

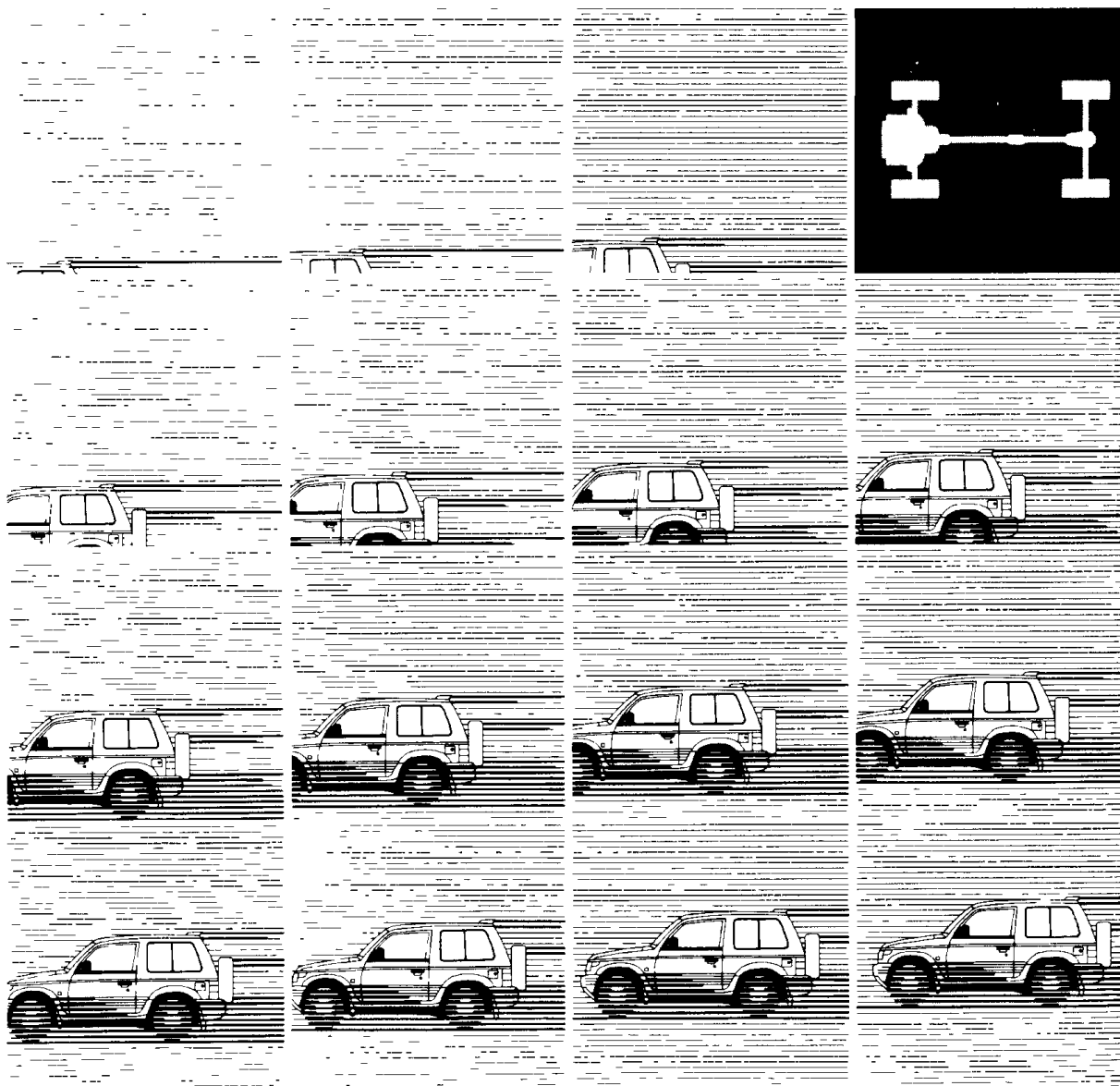


Workshop Manual

chassis

SUPPLEMENT

PAJERO '98



Pub. No. PWJE9086-I

MITSUBISHI PAJERO

WORKSHOP MANUAL SUPPLEMENT

FOREWORD

This Workshop Manual contains procedures for removal, disassembly, inspection, adjustment, reassembly and installation, etc. for service mechanics.

Use the following manuals in combination with this manual as required.

TECHNICAL INFORMATION MANUAL
PYJE9002

WORKSHOP MANUAL
ENGINE GROUP

PWEE□□□□
(Looseleaf edition)

CHASSIS GROUP

PWJE9086
(Looseleaf edition)
PWJE9086-G
(Supplement)
PWJE9086-H
(Supplement)

ELECTRICAL WIRING

PHJE9026
(Looseleaf edition)
PHJE9026-D
(Supplement)
PHJE9026-E
(Supplement)
PHJE9026-F
(Supplement)
PHJE9026-G
(Supplement)

PARTS CATALOGUE

B6035607A□

All information, illustrations and product descriptions contained in this manual are current as at the time of publication. We, however, reserve the right to make changes at any time without prior notice or obligation.

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GENERAL

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VEHICLE IDENTIFICATION

MODELS

<2-DOOR MODELS>

Model code		Body style	Engine model	Transmission model	Fuel supply system
V24C	NSFL6	Canvas top	4D56 [2,477 m ℓ] with turbocharger and inter-cooler	V5MT1 (5M/T)	Injection
V23C	GNHVL6/R6	Canvas top with blistered fender	6G72 [2,972 m ℓ]		MPI
	GRHVL6/R6				
V24W	NDFL6	Wagon	4D56 [2,477 m ℓ] with turbocharger and inter-cooler	V5MT1 (5M/T)	Injection
	NHFL6/R6				
	NDGL6*				
V24WG	NXFL6/R6	Wagon with blistered fender			
V26W	NHFL6	Wagon	4M40 [2,835 m ℓ] with turbocharger and inter-cooler	V5M31 (5M/T)	
V26WG	NXFL6/R6	Wagon with blistered fender			
	NXGL6*				
V23W	NHVL6	Wagon	6G72 [2,972 m ℓ]	V5M31 (5M/T)	MPI
	GNXVL6/R6	Wagon with blistered fender			
	GRXVL6/R6			V4AW3 (4A/T)	
V25WG*	NXVL6/R6	Wagon with blistered fender	6G74 [3,497 m ℓ]	V5M31 (5M/T)	
	RXVL6/R6			V4AW3 (4A/T)	

NOTE

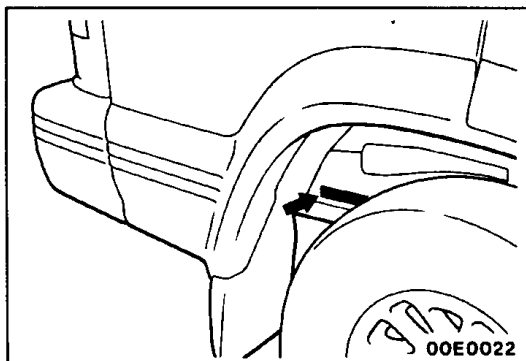
*: Indicates change.

<4-DOOR MODELS>

Model code		Body style	Engine model	Transmission model	Fuel supply system	
V44W	NDFL6	Wagon	4D56 [2,477 m /] with turbocharger and inter-cooler	V5MT1 (5M/T)	Injection	
	NDFCL6	Wagon without 3rd seat row				
	NHFL6	Wagon				
V44WG	NXFL6/R6	Wagon with blistered fender				
V46W	NDFL6	Wagon	4M40 [2,835 m /] with turbocharger and inter-cooler	V5M31 (5M/T)		
	NDFCL6	Wagon without 3rd seat row				
	NDGL6*	Wagon				
	NDGCL6*	Wagon without 3rd seat row		V4AW3 (4A/T)		
	NHFL6/R6	Wagon				
	NHGL6					
	RHFR6					
V46WG	NXFL6/R6	Wagon with blistered fender	V5M31 (5M/T)			
	RXFL6/R6		V4AW3 (4A/T)			
	NXGL6*		V5M31 (5M/T)			
	RXGL6*		V4AW3 (4A/T)			
V43W	NHVL6/R6	Wagon	6G72 [2,972 m /]	V5MT1 (5M/T)	MPI	
	RHVL6/R6			V4AW3 (4A/T)		
V43WG	NXVL6/R6	Wagon with blistered fender		V5MT1 (5M/T)		
	RXVL6/R6			V4AW3 (4A/T)		
V45WG*	NXVL6/R6		6G74 [3,497 m /]	V5M31 (5M/T)		
	RXVL6/R6			V4AW3 (4A/T)		

NOTE

*: Indicates change.

**CHASSIS NUMBER**

The chassis number is stamped on the side wall of the frame near the right rear wheel.


J **M** **B** **0** **N** **V24** **0** **W** **J** **000001** 
 1 2 3 4 5 6 7 8 9 10

1. Asia

2. Japan

3. MITSUBISHI

A: Right hand drive for Europe

B: Left hand drive for Europe

4. Sort

0: 4 or 2-door with tailgate (backdoor)

A: 2-door semi-open (canvas top)

5. Transmission

N: 5 × 2-speed manual transmission

R: 4 × 2-speed automatic transmission

7. Body style

0: Frame

8. Model year

W: 1998*

9. Plant

J,P,Y: Oye Plant of NAGOYA Motor Vehicle Works

10. Serial number

000001 ~

NOTE

*: Indicates change.

6. Development order

V23: 2,972 mℓ

Petrol engine <2-door models>

V24: 2,477 mℓ

Diesel engine <2-door models>

V25: 3,497 mℓ

Petrol engine <2-door models>

V26: 2,835 mℓ

Diesel engine <2-door models>

V43: 2,972 mℓ

Petrol engine <4-door models>

V44: 2,477 mℓ

Diesel engine <4-door models>

V45: 3,497 mℓ

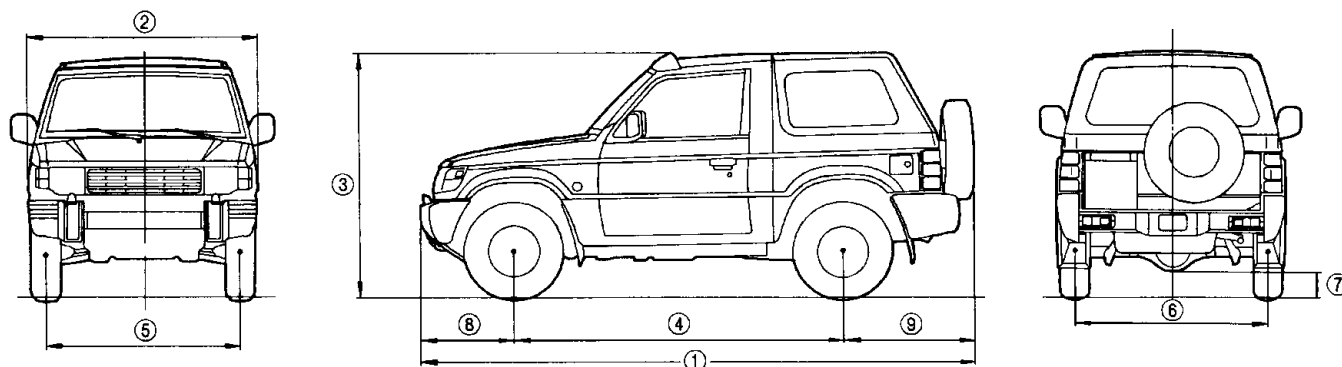
Petrol engine <4-door models>

V46: 2,835 mℓ

Diesel engine <4-door models>

MAJOR SPECIFICATIONS

CANVAS TOP



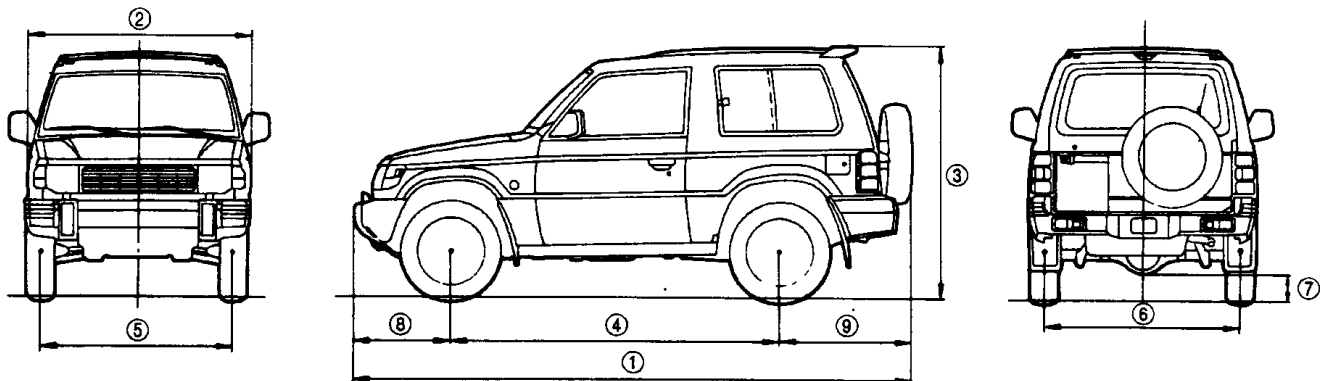
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Items			V24CNSFL6	V23CGNHVL6/R6	V23CGRHVL6/R6
Dimensions	mm				
Overall length		①	4,075		4,145
Overall width		②	1,695		1,785
Overall height (unladen)		③	1,835		1,845
Wheelbase		④	2,420		2,420
Track-front		⑤	1,420		1,465
Track-rear		⑥	1,435		1,480
Ground clearance (laden)		⑦	205		215
Overhang-front		⑧	675		720
Overhang-rear		⑨	980		1,005
Weight	kg				
Kerb weight			1,655 – 1,800	1,725 – 1,855	1,735 – 1,865
Max. gross vehicle weight			2,510	2,510	2,510
Max. front axle load			1,100 or 1,070 *1	1,200 or 1,030 *1	1,200 or 1,030 *1
Max. rear axle load			1,650 or 1,565 *1	1,650 or 1,405 *1	1,650 or 1,405 *1
Seating capacity			4		
Engine					
Model			4D56	6G72	
Total displacement	m l		2,477	2,972	
Transmission					
Type			5-speed manual	5-speed manual	4-speed automatic
Model			V5MT1	V5MT1	V4AW3

