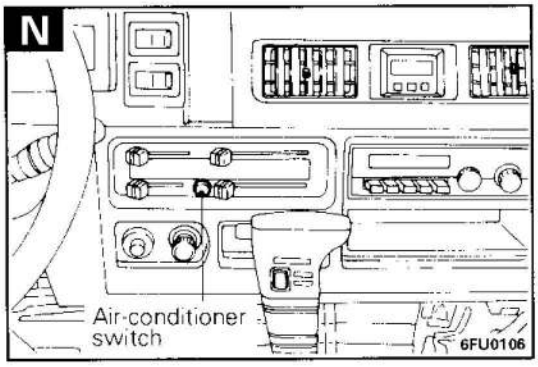
L


Vehicle-speed sensor
6FU0107

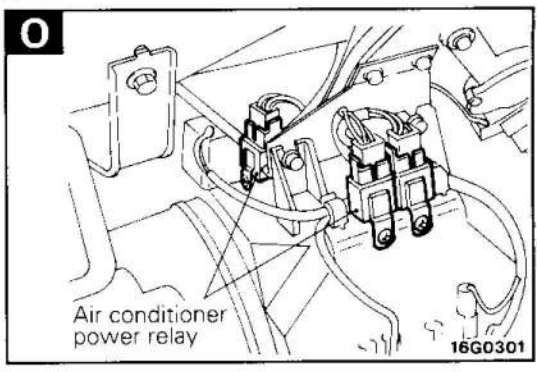
M


Engine warning lamp
TEMP
68G0069

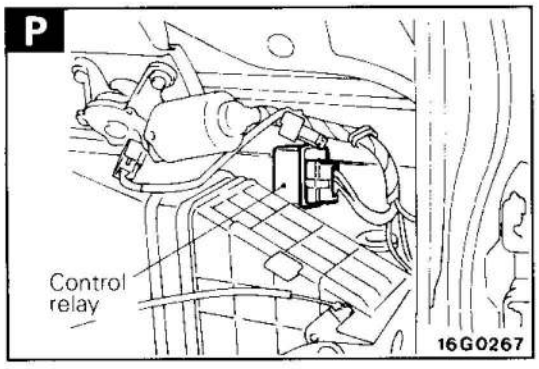
N



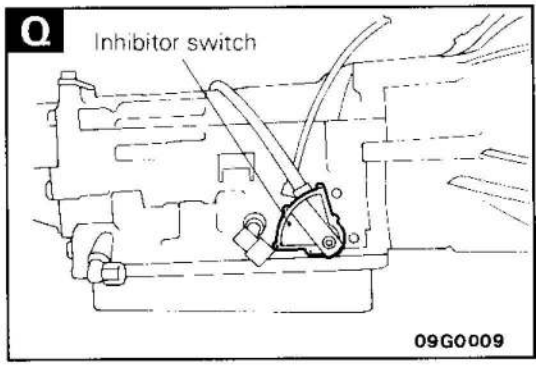
O



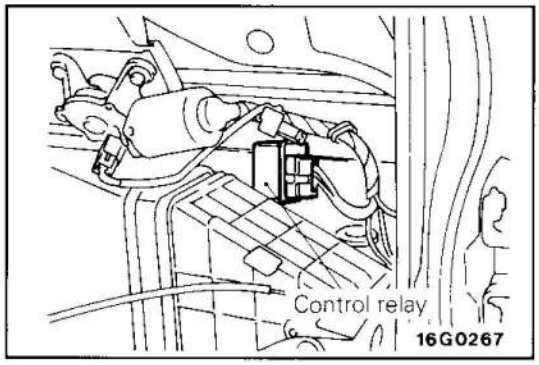
P

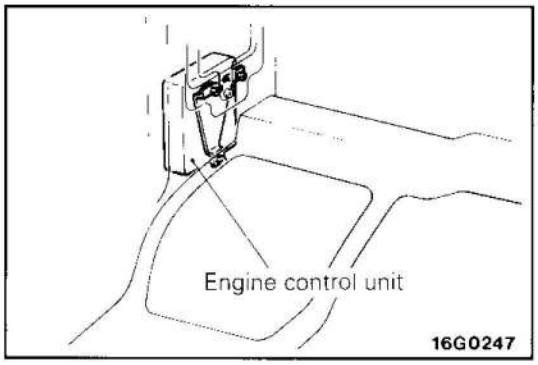


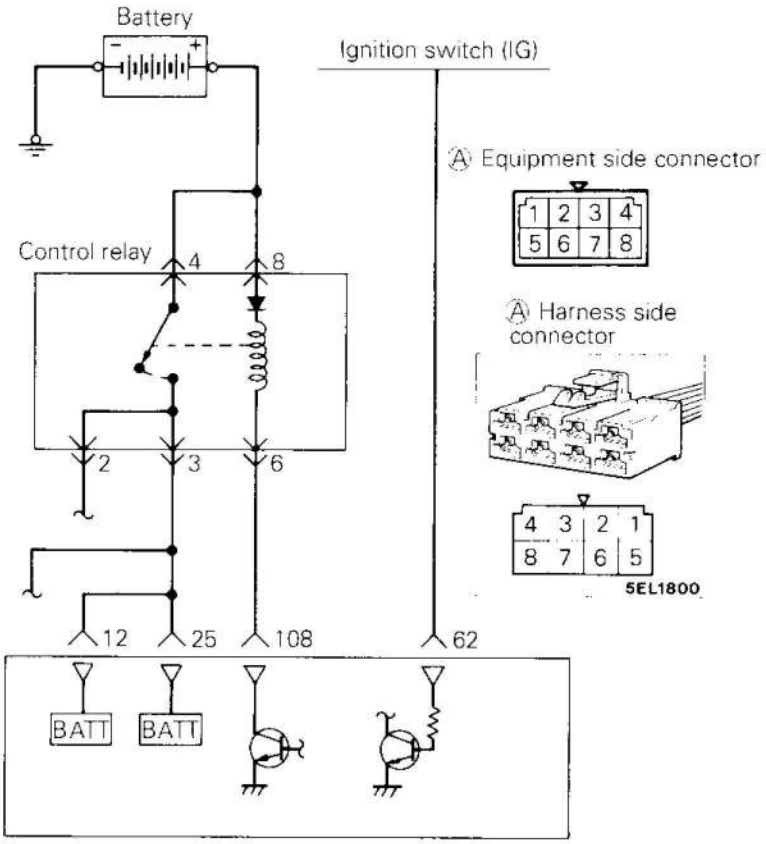
Q



POWER SUPPLY AND IGNITION SWITCH-IG







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.

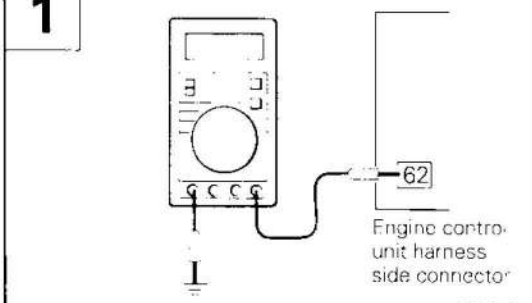
INSPECTION

Using MUT-II

Function	Item No.	Data display	Check condition	Standard value
Data reading	16	Engine control unit power voltage	Ignition switch: ON	11-13V

HARNESS INSPECTION

1



Measure the ignition switch (IG) terminal input voltage.

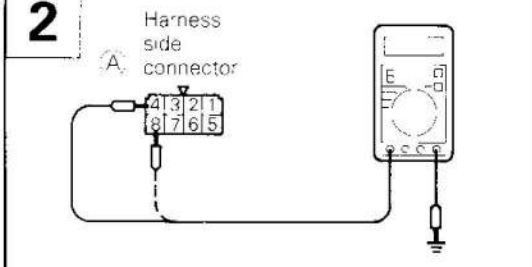
- Engine control unit connector: Disconnected

Ignition switch	Voltage (V)
OFF	0 – 1
ON	11 – 13

OK → 2

Repair the harness. (Ignition switch - 62) or check the ignition switch

2



Measure the power supply voltage of the control relay.

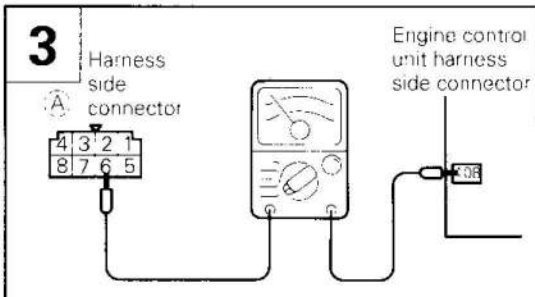
- Ignition switch: OFF
- Control relay connector: Disconnected

Voltage (V)
11 – 13

OK → 3

Repair the harness. (Battery - A 4, A 8)

3



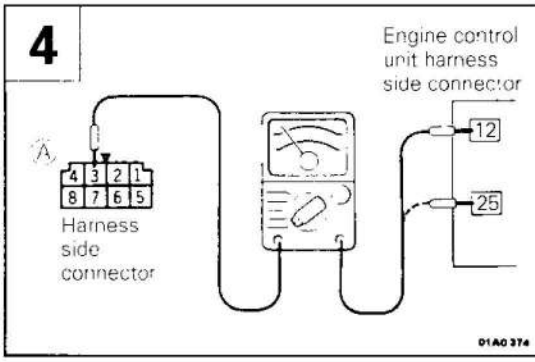
Check for an open-circuit, or a short-circuit to earth, between the engine control unit and the control relay.

- Engine control unit connector: Disconnected
- Control relay connector: Disconnected

OK → 4

Repair the harness. (A 6 - 108)

4



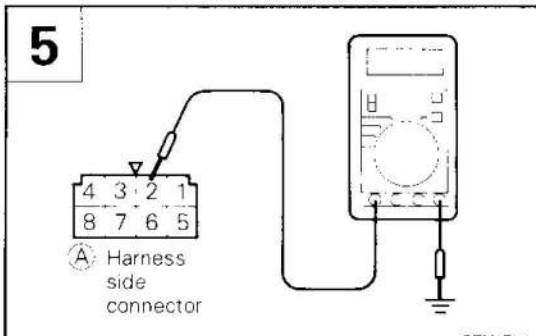
Check for an open-circuit, or a short-circuit to earth, between the engine control unit and the control relay.

- Engine control unit connector: Disconnected
- Control relay connector: Disconnected

OK → 5

Repair the harness. (A 3 - 12, 25)

5



Measure power voltage to the actuator.

- Control relay connector: Connected
- Engine control unit connector: Connected

Engine	Voltage (V)
Cranking	8V or higher
Racing	11 – 13

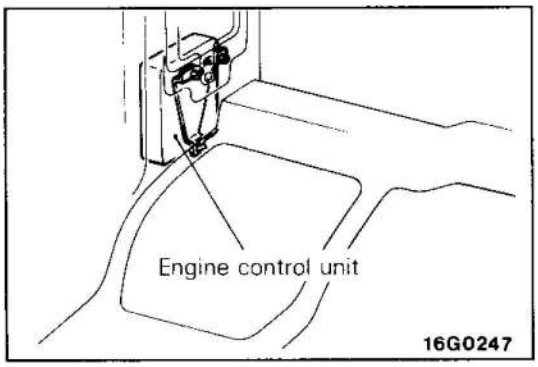
OK → STOP

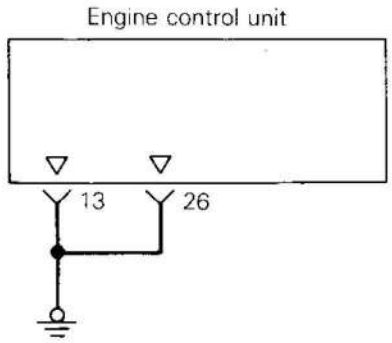
Replace the control relay

CONTROL RELAY INSPECTION

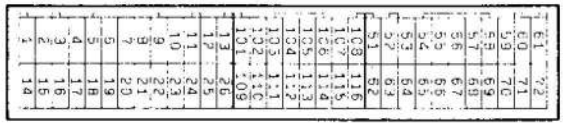
Refer to P.13-76-64.

ENGINE CONTROL UNIT POWER EARTH





Engine control unit connector



OPERATION

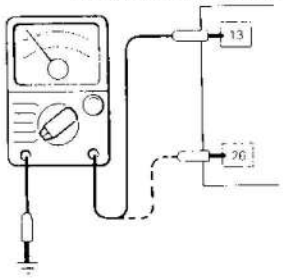
Grounds the engine control unit

TROUBLESHOOTING HINTS

If the earth wire of the engine control unit is not connected securely to earth, the unit will not operate correctly.

HARNESS INSPECTION

1 Engine control unit harness side connector



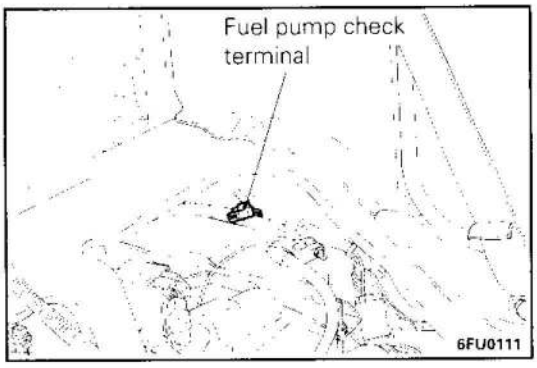
Check for continuity of the earth circuit.

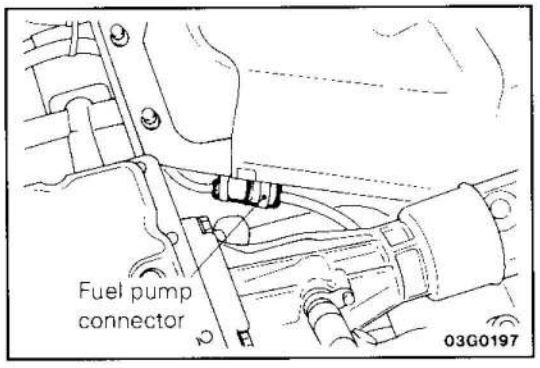
- Engine control unit connector: Disconnected

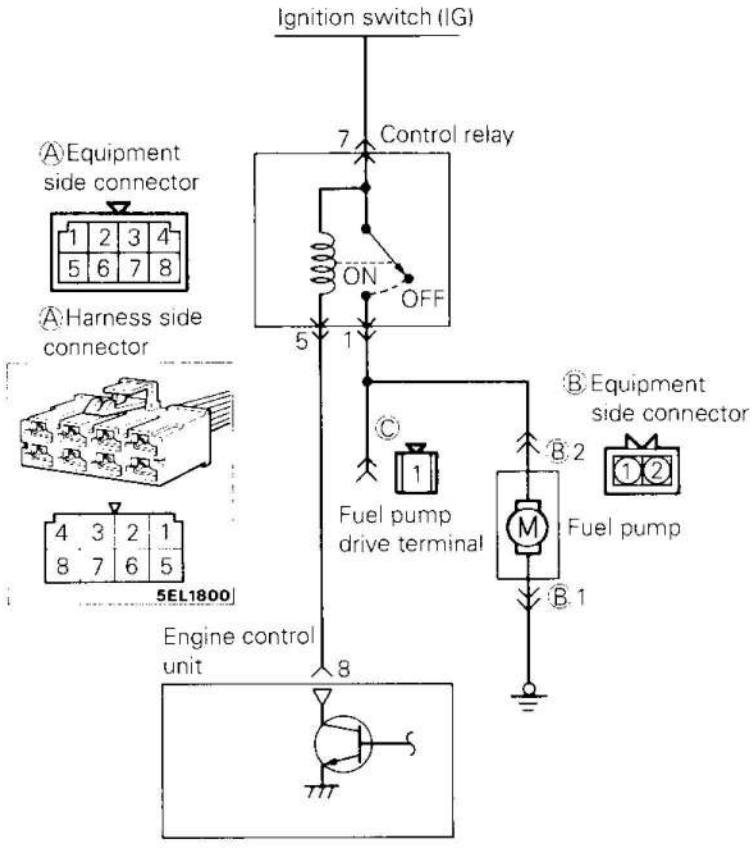
OK → STOP

NO → Repair the harness. ([13] – Earth [26] – Earth)

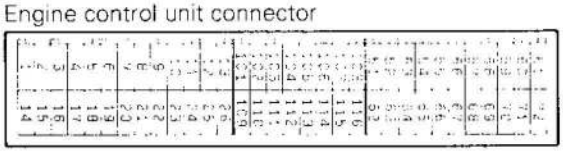
FUEL PUMP







Engine control unit connector



7FU0653

6AF0159

OPERATION

- The fuel pump is driven when the engine is cranking and while the engine is running.
- When the engine is cranking and while the engine is running, the engine control unit turns the power transistor ON to supply power to the control relay coil. This causes the control relay switch to turn ON, and current is supplied from the ignition switch via the control relay switch to drive the fuel pump.

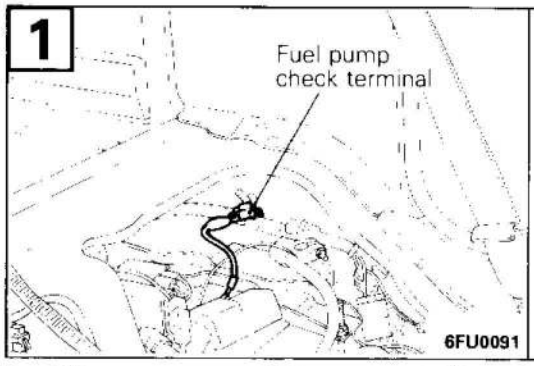
INSPECTION

Using MUT-II

Function	Item No.	Drive	Check condition	Check content	Normal state
Actuator test	07	Fuel pump is driven to circulate fuel	• Engine cranking • Forced drive of fuel pump Check is made for above two	Hold return hose with fingers to feel pulsation indicating fuel flow	Pulsation is felt
				Listen to pump operating sound near fuel tank	Operating sound is head

HARNESS INSPECTION

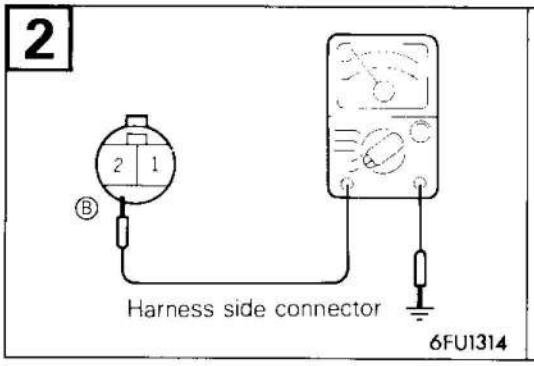
1



Check the fuel pump.
- Apply battery voltage to the checking terminal and operate the pump.

OK → 4
NO → 2

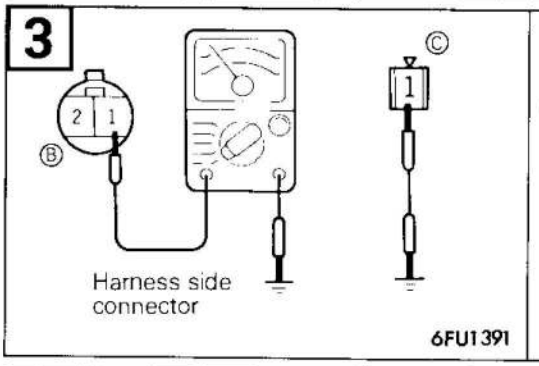
2



Check for continuity of the earth circuit.
- Fuel pump connector: Disconnected

OK → 3
NO → Repair the harness. (Ⓑ2 – Earth)

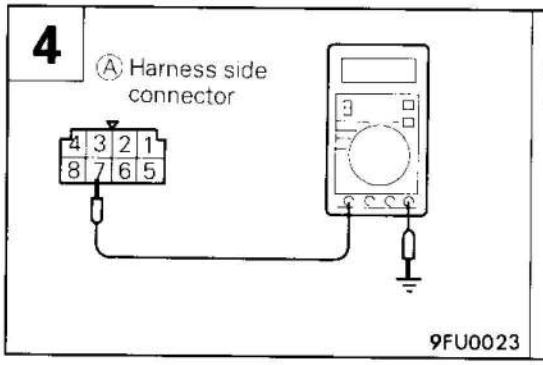
3



Check for continuity between the fuel pump and the checking terminal.
- Fuel pump connector: Disconnected

OK → 4
NO → Repair the harness. (Ⓑ1 – Ⓒ1)

4

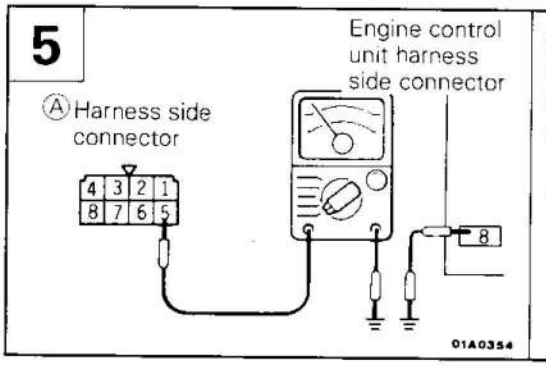


Measure the power supply voltage of the control relay.
- Control relay connector: Disconnect

Ignition switch	Voltage (V)
OFF	0 – 1
START	11 – 13

OK → 5
NO → Repair the harness. (Ignition switch - Ⓐ 7) or check for ignition switch.

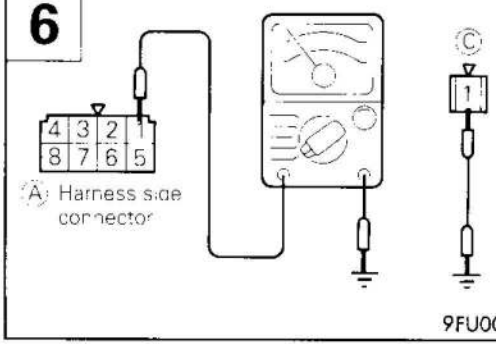
5



Check for an open-circuit, or a short-circuit to earth between the control relay and the engine control unit.
- Control relay connector: Disconnected
- Engine control unit connector: Disconnected

OK → 6
NO → Repair the harness. (Ⓐ 5 - 8)

6



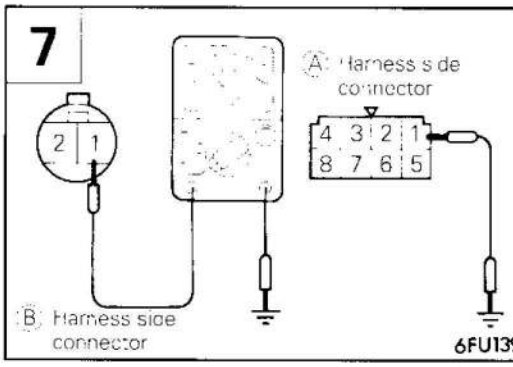
Check for continuity between the fuel pump drive terminal and the control relay.

- Control relay connector: Disconnected
- Fuel pump connector: Disconnected

OK → 7

NG → Repair the harness. (A-1 - C-1)

7



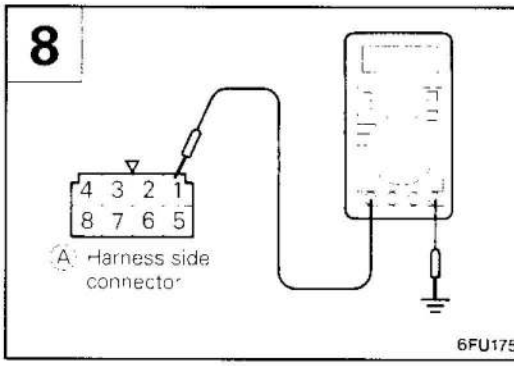
Check for an open-circuit, or a short-circuit to earth between the control relay and the fuel pump.

- Control relay connector: Disconnected
- Fuel pump connector: Disconnected

OK → 8

NG → Repair the harness. (A-1 - B-1)

8



Measure the power supply voltage of the fuel pump.

- Control relay connector: Connected
- Engine control unit connector: Connected

Engine	Voltage (V)
Cranking	8V or more
Racing	11 – 13

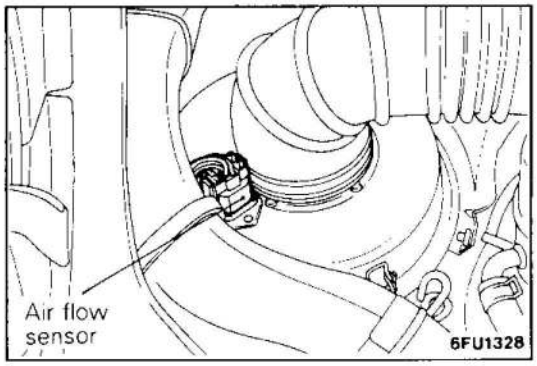
OK → STOP

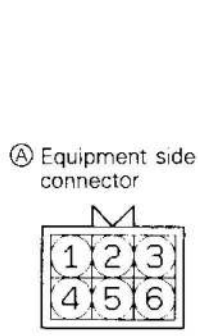
NG → Control relay or engine control unit is defective.

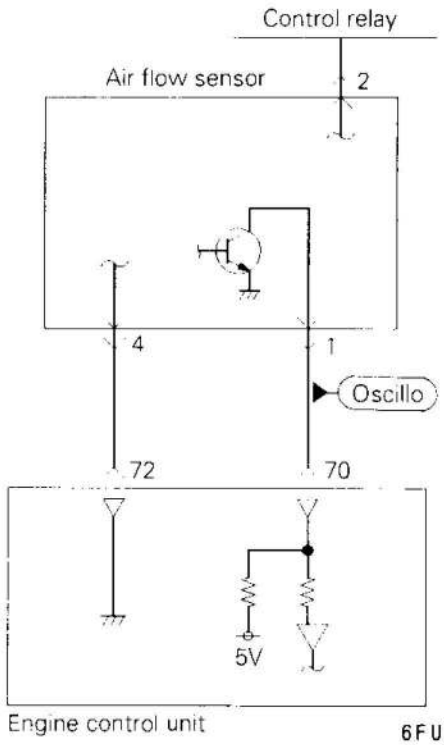
CONTROL RELAY INSPECTION

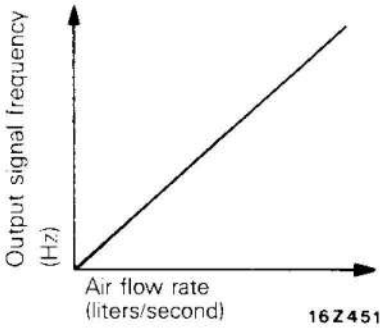
Refer to P.13-76-64.

AIR FLOW SENSOR

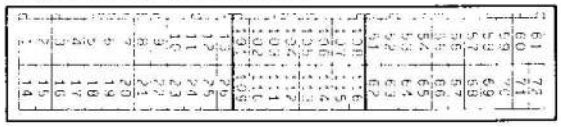








Engine control unit connector



7FU0653

OPERATION

Refer to P.13-64-18.

TROUBLESHOOTING HINTS

Refer to P.13-64-18.

INSPECTION

Using MUT-II

Function	Item No.	Data display	Check condition	Engine conditions	Standard value
Data reading	12	Sensor detection air flow (frequency)	• Engine coolant temperature: 80–95°C (176–203°F) • Light and accessories: OFF • Transmission: Neutral (Prange for A/T)	Idling	40–66 Hz <4G63> 40–60 Hz <4G64>
				2,000 r/min.	104–144 Hz <4G63> 120–140 Hz <4G64>
				Racing	Frequency increases by racing.

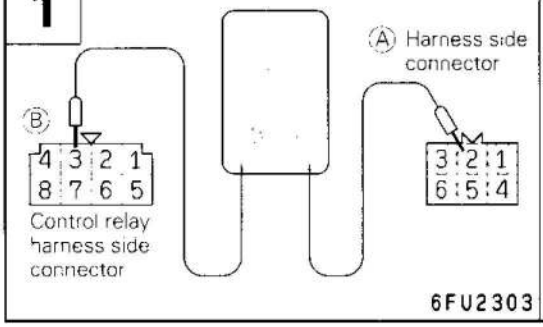
NOTE
When the vehicle is new [driven approximately 500 km (300 miles) or less], the air-flow sensor output frequency may be approximately 10% higher than indicated above.

Using Oscilloscope

Refer to P.13-64-19.

HARNESS INSPECTION

1



Check for continuity between air flor sensor and control relay.

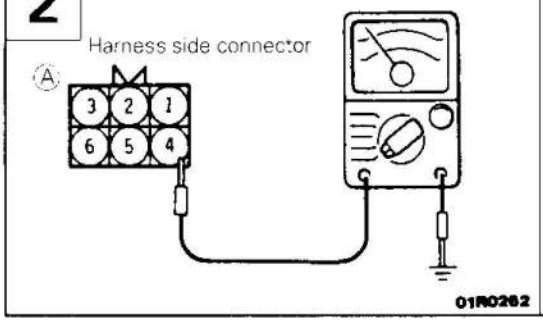
- Control relay connector: Disconnected
- Air flow sensor connector: Disconnected

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

OK → 2

NO → Repair the harness. (Ⓐ 2 - Ⓑ 3)

2



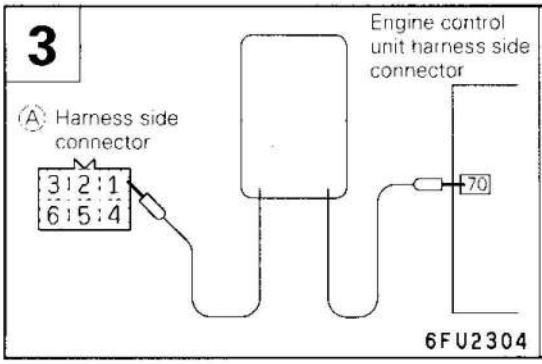
Check for continuity of the earth circuit.

- Air flow sensor connector: Disconnected

OK → 3

NO → Repair the harness. (Ⓐ 4 - 72)

3



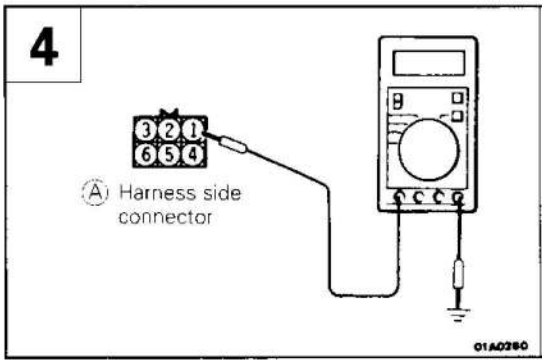
Check for open-circuit, or short-sircuit to earth, between air flow sensor and engine control unit.

- Air flow sensor connector: Disconnected
- Engine control unit connector: Disconnected

OK → 4

NO → Repair the harness. (Ⓐ 1 - 70)

4



Measure the impressed voltage.

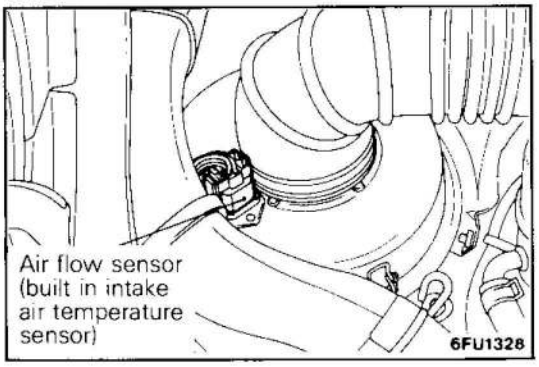
- Air flow sensor connector: Disconnected
- Engine control unit connector: Connected
- Ignition switch: ON

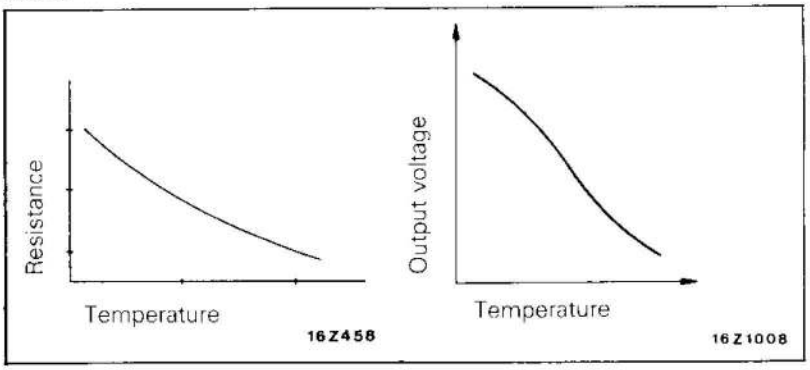
Voltage (V)
4.8 – 5.2

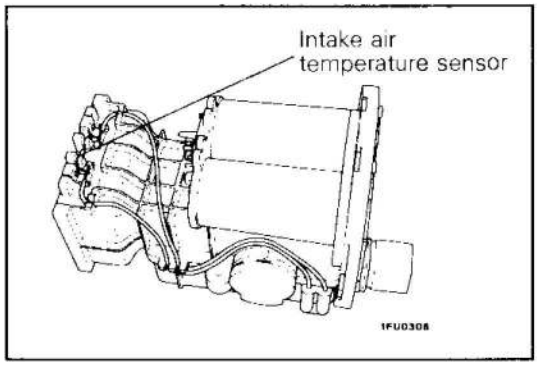
OK → STOP

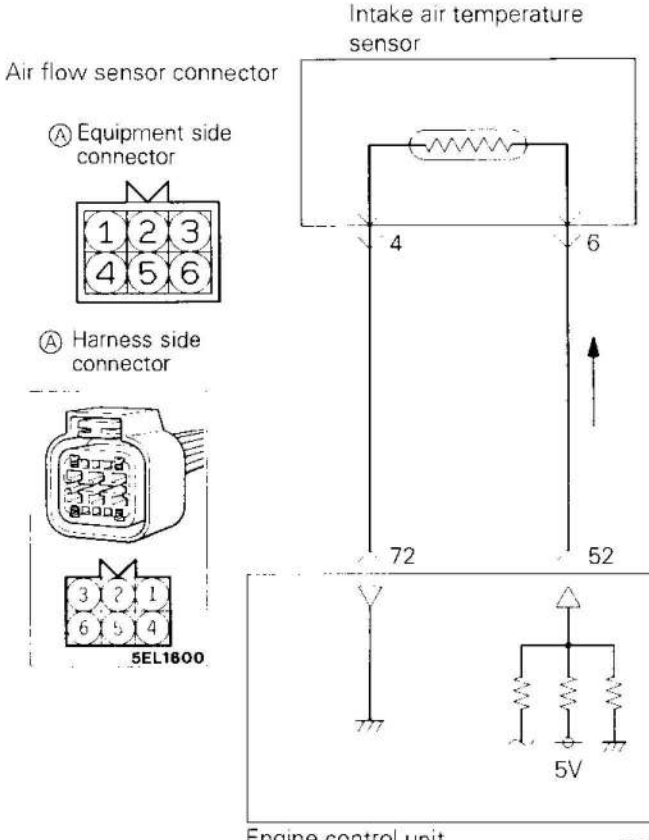
NO → Replace the engine control unit.

INTAKE AIR TEMPERATURE SENSOR

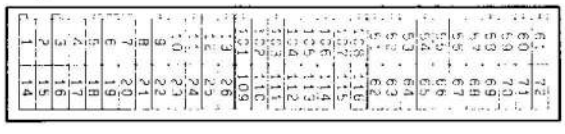








Engine control unit connector



7FU0653

OPERATION

Refer to P.13-64-20.

TROUBLESHOOTING HINTS

Refer to P.13-64-20.

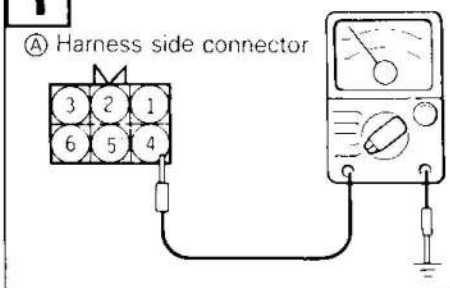
INSPECTION

Using MUT-II

Refer to P.13-64-21.

HARNESS INSPECTION

1

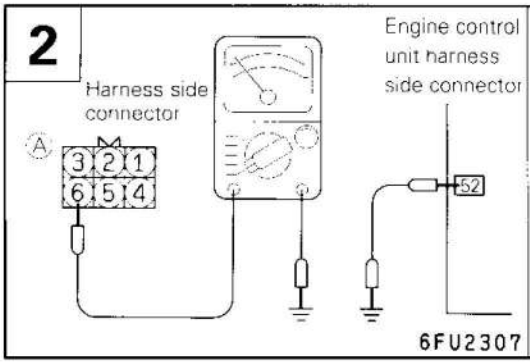


Check for continuity of the earth circuit.
- Air flow sensor connector: Disconnected

OK → 2

NO → Repair the harness. (Ⓐ 4 - 72)

2

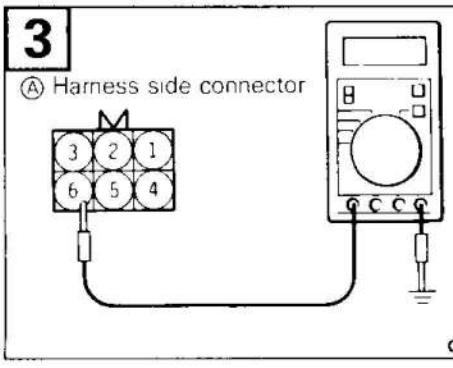


Check for open-circuit or short-circuit to earth, between intake air temperature sensor and engine control unit.
- Air flow sensor connector: Disconnected
- Engine control unit connector: Disconnected

OK → 3

NO → Repair the harness. (Ⓐ 6 - 52)

3



Measure the impressed voltage.
- Air flow sensor connector: Disconnected
- Engine control unit connector: Connected
- Ignition switch: ON

Voltage (V)
4.5 – 4.9

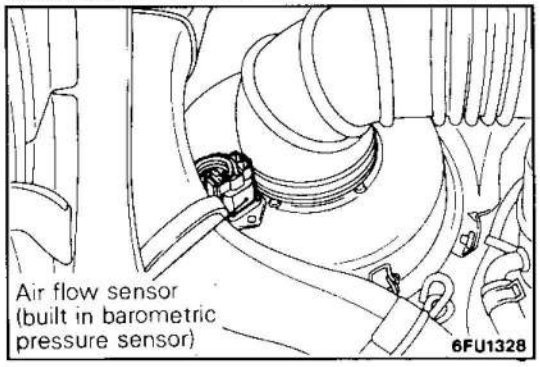
OK → STOP

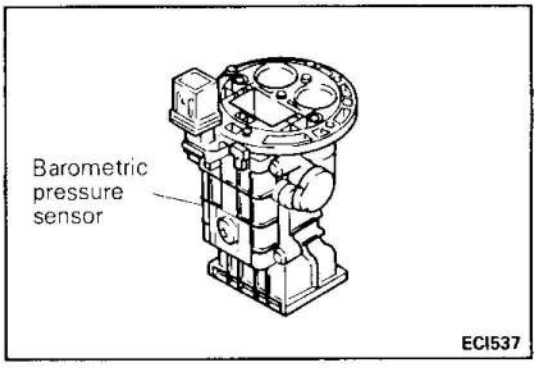
NO → Replace the engine control unit.

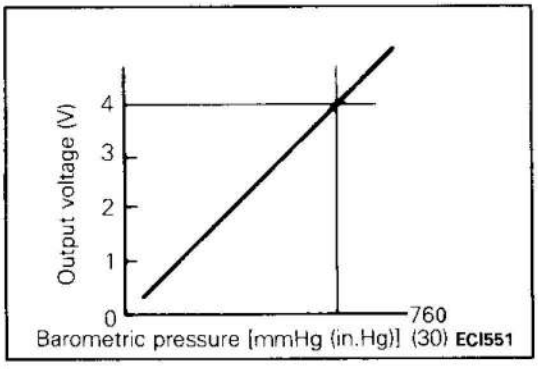
SENSOR INSPECTION

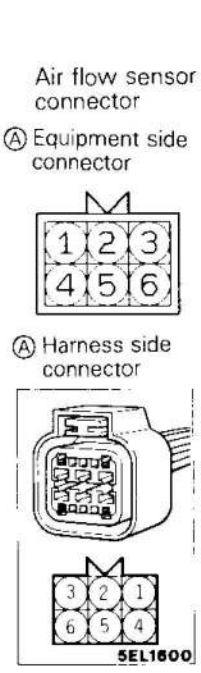
Refer to P. 13 – 73.

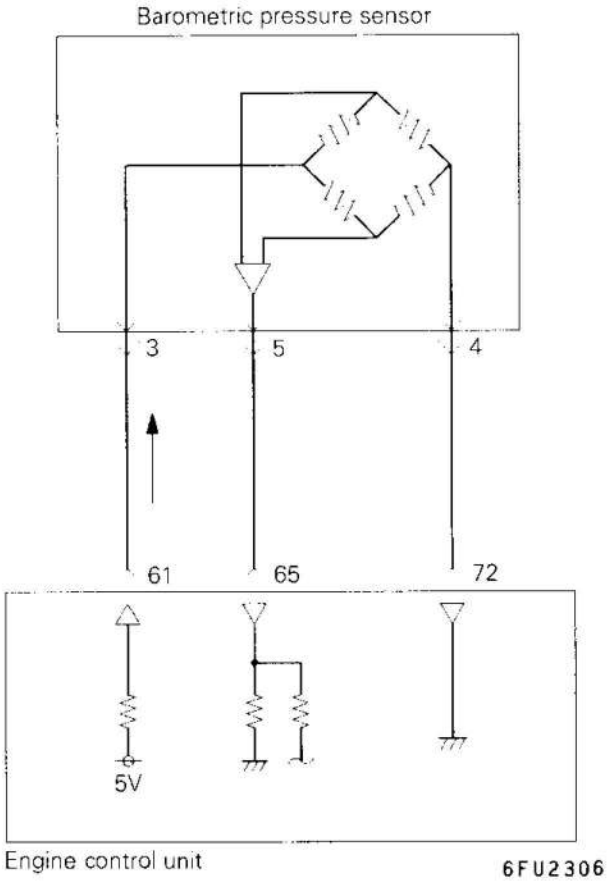
BAROMETRIC PRESSURE SENSOR



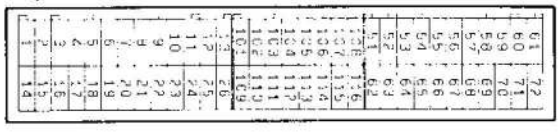








Engine control unit connector



7FU0653

OPERATION

Refer to P.13-64-22.

TROUBLESHOOTING HINTS

Refer to P.13-64-22.

INSPECTION

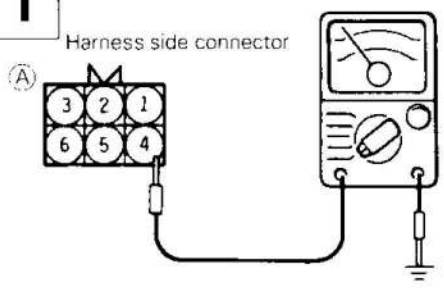
Using MUT-II

Refer to P.13-64-23.

ADDED

HARNESS INSPECTION

1



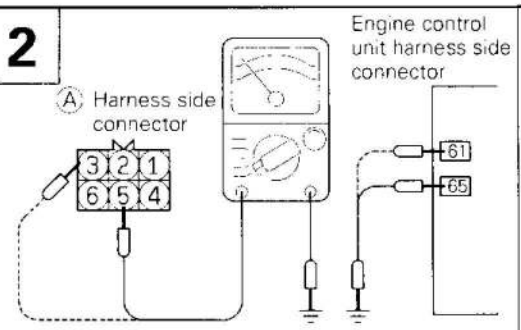
Check for continuity of the earth circuit.

- Air flow sensor connector: Disconnected

OK → 2

NO → Repair the harness. (Ⓐ 4 - 72)

2



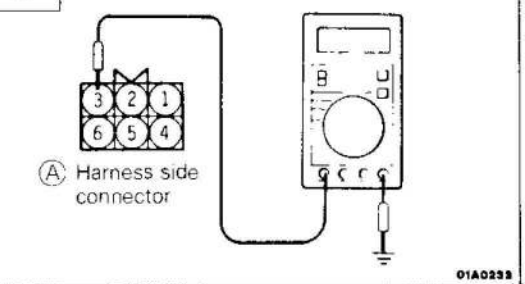
Check for an open-circuit, or a short-circuit to earth between the engine control unit and the barometric pressure sensor.

- Air flow sensor connector: Disconnected
- Engine control unit connector: Disconnected

OK → 3

NO → Repair the harness. (Ⓐ 5 - 65) (Ⓐ 3 - 61)

3



Measure the impressed voltage of the barometric pressure sensor.

- Air flow sensor connector: Disconnected
- Engine control unit connector: Connected
- Ignition switch: ON

Voltage (V)
4.8 – 5.2

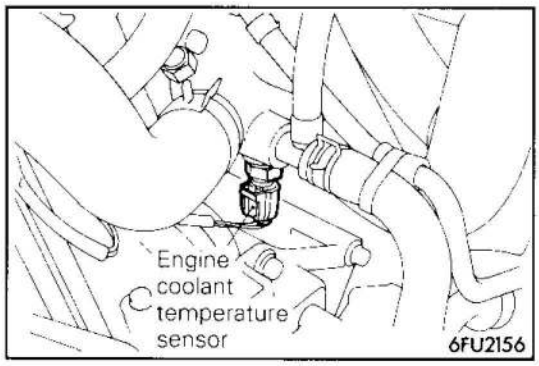
OK → STOP

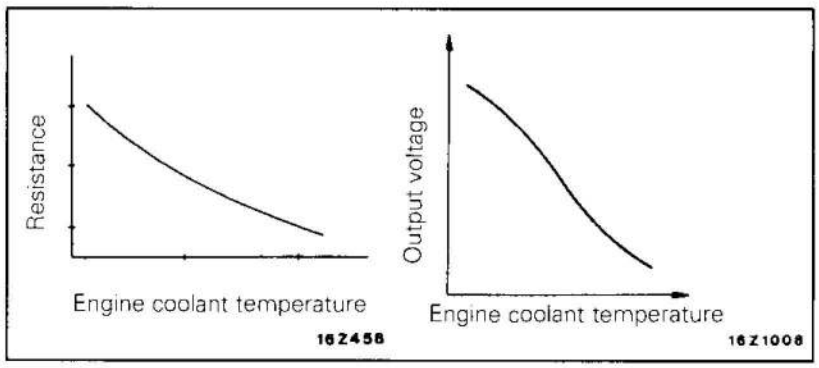
NO → Replace the engine control unit.

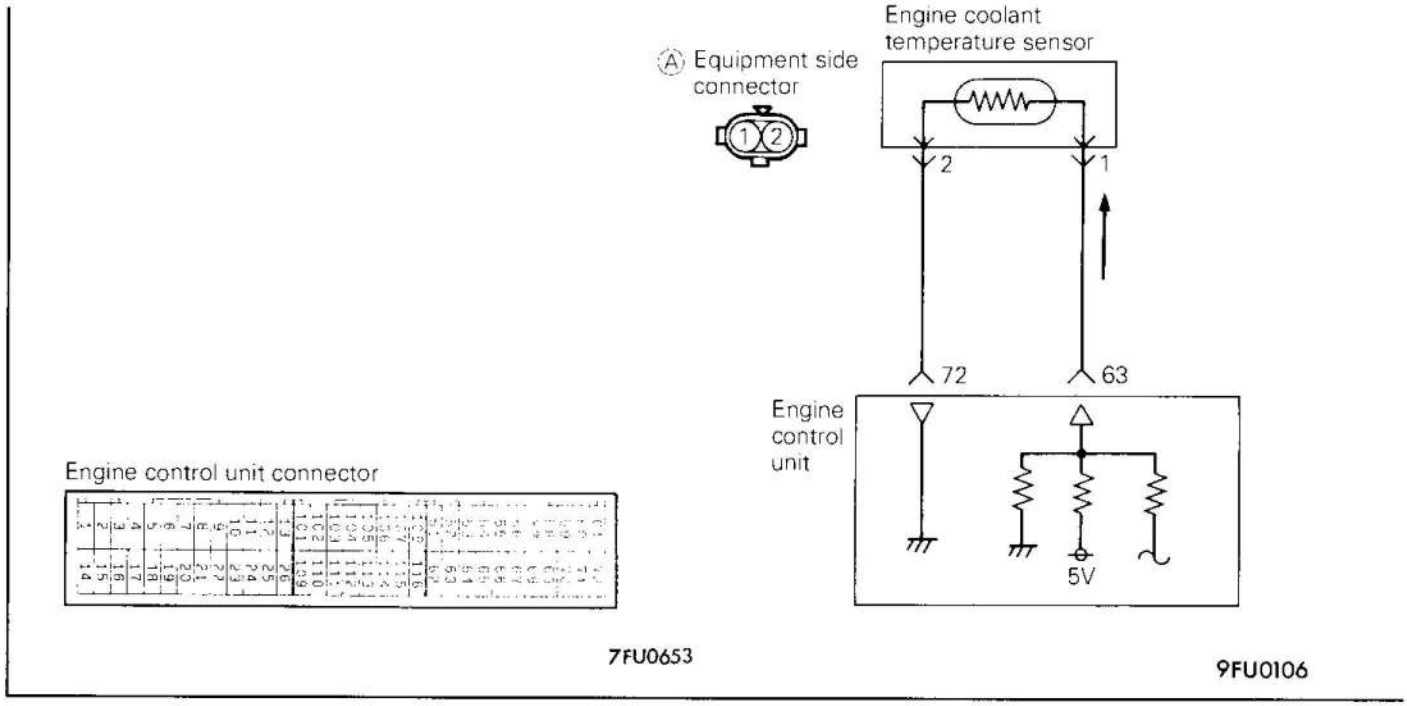
SENSOR INSPECTION

Refer to P.13-72.

ENGINE COOLANT TEMPERATURE SENSOR







OPERATION

Refer to P.13-64-24.

TROUBLESHOOTING HINTS

Refer to P.13-64-24.

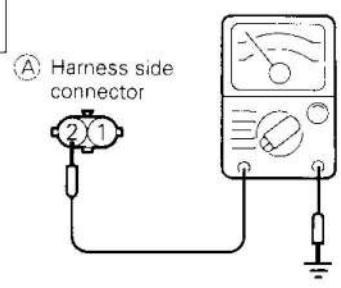
INSPECTION

Using MUT-II

Refer to P.13-64-25.

HARNESS INSPECTION

1



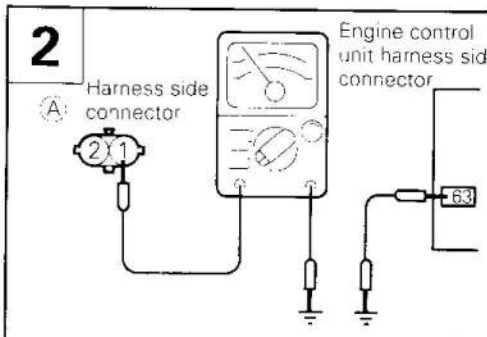
Check for continuity of the earth circuit.

- Engine coolant temperature sensor connector: Disconnected

OK → 2

NO → Repair the harness. (Ⓐ 2 - 72)

2



9FU0113

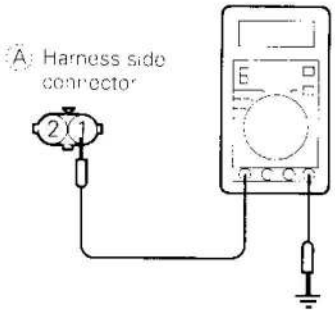
Check for open-circuit, or short-circuit to earth, between engine coolant temperature sensor and engine control unit.

- Engine coolant temperature sensor connector: Disconnected
- Engine control unit connector: Disconnected

OK → 3

NO → Repair the harness. (A 1 - 63)

3



9FU0114

Measure the impressed voltage.

- Engine coolant temperature sensor connector: Disconnected
- Engine control unit connector: Connected
- Ignition switch: ON

Voltage (V)
4.5 – 4.9

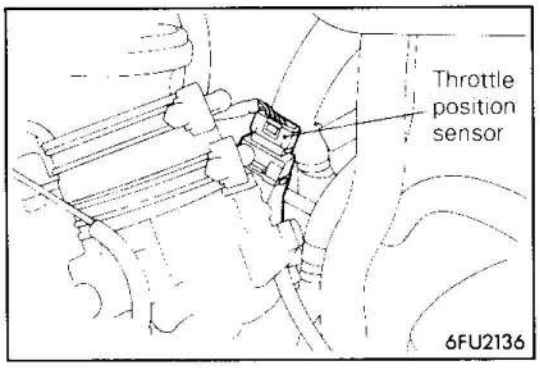
OK → STOP

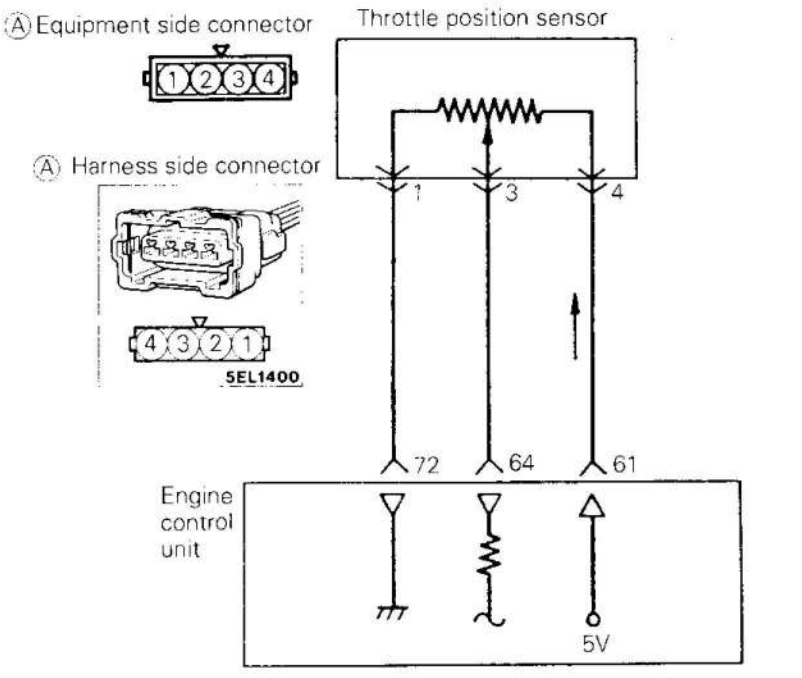
NO → Replace the engine control unit.

SENSOR INSPECTION

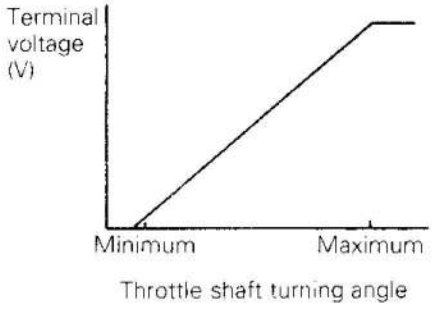
Refer to P.13-76-64.

THROTTLE POSITION SENSOR



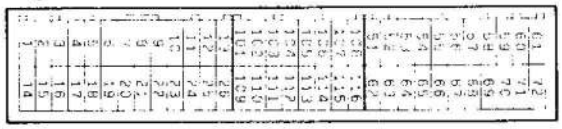


7FU0672



16Z461

Engine control unit connector



7FU0653

OPERATION

Refer to P.13-64-26.

TROUBLESHOOTING HINTS

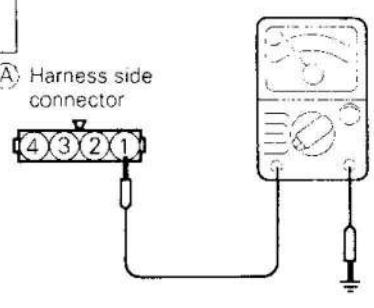
Refer to P.13-64-26.

INSPECTION

Using MUT-II

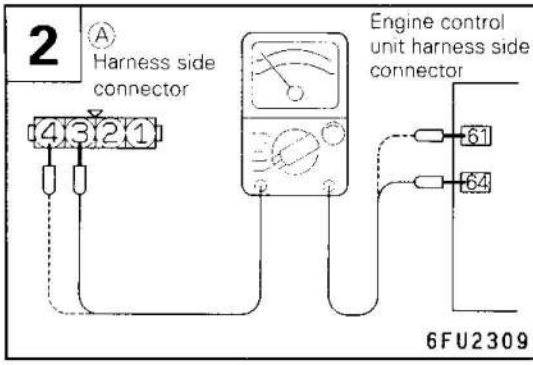
Refer to P.13-64-28-1.

HARNESS INSPECTION

1  7FU0483	Check for continuity of the earth circuit. • Throttle position sensor connector: Disconnected	OK →	2
		NG →	Repair the harness. (Ⓐ 1 - 72)

ADDED

2



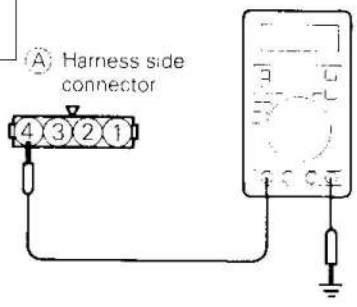
Check for an open-circuit, or a short-circuit to earth, between the engine control unit and the throttle position sensor.

- Throttle position sensor connector: Disconnected
- Engine control unit connector: Disconnected

OK → 3

NO → Repair the harness. (Ⓐ 3 - 64) (Ⓐ 4 - 61)

3



Measure the impressed voltage of the throttle position sensor.

- Throttle position sensor connector: Disconnected
- Engine control unit connector: Connected
- Ignition switch: ON

Voltage (V)
4.8 – 5.2

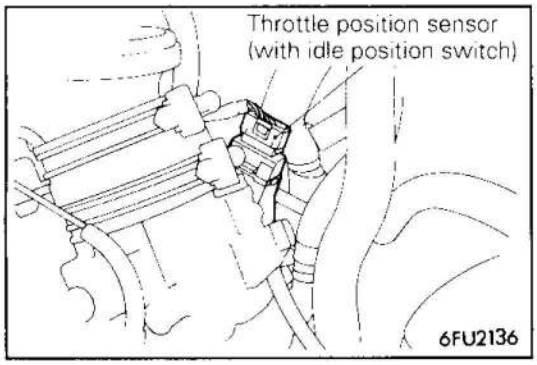
OK → STOP

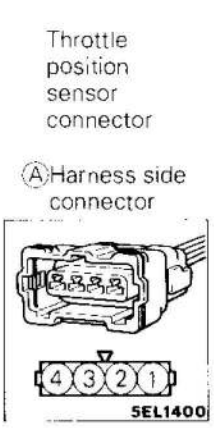
NO → Replace the engine control unit

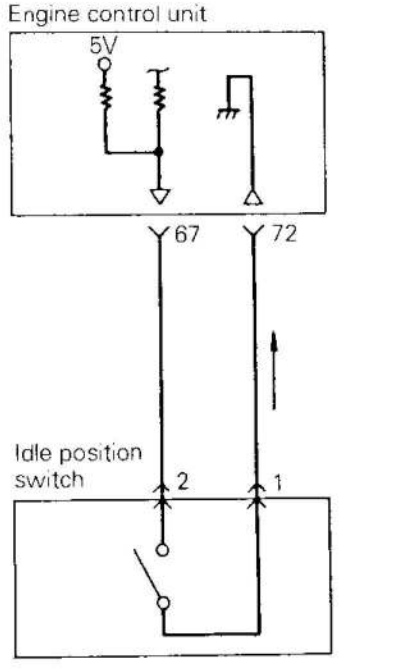
SENSOR INSPECTION

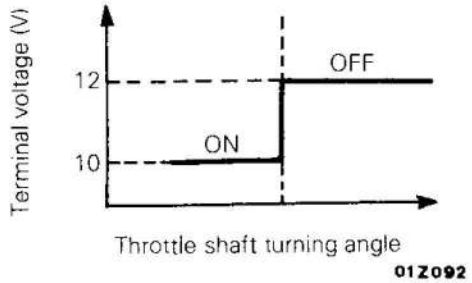
Refer to P.13-76-65.

IDLE POSITION SWITCH

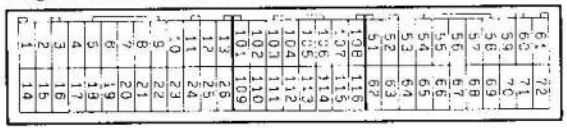








Engine control unit connector



7FU0653

ADDED

OPERATION

Refer to P.13-64-30.

TROUBLESHOOTING HINTS

Refer to P.13-64-30.

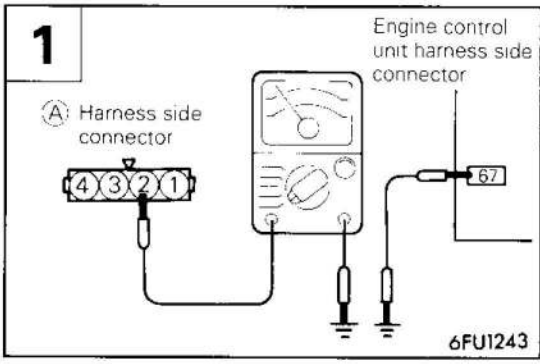
INSPECTION

Using MUT-II

Refer to 13-64-30.