NOTE

*1: Vehicles for Belgium and France

METAL TOP



<VEHICLES WITH PETROL ENGINE>

00E0039

Items		V23WNHVL6	V23WGNXVL6/R6	V23WGRXVL6/R6	V25WGNXVL6/R6 V25WGRXVL6/R6
Dimensions	mm				
Overall length	①	4,120	4,145	4,145	4,145
Overall width	②	1,695	1,785	1,785	1,785
Overall height (unladen)	③	1,835	1,845	1,845	1,845
Wheelbase	④	2,420	2,420	2,420	2,420
Track-front	⑤	1,420	1,465	1,465	1,465
Track-rear	⑥	1,435	1,480	1,480	1,480
Ground clearance (laden)	⑦	205	215	215	215
Overhang-front	⑧	720	720	720	720
Overhang-rear	⑨	980	1,005	1,005	1,005
Weight	kg				
Kerb weight		1,740 – 1,865	1,765 – 1,875	1,775 – 1,885	1,800 – 1,925
Max. gross vehicle weight		2,510	2,510	2,510	2,510
Max. front axle load		1,200 or 1,030 * ¹	1,200 or 1,030 * ¹	1,200 or 1,030 * ¹	1,200 or 1,050 * ¹
Max. rear axle load		1,650 or 1,405 * ¹ or 1,780 * ²	1,650 or 1,405 * ¹	1,650 or 1,405 * ¹	1,780 or 1,345 * ¹
Seating capacity		5			
Engine					
Model		6G72	6G72	6G72	6G74
Total displacement m ³		2,972	2,972	2,972	3,497
Transmission					
Type		5-speed manual	5-speed manual	4-speed automatic	5-speed manual or 4-speed automatic * ³
Model		V5MT1	V5MT1	V4AW3	V5M31 or V4AW3 * ³

NOTES

*¹: Vehicles for Belgium and France*²: Vehicles for Sweden*³: V25WGRXVL6/R6

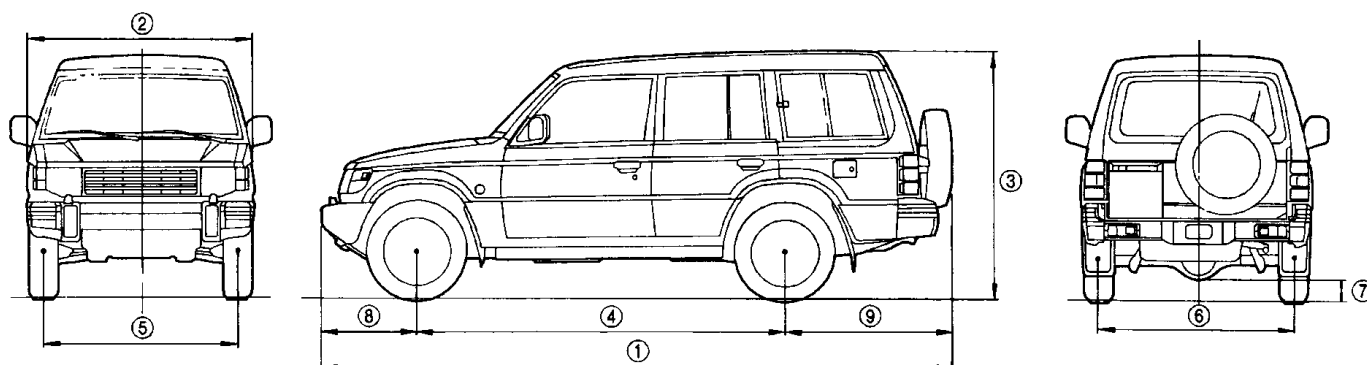
<VEHICLES WITH DIESEL ENGINE>

Items		V24WNDFL6 V24WNDGL6	V24WNHFL6/ R6	V24WGNXFL6 /R6	V26WNHFL6	V26WGNXFL6/R6 V26WGNXGL6
Dimensions	mm					
Overall length	①	4,075	4,120	4,145	4,120	4,145
Overall width	②	1,695	1,695	1,785	1,695	1,785
Overall height (unladen)	③	1,835	1,835	1,845	1,835	1,845
Wheelbase	④	2,420	2,420	2,420	2,420	2,420
Track-front	⑤	1,420	1,420	1,465	1,420	1,465
Track-rear	⑥	1,435	1,435	1,480	1,435	1,480
Ground clearance (laden)	⑦	205	205	215	190	205
Overhang-front	⑧	675	720	720	720	720
Overhang-rear	⑨	980	980	1,005	1,005	1,005
Weight	kg					
Kerb weight		1,690 – 1,820	1,735 – 1,900	1,760 – 1,905	1,830 – 2,000	1,855 – 2,005
Max. gross vehicle weight		2,510	2,510	2,510	2,510	2,510
Max. front axle load		1,100 or 1,070 * ¹	1,100 or 1,070 * ¹	1,100 or 1,070 * ¹	1,200 or 1,115 * ¹	1,200 or 1,115 * ¹
Max. rear axle load		1,650 or 1,565 * ¹	1,650 or 1,565 * ¹	1,650 or 1,565 * ¹	1,780 or 1,440 * ¹	1,780 or 1,440 * ¹
Seating capacity		5				
Engine						
Model		4D56			4M40	
Total displacement m ³ /		2,477			2,835	
Transmission						
Type		5-speed manual			5-speed manual	5-speed manual
Model		V5MT1			V5MT1	V5M31

NOTES

*¹: Vehicles for Belgium and France

WAGON



00E0040

<VEHICLES WITH PETROL ENGINE>

Items			V43WNHVL6/R6	V43WRHVL6/R6	V43WGNXVL6/R6
Dimensions	mm				
Overall length		①	4,700		4,725
Overall width		②	1,695		1,775
Overall height (unladen)		③	1,890		1,900
Wheelbase		④	2,725		2,725
Track-front		⑤	1,420		1,465
Track-rear		⑥	1,435		1,480
Ground clearance (laden)		⑦	205		215
Overhang-front		⑧	720		720
Overhang-rear		⑨	1,255		1,280
Weight	kg				
Kerb weight			1,925 – 2,085	1,920 – 2,105 or 1,920 – 2,080 *2	1,955 – 2,115
Max. gross vehicle weight			2,650	2,650	2,650
Max. front axle load			1,200 or 1,075 *1	1,200 or 1,075 *1	1,200 or 1,075 *1
Max. rear axle load			1,650	1,650	1,650
Seating capacity			7		
Engine					
Model			6G72		
Total displacement	m /		2,972		
Transmission					
Type			5-speed manual	4-speed automatic	5-speed manual
Model			V5MT1	V4AW3	V5MT1

NOTES

*1: Vehicles for Belgium and France

*2: Vehicles for Sweden

Items		V43WGRXVL6/R6	V45WGNXVL6/R6	V45WGRXVL6/R6
Dimensions	mm			
Overall length	①	4,725	4,725	4,725
Overall width	②	1,775	1,775	1,775
Overall height (unladen)	③	1,900	1,900	1,900
Wheelbase	④	2,725	2,725	2,725
Track-front	⑤	1,465	1,465	1,465
Track-rear	⑥	1,480	1,480	1,480
Ground clearance (laden)	⑦	215	205	205
Overhang-front	⑧	720	720	720
Overhang-rear	⑨	1,280	1,280	1,280
Weight	kg			
Kerb weight		1,955 – 2,115	1,985 – 2,150	1,980 – 2,145
Max. gross vehicle weight		2,650	2,720	2,720
Max. front axle load		1,200 or 1,075 * ¹	1,200 or 1,090 * ¹	1,200 or 1,090 * ¹
Max. rear axle load		1,650	1,780 or 1,670 * ¹	1,780 or 1,670 * ¹
Seating capacity		7		
Engine				
Model		6G72	6G74	6G74
Total displacement	m /	2,972	3,497	3,497
Transmission				
Type		4-speed automatic	5-speed manual	4-speed automatic
Model		V4AW3	V5M31	V4AW3

NOTE

*¹: Vehicles for Belgium and France

<VEHICLES WITH DIESEL ENGINE>

Items			V46WNDFL6 V46WNDGL6	V46WNDFCL6 V46WNDGCL6	V46WNHFL6/R6 V46WNHGL6
Dimensions	mm				
Overall length		①	4,655		4,700
Overall width		②	1,695		1,695
Overall height (unladen)		③	1,890		1,890
Wheelbase		④	2,725		2,725
Track-front		⑤	1,420		1,420
Track-rear		⑥	1,435		1,435
Ground clearance (laden)		⑦	190		190
Overhang-front		⑧	675		720
Overhang-rear		⑨	1,255		1,255
Weight	kg				
Kerb weight			1,960 – 2,095	1,920 – 2,055	2,010 – 2,180
Max. gross vehicle weight			2,720	2,720	2,720
Max. front axle load			1,200 or 1,145 * ¹	1,200 or 1,145 * ¹	1,200 or 1,145 * ¹
Max. rear axle load			1,780 or 1,655	1,780 or 1,655 * ¹	1,780 or 1,655 * ¹
Seating capacity			7	5	7
Engine					
Model			4M40		
Total displacement	m /		2,835		
Transmission					
Type			5-speed manual		
Model			V5M31		

NOTE

*¹: Vehicles for Belgium and France

Items		V46WRHFR6	V46WGNXFL6/R6 V46WGNXGL6	V46WGRXFL6/R6 V46WGRXGL6
Dimensions	mm			
Overall length	①	4,700		4,725
Overall width	②	1,695		1,775
Overall height (unladen)	③	1,890		1,900
Wheelbase	④	2,725		2,725
Track-front	⑤	1,420		1,465
Track-rear	⑥	1,435		1,480
Ground clearance (laden)	⑦	190		205
Overhang-front	⑧	720		720
Overhang-rear	⑨	1,255		1,280
Weight	kg			
Kerb weight		2,005 – 2,175	2,050 – 2,180	2,055 – 2,185
Max. gross vehicle weight		2,720	2,720	2,720
Max. front axle load		1,200 or 1,145 * ¹	1,200 or 1,145 * ¹	1,200 or 1,145 * ¹
Max. rear axle load		1,780 or 1,655	1,780 or 1,655 * ¹	1,780 or 1,655 * ¹
Seating capacity		7		
Engine				
Model		4M40		
Total displacement	m ³ /	2,835		
Transmission				
Type		4-speed automatic	5-speed manual	4-speed automatic
Model		V4AW3	V5M31	V4AW3

NOTE

*¹: Vehicles for Belgium and France

Items		V44WNDL6	V44WNDL6	V44WNHFL6	V44WGNXFL6/R6
Dimensions	mm				
Overall length	①	4,655	4,655	4,700	4,725
Overall width	②	1,695	1,695	1,695	1,775
Overall height (unladen)	③	1,890	1,890	1,890	1,900
Wheelbase	④	2,725	2,725	2,725	2,725
Track-front	⑤	1,420	1,420	1,420	1,465
Track-rear	⑥	1,435	1,435	1,435	1,480
Ground clearance (laden)	⑦	205	205	205	215
Overhang-front	⑧	650	650	720	720
Overhang-rear	⑨	1,280	1,280	1,255	1,280
Weight	kg				
Kerb weight		1,865 – 2,000	1,840 – 1,975	1,915 – 2,110	1,950 – 2,120
Max. gross vehicle weight		2,650	2,650	2,650	2,650
Max. front axle load		1,200 or 1,075 * ¹	1,100 or 1,090 * ¹	1,100 or 1,090 * ¹	1,100 or 1,090 * ¹
Max. rear axle load		1,650	1,650	1,650	1,650
Seating capacity		7	5	7	7
Engine					
Model		4D56			
Total displacement m ³ /		2,477			
Transmission					
Type		5-speed manual			
Model		V5MT1			

NOTE

*¹: Vehicles for Belgium and France

ENGINE <6G7>

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ENGINE <6G7>

GENERAL

OUTLINE OF CHANGES

- A 6G74-SOHC 24-valve engine has been added. To correspond to this, maintenance service procedures are given below.
- The ignition timing adjustment connector for a 6G72-SOHC 24-valve engine has been abolished. To correspond to this, maintenance service procedures are given below.

SPECIFICATIONS

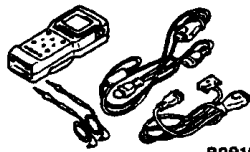
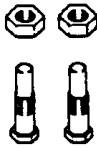
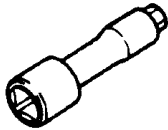
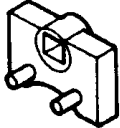
GENERAL SPECIFICATIONS <6G74-SOHC 24 Valve Engine>

Items			6G74-SOHC 24 Valve Engine
Total displacement m ℓ			3,497
Bore × Stroke mm			93.0 × 85.8
Compression ratio			9.0
Combustion chamber			Compact type
Camshaft arrangement			SOHC
Number of valve	Intake		12
	Exhaust		12
Valve timing	Intake	Opening	BTDC 13°
		Closing	ABDC 55°
	Exhaust	Opening	BBDC 51°
		Closing	ATDC 17°
Fuel system			Electronically controlled multipoint fuel injection
Rocker arm			Roller type
Lash adjuster			Equipped

SERVICE SPECIFICATIONS

Items			Standard value	Limit
Alternator drive belt tension	Tension N	When checked	392 – 588	–
		When a used belt is installed	637 – 833	–
		When a new belt is installed	441 – 539	–
	Deflection <Reference value> mm	When checked A	5.0 – 7.0	–
		When checked B	7.5 – 9.5	–
		When a used belt is installed A	5.5 – 6.5	–
		When a used belt is installed B	8.0 – 9.0	–
		When a new belt is installed A	4.0 – 5.0	–
		When a new belt is installed B	5.5 – 7.5	–
Power steering pump drive belt tension	Tension N	When checked	294 – 490	–
		When a used belt is installed	343 – 441	–
		When a new belt is installed	490 – 686	–
	Deflection <Reference value> mm	When checked	13.8 – 17.8	–
		When a used belt is installed	14.8 – 16.8	–
		When a new belt is installed	10.7 – 13.7	–
A/C compressor drive belt tension	Deflection mm	When checked	6.5 – 7.5	–
		When a used belt is installed	6.5 – 7.5	–
		When a new belt is installed	5.0 – 6.0	–
Basic ignition timing			5° BTDC ± 3°	–
Ignition timing			Approx. 15° BTDC	–
Idle speed r/min			700 ± 100	–
CO contents %			0.5 or less	–
HC contents ppm			100 or less	–
Compression pressure (250 – 400 r/min) kPa			1180	Min. 870
Compression pressure difference of all cylinder kPa			–	Max. 98
Intake manifold vacuum kPa			–	Min. 60
Amount of projection of auto tensioner rod mm (Distance between the tensioner arm and auto tensioner body)			3.8 – 5.0	–
Auto tensioner push rod movement mm			1 or less	–

SPECIAL TOOLS

Tool	Number	Name	Use
 8991502	MB991502	MUT-II sub assembly	Engine idle speed check Erasing diagnosis code
	MB990767	End yoke holder	Supporting the sprocket and shaft pulley during removal and installation Use with MD998715
	MD998715	Pulley holding pins	Supporting the crankshaft pulley when crankshaft bolt and pulley are removed or reinstalled. Use together with MB990767 Camshaft pulley supporting
	MD998769	Crankshaft sprocket spacer	Used if the crankshaft needs to be rotated to attach the timing belt, etc.
	MD998051	Wrench, cylinder head bolt	Loosening and tightening of cylinder head bolt
	MD998713	Camshaft oil seal installer	Camshaft oil seal installation
	MB991559	Camshaft oil seal installer	Press fitting the camshaft oil seal (For left bank)
	MD998767	Tension pulley socket wrench	Adjustment of the timing belt

SERVICE ADJUSTMENT PROCEDURES

DRIVE BELTS TENSION INSPECTION AND ADJUSTMENT

The inspection procedures are the same as before.