HARNESS INSPECTION

1



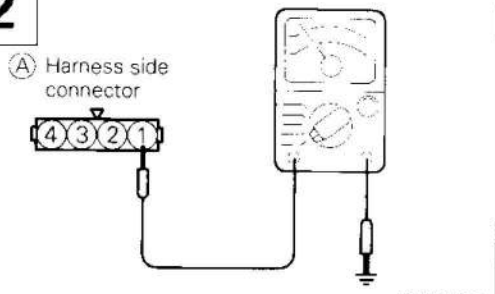
Check for an open-circuit, or a short circuit to earth, between the engine control unit and the idle position switch.

- Throttle position sensor connector: Disconnected
- Engine control unit connector: Disconnected

OK → 2

NG → Repair the harness. (Ⓐ 2 - 67)

2



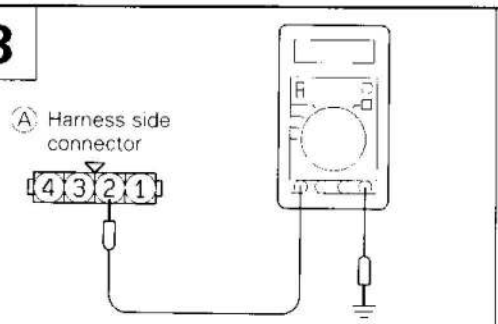
Check for continuity of the earth circuit.

- Throttle position sensor connector: Disconnected

OK → 3

NG → Repair the harness. (Ⓐ 1 - 72)

3



Measure the impressed voltage of the idle position switch.

- Throttle position sensor connector: Disconnected
- Engine control unit connector: Connected
- Ignition switch: ON

Voltage (V)
4 or higher

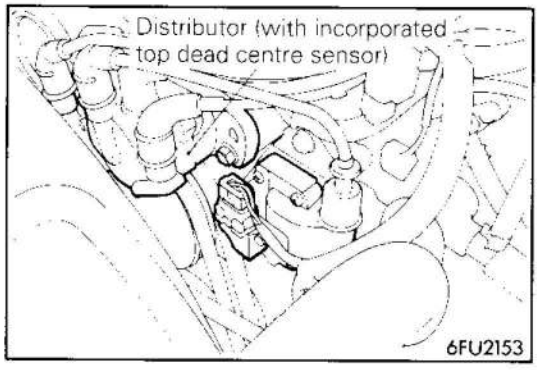
OK → STOP

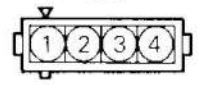
NG → Replace the engine control unit.

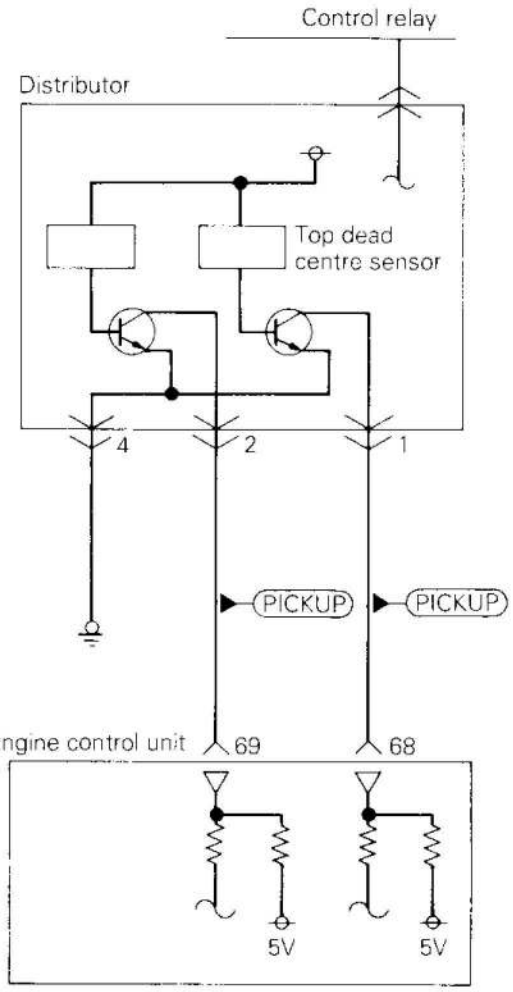
SENSOR INSPECTION

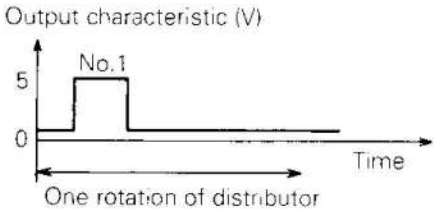
Refer to P.13-76-65.

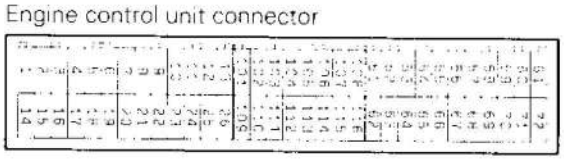
TOP DEAD CENTRE SENSOR











9FU0205

OPERATION

- The top dead centre sensor detects the top dead centre on the compression stroke of the No.1 cylinder, converts it into a pulse signal and inputs it to the engine control unit. The engine control unit determines the fuel injection sequence based on this signal.
- Power to the top dead centre sensor is supplied from the control relay, and the earth is located in the body. A 5V voltage is applied from the engine control unit to the top dead centre sensor output terminal, and the top dead centre 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 there is a malfunction of the top dead centre sensor, fuel will not be injected at the correct timing, which will cause engine stalling, unstable idling and poor acceleration.

Hint 2: When the top dead centre sensor outputs a pulse signal when the ignition switch is turned to ON (without starting the engine), the top dead centre sensor or engine control unit is probably defective.

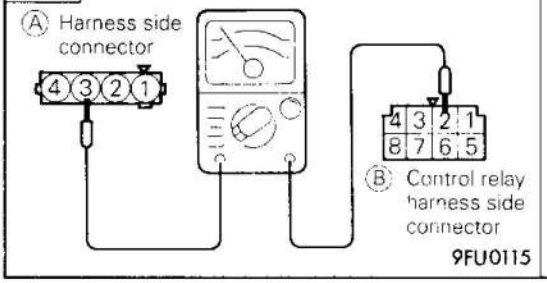
INSPECTION

Using Oscilloscope

Refer to P.13-64-36.

HARNESS INSPECTION

1



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

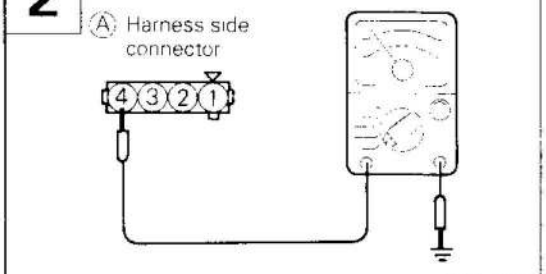
- Distributor connector: Disconnected
- Control relay connector: Disconnected

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

OK → 2

NG → Repair the harness. (Ⓐ 3 - Ⓑ 2)

2



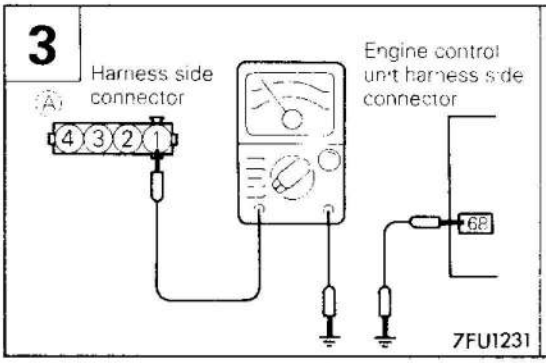
Check for continuity of the earth circuit.

- Distributor connector: Disconnected

OK → 3

NG → Repair the harness. (Ⓐ 4 - Earth)

3



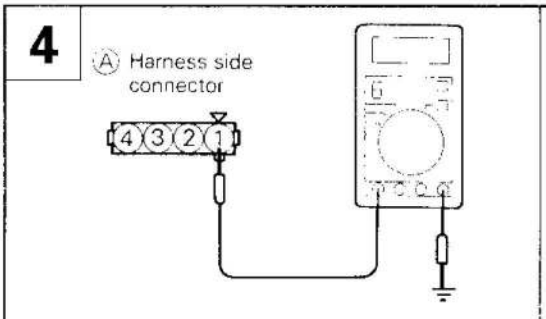
Check for open-circuit, or short-circuit to earth, between air flow sensor and engine control unit.

- Engine control unit connector: Disconnected
- Distributor connector: Disconnected

OK → 4

NG → Repair the harness. (Ⓐ 1 - 68)

4



Measure the impressed voltage.

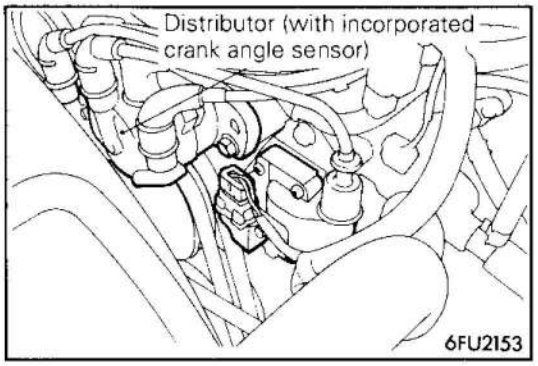
- Distributor connector: Disconnected
- Engine control unit connector: Connected
- Ignition switch: ON

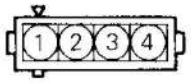
Voltage (V)
4.8 – 5.2

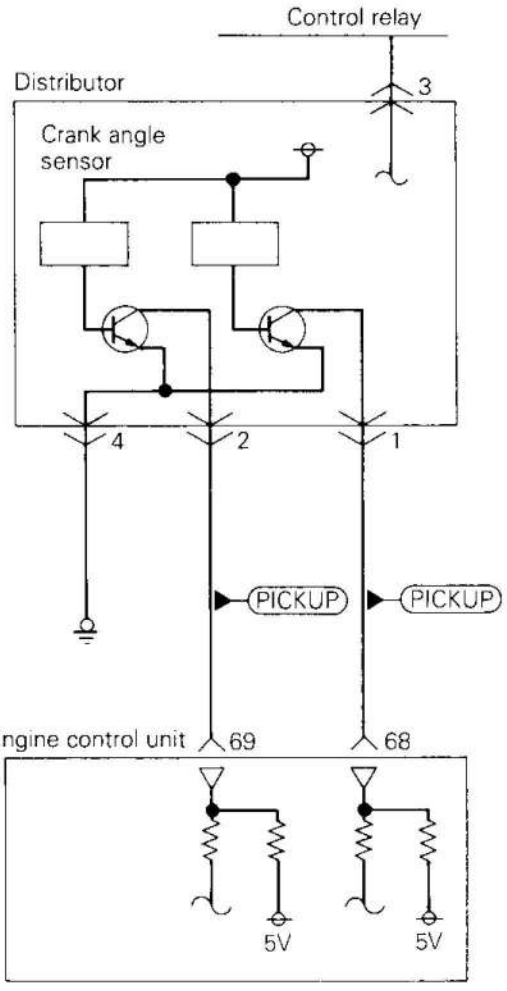
OK → STOP

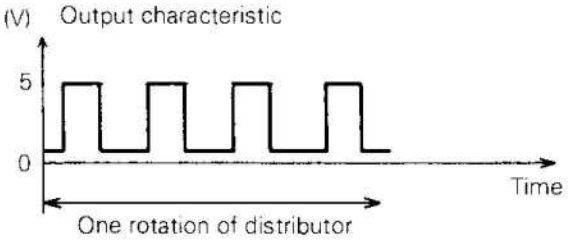
NG → Replace the engine control unit.

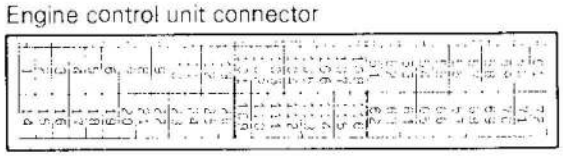
CRANK ANGLE SENSOR











7FU0653

9FU0205

OPERATION

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

INSPECTION

Using MUT-II

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-II reading	Indicated speed to agree

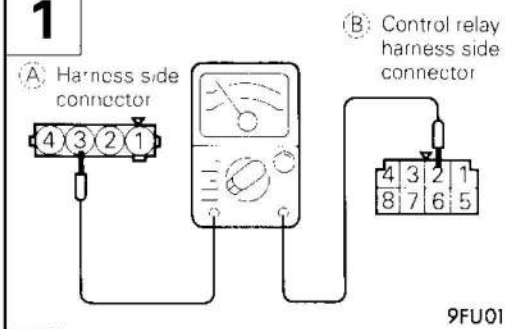
Function	Item No.	Data display	Check condition	Check condition	Standard value
Data reading	22	Idle speed	• Engine: Idling • Idle position switch: ON	–20°C (–4°F)	1,280 – 1,480 r/min.<4G63> 1,620 – 1,820 r/min.<4G64>
				0°C (32°F)	1,220 – 1,420 r/min.<4G63> 1,450 – 1,650 r/min.<4G64>
				20°C (68°F)	1,100 – 1,300 r/min.<4G63> 1,300 – 1,500 r/min.<4G64>
				40°C (104°F)	940 – 1,140 r/min.<4G63> 1,020 – 1,220 r/min.<4G64>
				80°C (176°F)	650 – 850 r/min.

Using Oscilloscope

Refer to P.13-64-39.

HARNESS INSPECTION

1



Check for continuity between crank angle sensor and control relay.

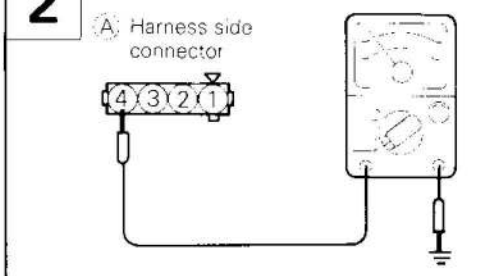
- Distributor connector: Disconnected
- Control relay connector: Disconnected

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

OK → 2

NO → Repair the harness. (Ⓐ 3 - Ⓑ 2)

2



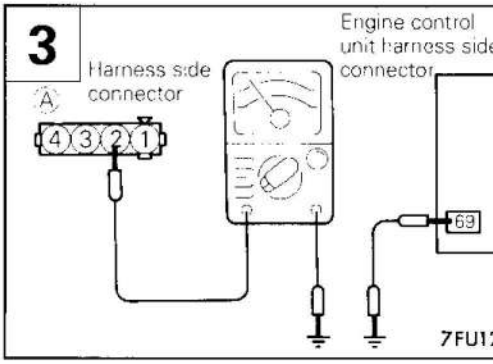
Check for continuity of the earth circuit.

- Distributor connector: Disconnected

OK → 3

NO → Repair the harness. (Ⓐ 4 - Earth)

3



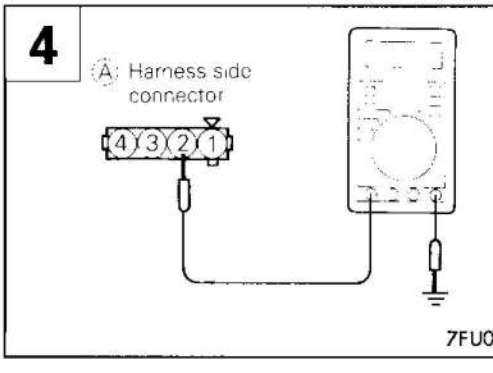
Check for open-circuit or shortcircuit to earth, between top dead centre sensor and engine control unit.

- Engine control unit connector: Disconnected
- Distributor connector: Disconnected

OK → 4

NO → Repair the harness. (Ⓐ 2 - 69)

4



Measure the impressed voltage.

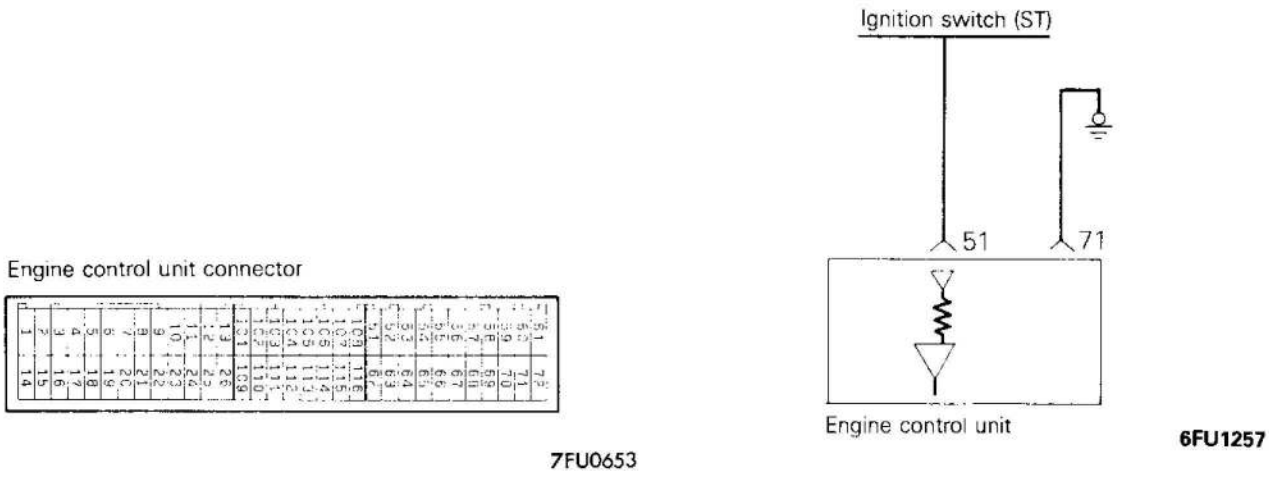
- Distributor connector: Disconnected
- Engine control unit connector: Connected
- Ignition switch: ON

Voltage (V)
4.8 – 5.2

OK → STOP

NO → Replace the engine control unit.

IGNITION SWITCH – ST<M/T>



OPERATION

Refer to P.13-64-41.

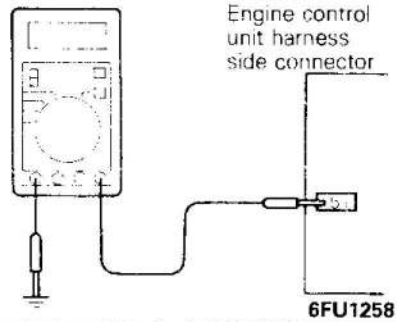
INSPECTION

Using MUT-II

Refer to P.13-64-41.

HARNESS INSPECTION

1



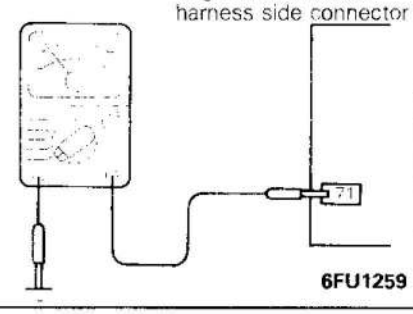
Measure the input voltage to the engine control unit.
- Engine control unit connector: Disconnected
- Ignition switch: START

Voltage (V)
8 or higher

OK → 2

NG → Repair the harness (51 - Ignition switch)

2

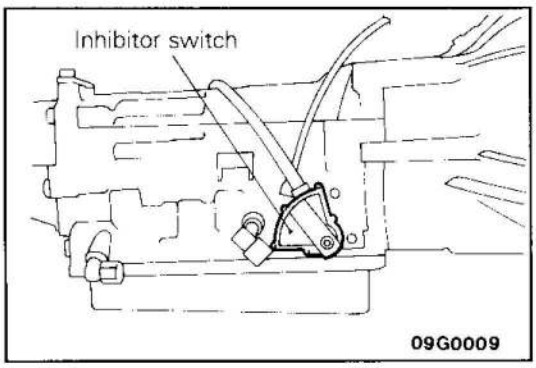


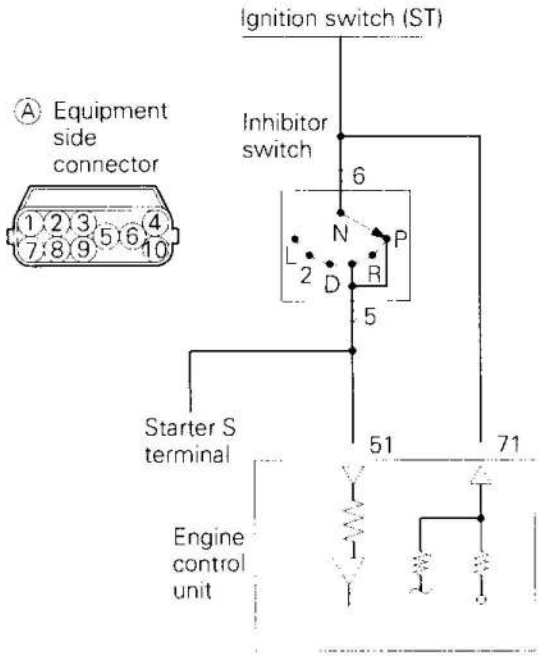
Check for continuity of the earth circuit.
- Engine control unti connector: Disconnected

OK → STOP

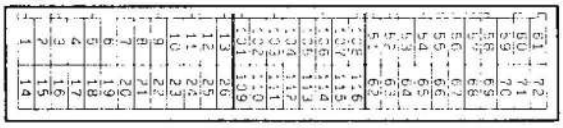
NG → Repair the harness (71 - Earth)

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





Engine control unit connector



7FU0653

7FU1528

OPERATION

- The ignition switch-ST inputs a high signal to the engine control unit while the engine is cranking. The engine control unit provides fuel injection control, etc., at engine startup based on this signal.
- When the ignition switch is set to START, the battery voltage at cranking is applied through the ignition switch and inhibitor switch to the engine control unit, which detects that the engine is cranking. In case the selector lever is in a position other than the P/N range, the battery voltage is not applied to the engine control unit.
- The inhibitor switch converts the selector lever position (whether it is at the P/N range or at others) into high/low voltage and inputs it to the engine control unit, which then controls the idle speed control servo based on this signal.
- The battery voltage in the engine control unit is applied through a resistor to the inhibitor switch. When the selector lever is set to the P/N range, continuity is produced between the inhibitor switch terminal of the engine control unit and earth through the starter motor, thereby making the terminal voltage go low.

TROUBLESHOOTING HINTS

If the inhibitor switch harness and individual part check have resulted normal but the inhibitor switch output is abnormal, poorly adjusted control cable is suspected.

INSPECTION

Using MUT-II

IGNITION SWITCH-ST

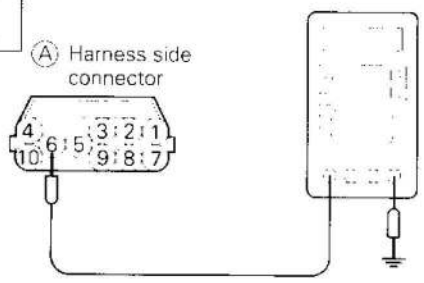
Function	Item No.	Data display	Check condition	Engine	Normal indication
Data reading	18	Switch state	Ignition switch: ON	Stop	OFF
				Cranking	ON

INHIBITOR SWITCH

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

HARNESS INSPECTION

1



7FU1529

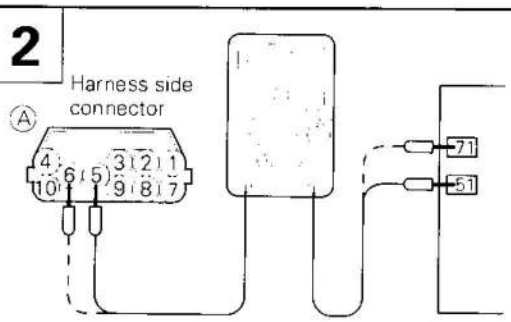
Measure the power supply voltage of the inhibitor switch
- Engine control unit connector: Disconnected
- Inhibitor switch connector: Disconnected
- Ignition switch: START

Voltage (V)
11 – 13

OK → 2

NG → Check the power supply circuit.

2



7FU1530

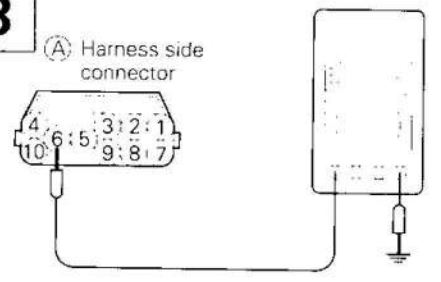
Check for continuity between the inhibitor switch and the engine control unit.
- Engine control unit connector: Disconnected
- Inhibitor switch connector: Disconnected

NOTE
Touch the ohmmeter probes to both ends of the harness.

OK → 3

NG → Repair the harness.
(Ⓐ 5 - 51)
(Ⓐ 6 - 71)

3



7FU1529

Measure the inhibitor switch terminal input voltage.
- Engine control unit connector: Connected
- Inhibitor switch connector: Disconnected
- Ignition switch: ON

Voltage (V)
11 – 13

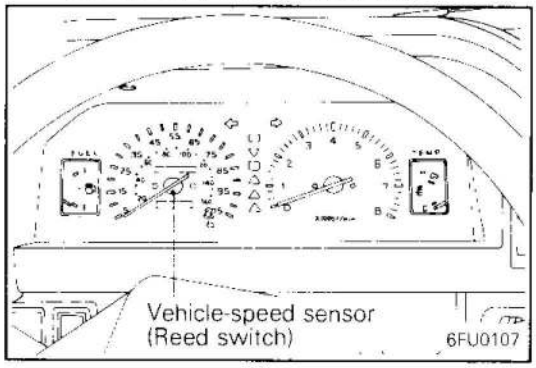
OK → STOP

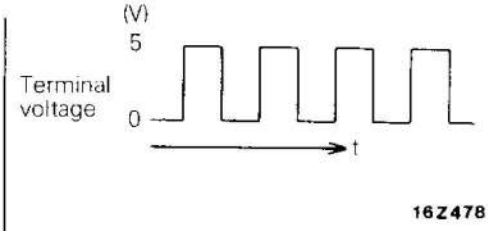
NG → Replace the engine control unit.

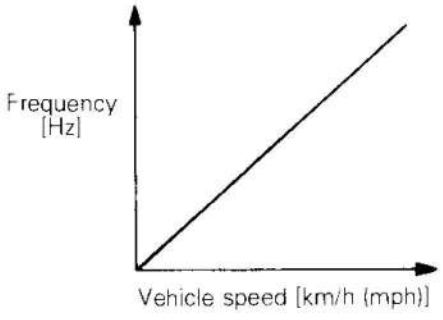
INHIBITOR SWITCH INSPECTION

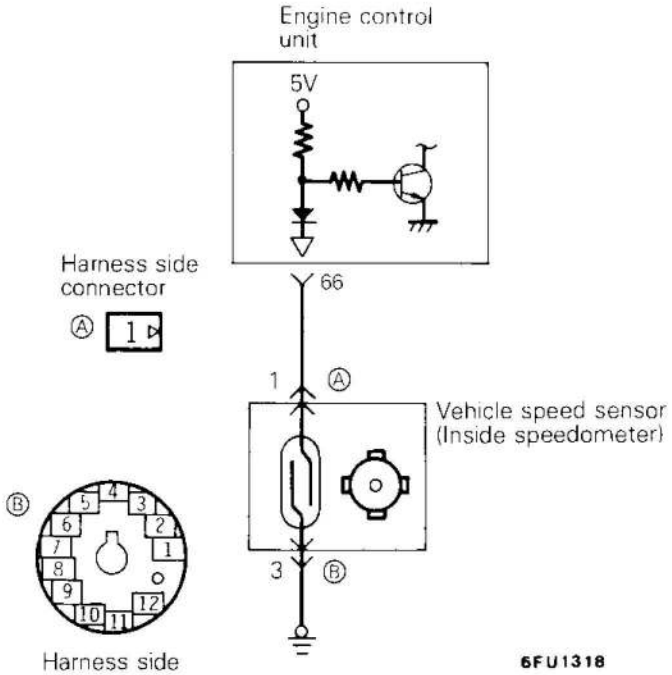
Refer to GROUP 23 — Service Adjustment Procedures.

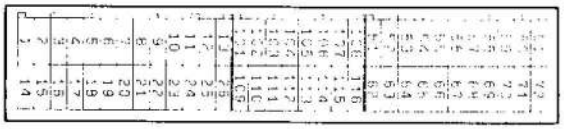
VEHICLE SPEED SENSOR











OPERATION

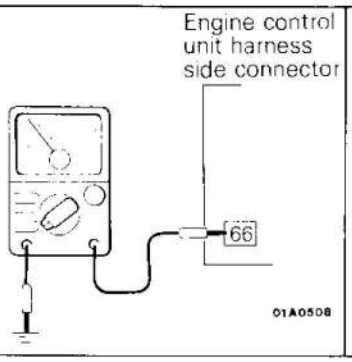
Refer to P.13-64-42.

TROUBLESHOOTING HINTS

Refer to P.13-64-42.

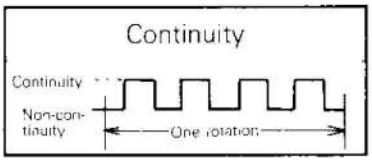
HARNESS INSPECTION

1



Check the vehicle speed sensor output circuit for continuity.

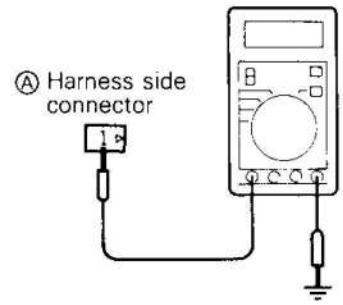
- Engine control unit connector: Disconnected
- Move the vehicle.



OK → STOP

OK → 2

2



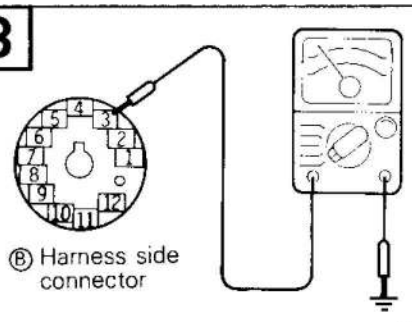
Measure the power supply voltage of the vehicle speed sensor.
- Connector: Disconnected
- Ignition switch: ON

Voltage (V)
4.5–4.9

OK → 3

NO → Repair the harness. (Ⓐ1 – 66)

3



Check for continuity of the earth circuit.
- Connector: Disconnected

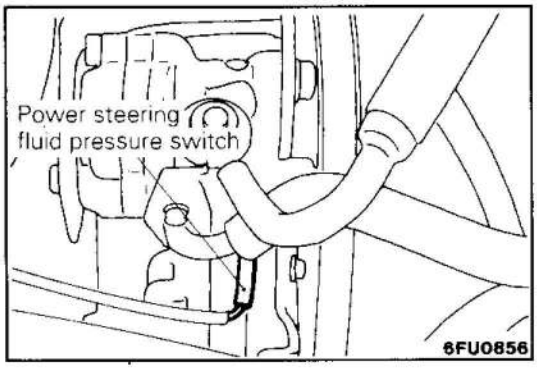
OK → STOP

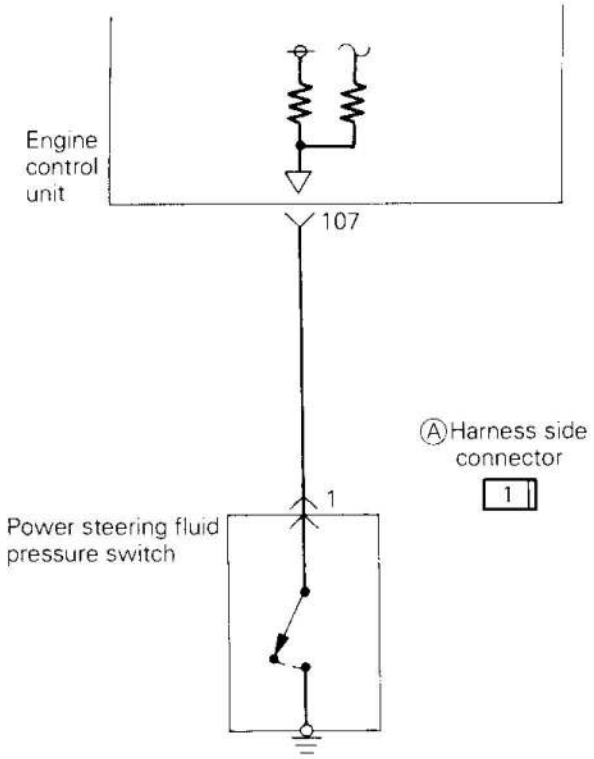
NO → Repair the harness. (Ⓑ3 – Earth)

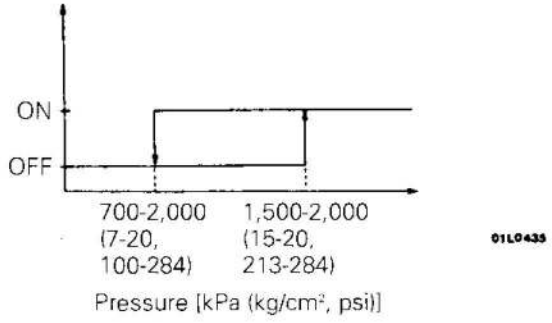
SENSOR INSPECTION

Refer to GROUP 54 – Meters and Gauges.

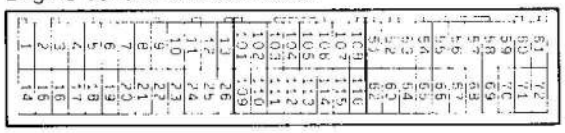
POWER STEERING FLUID PRESSURE SWITCH







Engine control unit connector



7FU0653

OPERATION

- The power steering fluid pressure switch converts presence/absence of power steering load into low/high voltage and inputs it to the engine control unit, which then controls the idle speed control servo based on this signal.
- The battery voltage in the engine control unit is applied through a resistor to the power steering fluid pressure switch. Steering operating causes the power steering fluid pressure to increase, turning the switch on. As a result, continuity is produced between the battery voltage applied and earth. This causes the power steering fluid pressure terminal voltage to go from high to low.

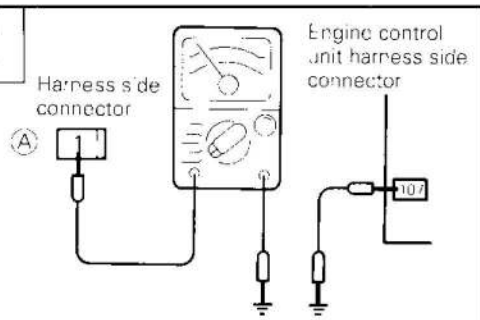
INSPECTION

Using MUT-II

Function	Item No.	Data display	Check condition	Steering wheel	Normal indication
Data reading	27	Switch state	Engine: Idling	When stationary	OFF
				When being turned	ON

HARNESS INSPECTION

1



7FU1235

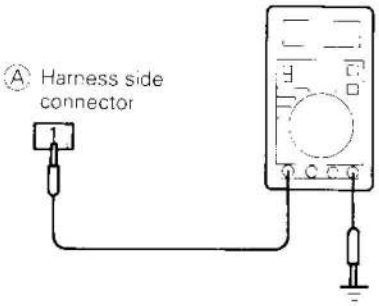
Check for open-circuit or short-circuit to earth, between engine control unit and power steering fluid pressure switch.

- Power steering fluid pressure switch connector: Disconnected
- Engine control unit connector: Disconnected

OK → 2

NG → Repair the harness. (Ⓐ 1 - 107)

2



7FU0505

Measure the impressed voltage.

- Power steering fluid pressure switch connector: Disconnected
- Engine control unit connector: Connected
- Ignition switch: ON

Voltage (V)
11 – 13

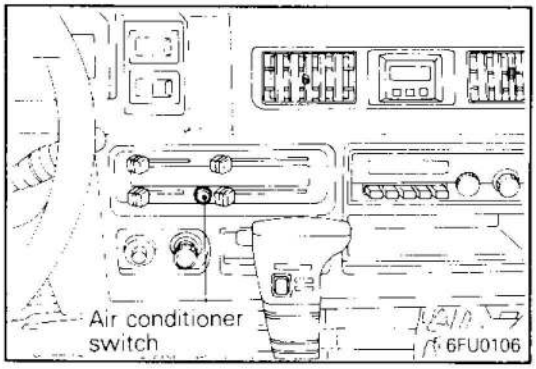
OK → STOP

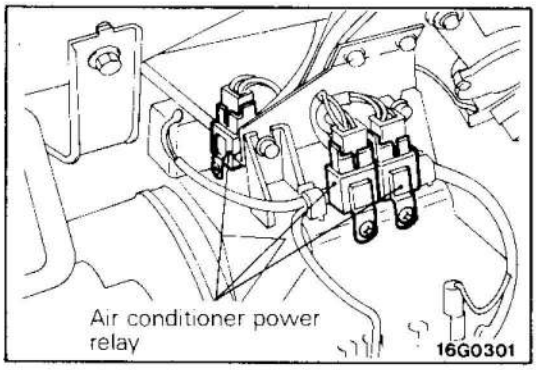
NG → Replace the engine control unit.

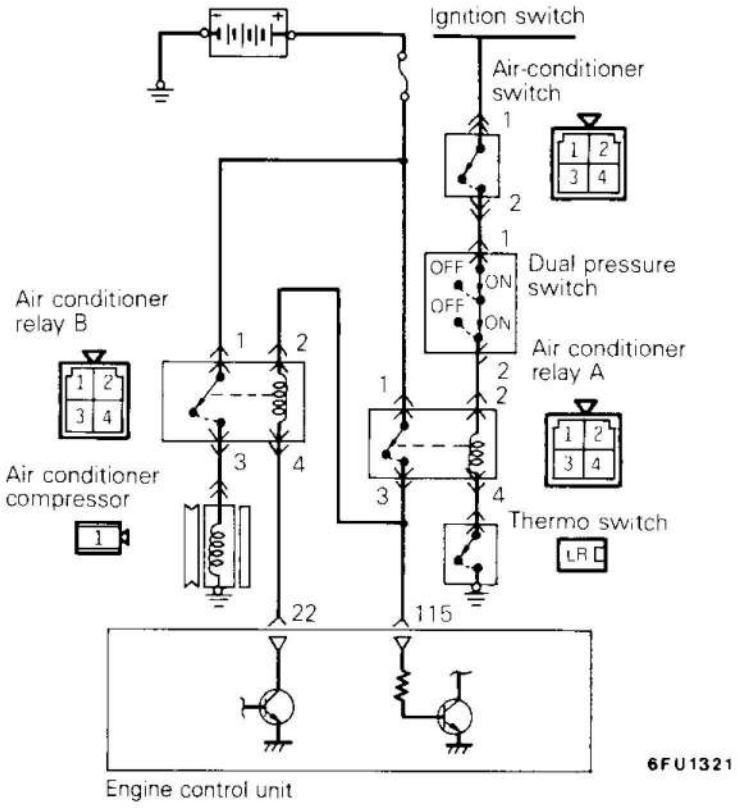
SENSOR INSPECTION

Refer to GROUP 37–Service Adjustment Procedures.

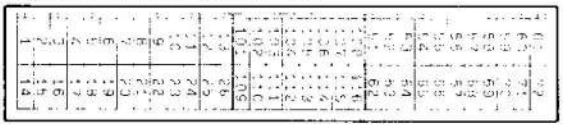
AIR CONDITIONER SWITCH AND POWER RELAY







Engine control unit connector



7FU0653

OPERATION

Refer to P.13-64-44.

TROUBLESHOOTING HINTS

Refer to P.13-64-44.

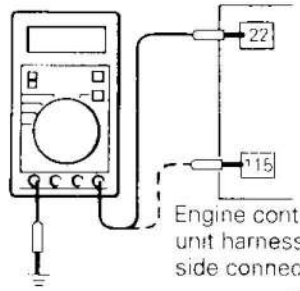
INSPECTION

Using MUT-II

Refer to P.13-64-44.

HARNESS INSPECTION

1



Measure the power supply voltage of the air conditioner circuit.

- Engine control unit connector: Disconnected
- Ignition switch: ON
- Air conditioner switch: ON

Voltage (V)
11 – 13

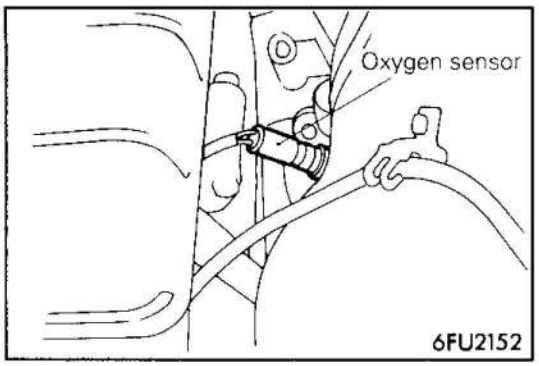
OK → STOP

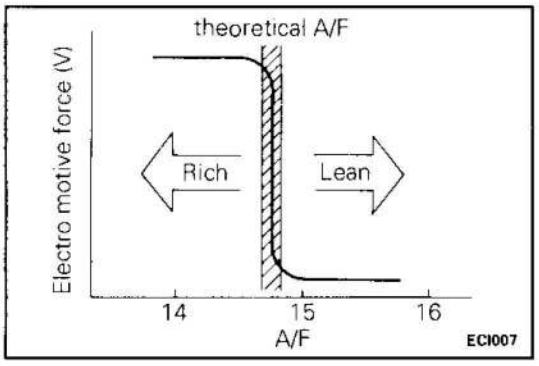
NG → Check the air conditioner circuit

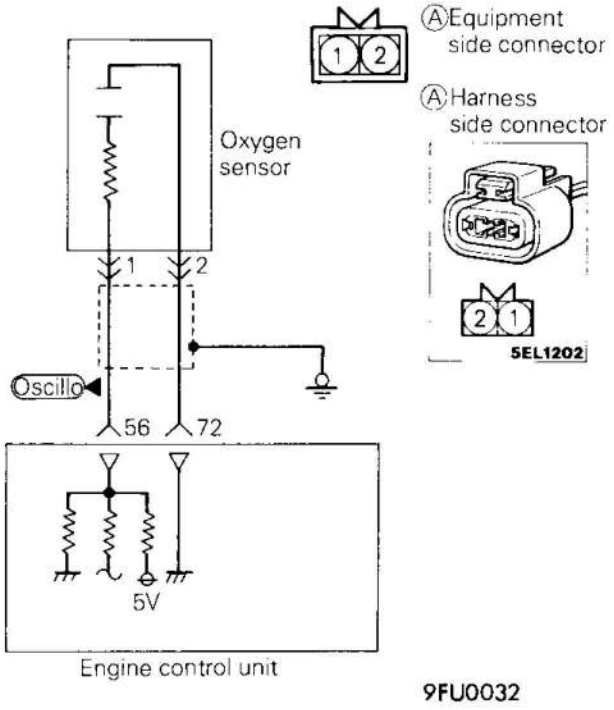
AIR CONDITIONER INSPECTION

Refer to GROUP 55 - Service Adjustment Procedures.

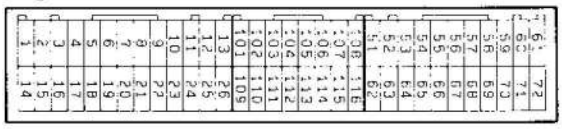
OXYGEN SENSOR <4G64>







Engine control unit connector



7FU0653

OPERATION

Refer to P.13-64-46.

TROUBLESHOOTING HINTS

Refer to P.13-64-46.

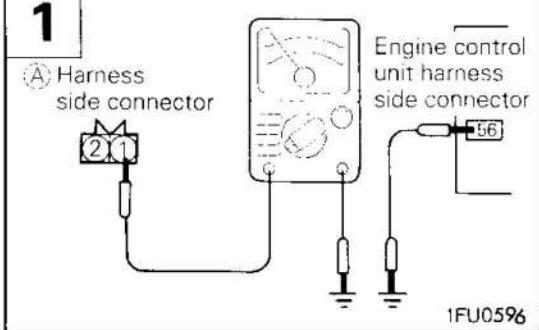
INSPECTION

Using MUT-II

Refer to P.13-64-47.

HARNESS INSPECTION

1

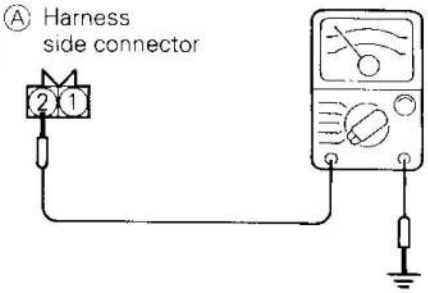


Check for an open-circuit or a short-circuit to earth, between the engine control unit and the oxygen sensor.

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

OK → 2

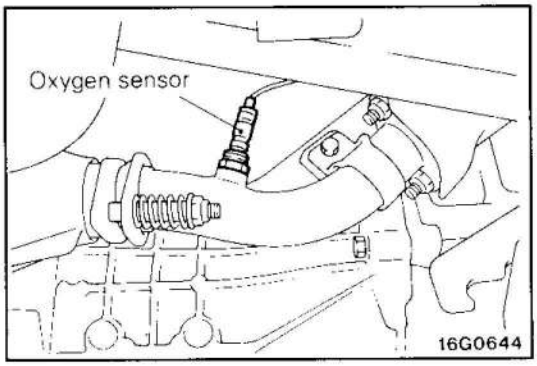
NG → Repair the harness. (Ⓐ 1 - 56)

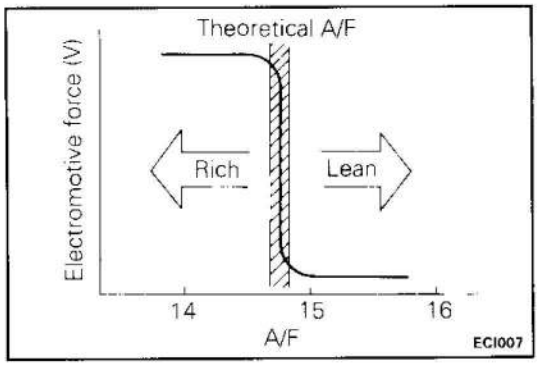
2	Ⓐ Harness side connector  1FU0597	Check for continuity of the earth circuit. • Oxygen sensor connector: Disconnected	OK → STOP NO → Repair the harness. (Ⓐ 2 - Earth)

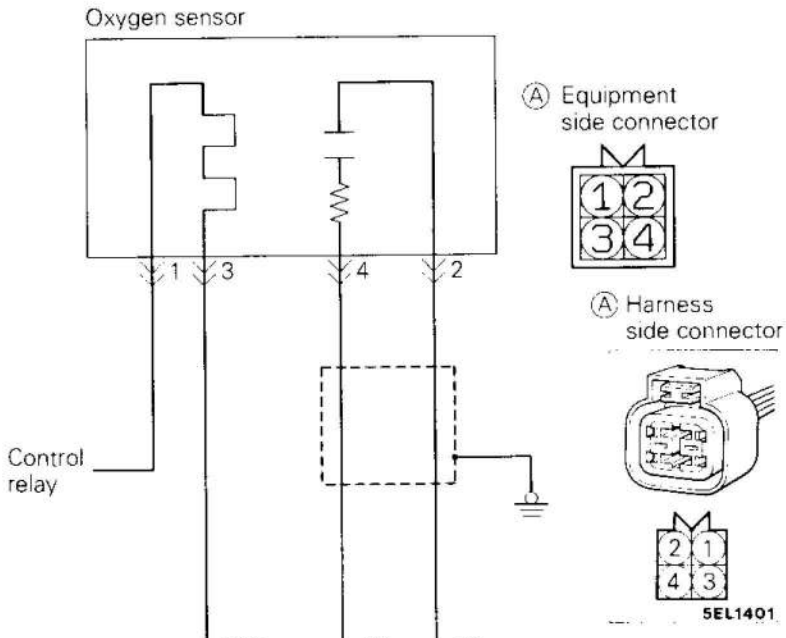
SENSOR INSPECTION

Refer to P.13-76-66.

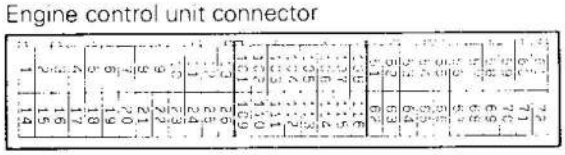
OXYGEN SENSOR <4G63>







Engine control unit connector



7FU0653

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 in 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

Refer to P.13-64-46.

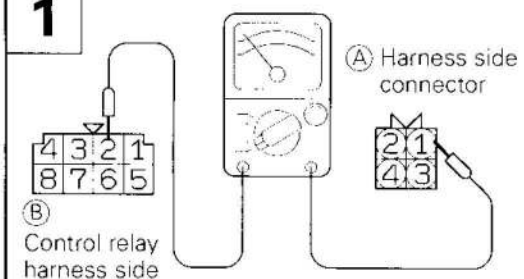
INSPECTION

Using MUT-II

Refer to P.13-64-47.

HARNESS INSPECTION

1



Check for continuity between oxygen sensor and control relay.

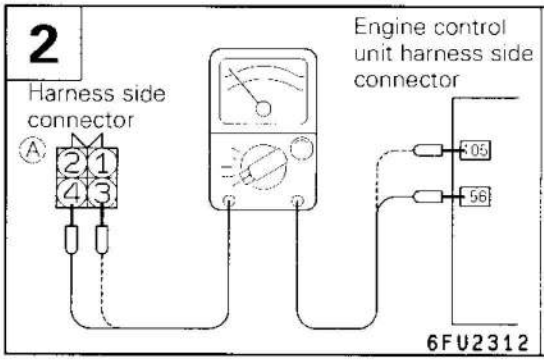
- Oxygen sensor connector: Disconnected
- Control relay connector: Disconnected

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

OK → 2

NG → Repair the harness. (Ⓐ 1 - Ⓑ 2)

2



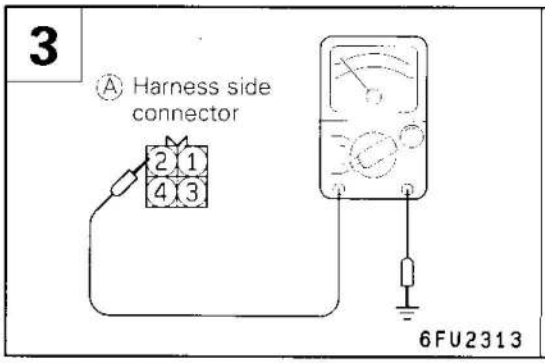
Check for an open-circuit, or a short-circuit to earth, between the engine control unit and the oxygen sensor.

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

OK → 3

NG → Repair the harness. (Ⓐ 3 - 105) (Ⓐ 4 - 56)

3



Check for continuity of the earth circuit.

- Oxygen sensor connector: Disconnected

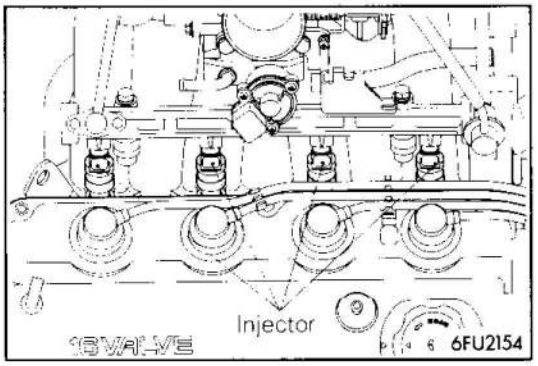
OK → STOP

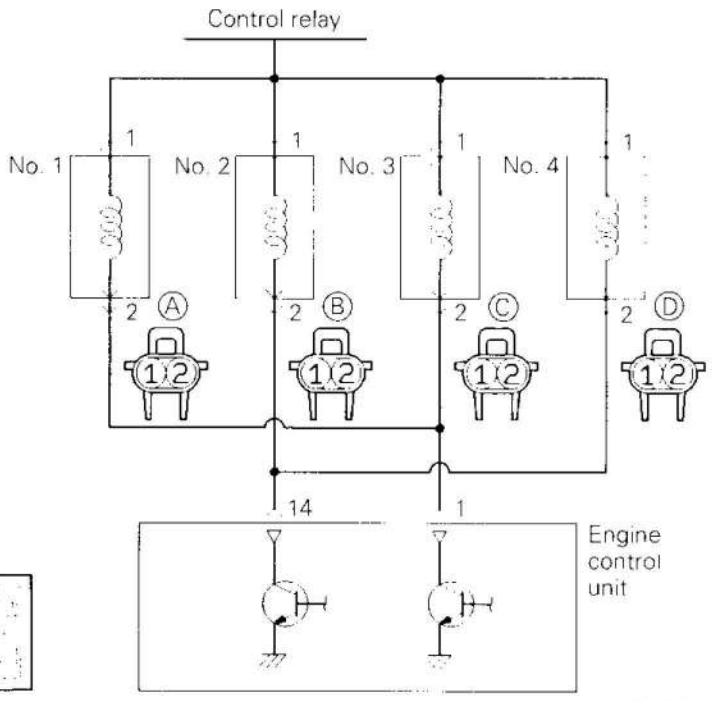
NG → Repair the harness. (Ⓐ 2 - 72)

SENSOR INSPECTION

Refer to P.13-76-66.

INJECTOR





Engine control unit connector

7FU0653

OPERATION

Refer to P.13-64-48.

TROUBLESHOOTING HINTS

Refer to P.13-64-48.

INSPECTION

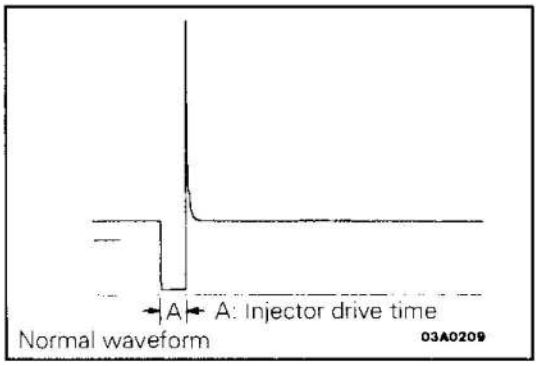
Using MUT-II

Function	Item No.	Data display	Check condition	Coolant temperature	Standard value
Data reading	41	Drive time*1	Engine: Cranking	0°C (32°F)*2	57 – 72 ms <4G63> 17 – 21 ms <4G64>
				20°C (68°F)	30 – 37 ms <4G63> 37 – 45 ms <4G64>
				80°C (176°F)	5.8 – 7.0 ms <4G63> 10.0 – 12.1 ms <4G64>

Function	Item No.	Data display	Check condition	Engine state	Standard value
Data reading	41	Drive time *1	• Coolant temperature: 80 to 95°C (176 to 203°F) • Lamps and accessories: OFF • Transmission: Neutral (P range for A/T)	Idle speed	2.8 – 4.0 ms <4G63> 2.9 – 3.5 ms <4G64>
				2,000 r/min.	2.6 – 3.8 ms <4G63> 2.9 – 3.5 ms <4G64>
				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.

Using Oscilloscope

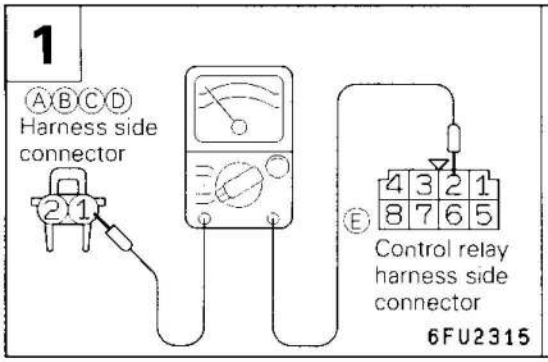


(1) Run the engine at idle speed.
(2) Connect the probe to the oscilloscope pick-up point as shown in the circuit diagram, and check the waveform at the drive side of each injector.

NOTE
1. Because the fuel injection method is a group injection method (injection with two individual injectors being one group), a normal waveform will be output if one of the injector drive circuits is normal, even if the injector drive circuit of the other injector in the group is abnormal.
2. If there is an abnormality in the power transistor for driving the injectors inside the engine control unit, an abnormal waveform will be output.

HARNESS INSPECTION

1

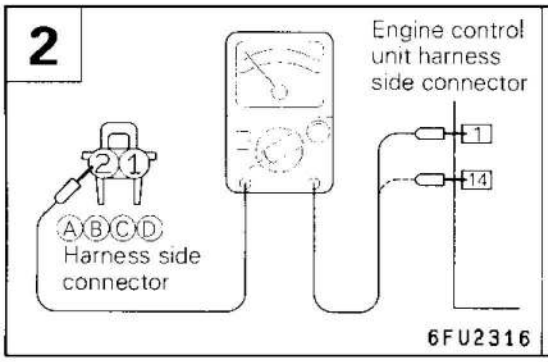


Check for continuity between the control relay and the injector.
- Injector connector: Disconnected
- Control relay connector: Disconnected

OK → 2

NG → Repair the harness. (ABCD 1 - E 2)

2



Check for an open-circuit, or a short-circuit to earth between the engine control unit and the injector
- Engine control unit connector: Disconnected
- Injector connector: Disconnected

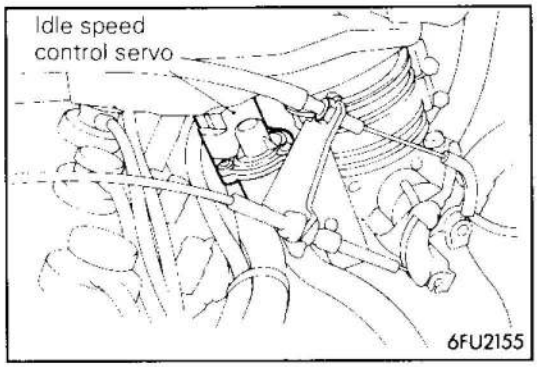
OK → STOP

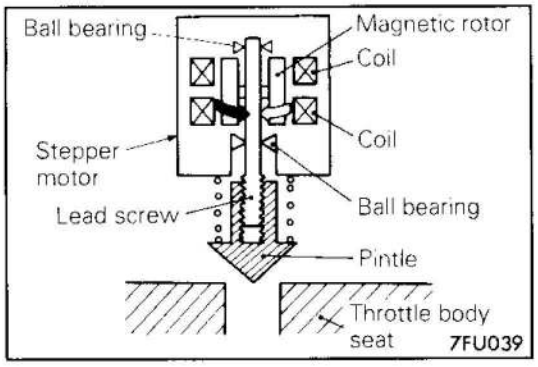
NG → Repair the harness. (ABCD 2 - 1 14)

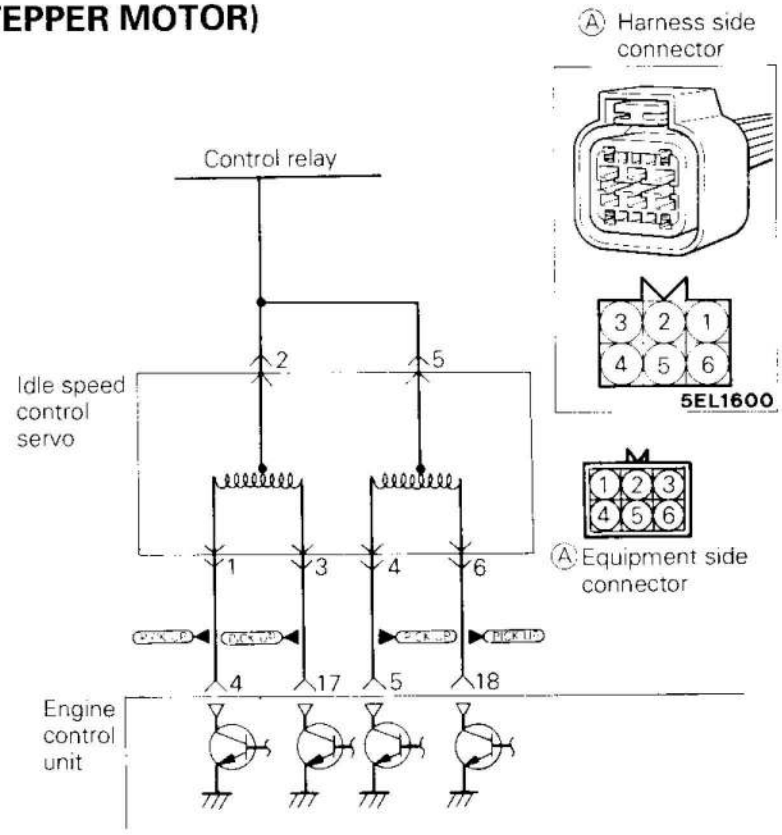
ACTUATOR INSPECTION

Refer to P.13-76-67.

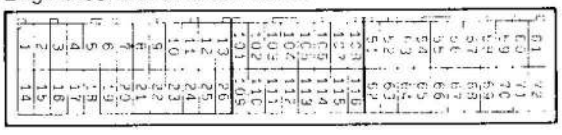
IDLE SPEED CONTROL SERVO (STEPPER MOTOR)







Engine control unit connector



OPERATION

- The intake air volume during idling is controlled by opening or closing the servo valve provided in the air path that bypasses the throttle valve.
- The servo valve is opened or closed by operating the stepper motor in the speed control servo in normal or reverse direction.
- The battery power is supplied to the stepper motor through the control relay. As the engine control unit turns on power transistors in the unit one after another, the stepper motor coil is energized and the motor rotates in normal or reverse direction.

TROUBLESHOOTING HINTS

Hint 1: If the stepper motor step increases to 100 to 120 steps or decreases to 0 step, faulty stepper motor or open circuit in the harness is suspected.

Hint 2: If the idle speed control servo harness and individual part checks have resulted norma but the stepper motor steps are out of specification, the following faults are suspected.

(1) Poorly adjusted reference idle speed
(2) Deposit on the throttle valve
(3) Air leaking into the intake manifold through gasket gap
(4) Poor combustion in the cylinder (faulty ignition plug, ignition coil, injector, low compression pressure, etc.)

INSPECTION

Using MUT-II

Function	Item No.	Data display	Check condition	Load state	Standard value
Data reading	45	Stepper motor steps	• Engine coolant temperature: 80 to 95°C (176 to 203°F) • Lights and accessories: OFF • Transmission: Neutral (P range for A/T) • Idle position switch: ON • Engine: Idling (compressor clutch to be ON if air conditioner switch is ON)	Air conditioner switch: OFF	2-25 step
				Air conditioner switch: OFF → ON	Increase by 10-70 step
				Air conditioner switch: OFF Selector lever: N to "D" range.	Increase by 5-50 step

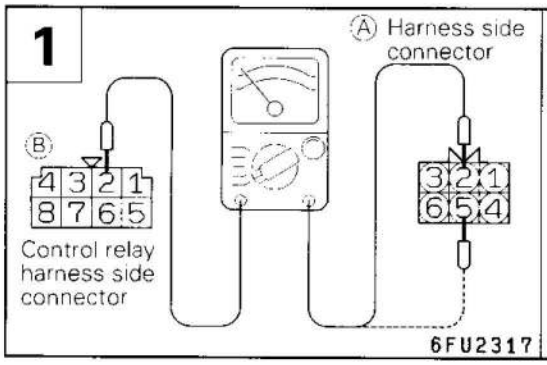
NOTE
1. When the vehicle is new [within initial operation of about 500 km (300 miles)], the stepper motor steps may be about 30 steps more than standard.

Caution

Apply the brake so the vehicle does not move foreword when shifting the shift lever to the D range.

HARNESS INSPECTION

1



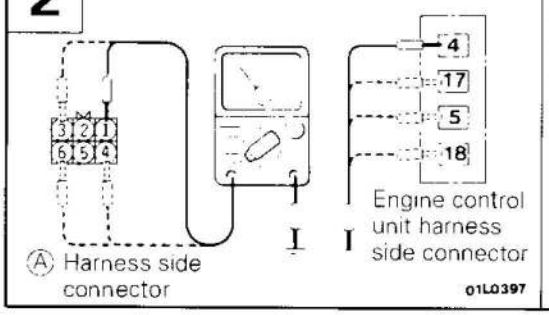
Check for continuity between the idle speed control servo and the control relay.
- Idle speed control servo connector: Disconnected
- Control relay connector: Disconnected

NOTE
Touch the ohmmeter probes to both ends of the harness.

OK → 2

NG → Repair the harness. (Ⓐ 2 5 - Ⓑ 2)

2



Check for an 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

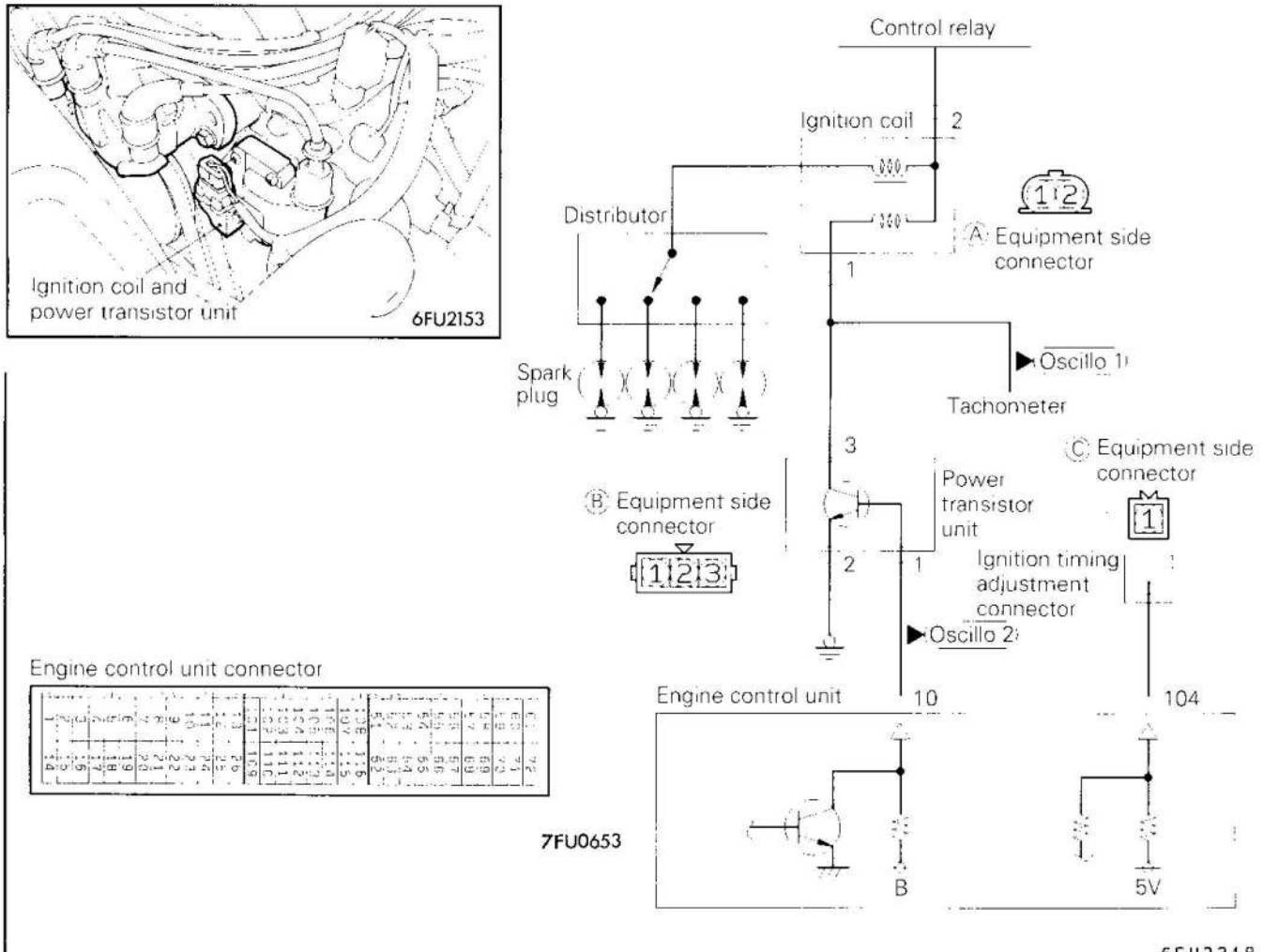
OK → STOP

NG → Repair the harness.
(Ⓐ 1 - 4)
(Ⓐ 3 - 17)
(Ⓐ 4 - 5)
(Ⓐ 6 - 18)

ACTUATOR INSPECTION

Refer to P.13-76-67.

IGNITION COIL AND POWER TRANSISTOR UNIT



OPERATION

Refer to P.13-64-54.

INSPECTION

Using MUT-II

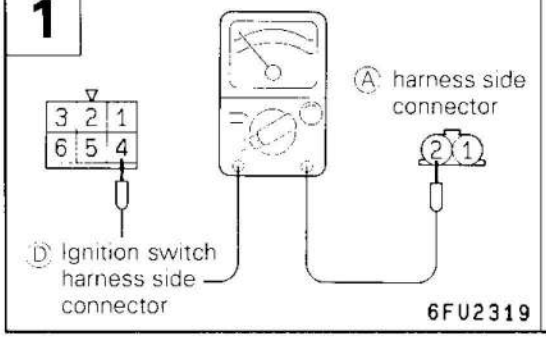
Function	Item No.	Data display	Check condition	Engine state	Standard value
Data reading	44	Ignition advance	●Engine: Warming up ●Timing lamp: Set (set timing lamp to check actual ignition timing)	Idling	2 – 18° BTDC <4G63> 5 – 15° BTDC <4G64>
				2,000 r/min.	20 – 40° BTDC <4G63> 35 – 43° BTDC <4G64>

Using Oscilloscope

Refer to P.13-64-54.

HARNESS INSPECTION

1



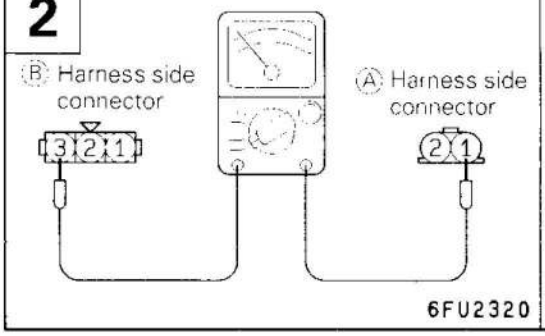
Check for continuity between ignition coil and ignition switch [IG].
- Ignition switch [IG] connector: Disconnected
- Ignition coil connector: Disconnected

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

OK → 2

NO → Repair the harness. (Ⓐ 2 - Ⓓ 4)

2

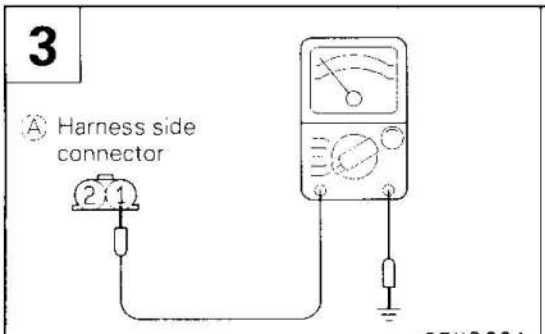


Check for continuity between the power transistor unit and ignition coil.
- Ignition coil connector: Disconnected
- Power transistor connector: Disconnected

OK → 3

NO → Repair the harness. (Ⓐ 1 - Ⓑ 3)

3

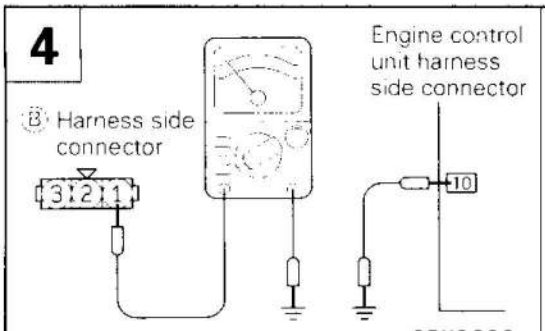


Check for short-circuit to earth between the power transistor unit and ignition coil.
- Ignition coil connector: Disconnected
- Power transistor unit connector: Disconnected

OK → 4

NO → Check the primary circuit of the ignition coil for short-circuit.

4

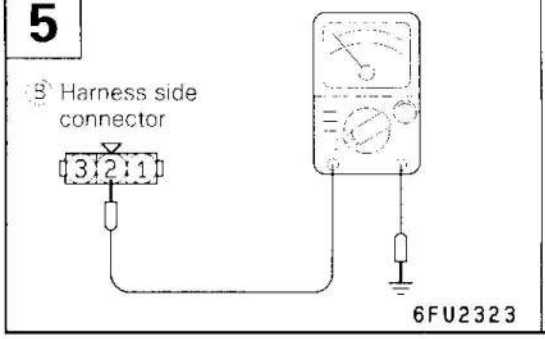


Check for open-circuit or short-circuit to earth between the power transistor unit and engine control unit.
- Power transistor unit connector: Disconnected
- Engine control unit connector: Disconnected

OK → 5

NO → Repair the harness. (Ⓑ 1 - 10)

5

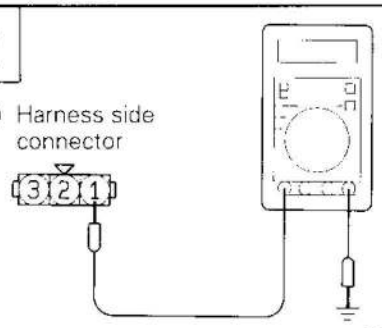


Check for continuity of the earth circuit.
- Power transistor unit connector: Disconnected

OK → 6

NO → Repair the harness. (Ⓑ 2 - Earth)

6



Measure the voltage of the control signal circuit of the power transistor.

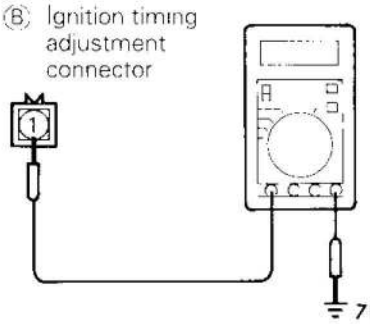
- Power transistor unit connector: Disconnected
- Engine control unit connector: Connected
- Ignition switch: START

Voltage (V)
2 - 6

OK → 7

NG → Repair the harness. (Ⓑ 1 - 10)

7



Measure the voltage of the ignition timing adjustment terminal.

- Ignition switch: ON

Voltage (V)
4.0 - 5.2

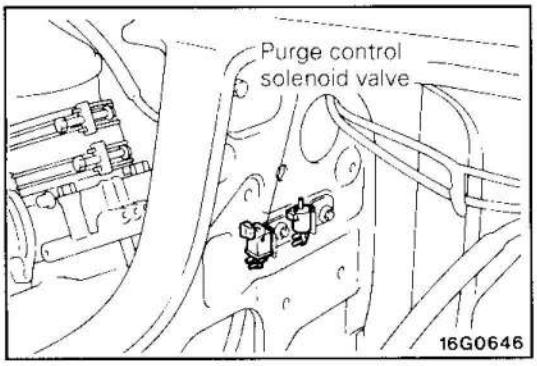
OK → STOP

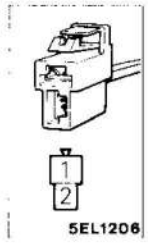
NG → Repair the harness. (Ⓒ 1 - 104)

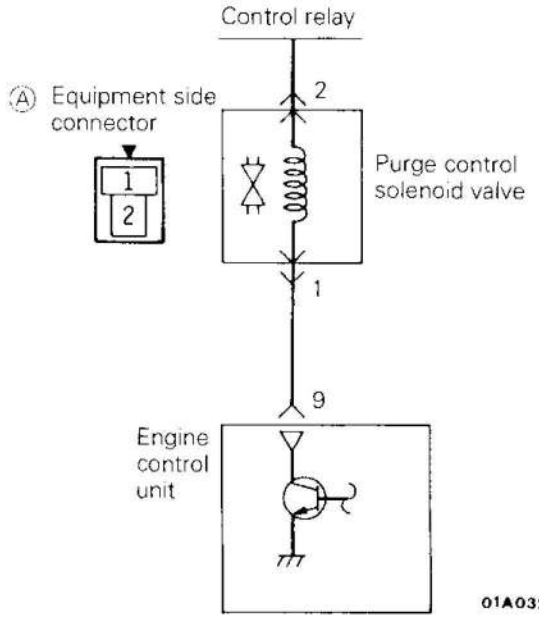
ACTUATOR INSPECTION

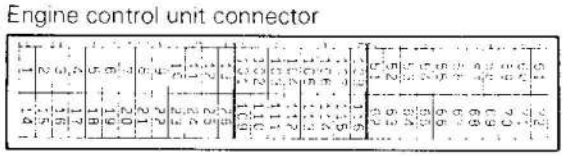
Refer to GROUP 16 - Ignition System.

PURGE CONTROL SOLENOID VALVE <4G63>









7FU0653

OPERATION

Refer to P.13-64-57.

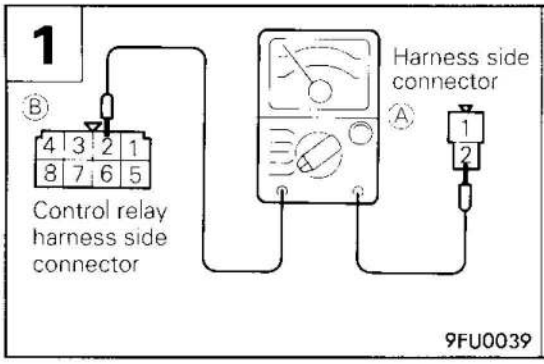
INSPECTION

Using MUT-II

Refer to P.13-64-57.

HARNESS INSPECTION

1



Check for continuity between purge control solenoid valve and control relay.

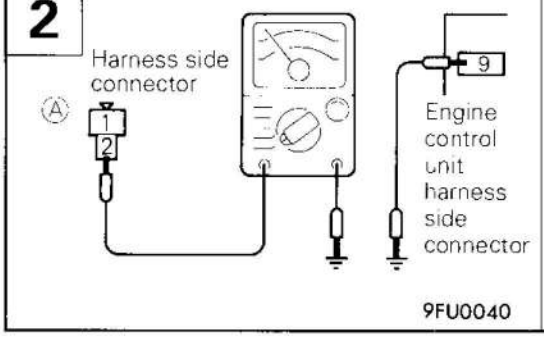
- Purge control solenoid valve connector: Disconnected
- Control relay connector: Disconnected

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

OK → 2

NO → Repair the harness. (Ⓐ 2 - Ⓑ 2)

2



Check for an open-circuit, or a short-circuit to earth, between the purge control solenoid valve and the engine control unit.

- Purge control solenoid valve connector: Disconnected
- Engine control unit connector: Disconnected

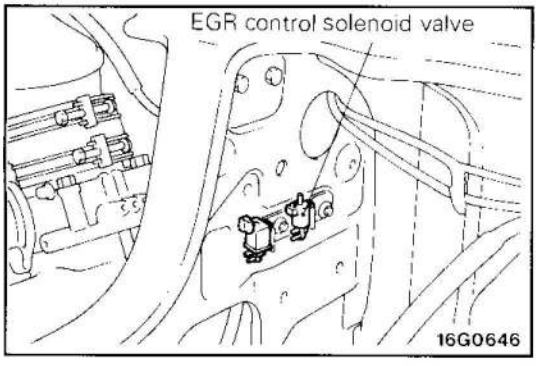
OK → STOP

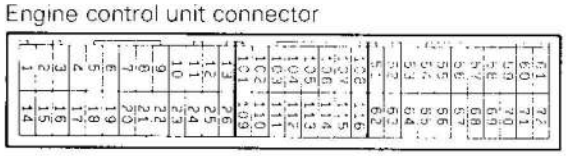
NO → Repair the harness. (Ⓐ 1 - 9)

ACTUATOR INSPECTION

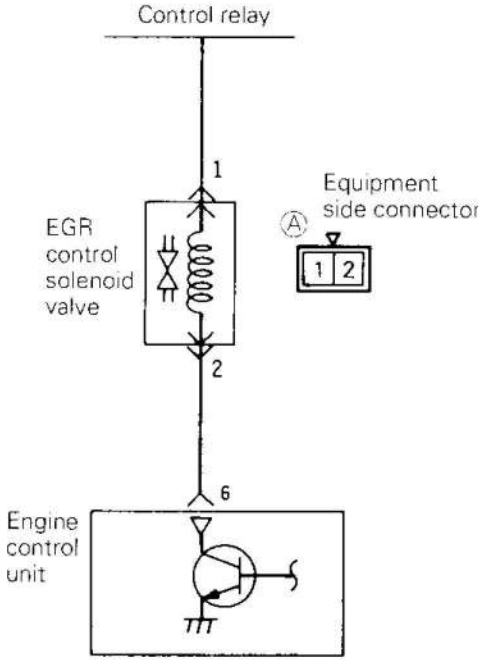
Refer to GROUP 17 - Evaporative Emission Control System.

EGR CONTROL SOLENOID VALVE <4G63>





7FU0653



OPERATION

- The EGR control solenoid valve is a duty-control type of solenoid valve; it performs its control function by leaking the EGR valve-activation vacuum to the throttle body A port.
- Battery power supply is supplied, by way of the control relay, to the EGR control solenoid valve. When the engine control unit switches OFF the power transistor within the unit, current stops flowing to the coil, and the EGR valve-activation negative pressure leaks.

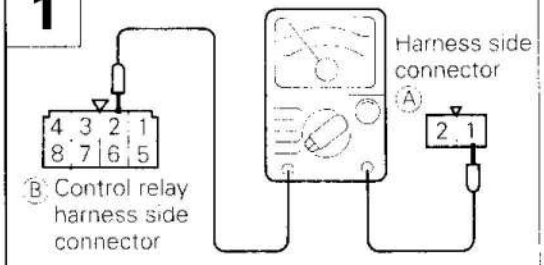
INSPECTION

Using MUT-II

Function	Item No.	Drive content	Coolant temperature	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



Check for continuity between EGR control solenoid valve and control relay.

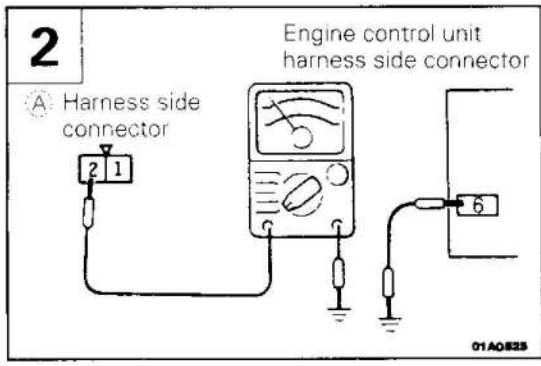
- EGR control solenoid valve connector: Disconnected
- Control relay connector: Disconnected

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

OK → 2

NO → Repair the harness. (A 1 - B 2)

2



Check for an open-circuit, or a short-circuit to earth, between the EGR control solenoid valve and the engine control unit.

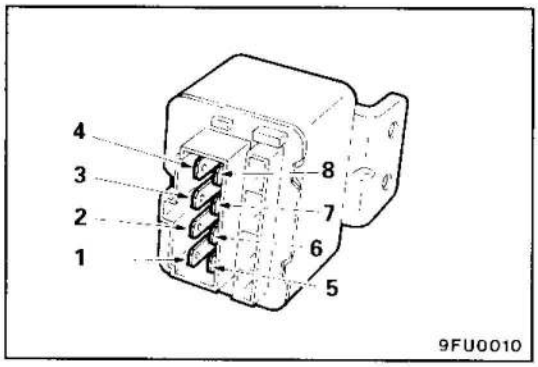
- EGR control solenoid valve connector: Disconnected
- Engine control unit connector: Disconnected

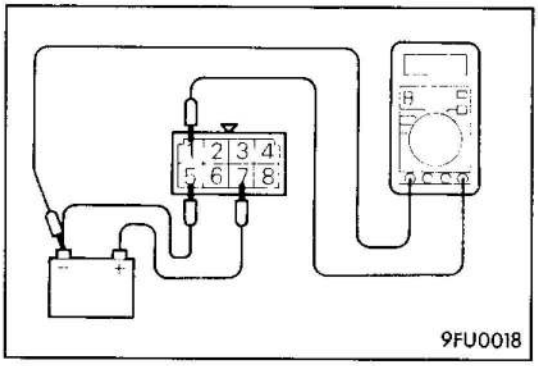
OK → STOP

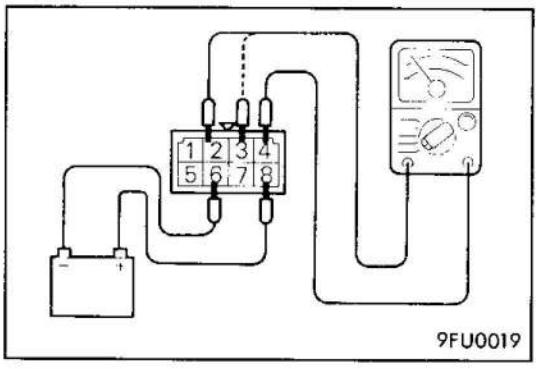
NO → Repair the harness. (A 2 - 6)

ACTUATOR INSPECTION

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







INSPECTION OF SENSORS AND SWITCHES

1. INSPECTION OF CONTROL RELAY

(1) Remove the control relay.
(2) Check the continuity between the control relay terminals.

Inspection terminals	Continuity
5 - 7	Continuity
6 - 8	Continuity in one direction

(3) Use jumper leads to connect control relay terminal 7 to the battery (+) terminal and terminal 5 to the battery (–) terminal.

Caution
When connecting the jumper leads, be careful not to mistake the connection terminals, as damage to the relay will result.

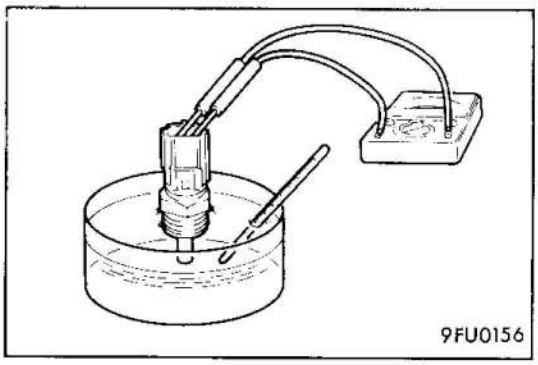
(4) Check the voltage at control relay terminal 1 while connecting and disconnecting the jumper lead at the battery (–) terminal.

Jumper lead	Voltage at terminal 1
Connected	5V
Disconnected	0V

(5) Use the jumper leads to connect control relay terminal 8 to the battery (+) terminal and terminal 6 to the battery (–) terminal.
(6) Check the continuity between control relay terminals 2 - 4 and terminals 3 - 4 while connecting and disconnecting the jumper lead at the battery (–) terminal.

Jumper lead	Continuity between terminals 2 - 4	Continuity between terminals 3 - 4
Connected	Continuity (0 Ω)	Continuity (0 Ω)
Disconnected	No continuity (∞ Ω)	No continuity (∞ Ω)

(7) If there is a defect, replace the control relay.



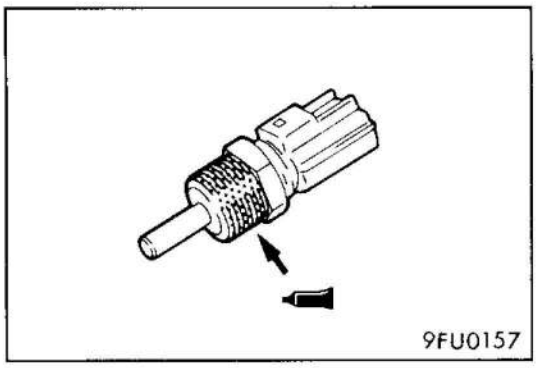
2. INSPECTION OF ENGINE COOLANT TEMPERATURE SENSOR

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

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

Standard value: 2.1 – 2.7kΩ [at 20℃ (68°F)]
0.26 – 0.36kΩ [at 80° (176°F)]

ADDED


9FU0157

(3) If the resistance deviates from the standard value greatly, replace the sensor.
(4) Apply sealant threaded portion.

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

(5) Install engine coolant temperature sensor and tighten it to specified torque.

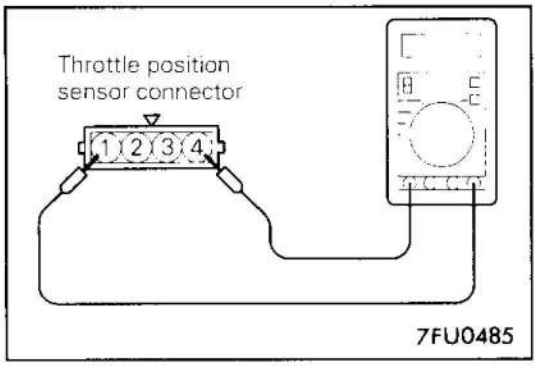
Sensor tightening torque: 30 Nm (3.0 kgm, 22 ft.lbs.)

(6) Fasten harness connectors securely.

3. INSPECTION OF THROTTLE POSITION SENSOR

(1) Disconnect the throttle position sensor connector.
(2) Measure the resistance between the throttle position sensor side connector terminal 1 and terminal 4.

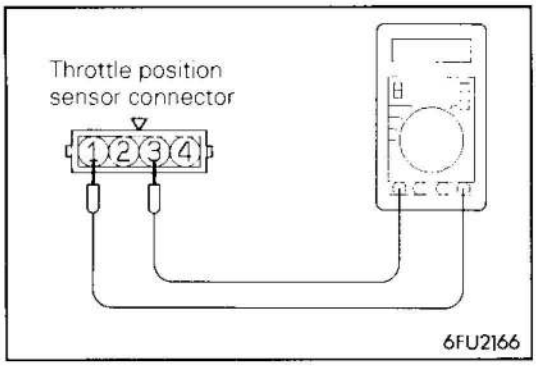
Standard value: 3.5 – 6.5 kΩ



7FU0485

(3) Measure the resistance between the throttle position sensor side connector terminal 1 and terminal 3.

Throttle valve slowly open until fully open from the idle position	Changes smoothly in proportion to the opening angle of the throttle valve



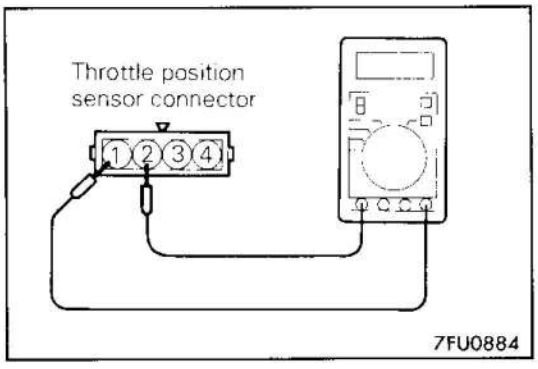
6FU2166

(4) If the resistance is outside the standard value, or if it doesn't change smoothly, replace the throttle position sensor.

NOTE
For the throttle position sensor adjustment procedure, refer to P.13-76-6.

4. INSPECTION OF IDLE POSITION SWITCH

(1) Disconnect the throttle position sensor connector.
(2) Check the continuity between the throttle position sensor connector side terminal 1 and terminal 2.

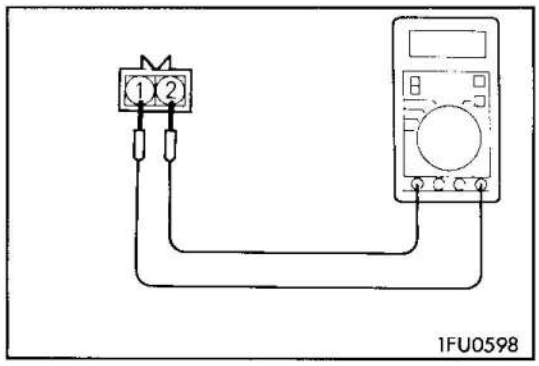


7FU0884

Accelerator pedal	Continuity
Depressed	Non-conductive (∞ Ω)
Released	Conductive (0 Ω)

(3) If out of specification, replace the throttle position sensor.

NOTE
After replacement, the idle position switch and throttle position sensor should be adjusted. (Refer to P.13-76-6.)



5. INSPECTION OF OXYGEN SENSOR

<4G64>

(1) Warm the engine and check to be sure that the engine coolant temperature is 80 – 95℃ (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.

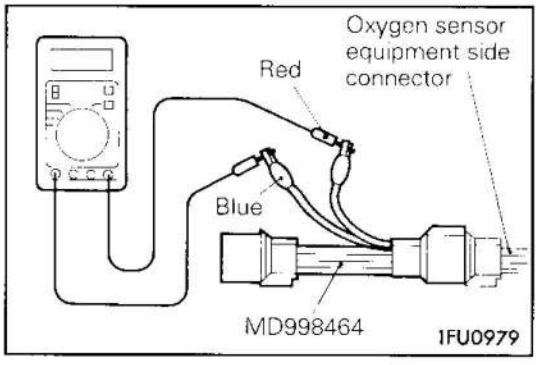
(3) While repeatedly racing the engine, measure the oxygen sensor output voltage.

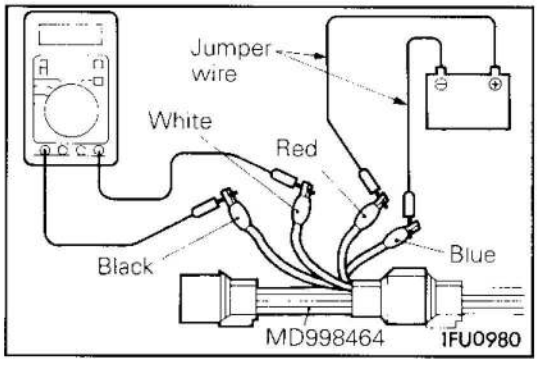
Standard value:

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.

(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.





<4G63>

(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 (7 – 40 Ω at 20℃ (68 ˚F)] between terminal 1 (red clip of special tool) and terminal 3 (blue clip of special tool) 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℃ (176 ˚F) or higher.

(5) Use the jumper wires to connect terminal 1 (red clip) of the oxygen sensor connector to the battery (+) terminal and terminal 3 (blue clip) to the battery (–) terminal.

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

(6) Connect a digital voltmeter between terminal 2 (black clip) and terminal 4 (white clip).

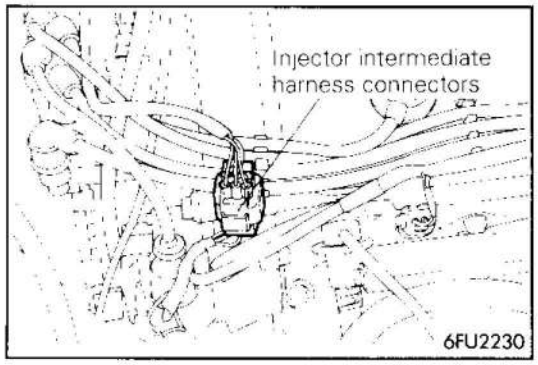
(7) While repeatedly racing the engine, measure the oxygen sensor output voltage.

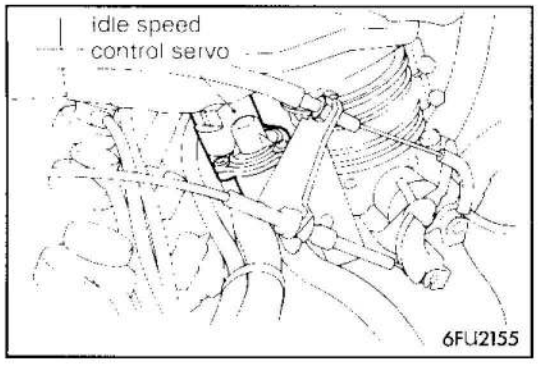
Standard value:

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 – 1.0V.

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

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





6. INSPECTION OF INJECTORS

Measurement of Resistance between Terminals

(1) Disconnect the injector intermediate harness connectors.
(2) Measure the resistance between terminals.

Standard value: 6.5 – 8 Ω [at 20℃ (68˚F)]

Injector	Measurement probe
No.1 cylinder and No.3 cylinder	2 – 3
No.2 cylinder and No.4 cylinder	1 – 3

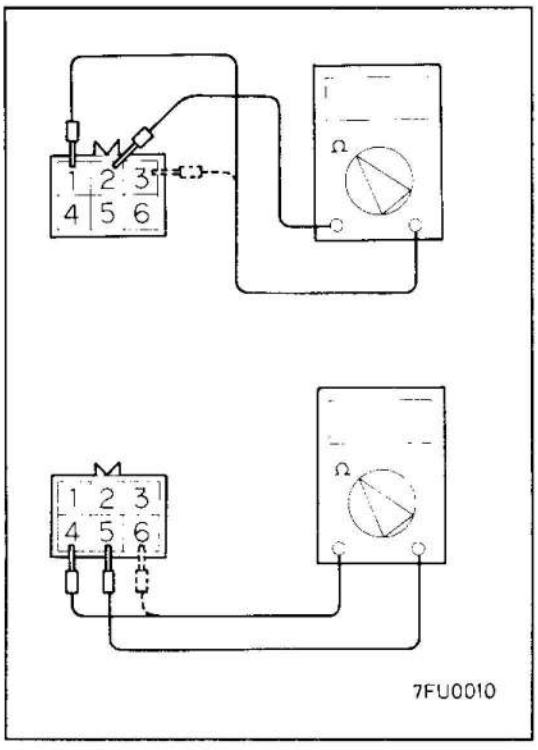
7. INSPECTION OF IDLE SPEED CONTROL SERVO (STEPPER MOTOR)

Checking the Operation Sound

(1) Check to be sure that the engine coolant temperature is 20℃ (68˚F) or below.

NOTE
Disconnecting the engine coolant temperature sensor connector and connecting the harness-side of the connector to another engine coolant temperature sensor that is at 20℃ (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.



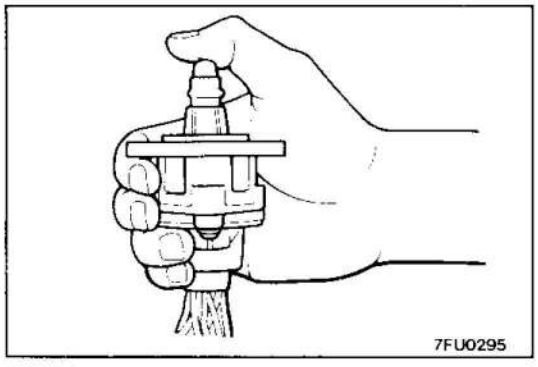
Checking the Coil Resistance

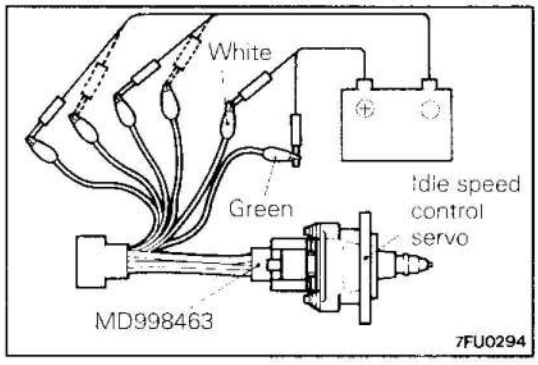
(1) Disconnect the idle speed control servo connector and connect the special tool (test harness).
(2) Measure the resistance between terminal 2 (white clip of the special tool) and either terminal 1 (red clip) or terminal 3 (blue clip) of the connector at the idle speed control servo side.

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.

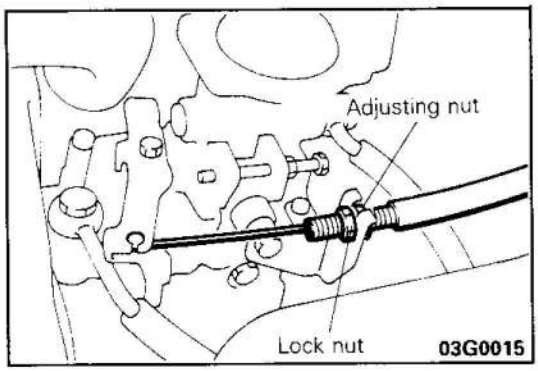
SERVICE ADJUSTMENT PROCEDURES (DIESEL-POWERED VEHICLES) E13FCAH

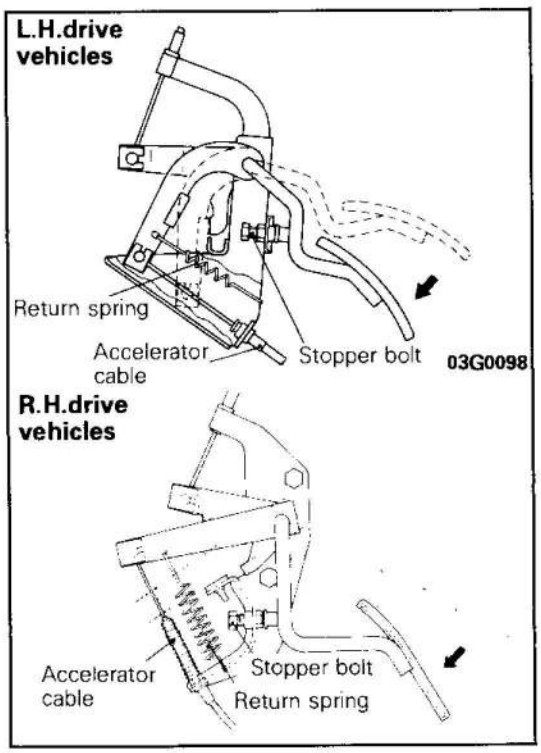
GENERAL INSPECTION

1. INSPECTION AND ADJUSTMENT OF ACCELERATOR CABLE

(1) Warm engine until stabilized at idle.
(2) Confirm idle rpm is at prescribed rpm.
(3) Stop engine.
(4) Confirm there are no sharp bends in accelerator cable.
(5) Check inner cable for correct slack.
(6) If there is too much slack or no slack, adjust play by the following procedures.
① Loosen adjusting nut. Fully close throttle lever.
② Tighten adjusting nut until throttle lever just starts moving. Return 1 turn (Manual transmission models) or 3 turns (Automatic transmission models), and lock with lock nut.
This adjusts accelerator cable play to the standard value.

Standard value: Approx. 1 mm (0.04 in.)



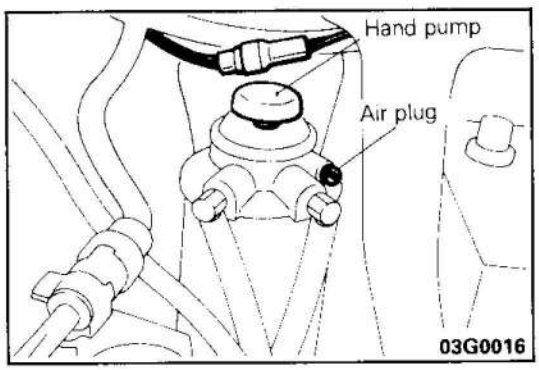


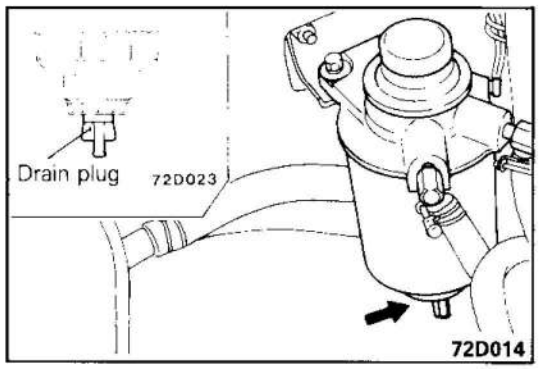
③ Adjust so that accelerator pedal stopper touches pedal arm when throttle lever is fully opened.
④ After adjusting, confirm that throttle lever fully opens and closes by operating pedal.

2. EVACUATION OF AIR FROM FUEL LINE E13FSAB

Evacuate air after following services.
- When fuel is drained and re-filled for service.
- When fuel filter is replaced.
- When main fuel line is removed.

(1) Loosen fuel filter air plug.
(2) Place rags around air plug hole. Operate hand pump repeatedly until no bubbles come from plug hole. Tighten air plug.
(3) Repeat until hand pump operation becomes stiff.

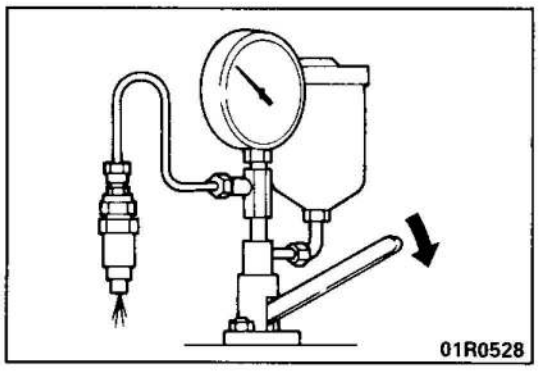


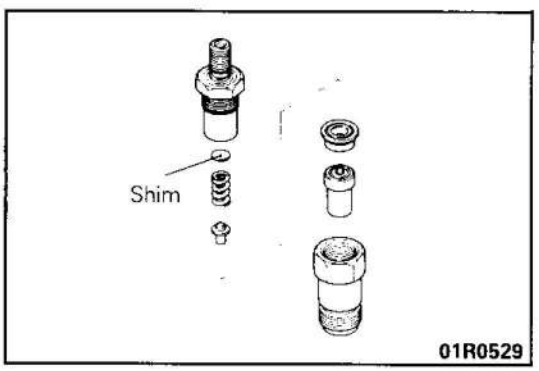


3. EVACUATION OF WATER FROM FUEL FILTER E13FVAB

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

(1) Loosen drain plug.
(2) Drain water with hand pump. Finger-tighten drain plug.





INSPECTION AND ADJUSTMENT OF INJECTION NOZZLE E13FOAB

1. INSPECTION AND ADJUSTMENT OF INJECTION START PRESSURE

(1) Set injection nozzle in nozzle tester and check the following.
(2) Move nozzle tester handle at about one stroke per second.
(3) The pressure gauge pointer rises slowly and swings when injection is made. Read the position at which the pointer started to swing. Check the injection start pressure is the standard value.

Standard value:
<Vehicles for Europe built up to May 1994 – except vehicles with EGR built from July 1993;
Vehicles for General Export – except vehicles for Hong Kong and Turkey built from June 1994;
Vehicles for Australia>

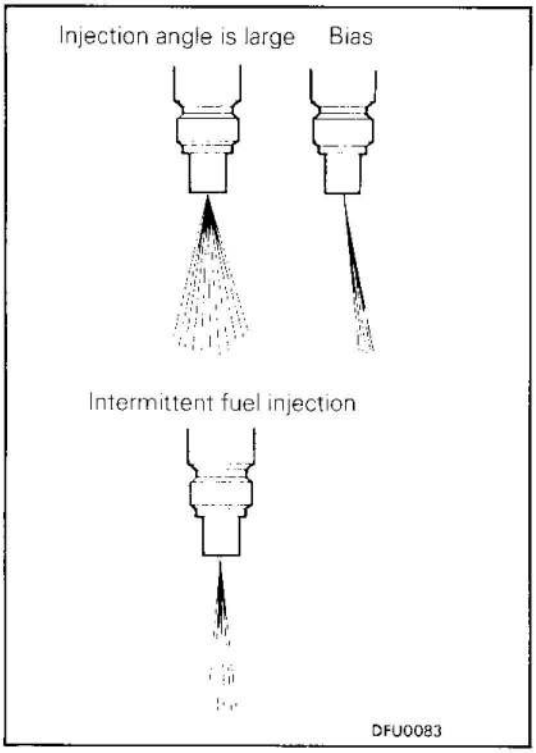
11,768 – 12,749 kPa (120 – 130 kg/cm², 1,707 – 1,849 psi)

<Vehicles for Europe built from June 1994;
Vehicles with EGR for Europe built from July 1993;
Vehicles for Hong Kong and Turkey built from June 1994>
14,710 – 15,691 kPa (150 – 160 kg/cm², 2,133 – 2,276 psi)

(4) If the nozzle is faulty, disassemble and adjust injection start pressure to the standard value by changing the shim thickness. Injection pressure increases by approx. 2,354 kPa (24 kg/cm², 341 psi) as shim thickness is increased by 0.1 mm (0.0039 in.).

Caution
When disassembling nozzle holder, be careful not to allow entry of dirt or water.

(5) If the injection start pressure can not be adjusted by changing the shim thickness, replace nozzle assembly.



2. INSPECTION OF INJECTION STATUS

(1) Move the lever of the nozzle tester rapidly (4 - 6 times per second) within a small angle to eject the fuel continuously.

(2) Check the spray pattern. The injection spray patterns shown in the illustration at left are wrong.

Normal spray condition:
<Vehicles for Europe built up to May 1994 – except vehicles with EGR built from July 1993;
Vehicles for General Export – except vehicles for Hong Kong and Turkey built from June 1994;
Vehicles for Australia>

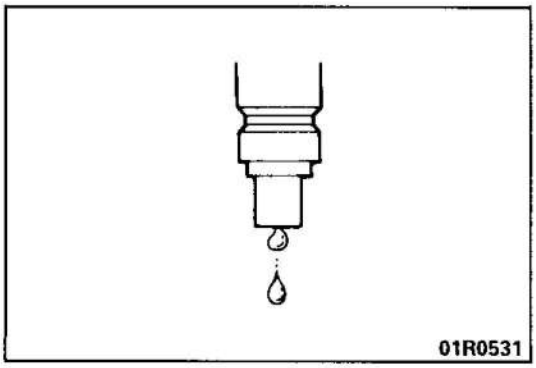
0° (Sprays out evenly in a thin, straight line)

<Vehicles without turbocharger for Switzerland and Austria from December 1988 up to May 1994>

15° (Sprays out evenly in a fan shape)

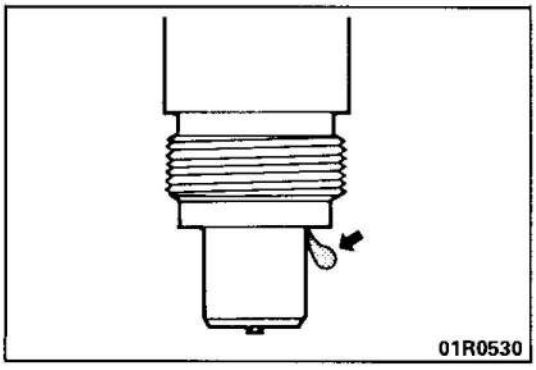
<Vehicles for Europe built from June 1994;
Vehicles with EGR for Europe built from July 1993;
Vehicles for Hong Kong and Turkey built from June 1994>

10° (Sprays out evenly in a fan shape)



(3) Confirm fuel does not drip after injection.

(4) If dripping, disassemble injection nozzle and replace nozzle tip or entire assembly.

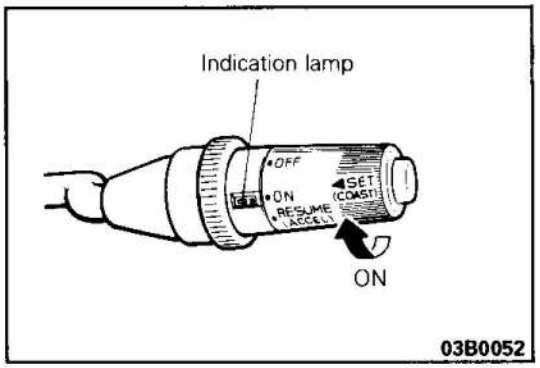


3. INSPECTION OF NOZZLE OIL SEAL

(1) Gently press down the lever of the nozzle tester until the gauge indication shows the standard pressure. After holding the lever in that position for approximately 10 seconds, check that there is no fuel leaking from the nozzle.

Standard value:
<Vehicles for Europe built up to May 1994 – except vehicles with EGR built from July 1993;
Vehicles for General Export – except vehicles for Hong Kong and Turkey built from June 1994;
Vehicles for Australia>
9,807–10,787 kPa (100–110 kg/cm², 1,422–1,565 psi)
<Vehicles for Europe built from June, 1994;
Vehicles with EGR for Europe built from July 1993;
Vehicles for Hong Kong and Turkey built from June 1994>
12,749 – 13,729 kPa (130 – 140 kg/cm², 1,849 – 1,991 psi)

(2) If there is leakage, disassemble injection nozzle and replace nozzle tip or entire assembly.

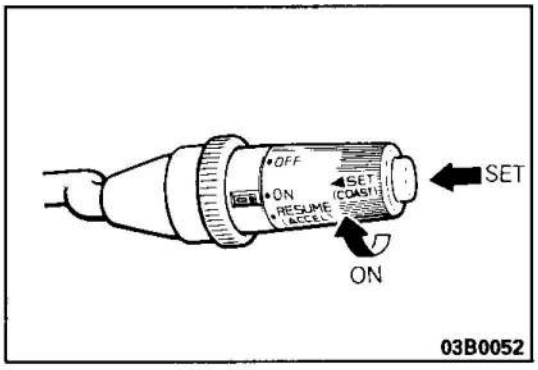


SERVICE ADJUSTMENT PROCEDURES (AUTO-CRUISE CONTROL SYSTEM)

AUTO-CRUISE CONTROL SYSTEM INSPECTION E13FYAB

AUTO-CRUISE CONTROL MAIN SWITCH CHECK

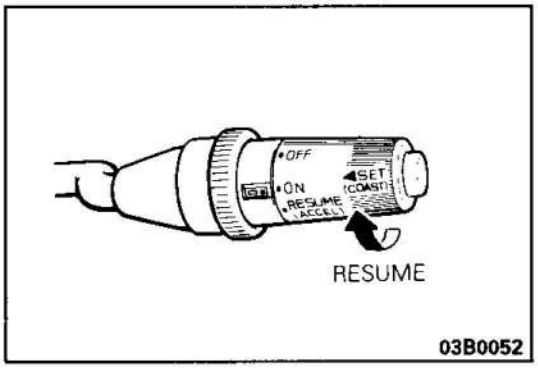
1. Turn the ignition key to ON.
2. Check to be sure that the indicator lamp within the switch illuminates when the MAIN switch is switched ON.



AUTO-CRUISE CONTROL SETTING CHECK

1. Switch ON the auto-cruise control switch.
2. Drive at the desired speed within the range of approximately 40 – 145 km/h (25 – 90 mph).
3. Press the SET button.
4. Check to be sure that when the switch is released the speed is the desired constant speed.

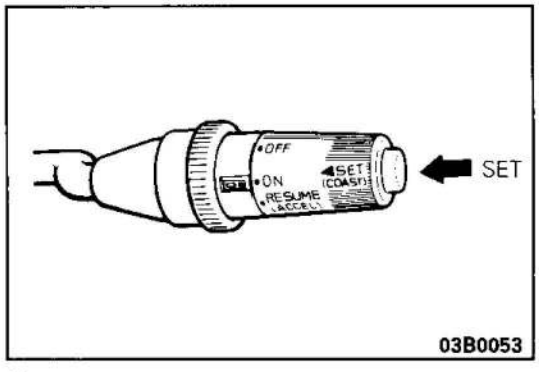
NOTE
If the vehicle speed decreases to approximately 20 km/h (12 mph) below the set speed, because of climbing a hill for example, the auto-cruise control will be cancelled.



SPEED-INCREASE SETTING CHECK

1. Set to the desired speed.
2. Turn the control switch to RESUME position.
3. Check to be sure that acceleration continues while the switch is hold, and that when it is released the constant speed at the time when it was released becomes the driving speed.

NOTE
Even if, during acceleration, the vehicle speed reaches or exceeds the high limit [approximately 145 km/h (90 mph)], acceleration will continue, and, when the switch is released, the speed at that time ("memorized speed") will become the high limit of the vehicle speed.



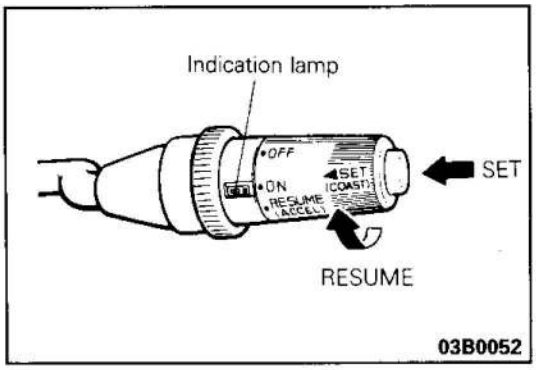
SPEED-REDUCTION SETTING CHECK

1. Set to the desired speed.
2. Press the SET button.
3. Check to be sure that deceleration continues while the switch is pressed, and that when it is released the constant speed at the time when it was released becomes the driving speed.

NOTE
When the vehicle speed reaches the low limit [approximately 40 km/h (25 mph)] during deceleration, auto-cruise control will be cancelled.

AUTO-CRUISE CONTROL CANCELLATION CHECK

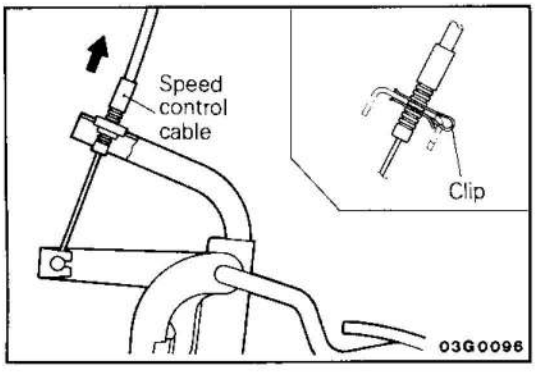
1. Set the auto-cruise control.
2. Check to be sure that there is a return to ordinary driving when either of the operations below is performed.
   (1) The brake pedal is depressed.
   (2) The clutch pedal is depressed.
   (3) The auto-cruise control switch is switched OFF.



RETURN TO THE SET SPEED BEFORE CANCELLATION CHECK

1. Set the auto-cruise control.
2. Check to be sure that the auto-cruise control is cancelled when either of the operations below is performed.
   (1) The brake pedal is depressed.
   (2) The clutch pedal is depressed.
3. Turn control switch to RESUME position and release (RESUME switch ON → OFF) while driving at a vehicle speed of approximately 40 km/h (25 mph) or higher.

   NOTE
   In vehicles built from November 1989, if the vehicle speed becomes lower than 35km/h (22mph), the preset auto-cruise speed will be cancelled and auto-cruise will not be resumed even after the vehicle speed becomes 40km/h (25mph) or higher.
4. After switching RESUME switch to OFF, there will be a return to the speed before the auto-cruise control speed cancellation and the vehicle will travel at the constant speed.



AUTO-CRUISE CONTROL CABLE PLAY ADJUSTMENT

E13FYBA

1. Adjust the play of the accelerator cable.
2. Slide the auto-cruise control cable in the direction of the arrow up to a point just before the accelerator pedal begins to move, and secure the auto-cruise control cable by inserting a clip.
3. Check to ensure that the play of the auto-cruise control cable is 0 – 3 mm (0 – 0.1 in.).

   NOTE
   If the play adjustment is incorrect, either an increase of idle speed or lack of auto-cruise control in the high speed range will result.

TROUBLESHOOTING

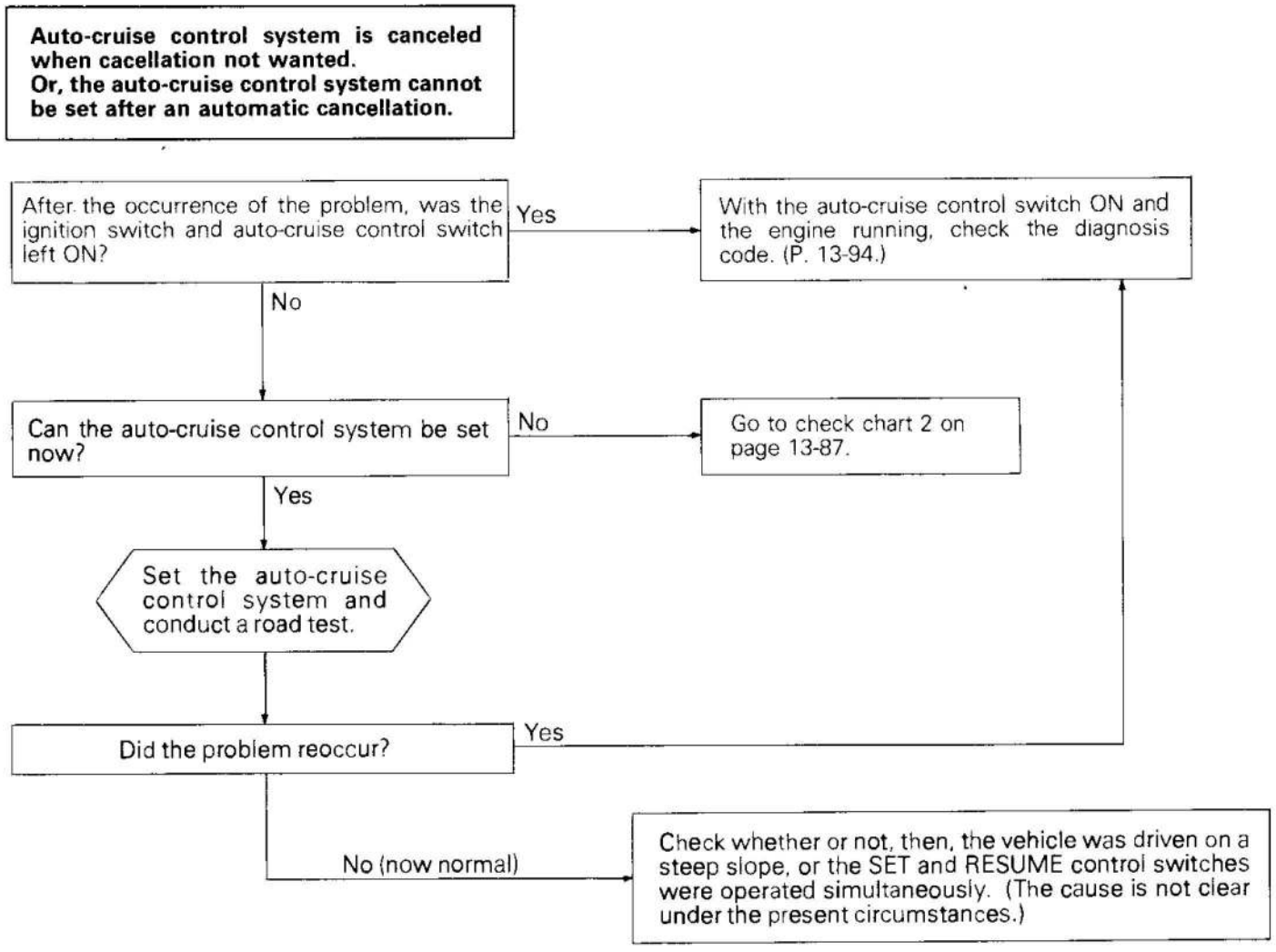
E13EDAC

CAUTIONS AND IMPORTANT POINTS FOR TROUBLESHOOTING

The auto-cruise control system performs control functions for the setting or cancellation of the fixed-speed driving speed based upon the data provided by input signals. As a result, when the auto-cruise control system is canceled, the cause of the cancellation is memorized in a separate circuit by the auto-cruise control unit, regardless of whether or not the auto-cruise control system condition is normal or abnormal, thus providing the auto-cruise control unit with the self-diagnosis function by certain fixed patterns, as well as the function of being able to check whether or not the auto-cruise control unit's input switches or sensor are normal. Thus, by effectively using these function, the time required checking and repair can be shortened.