Standard value:

Item		Check value	Adjustment value (used belt)	Adjustment value (new belt)
For alternator	Tension N	392 – 588	637 – 833	441 – 539
	Deflection <Reference value> mm	A: 5.0 – 7.0	A: 5.5 – 6.5	A: 4.0 – 5.0
		B: 7.5 – 9.5	B: 8.0 – 9.0	B: 5.5 – 7.5
For power steering	Tension N	294 - 490	343 – 441	490 – 686
	Deflection <Reference value> mm	13.8 – 17.8	14.8 – 16.8	10.7 – 13.7
For A/C	Deflection mm	6.5 – 7.5	6.5 – 7.5	5.0 – 6.0

A: Measure between the water pump pulley and the crankshaft pulley.

B: Measure between the water pump pulley and the alternator.

IGNITION TIMING INSPECTION

- (1) Perform inspection with the vehicles in the following condition.
 - Engine coolant temperature: 80 – 95°C
 - Lights and all accessories: OFF
 - Transmission: Neutral (P range for vehicles with automatic transmission)
- (2) Connect the MUT-II to the diagnosis connector.
- (3) Set up a timing light.
- (4) Start the engine and run at idle.
- (5) Check that engine idle speed is within the standard value.

Standard value: 700 ± 100 r/min
- (6) Select No.17 of the MUT-II Actuator test.
- (7) Check that basic ignition timing is within the standard value.

Standard value: 5° BTDC ± 3°

- (8) If the basic ignition timing is outside the standard value, inspect the MPI system while referring to GROUP 13A – Troubleshooting.
- (9) Press the MUT-II clear key (Select a forced driving cancel mode) to release the Actuator test.

Caution

If the test is not cancelled, a forced driving will continue for 27 minutes. Driving under this condition may damage the engine.

- (10) Check that ignition timing is at the standard value.

Standard value: approx. 15° BTDC

NOTE

- ① Ignition timing is variable within about $\pm 7^\circ$, even under normal operating.
- ② And it is automatically further advanced by about 5° from standard value at higher altitudes.

IDLE SPEED INSPECTION

- (1) Perform inspection with the vehicles in the following condition.
 - Engine coolant temperature: 80 – 95°C
 - Lights and all accessories: OFF
 - Transmission: Neutral (P range for vehicles with automatic transmission)
- (2) Turn the ignition switch to OFF and connect the MUT-II to the diagnosis connector.
- (3) Check the basic ignition timing. Adjust if necessary.
- (4) Run the engine at idle for 2 minutes.
- (5) Check the idle speed. Select item No.22 and take a reading of the idle speed.

Curb idle speed: 700 $\pm$ 100 r/min

NOTE

The idle speed is controlled automatically by the idle speed control (ISC) system.

- (6) If the idle speed is outside the standard value, check the MPI components by referring to GROUP 13A – Troubleshooting.

IDLE MIXTURE INSPECTION

- (1) Perform inspection with the vehicles in the following condition.
 - Engine coolant temperature: 80 – 95°C
 - Lights and all accessories: OFF
 - Transmission: Neutral (P range for vehicles with automatic transmission)
- (2) Turn the ignition switch to OFF and connect the MUT-II to the diagnosis connector.
- (3) Check that the basic ignition timing is within the standard value.

Standard value: 5° BTDC $\pm$ 3°

- (4) Run the engine at 2,500 r/min for 2 minutes.
- (5) Set the CO, HC tester.
- (6) Check the CO contents and the HC contents at idle.

Standard value

CO contents: 0.5% or less

HC contents: 100 ppm or less

- (7) If there is a deviation from the standard value, check the following items:
 - Diagnosis output
 - Closed-loop control (When the closed-loop control is normal, the output signal of the oxygen sensor changes between 0 – 400 mV and 600 – 1,000 mV at idle.)
 - Fuel pressure
 - Injector
 - Ignition coil, spark plug cable, spark plug
 - Leak in the EGR system and in the EGR valve
 - Evaporative emission control system
 - Compression pressure

NOTE

Replace the three way catalyst when the CO and HC contents are not within the standard value, even though the result of the inspection is normal on all items.

COMPRESSION PRESSURE INSPECTION
<6G74-SOHC 24 Valve Engine>

The inspection procedures are the same as 6G72-SOHC 24-valve engine.

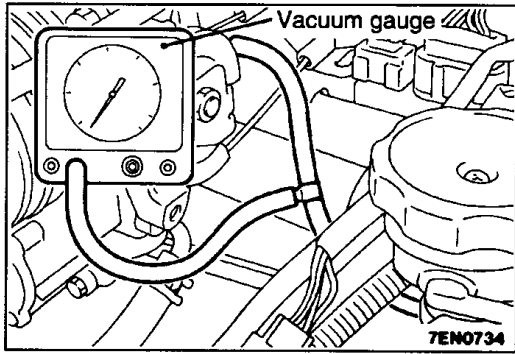
Standard value

Compression pressure: 1,180 kPa

Limit

Compression pressure: 870 kPa

Compression pressure difference between each cylinder: max. 98 kPa



MANIFOLD VACUUM INSPECTION

- (1) Perform inspection with the vehicle in the following condition.
 - Engine coolant temperature: 80 – 95°C
 - Lights and all accessories: OFF
 - Transmission: Neutral (P range for vehicles with an automatic transmission)
- (2) Install a tachometer or connect the MUT-II to the diagnosis connector.
- (3) Attach a three-way union to the vacuum hose between the fuel pressure regulator and the air intake plenum, and connect a vacuum gauge.
- (4) Start the engine and check that idle speed is within the standard value.

Standard value: 700 ± 100 r/min

- (5) Check the manifold vacuum.

Limit: Min. 60 kPa

LASH ADJUSTER INSPECTION

If an abnormal noise (knocking) that seems to be coming from the lash adjuster is heard after starting the engine and does not stop, carry out the following check.

NOTE

- ① The abnormal noise which is caused by a problem with the lash adjusters is generated after the engine is started, and will vary according to the engine speed. However, this noise is not related to the actual engine load.

Because of this, if the noise does not occur immediately after the engine is started, if it does not change in accordance with the engine speed, or if it changes in accordance with the engine load, the source of the noise is not the lash adjusters.

- ② If there is a problem with the lash adjusters, the noise will almost never disappear, even if the engine has been run at idle to let it warm up.

The only case where the noise might disappear is if the oil in the engine has not been looked after properly and oil sludge has caused the lash adjusters to stick.

- (1) Start the engine.
(2) Check that the noise occurs immediately after the engine is started, and that the noise changes in accordance with changes in the engine speed.

If the noise does not occur immediately after the engine is started, or if it does not change in accordance with the engine speed, the problem is not being caused by the lash adjusters, so check for some other cause of the problem. Moreover, if the noise does not change in accordance with the engine speed, the cause of the problem is probably not with the engine. (In these cases the lash adjusters are normal.)

- (3) While the engine is idling, check that the noise level does not change when the engine load is varied (for example by shifting from N → D).

If the noise level changes, the cause of the noise is probably parts striking because of worn crankshaft bearings or connecting rod bearings. (In such cases, the lash adjusters are normal.)

- (4) After the engine has warmed up, run it at idle and check if any noise can be heard.

If the noise has become smaller or has disappeared the cause of the noise was probably that oil sludge had caused the lash adjusters to become stuck. If this happens, carry out the following check. If the noise level does not change, go to step 5.

- ① Let the engine cool down sufficiently.
② Turn the crankshaft two full revolutions.

③ Carry out lash adjuster simple check.

- If any of the rocker arms can be pushed down easily during the lash adjuster simple check, replace the corresponding lash adjusters.
- If the lash adjuster simple check has been carried out but all lash adjusters are normal (if none of the rocker arms could be pushed down easily), check for some other cause of the problem.

NOTE

You can check whether the lash adjusters are normal or not by carrying out a leak-down test. (Refer to the Engine Workshop Manual.)

Caution

Make sure that the air has been fully bled before installation of a new lash adjuster. (Refer to the Engine Workshop Manual.)

(5) Bleed the air from the lash adjusters.

(6) If the noise does not disappear even after the air has been bled from the lash adjusters, carry out the following check.

Carry out lash adjuster simple check.

- If one of the rocker arms can be pushed down easily during the lash adjuster simple check, replace the corresponding lash adjuster.
- If two or more of the rocker arms can be pushed down easily during the lash adjuster simple check, the cause may be that the oil passage to the cylinder head is blocked.

Check for blockages in the oil passage, and clear the blockages if any are found. If there are no blockages, replace the lash adjusters.

- If the lash adjuster simple check has been carried out but all lash adjusters are normal (if none of the rocker arms could be pushed down easily), check for some other cause of the problem.

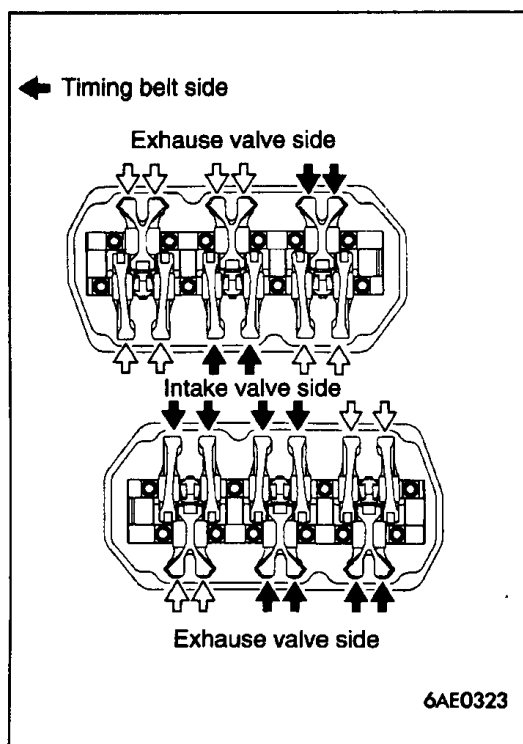
NOTE

You can check whether the lash adjusters are normal or not by carrying out a leak-down test. (Refer to the Engine Workshop Manual.)

Caution

Make sure that the air has been fully bled before installation of a new lash adjuster. (Refer to the Engine Workshop Manual.)

(7) Start the engine and check that the abnormal noise has disappeared. If necessary, bleed the air from the lash adjusters.

**<LASH ADJUSTER SIMPLE CHECK>**

- (1) Stop the engine.
- (2) Remove the rocker cover.
- (3) Set the No.1 cylinder to the compression top dead centre position.
- (4) Check the rocker arms indicated by white arrows in the illustration by the procedures given below.

<Checking an intake-side rocker arm>

Check whether the rocker arm moves downwards when the part of the rocker arm which touches the top of the lash adjuster is pushed.

- If the rocker arm moves down easily when it is pushed, make a note of which is the corresponding lash adjuster.
- If the rocker arm feels extremely stiff when it is pushed and does not move down, the lash adjuster is normal, so check for some other cause of the problem.

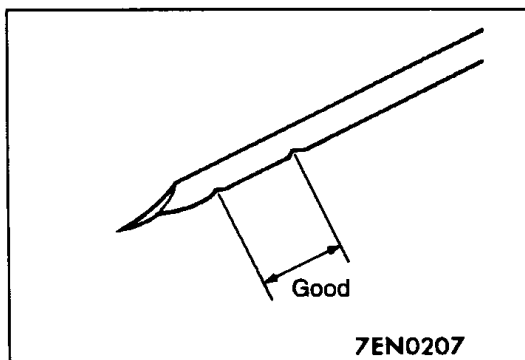
<Checking an exhaust-side rocker arm>**NOTE**

It will not be possible to depress the Y-shaped rocker arm at the exhaust valve side if one lash adjuster is defective but the other one is normal. In such cases, carry out the following procedure using a thickness gauge.

- ① Check that a thickness gauge with a thickness of 0.1 – 0.2 mm can be inserted easily between the valve and the lash adjuster.
 - ② If the thickness gauge can be inserted easily, make a note of which is the corresponding lash adjuster.
 - ③ If the thickness gauge cannot be inserted easily, the lash adjuster is normal, so check for some other cause of the problem.
- (5) Slowly turn the crankshaft 360° in the clockwise direction.
 - (6) Check the rocker arms indicated by black arrows in the illustration in the same way as explained in step 4.

<LASH ADJUSTER AIR BLEEDING>**NOTE**

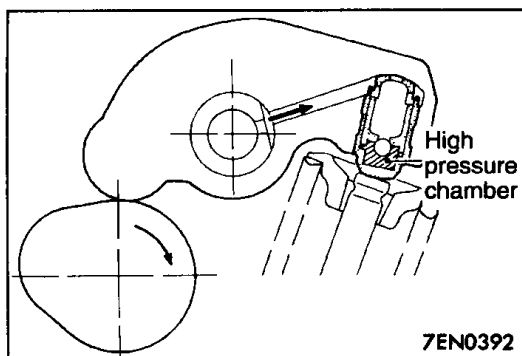
- ① If the vehicle is parked on a slope for a long period of time, the amount of oil inside the lash adjuster will decrease, and air may get into the high pressure chamber when starting the engine.
- ② After parking the vehicle for long periods, the oil drains out of the oil passage, and it takes time for the oil to be supplied to the lash adjuster, so air can get into the high pressure chamber.
- ③ If either of the above situations occur, the abnormal noise can be eliminated by bleeding the air from inside the lash adjusters.



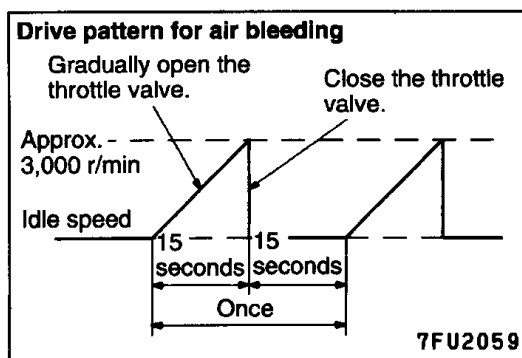
- (1) Check the engine oil and replenish or replace the oil if necessary.

NOTE

- ① If there is a only small amount of oil, air will be drawn in through the oil screen and will get into the oil passage.
- ② If the amount of oil is greater than normal, then the oil will being mixed by the crankshaft and a large amount of air may get mixed into the oil.
- ③ If the oil is degenerated, air and oil will not separate easily in oil, and the amount of air mixed into the oil will increase.