NOTE
When the computer (auto-cruise control unit) power supply (ignition switch and auto-cruise control switch) is switched OFF, the memorized diagnosis codes are erased, and so for this reason the power supply must be left ON until the checking is completed..

TROUBLESHOOTING QUICK-REFERENCE CHART



Auto-cruise control system cannot be set.

Prepare to conduct input check. (Refer to P. 13-95.)

Were codes 21, 22 and 25 displayed when, with the vehicle stationary, the input check codes were recalled?

NO →
- Damaged or disconnected wiring of the auto-cruise control unit power-supply circuit (Go to check chart 1 on page 13-86.)
- Damaged or disconnected wiring of the SET or RESUME switch (Go to check chart 2 and 3 on page 13-87, 88.)

Yes

Are the results of all input checks normal?

Yes

No

Check results	Probable cause	Remedy	Check chart
Code 21 remains even though SET switch is set to OFF.	SET switch ON malfunction	Replace the control switch	2
	SET switch input line short-circuit	Repair the harness.	
Code 22 remains even though RESUME switch is set to OFF.	RESUME switch ON malfunction	Replace the control switch.	3
	RESUME switch input line short-circuit	Repair the harness.	
Code 23 remains even though CANCEL switch is set to OFF.	Malfunction of the CANCEL circuit (ON malfunction)	Check or repair each CANCEL circuit.	6-1, 6-2
Code 25 does not disappear, and code 24 does not appear, even though vehicle speed reaches approximately 40 km/h (25 mph) or higher.	Malfunction of the vehicle-speed sensor circuit (damaged or disconnected wiring, or short-circuit)	Check or repair the vehicle speed sensor circuit.	4

Check the actuator circuit.
(Go to check chart 5 on page 13-90.)

NOTE
If, after the occurrence of the problem, the ignition switch and the auto-cruise control switch have not been switched OFF, it is possible to determine (by checking the diagnosis output code) which circuit canceled the system's operation.
This chart is to be used, then, for troubleshooting if it is not possible to use the self-diagnosis for checking.

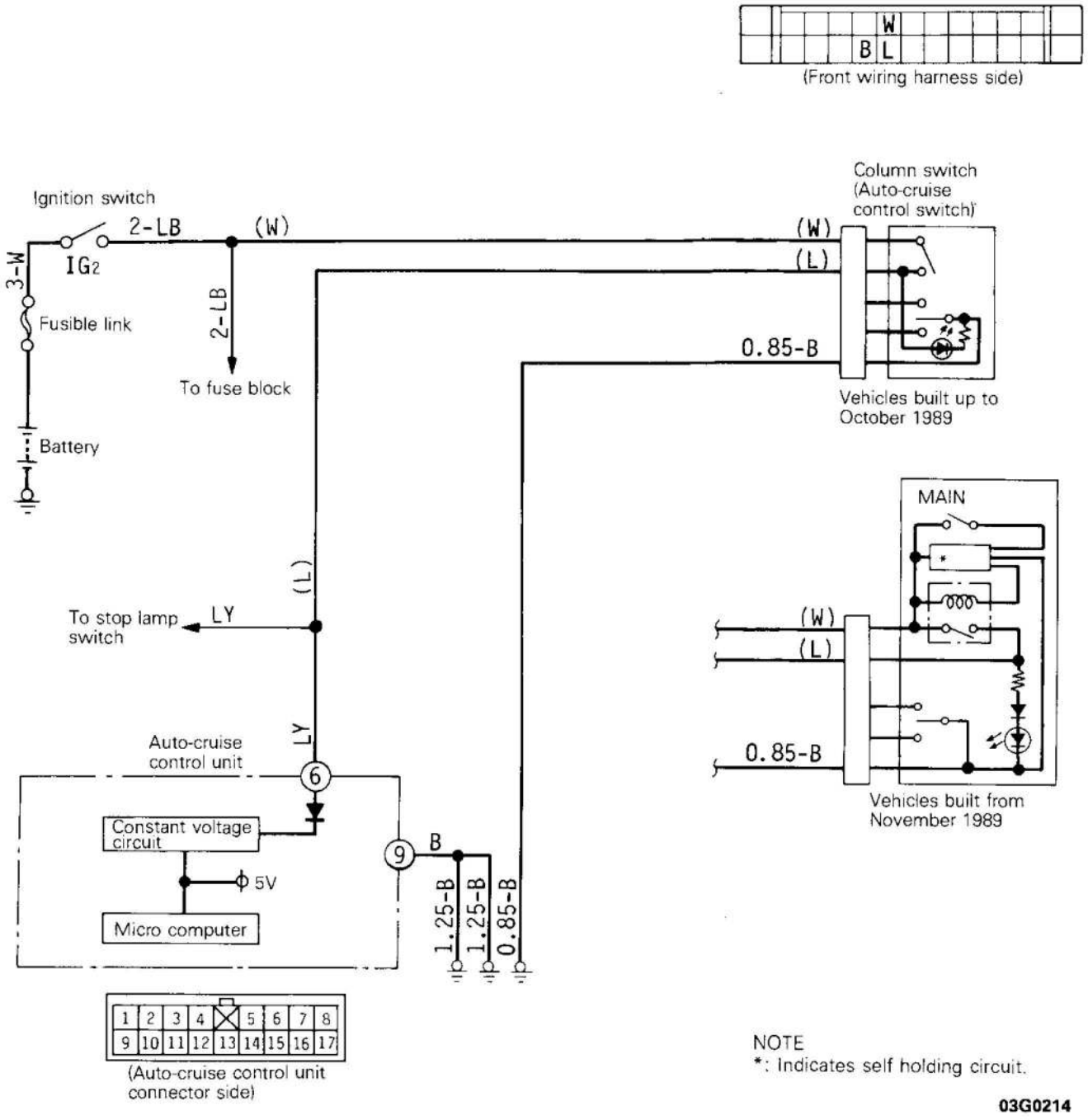
NOTE
If the results of the check of the actuator circuit (check chart 5) and of the actuator itself (P. 13-132.) reveal no abnormal condition, replace the auto-cruise control unit.

Trouble symptom	Probable cause	Check chart	Remedy
• The set vehicle speed varies greatly upward or downward. • "Hunching" (repeated alternating accelleration and deceleration) occurs after setting is made.	Malfunction of the vehicle speed sensor circuit	4	Repair the vehicle-speed sensor system, or repalce the part.
	Malfunction of the speedometer cable or speedometer drive gear		
	Actuator circuit poor contact	5	Repair the actuator system, or replace the part.
	Malfunction of the actuator		
	Malfunction of the auto-cruise control unit	–	Replace the auto-cruise control unit.
The auto-cruise control system is not canceled when the brake pedal is depressed.	Damaged or disconnected wiring of the stop lamp switch input circut; brake switch (for auto-cruise control) malfunction (short-circuit)	Check input code No.23. If a malfunction is indicated, inspect check-chart 6-1.	Repair the harness or replace the stop lamp switch.
	Actuator drive circuit short-circuit	5	Repair the harness or replace the actuator.
	Malfunction of the auto-cruise control unit	–	Replace the auto-cruise control unit.
The auto-cruise control system is not canceled when the clutch pedal is depressed. (It is canceled, however, when the brake pedal is depressed.)	Damaged or disconnected wiring of clutch switch input circuit	Check input code No.23. If a malfunction is indicated, inspect check chart 6-2.	Repair the harness, or repair or replace the clutch switch.
	Clutch switch improper installation (won't switch ON)		
	Malfunction of the auto-cruise control unit	–	Replace the auto-cruise control unit.
Cannot decelerate by using the SET (COAST) switch	Temporary damaged or disconnected wiring of SET (COAST) switch input circuit	2	Repair the harness or replace the SET (COAST) switch.
	Actuator circuit poor contact	5	Repair the harness or replace the actuator.
	Malfunction of the actuator		
	Malfunction of the auto-cruise control unit	–	Replace the auto-cruise control unit.

Trouble symptom	Probable cause	Check chart	Remedy
Cannot accelerate or resume speed by using the RESUME (ACCEL) switch.	Damaged or disconnected wiring, or short-circuit, of RESUME (ACCEL) switch input circuit	3	Repair the harness or replace the RESUME (ACCEL) switch.
	Actuator circuit poor contact	5	Repair the harness or replace the actuator.
	Malfunction of the actuator		
	Malfunction of the auto-cruise control unit	–	Replace the auto-cruise control unit.
Auto-cruise control system can be set while traveling at a vehicle speed of less than 40 km/h (25 mph), or there is no automatic cancellation at that speed.	Malfunction of the vehicle-speed sensor circuit	4	Repair the vehicle-speed sensor system, or replace the part.
	Malfunction of the speedometer cable or the speedometer drive gear		
	Malfunction of the auto-cruise control unit	–	Replace the auto-cruise control unit.

CHECK CHART

1. AUTO-CRUISE CONTROL UNIT POWER-SUPPLY CIRCUIT CHECK



Description of Operation

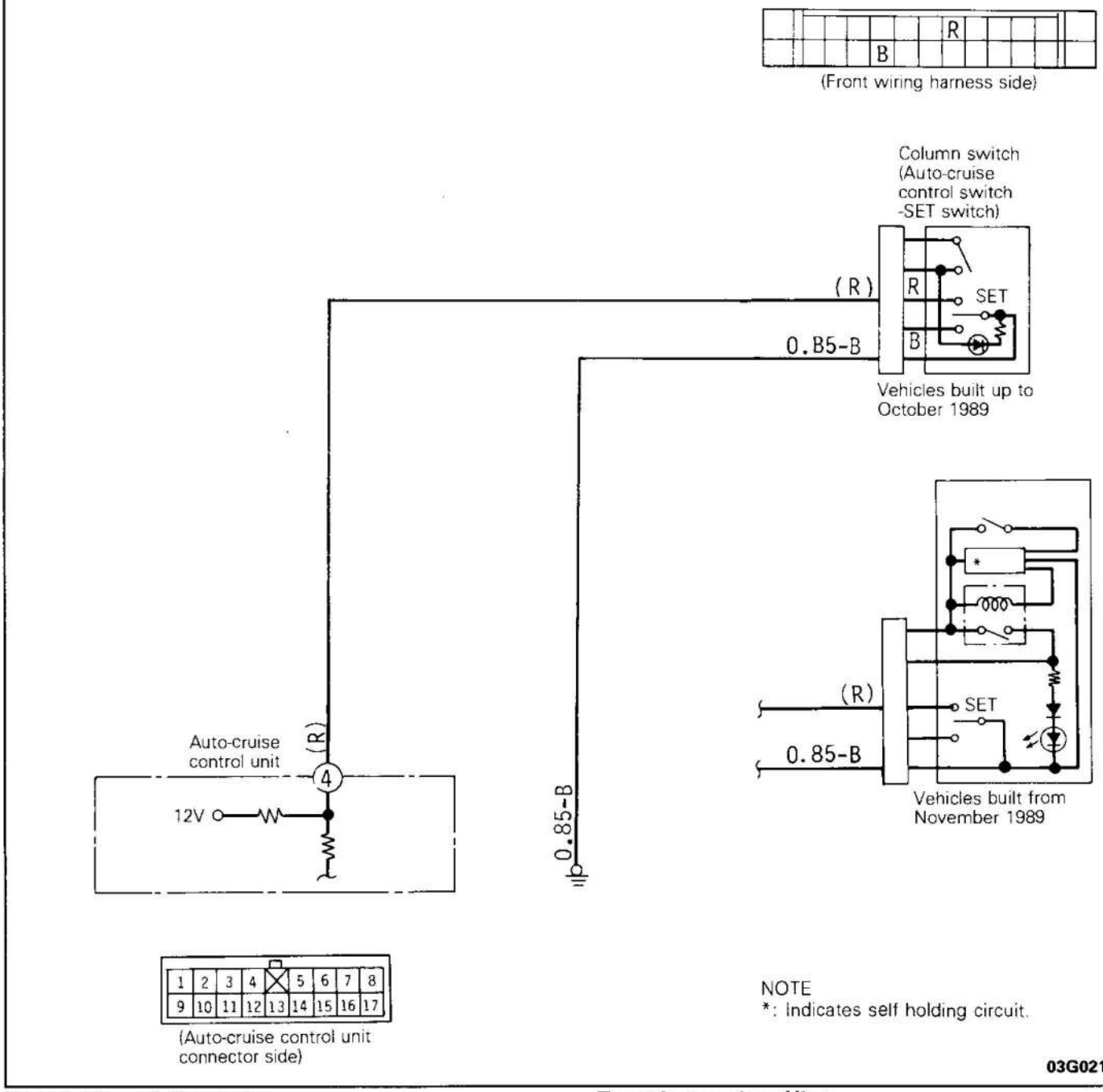
When the auto-cruise control switch is switched ON while the ignition swtich is ON, current flows to the ignition switch, to the auto-cruise control switch, to the auto-cruise control unit, and to earth.

Troubleshooting Hint

AUTO-CRUISE CONTROL UNIT TERMINAL VOLTAGE

Terminal No.	Signal	Conditions	Terminal voltage
6	Control unit power supply	When the auto-cruise control switch is switched ON	12V
9	Control unit earth	At all tiems	0V

2. SET SWITCH CIRCUIT CHECK



Description of Operation

When the SET switch is switched ON (at the vehicle speed desired to be maintained, and with the auto-cruise control switch ON) that vehicle speed is maintained as a constant speed. Furthermore, the constant speed is gradually reduced (the "coasting" feature) when the SET switch is pressed speed, and, when, the SET switch is released, the vehicle then maintains that newly set constant speed (the speed at which the SET switch was released).
Current flows to the auto-cruise control unit, the auto-cruise control switch ("SET"), and to earth.

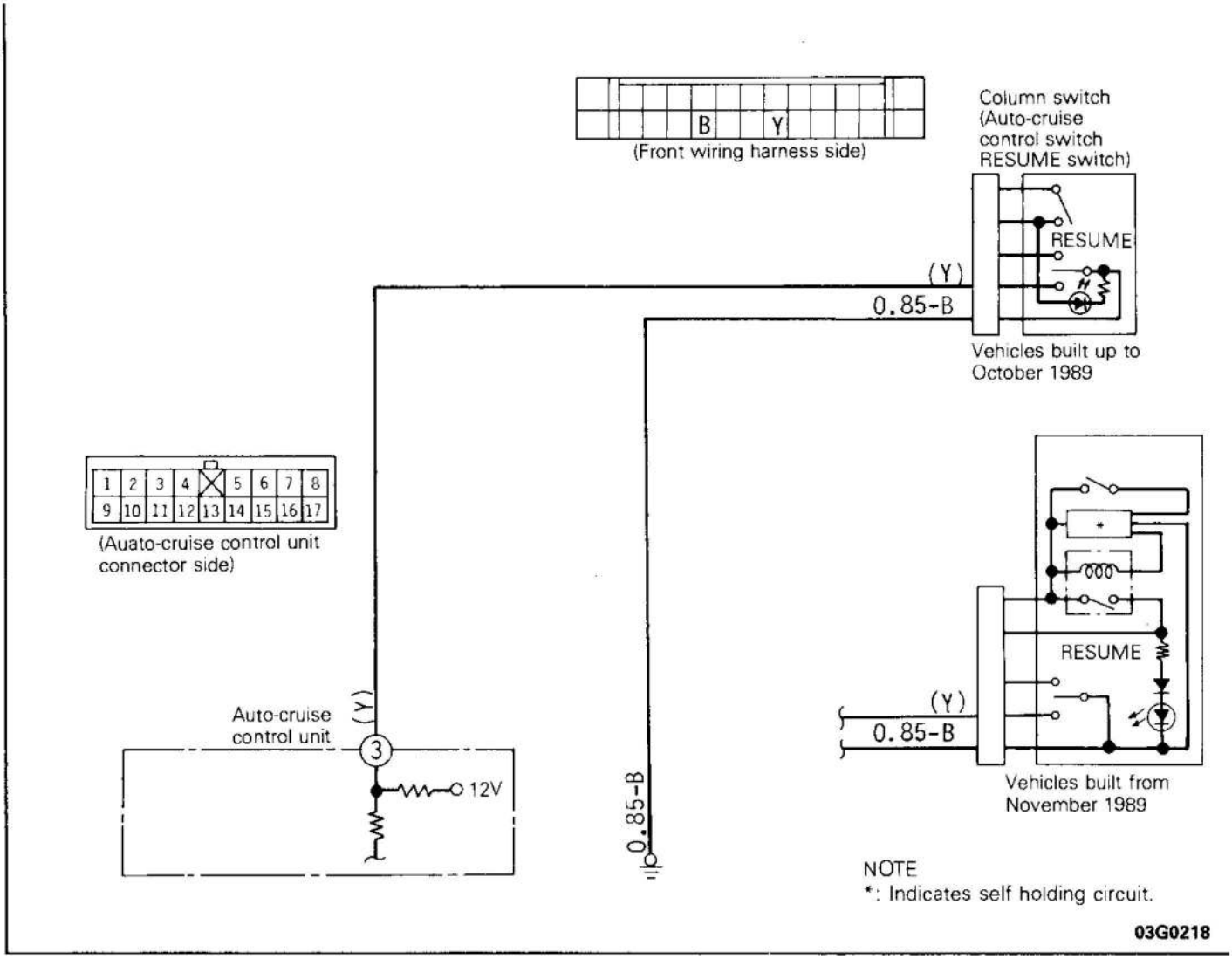
Troubleshooting Hint

Diagnosis – No. 15 (automatically cancelled)

AUTO-CRUISE CONTROL UNIT TERMINAL VOLTAGE

Terminal No.	Signal	Conditions	Terminal voltage
4	SET switch	When the SET switch is switched ON	0V
		When the SET switch is switched OFF	12V

3. RESUME SWITCH CIRCUIT CHECK



Description of Operation

The set speed (before cancellation) resumes when the RESUME switch is switched ON, even if the constant-speed control has been cancelled. That speed will not resume, however, even if the "RESUME" switch is switched ON, if the auto-cruise control switch is switched OFF and if the vehicle speed decreases to 40 km/h (25 mph) or lower.In vehicles built from November 1989, if the vehicle speed becomes lower than 35 km/h (22 mph), the preset auto-cruise speed will be cancelled and auto-cruise will not be resumed even after the vehicle speed becomes 40 km/h (25 mph) or higher.

The RESUME switch is switched ON and held while the vehicle is traveling at a constant speed, the vehicle speed will increase (The vehicle speed cannot increase to 145 km/h (90 mph) or more.); the speed at which the switch is subsequently released will become the newly set constant speed.

Current flows to the auto-cruise control unit, the cruise contorl switch (RESUME), and to earth.

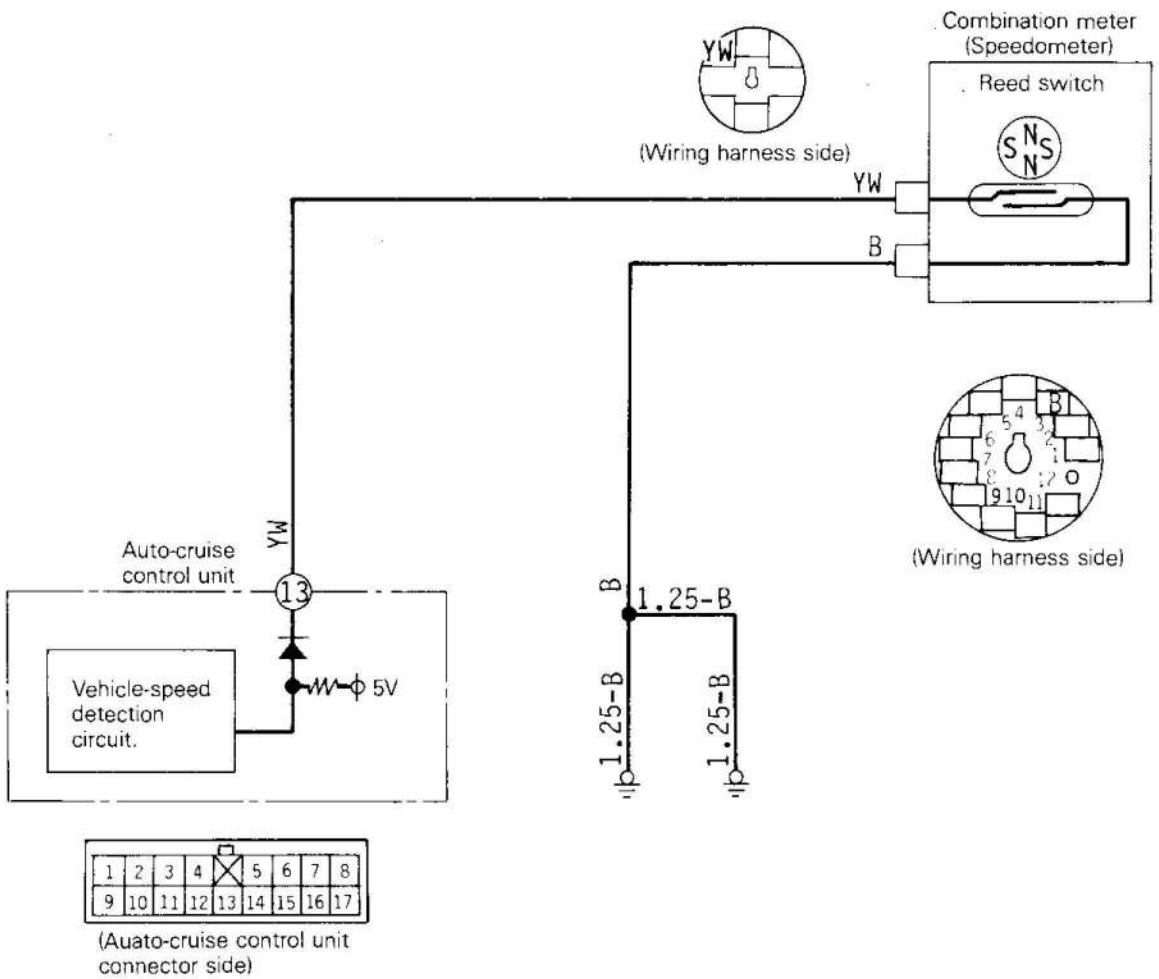
Troubleshooting Hint

Diagnosis – No. 5 (automatically cancelled)

AUTO-CRUISE CONTROL UNIT TERMINAL VOLTAGE

Terminal No.	Signal	Conditions	Terminal voltage
3	RESUME switch	When the RESUME switch is switched ON	0V
		When the RESUME switch is switched OFF	12V

4. VEHICLE-SPEED SENSOR CIRCUIT CHECK



03G0215

Description of Operation

The vehicle-speed sensor is installed within the speedometer; it sends to the auto-cruise control unit pulse signals that are proportional to the rotation speed (i.e., the vehicle speed) of transmission's output gear. This vehicle-speed sensor is the reed switch type of sensor; it generates 4 pulse signals for each rotation of the speedometer's driven gear.

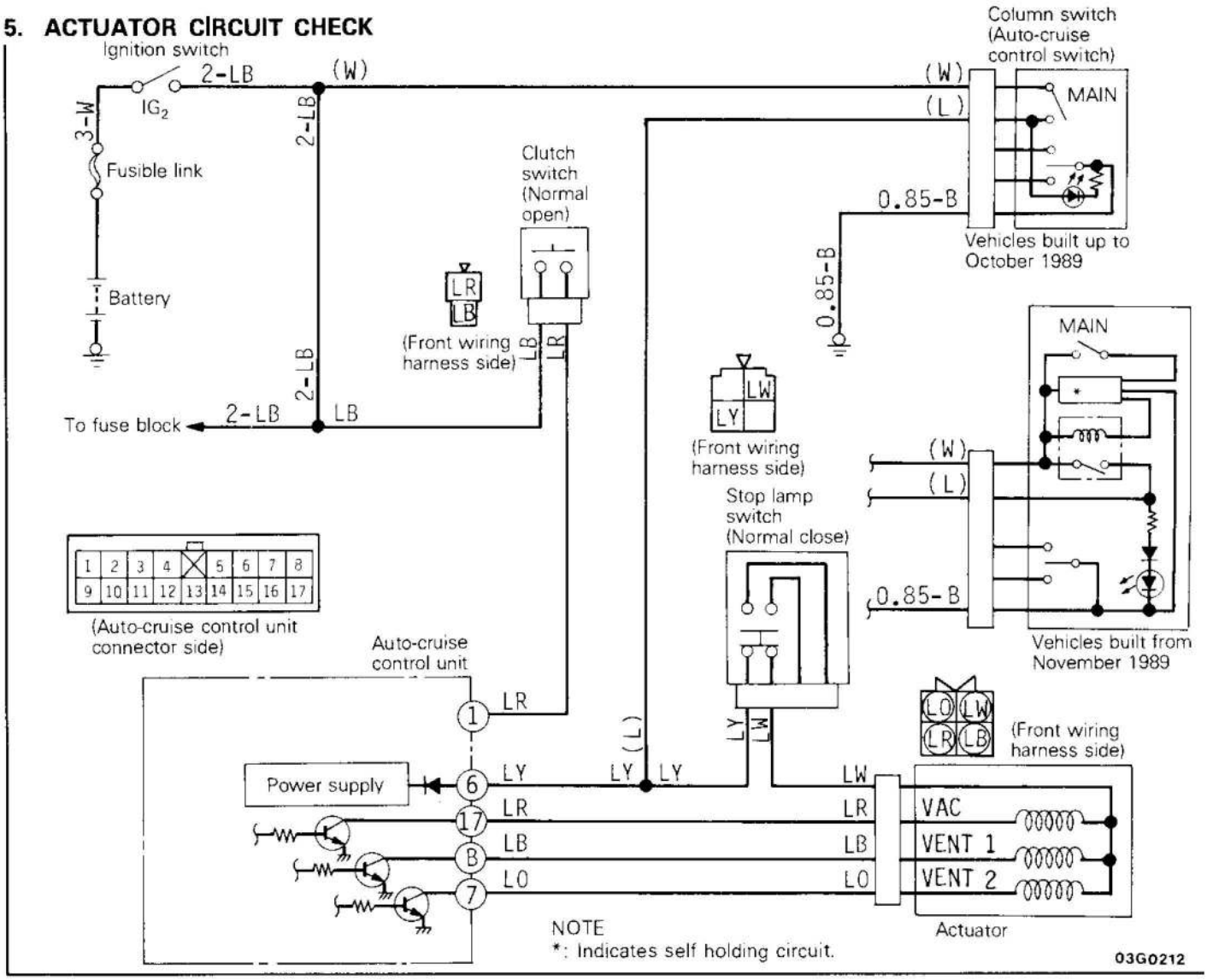
Troubleshooting Hint

Diagnosis – No. 12 (automatically cancelled)

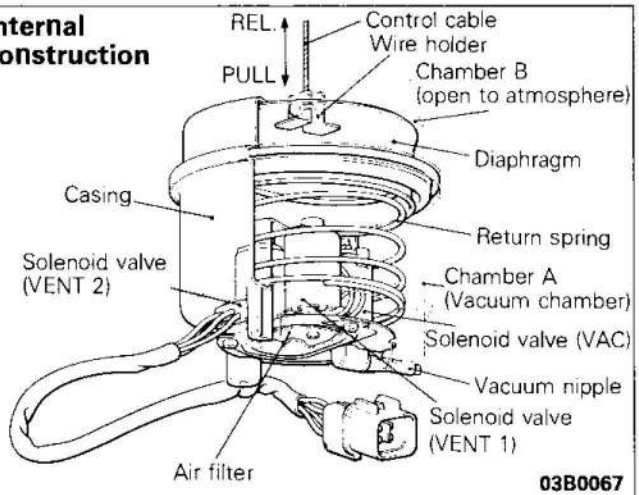
AUTO-CRUISE CONTROL UNIT TERMINAL VOLTAGE

Terminal No.	Signal	Conditions	Terminal voltage
13	Vehicle-speed sensor	Move the vehicle forward slowly.	0V to 0.7 V ↑ Flashing ↓ 3 V or higher

5. ACTUATOR CIRCUIT CHECK



Internal construction



Mode \ Valve	VAC	VENT 1	VENT 2
ACCELERATE	ON	ON	ON
DECELERATE	OFF	OFF	ON
HOLD	OFF	ON	ON
CANCEL	OFF	OFF	OFF

Description of Operation

1. When, with the auto-cruise control switch at the ON setting, the SET switch is moved from the ON to the OFF setting (release after pressing the switch) while driving within the speed range within which the speed setting can be made [approximately 40 – 145 km/h (25 – 90 mph)], the vehicle speed at the time when the ON to OFF setting was made is memorized as the "SET" vehicle speed, and the actuator functions to control so that thereafter constant-speed driving is possible at that vehicle speed.
2. During the period that the SET switch is at the ON setting during constant-speed driving, the actuator valves VAC and VENT 1 are switched to OFF, and deceleration continues; the speed at which the switch setting is changed to OFF is memorized, and thereafter the speed is controlled at a constant speed.

3. After the speed-control setting has been cancelled (during constant-speed driving) by the occurrence of one of the conditions in (Cancel) below, if the RESUME switch setting is then changed from the OFF setting to the ON setting while the vehicle is moving at a speed equivalent to or higher than the low-speed limit [approximately 40 km/h (25 mph)], the speed-control function will resume control at the memorized vehicle speed which was in effect before the speed-control setting was cancelled.
4. During the period that the RESUME switch is at the ON setting during constant-speed driving, the actuator VAC valve is switched to ON, and acceleration continues; the speed at which the switch setting is changed to OFF is memorized, and thereafter the speed is controlled at a constant speed.
5. When, during constant-speed driving, any of signals described below is input, the power to all the solenoid valves of the actuator is cut, and the speed-control function is cancelled.
   (1) "Stop lamp switch ON" signal (when the brake pedal is depressed)
   (2) "Clutch switch ON" signal (when the clutch pedal is depressed)
   (3) When there is a malfunction of the circuitry within the auto-cruise control unit.

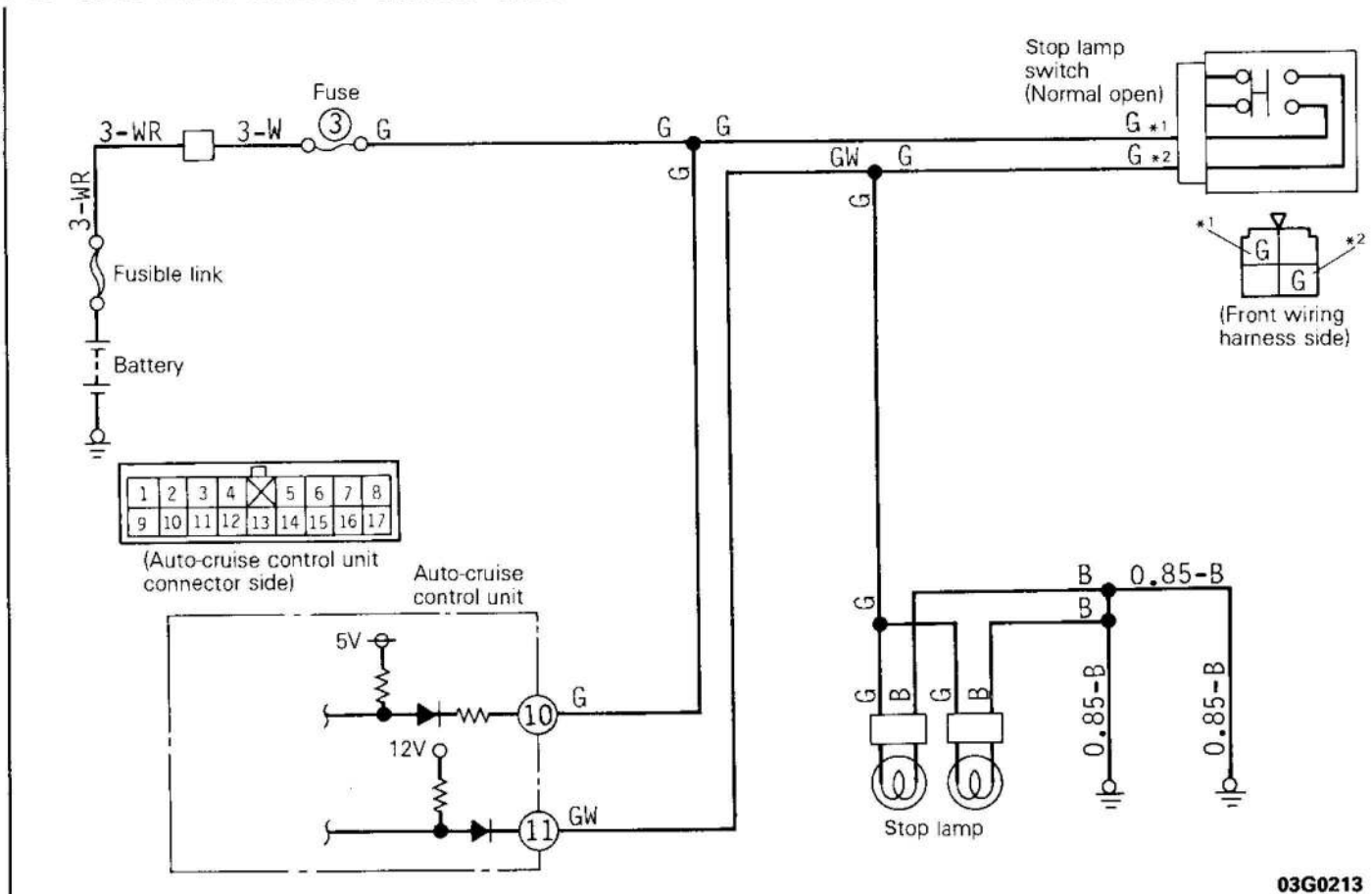
Troubleshooting Hint

Diagnosis – No. 11 (automatically cancelled)

AUTO-CRUISE CONTROL UNIT TERMINAL VOLTAGE

Terminal No.	Signal	Conditions	Terminal voltage
6	Transistor for electromagnetic clutch coil	When the cruise-control switch is switched ON	12V
7	Actuator solenoid valve (VENT 2)	During acceleration by RESUME switch	0V
		During speed reduction (coasting) by SET switch	0V
8	Actuator solenoid valve (VENT 1)	During acceleration by RESUME switch	0V
		During speed reduction (coasting) by SET switch	12V
17	Actuator solenoid valve (VAC)	During acceleration by RESUME switch	0V
		During speed reduction (coasting) by SET swtich)	12V

6-1. STOP LAMP SWITCH CIRCUIT CHECK



Description of Operation

When the brake pedal is depressed during constant-speed travel, the stop lamp switch's contacts for the auto-cruise control system open, with the result that the current to the solenoid valves of the actuator is interrupted, thus cancelling the constant-speed travel. At the same time, moreover, the closing of the contacts for the stop lamp switch results in the sending of the cancel signal to the auto-cruise control unit.
The flow of current is from the battery to the stop lamp switch, and the auto-cruise control unit.

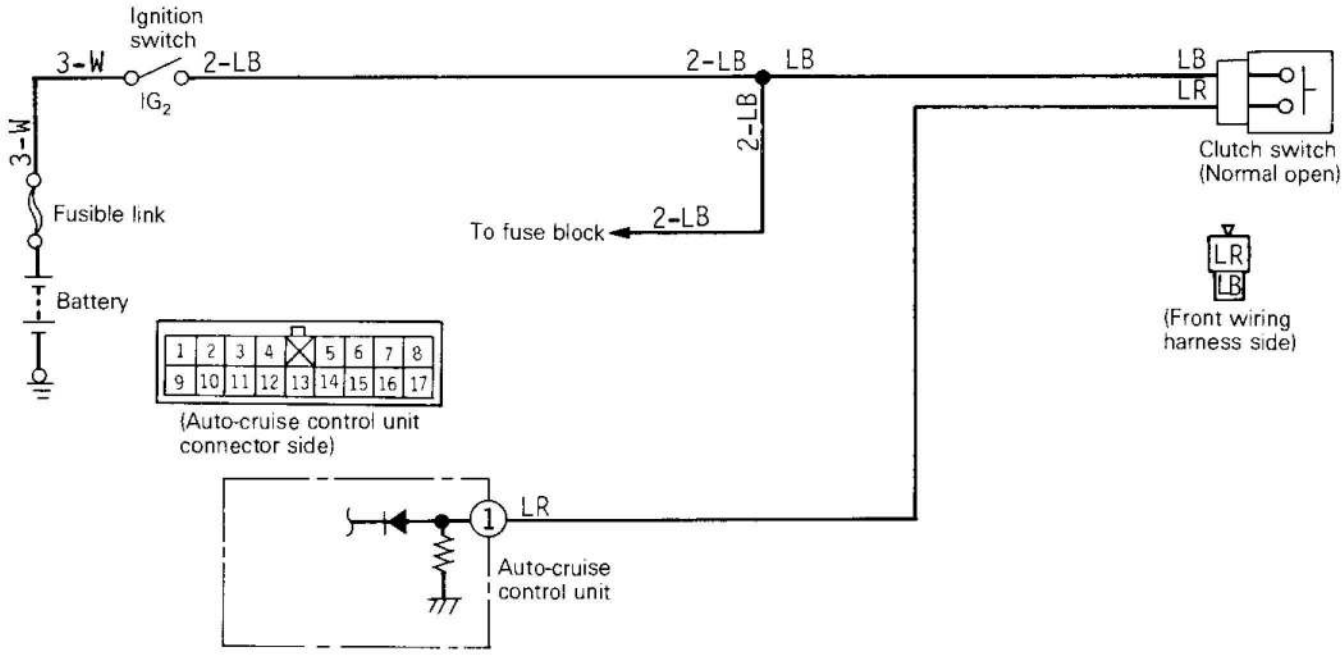
Troubleshooting Hint

Diagnosis – No. 16 (automatically cancelled)

AUTO-CRUISE CONTROL UNIT TERMINAL VOLTAGE

Terminal No.	Signal	Conditions	Terminal voltage
11	Stop lamp switch (load side)	When the brake pedal is depressed	12V
		When the brake pedal is not depressed	0V
10	Stop lamp switch (power supply side)	At all times	12V

6-2. CLUTCH SWITCH CIRCUIT CHECK



03G0216

Description of Operation

If the clutch pedal is depressed during constant-speed travel, the contacts of the clutch switch close, with the result that the cancel signal is sent to the control unit, so that the current to the solenoid valve of the actuator is discontinued within the control unit, thereby cancelling the constant-speed travel.
The flow of current is to the ignition switch, the clutch switch, and the control unit.

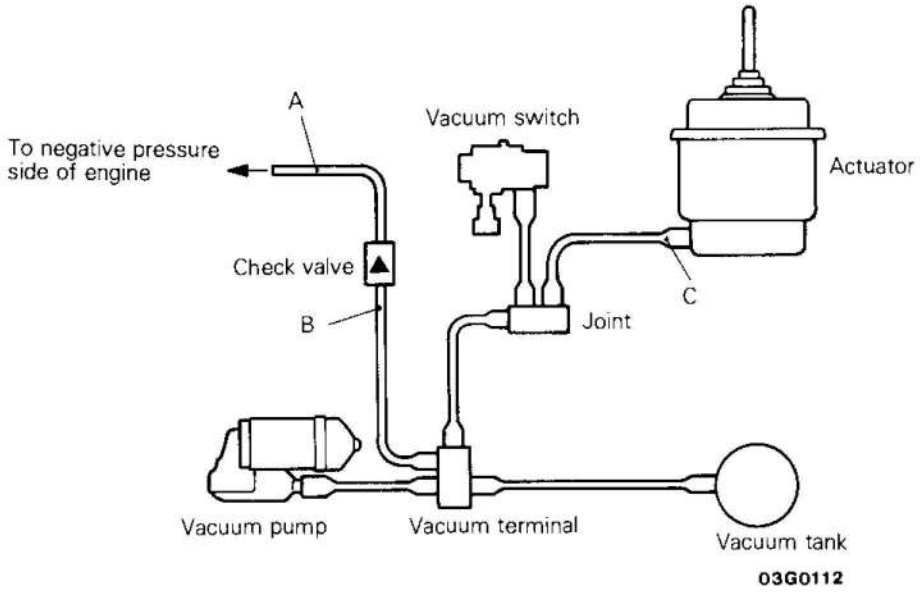
Troubleshooting Hint

Diagnosis – No. 16 (automatically cancelled)

AUTO-CRUISE CONTROL UNIT TERMINAL VOLTAGE

Terminal No.	Signal	Conditions	Terminal voltage
1	Clutch switch	When the clutch pedal is depressed	12V
		When the clutch pedal is not depressed	0V

7. VACUUM CIRCUIT CHECK

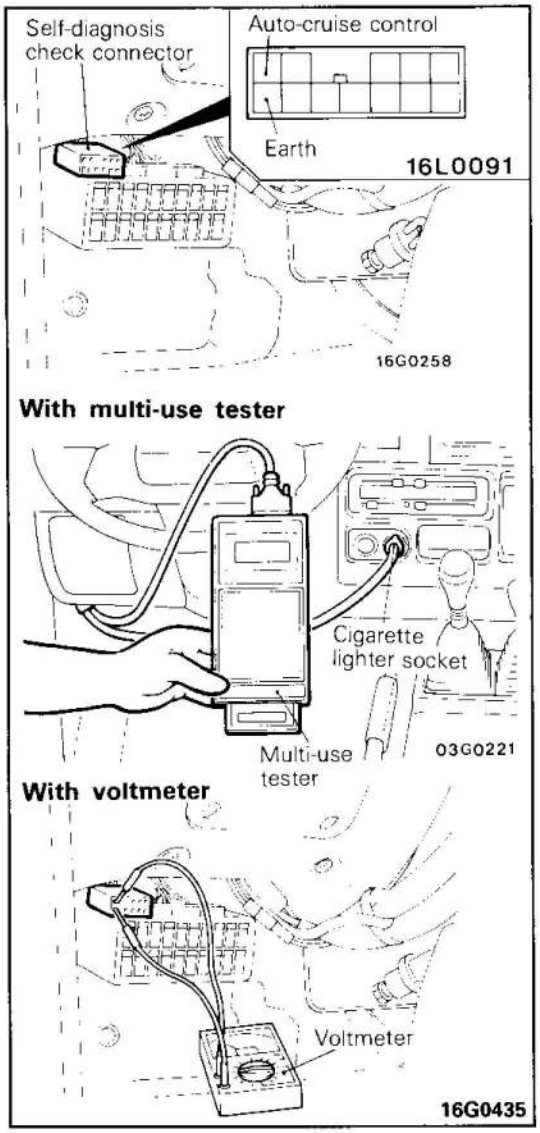


03G0112

Disconnect the vacuum hose at "A" part, and connect the Handy-pump or a similar pump. Connect the vacuum gauge to vacuum hose "C" part, and check with the speedometer tester as follows.

Step	Check method		Judgment		Cause	Remedy
	Condition	Check object	Normal	Malfunction		
1	Apply a vacuum with the Handy-pump or a similar pump and set auto-cruise control.	Vacuum is maintained	Vacuum gauge shows stable negative pressure.	Vacuum decreases	Leakage in vacuum system	Check air-tightness between check valve and vacuum hose "C". Replace if necessary.
				Vacuum increases	Defective vacuum switch or vacuum relay	Check vacuum switch or vacuum relay. Replace if necessary.
2	Disconnect vacuum hose at check valve "B" part, and plug the hose immediately with a finger.	Vacuum occurs	Vacuum gauge shows negative pressure.	Vacuum decreases	Defective vacuum switch, vacuum relay or vacuum pump	Check vacuum switch, vacuum relay or vacuum pump. Replace if necessary.

NOTE
1. Check that connectors and vacuum hose are free of detrimental cracks or collapse.
2. If all the results of the above inspection are correct then inspect the actuator. (Refer to P. 13-132.)



SELF-DIAGNOSIS CHECK

Self-diagnosis checking is performed when there has been an automatic cancellation, without cancel switch operation.

(1) The following method can be used for checking the diagnosis. The diagnosis check connector is located on the fuse block.

① If a multi-use tester is used.
Connect the multi-use tester's socket and connector to the cigarette lighter socket and the self-diagnosis check connector, and set the tester.
Use the tester according to its operation instructions; display the diagnosis code number and then check.

② If a voltmeter is used.
Connect a voltmeter between the earth terminal and the terminal for auto-cruise control of the diagnosis check connector.
It is possible to discover which circuit is the cause of the cancellation by verifying the indication shown by the voltmeter with the display patterns shown on the next page.

(2) When diagnosis code No. 11, 12, 15 or 16 is displayed, check by referring to the check chart applicable to that number.

NOTE
There are six diagnosis items, inclucing the one for the normal condition. As examples of the normal condition, code No. 16 is entered in the memory as cancel switch ON signal input if the system is canceled by depressing the brake pedal, and code No. 13 or No. 14 is entered when there is an automatic cancellation because the vehicle speed drops when the vehicle is driven up a steep slope with the preset speed setting left set, etc.. When, however, there is cancellation not intentionally made by the driver, the cause might be damaged or disconnected stop light switch input wiring, a malfunction of the stop light switch ON, etc., even though the same code No. 16 is displayed.

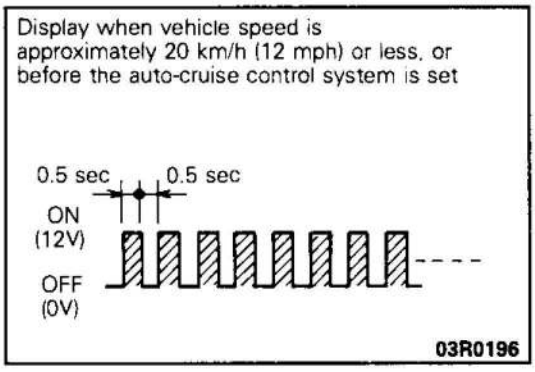
DIAGNOSIS CODES AND VOLTMETER DISPLAY PATTERNS

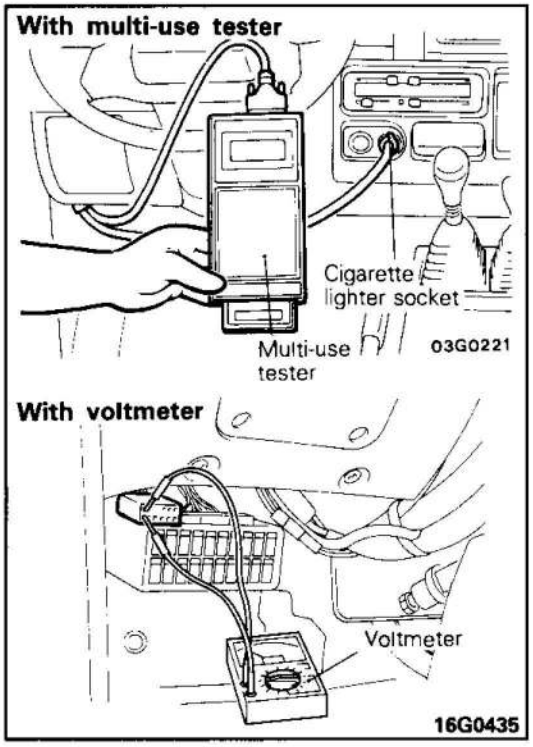
Output codes		Probable cause	Check chart
Code No.	Voltmeter display patterns		
11	12V 0V 1 1	Abnormal condition of actuator drive system	5
12	12V 0V 1 2	Abnormal condition of vehicle-speed signal system	4
13*	12V 0V 1 3	Low-speed limitter activation (The system is normal if it can be reset.)	–
14*	12V 0V 1 4	Automatic cancellation activated by vehicle speed reduction. (The system is normal if it can be reset.)	–
15*	12V 0V 1 5	Control switch malfunction (when SET and RESUME switches switched ON simultaneously)	2, 3
16*	12V 0V 1 6	Cancel switch ON signal input (including stop lamp switch and clutch switch input wiring damage or disconnection)	6, 7

03R0193

NOTE
1. Codes indicated by the * symbol are displayed, if the conditions are satisfied, even if the system is normal. In either case, the system is normal if it can be reset. If there is an automatic cancellation not intentionally made by the driver, however, excluding cancellatinos explicitly made by the cancel procedure, there may be a temporary malfunction such as poor contact of a harness connector even though the system can be reset, and for that reason it is necessary to check according to each indivudual check chart that is applicable.

2. Diagnosis codes are displayed when, after cancellation of the auto-cruise control system, the vehicle speed decreases to less than approximately 20 km/h (12 mph), and are erased by switching OFF the ignition switch or the auto-cruise control swtich.
   After the diagnosis codes in the memory are erased, if (when the power supply of the auto-cruise control unit is switched ON once again) the power supply of the electronic control unit is normal, the diagnosis output code display will be as below, regardless of whether the system condition is normal or not.
   (1) If a multi-use tester is used: "NORMALII" will be displayed.
   (2) If a voltmeter is used:
   Continuous ON/OFF signals will be displayed at 0.5 second intervals.
   (Refer to the figure at the left)



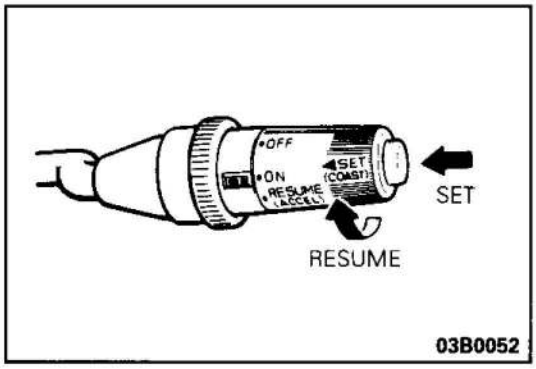


INPUT CHECK

Input checks should be made when the auto-cruise control system cannot be set and when it is necessary to check (when a malfunction related to the auto-cruise control system occurs) whether or not the input signals are normal.

NOTE
1. If inspection of self-diagnosis is necessary, confirm diagnosis code first and conduct input check.
2. Input check can be conducted by set operations.
   Self-diagnosis terminal outputs codes number or display patterns.
3. Display codes are displayed only if the circuit is normal according to the conditions shown in the table the next page.

(1) If a multi-use tester is used, the setting of the tester is the same as for the self-diagnosis check, and call-out the auto-cruise control system.
(2) The voltmeter is set in the same way as for the self-diagnosis check.
(3) Turn the ignition key to ON. (Check No. 1 to No. 3 of the input check table.)
(4) Start the engine. (Check No. 4 and No. 5 of the input check table.)



(5) Code call–out
① Switch OFF the main switch.
② With the SET switch in the ON position, turn the MAIN switch ON. Then, within 1.0 second, place the RESUME switch in the ON position.

(6) Code read-out
① Perform each input operation according to the input check table and read the codes.

NOTE
- Each code will be displayed in an order of priority beginning from No. 1.
  When each input operation is performed and the signals for the conditions are received by the computer, each output code will be repeatedly displayed in the sequence of priority for as long as that signal continues.
  If there is no display, it is possible that there is a malfunction of the auto-cruise control unit power-supply circuit or the SET and/or RESUME switch, so check according to check charts 1, 2 and 3 (P. 13-86, 87, 88).
- If, during the display of output codes, the input operation is canceled (if, for example, the SET switch is set from ON to OFF), the code will be displayed for one cycle of the display, but will not be displayed during the next cycle.
  This makes it possible, therefore, to check the OFF condition (existence of not of a short-circuit of the input line or the switch).

② Switch the auto-cruise control switch OFF.

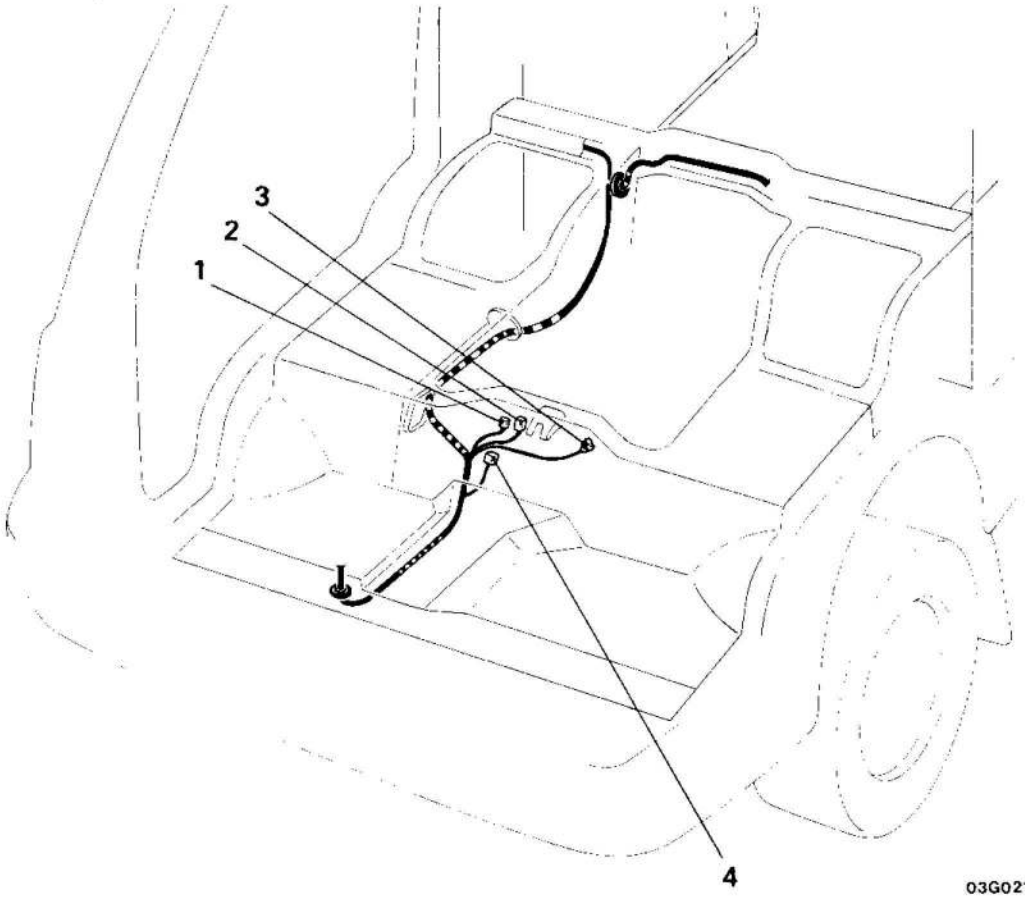
INPUT CHECK TABLE

Checking sequence	Input operation	Output codes		Check results
		Code No.	Voltmeter display patterns	
1	SET switch ON	21	12V 0V	SET switch circuit normal
2	RESUME switch ON	22	12V 0V	RESUME switch circuit normal
3	Each CANCEL switch ON 1. Stop lamp switch (brake pedal depressed) 2. Clutch switch (clutch pedal depressed)	23	12V 0V	Each CANCEL circuit normal
4	Driving at approximately to 40 km/h (25 mph) or higher	24	12V 0V	When both No. 4 and No. 5 can be confirmed, vehicle-speed sensor circuit normal.
5	Driving at less than approximately 40 km/h (25 mph) or stopped	25	12V 0V	

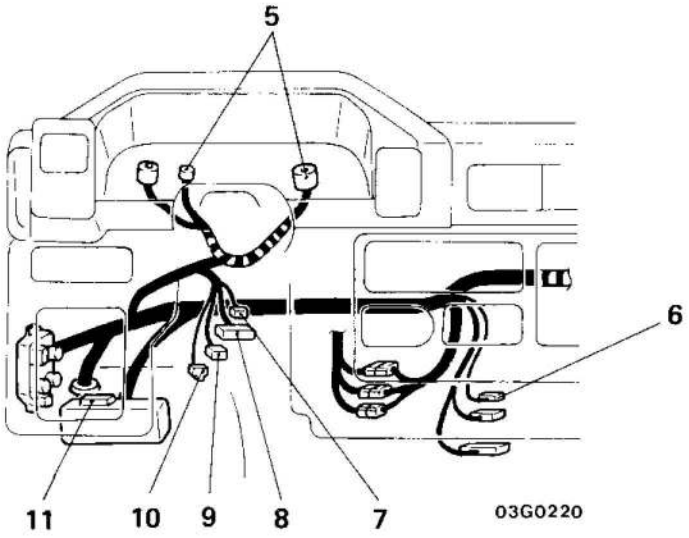
03R0192

AUTO-CRUISE CONTROL RELATED HARNESSES

ENGINE COMPARTMENT, UNDER FLOOR

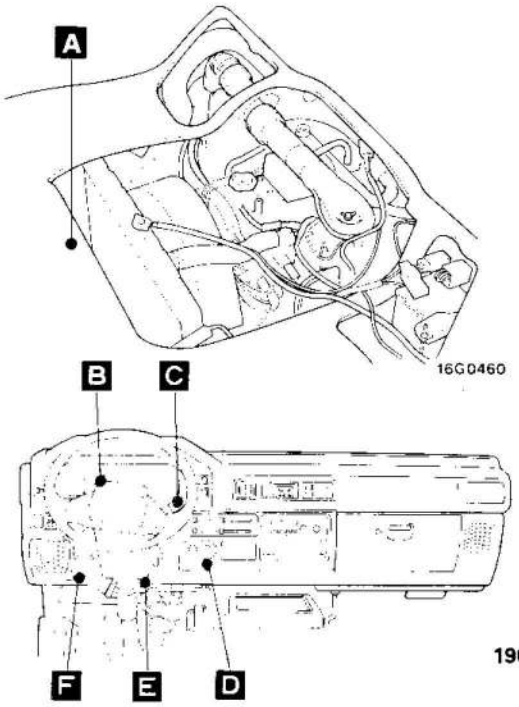


INSIDE THE CABIN



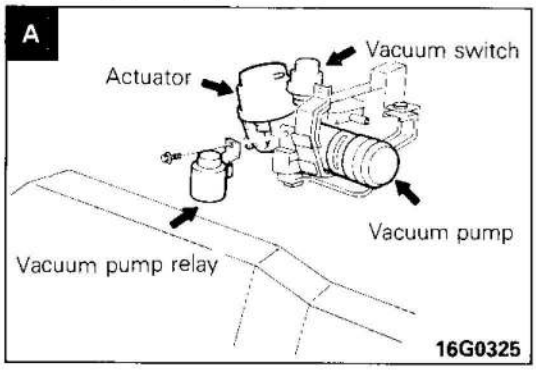
1. Vacuum pump
2. Actuator
3. Vacuum switch
4. Vacuum pump relay
5. Combination meter (Reed switch)
6. Auto-cruise control unit
7. Ignition switch
8. Column switch (Auto-cruise control switch)
9. Stop lamp switch
10. Clutch switch
11. Self-diagnosis check connector

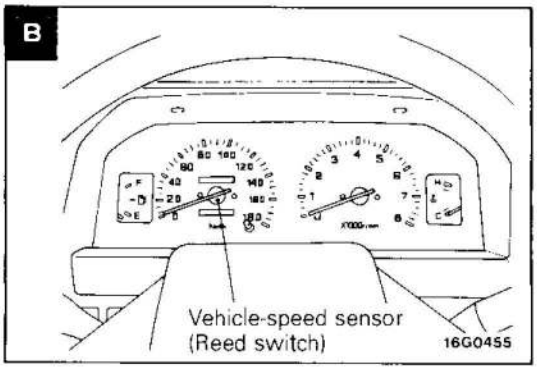
AUTO-CRUISE CONTROL COMPONENTS LOCATION

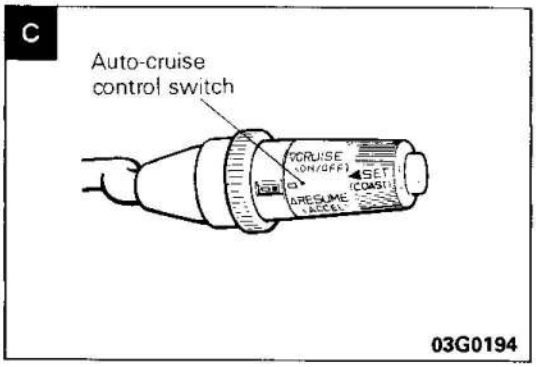


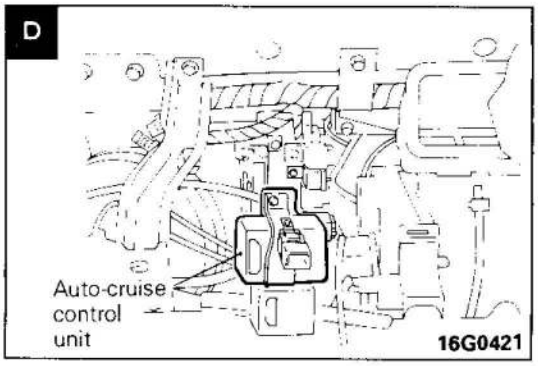
19G0361

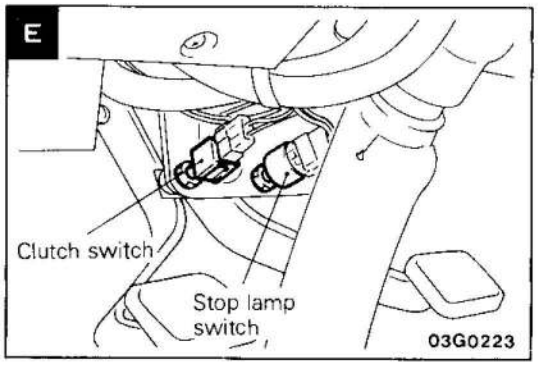
Name	Symbol
Actuator	A
Vacuum pump	
Vacuum pump relay	
Vacuum swtich	
Vehicle-speed sensor (reed switch)	B
Auto-cruise contol switch	C
Auto-cruise contorl unit	D
Stop lamp switch	E
Clutch switch	
Self-diagnosis check connector	F

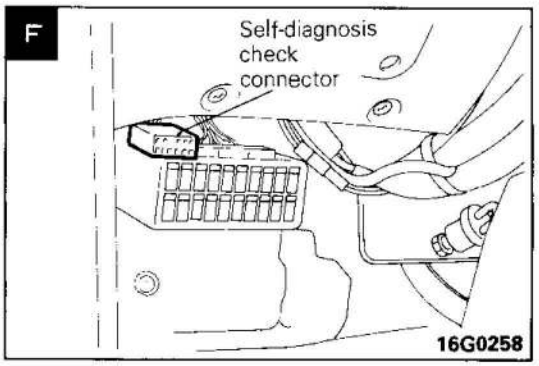










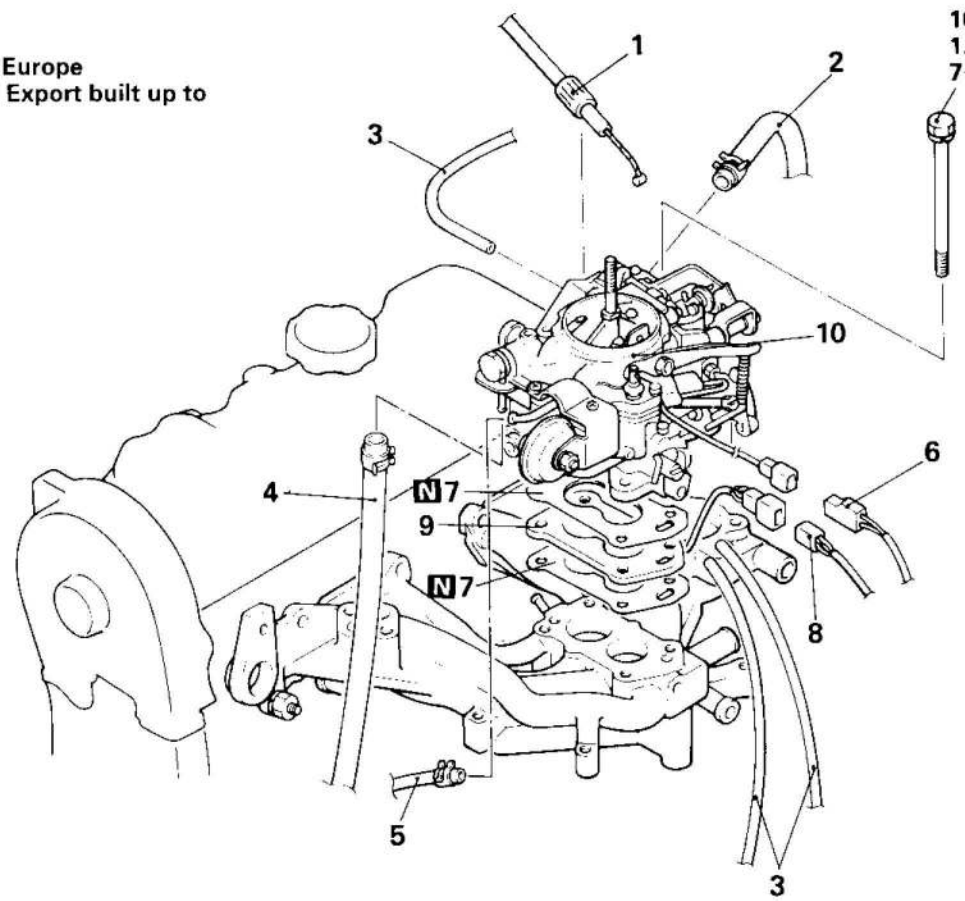


CARBURETOR (CONVENTIONAL TYPE)

E13PA--

REMOVAL AND INSTALLATION

Vehicles for Europe
and General Export built up to
May 1994



03G0023

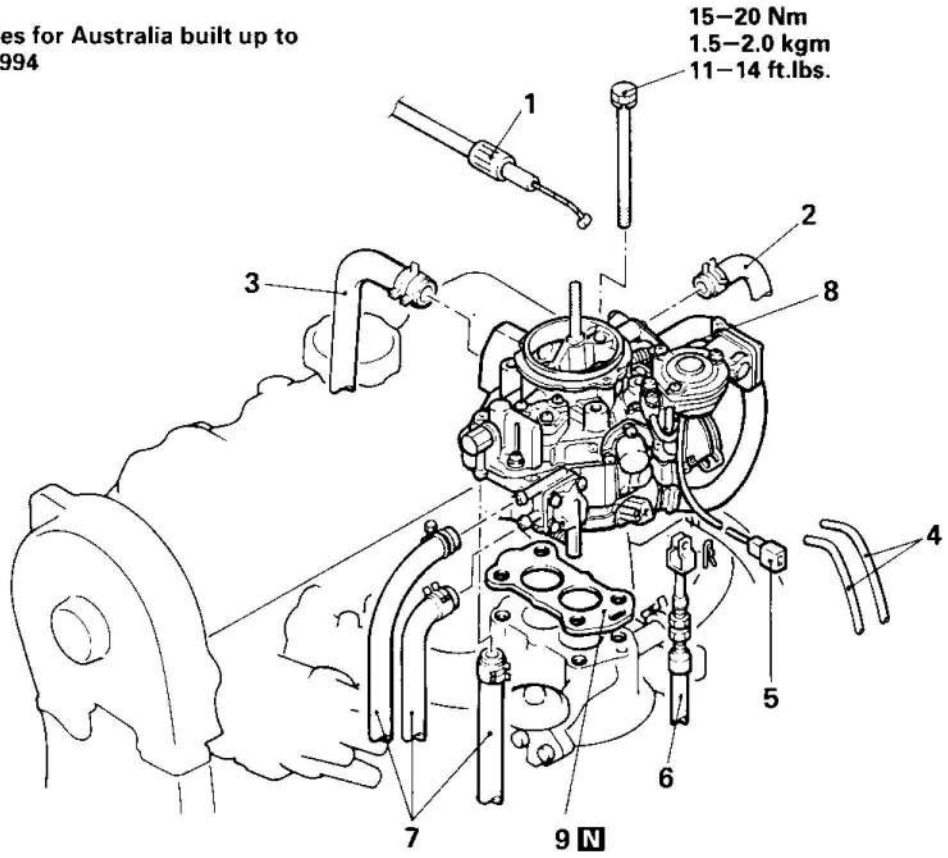
Removal steps

1. Accelerator cable
2. Water hose (vehicles for Europe)
3. Vacuum hoses
4. Fuel hose
5. Fuel vapor hose
6. Fuel cut solenoid valve connector connection
7. Gasket
8. Heater assembly connector connection (vehicles for Europe)
9. Heater assembly (vehicles for Europe 4G63 engine)
   Insulator (vehicles except for Europe 4G63 engine)
10. Carburetor assembly

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

Pre-removal Operation
- Removal of seat underframe (L.H. drive vehicles)
  (Refer to GROUP 01 GENERAL–Engine Compartment Work.)
- Removal of air horn
  (Refer to GROUP 15 INTAKE AND EXHAUST–Air Cleaner.)
- Drainage of Coolant (vehicles for Europe)

Post-installation Operation
- Installation of air horn
  (Refer to GROUP 15 INTAKE AND EXHAUST–Air Cleaner.)
- Filling of coolant (vehicles for Europe)
  (Refer to GROUP 14 COOLING–Service Adjustment Procedures.)
- Adjustment of engine
  (Refer to GROUP 11 ENGINE–Adjustment of Engine.)
- Adjustment of accelerator cable
  (Refer to P.13–17.)
- Installation of seat underframe



Pre-removal Operation
- Removal of air horn (Refer to GROUP 15 INTAKE AND EXHAUST–Air Cleaner.)
- Drainage of Coolant

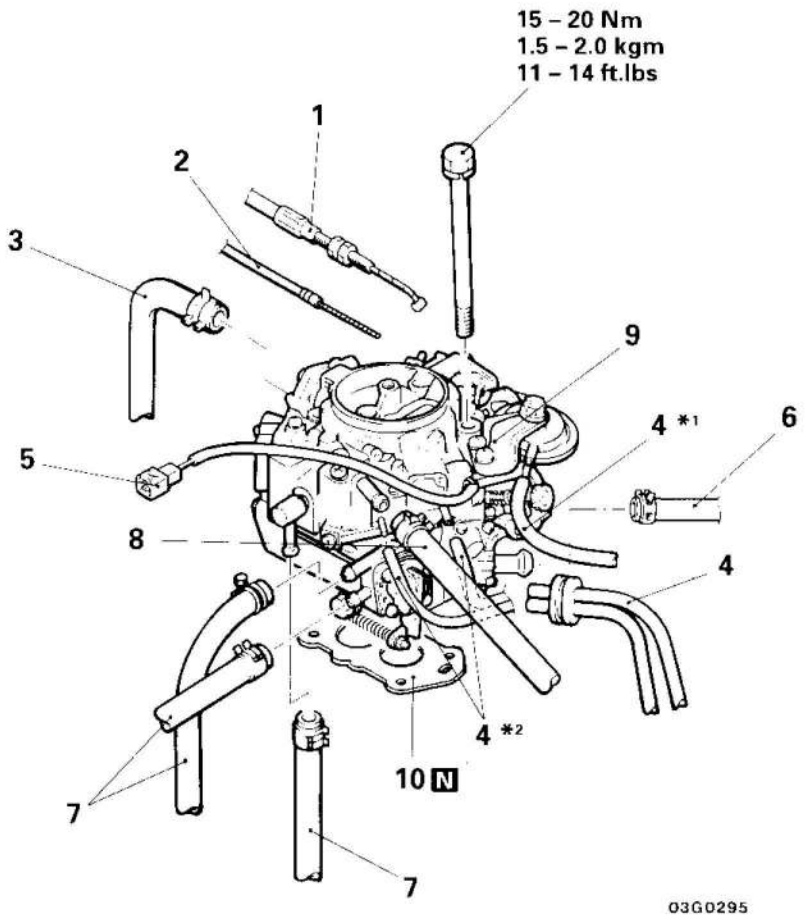
Post-installation Operation
- Installation of air horn (Refer to GROUP 15 INTAKE AND EXHAUST–Air Cleaner.)
- Filling of coolant (Refer to GROUP 14 COOLING–Service Adjustment Procedures.)
- Adjustment of engine (Refer to GROUP 11 ENGINE–Adjustment of Engine.)
- Adjustment of accelerator cable (Refer to P.13–17.)

Removal steps

1. Accelerator cable
2. Water hose
3. Fuel vapor hose
4. Vacuum hose
5. Fuel cut solenoid valve connector connection
6. Kick-down cable (vehicles with automatic transmission)
7. Fuel hose
8. Carburetor assembly
9. Gasket

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

Vehicles with manual choke built from June 1994



Removal steps

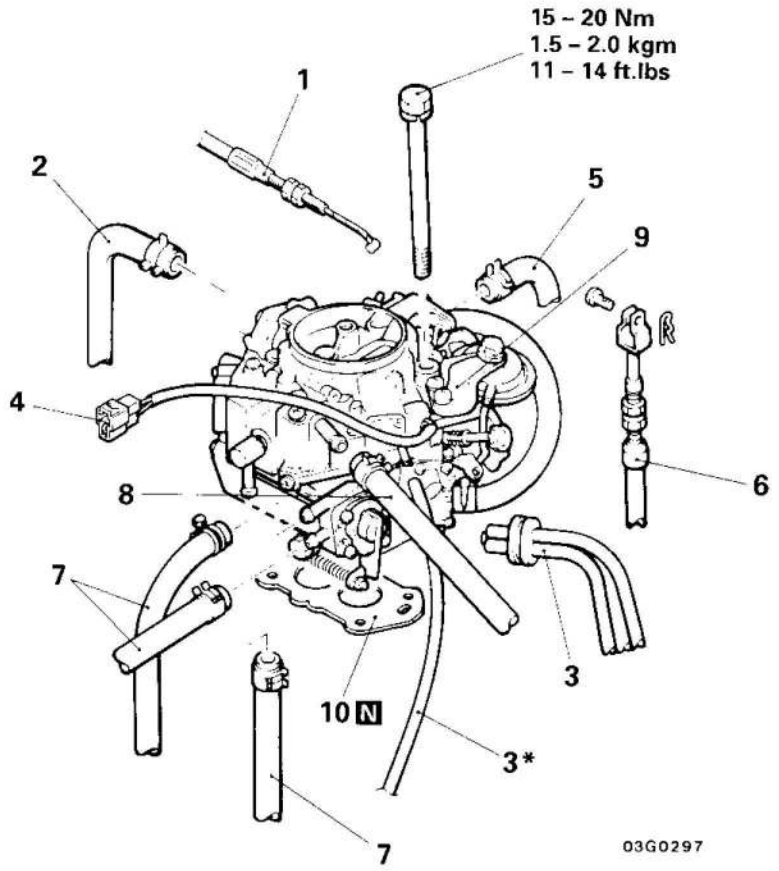
1. Accelerator cable
2. Choke cable
3. Fuel vapor hose
4. Vacuum hose
5. Solenoid valve connector connection
6. Water hose
7. Fuel hose
8. Innervent hose
9. Carburetor assembly
10. Gasket

NOTE
(1) Reverse the removal procedures to reinstall.
(2) N: Non-reusable parts
(3) *1: Vehicles with power steering (4G92)
(4) *2: Vehicles with high altitude compensator

Pre-removal Operation
- Removal of seat underframe (Refer to GROUP 01 GENERAL – Engine Compartment Work.)
- Removal of air horn (Refer to GROUP 15 INTAKE AND EXHAUST – Air Cleaner.)
- Drainage of Coolant

Post-installation Operation
- Installation of air horn (Refer to GROUP 15 INTAKE AND EXHAUST-Air Cleaner.)
- Filling of coolant (Refer to GROUP 14 COOLING – Service Adjustment Procedures.)
- Adjustment of engine (Refer to GROUP 11 ENGINE – Adjustment of Engine.)
- Adjustment of accelerator cable (Refer to P.13 – 17.)
- Installation of seat underframe

Vehicles with automatic choke built from June 1994



Pre-removal Operation
- Removal of air horn (Refer to GROUP 15 INTAKE AND EXHAUST – Air Cleaner.)
- Drainage of Coolant

Post-installation Operation
- installation of air horn (Refer to GROUP 15 INTAKE AND EXHAUST – Air Cleaner.)
- Filling of coolant (Refer to GROUP 14 COOLING – Service Adjustment Procedures.)
- Adjustment of engine (Refer to GROUP 11 ENGINE – Adjustment of Engine.)
- Adjustment of accelerator cable (Refer to P.13 – 17.)

Removal steps

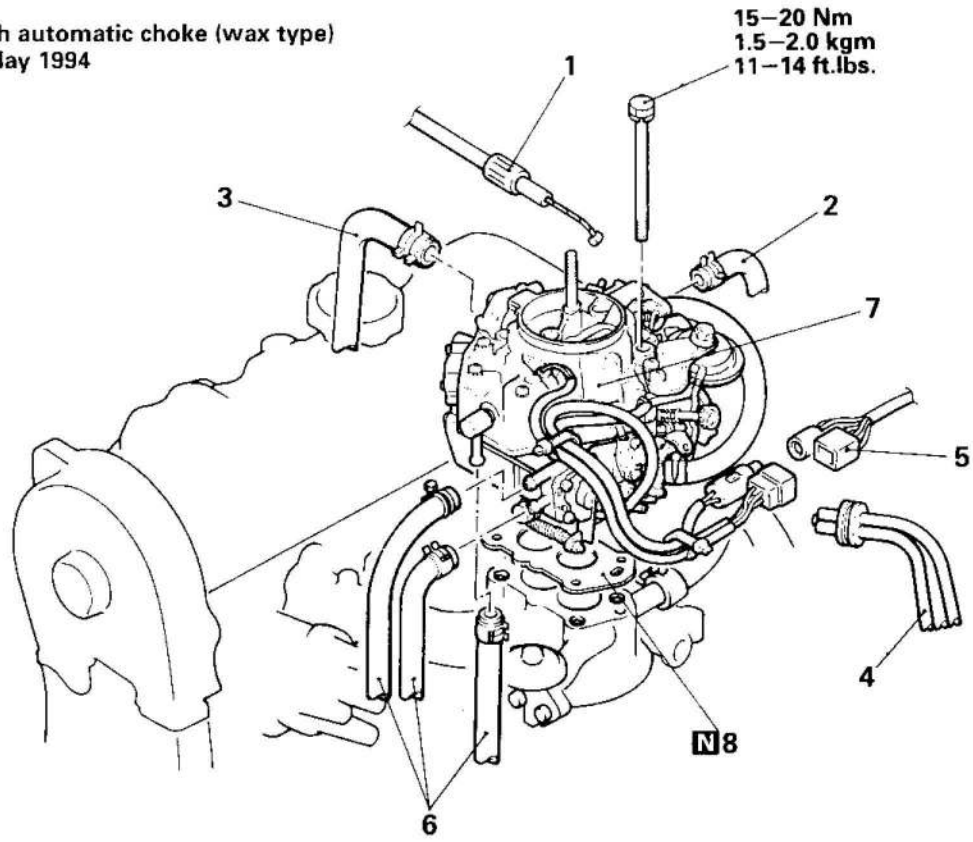
1. Accelerator cable
2. Fuel vapor hose
3. Vacuum hose
4. Solenoid valve connector connection
5. Water hose
6. Kick-down cable (vehicles with automatic transmission)
7. Fuel hose
8. Innervent hose
9. Carburetor assembly
10. Gasket

NOTE
(1) Reverse the removal procedures to reinstall.
(2) N : Non-reusable parts
(3) * : Vehicles for Australia

CARBURETOR (FBC)

REMOVAL AND INSTALLATION

Vehicles with automatic choke (wax type) built up to May 1994



Pre-removal Operation
- Removal of seat underframe
  (Refer to GROUP 01 GENERAL–Engine Compartment Work.)
- Removal of air horn
  (Refer to GROUP 15 INTAKE AND EXHAUST–Air Cleaner.)
- Drainage of Coolant

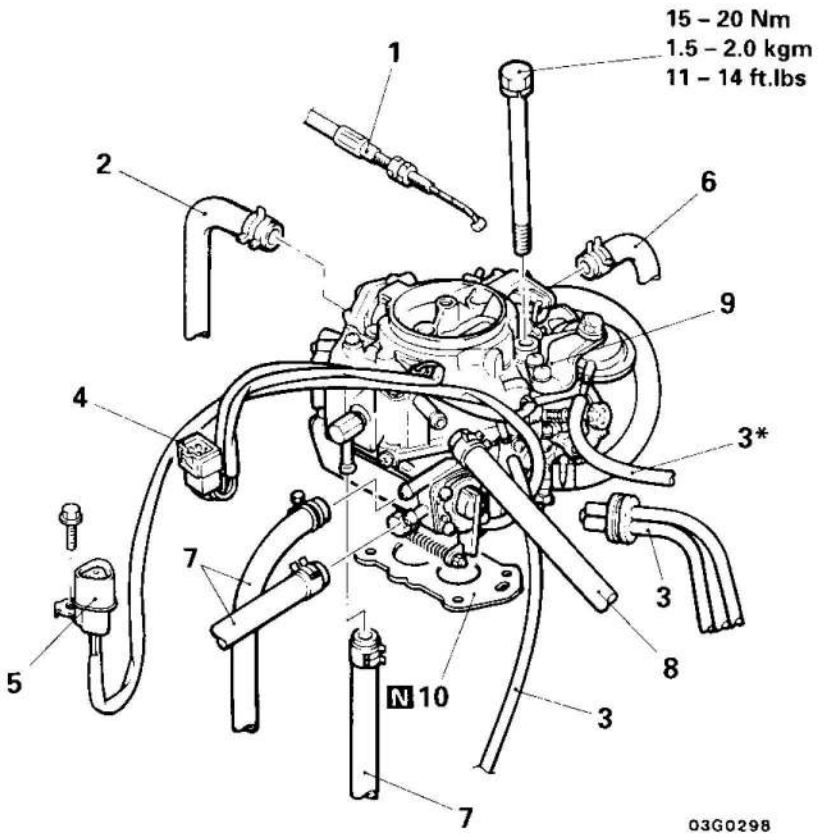
Post-installation Operation
- Installation of air horn
  (Refer to GROUP 15 INTAKE AND EXHAUST–Air Cleaner.)
- Filling of coolant
  (Refer to GROUP 14 COOLING–Service Adjustment Procedures.)
- Adjustment of engine
  (Refer to GROUP 11 ENGINE–Adjustment of Engine.)
- Adjustment of accelerator cable
  (Refer to P.13–33.)
- Installation of seat underframe

Removal steps

1. Accelerator cable
2. Water hose
3. Fuel vapor hose
4. Vacuum hose
5. Fuel control harness connection
6. Fuel hose
7. Carburetor assembly
8. Gasket

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

Vehicles with automatic choke (wax type) built from June 1994



Removal steps

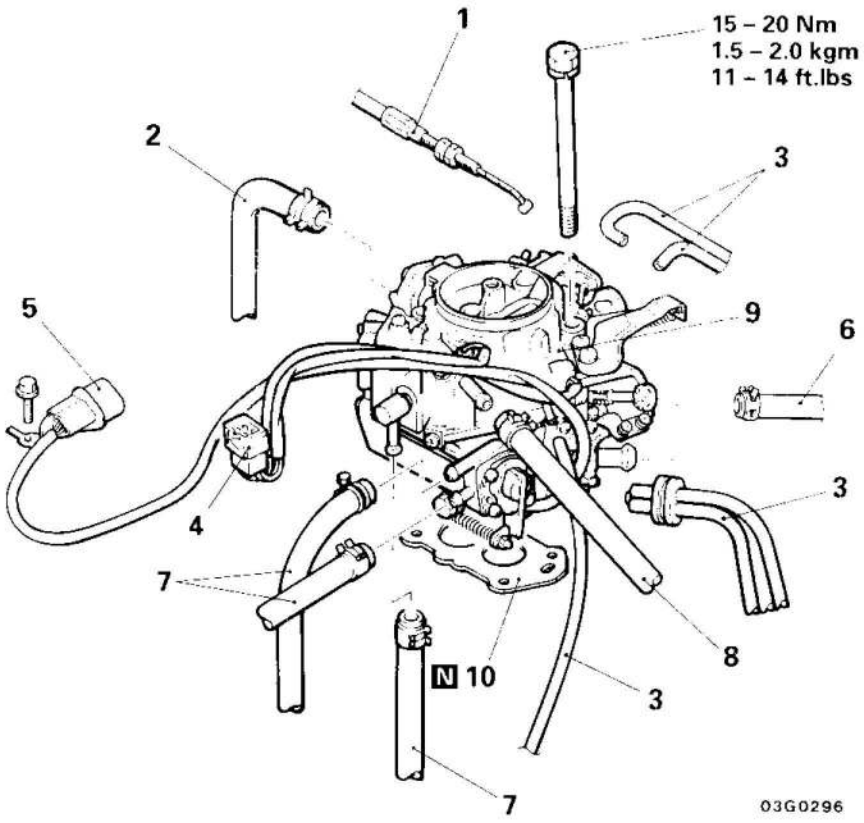
1. Accelerator cable
2. Fuel vapor hose
3. Vacuum hose
4. Solenoid valve connector connection
5. Throttle position sensor connector connection
6. Water hose
7. Fuel hose
8. Innervent hose
9. Carburetor assembly
10. Gasket

NOTE
(1) Reverse the removal procedures to reinstall.
(2) N : Non-reusable parts
(3) * : Vehicles with power steering

Pre-removal Operation
- Removal of air horn
  (Refer to GROUP 15 INTAKE AND EXHAUST – Air Cleaner.)
- Drainage of Coolant

Post-installation Operation
- installation of air horn
  (Refer to GROUP 15 INTAKE AND EXHAUST – Air Cleaner.)
- Filling of coolant
  (Refer to GROUP 14 COOLING – Service Adjustment Procedures.)
- Adjustment of engine
  (Refer to GROUP 11 ENGINE – Adjustment of Engine.)
- Adjustment of accelerator cable
  (Refer to P.13-56-1.)

Vehicles with automatic choke (electrical type) built from June 1994



Removal steps

1. Accelerator cable
2. Fuel vapor hose
3. Vacuum hose
4. Solenoid valve connector connection
5. Throttle position sensor connector connection
6. Water hose
7. Fuel hose
8. Innervent hose
9. Carburetor assembly
10. Gasket

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

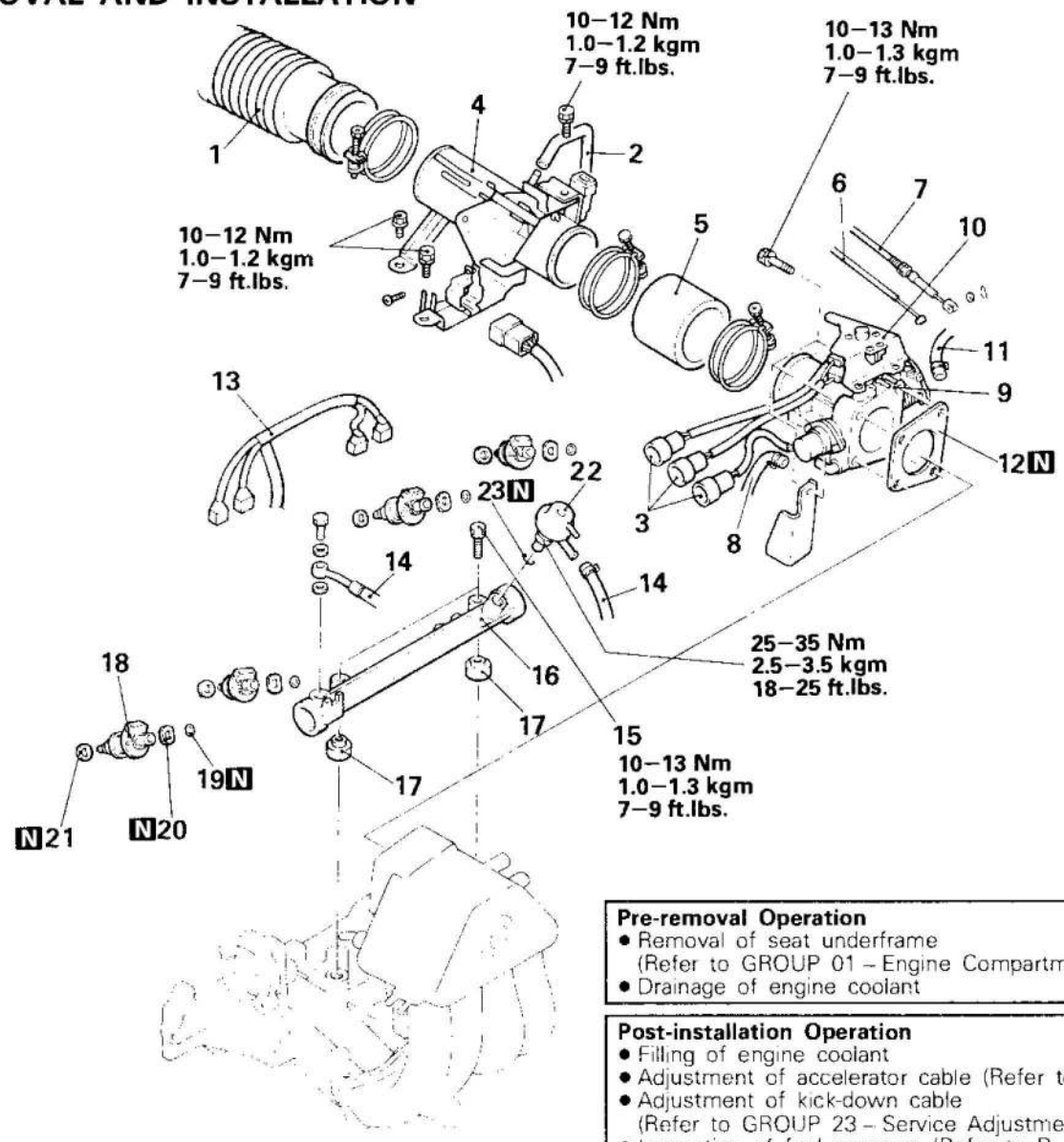
Pre-removal Operation
- Removal of seat underframe (Refer to GROUP 01 GENERAL – Engine Compartment Work.)
- Removal of air horn (Refer to GROUP 15 INTAKE AND EXHAUST – Air Cleaner.)
- Drainage of Coolant

Post-installation Operation
- installation of air horn (Refer to GROUP 15 INTAKE AND EXHAUST – Air Cleaner.)
- Filling of coolant (Refer to GROUP 14 COOLING – Service Adjustment Procedures.)
- Adjustment of engine (Refer to GROUP 11 ENGINE – Adjustment of Engine.)
- Adjustment of accelerator cable (Refer to P.13-56-1.)
- Installation of seat underframe

INJECTOR AND THROTTLE BODY (MPI) [Vehicles built up to June 1989]

REMOVAL AND INSTALLATION

E13WA – A



Pre-removal Operation
- Removal of seat underframe
  (Refer to GROUP 01 – Engine Compartment Work.)
- Drainage of engine coolant

Post-installation Operation
- Filling of engine coolant
- Adjustment of accelerator cable (Refer to P. 13-57.)
- Adjustment of kick-down cable
  (Refer to GROUP 23 – Service Adjustment Procedures.)
- Inspection of fuel pressure (Refer to P. 13-59.)
- Installation of seat underframe

Removal steps

1. Air intake hose
2. Breather hose
3. Wiring harness connector
4. Air intake pipe
- ◆◆ 5. Air hose
6. Accelerator cable
7. Kick down cable
   (vehicles with automatic transmission)
8. Water hose
9. Vacuum hose connection
10. Throttle body
11. Water hose
12. Gasket
13. Fuel injector harness connector
- ◆◆ 14. Fuel high pressure hose connection
15. Bolt
- ◆◆ ◆◆ 16. Delivery pipe
- ◆◆ 17. Insulator
- ◆◆ 18. Injector
19. O-ring
20. Grommet
21. Insulator
- ◆◆ 22. Fuel pressure regulator
23. O-ring

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 E13WBAA

14. DISCONNECTION OF FUEL HIGH PRESSURE HOSE

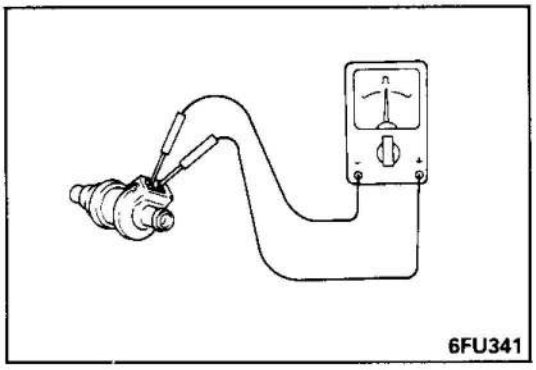
Release residual pressure from the fuel pipe line to prevent fuel from spilling.
Refer to P. 13-59 for releasing residual pressure.

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.

16. REMOVAL OF DELIVERY PIPE

Remove the delivery pipe with the fuel injector and pressure regulator as installed.

Caution
Do not drop the injector when remove the delivery pipe.



INSPECTION E13WCAA

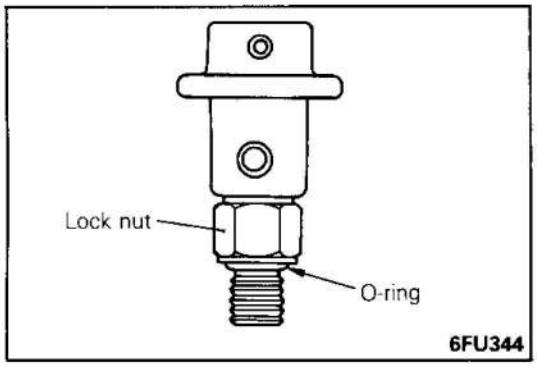
INJECTORS

(1) Measure resistance between terminals of injector using an ohmmeter.

Standard value [at 20°C (68°F)]:

Vehicles for Europe	
Built up to November 1988	**2 – 3 Ω**
Built from December 1988	**13 – 16 Ω**
Vehicles for Australia	**2 – 3 Ω**

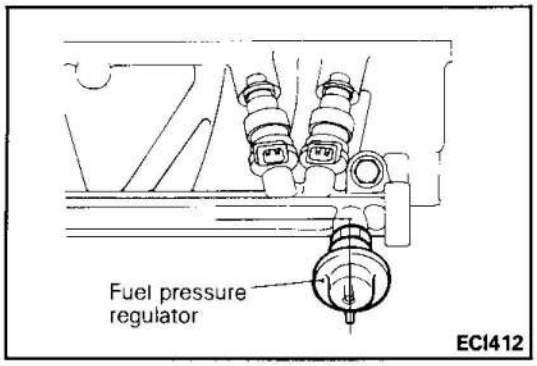
(2) If the resistance is out of specification, replace the injector.



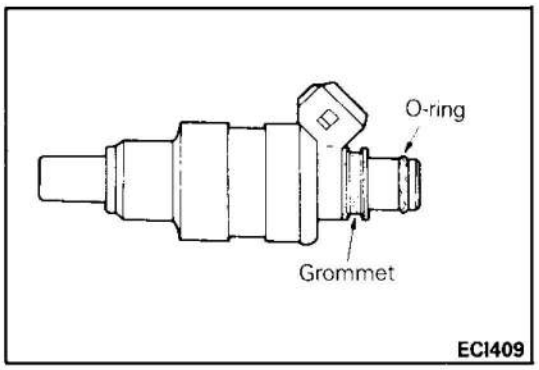
SERVICE POINTS OF INSTALLATION E13WDAA

22. INSTALLATION OF FUEL PRESSURE REGULATOR

(1) Apply a coating of spindle oil or gasoline to the new O-ring.
(2) Return the lock nut to the regulator side until it stops.
(3) Manually screw the pressure regulator to the delivery pipe.



(4) Turn in the reverse direction (less than 1 turn) so that the nipple is in the position shown in the figure.
(5) After the position is determined, tighten the lock nut at the specified torque.

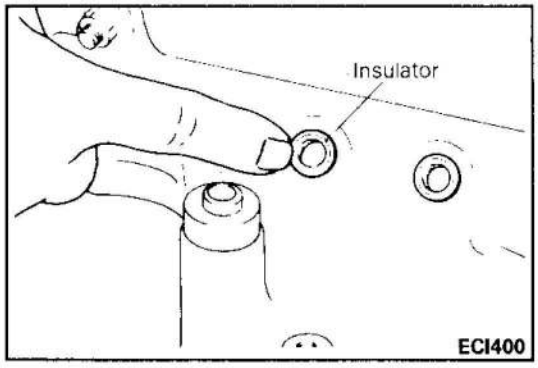


18. INSTALLATION OF INJECTOR

(1) Install a new grommet and O-ring to the injector.
(2) Apply a coating of spindle oil or gasoline to the O-ring of the injector.

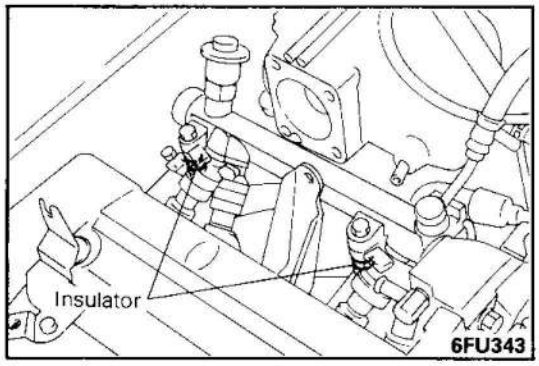
(3) While turning the injector to the left and right, install it to the delivery pipe.
(4) Check to be sure that the injector turns smoothly.

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



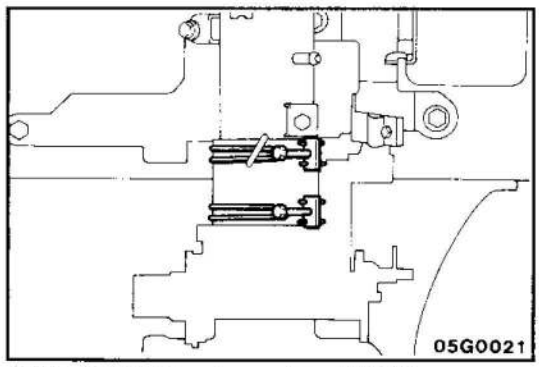
17. INSTALLATION OF INSULATOR

Install a new insulator to the intake manifold.



16. INSTALLATION OF DELIVERY PIPE

Check to be sure that the insulator is correctly inserted into the delivery pipe's installation hole.



5. INSTALLATION OF AIR HOSE

When installing air hose, tighten so that air hose band bolt is slanted approx. 45° from the horizontal.

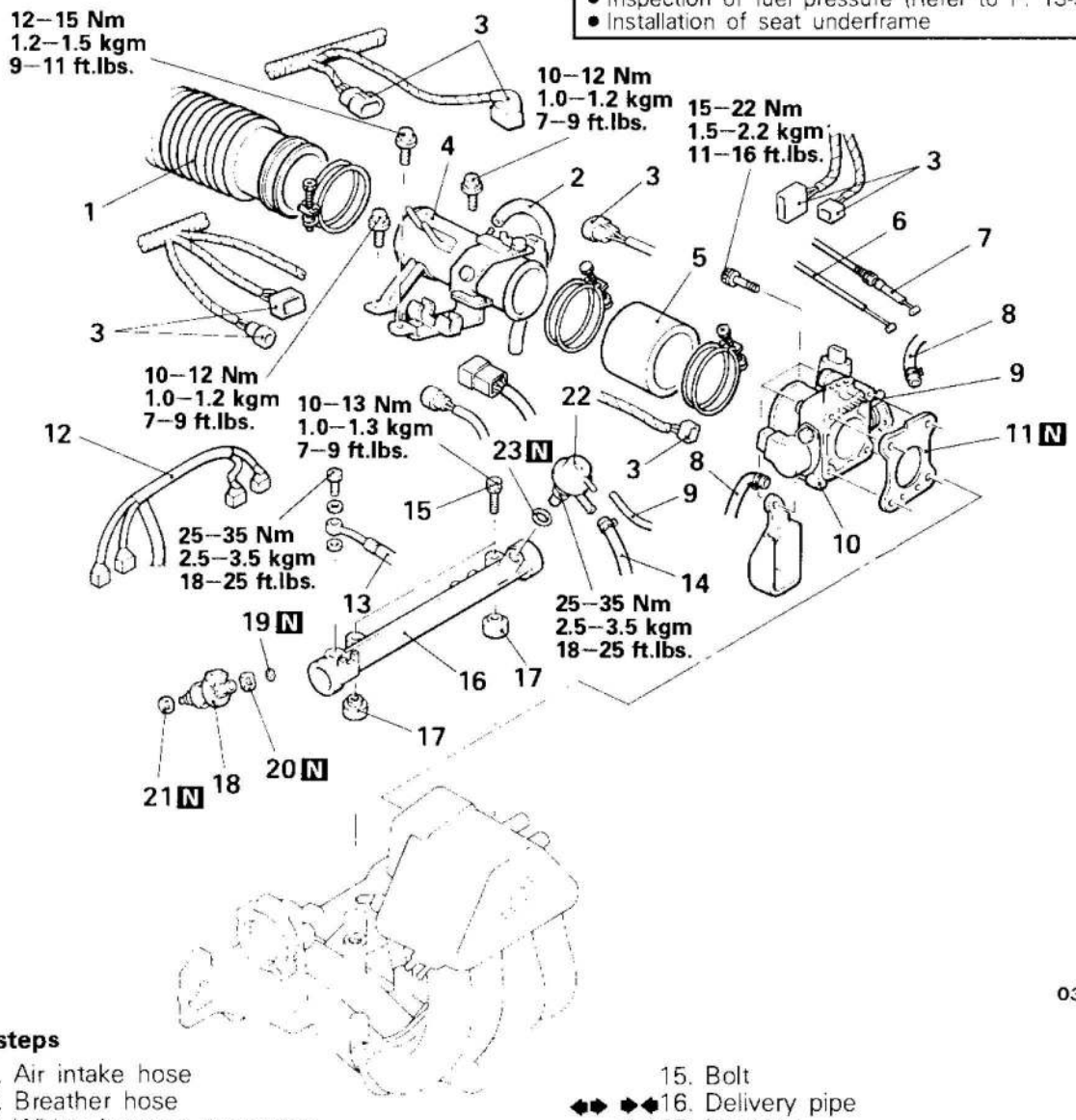
INJECTOR (MPI)
[Vehicles built from July 1989 up to May 1994]

REMOVAL AND INSTALLATION

E13WA – B

Pre-removal Operation
- Removal of seat underframe (Refer to GROUP 01 – Engine Compartment Work.)
- Drainage of engine coolant

Post-installation Operation
- Filling of engine coolant
- Adjustment of accelerator cable (Refer to P. 13-57.)
- Adjustment of kick-down calbe (Refer to GROUP 23 – Service Adjustment Procedures.)
- Inspection of fuel pressure (Refer to P. 13-59.)
- Installation of seat underframe



03G0199

Removal steps

1. Air intake hose
2. Breather hose
3. Wiring harness connector
4. Air intake pipe
- ◆◆ 5. Air hose
6. Accelerator cable
7. Kick down cable (vehicles with automatic transmission)
8. Water hose
9. Vacuum hose connection
10. Throttle body
- ◆◆ 11. Gasket
12. Fuel injector harness connector
- ◆◆ 13. Fuel high pressure hose connection
14. Fuel return hose
15. Bolt
- ◆◆ ◆◆ 16. Delivery pipe
- ◆◆ 17. Insulator
- ◆◆ 18. Injector
19. O-ring
20. Grommet
21. Insulator
- ◆◆ 22. Fuel pressure regulator
23. O-ring

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 E13WBBA

13. DISCONNECTION OF FUEL HIGH PRESSURE HOSE

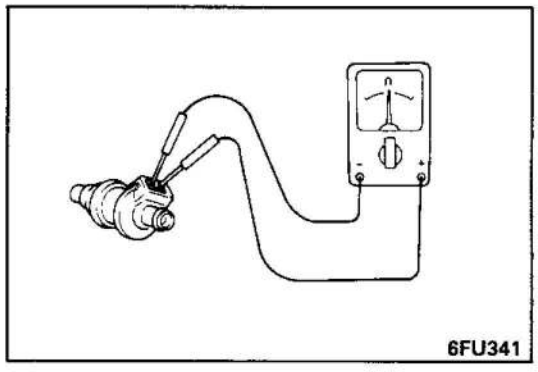
Release residual pressure from the fuel pipe line to prevent fuel from spilling.
Refer to P. 13-59 for releasing residual pressure.

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.

16. REMOVAL OF DELIVERY PIPE

Remove the delivert pipe with the fuel injector and pressure regulator as installed.

Caution
Do not drop the injector when removing the delivert pipe.


6FU341

INSPECTION E13WCAA

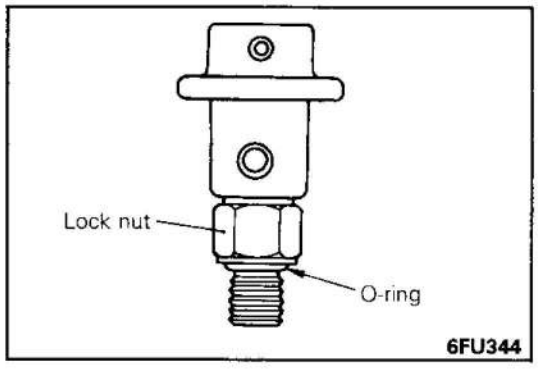
INJECTORS

(1) Measure resistance between terminals of injector using an ohmmeter.

Standard value [at 20°C (68°F)]:

Vehicles for Europe	**13 – 16 Ω**
Vehicles for Australia	**2 – 3 Ω**

(2) If the resistance is out of specification, replace the injector.

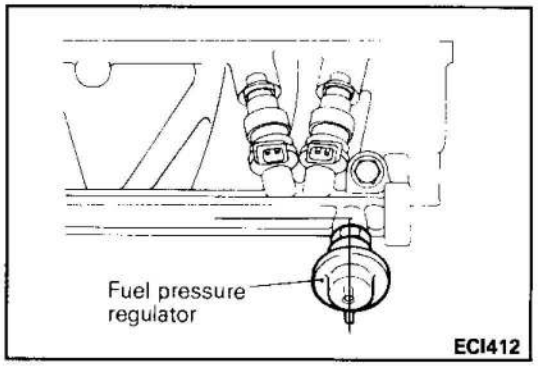


6FU344

SERVICE POINTS OF INSTALLATION E13WDBA

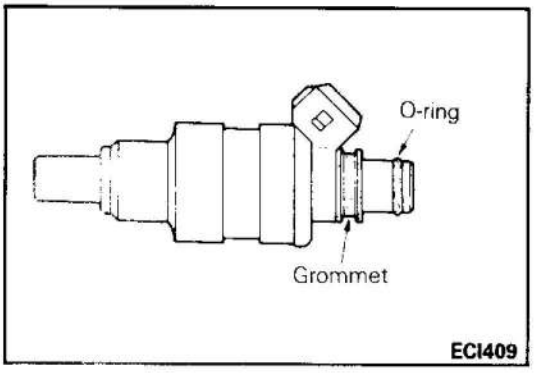
22. INSTALLATION OF FUEL PRESSURE REGULATOR

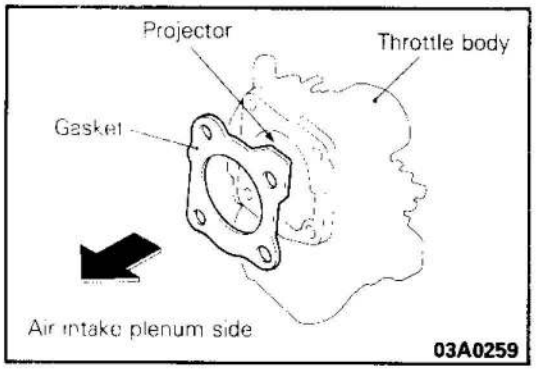
(1) Apply a coating of spindle oil or gasoline to the new O-ring.
(2) Return the lock nut to the regulator side until it stops.
(3) Manually screw the pressure regulator to the delivery pipe.

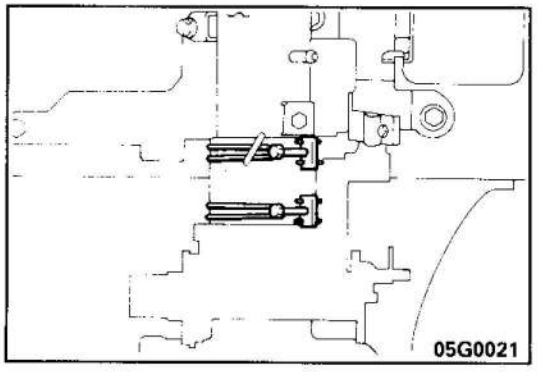


ECI412

(4) Turn in the reverse direction (less than 1 turn) so that the nipple is in the position shown in the figure.
(5) After the position is determined, tighten the lock nut at the specified torque.







18. INSTALLATION OF INJECTOR

(1) Install a new grommet and O-ring to the injector.
(2) Apply a coating of spindle oil or gasoline to the O-ring of the injector.
(3) While turning the injector to the left and right, install it to the delivery pipe.
(4) Check to be sure that the injector turns smoothly.

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

11. INSTALLATION OF GASKET

Install the gasket with its projection located as shown in the illustration.

Caution
Gasket installed in a wrong direction may cause poor idling and other troubles.

5. INSTALLATION OF AIR HOSE

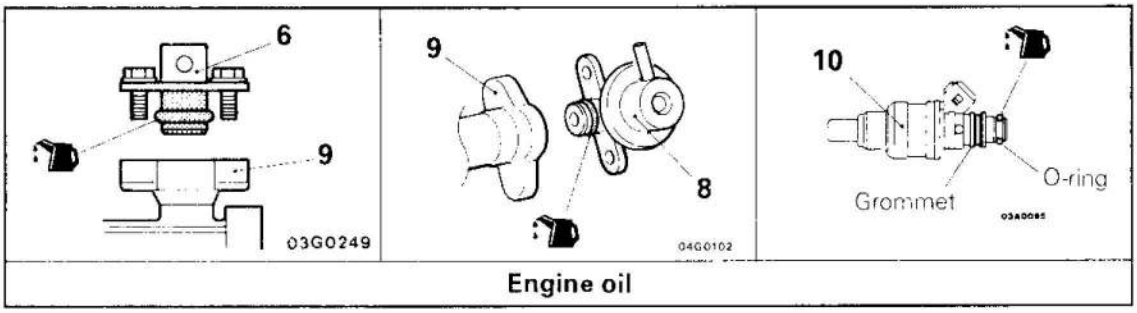
When installing air hose, tighten so that air hose band bolt is slanted approx. 45° from the horizontal.

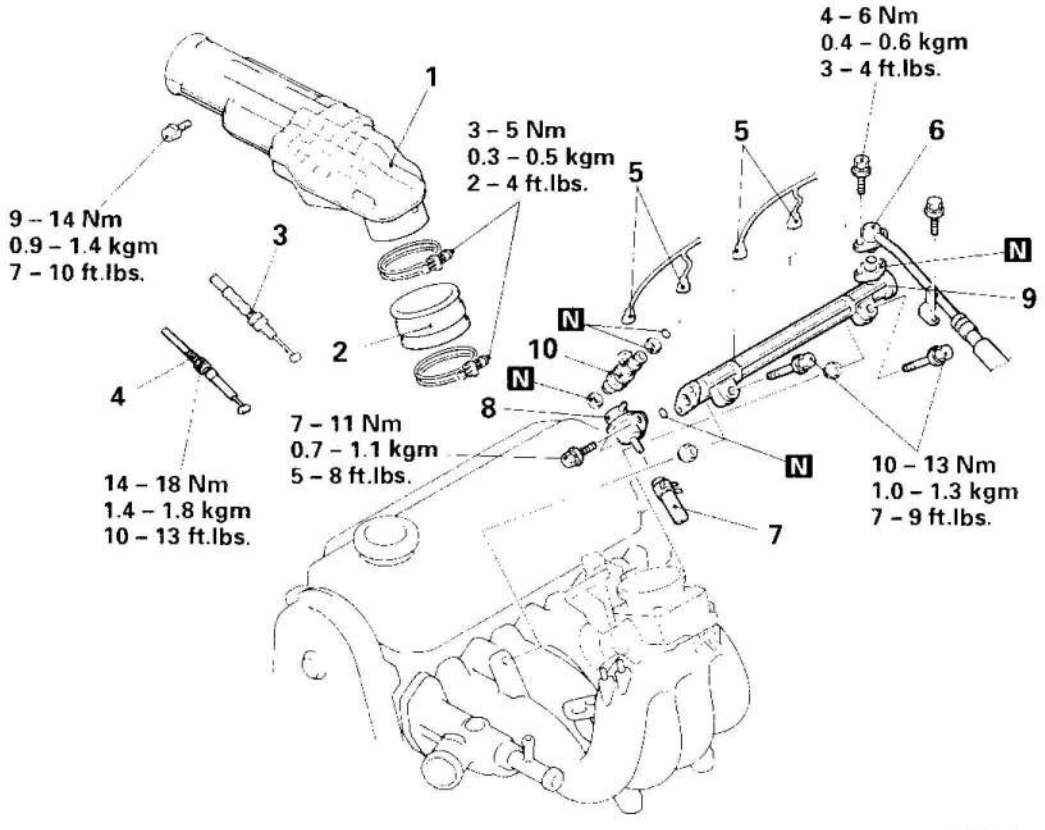
[Vehicles built from June 1994]

REMOVAL AND INSTALLATION

Pre-removal Operation
- Removal of seat underframe (Refer to GROUP 01 – Engine Compartment Work.)
- Drainage of engine coolant

Post-installation Operation
- Filling of engine coolant
- Adjustment of accelerator cable (Refer to P.13-56-1.)
- Adjustment of kick-down cable (Refer to GROUP 23 – Service Adjustment Procedures.)
- Inspection of fuel pressure (Refer to P.13-76-10.)
- Installation of seat underframe





Removal steps

1. Resonance tank
2. Air hose
3. Accelerator cable connection
4. Kick down cable connection (vehicles with automatic transmission)
5. Injector connectors

⬅➡ 6. Fuel pressure pipe connection

7. Fuel return hose connection

➡⬅ 8. Fuel pressure regulator

⬅➡ 9. Delivery pipe

⬅➡➡⬅ 10. Injector

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 E13AH01AA

6. DISCONNECTION OF FUEL PRESSURE PIPE

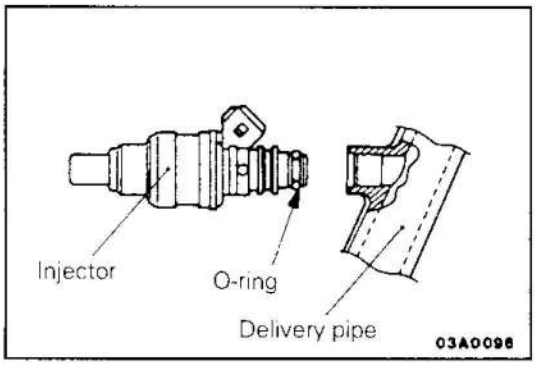
Release residual pressure from the fuel pipe line to prevent fuel from spilling.
Refer to P.13-59 for releasing residual pressure.

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.

9. REMOVAL OF DELIVERY PIPE/10. 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.



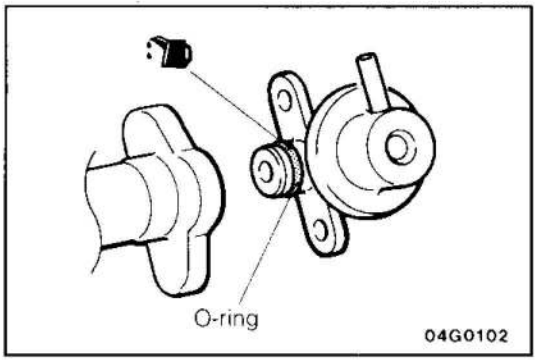
SERVICE POINTS OF INSTALLATION E13AH04AA

10. INSTALLATION OF INJECTOR

(1) Apply a drop of new engine oil to the O-ring.

Caution
Be sure not to let engine oil in the delivery pipe.

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



8. INSTALLATION OF FUEL PRESSURE REGULATOR

(1) When connecting the fuel-pressure regulator to the delivery pipe, apply a drop of new engine oil to the O-ring, and then insert, being careful not to damage the O-ring.

Caution
Be sure not to let engine oil in the delivery pipe.

(2) Check to be sure that the fuel pressure regulator turns smoothly.
If it does not turn smoothly, the O-ring may be trapped, remove the fuel pressure regulator and then re-insert it into the delivery pipe and check once again.
(3) Tighten the bolts.

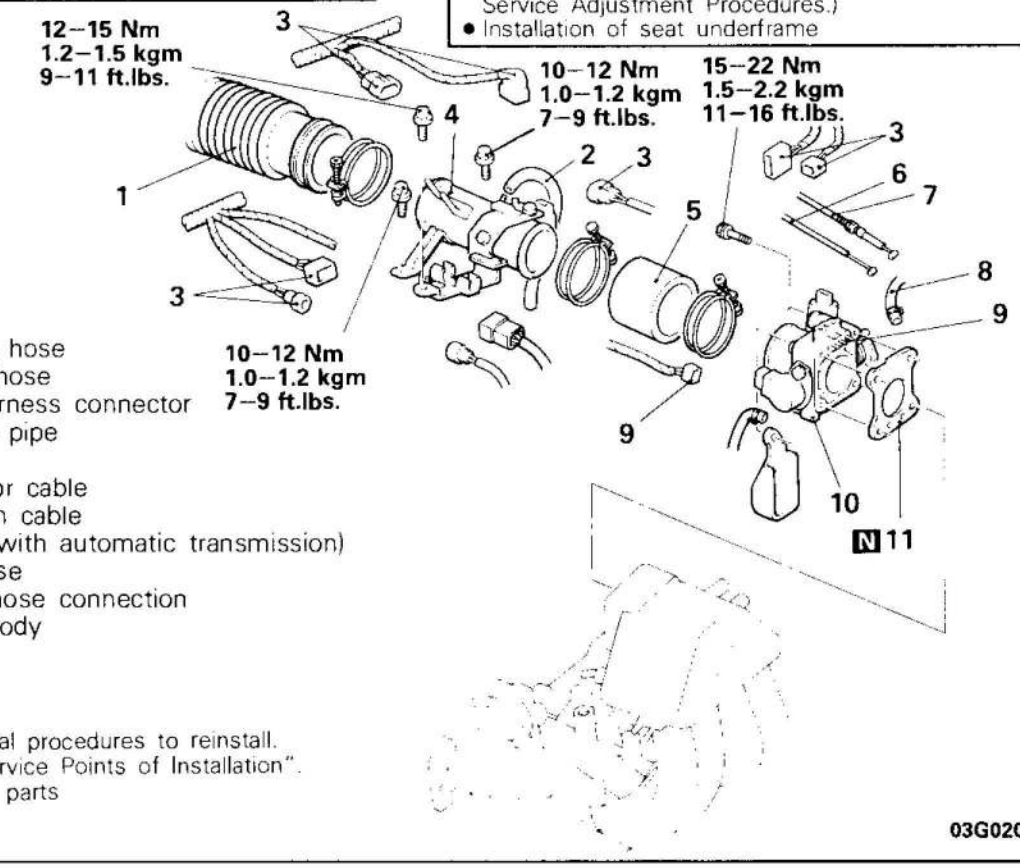
THROTTLE BODY (MPI)
[Vehicles built from July 1989 up to May 1994]

REMOVAL AND INSTALLATION

E13WA – C

Pre-removal Operation
- Removal of seat underframe (Refer to GROUP 01 – Engine Compartment Work.)
- Drainage of engine coolant

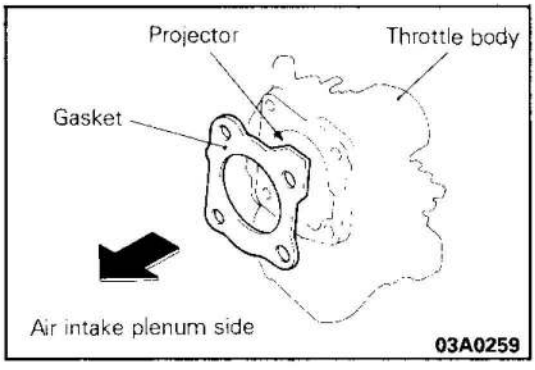
Post-installation Operation
- Filling of engine coolant
- Adjustment of accelerator cable (Refer to P. 13-57.)
- Adjustment of kick-down calbe (Refer to GROUP 23 – Service Adjustment Procedures.)
- Installation of seat underframe

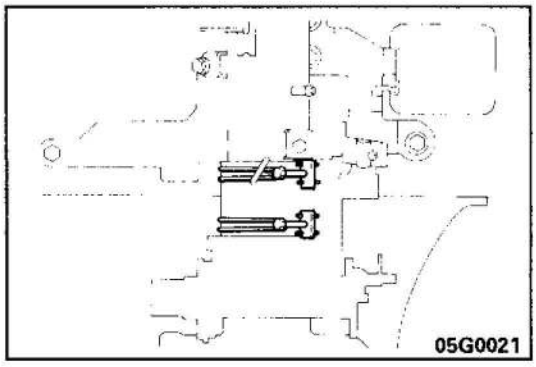


Removal steps

1. Air intake hose
2. Breather hose
3. Wiring harness connector
4. Air intake pipe
- ◆◆ 5. Air hose
6. Accelerator cable
7. Kick down cable (vehicles with automatic transmission)
8. Water hose
9. Vacuum hose connection
10. Throttle body
- ◆◆ 11. 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

E13WDCA

11. INSTALLATION OF GASKET

Install the gasket with its projection located as shown in the illustration.

Caution
Gasket installed in a wrong direction may cause poor idling and other troubles.