- ④ If the air which has been mixed in with the oil due to any of the above reasons gets into the high pressure chamber of the lash adjuster, the air inside the high pressure chamber will be compressed when the valve is open and the lash adjuster will over-compress, resulting in abnormal noise when the valve closes. This is the same effect as if the valve clearance is adjusted to be too large by mistake. If the air inside the lash adjusters is then released, the operation of the lash adjusters will return to normal.



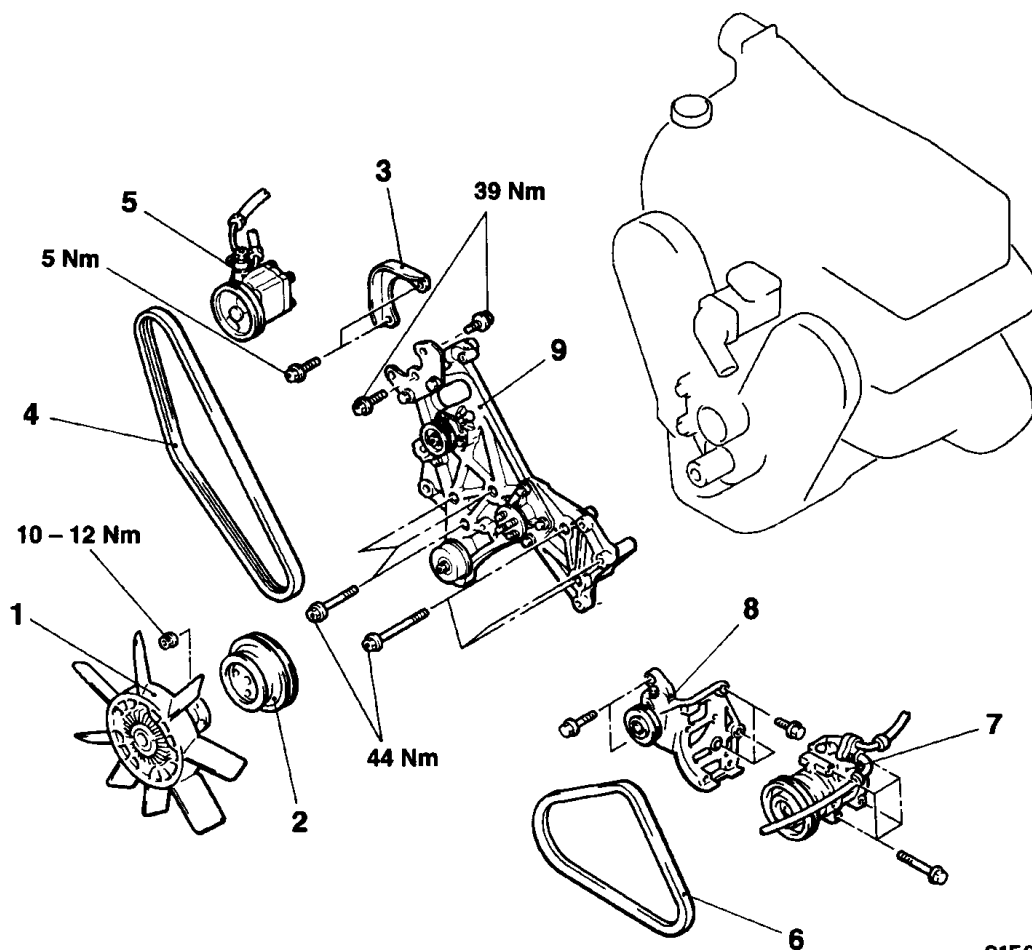
- (2) Run the engine at idle for 1 – 3 minutes to let it warm up.
- (3) With no load on the engine, repeat the drive pattern shown in the illustration at left and check if the abnormal noise disappears. (The noise should normally disappear after 10 – 30 repetitions, but if there is no change in the noise level after 30 repetitions or more, the problem is probably not due to air inside the lash adjusters.)
- (4) After the noise has disappeared, repeat the drive pattern shown in the illustration at left a further 5 times.
- (5) Run the engine at idle for 1 – 3 minutes and check that the noise has disappeared.

TIMING BELT <6G74-SOHC>**REMOVAL AND INSTALLATION****Pre-removal Operation**

- Under skid plate, Under cover removal
- Battery, battery tray removal
- Radiator shroud removal
- Engine coolant draining

Post-installation Operation

- Battery, battery tray installation
- Under skid plate, under cover installation
- Drive belts tension adjustment
- Radiator shroud installation
- Engine coolant refilling



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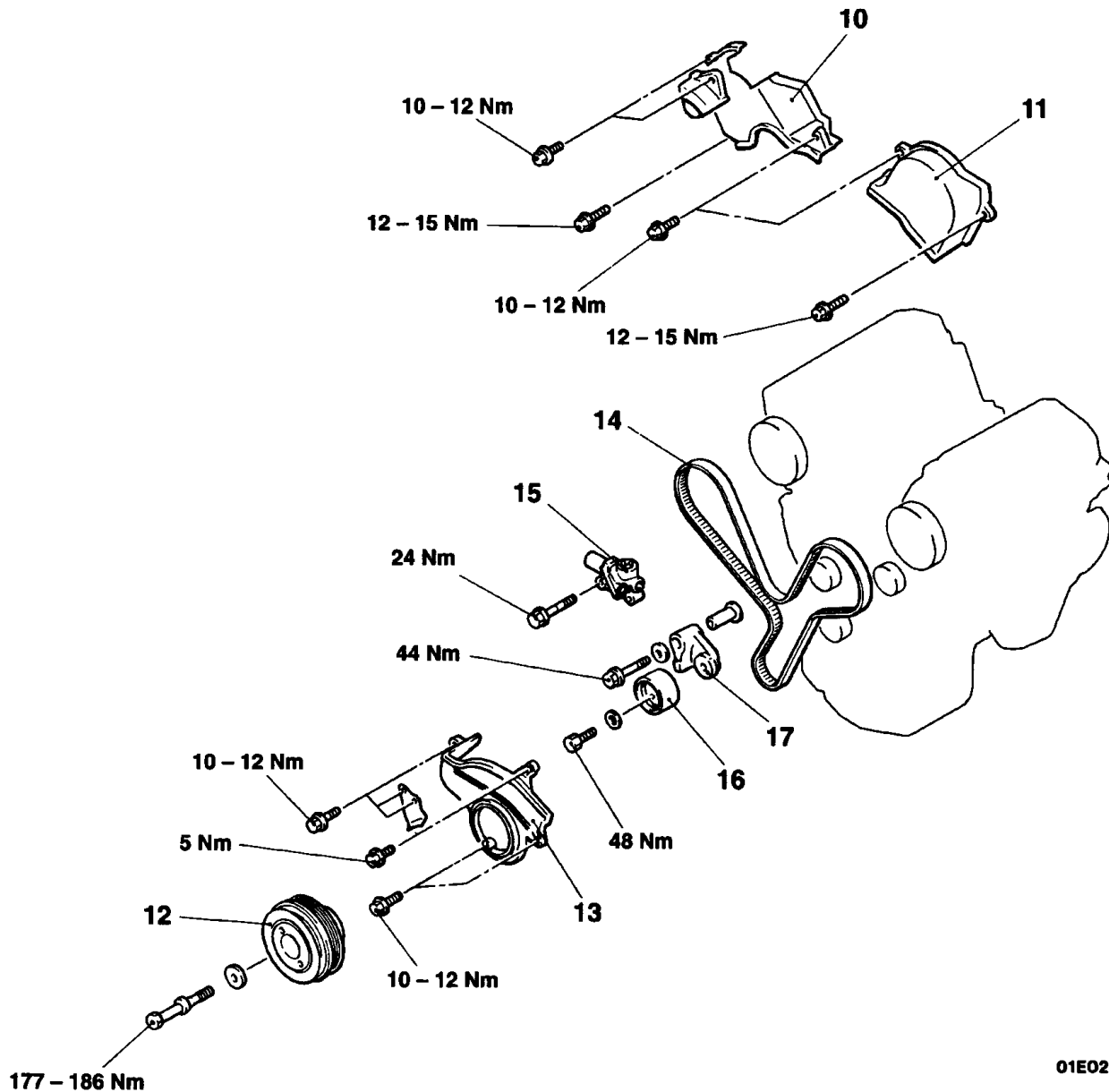
Removal steps

1. Cooling fan clutch assembly
2. Cooling fan pulley
3. Cover
4. Power steering oil pump drive belt
5. Power steering oil pump assembly
- Alternator



6. A/C compressor drive belt
7. A/C compressor assembly
8. Compressor bracket
9. Accessory mount assembly





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- ◀B▶▶C▶
 ▶C▶▶B▶
 ▶A▶
- 10. Timing belt upper cover (LH)
 - 11. Timing belt upper cover (RH)
 - 12. Crankshaft pulley
 - 13. Timing belt lower cover
 - 14. Timing belt
 - 15. Auto tensioner
 - 16. Tensioner pulley
 - 17. Tensioner arm assembly

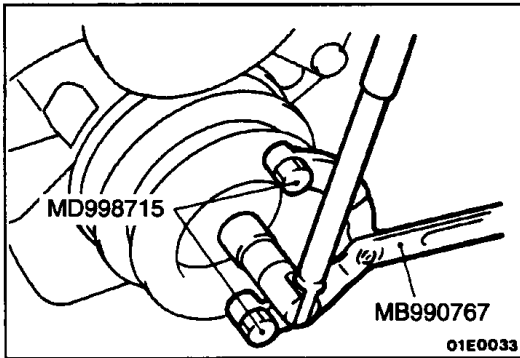
REMOVAL SERVICE POINTS

◀A▶ POWER STEERING OIL PUMP ASSEMBLY / A/C COMPRESSOR ASSEMBLY REMOVAL

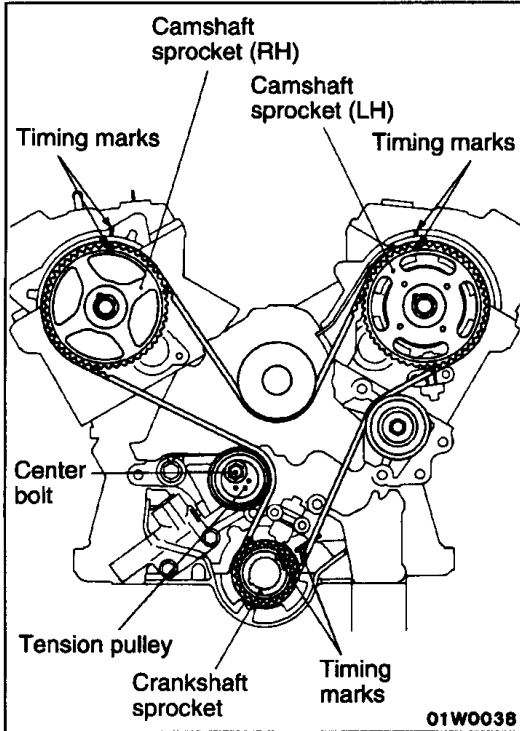
Remove the oil pump and air conditioning compressor (with the hose attached).

NOTE

Suspend the removed oil pump (by using wire or similar material) at a place where no damage will be caused during removal/installation of the engine assembly.



◀B▶ CRANKSHAFT PULLEY REMOVAL

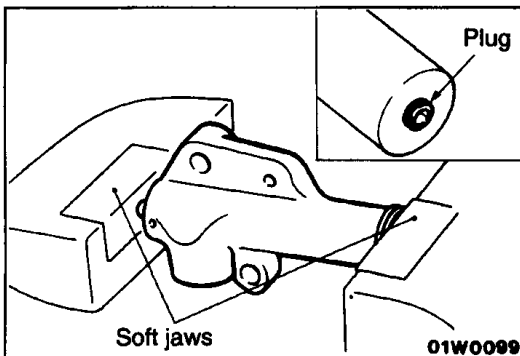


◀C▶ TIMING BELT REMOVAL

- (1) Align the timing marks.
- (2) Loosen the center bolt on the tension pulley to remove the timing belt.

Caution

Make a mark on the back of the timing belt, indicating the direction of rotation, so it may be reassembled in the same direction, if it is to be reused.



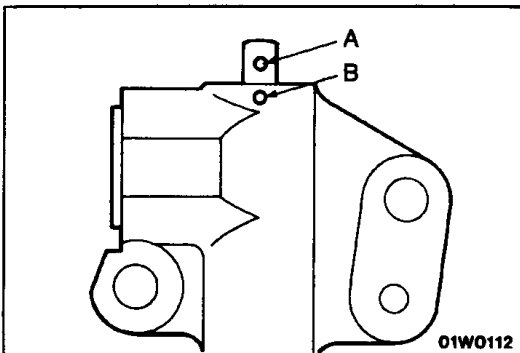
INSTALLATION SERVICE POINTS

▶A◀ AUTO TENSIONER INSTALLATION

- (1) If the auto tensioner rod is in its fully extended position, reset it as follows.
 - 1) Keep the auto tensioner level and, in that position, clamp it in the vise with soft jaws.
 - 2) Push in the rod little by little with the vise until the set hole A in the rod is aligned with that B in the cylinder.

Caution

1. The auto tensioner must be placed at a right angle to the pressing surface of press or vise.
2. Push in the rod slowly to prevent the push rod from being damaged.



- 3) Insert a wire [1.4 mm in diameter] into the set holes.

NOTE

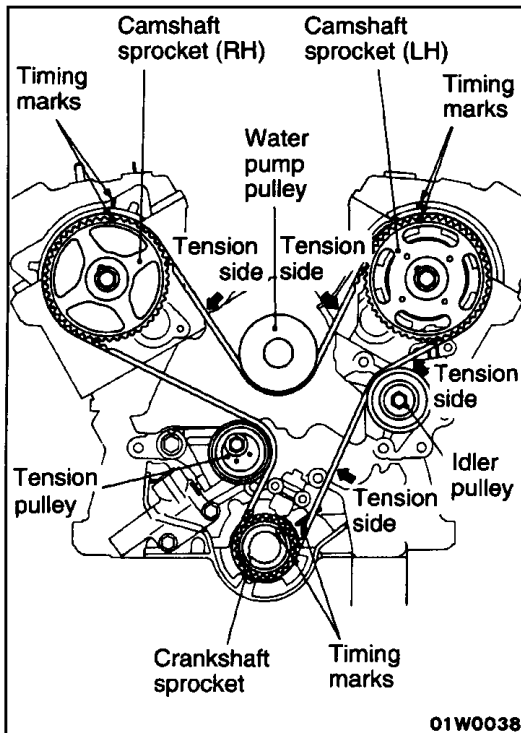
- The wire should be as stiff as possible (such as piano wire, etc.), and should be bent into the shape of an “L”.

- 4) Unclamp the auto tensioner from the vise.

- (2) Install the auto tensioner.

Caution

Leave the wire installed in the auto tensioner.



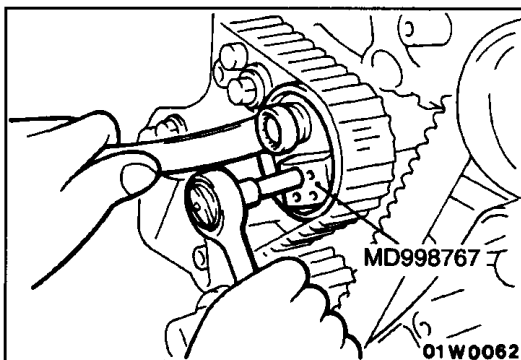
►B◄ TIMING BELT INSTALLATION

- (1) Align the timing marks of the camshaft sprockets and crankshaft sprocket.
- (2) Install the timing belt by the following procedure so that there is no deflection in the timing belt between each sprocket and pulley.
 1. Crankshaft sprocket
 2. Idler pulley
 3. Camshaft sprocket (left side)
 4. Water pump pulley
 5. Camshaft sprocket (right side)
 6. Tension pulley

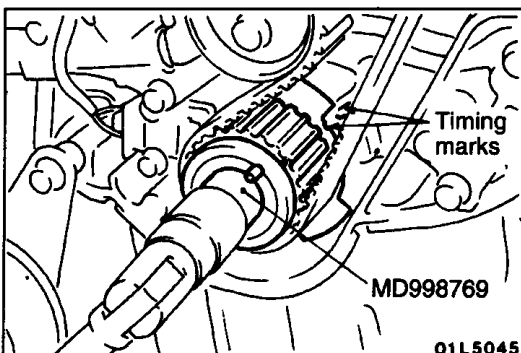
Caution

The camshaft sprocket (right side) can turn easily due to the spring force applied, so be careful not to get your fingers caught.

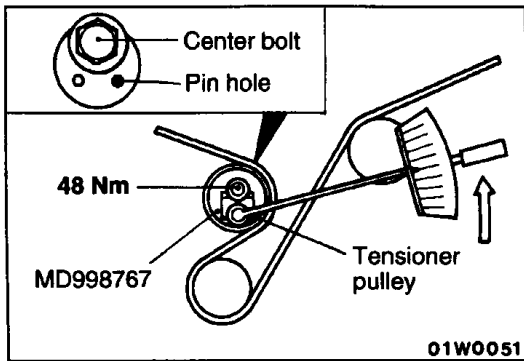
- (3) Turn the camshaft sprocket (right side) counterclockwise until the tension side of the timing belt is firmly stretched, and then check again that all timing marks are aligned.



- (4) Use the special tool to push the tension pulley into the timing belt, and then temporarily tighten the center bolt.



- (5) Use the special tool to turn the crankshaft 1/4 of a turn counterclockwise and then turn it again clockwise until the timing marks are aligned.



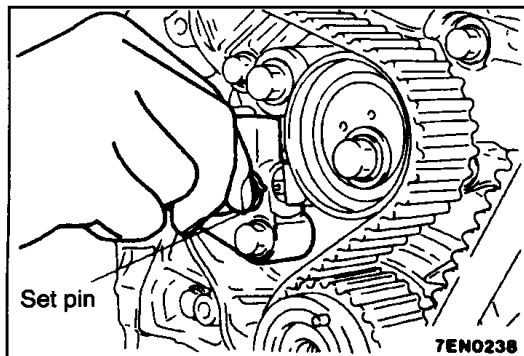
- (6) Loosen the center bolt on the tensioner pulley. Using the special tool and torque wrench, apply tensioning torque to the timing belt and, at the same time, tighten the center bolt to specification.

Reference value:

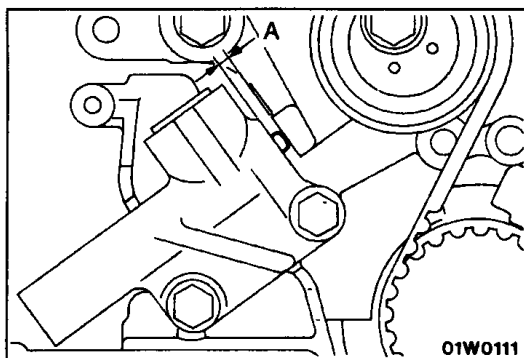
4.4 Nm (Timing belt tensioning torque)

Caution

When tightening the center bolt, make sure that the tensioner pulley is not rotated together.



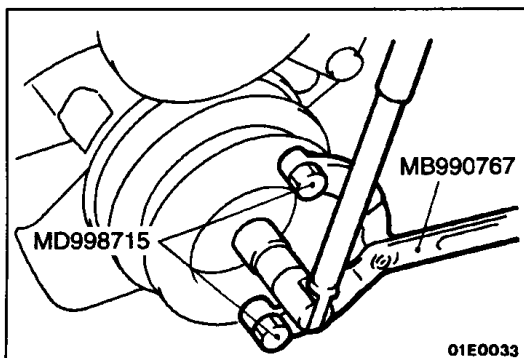
- (7) Remove the setting pin that has been inserted into the auto tensioner.
(8) Turn the crankshaft two turns clockwise to align the timing marks.



- (9) Leave everything in this condition for five minutes or more, and then check that the protrusion of the auto tensioner push rod is within the range of the standard value.

Standard value (A): 3.8 to 5.0 mm

- (10) If the protrusion is out of specification, repeat steps (5) to (9).
(11) Check again that timing marks on all sprockets are aligned properly.



►C◄ CRANKSHAFT PULLEY INSTALLATION

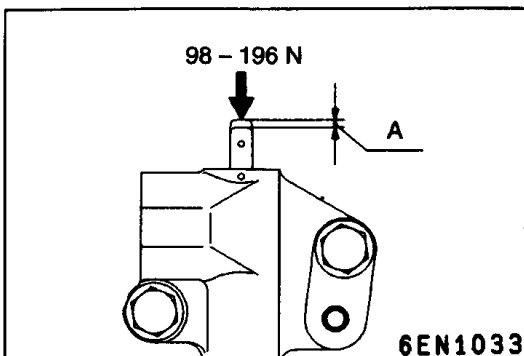
INSPECTION

AUTO TENSIONER

- (1) Hold the auto tensioner by hand and measure contraction (A) when pressing the tip of the rod on a steel (cylinder block; etc.) with a force of 98 – 196 N.

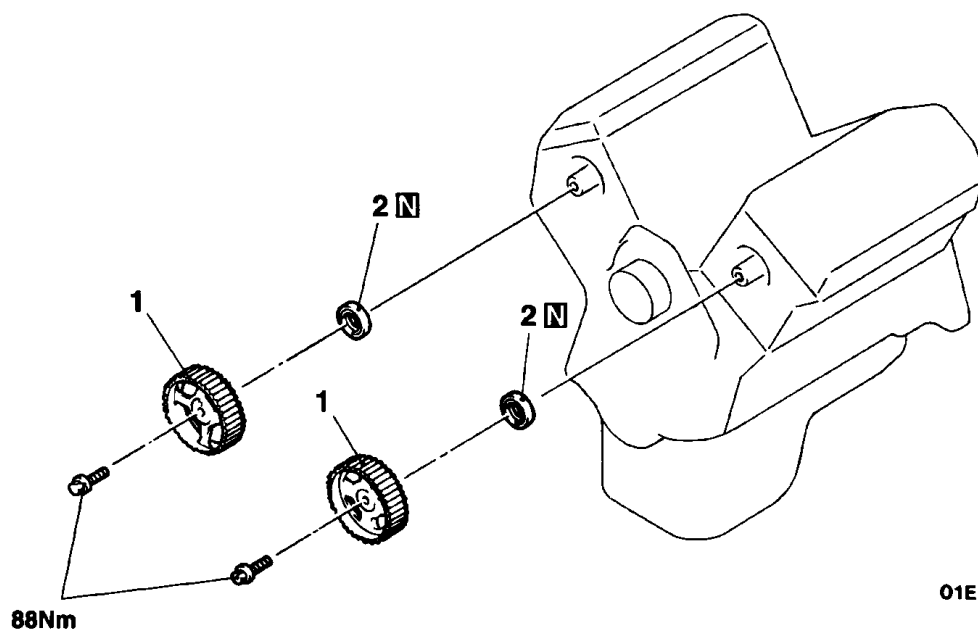
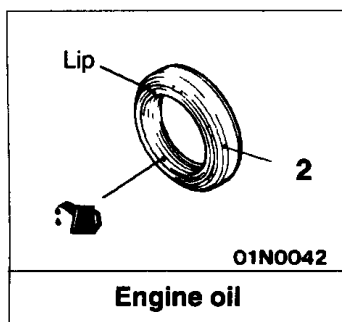
Standard value (A): 1 mm or less

- (2) If not within the standard value, replace the auto tensioner.

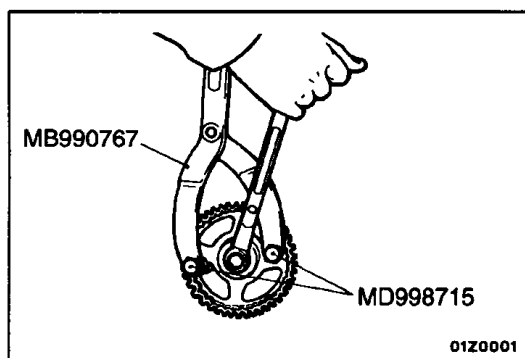
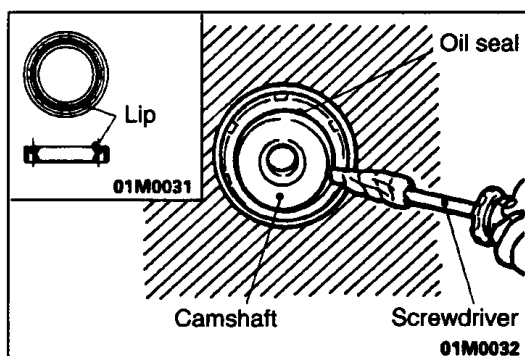


CAMSHAFT OIL SEAL <6G74-SOHC>**REMOVAL AND INSTALLATION****Pre-removal and Post-Installation operation**

- Timing Belt Removal and Installation
(Refer to P.11-13.)

**Removal steps**

1. Camshaft sprocket
2. Camshaft oil seals

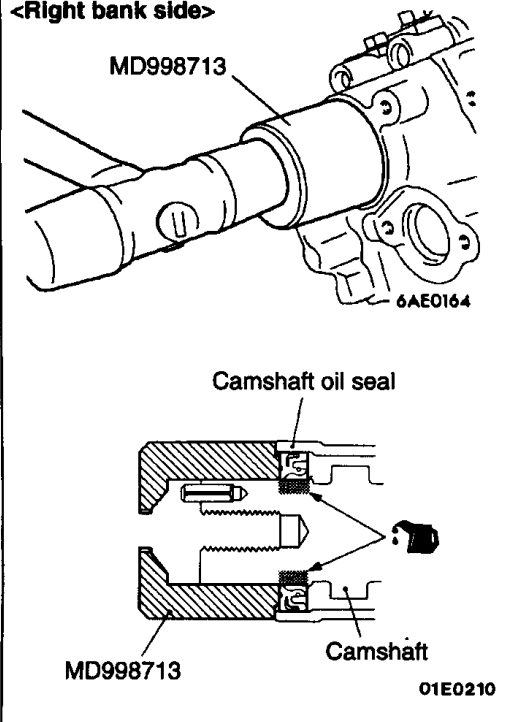
**REMOVAL SERVICE POINTS****◀A▶ CAMSHAFT SPROCKET REMOVAL****◀B▶ CAMSHAFT OIL SEAL REMOVAL**

- (1) Cut out a portion in the camshaft oil seal lip.
- (2) Cover the tip of a screwdriver with a cloth and apply it to the cutout in the oil seal to pry off the oil seal.

Caution

Use care not to damage the camshaft and cylinder head.

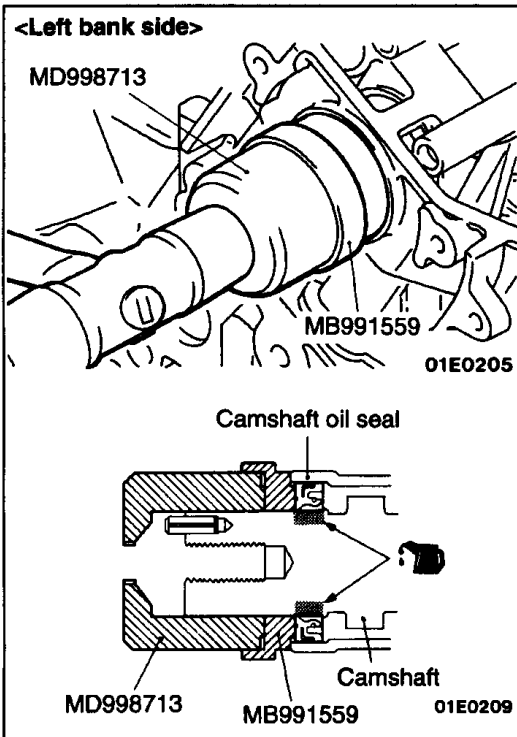
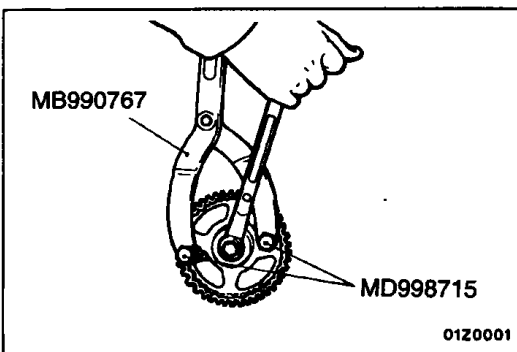
<Right bank side>

**INSTALLATION SERVICE POINTS****►A◄ CAMSHAFT OIL SEAL INSTALLATION**

Coat engine oil on the whole circumference of the oil seal lip section.

Using the special tool, install the camshaft oil seal.