5. INSTALLATION OF AIR HOSE

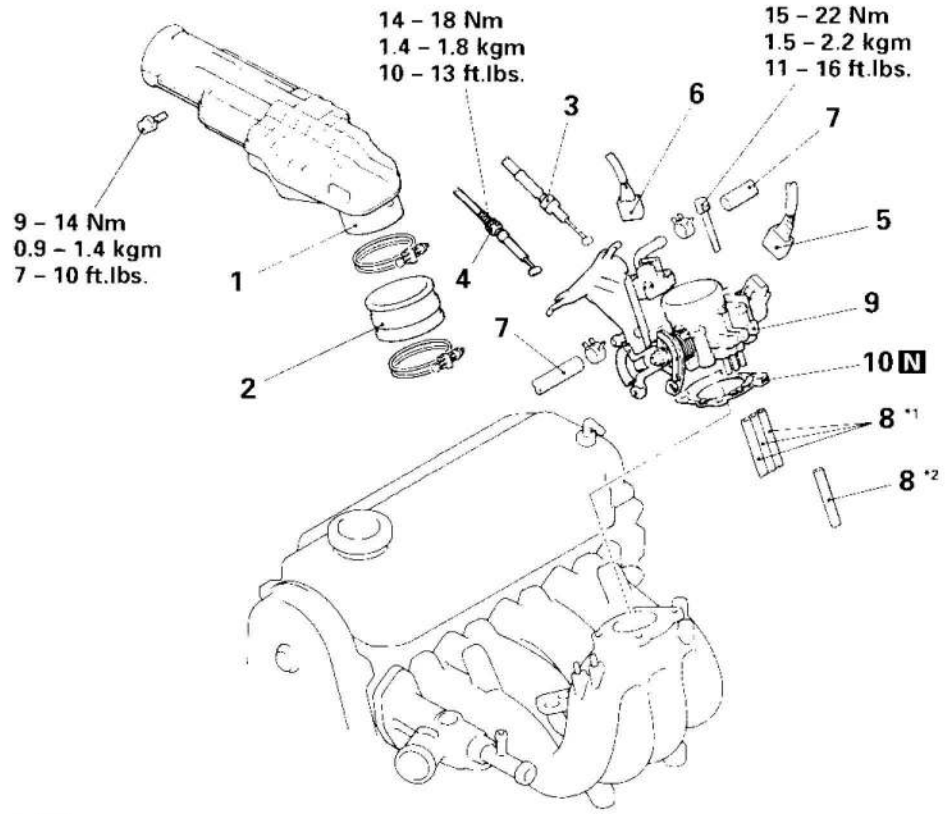
When installing air hose, tighten so that air hose band bolt is slanted approx. 45° from the horizontal.

[Vehicles built from June 1994]

REMOVAL AND INSTALLATION

Pre-removal Operation
- Removal of seat underframe (Refer to GROUP 01 – Engine Compartment Work.)
- Drainage of engine coolant

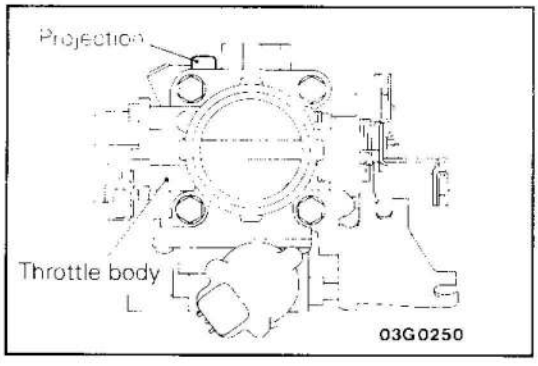
Post-installation Operation
- Filling of engine coolant
- Adjustment of accelerator cable (Refer to P.13-56-1.)
- Adjustment of kick-down cable (Refer to GROUP 23 – Service Adjustment Procedures.)
- Installation of seat underframe



Removal steps

1. Resonance tank
2. Air hose
3. Accelerator cable connection
4. Kick down cable connection (Vehicles with automatic transmission)
5. Throttle position sensor connector
6. Idle speed control servo connector
7. Water hose connection
8. Vacuum hose connection
9. Throttle body
- ➡⬅10. Gasket

NOTE
(1) Reverse the removal procedures to reinstall.
(2) ➡⬅ : Refer to "Service Points of Installation".
(3) N : Non-reusable parts
(4) * : 4G63 engine
(5) *1 : 4G64 engine



SERVICE POINTS OF INSTALLATION

10. INSTALLATION OF GASKET

Install the gasket with its projection located as shown in the illustration.

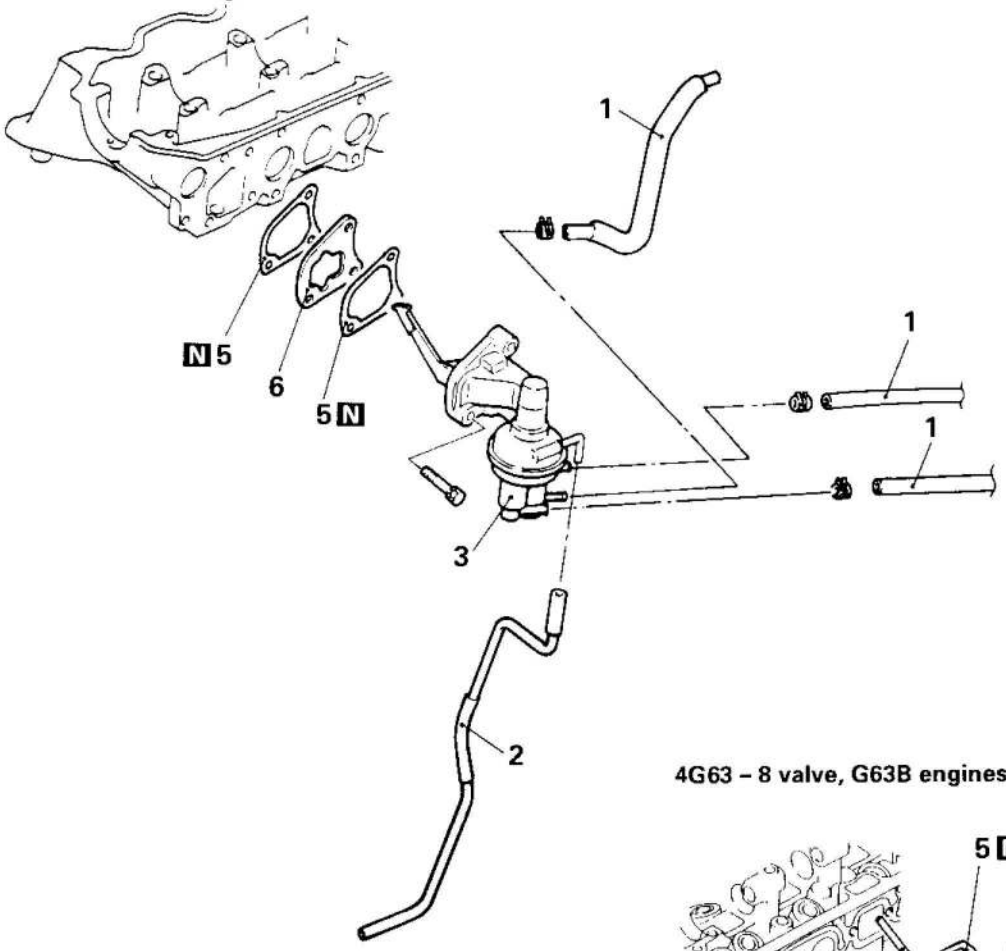
Caution
Gasket installed in a wrong direction may cause poor idling and other troubles.

NOTES

FUEL PUMP (PETROL-POWERED VEHICLE WITH CARBURETOR) E13LA--

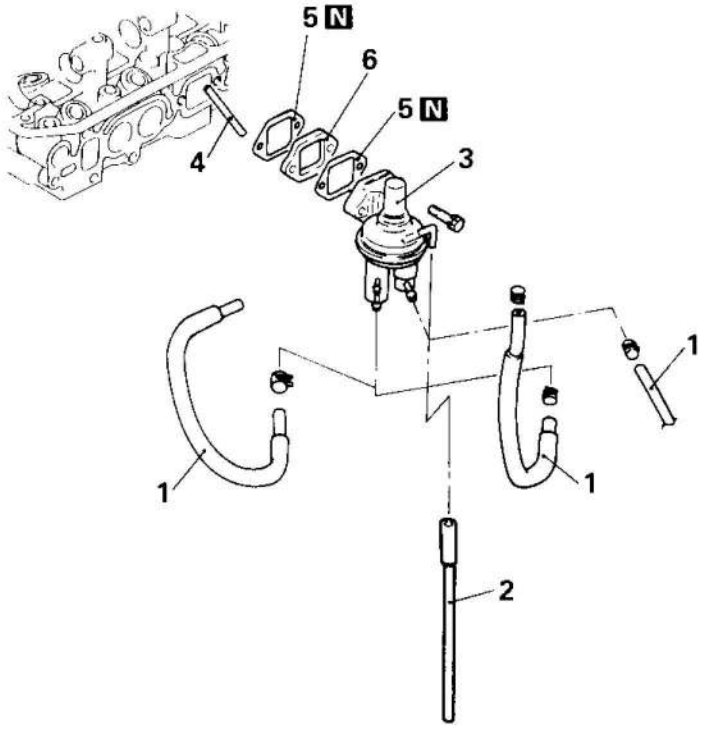
REMOVAL AND INSTALLATION

4G32, 4G33 engines



03B0006

4G63 – 8 valve, G63B engines



03B0008

Pre-removal Operation
- Removal of seat underframe (L.H. drive vehicles) (Refer to GROUP 01 GENERAL– Engine Compartment Work.)

Post-installation Operation
- Installation of seat underframe (L.H. drive vehicles)

Removal steps

1. Fuel hose
2. Breather tube
◆◆ 3. Fuel pump
4. Push rod
5. Gasket
6. Insulator

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

SERVICE POINTS OF REMOVAL E13LBAC

3. REMOVAL OF FUEL PUMP

Before removing fuel pump, turn crankshaft and set No. 2 piston (4G32, 4G33 engines) or No. 1 piston (4G63 – 8 valve, G63B engines) at full compression stroke position (TDC).

NOTE
From above service, fuel pump driving lever (push rod) is relieved from full compression enabling easier removal/installation.

INSPECTION E13LCAB

INSPECTION OF FUEL PUMP

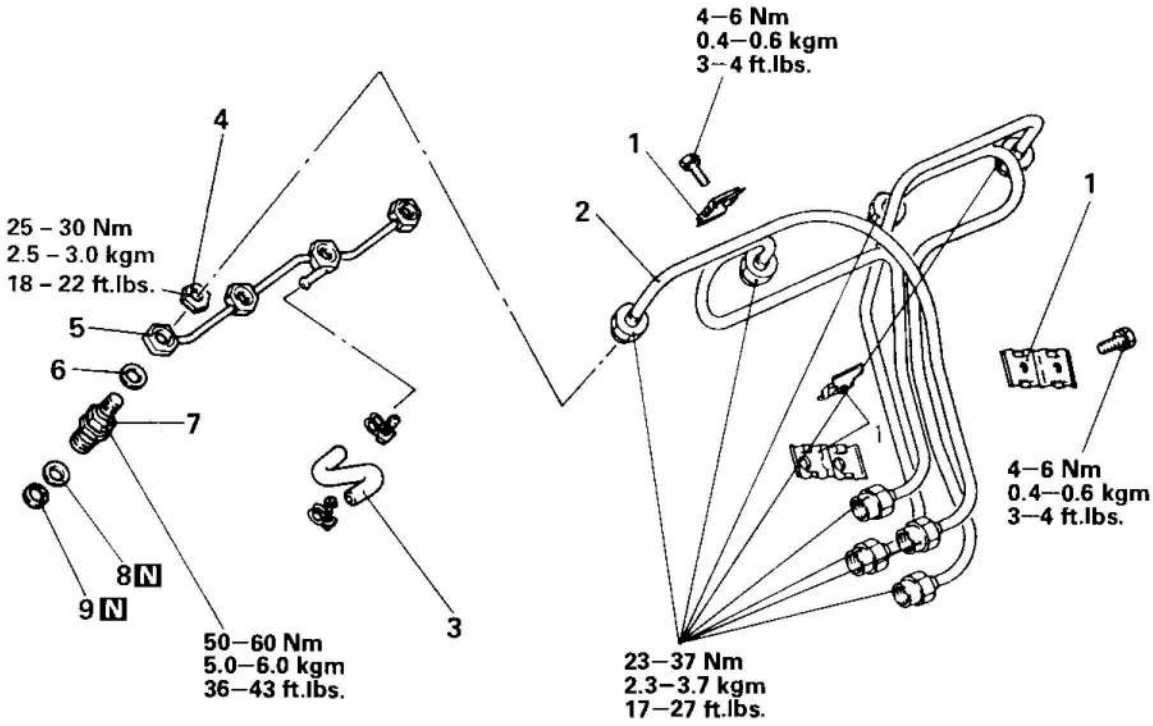
- Check breather nipple for fuel or oil leak.
- Check all parts for damage or cracks.
- Check rocker arm for wear.

Caution
Replace the fuel pump as assembly.

INJECTION NOZZLE (DIESEL-POWERED VEHICLES)

E13NA--

REMOVAL AND INSTALLATION



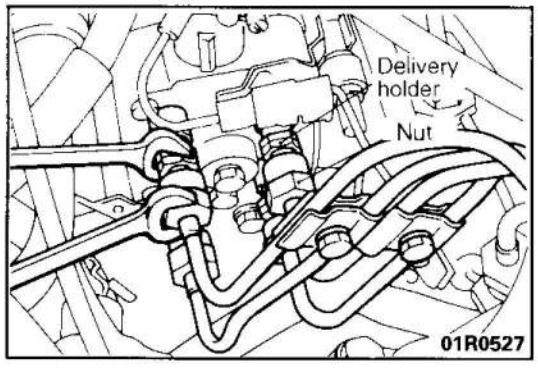
Removal steps

1. Injection pipe clamp
◆◆ 2. Injection pipe
3. Fuel return hose
4. Nut
◆◆ 5. Fuel return pipe
6. Fuel return pipe gasket
◆◆◆◆ 7. Nozzle holder
8. Holder gasket
9. 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

Pre-removal Operation
- Removal of seat underframe (L.H. drive vehicles) (Refer to GROUP 01 GENERAL– Engine Compartment Work.)

Post-installation Operation
- Adjustment of injection nozzle (Refer to P.13–78.)
- Installation of seat underframe (L.H. drive vehicles)

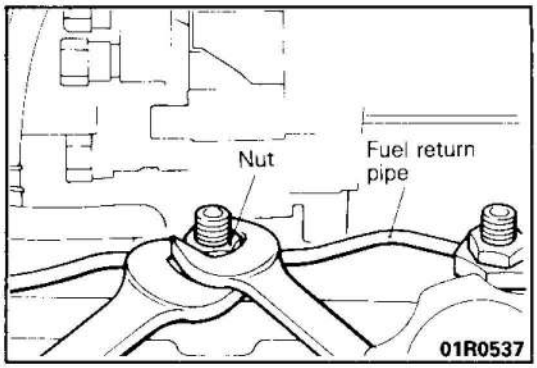


SERVICE POINTS OF REMOVAL

E13NBAB

2. DISCONNECTION OF INJECTION PIPE

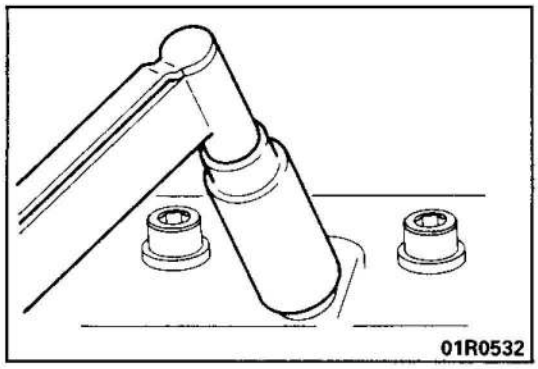
When loosening nuts at both ends of injection pipe, hold the other side (pump side-delivery holder, nozzle side-nozzle holder) with wrench and loosen nut.



5. DISCONNECTION OF FUEL RETURN PIPE

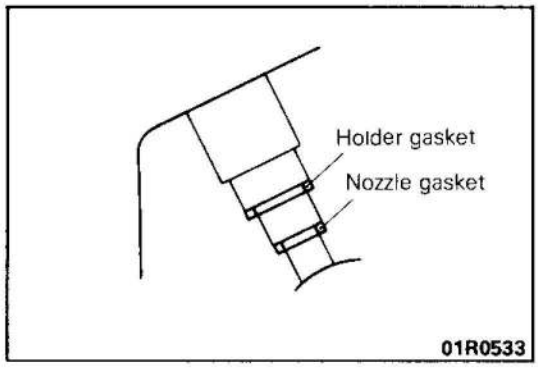
Hold fuel return line hexagon nut with wrench and remove nut.

Caution
Loosening nut without holding fuel return line may damage the line. Be sure to hold line.



7. REMOVAL OF NOZZLE HOLDER

Caution
Label cylinder No. on removed injection nozzle holder to ensure correct nozzle to cylinder reassembly.



SERVICE POINTS OF INSTALLATION E13NDAB

7. INSTALLATION OF NOZZLE HOLDER

(1) Clean cylinder head injection nozzle aperture and install new gasket.

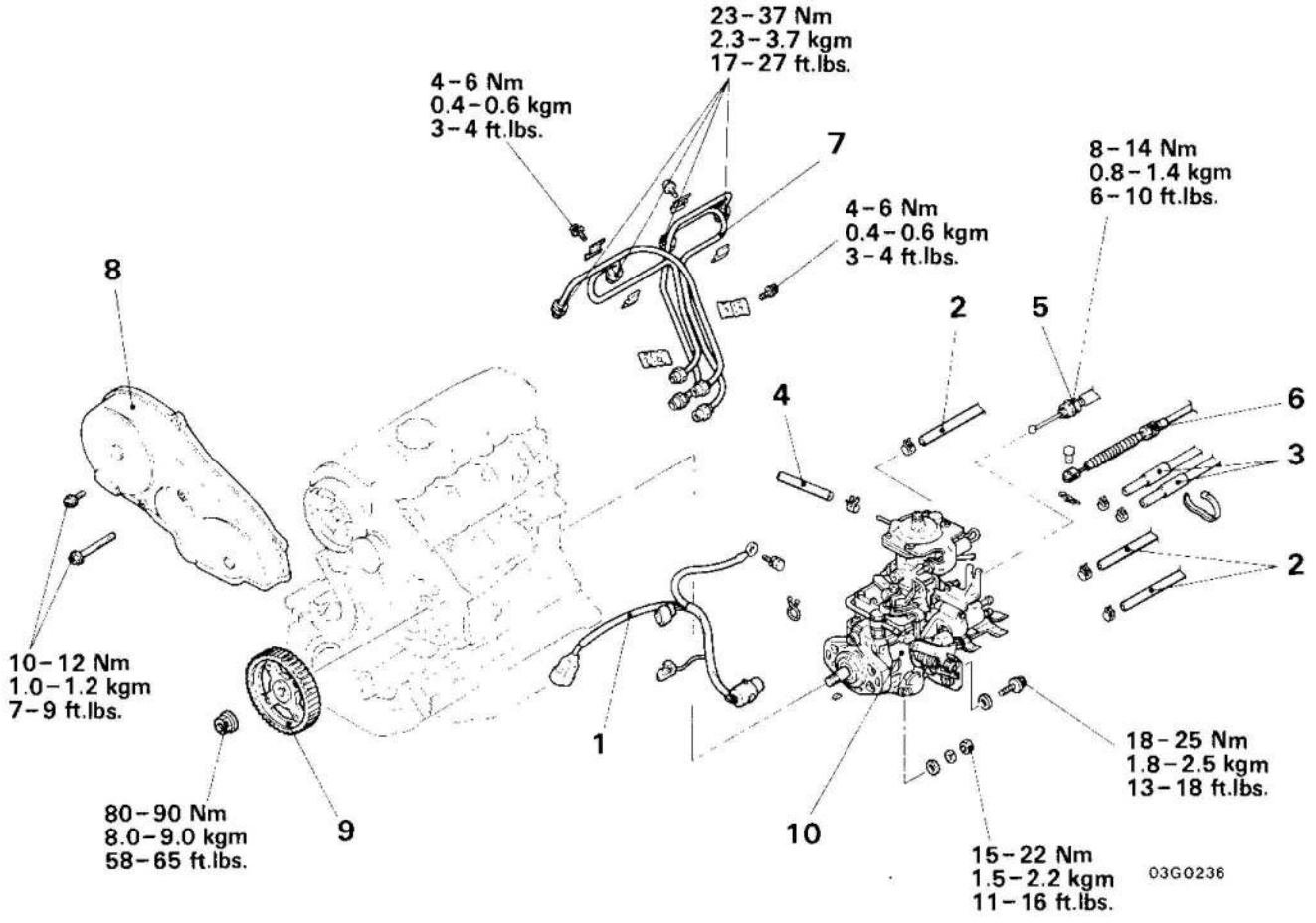
Caution
A defective gasket can cause improper idle rpm.

(2) Tighten to specified torque with deep socket wrench.

INJECTION PUMP (DIESEL-POWERED VEHICLES)

REMOVAL AND INSTALLATION

E13MA--



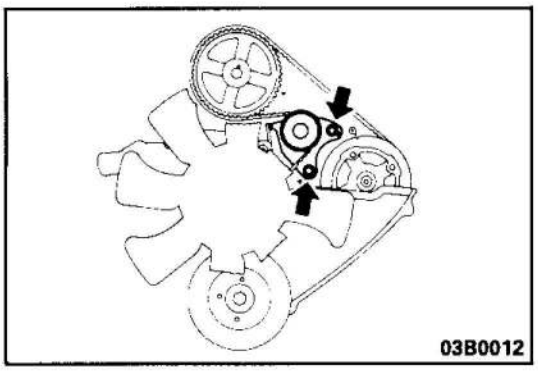
Removal steps

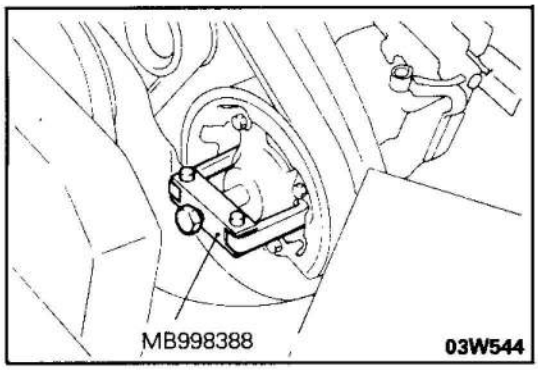
1. Fuel injection pump wiring harness
2. Fuel hose
3. Water hose <Vehicles with cold start device>
4. Boost hose <Vehicles with turbocharger>
5. Accelerator cable
6. Throttle control cable <Vehicles with automatic transmission>
- ◆◆ 7. Fuel injection pipe
8. Timing belt upper cover
- ◆◆ ◆◆ 9. Fuel injection pump sprocket
10. Fuel injection pump

Pre-removal Operation
- Draining of engine coolant
- Removal of seat underframe (L.H. drive vehicles) (Refer to GROUP 01 – Engine Compartment Work.)

Post-installation Operation
- Filling of engine coolant
- Adjustment of accelerator cable (Refer to P.13-77.)
- Installation of seat underframe (L.H. drive vehicles)
- Adjustment of timing belt tension (Refer to GROUP 11 – Adjustment of Engine.)

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 E13MBAB

7. REMOVAL OF FUEL INJECTION PIPE

Refer to P.13–107 for removal procedures.

9. REMOVAL OF FUEL INJECTION PUMP SPROCKET

(1) Turn crankshaft and set No.1 cylinder at full compression stroke. (TDC)

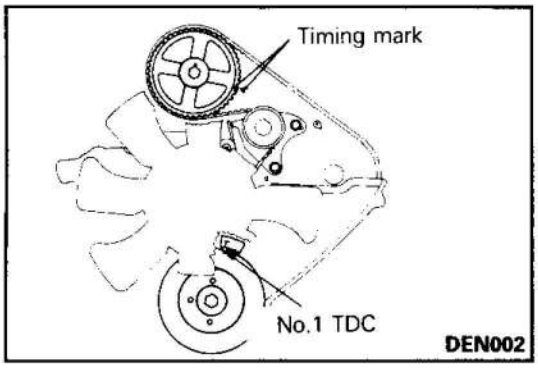
(2) Adjust belt tensioner so that timing belt is completely loose.

(3) Remove sprocket installing nut and remove sprocket from pump drive shaft with special tool.

Caution
Do not hit pump drive shaft with hammer etc.

(4) Leave sprocket with timing belt attached in timing belt lower cover.

Caution
1. **Be careful not to exert excessive force (twist or bend) on timing belt.**
2. **Do not turn crankshaft after removal.**
3. **When holding injection pump, do not allow to dangle by holding accelerator lever or fast idle lever. Do not remove these levers. Removal will cause injection pump malfunction.**



SERVICE POINTS OF INSTALLATION E13MDAB

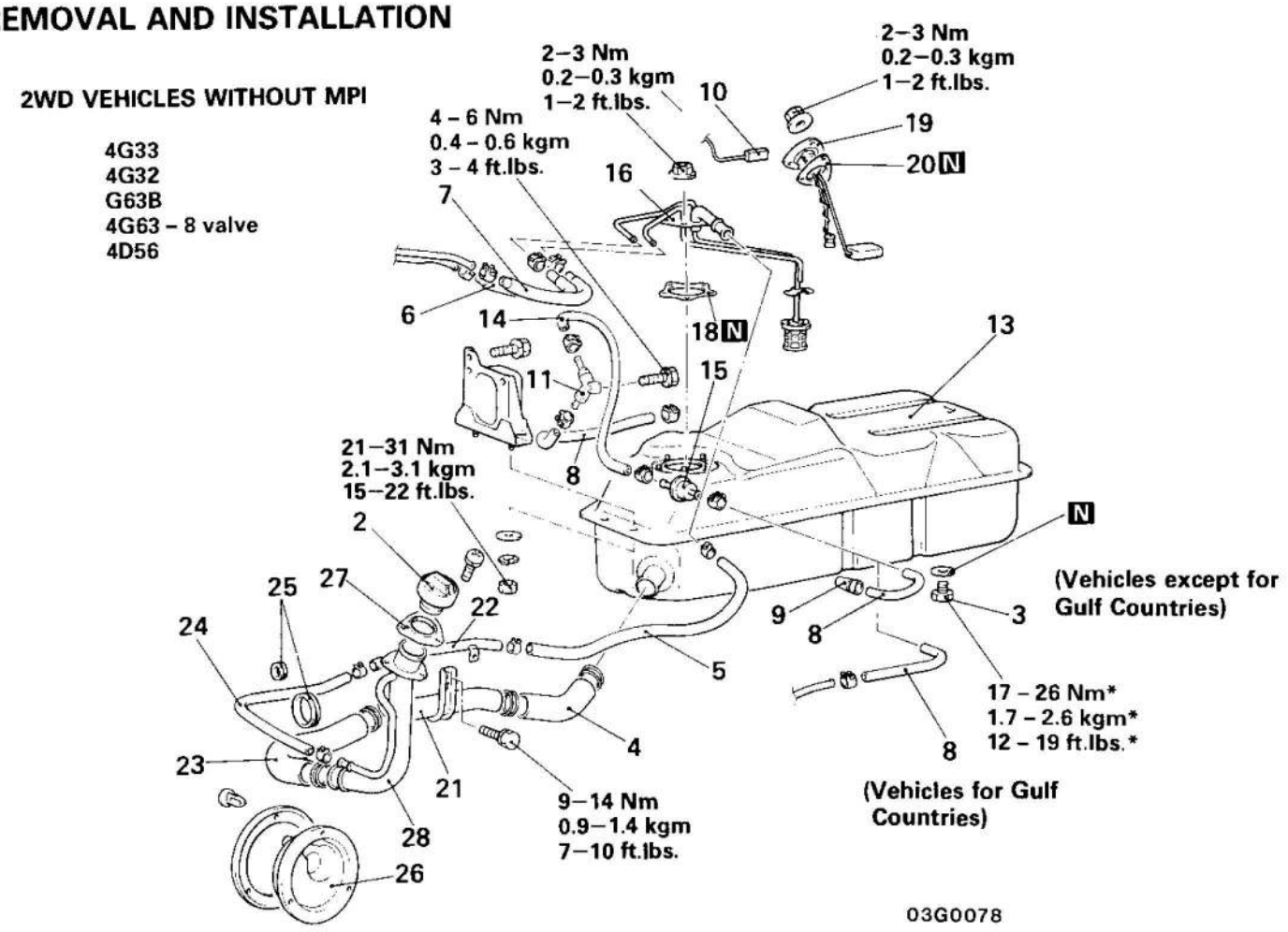
9. INSTALLATION OF FUEL INJECTION PUMP SPROCKET

When installing sprocket to injection pump, confirm timing marks are aligned and tighten nut to specified torque.

FUEL TANK

E13GA--

REMOVAL AND INSTALLATION



Removal steps of fuel tank

2. Fuel filler cap
3. Drain plug
4. Filler hose connection
5. Leveling hose connection
- ➡⬅ 6. Main hose
- ➡⬅ 7. Return hose
8. Vapor hose
9. Grommet (vehicles except for Gulf Countries)
10. Fuel gauge unit connector connection
- ➡⬅ 11. Check valve (vehicles for Europe built up to June 1991 and vehicles built from July 1991)
13. Fuel tank
14. Vapor hose (vehicles for Europe built up to June 1991 and vehicles built from July 1991)
- ➡⬅ 15. 2-way valve
16. Pipe assembly
18. Packing
19. Fuel gauge unit
20. Packing

Removal steps of fuel gauge unit

2. Fuel filler cap
3. Drain plug
10. Fuel gauge unit connector connection
19. Fuel gauge unit
20. Packing

Removal steps of fuel filler neck

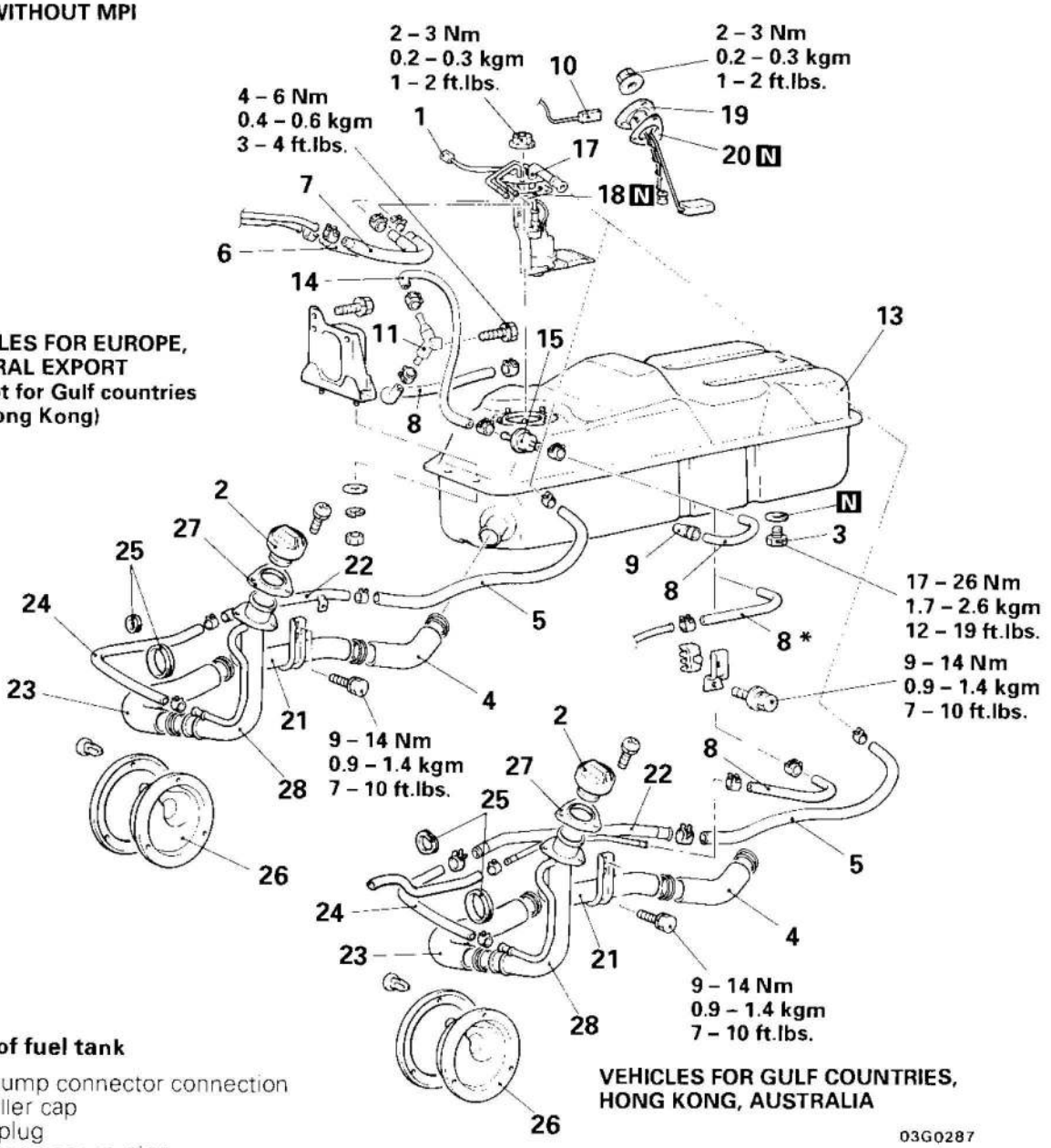
2. Fuel filler cap
3. Drain plug
4. Filler hose
5. Leveling hose
21. Filler pipe assembly
22. Leveling pipe assembly
23. Filler hose
24. Leveling hose
25. Grommet
26. Dust cover
27. Packing
28. Filler neck assembly

NOTE
(1) Reverse the removal procedures to reinstall.
(2) ➡⬅ : Refer to "Service Points of Installation".
(3) N : Non-reusable parts
(4) * : In case of bolt headmark "7"

2WD VEHICLES WITHOUT MPI

4G92

4G63 – 16 valve



Removal steps of fuel tank

- ⬅➡ 1. Fuel pump connector connection
- 2. Fuel filler cap
- 3. Drain plug
- 4. Filler hose connection
- 5. Leveling hose connection
- ➡⬅ 6. Main hose
- ➡⬅ 7. Return hose
- 8. Vapor hose
- 9. Grommet
- 10. Fuel gauge unit connector connection
- ➡⬅ 11. Check valve
- 13. Fuel tank
- 14. Vapor hose
- ➡⬅ 15. 2-way valve
- 17. Fuel pump assembly
- 18. Packing
- 19. Fuel gauge unit
- 20. Packing

Removal steps of fuel gauge unit

- 2. Fuel filler cap
- 3. Drain plug
- 10. Fuel gauge unit connector connection
- 19. Fuel gauge unit
- 20. Packing

Removal steps of fuel filler neck

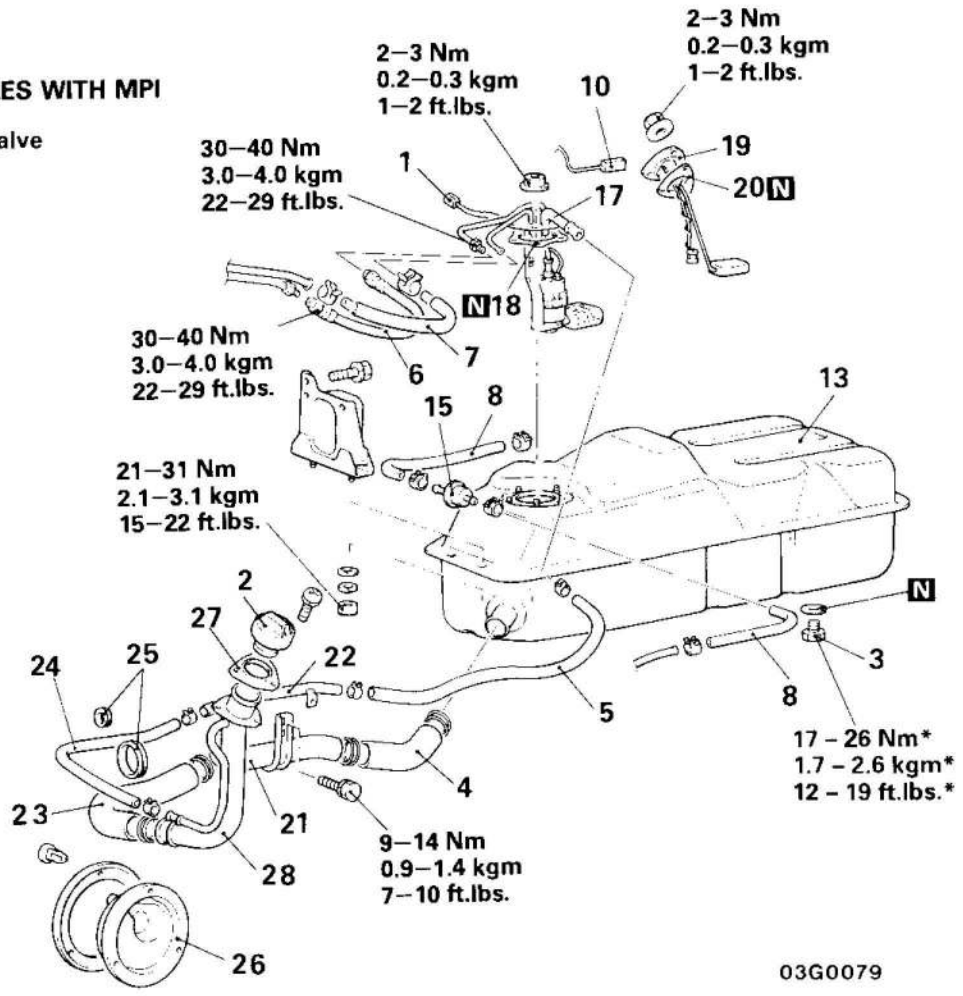
- 2. Fuel filler cap
- 3. Drain plug
- 4. Filler hose
- 5. Leveling hose
- 21. Filler pipe assembly
- 22. Leveling pipe assembly
- 23. Filler hose
- 24. Leveling hose
- 25. Grommet
- 26. Dust cover
- 27. Packing
- 28. Filler neck assembly

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) * : Vehicles for Europe with FBC.

2WD VEHICLES WITH MPI

4G64 – 8 valve



Removal steps of fuel tank

◆◆ 1. Fuel pump connector connection
2. Fuel filler cap
3. Drain plug
4. Filler hose connection
5. Leveling hose connection
◆◆ 6. Main hose
◆◆ 7. Return hose
8. Vapor hose
10. Fuel gauge unit connector connection
13. Fuel tank
◆◆ 15. 2-way valve
17. Fuel pump assembly
18. Packing
19. Fuel gauge unit
20. Packing

Removal steps of fuel gauge unit

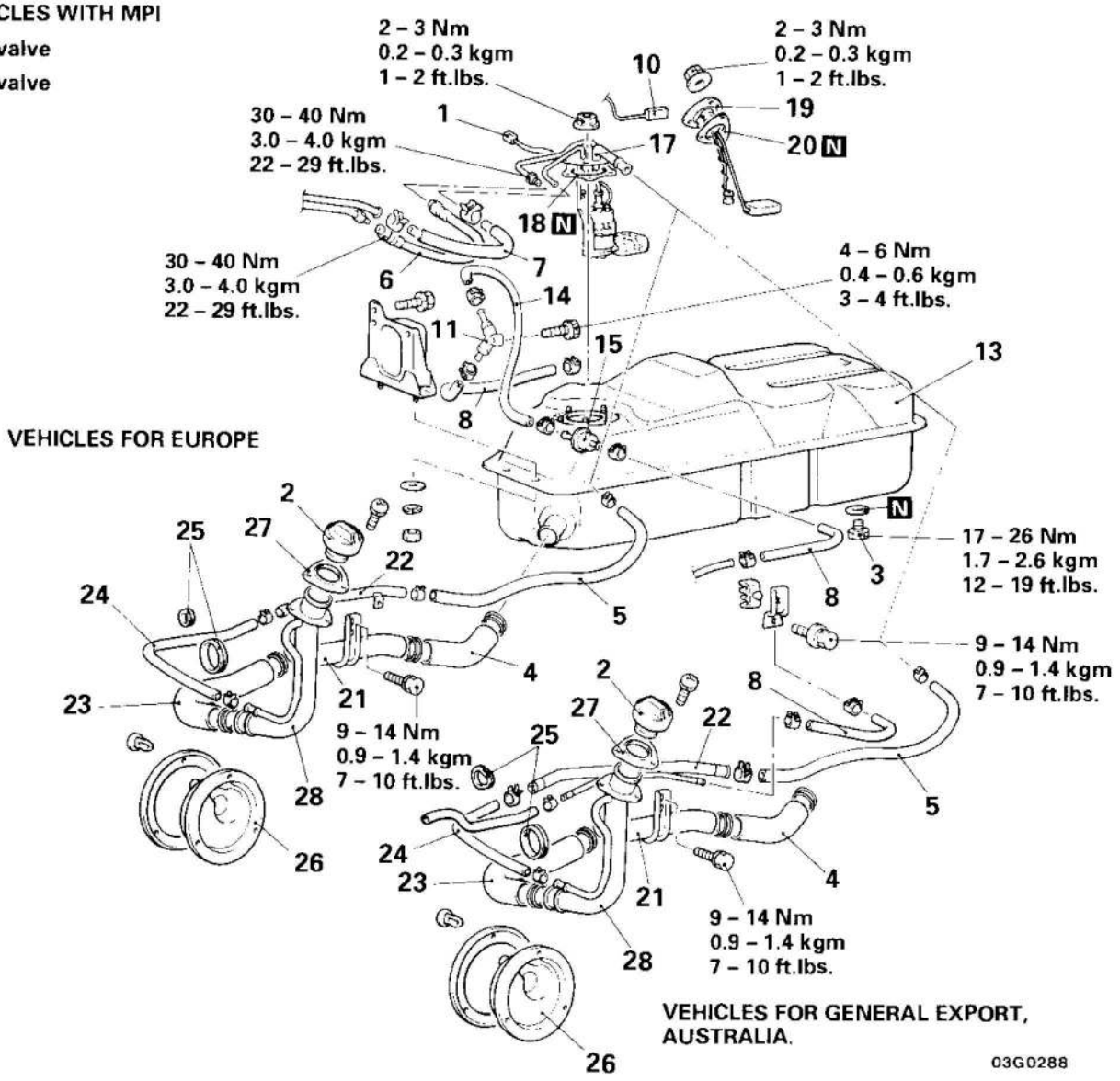
2. Fuel filler cap
3. Drain plug
10. Fuel gauge unit connector connection
19. Fuel gauge unit
20. Packing

Removal steps of fuel filler neck

2. Fuel filler cap
3. Drain plug
4. Filler hose
5. Leveling hose
21. Filler pipe assembly
22. Leveling pipe assembly
23. Filler hose
24. Leveling hose
25. Grommet
26. Dust cover
27. Packing
28. Filler neck assembly

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) * : In case of bolt headmark "7"

2WD VEHICLES WITH MPI
4G63 – 16 valve
4G64 – 16 valve



Removal steps of fuel tank

- ⬅➡ 1. Fuel pump connector connection
- 2. Fuel filler cap
- 3. Drain plug
- 4. Filler hose connection
- 5. Leveling hose connection
- ➡⬅ 6. Main hose
- ➡⬅ 7. Return hose
- 8. Vapor hose
- 10. Fuel gauge unit connector connection
- ➡⬅ 11. Check valve
- 13. Fuel tank
- 14. Vapor hose
- ➡⬅ 15. 2-way valve
- 17. Fuel pump assembly
- 18. Packing
- 19. Fuel gauge unit
- 20. Packing

Removal steps of fuel gauge unit

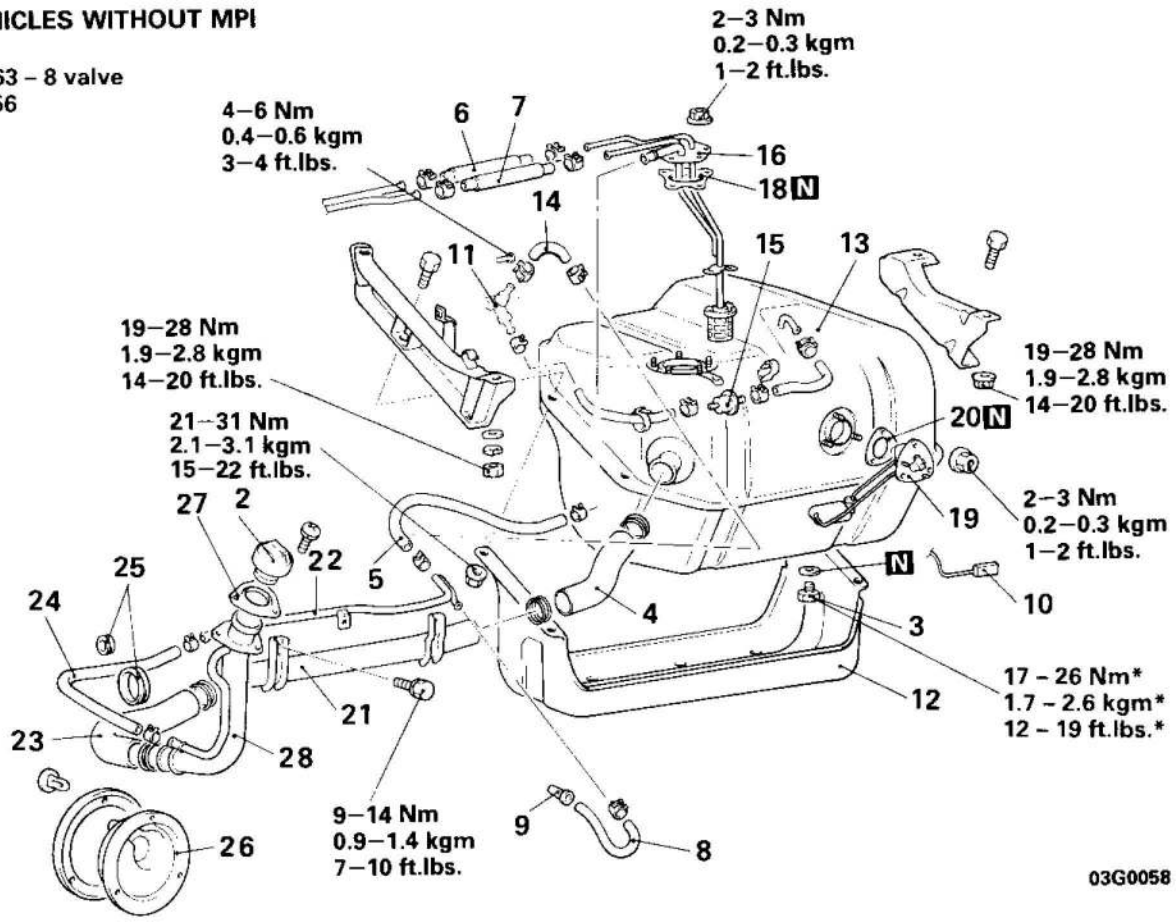
- 2. Fuel filler cap
- 3. Drain plug
- 10. Fuel gauge unit connector connection
- 19. Fuel gauge unit
- 20. Packing

Removal steps of fuel filler neck

- 2. Fuel filler cap
- 3. Drain plug
- 4. Filler hose
- 5. Leveling hose
- 21. Filler pipe assembly
- 22. Leveling pipe assembly
- 23. Filler hose
- 24. Leveling hose
- 25. Grommet
- 26. Dust cover
- 27. Packing
- 28. Filler neck assembly

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

4WD VEHICLES WITHOUT MPI



Removal steps of fuel tank

2. Fuel filler cap
3. Drain plug
4. Filler hose connection
5. Leveling hose connection
- ➡⬅ 6. Main hose
- ➡⬅ 7. Return hose
8. Vapor hose
9. Grommet
10. Fuel gauge unit connector connection
- ➡⬅ 11. Check valve (vehicles for Europe built up to June 1991 and vehicles built from July 1991)
12. Fuel tank protector
13. Fuel tank
14. Vapor hose (vehicles for Europe built up to June 1991 and vehicles built from July 1991)
- ➡⬅ 15. 2-way valve
16. Pipe assembly
18. Packing
19. Fuel gauge unit
20. Packing

Removal steps of fuel gauge unit

2. Fuel filler cap
3. Drain plug
10. Fuel gauge unit connector connection
19. Fuel gauge unit
20. Packing

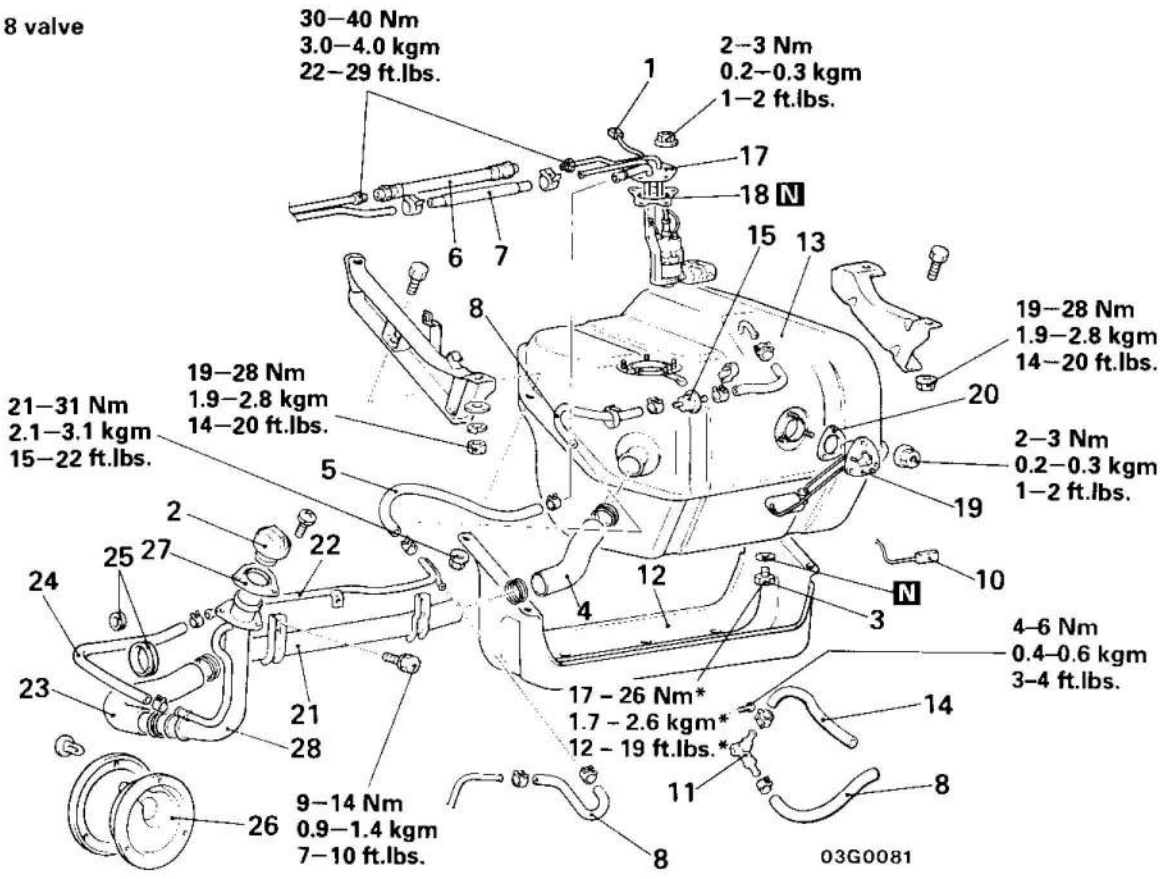
Removal steps of fuel filler neck

2. Fuel filler cap
3. Drain plug
4. Filler hose
5. Leveling hose
8. Vapor hose
9. Grommet
21. Filler pipe assembly
22. Leveling pipe assembly
23. Filler hose
24. Leveling hose
25. Grommet
26. Dust cover
27. Packing
28. Filler neck assembly

NOTE
(1) Reverse the removal procedures to reinstall.
(2) ➡⬅ : Refer to "Service Points of Installation".
(3) N : Non-reusable parts
(4) * : In case of bolt headmark "7"

4WD VEHICLES WITH MPI

G64B
4G64 – 8 valve



Removal steps of fuel tank

- ◆◆ 1. Fuel pump connector connection
- 2. Fuel filler cap
- 3. Drain plug
- 4. Filler hose connection
- 5. Leveling hose connection
- ◆◆ 6. Main hose
- ◆◆ 7. Return hose
- 8. Vapor hose
- 10. Fuel gauge unit connector connection
- 11. Check valve (vehicles for Europe built up to June 1991 and vehicles built from July 1991)
- 12. Fuel tank protector
- 13. Fuel tank
- 14. Vapor hose (vehicles for Europe built up to June 1991 and vehicles built from July 1991)
- 15. 2-way valve
- ◆◆ 17. Fuel pump assembly
- 18. Packing
- 19. Fuel gauge unit
- 20. Packing

Removal steps of fuel gauge unit

- 2. Fuel filler cap
- 3. Drain plug
- 10. Fuel gauge unit connector connection
- 19. Fuel gauge unit
- 20. Packing

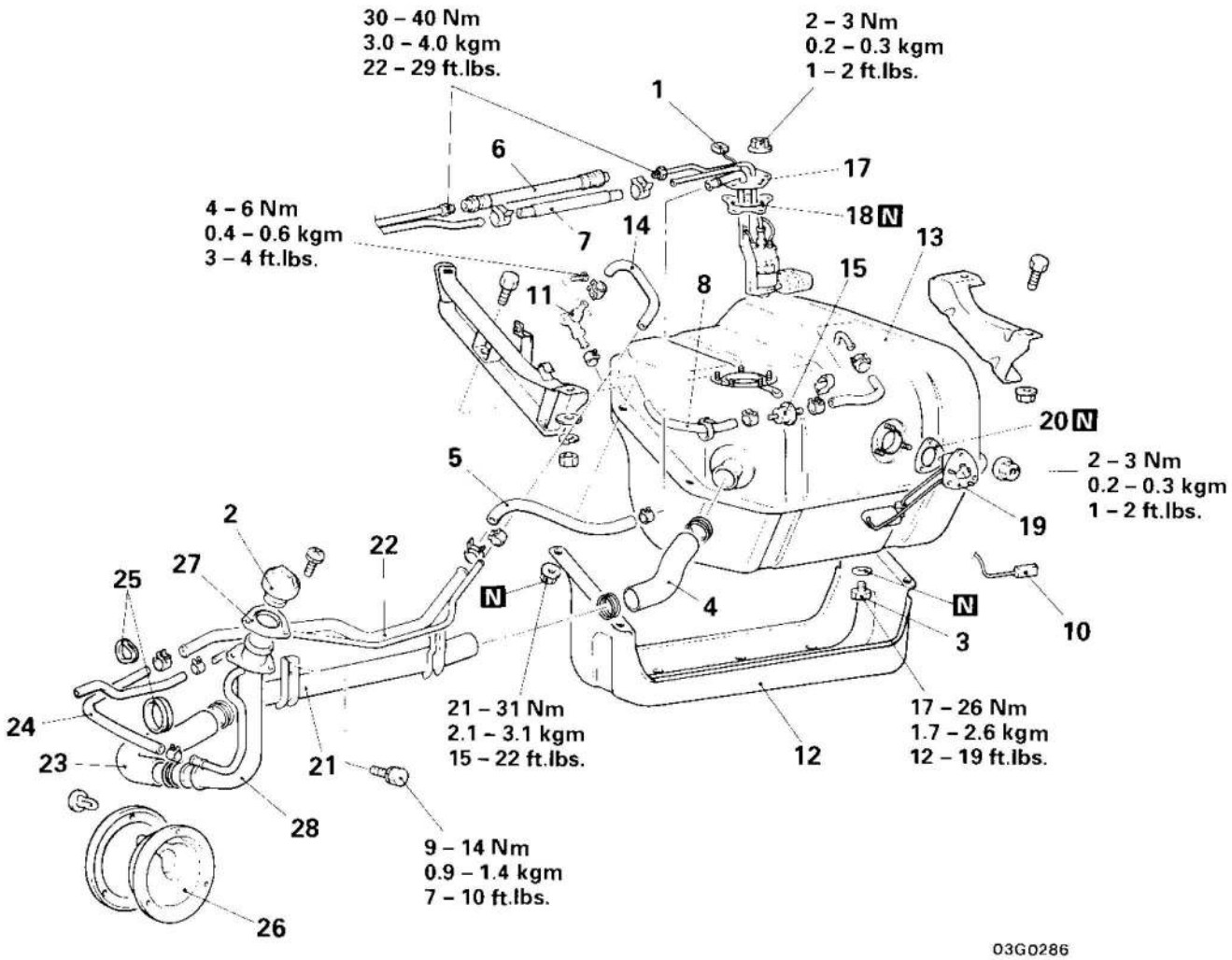
Removal steps of fuel filler neck

- 2. Fuel filler cap
- 3. Drain plug
- 4. Filler hose
- 5. Leveling hose
- 8. Vapor hose
- 21. Filler pipe assembly
- 22. Leveling pipe assembly
- 23. Filler hose
- 24. Leveling hose
- 25. Grommet
- 26. Dust cover
- 27. Packing
- 28. Filler neck assembly

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) * : In case of bolt headmark "7"

4WD VEHICLES WITH MPI

4G64 – 16 valve



Removal steps of fuel tank

- ⬅➡ 1. Fuel pump connector connection
- 2. Fuel filler cap
- 3. Drain plug
- 4. Filler hose connection
- 5. Leveling hose connection
- ➡⬅ 6. Main hose
- ➡⬅ 7. Return hose
- 8. Vapor hose
- 10. Fuel gauge unit connector connection
- 11. Check valve
- 12. Fuel tank protector
- 13. Fuel tank
- 14. Vapor hose
- 15. 2-way valve
- ➡⬅ 17. Fuel pump assembly
- 18. Packing
- 19. Fuel gauge unit
- 20. Packing

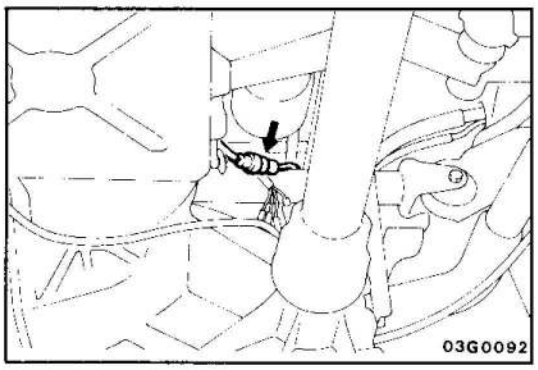
Removal steps of fuel gauge unit

- 2. Fuel filler cap
- 3. Drain plug
- 10. Fuel gauge unit connector connection
- 19. Fuel gauge unit
- 20. Packing

Removal steps of fuel filler neck

- 2. Fuel filler cap
- 3. Drain plug
- 4. Filler hose
- 5. Leveling hose
- 8. Vapor hose
- 21. Filler pipe assembly
- 22. Leveling pipe assembly
- 23. Filler hose
- 24. Leveling hose
- 25. Grommet
- 26. Dust cover
- 27. Packing
- 28. Filler neck assembly

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 E13GBAE

1. DISCONNECTION OF FUEL PUMP CONNECTOR

Reduce the internal pressure of the fuel main pipes and hoses by using the following procedure.

NOTE
Be sure to reduce the fuel pressure before disconnecting the fuel main pipe and hose as otherwise fuel will gush out.

(1) Start the engine, and then disconnect the electrical fuel pump connector.
(2) After the engine has been stopped, set the ignition key to the OFF position.
(3) Disconnect the battery cable from the negative terminal of the battery.

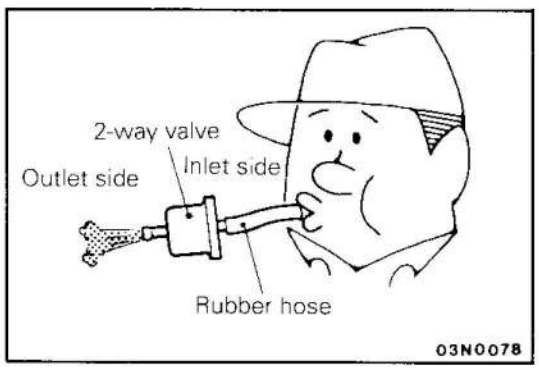
INSPECTION E13GCAD

- Check the hoses and the pipes for crack 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

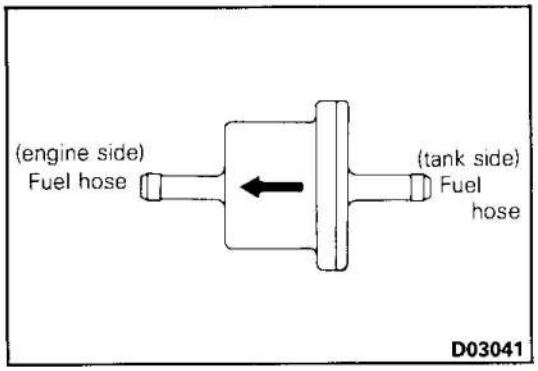
- Check the in-tank fuel filter for damage or clogging.
- Check the check valve for malfunction.



CHECKING 2-WAY VALVE

Attach a clean hose and check the operation of the 2-way valve.

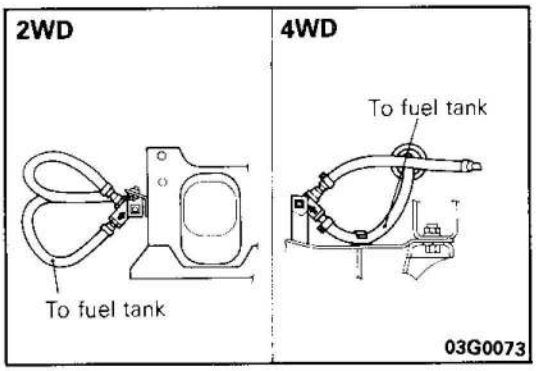
Inspection procedure	Normal condition
Lightly blow from inlet side (fuel tank side).	Air passes through with a slight feeling of resistance.
Lightly blow from outlet side (canister side).	Air passes through.