<Left bank side>

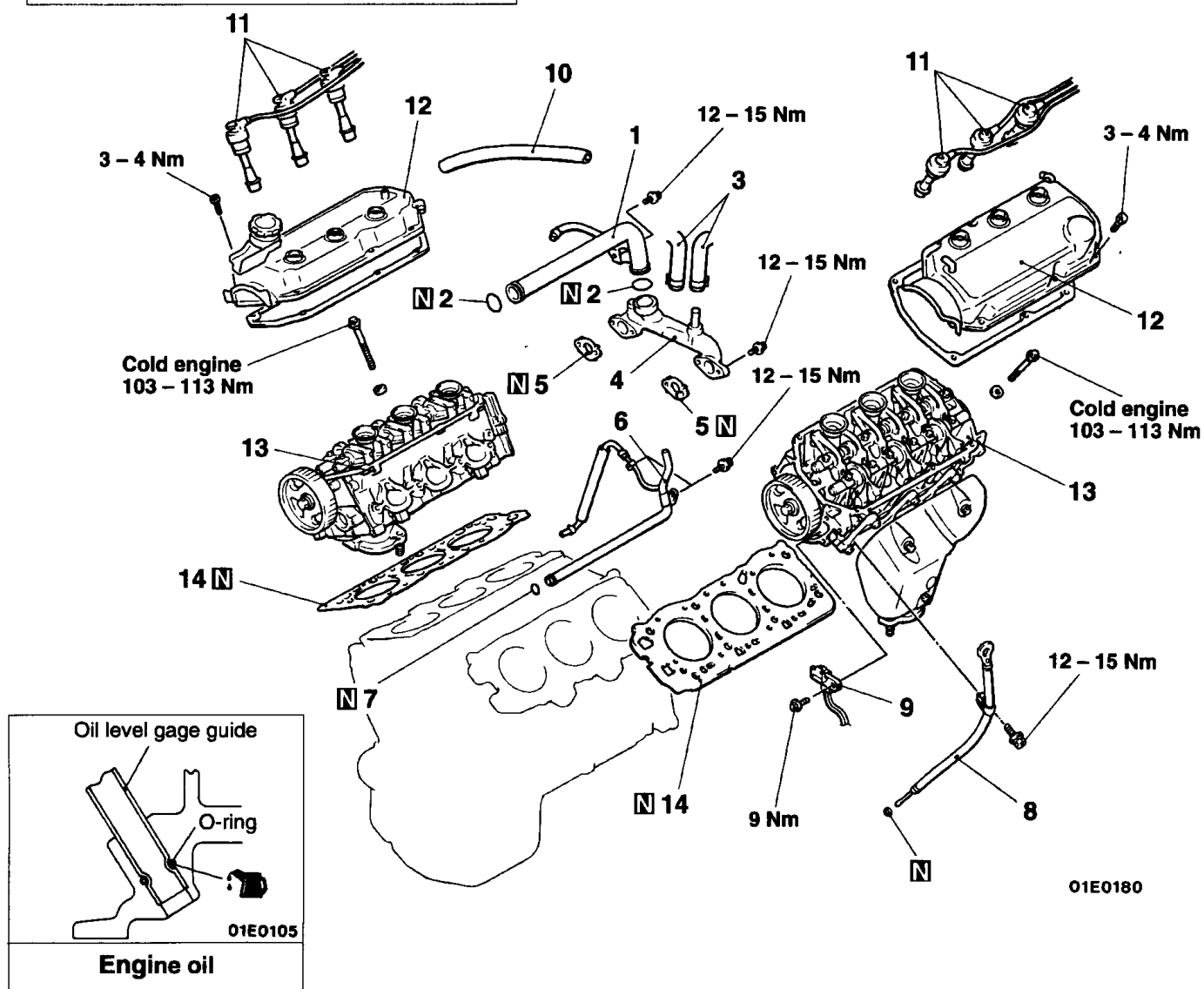
**►B◄ CAMSHAFT SPROCKET INSTALLATION**

CYLINDER HEAD GASKET <6G74-SOHC>

REMOVAL AND INSTALLATION

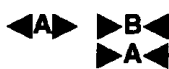
Pre-removal and Post-installation Operation

- Engine Coolant Draining and Supplying
- Timing Belt Removal and Installation
(Refer to P.11-13.)
- Intake Manifold Removal and Installation
(Refer to GROUP 15 – Intake Manifold.)
- Front Exhaust Pipe Removal and Installation

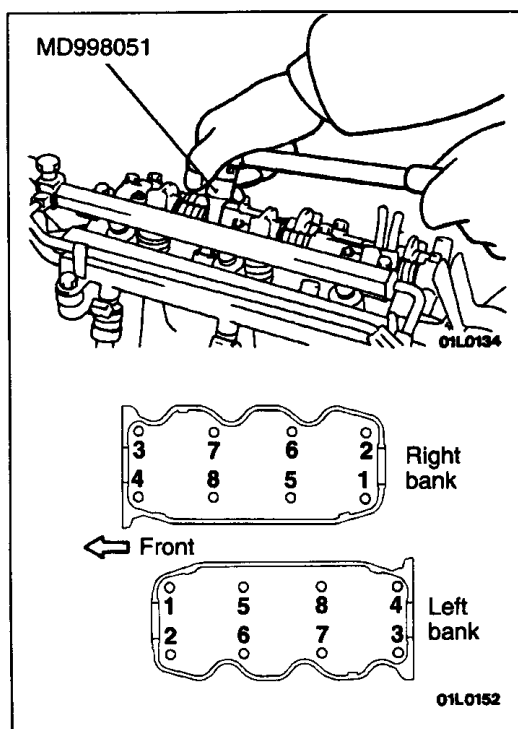
**Removal steps**

- ▶C◀ 1. Water outlet pipe
 ▶D◀ 2. O-ring
 ▶D◀ 3. Heater hose
 ▶D◀ 4. Water passage
 ▶C◀ 5. Gasket
 ▶C◀ 6. Water pipe and hose assembly
 ▶C◀ 7. O-ring
 ▶C◀ 8. Oil level gage guide
 <Only left bank is removed>

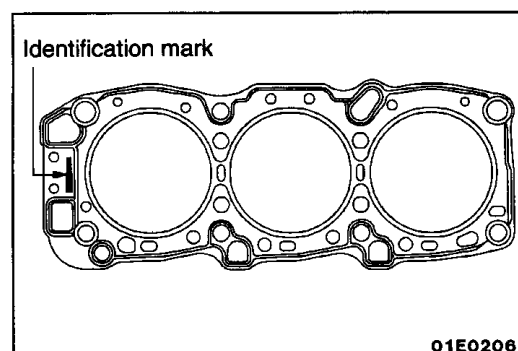
9. Camshaft position sensor
 <Only left bank is removed>
 10. Ventilation hose
 11. Spark plug cable
 12. Rocker cover
 13. Cylinder head assembly
 14. Cylinder head gasket



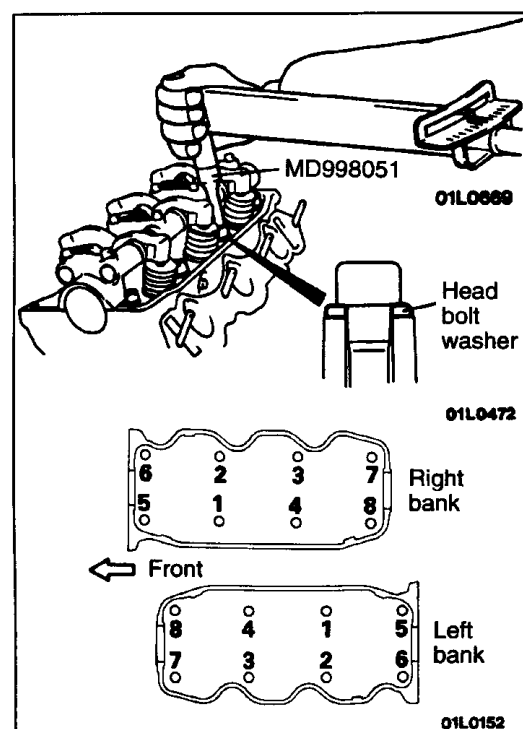
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**REMOVAL SERVICE POINT****◀A▶ CYLINDER HEAD ASSEMBLY REMOVAL**

Using the special tool, after loosening the bolts (in 2 or 3 cycles), remove the cylinder head assembly.

**INSTALLATION SERVICE POINTS****▶A◀ CYLINDER HEAD GASKET INSTALLATION**

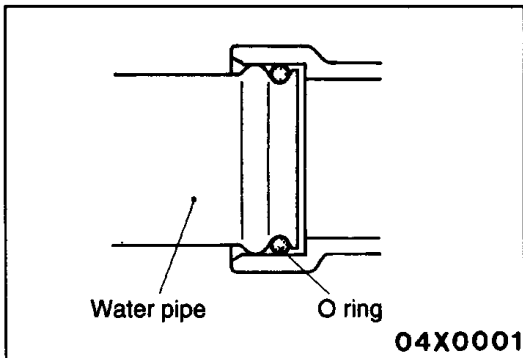
- (1) Degrease the mounting surface of the cylinder head gasket.
- (2) Lay the cylinder head gasket on cylinder block with the identification mark at front top.

**▶B◀ CYLINDER HEAD ASSEMBLY INSTALLATION**

Using the special tool, tighten the bolts in the order shown in two or three steps.

Caution

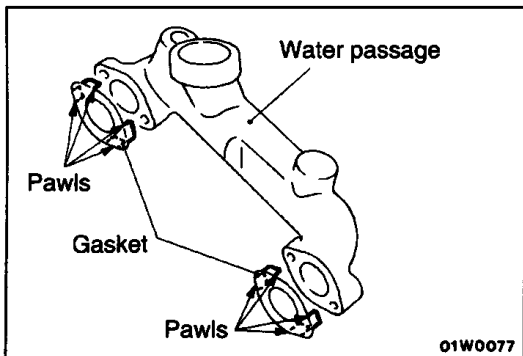
Attach the head bolt washer in the direction shown in the figure.

**►C◄ O-RING INSTALLATION**

Rinse the mounting location of the O-ring and water pipe with water, and install the O-ring.

Caution

Do not apply oil and grease to water pipe O-ring.

**►D◄ GASKET/WATER PASSAGE INSTALLATION**

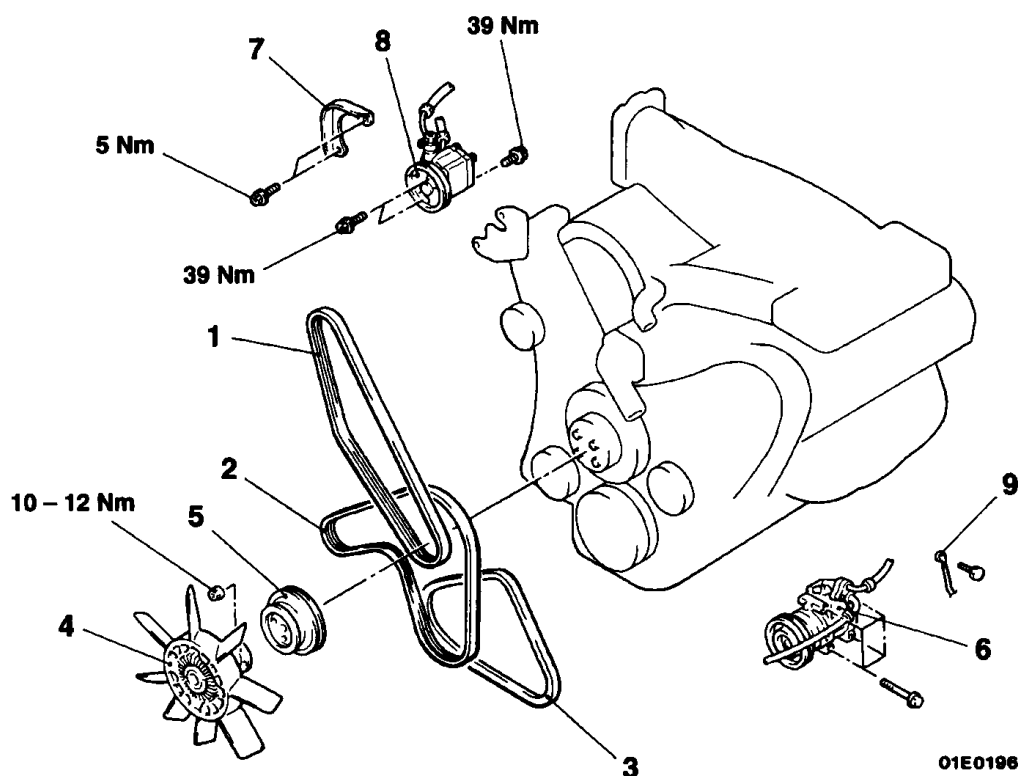
Bend the tabs onto the water passage assembly, and then install the water passage assembly to the cylinder head so that the gasket doesn't slip.

ENGINE ASSEMBLY <6G74-SOHC>**REMOVAL AND INSTALLATION****Pre-removal Operation**

- Hood Removal
- Battery and Battery Tray Removal
- Auto-cruise Control Intermediate Link Removal
- Radiator Removal
- Under Skid Plate, Under Cover Removal
- Front Exhaust Pipe
- Transmission and Transfer Assembly Removal

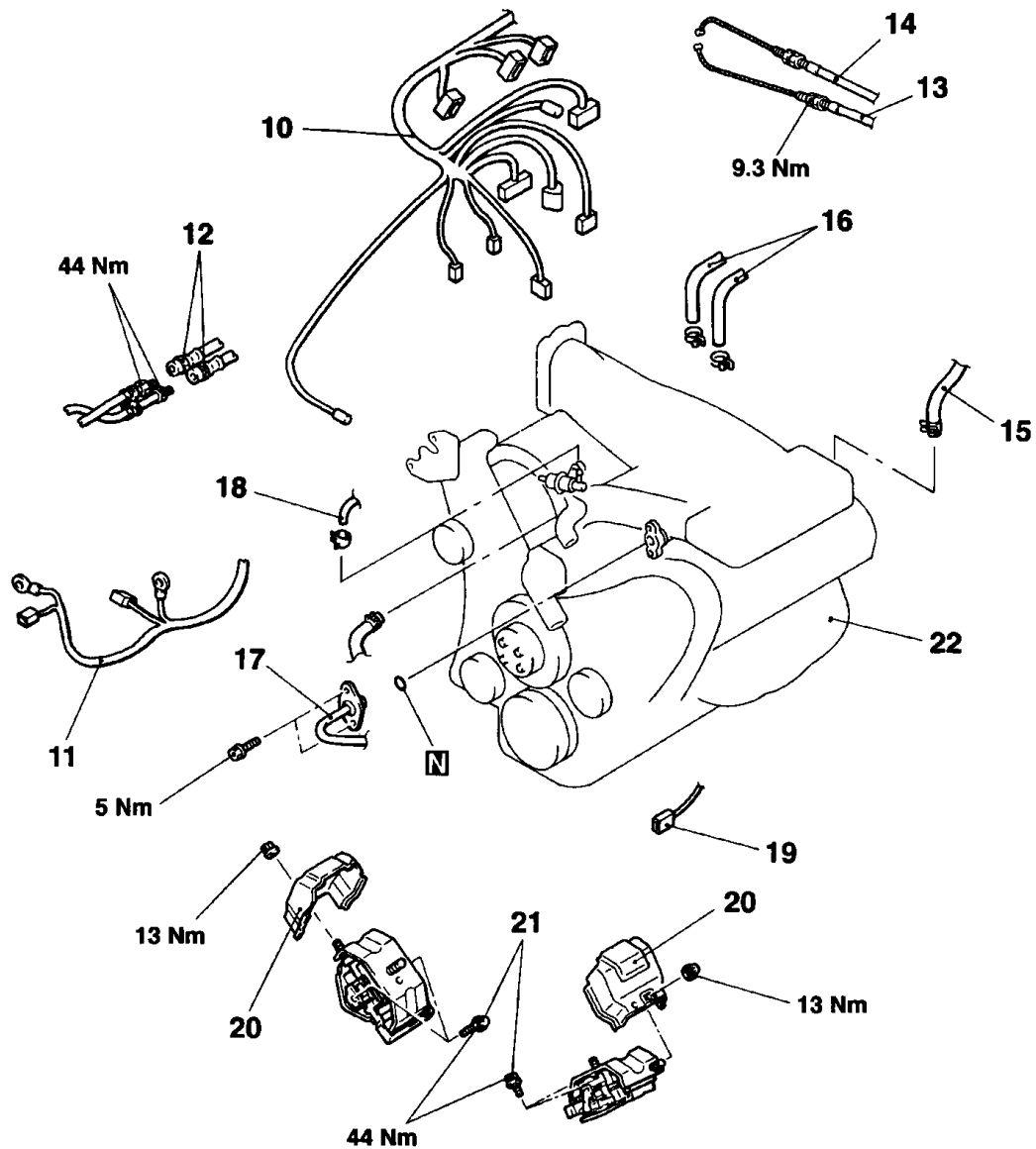
Post-installation Operation

- Transmission and Transfer Assembly Installation
- Front Exhaust Pipe Installation
- Under Skid Plate, Under Cover Installation
- Radiator Installation
- Battery and Battery Tray Installation
- Auto-cruise Control Intermediate Link Installation and Adjustment
- Hood Installation
- Engine Adjustment
- Accelerator Cable Adjustment
- Throttle Cable Adjustment
- Engine Oil Supplying and Checking