SERVICE POINTS OF INSTALLATION E13GDAK

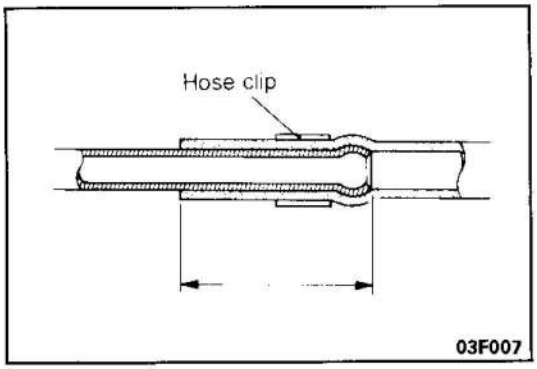
15. INSTALLATION OF 2-WAY VALVE

Install so that the 2-way valve is facing in the direction shown in the figure.



11. INSTALLATION OF CHECK VALVE (Vehicles for Europe built up to June 1991 and vehicles built from July 1991

Install so that the ckeck valve is facing in the direction shown in the figure.

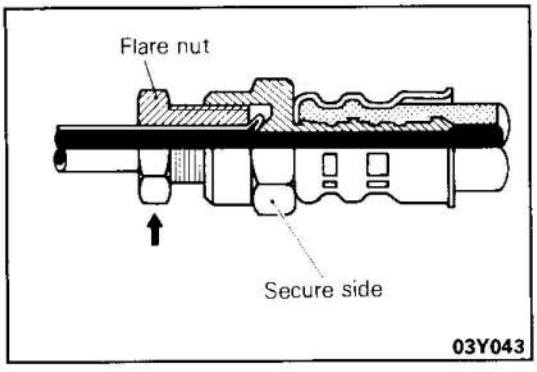


7. INSTALLATION OF RETURN HOSE/6. MAIN HOSE

Hose Clip

Insert securely into hose pipe so that insertion is within the standard value.

Standard value: 20–25 mm (0.79–0.98 in.)



Flare Nut

(1) 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.

Caution
When tightening flare nut, be careful not to bend or twist line to prevent damage to fuel tank low connection.

(2) After all of the fuel pipes and hoses have been connected start the engine, and then confirm that there is no fuel leakage from any of the connections.

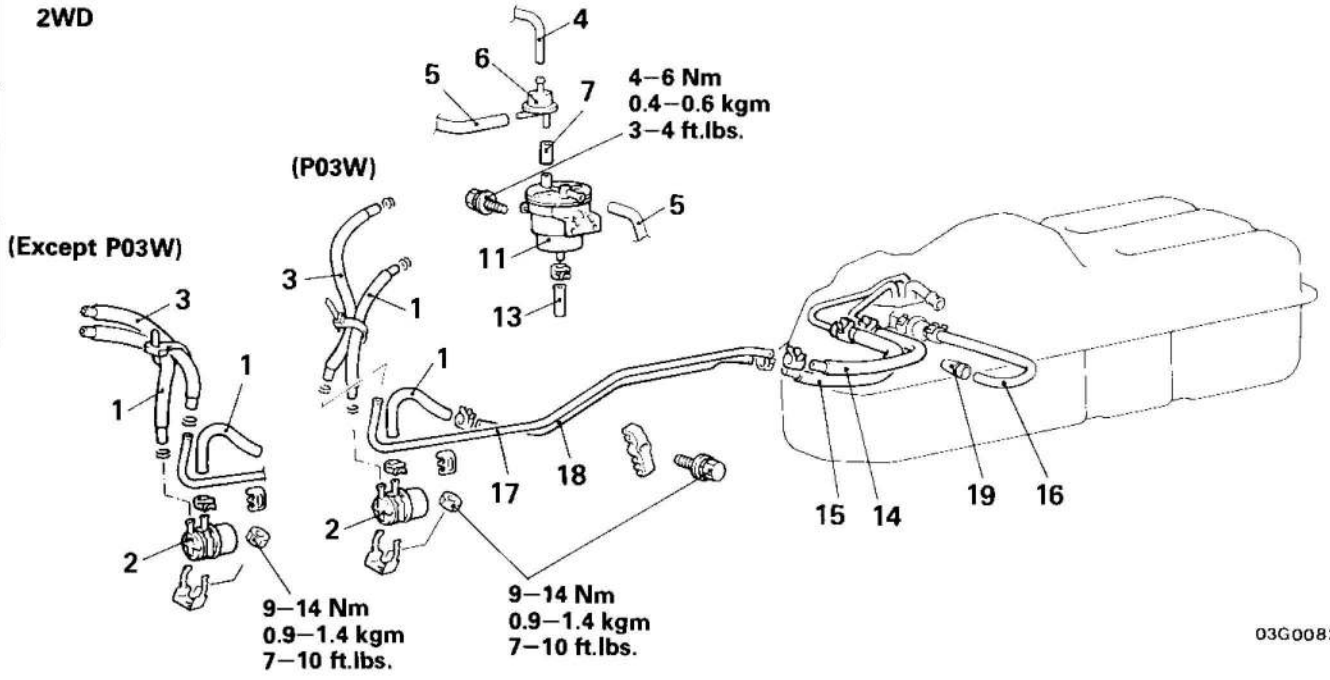
FUEL LINE (PETROL-POWERED VEHICLES WITHOUT MPI)

E13KA--0

REMOVAL AND INSTALLATION <Vehicles built up to May 1994>

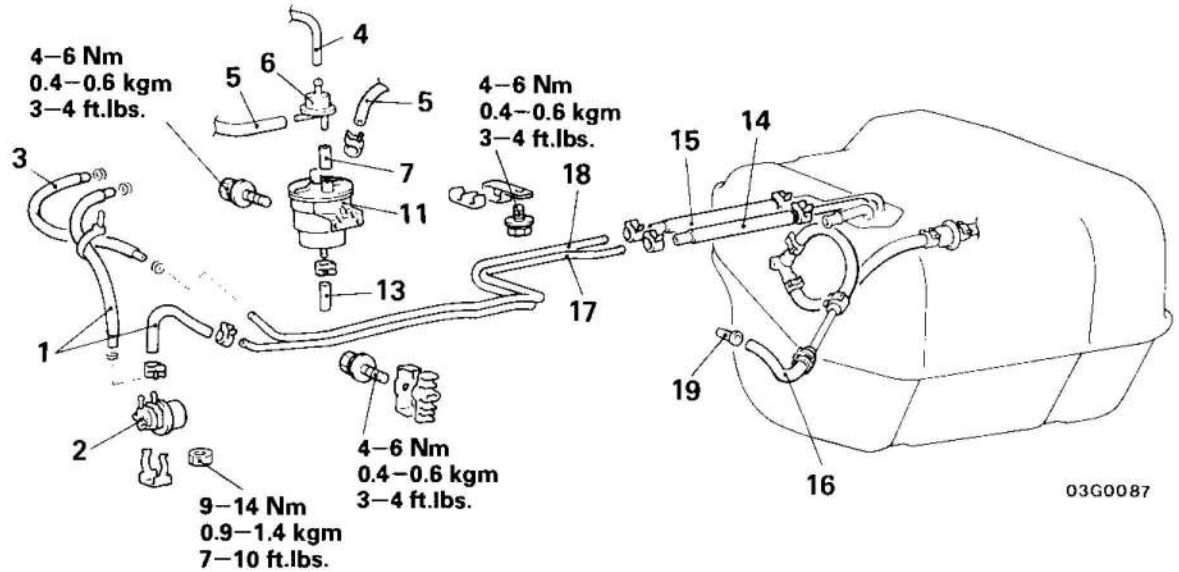
**VEHICLES FOR EUROPE,
GENERAL EXPORT
(EXCEPT FOR GULF COUNTRIES)**

2WD



03G0082

4WD



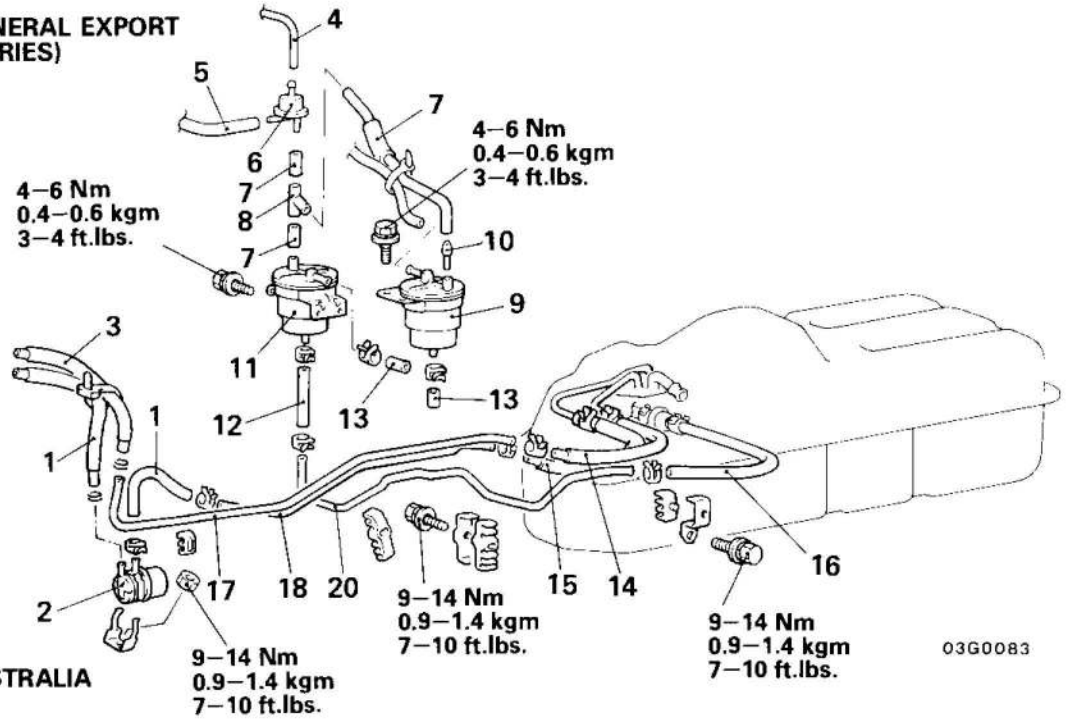
03G0087

- ◆◆ 1. Main hose
- 2. Fuel filter
- ◆◆ 3. Return hose
- 4. Connection of vacuum hose and purge control valve
- 5. Connection of vapor hose and canister assembly
- 6. Purge control valve
- 7. Purge hose
- ◆◆ 11. Canister assembly
- 13. Drain pipe cap
- ◆◆ 14. Connection of return hose and return pipe
- ◆◆ 15. Connection of main hose and main pipe
- 16. Connection of vapor hose and grommet
- 17. Return pipe
- 18. Main pipe
- 19. Grommet

NOTE
◆◆ : Refer to "Service Points of Installation".

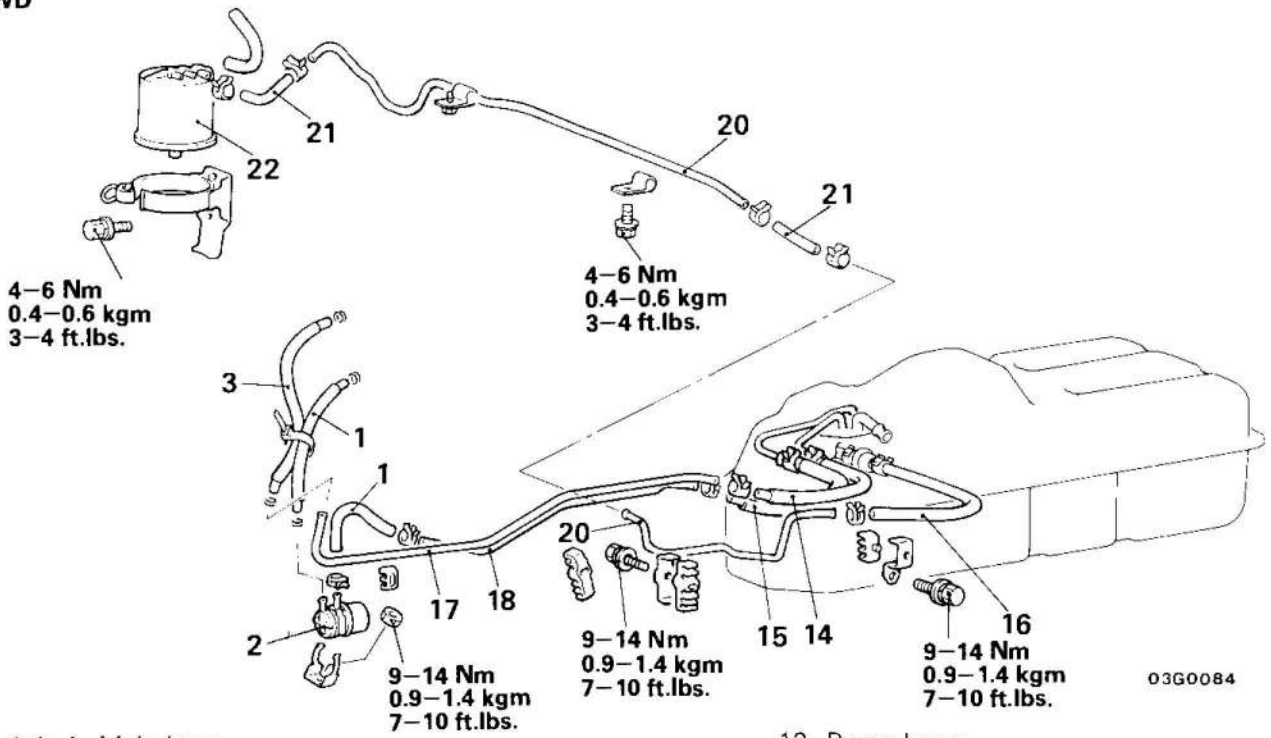
VEHICLES FOR GENERAL EXPORT (FOR GULF COUNTRIES)

2WD



VEHICLES FOR AUSTRALIA

2WD



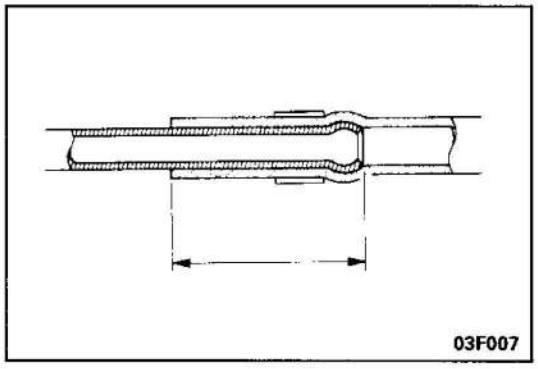
- ◆◆ 1. Main hose
- 2. Fuel filter
- ◆◆ 3. Return hose
- 4. Connection of vacuum hose and purge control valve
- 5. Connection of vapor hose and purge control valve
- 6. Purge control valve
- 7. Purge hose
- 8. Purge hose connector
- ◆◆ 9. Canister assembly
- 10. Check valve
- ◆◆ 11. Canister assembly
- 12. Purge hose
- 13. Drain pipe cap
- ◆◆ 14. Connection of return hose and return pipe
- ◆◆ 15. Connection of main hose and main pipe
- 16. Connection of vapor hose and vapor pipe
- 17. Return pipe
- 18. Main pipe
- 20. Vapor pipe
- 21. Vapor hose
- 22. Canister assembly

NOTE

◆◆ : Refer to "Service Points of Installation".

INSPECTION E13KCAL

- Check the fuel hoses and pipes for cracks, bend, deformation, deterioration or clogging.
- Check the fuel filter for clogging or damage.
- Check the canister for clogging or damage.
- Check the purge-control valve for malfunction.

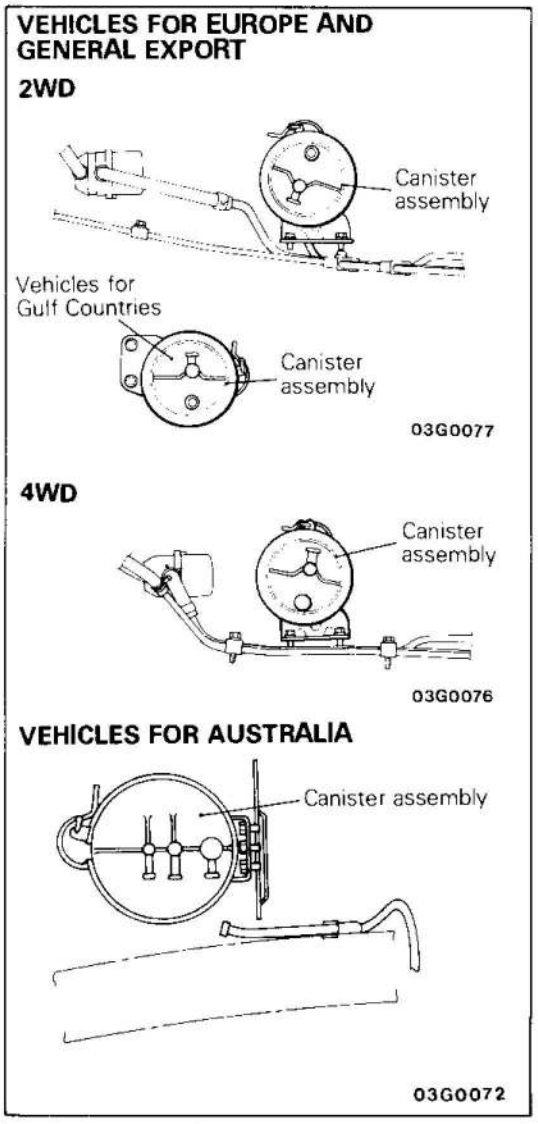


SERVICE POINTS OF INSTALLATION E13KDAH

15. INSTALLATION OF MAIN HOSE AND MAIN PIPE/14. RETURN HOSE AND RETURN PIPE/3. RETURN HOSE/1. MAIN HOSE

Insert fuel hose securely into fuel pipe so that insertion is within the standard value.

Standard value: 20–25 mm (0.79–0.98 in.)



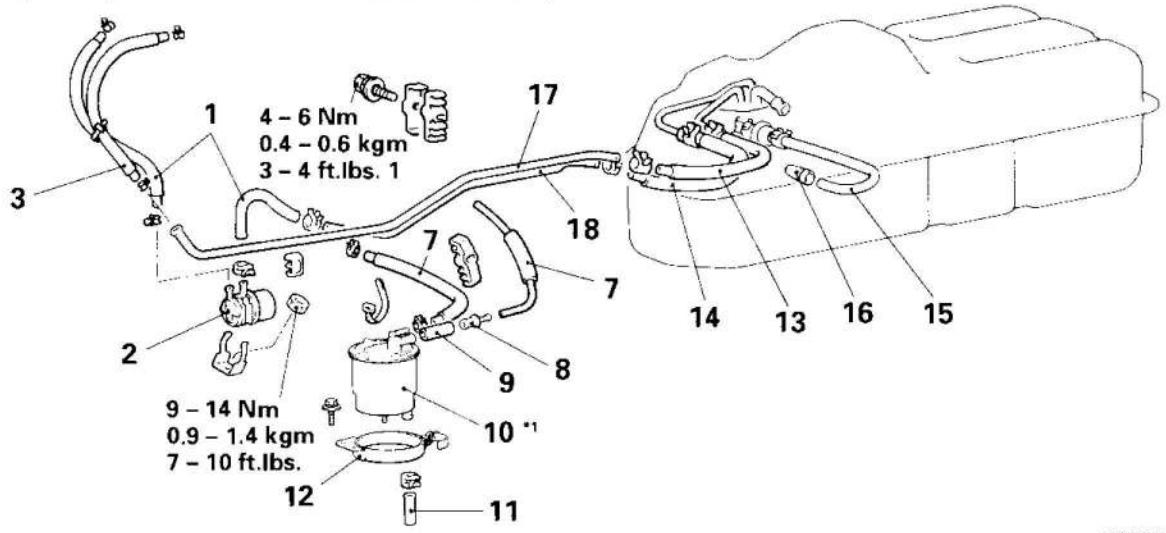
22. /11./9. INSTALLATION OF CANISTER ASSEMBLY

Fix canister assembly with clamp so that it faces the direction indicated in the diagram.

REMOVAL AND INSTALLATION <Vehicles built from June 1994>

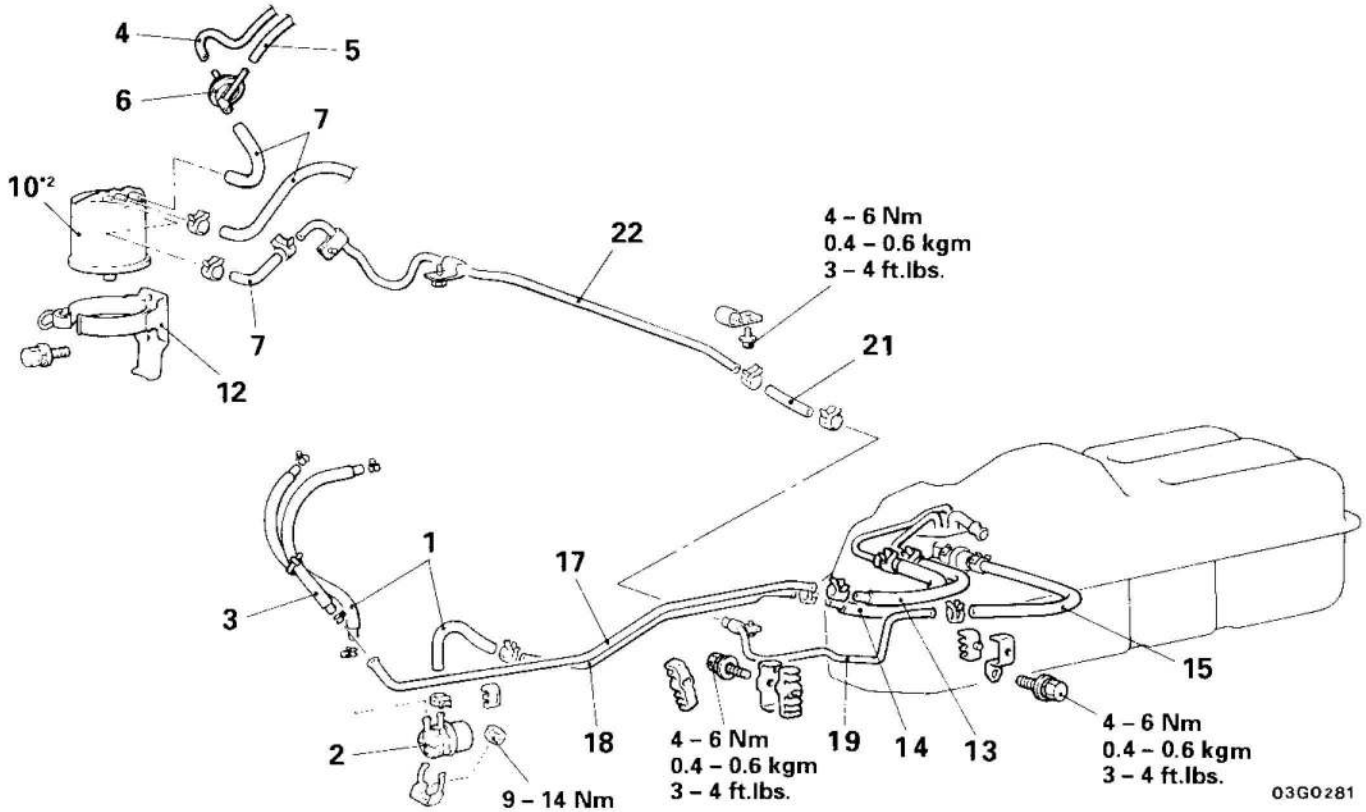
VEHICLES FOR EUROPE, GENERAL EXPORT (EXCEPT FOR GULF COUNTRIES AND HONG KONG)

4G92, 4G63 (Vehicles with conventional carburetor)



03G0282

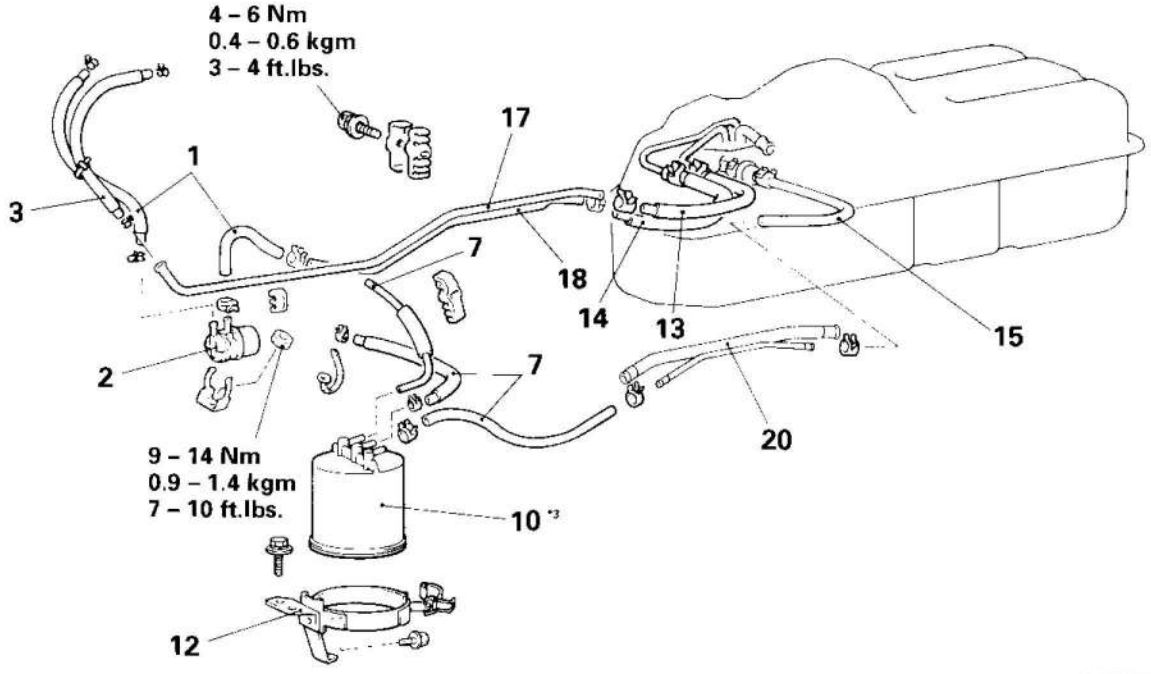
4G63 (Vehicles with F.B.C.)



03G0281

- ➡⬅ 1. Main hose
- 2. Fuel filter
- ➡⬅ 3. Return hose
- 4. Connection of vacuum hose and purge control valve
- 5. Connection of vapor hose and canister assembly
- 6. Purge control valve
- 7. Vapor hose
- 8. Connector
- 9. Vapor hose
- ➡⬅ 10. Canister assembly
- 11. Drain pipe cap
- 12. Canister bracket
- ➡⬅ 13. Connection of return hose and return pipe
- ➡⬅ 14. Connection of main hose and main pipe
- 15. Connection of vapor hose and grommet
- 16. Grommet
- 17. Return pipe
- 18. Main pipe
- 19. Vapor pipe
- 21. Vapor hose
- 22. Vapor pipe

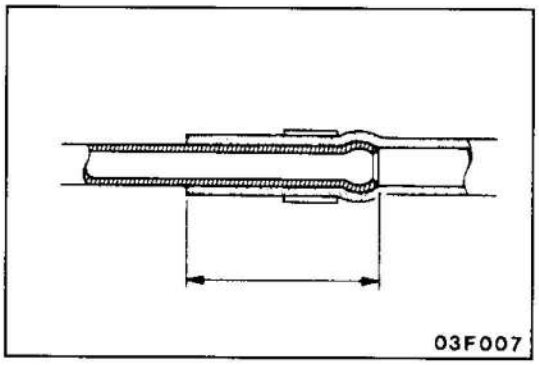
VEHICLES FOR GENERAL EXPORT, AUSTRALIA
(FOR GULF COUNTRIES AND HONG HONG)
4G92 (Vehicle with F.B.C.)
4G63 (Vehicle with conventional carburetor)



➡⬅ 1. Main hose
2. Fuel filter
➡⬅ 3. Return hose
7. Vapor hose
➡⬅ 10. Canister assembly
12. Canister bracket
➡⬅ 13. Connection of return hose and return pipe
➡⬅ 14. Connection of main hose and main pipe
15. Connection of vapor hose and leveling pipe assembly
17. Return pipe
18. Main pipe
20. Leveling pipe assembly

INSPECTION E13KCAL

- Check the fuel hoses and pipes for cracks, bend, deformation, deterioration or clogging.
- Check the fuel filter for clogging or damage.
- Check the canister for clogging or damage.
- Check the purge-control valve for malfunction.

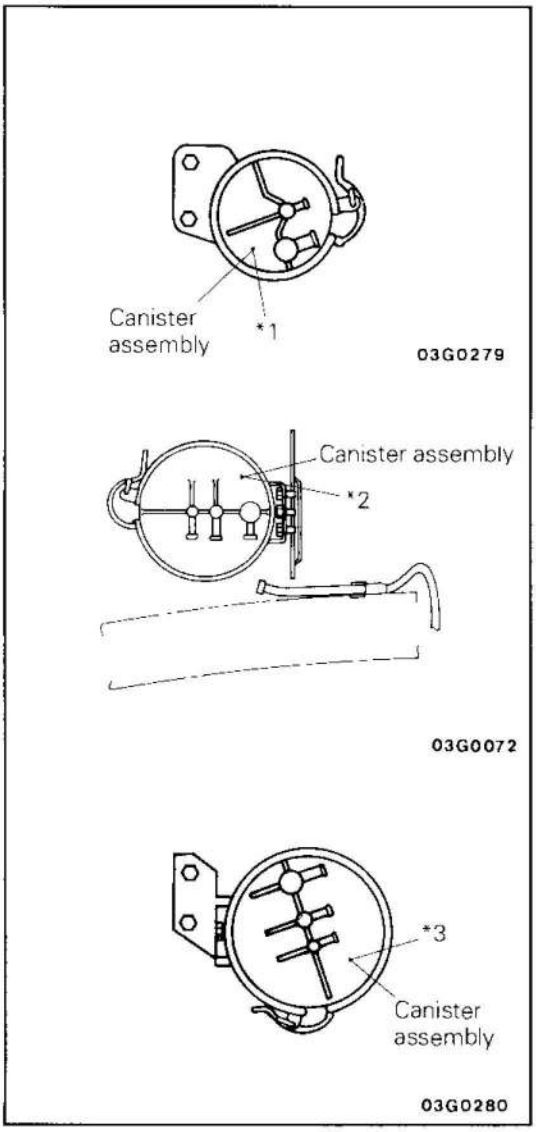


SERVICE POINTS OF INSTALLATION E13KDAH

14. INSTALLATION OF MAIN HOSE AND MAIN PIPE/13. RETURN HOSE AND RETURN PIPE/3. RETURN HOSE/1. MAIN HOSE

Insert fuel hose securely into fuel pipe so that insertion is within the standard value.

Standard value: 20 – 25 mm (0.79 – 0.98 in.)



10. INSTALLATION OF CANISTER ASSEMBLY

Fix canister assembly with clamp so that it faces the direction indicated in the diagram.

NOTE

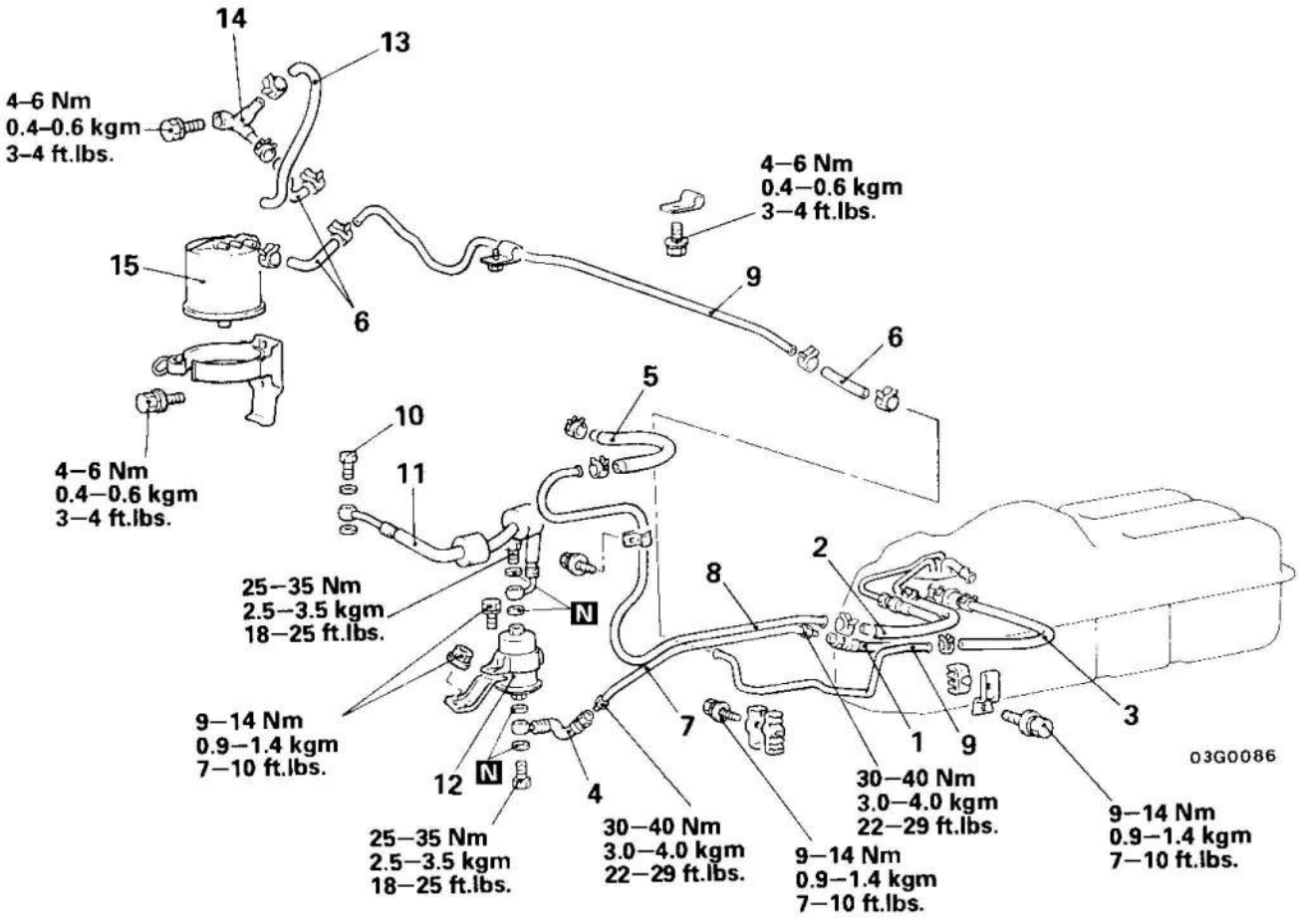
The *1, *2 and *3 symbols in the illustration at left correspond to the canisters shown in the "REMOVAL AND INSTALLATION" diagram.

FUEL LINE (PETROL-POWERED VEHICLES WITH MPI)

REMOVAL AND INSTALLATION <Vehicles built up to May 1994>

E13KA--1

2WD

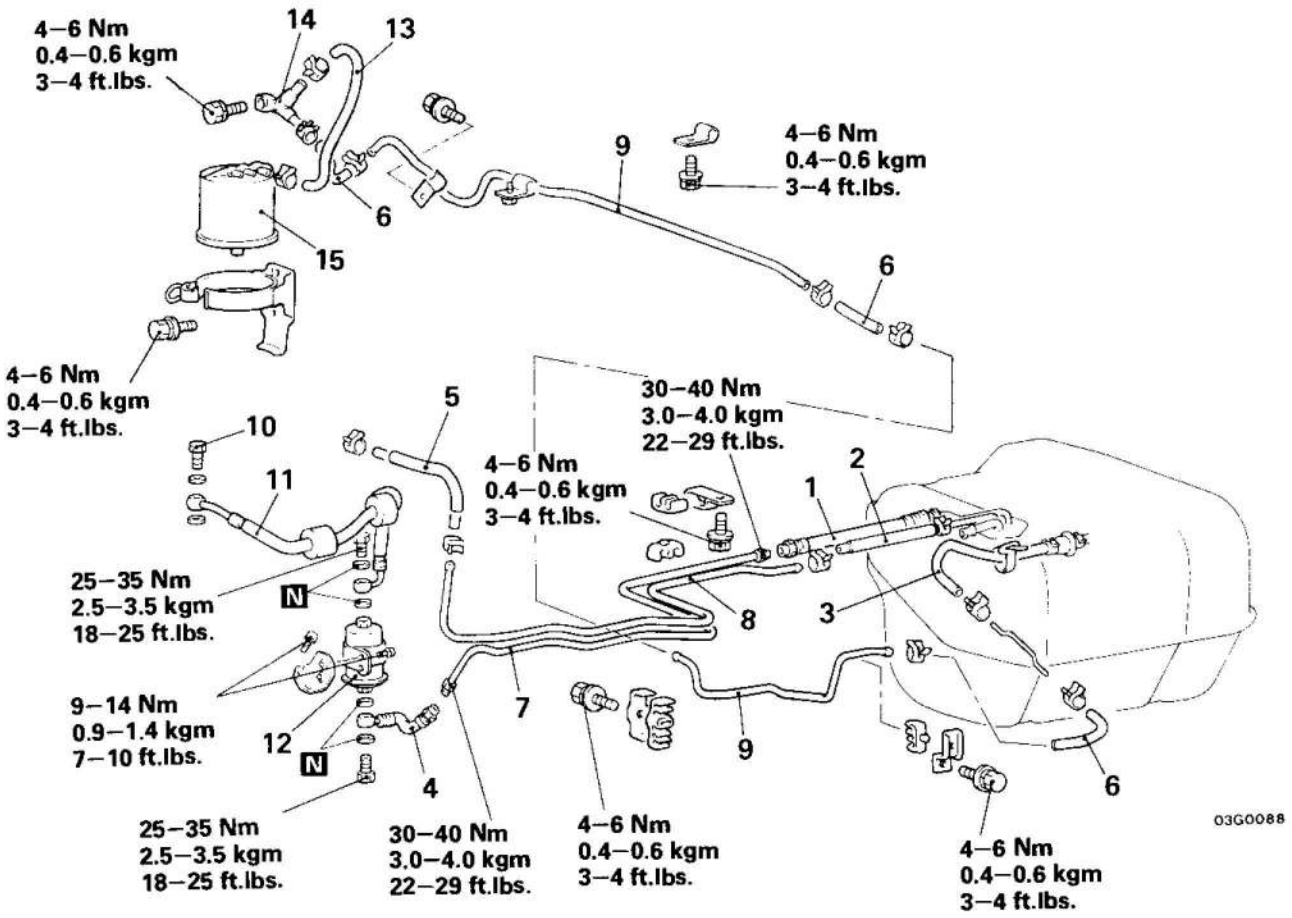


- ◆◆ 1. Connection of main hose and main pipe
- ◆◆ 2. Connection of return hose and return pipe
- 3. Connection of vapor hose and vapor pipe
- ◆◆ 4. High pressure hose
- ◆◆ 5. Return hose
- 6. Vapor hose
- 7. Main pipe
- 8. Return pipe
- 9. Vapor pipe
- 10. Connection of high pressure hose and delivery pipe
- 11. High pressure hose
- 12. Fuel filter
- 13. Vapor hose (vehicles for Europe built up to June 1991 and vehicles built from July 1991)
- ◆◆ 14. Check valve (vehicles for Europe built up to June 1991 and vehicles built from July 1991)
- ◆◆ 15. Canister assembly

Pre-removal Operation
- Removal of fuel pump connector (Refer to P.13–115.)

NOTE
◆◆: Refer to "Service Points of Installation".

4WD



- ➡⬅ 1. Connection of main hose and main pipe
- ➡⬅ 2. Connection of return hose and return pipe
- 3. Connection of vapor hose and vapor pipe
- ➡⬅ 4. High pressure hose
- ➡⬅ 5. Return hose
- 6. Vapor hose
- 7. Main pipe
- 8. Return pipe
- 9. Vapor pipe
- 10. Connection of high pressure hose and delivery pipe
- 11. High pressure hose
- 12. Fuel filter
- 13. Vapor hose (vehicles for Europe built up to June 1991 and vehicles built from July 1991)
- ➡⬅ 14. Check valve (vehicles for Europe built up to June 1991 and vehicles built from July 1991)
- ➡⬅ 15. Canister assembly

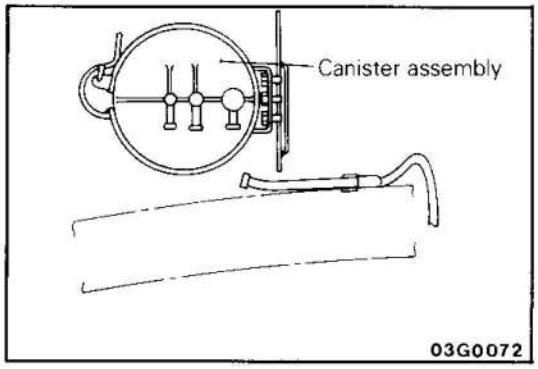
Pre-removal Operation
- Removal of fuel pump connector (Refer to P.13–115.)

NOTE
➡⬅: Refer to "Service Points of Installation".

INSPECTION E13KCAM

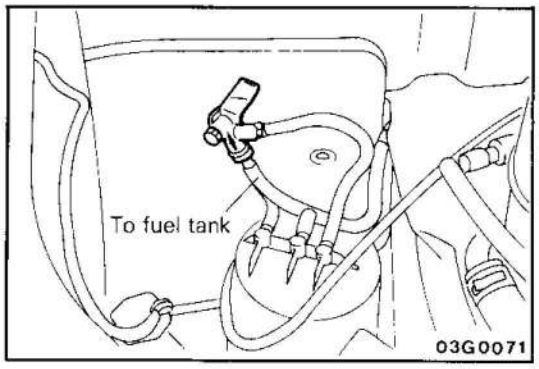
- Check the fuel hoses and pipes for cracks, bend, deformation, deterioration or clogging.
- Check the fuel filter for clogging or damage.
- Check the canister for clogging or damage.
- Check the purge-control valve for malfunction.
- Check the check valve for malfunction

SERVICE POINTS OF INSTALLATION E13KDAI



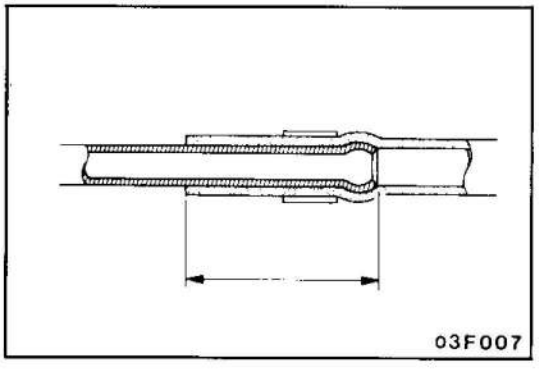
15. INSTALLATION OF CANISTER

Fix canister assembly with clamp so that it faces the direction indicated in the diagram.



14. INSTALLATION OF CHECK VALVE (vehicles for Europe built up to June 1991 and vehicles built from July 1991)

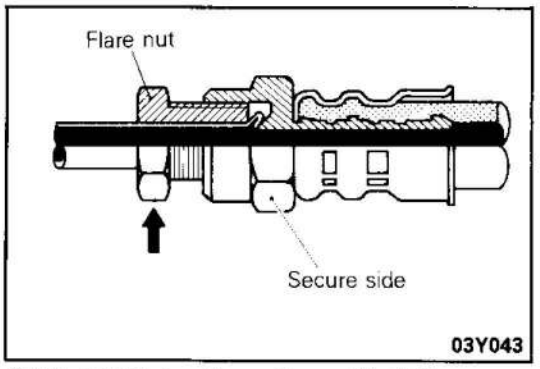
Install so that the check valve is facing in the direction shown in the figure.



5. INSTALLATION OF RETURN HOSE/2. RETURN HOSE AND RETURN PIPE

Insert fuel hose securely into fuel pipe so that insertion is within the standard value.

Standard value: 20–25 mm (0.79–0.98 in.)



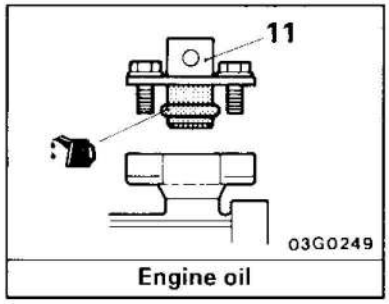
4. INSTALLATION OF HIGH PRESSURE HOSE/1. MAIN HOSE AND MAIN PIPE

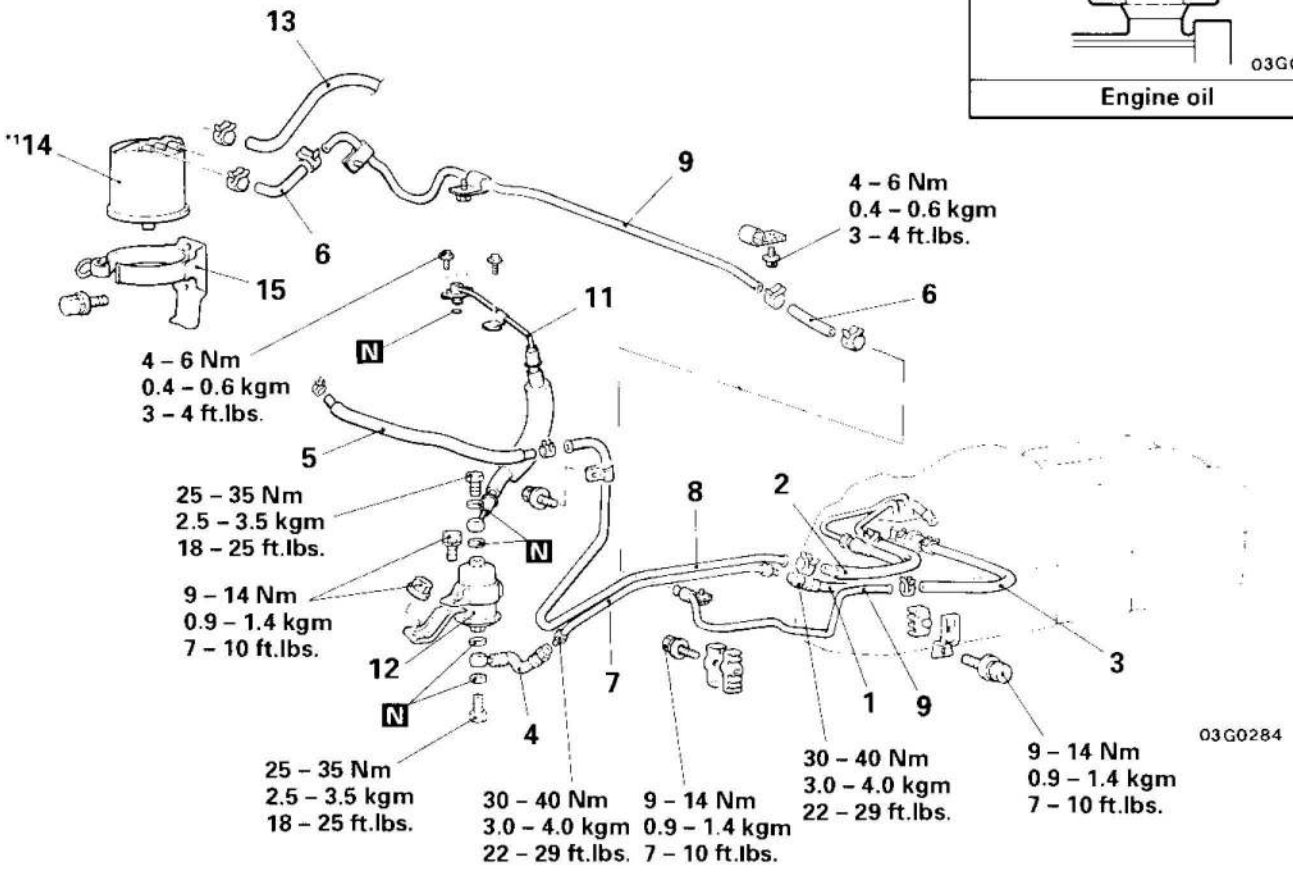
(1) Temporarily tighten the flare nut by hand, and then tighten it to the specified torque, being careful that the fuel hose does not become twisted.
(2) After all of the fuel pipes and hoses have been connected, start the engine, and then confirm that there is no fuel leakage from any of the connections.

REMOVAL AND INSTALLATION <Vehicles built from June 1994>

VEHICLES FOR EUROPE

2WD





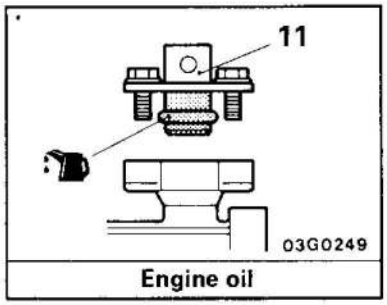
➡⬅ 1. Connection of main hose and main pipe
➡⬅ 2. Connection of return hose and return pipe
3. Connection of vapor hose and vapor pipe
➡⬅ 4. High pressure hose
➡⬅ 5. Return hose
6. Vapor hose
7. Main pipe
8. Return pipe
9. Vapor pipe
11. High pressure hose
13. Purge hose
➡⬅ 14. Canister assembly
15. Canister bracket

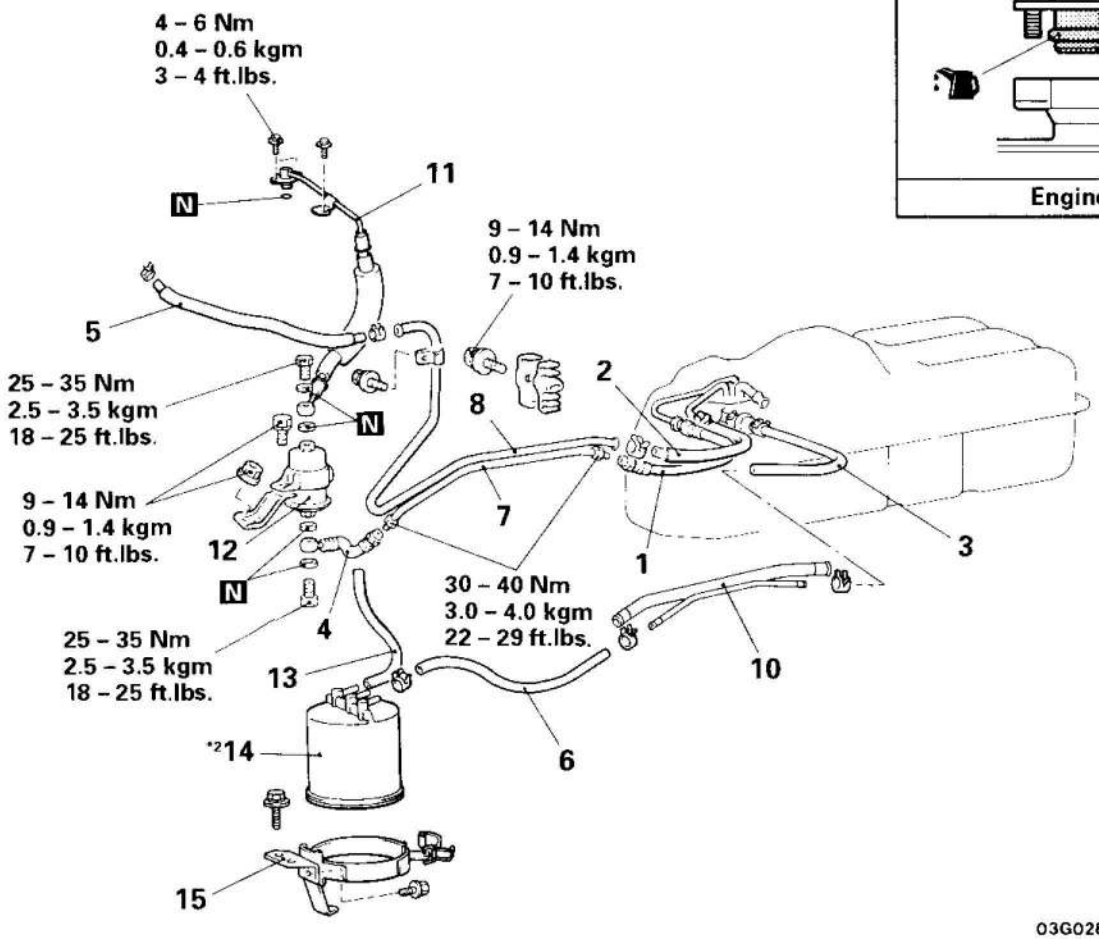
Pre-removal Operation
- Removal of fuel pump connector (Refer to P.13 – 115.)

NOTE
➡⬅: Refer to "Service Points of Installation".

VEHICLES FOR GENERAL EXPORT, AUSTRALIA

2WD



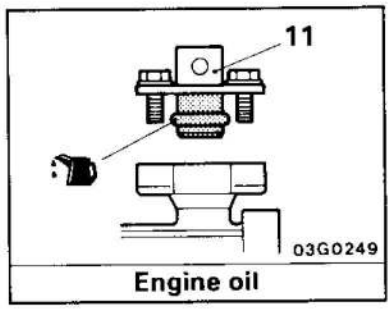


➡⬅ 1. Connection of main hose and main pipe
➡⬅ 2. Connection of return hose and return pipe
3. Connection of vapor hose and leveling pipe assembly
➡⬅ 4. High pressure hose
➡⬅ 5. Return hose
6. Vapor hose
7. Main pipe
8. Return pipe
10. Leveling pipe assembly
11. High pressure hose
12. Fuel filter
13. Purge hose
➡⬅ 14. Canister assembly
15. Canister bracket

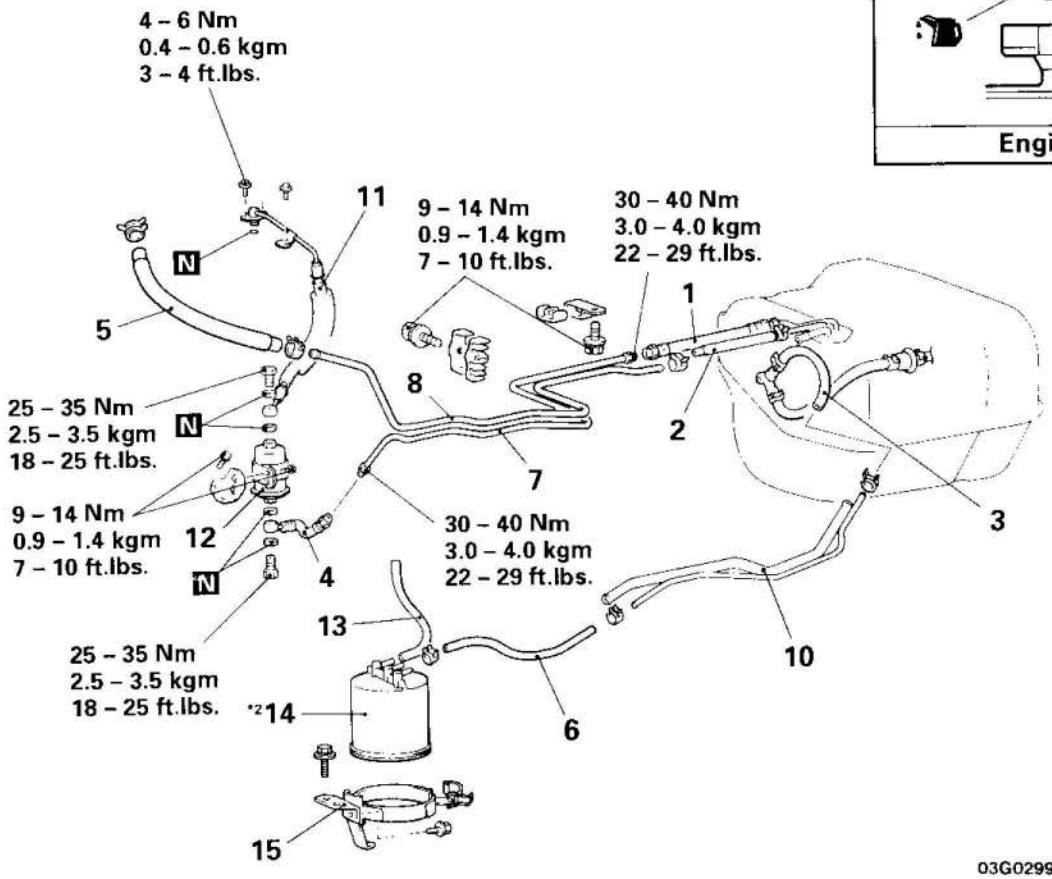
Pre-removal Operation
- Removal of fuel pump connector (Refer to P.13 – 115.)

NOTE
➡⬅: Refer to "Service Points of Installation".

4WD



Engine oil



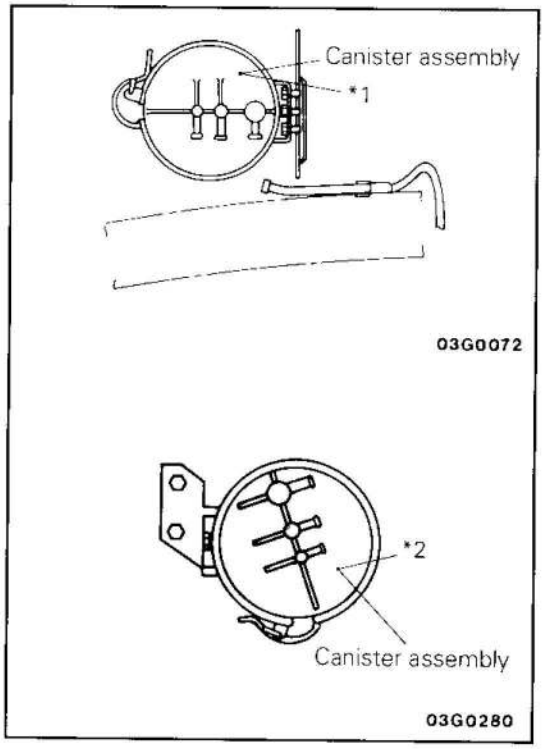
➡⬅ 1. Connection of main hose and main pipe
➡⬅ 2. Connection of return hose and return pipe
3. Connection of vapor hose and leveling pipe assembly
➡⬅ 4. High pressure hose
➡⬅ 5. Return hose
6. Vapor hose
7. Main pipe
8. Return pipe
10. Leveling pipe assembly
11. High pressure hose
12. Fuel filter
13. Purge hose
➡⬅14. Canister assembly
15. Canister bracket

Pre-removal Operation
- Removal of fuel pump connector (Refer to P.13 – 115.)

NOTE
➡⬅: Refer to "Service Points of Installation".

INSPECTION E13KCAM

- Check the fuel hoses and pipes for cracks, bend, deformation, deterioration or clogging.
- Check the fuel filter for clogging or damage.
- Check the canister for clogging or damage.
- Check the purge-control valve for malfunction.
- Check the check valve for malfunction

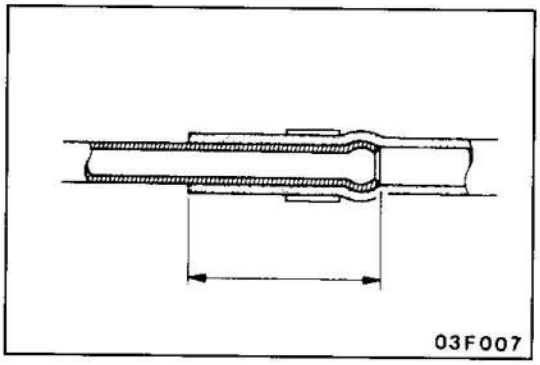


SERVICE POINTS OF INSTALLATION E13KDAI

14. INSTALLATION OF CANISTER ASSEMBLY

Fix canister assembly with clamp so that it faces the direction indicated in the diagram.

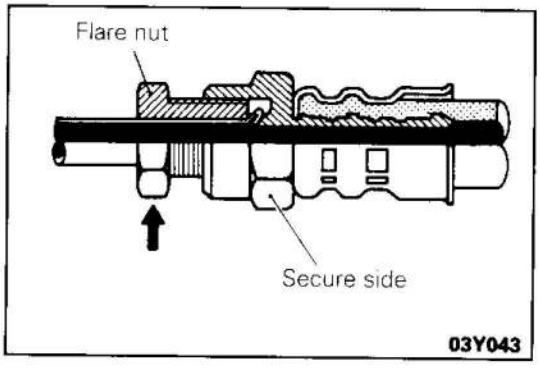
NOTE
The *1 and *2 symbols in the illustration at left correspond to the canisters shown in the "REMOVAL AND INSTALLATION" diagram.



5. INSTALLATION OF RETURN HOSE/2. RETURN HOSE AND RETURN PIPE

Insert fuel hose securely into fuel pipe so that insertion is within the standard value.

Standard value: 20 – 25 mm (0.79 – 0.98 in.)