**Removal steps**

1. Power steering oil pump drive belt
2. Alternator drive belt
3. A/C compressor drive belt
4. Cooling fan and clutch assembly
5. Cooling fan pulley
6. A/C compressor

7. Cover
8. Power steering oil pump
9. Earth cable connection



01E0148

10. Engine control harness connection
 11. Alternator and starter harness connection
 12. Engine oil cooler hose connection
 13. Accelerator cable connection
 14. Throttle cable connection
 15. Brake booster vacuum hose connection

16. Heater hose connection
 17. Fuel hose connection
 18. Fuel return hose connection
 19. Oil pressure switch harness connection
 20. Heat protectors
 21. Engine mounting bolt
 22. Engine assembly

◀B▶▶B▶

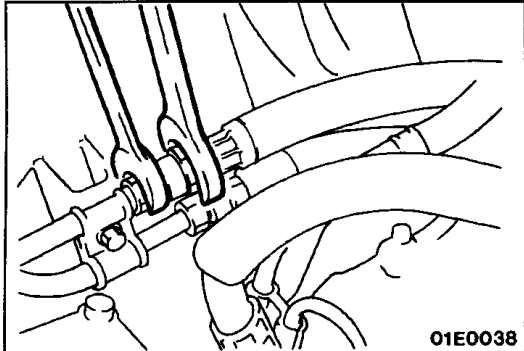
◀C▶▶A▶

REMOVAL SERVICE POINTS**◀A▶ POWER STEERING OIL PUMP ASSEMBLY / A/C COMPRESSOR ASSEMBLY REMOVAL**

Remove the oil pump and air conditioning compressor (with the hose attached).

NOTE

Suspend the removed oil pump (by using wire or similar material) at a place where no damage will be caused during removal/installation of the engine assembly.

**◀B▶ ENGINE OIL COOLER HOSE DISCONNECTION**

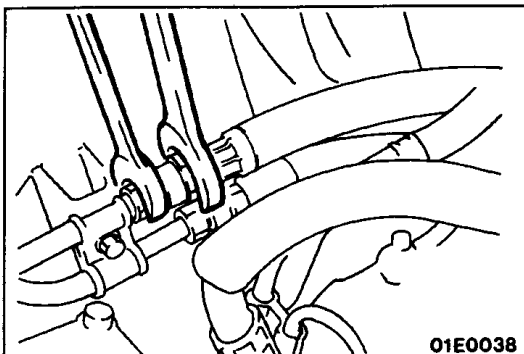
Use a spanner or similar tool to disconnect the oil cooler hose.

◀C▶ ENGINE ASSEMBLY REMOVAL

- (1) Check that all cables, hoses, harness connectors, etc. are disconnected from the engine.
- (2) Lift the chain block slowly to remove the engine assembly upward from the engine compartment.

INSTALLATION SERVICE POINTS**▶A▶ ENGINE ASSEMBLY INSTALLATION**

Install the engine assembly. When doing so, check carefully that all pipes and hoses are connected, and that none are twisted, damaged, etc.

**▶B▶ ENGINE OIL COOLER HOSE CONNECTION**

Use a spanner or similar tool to connect the oil cooler hose.

FUEL

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FUEL SYSTEM <6G72-SOHC 24 Valve Engine, 6G74-SOHC 24 Valve Engine>

GENERAL

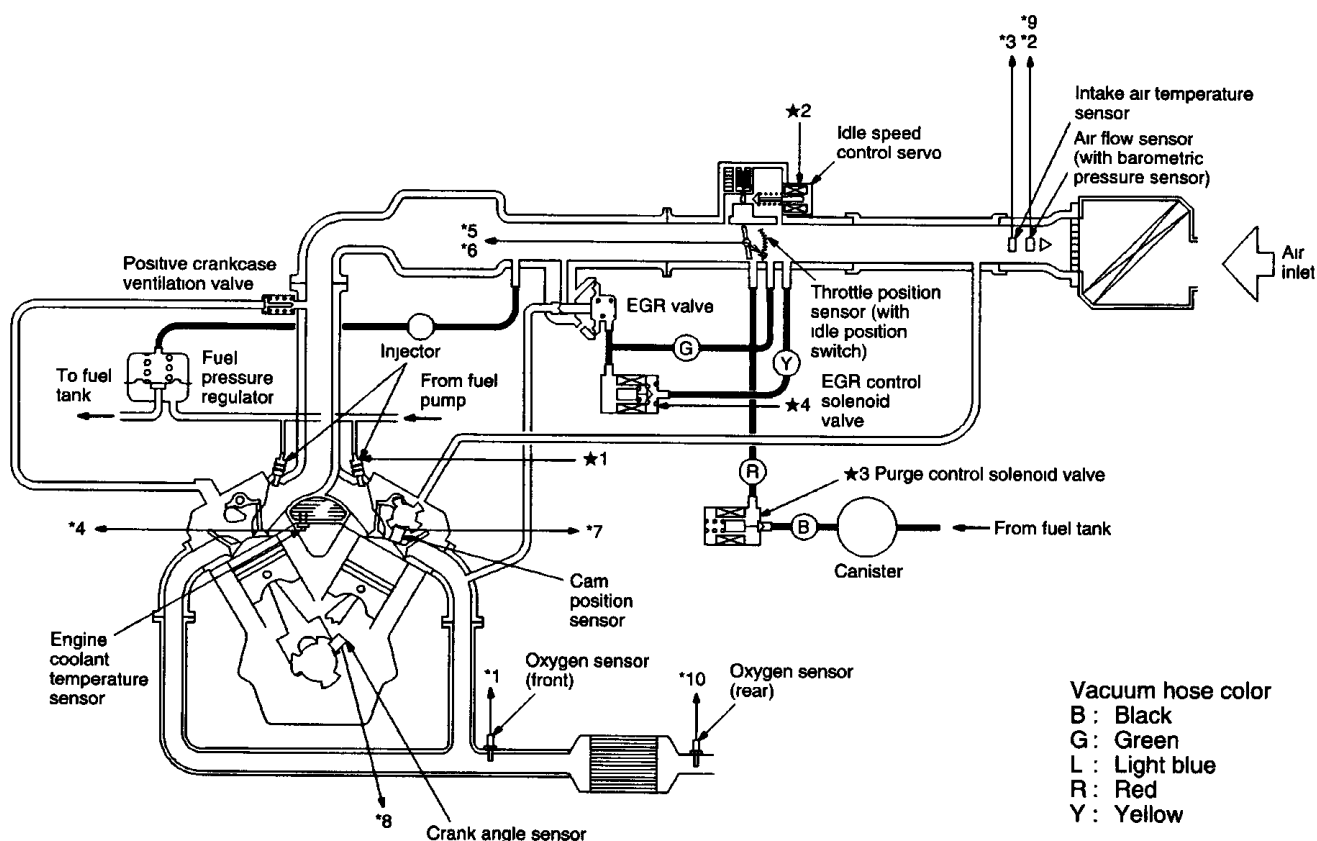
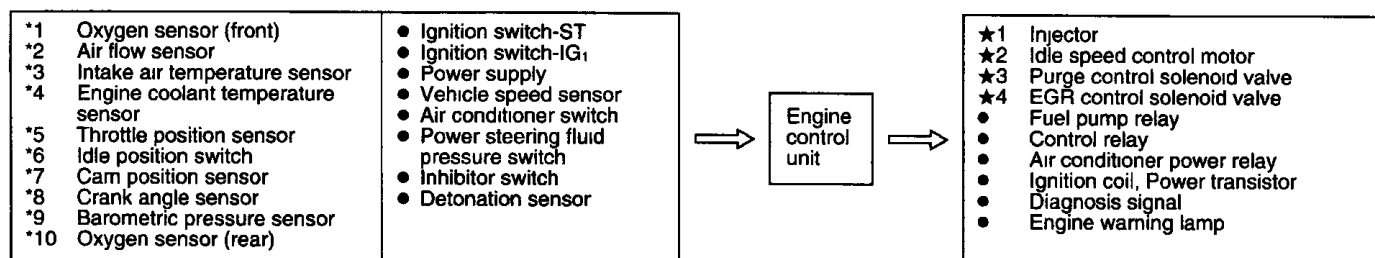
OUTLINE OF CHANGES

- A 6G74-SOHC 24-valve engine has been added. To correspond to this, maintenance service procedures are given below.
- The specifications for a 6G72-SOHC 24-valve engine has been changed. To correspond to this, maintenance service procedures are given below.
- The high-pressure hose connection has been changed to a one-touch connector type.

GENERAL INFORMATION

MULTIPOINT INJECTION SYSTEM DIAGRAM

<6G74-SOHC 24 Valve Engine>



13-4 FUEL SYSTEM <6G72-SOHC 24 Valve Engine, 6G74-SOHC 24 Valve Engine> – Specifications

SPECIFICATIONS

GENERAL SPECIFICATIONS

Items	Specifications
Fuel Tank capacity Standard Wheelbase Long Wheelbase	75 92
Fuel pump Type Driven by	Electrical, in-tank type Electric motor
Throttle body Throttle bore Throttle position sensor Idle speed control servo Idle position switch	60 Variable resistor type Stepper motor type Stepper motor type by-pass air control system with the Fast Idle Air Valve Rotary contact type
Engine control unit Identification model No. <6G72-SOHC 24 Valve Engine> <6G74-SOHC 24 Valve Engine>	E2T68673 <Vehicles without immobilizer> E2T68674 <Vehicles with immobilizer> E2T68675 <Vehicles without immobilizer> E2T68676 <Vehicles with immobilizer>
Sensors Air flow sensor Barometric pressure sensor Intake air temperature sensor Engine coolant temperature sensor Oxygen sensor Vehicle speed sensor Inhibitor switch Detonation sensor <6G74-SOHC 24 Valve Engine> Cam position sensor Crank angle sensor Power steering fluid pressure switch	Karman vortex type Semiconductor diffusion-type Thermistor type Thermistor type Zirconia type Reed switch type Contact switch type Piezoelectric type Hall element type Hall element type Contact switch type
Actuators Control relay type Injector type and number Purge control solenoid valve EGR control solenoid valve	Contact switch type Electromagnetic, 6 ON/OFF type solenoid valve Duty cycle type solenoid valve
Fuel pressure regulator Regulated pressure	329

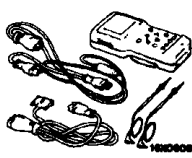
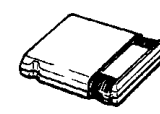
SERVICE SPECIFICATIONS

Items		Standard value
Accelerator cable play	mm	1 – 2
Basic ignition timing		$5^{\circ} \pm 3^{\circ}$ BTDC at curb idle
Curb idle speed	r/min.	700 ± 100
Idle speed when air conditioner ON	r/min.	900 at neutral position 650 at D range <A/T>
Basic idle speed	r/min.	700 ± 50
Throttle position sensor output voltage	mV	400 – 1000
Throttle position sensor resistance	k Ω	3.5 – 6.5
Idle speed control servo (stepper motor) coil resistance [at 20°C]	Ω	28 – 33
Intake air temperature sensor resistance [at 20°C]	k Ω	2.7
Engine coolant temperature sensor resistance	k Ω	
20°C		2.4
80°C		0.3
Fuel pressure (at curb idle)	kPa	
Vacuum hose disconnected		324 – 343
Vacuum hose connected		Approx. 265
Injector coil resistance [at 20°C]	Ω	13 – 16

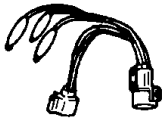
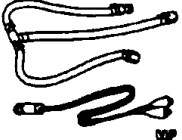
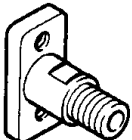
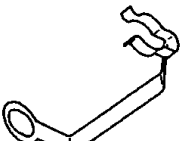
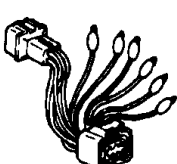
SEALANT

Items	Specified sealant	Remarks
Engine coolant temperature sensor threaded portion	3M Nut Locking Part No. 4171 or equivalent	Drying sealant

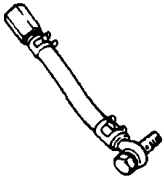
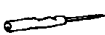
SPECIAL TOOLS

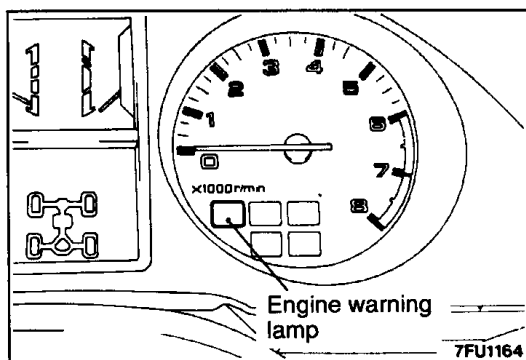
Tool	Number	Name	Use
	MB991502	MUT-II	● Reading diagnosis code ● MPI system inspection
	 16X0607	ROM pack	
	MB991529	Diagnosis code check harness	● Reading diagnosis code ● Basic idle speed adjustment
	MB991348	Test harness set	● Adjustment of throttle position sensor ● Inspection with analyzer

13-6 FUEL SYSTEM <6G72-SOHC 24 Valve Engine, 6G74-SOHC 24 Valve Engine> – Special Tools

Tool	Number	Name	Use
	MD998478	Test harness (3 pin, square)	● Inspection with analyzer
	MD998474	Test harness (8 pin, square)	● Inspection with analyzer
	MD998706	Injector test set	● Checking injection condition of injector
	MD998741	Injector test adaptor	
	MB991692	Injector test clip	
	MB991607	Injector test harness	
	MD998463	Test harness (6 pin, square)	● Idle speed control servo inspection ● Inspection with analyzer

FUEL SYSTEM <6G72-SOHC 24 Valve Engine, 6G74-SOHC 24 Valve Engine> – Special Tools 13-7

Tool	Number	Name	Use
	MD998709	Adapter hose	Measurement of fuel pressure
	MD998742	Hose adapter	
For red harness (for DLI)  For white harness (for LC)  	MB991223	Inspection harness set connector ● Pin contact pressure inspection harness ● Marketing tester connection probe (for general connectors)	● Measurement of terminal voltages



TROUBLESHOOTING

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 switch 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 turn on, the engine warning lamp is lit for 5 seconds to indicated that the engine warning lamp operates normally.