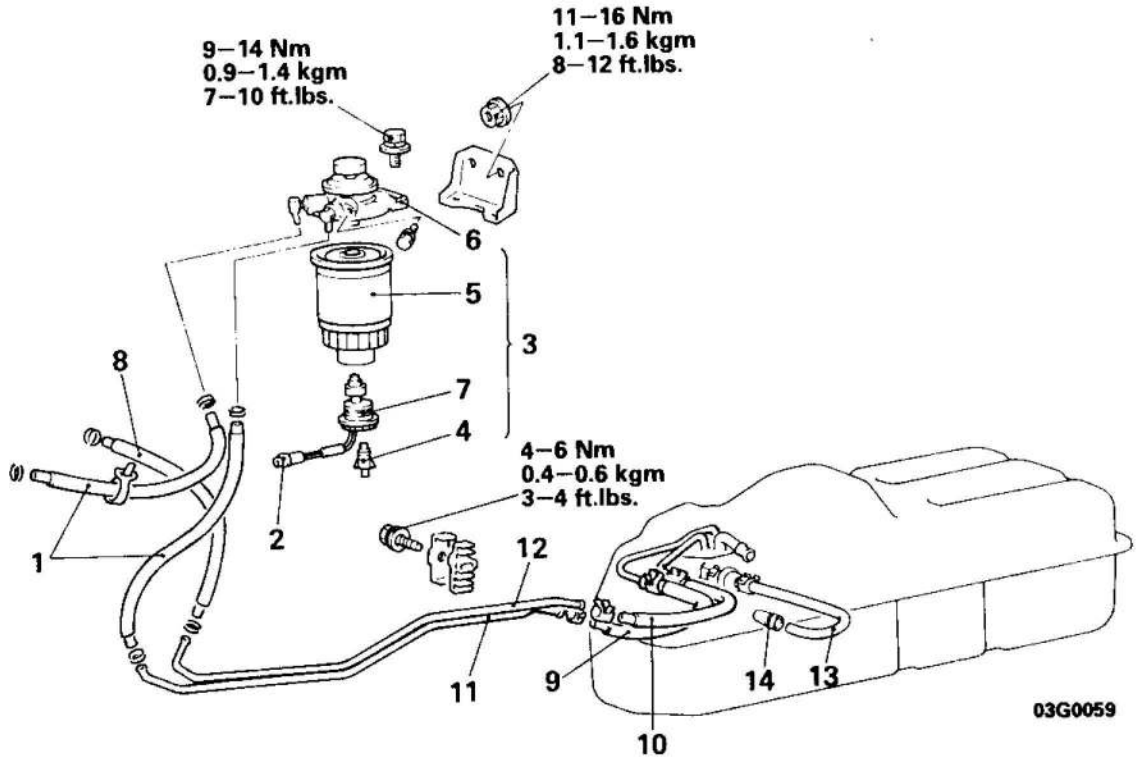
4. INSTALLATION OF HIGH PRESSURE HOSE/1. MAIN HOSE AND MAIN PIPE

(1) 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.
(2) After all of the fuel pipes and hoses have been connected, start the engine, and then confirm that there is no fuel leakage from any of the connections.

FUEL LINE (DIESEL-POWERED VEHICLES)

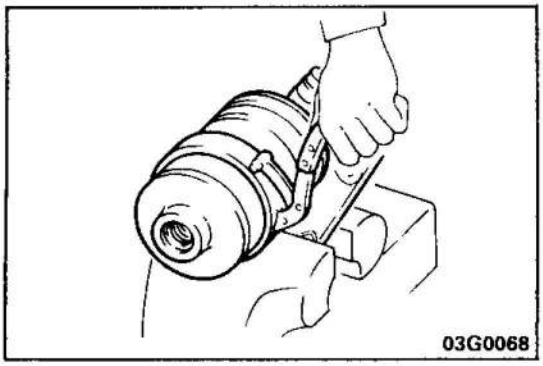
E13KA--2

REMOVAL AND INSTALLATION



◆◆ 1. Main hose
2. Water level sensor connector connection
3. Fuel filter
4. Drain plug
◆◆ 5. Fuel filter cartridge
6. Fuel filter pump
◆◆ 7. Water level sensor
◆◆ 8. Return hose
◆◆ 9. Connection of main hose and main pipe
◆◆ 10. Connection of return hose and return pipe
11. Main pipe
12. Return pipe
13. Vapor hose
14. Grommet

NOTE
(1) ◆◆ : Refer to "Service Points of Removal".
(2) ◆◆ : Refer to "Service Points of Installation".

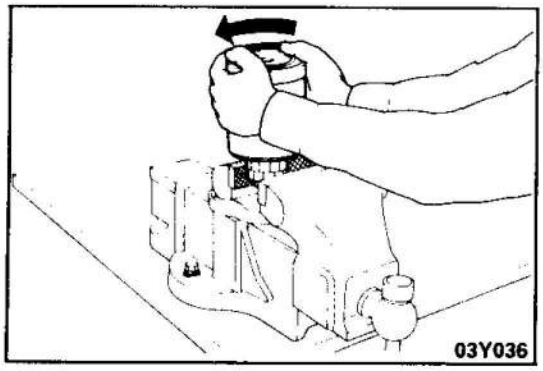


SERVICE POINTS OF REMOVAL

E13KBAC

5. REMOVAL OF FUEL FILTER CARTRIDGE

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

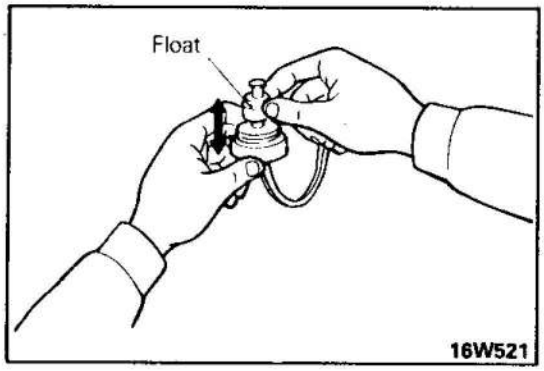


7. REMOVAL OF WATER LEVEL SENSOR

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

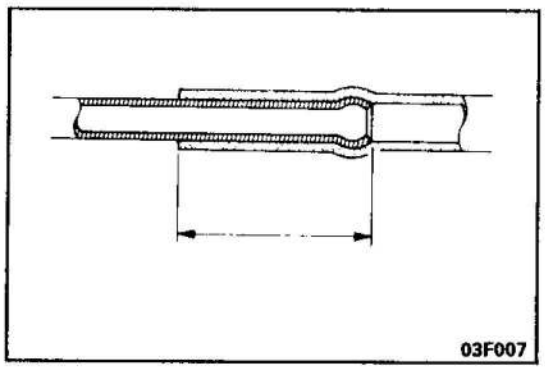
INSPECTION E13KCAN

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



INSPECTION OF WATER LEVEL SENSOR OPERATION

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



SERVICE POINTS OF INSTALLATION E13KDAJ

10. INSTALLATION OF RETURN HOSE AND RETURN PIPE/9. MAIN HOSE AND MAIN PIPE/8. RETURN HOSE/1. MAIN HOSE

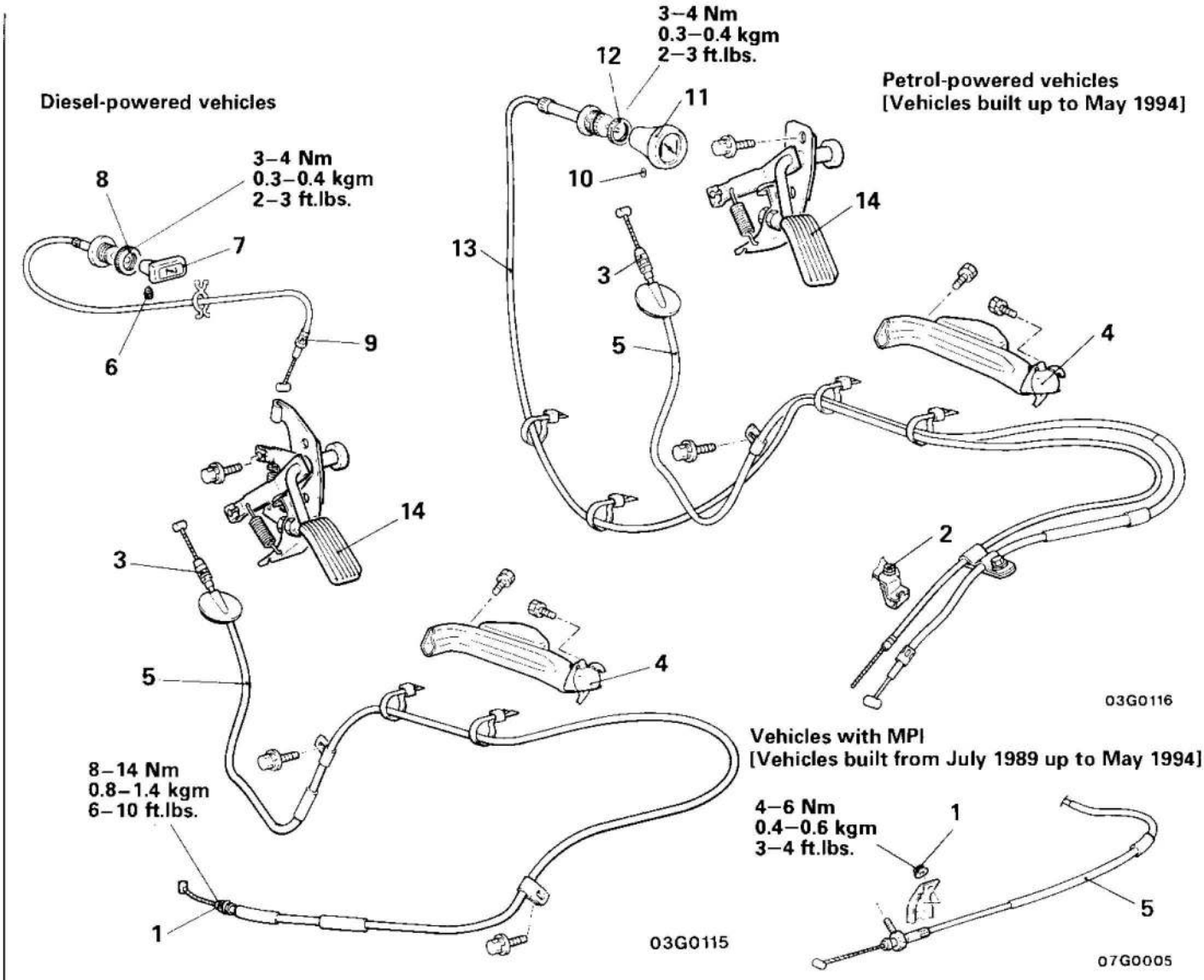
Insert fuel hose securely into fuel pipe so that insertion is within the standard value.

Standard value: 20–25 mm (0.79–0.98 in.)

ACCELERATOR CABLE AND PEDAL (R.H.D.)

REMOVAL AND INSTALLATION

E130A---0



Removal steps of accelerator cable

1. Adjusting nut
2. Adjusting bolt
3. Lock nut
4. Air duct
- ◆◆ 5. Accelerator cable

Removal steps of control cable

6. Set screw
7. Knob
8. Stopper ring
9. Control cable

Removal steps of choke cable

10. Bolt
11. Knob
12. Adjusting nut
13. Choke cable

Post-installation Operation

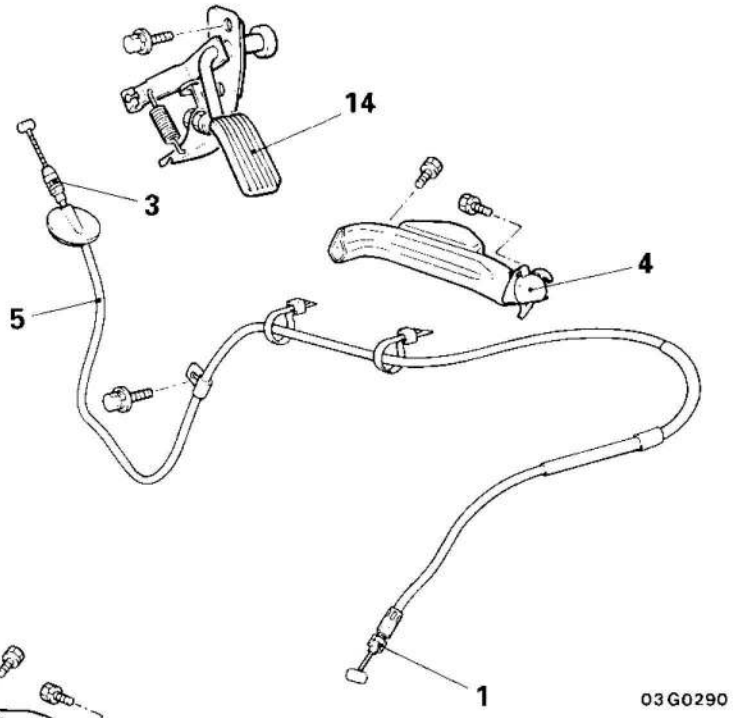
- Inspection and adjustment of accelerator cable (Refer to P.13–17, 33, 57, 77.)

Removal steps of accelerator pedal

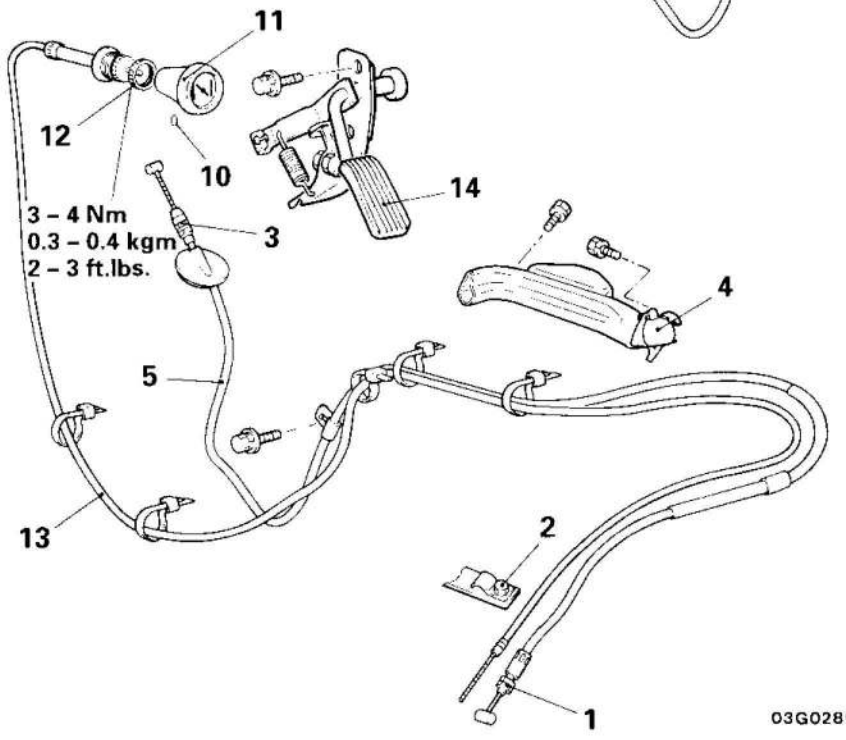
5. Connection of accelerator pedal and cable
9. Connection of accelerator pedal and control cable (diesel-powered vehicles)
14. Accelerator pedal

NOTE
(1) Reverse the removal procedures to reinstall.
(2) ◆◆ : Refer to "Service Points of Installation".

Petrol-powered vehicles with automatic choke [Vehicles built from June 1994]



Petrol-powered vehicles with manual choke [Vehicles built from June 1994]



Removal steps of accelerator cable

1. Adjusting nut
3. Lock nut
4. Air duct
➡⬅ 5. Accelerator cable

Removal steps of choke cable

2. Adjusting bolt
10. Bolt
11. Knob
12. Adjusting nut
13. Choke cable

Post-installation Operation

- Inspection and adjustment of accelerator cable (Refer to P.13 – 17, 56 – 1, 76 – 5)

Removal steps of accelerator pedal

5. Connection of accelerator pedal and cable
14. Accelerator pedal

NOTE
(1) Reverse the removal procedures to reinstall.
(2) ➡⬅: Refer to "Service Points of Installation".

INSPECTION

E13OCAD0

- Check inner cable for damage.
- Check outer cable for damage.
- Check sliding condition of cable.
- Check accelerator arm bend.
- Check return spring for wear.
- Check connection of inner cable and end metal fittings.

SERVICE POINTS OF INSTALLATION

E13ODAG0

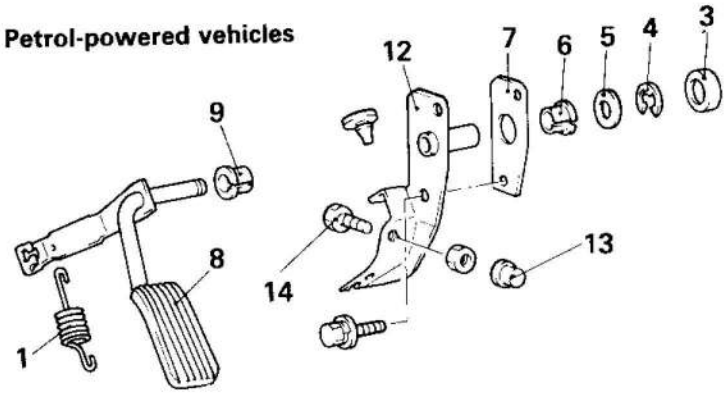
5. INSTALLATION OF ACCELERATOR CABLE

Install accelerator cable so that there are no sharp bends.

DISASSEMBLY AND REASSEMBLY

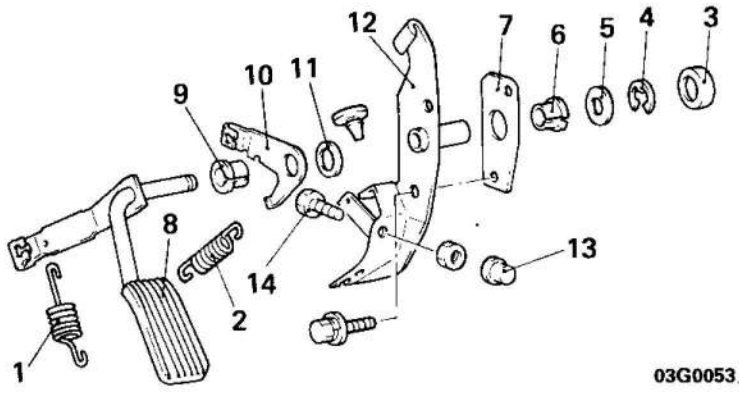
E13OE--0

Petrol-powered vehicles



03G0052

Diesel-powered vehicles

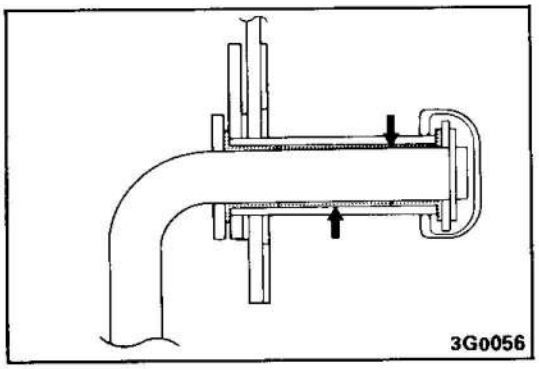


03G0053

Disassembly steps

1. Return spring
2. Return spring (diesel-powered vehicles)
3. Boots
4. Snap ring
5. Washer
- ◆◆ 6. Bushing
7. Gasket
- ◆◆ 8. Accelerator pedal
- ◆◆ 9. Bushing
10. Lever (diesel-powered vehicles)
11. Gasket (diesel-powered vehicles)
12. Bracket
13. Cap
14. Bolt

NOTE
(1) Reverse the disassembly procedures to reassemble.
(2) ◆◆ : Refer to "Service Points of Reassembly".



SERVICE POINTS OF REASSEMBLY

E13OGAA

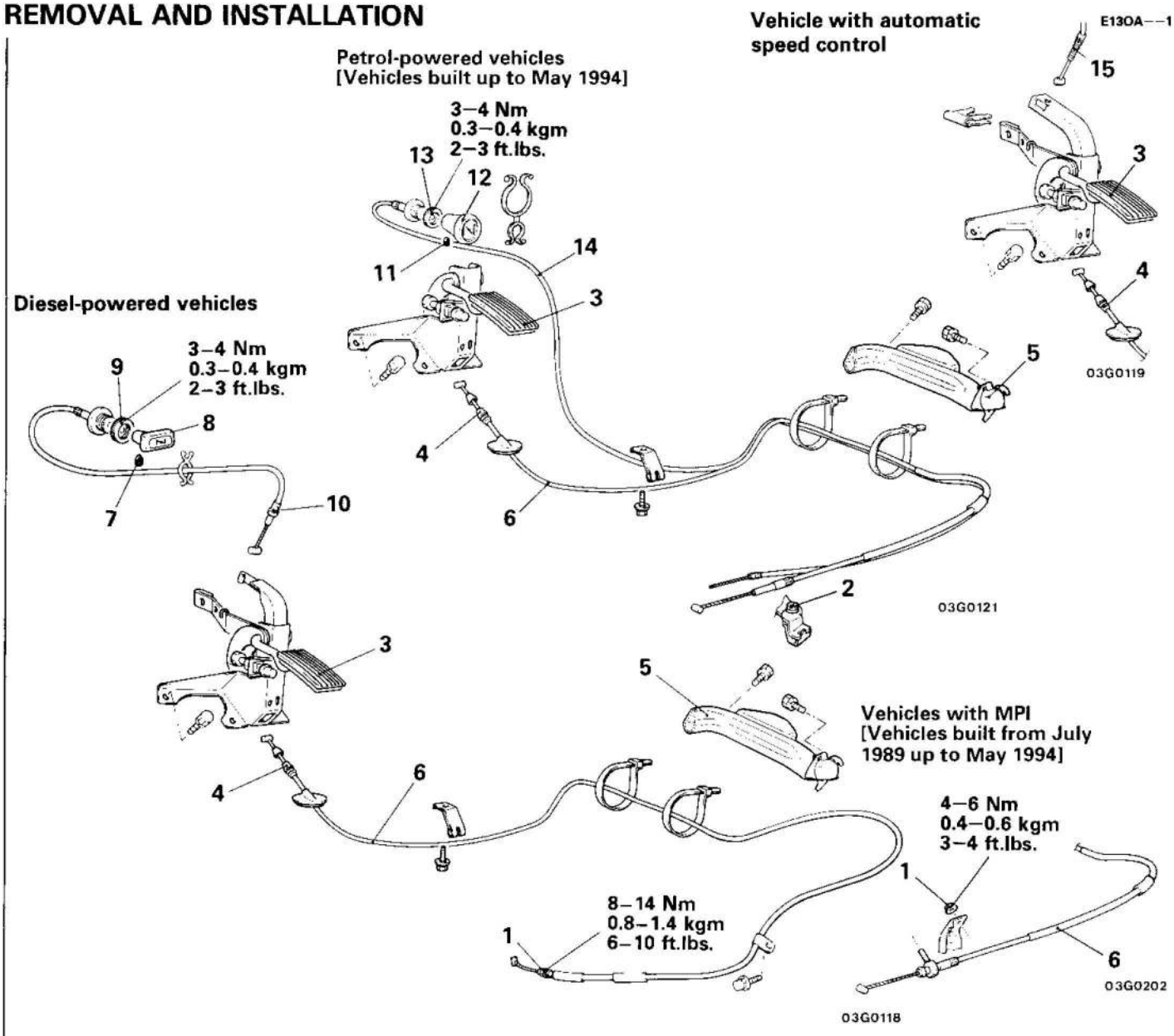
9. APPLICATION OF GREASE TO BUSHING/8. ACCELERATOR PEDAL/6. BUSHING

Apply the specified grease onto the bushing and accelerator pedal shaft.

Specified grease: Multipurpose grease, SAE J310, NLGI No.2

ACCELERATOR CABLE AND PEDAL (L.H.D.)

REMOVAL AND INSTALLATION



Removal steps of accelerator cable

1. Adjusting nut
2. Adjusting bolt
3. Accelerator pedal
◆◆ 4. Clip
5. Air duct
◆◆ 6. Accelerator cable

Removal steps of control cable

7. Set screw
8. Knob
9. Stopper ring
10. Control cable

Removal steps of choke cable

11. Bolt
12. Knob
13. Adjusting nut
14. Choke cable

Post-installation Operation

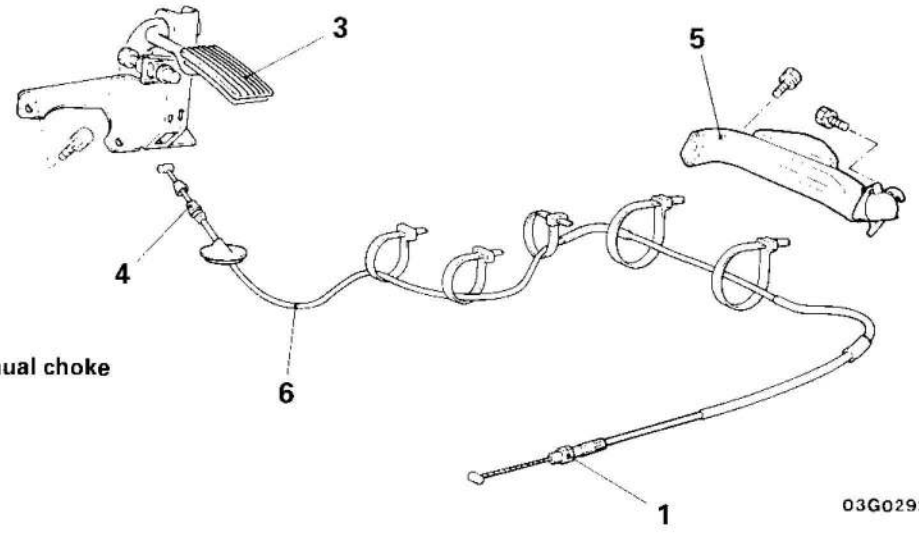
- Inspection and adjustment of accelerator cable (Refer to P.13–17, 33, 57, 77.)

Removal steps of accelerator pedal

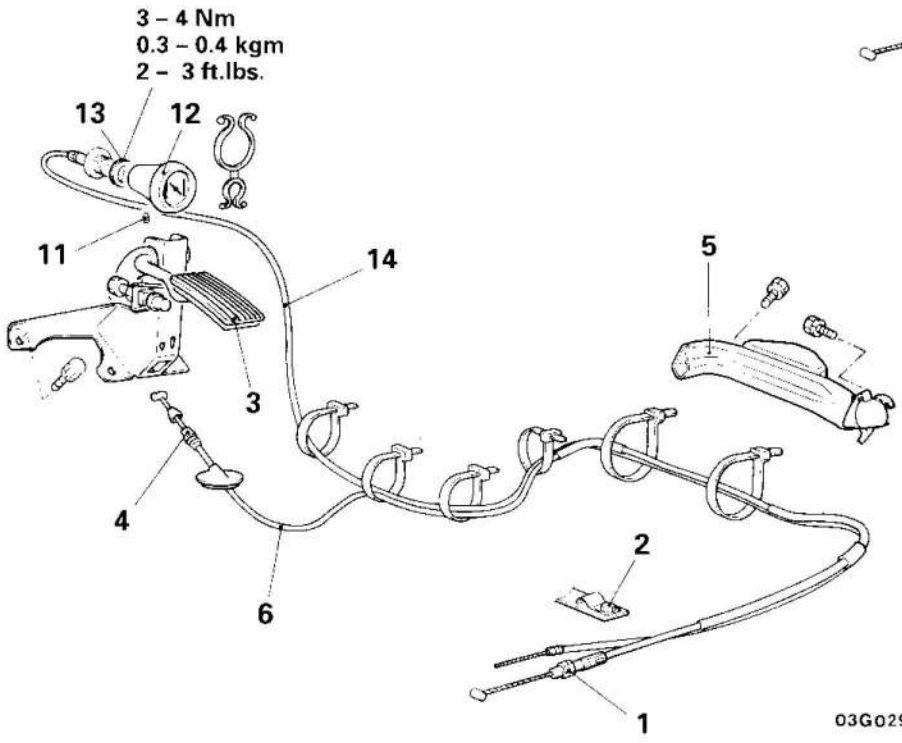
◆◆ 4. Clip
10. Connection of accelerator pedal and control cable (diesel-powered vehicles)
15. Connection of accelerator pedal and speed control cable (vehicles with automatic speed control)
3. Accelerator pedal
6. Connection of accelerator pedal and cable

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

Petrol-powered vehicles with automatic choke [Vehicles built from June 1994]



Petrol-powered vehicles with manual choke [Vehicles built from June 1994]



Removal steps of accelerator cable

1. Adjusting nut
2. Adjusting bolt
3. Accelerator pedal
4. Clip
5. Air duct
6. Accelerator cable

Removal steps of choke cable

11. Bolt
12. Knob
13. Adjusting nut
14. Choke cable

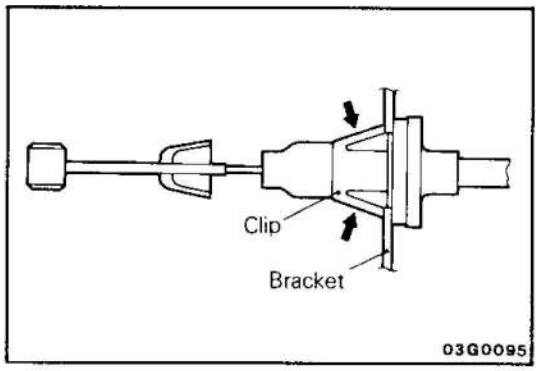
Post-installation Operation

- Inspection and adjustment of accelerator cable (Refer to P.13 – 17, 56 – 1, 76 – 5)

Removal steps of accelerator pedal

4. Clip
3. Accelerator pedal
6. Connection of accelerator pedal and 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 E13OBAB

4. REMOVAL OF CLIP

Press clip retainers from both sides and remove cable from accelerator arm bracket.

INSPECTION E13OCAD1

- Check inner cable for damage
- Check outer cable for damage
- Check sliding condition of cable
- Check accelerator arm bend
- Check return spring for wear
- Check connection of inner cable and end metal fittings

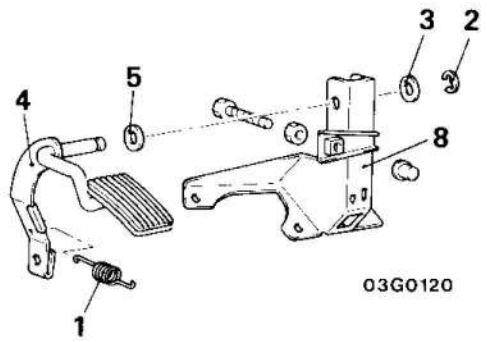
SERVICE POINTS OF INSTALLATION E13ODAG1

6. INSTALLATION OF ACCELERATOR CABLE

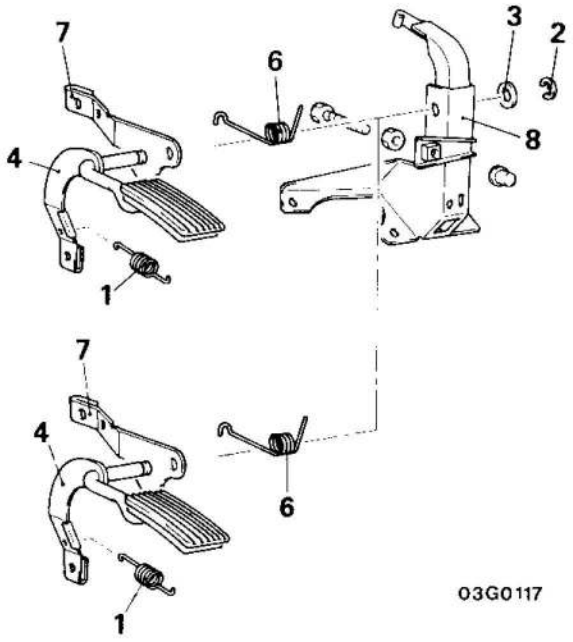
Install accelerator cable so that there are no sharp bends.

DISASSEMBLY AND REASSEMBLY E13OE--1

Petrol-powered vehicles



Diesel-powered vehicles

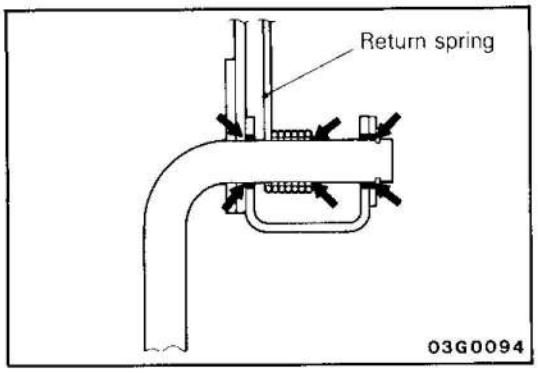


Petrol-powered vehicles with automatic speed control system

Disassembly steps

1. Return spring
2. Snap ring
3. Washer (petrol-powered vehicles)
◆◆ 4. Accelerator pedal
5. Washer
6. Return spring
7. Lever
8. Bracket

NOTE
(1) Reverse the disassembly procedures to reassemble.
(2) ◆◆ : Refer to "Service Points of Reassembly".



SERVICE POINTS OF REASSEMBLY E13OGAB

4. APPLICATION OF GREASE TO ACCELERATOR PEDAL

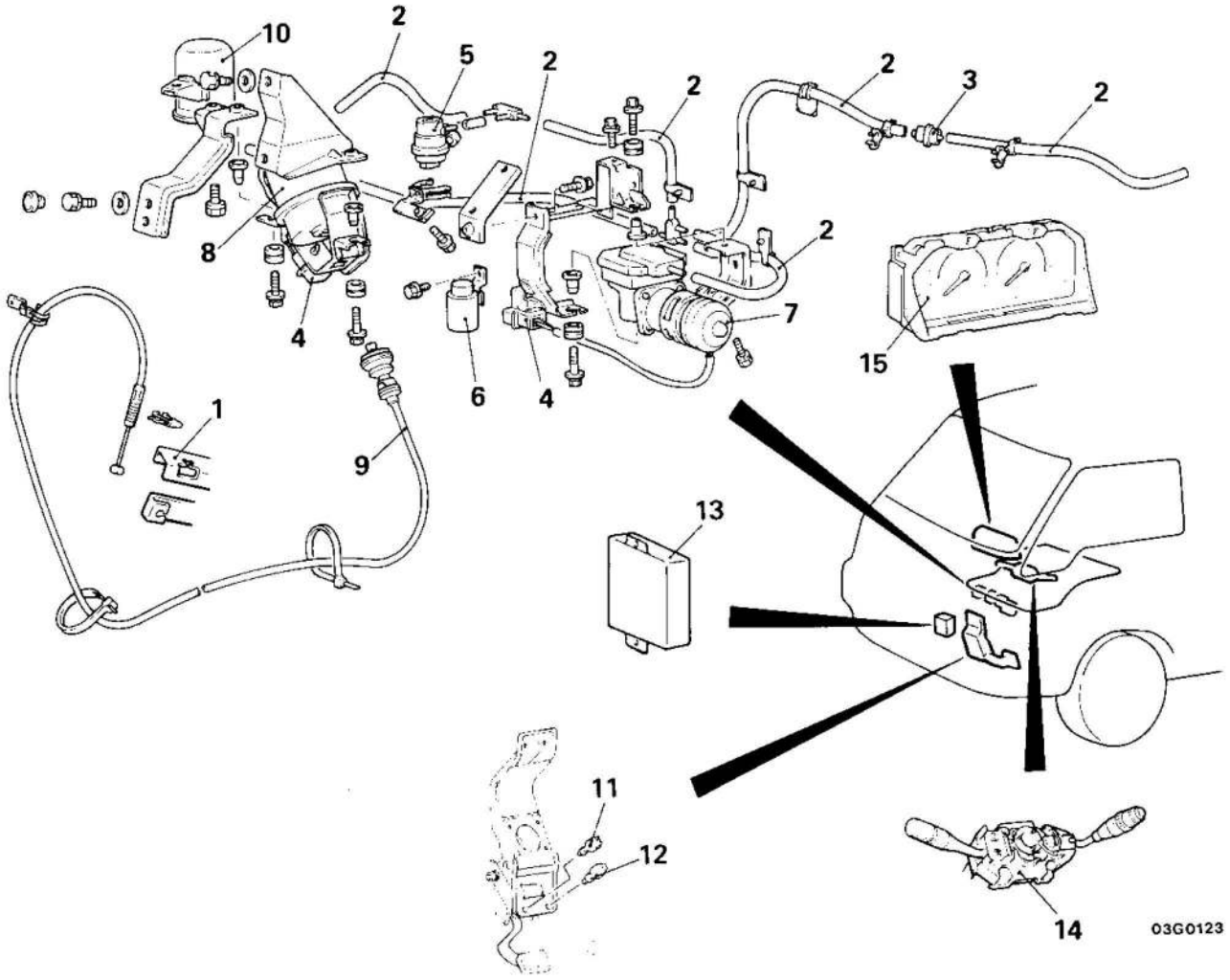
Apply the specified grease onto the accelerator pedal shaft.

Specified grease: Multipurpose grease, SAE J310, NLGI No.2

AUTO-CRUISE CONTROL SYSTEM

REMOVAL AND INSTALLATION

E13SA--



Removal steps of actuator

1. Connection of accelerator pedal and auto-cruise control cable
2. ◆◆ Vacuum hose connection
3. ◆◆ Check valve
4. Wiring harness connection
5. Vacuum switch
6. Vacuum pump relay
7. Vacuum pump assembly
8. ◆◆ Actuator assembly
9. Auto-cruise control cable
10. Vacuum tank

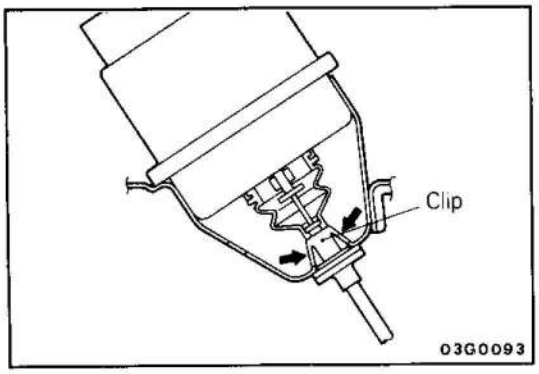
Removal of switches and control unit

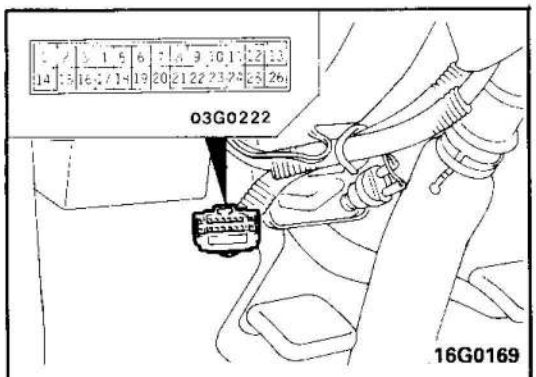
11. Clutch switch
12. Stop lamp switch
13. Auto-cruise control unit
14. Column switch (Auto-cruise control switch)
15. Speedometer (Vehicle speed sensor)

Pre-removal Operation
- Removal of column switch (Refer to GROUP 54 – Column Switch.)
- Removal of meter and gauge (Refer to GROUP 54 – Meters and Gauges.)

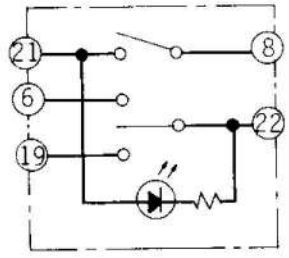
Post-installation Operation
- Installation of meter and gauge (Refer to GROUP 54 – Meters and Gauges.)
- Installation of column switch (Refer to GROUP 54 – Column Switch.)
- Inspection of accelerator pedal play and function of auto-cruise control system (Refer to P. 13-80.)
- Adjustment of brake pedal (Refer to GROUP 35 – Service Adjustment Procedure.)

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

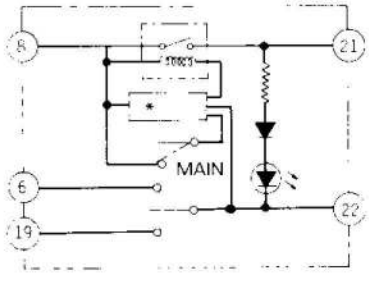




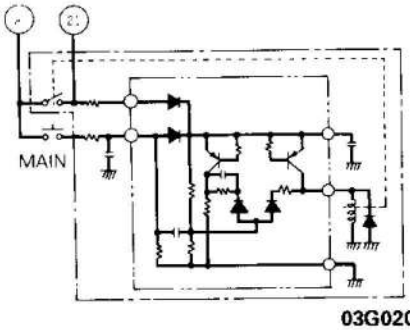
Vehicles built up to October 1989



Vehicles built from November 1989



***Indicates self holding circuit**



SERVICE POINTS OF REMOVAL E13SBAB

8. REMOVAL OF ACTUATOR ASSEMBLY

(1) Remove actuator with auto-cruise control cable attached.
(2) Press auto-cruise control cable clip at indicated part and remove from actuator.

INSPECTION E13SCAB

- Check vacuum hose for cracks or folds.
- Check bracket for damage.
- Check inner and outer cables for damage or binding.

AUTO-CRUISE CONTROL SWITCH

1. Disconnect the connection of the column switch connector, and check at the connector at the switch side.
2. Operate the switch, and check the continuity between the terminals.

NOTE
○—○ indicates that there is continuity between the terminals.

Vehicles built up to October 1989

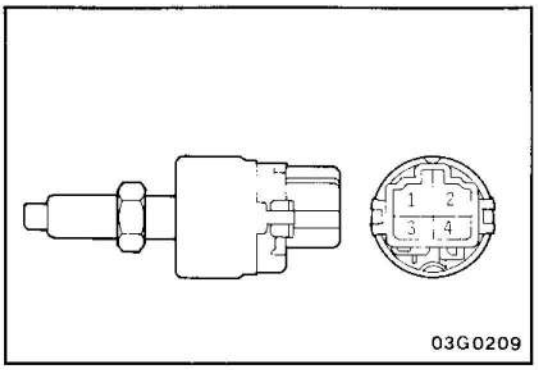
Switch position \ Terminal		22	19	6	21	8
SET	OFF					
	ON (Push)	○	—	○		
OFF						
ON					○	○
RESUME		○	○		○	○

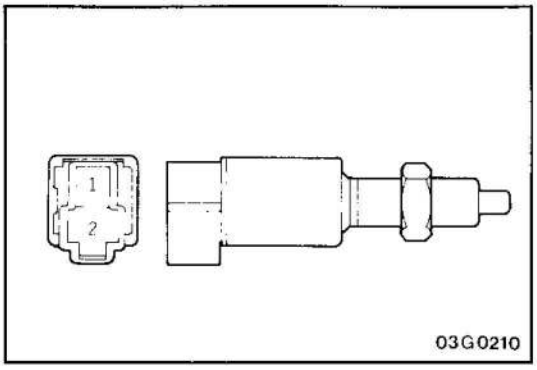
Vehicles built from November 1989

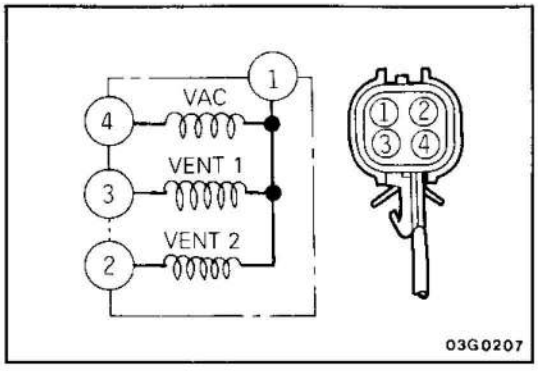
Switch position \ Terminal		22	19	6	21	8	MAIN
SET	OFF						
	ON (Push)	○	—	○			
CRUISE						○	○
NEUTRAL							
RESUME		○	○		○	○	

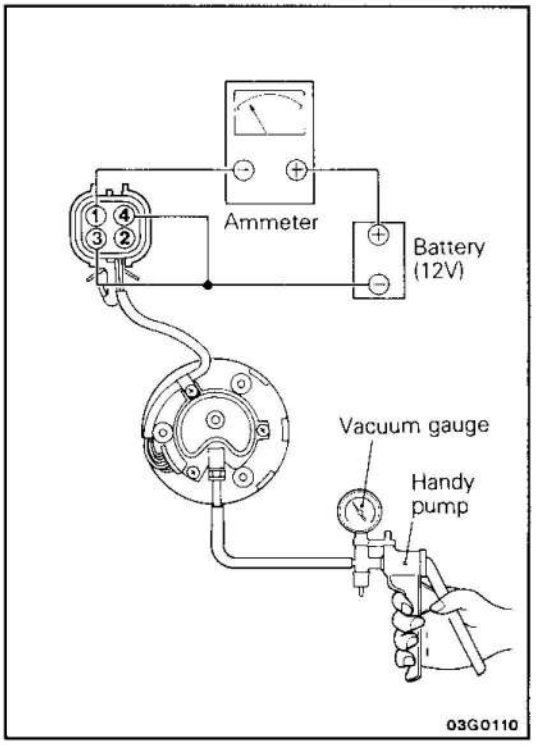
VEHICLE-SPEED SENSOR

Refer to GROUP 54 – Meters and Gauges.









STOP LAMP SWITCH

1. Disconnect the connector.
2. Depress and release the brake pedal and check continuity between the switch terminals.

Measurement condition \ Terminal	1	2	3	4
When brake pedal depressed	○			○
When brake pedal not depressed		○	○	

NOTE
○—○ indicates that there is continuity between the terminals.

CLUTCH SWITCH

1. Disconnect the connector.
2. Depress and release the clutch pedal and check continuity between the switch terminals.

Measurement condition \ Terminal	1	2
When clutch pedal depressed	○	○
When clutch pedal not depressed		

NOTE
○—○ indicates that there is continuity between the terminals.

ACTUATOR

Solenoid Valves

Measure resistance of each solenoid valve assembly (VAC, VENT1, VENT2) in the actuator.

Standard value:

Terminals 1 – 2 (with continuity)	**18 – 28 Ω**
Terminals 1 – 3 (with continuity)	**25 – 35 Ω**
Terminals 1 – 4 (with continuity)	**45 – 65 Ω**

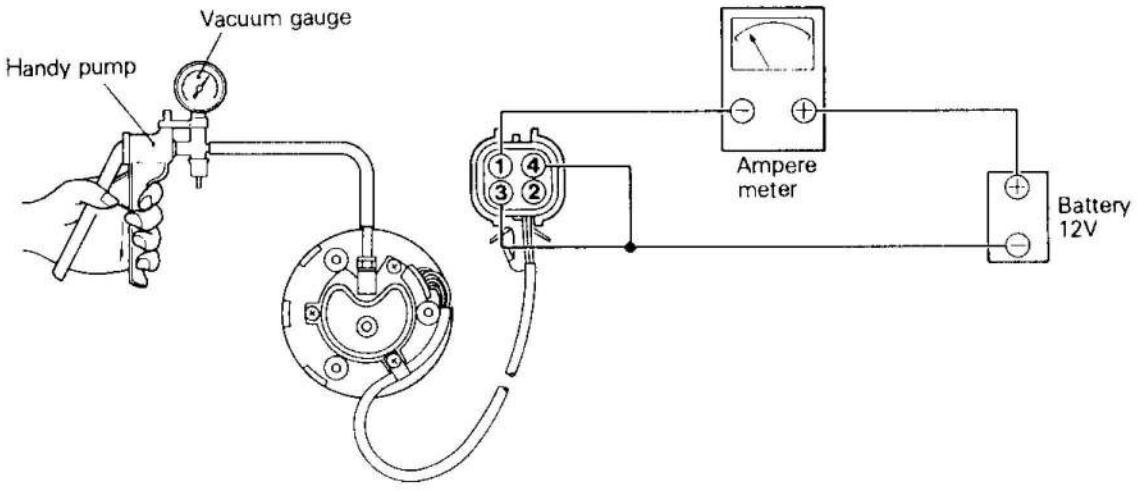
Actuator Operation

Disconnect the actuator's connector and, in the order described below, check the actuator's operation and the circuit tester and vacuum gauge indications; replace the actuator assembly if any abnormal condition is discovered.

1. Apply negative pressure [approx. 400 mmHg. (16 in.Hg.)] to the vacuum nipple using a handy pump and wire battery and ammeter as shown in the figure.
   [VAC, VENT1, VENT2 solenoids all ON]

Judgement		Probable cause
Normal	Abnormal	
Holder moves in PULL direction · Gauge indicates negative pressure · Ammeter indicates 1.5A or less	Holder does not move in PULL direction · Ammeter: 0A	Open circuit in lead wire Open circuit in valve solenoid coil
	Holder does not move in PULL direction · Ammeter: 0.7 to 1.5A · No gauge indication	Faulty solenoid valve in actuator (foreign matter caught inside)
	Holder does not move in PULL direction · Ammeter: 0.5 to 0.6A · Gauge gives indication	Open circuit in VAC side solenoid or valve remaining closed
	Holder once moves in PULL direction but soon moves back · Ammeter: 0.4 to 0.5A	Open circuit in VENT1 or VENT2 solenoid

(2) From state of (1) above, disconnect wiring from actuator terminal (2) and earth. [VAC solenoid only OFF]



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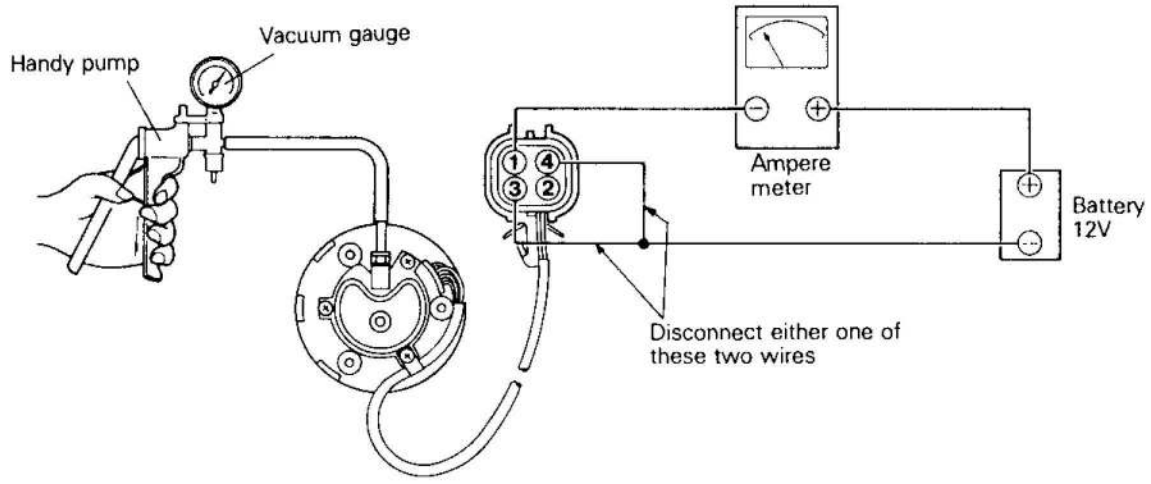
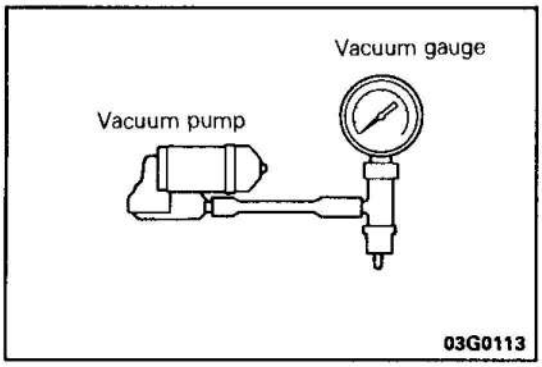
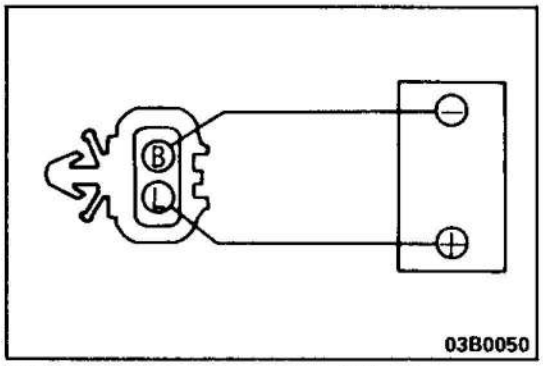
Judgement		Probable cause
Normal	Abnormal	
Holder keeps its position · Gauge negative pressure reading constant · Ammeter: 0.5 to 0.6A	Holder returns to initial position · Gauge reading constant · Ammeter: 0.5 to 0.6A	Leaks from VENT1 or VENT2 valve seal (foreign matter caught in valve, etc.)
	Holder returns to initial position · Gauge reading: 0 mmHg. (0 in. Hg.) · Ammeter: 0.5 to 0.6A	VAC valve and VENT valves both sealing poorly

(3) From state of (2) above, disconnect wiring from actuator terminal (3) or (4) and earth.
[From negative pressure holding state (VAC solenoid OFF), turn OFF VENT1 or VENT2 solenoid.]



Judgement		Probable cause
Normal	Abnormal	
Holder returns to initial position · Gauge negative pressure reading remains as (2) · Ammeter: 0.2 to 0.4A	Holder does not return to initial position · Gauge negative pressure reading remaining as (2)	· VENT valve binding · Atmosphere section filter completely loaded





CHECKING VACUUM PUMP

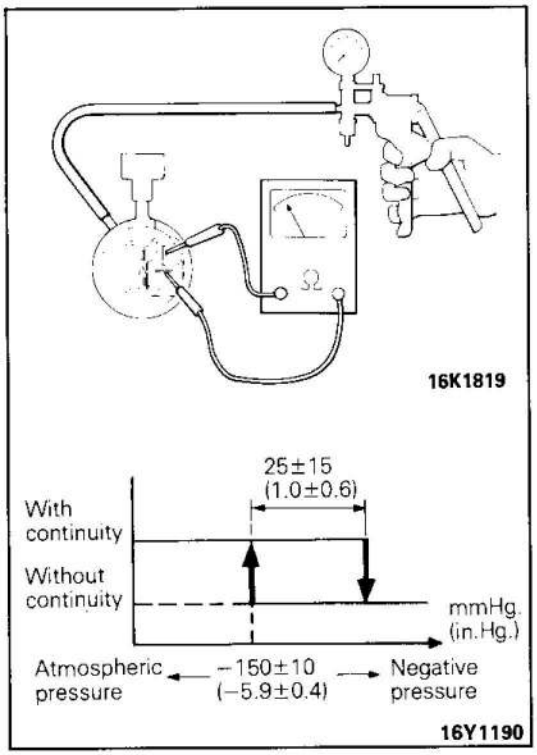
1. Install vacuum gauge to vacuum pump.

2 Connect the battery (12V) ⊕ terminal to connector L terminal (power side) and battery ⊖ terminal to connector B terminal (earth side) and operate the motor to check generated negative pressure.

Standard value:

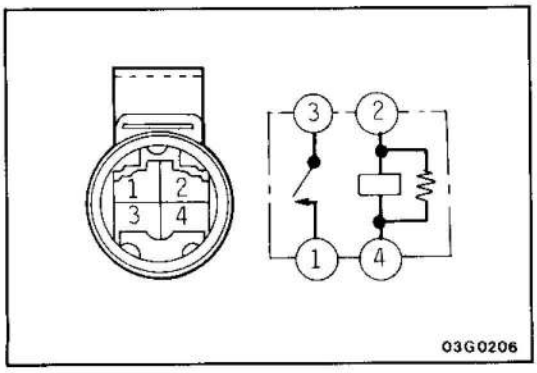
Negative pressure	**150 mmHg/min. (5.9 in.Hg/min.) or more**

3. Then check that disconnection of battery to stop motor operation does not cause sudden loss of negative pressure.



VACUUM SWITCH

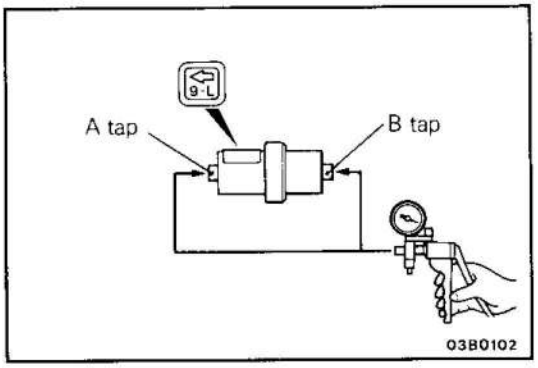
1. Disconnect the wiring connector.
2. With a handy pump connected to the negative pressure port of the vacuum switch to apply vacuum, check continuity between switch terminals.
3. Check that there is no sudden drop of negative pressure.



VACUUM PUMP RELAY

Check continuity between terminals when the relay coil is energized and de-energized.

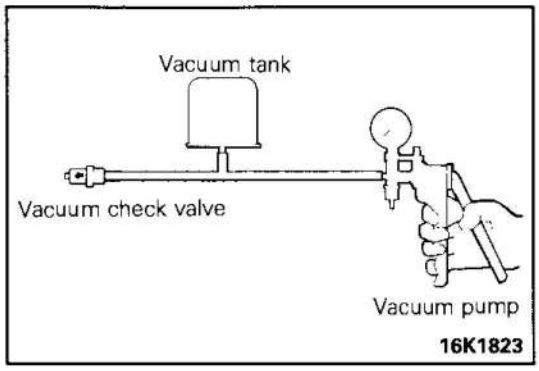
When de-energized	Terminals ② – ④	Approx. 70 Ω
	Terminals ① – ③	No continuity (∞ Ω)
When terminals ② – ④ energized	Terminals ① – ③	With continuity (approx. 0 Ω)



VACUUM CHECK VALVE

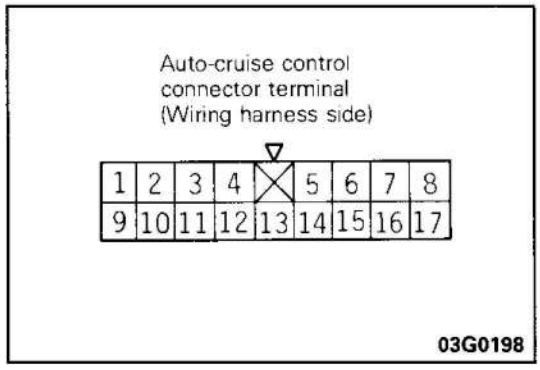
1. Check the operation of the check valve by using a vacuum pump.

Vacuum pump connection	Accept/reject criteria
Connection at the B tap	A negative pressure (vacuum) is created and held.
Connection at the A tap	A negative pressure (vacuum) is not created.



2. With a vacuum tank and pump connected to tap B to apply negative pressure, check that there is no rapid loss of negative pressure.

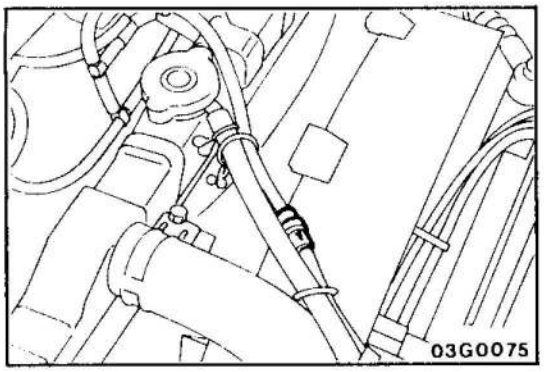
Caution
If negative pressure drops rapidly, faulty vacuum tank is suspected. Then, connect the vacuum pump to the vacuum tank and check the vacuum tank itself.



AUTO-CRUISE CONTROL UNIT SIGNAL CIRCUIT

Disconnect the connector of the auto-cruise control unit and then check at the body side wiring harness according to the chart below.

Terminal	Destination or part to be measured	Measurement item	Tester connection	Check condition	Standard
1	Actuator (VENT1)	Voltage	1 to earth	With ignition switch and auto-cruise control switch ON (Don't depress brake pedal)	Approx. 12V
2	Actuator (VENT2)		2 to earth		
3	Power supply		3 to eartn	Ignition switch ON, auto-cruise control switch ON	
4	Diagnosis	Continuity	4 to earth	At all times	Continuity
5	SET switch		5 to earth	SET switch ON (depress)	Continuity
				SET switch OFF (release)	No continuity
6	RESUME switch		6 to earth	RESUME switch ON (turn)	Continuity
				RESUME switch OFF (release)	No continuity
8	Clutch switch	Voltage	8 to earth	With ignition switch ON, depress clutch pedal	Approx. 12V
9	Actuator (VAC)		9 to earth	With ignition switch and auto-cruise control switch ON (Don't depress brake pedal)	
12	Earth	Continuity	12 to earth	At all times	Continuity
13	Vehicle speed sensor (Speedometer)	Voltage	13 to earth	Turn speedometer cable slowly with ignition switch ON	Voltage to change 4 times/cable revolution
14	Earth	Continuity	14 to earth	At all times	No continuity
15	Stop lamp switch (load side)	Voltage	15 to earth	Brake pedal not depressed	0V
				Brake pedal depressed	Approx. 12V
16	Stop lamp switch (power side)		16 to earth	At all times	Approx. 12V
17	Earth	Continuity	17 to earth	At all times	Continuity



SERVICE POINTS OF INSTALLATION E13SDAA

3. INSTALLATION OF CHECK VALVE

Install check valve so that arrow points to inlet manifold side.

2. INSTALLATION OF VACUUM HOSE

(1) Install vacuum hose so that it is not folded.
(2) Insert vacuum hose securely to nipples. Insertion should be at least 10 mm (0.4 in.)