Item Indicated by the lightening engine warning lamp

Engine control unit	Cam position sensor
Oxygen sensor	Barometric pressure sensor
Air flow sensor	Detonation sensor <6G74-SOHC 24 Valve Engine>
Intake air temperature sensor	Immobilizer system
Throttle position sensor	Injector
Engine coolant temperature sensor	EGR system
Crank angle sensor	Ignition coil, Power transistor unit

ENGINE WARNING LAMP INSPECTION

- (1) Check to be sure, when the ignition switch is set to the "ON" position, that the lamp illuminates for about five seconds and then switches OFF.
- (2) If the lamp does not illuminate, check for damage or disconnection of the harness, or for a blown fuse or a failed light bulb.

SELF-DIAGNOSIS

The engine control unit monitors the input/output signals (some signals at all times and the others under specified conditions) of the engine control unit. When it is noticed that an irregularity has continued for a specified time or longer from when the irregular signal is initially monitored, passing a certain number, the engine control unit judges that an irregularity has occurred, memorizes the malfunction code, and outputs the signal to the self-diagnosis output terminals. There are 18 diagnosis items, including the normal state, and the diagnosis results can be read out with a voltmeter or MUT-II. 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.

The malfunction codes are also erased by setting the ignition switch to the "ON" position and then sending the malfunction-code-erase signal from the MUT-II to the engine control unit.

Caution

If the sensor connector is disconnected while the ignition switch is ON, the malfunction code is memorized. In this instance, either send the malfunction-code-erase signal from the MUT-II to the engine control unit, or disconnect the battery's negative (–) terminal for ten seconds or longer; the diagnosis memory will be erased.

The 18 diagnosis items are provided as follows, and if plural items are activated, they are all indicated sequentially from the smallest code number.

13-10 FUEL SYSTEM <6G72-SOHC 24 Valve Engine, 6G74-SOHC 24 Valve Engine> – Troubleshooting

DIAGNOSIS CHART

Output preference order	Diagnosis item	Diagnosis code		Check item (Remedy)
		No.	Memory	
1	Engine control unit	–	–	(Replace engine control unit)
2	Oxygen sensor <front>	11	Retained	● Harness and connector ● Oxygen sensor ● Fuel pressure ● Injectors (Replace if defective) ● Intake air leaks
3	Air flow sensor	12	Retained	● Harness and connector (if harness and connector are normal, replace air flow sensor assembly.)
4	Intake air temperature sensor	13	Retained	● Harness and connector ● Intake air temperature sensor
5	Throttle position sensor	14	Retained	● Harness and connector ● Throttle position sensor ● Idle position switch
6	Engine coolant temperature sensor	21	Retained	● Harness and connector ● Engine coolant temperature sensor
7	Crank angle sensor	22	Retained	● Harness and connector (If harness and a connector are normal, replace distributor assembly.)
8	Cam position sensor	23	Retained	● Harness and connector (If harness and a connector are normal, replace distributor assembly.)
9	Vehicle speed sensor (reed switch)	24	Retained	● Harness and connector ● Vehicle speed sensor (reed switch)
10	Barometric pressure sensor	25	Retained	● Harness and connector (If harness and connector are normal, replace barometric pressure sensor assembly.)

FUEL SYSTEM <6G72-SOHC 24 Valve Engine, 6G74-SOHC 24 Valve Engine> – Troubleshooting 13-11

Output preference order	Diagnosis item	Diagnosis code		Check item (Remedy)
		No.	Memory	
11	Detonation sensor <6G74-SOHC 24 Valve Engine>	31	Retained	● Harness and connector (If harness and connector are normal; replace detonation sensor.)
12	Injector	41	Retained	● Harness and connector ● Injector oil resistance
13	Ignition coil, Power transistor unit (No.1 – 4 cylinder)	44	Retained	● Harness and connector ● Ignition coil ● Power transistor unit
14	Ignition coil, Power transistor unit (No.2 – 5 cylinder)	52	Retained	● Harness and connector ● Ignition coil ● Power transistor unit
15	Ignition coil, Power transistor unit (No.3 – 6 cylinder)	53	Retained	● Harness and connector ● Ignition coil ● Power transistor unit
16	Immobilizer system	54	Retained	(Inspect according to the troubleshooting procedures given in GROUP 54 – Ignition Switch and Immobilizer System)
17	Oxygen sensor <rear>	59	Retained	● Harness and connector ● Oxygen sensor
18	Normal state	–	–	–

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.

13-12 FUEL SYSTEM <6G72-SOHC 24 Valve Engine, 6G74-SOHC 24 Valve Engine> – Troubleshooting

TROUBLE DIAGNOSIS QUICK REFERENCE CHART

Trouble code No.	Diagnosis item	Description	Major cause	Remarks (Symptoms, etc.)
—	Engine control unit	Trouble in engine control unit itself	—	● Engine stalls ● Engine cannot be started.
11	Oxygen sensor <front>	Air-fuel ratio feedback control (closed loop control) is in effect but oxygen sensor signal voltage does not change (air-fuel mixture lean/rich).	(1) Defective oxygen sensor (2) Open or short circuit in oxygen sensor circuit, or connector in loose contact	● Poor exhaust emission purifying performance
			(3) Improper fuel pressure (4) Defective injector (5) Air drawn in through gasket clearance, etc. (6) Defective engine control unit	● Poor exhaust emission purifying performance ● Poor startability ● Unstable idling ● Poor acceleration
12	Air flow sensor	Air flow sensor signal frequency 10Hz or less even with engine running	(1) Defective air flow sensor (2) Open or short circuit in air flow sensor circuit, or connector in loose contact (3) Defective engine control unit	● Poor acceleration* ● Improper idling speed* ● Unstable idling*
13	Intake air temperature sensor	(1) Intake air temperature sensor signal voltage over 4.5 V (2) Intake air temperature sensor signal voltage less than 0.27 V	(1) Defective intake air temperature sensor (2) Open or short circuit in intake air temperature sensor circuit, or connector in loose contact (3) Defective engine control unit	● Somewhat poor driveability* ● At high temperatures (a) Poor startability* (b) Unstable idling*
14	Throttle position sensor	(1) Throttle position sensor signal voltage less than 0.2 V (2) Throttle position sensor signal voltage over 2 V even with idle position switch at ON	(1) Throttle position sensor out of order or maladjusted (2) Open or short circuit in throttle position sensor circuit, or connector in poor contact	● Somewhat poor acceleration ● Engine stalls
			(3) Idle position switch ON failure (4) Short circuit in idle position signal line (5) Defective engine control unit	● Engine stalls. ● Engine cannot be raced.

NOTE

*: Failsafe/backup function is in operation.

FUEL SYSTEM <6G72-SOHC 24 Valve Engine, 6G74-SOHC 24 Valve Engine> – Troubleshooting **13-13**

Trouble code No.	Diagnosis item	Description	Major cause	Remarks (Symptoms, etc.)
21	Engine coolant temperature sensor	(1) Engine coolant temperature sensor signal voltage over 4.6 V (2) Engine coolant temperature sensor signal voltage less than 0.11 V (3) Engine coolant temperature sensor signal indicates a low engine coolant temperature while the engine is in warmup operation.	(1) Defective engine coolant temperature sensor (2) Open or short circuit in engine coolant temperature sensor circuit, or connector in poor contact (3) Defective engine control unit	With engine cold ● Poor startability* ● Unstable idling* ● Poor acceleration*
22	Crank angle sensor	(1) Cranking the engine for more than four seconds does not cause the crank angle sensor signal voltage to change (go high or low). (2) Abnormal crank angle sensor signal	(1) Defective crank angle sensor (2) Open or short circuit in crank angle sensor circuit, or connector in loose contact (3) Defective cam position sensor, or connector in loose contact (4) Defective engine control unit	● Engine stalls. ● Engine cannot be started.
23	Cam position sensor	(1) Cam position sensor signal voltage does not change (go high or low) even with the engine running. (2) Abnormal top dead center signal pattern	(1) Defective cam position sensor (2) Open or short circuit in cam position sensor circuit, or connector in loose contact (3) Defective crank angle sensor, or connector in loose contact (4) Defective engine control unit	● Engine stalls.*
24	Vehicle speed sensor (reed switch)	With the engine in accelerated operation at an engine speed of over 3,000 r/min, the vehicle speed sensor signal voltage does not change (go high or low).	(1) Defective vehicle speed sensor (2) Open or short circuit in vehicle speed sensor circuit, or connector in loose contact (3) Defective engine control unit	When the vehicle is stopped with the engine in decelerated operation, the engine might stall.

NOTE

*: Failsafe/backup function is in operation.

13-14 FUEL SYSTEM <6G72-SOHC 24 Valve Engine, 6G74-SOHC 24 Valve Engine> – Troubleshooting

Trouble code No.	Diagnosis item	Description	Major cause	Remarks (Symptoms, etc.)
25	Barometric pressure sensor	(1) Barometric pressure sensor signal voltage over 4.5 V (2) Barometric pressure sensor signal voltage less than 0.2 V	(1) Defective barometric pressure sensor (2) Open or short circuit in barometric pressure sensor circuit, or connector in loose contact (3) Defective engine control unit	● Unstable idling* ● Poor acceleration* ● Poor startability*
31	Detonation sensor <6G74-SOHC 24 Valve Engine>	Abnormal detonation sensor signal voltage	(1) Defective detonation sensor (2) Open or short circuit in detonation sensor circuit, or connector in loose contact (3) Defective engine control unit	● Poor acceleration*
41	Injector	Injector is not driven for more than four consecutive seconds during engine cranking or idling operation	(1) Defective injector (2) Open or short circuit in injector circuit, or connector in loose contact (3) Defective engine control unit	● Poor idling ● Poor acceleration ● Poor startability
44	Ignition coil and power transistor unit for 1-4 cylinders	With the engine running, no ignition signal is input (except in cases where no ignition signal is input to all the cylinders)	(1) Defective ignition coil (2) Open or short circuit in primary ignition circuit, or connector in loose contact (3) Defective power transistor unit (4) Defective engine control unit	● Unstable idling* ● Poor acceleration* ● Poor startability*
52	Ignition coil and power transistor unit for 2-5 cylinders	With the engine running, no ignition signal is input (except in cases where no ignition signal is input to all the cylinders)	(1) Defective ignition coil (2) Open or short circuit in primary ignition circuit, or connector in loose contact (3) Defective power transistor unit (4) Defective engine control unit	● Unstable idling* ● Poor acceleration* ● Poor startability*
53	Ignition coil and power transistor unit for 3-6 cylinders	With the engine running, no ignition signal is input (except in cases where no ignition signal is input to all the cylinders)	(1) Defective ignition coil (2) Open or short circuit in primary ignition circuit, or connector in loose contact (3) Defective power transistor unit (4) Defective engine control unit	● Unstable idling* ● Poor acceleration* ● Poor startability*
54	Immobilizer system	Communication problem between the engine control unit and the immobilizer-ECU	(1) Malfunction of communication wire between the engine control unit and immobilizer-ECU (2) Malfunction of immobilizer-ECU (3) Malfunction of engine control unit	● Starting is impossible
59	Oxygen sensor <rear>	Even if engine has been warmed up, oxygen sensor signal voltage does not change to more than 0.1 V.	(1) Defective oxygen sensor (2) Open or short circuit in oxygen sensor circuit, or connector in loose contact (3) Defective engine control unit	● Poor exhaust emission purifying performance

NOTE

*: Failsafe/backup function is in operation.

LIST OF FAIL-SAFE/BACK-UP FUNCTIONS

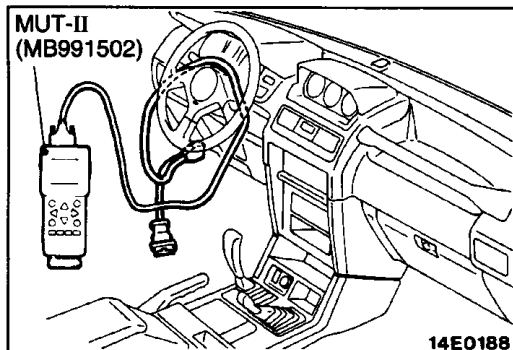
When the failure of a major sensor is detected by the self diagnosis functions, the preset control logic provides controls to assure safe operation of the vehicle.

Trouble item	Controls to be provided in the event of trouble
Air flow sensor	(1) Injector basic drive timing and basic ignition timing read from the preset map based on the throttle position sensor (TPS) signal and engine speed signal (crank angle sensor signal). (2) Idle speed control servo fixed at predetermined position, and no idling speed control achieved.
Intake air temperature sensor	Controls provided on the assumption that intake air temperature is 25°C
Throttle position sensor (TPS)	No additional fuel injection provided on the basis of throttle position sensor signal at acceleration
Engine coolant temperature sensor	Controls provided on the assumption that engine coolant temperature is 80°C (Even if the sensor signal returns to normal, this control mode is retained until the ignition switch is set to OFF.)
Cam position sensor	(1) Fuel injected into all cylinders simultaneously (Provided that no No. 1 cylinder top dead center has been detected since the ignition switch was placed in the ON position) (2) Fuel cut 4 seconds after a failure was detected (Provided that no No. 1 cylinder top dead center has been detected since the ignition switch was placed in the ON position)
Barometric pressure sensor	Controls provided on the assumption that barometric pressure is 101 kPa
Detonation sensor <6G74-SOHC 24 Valve Engine>	The ignition timing is switched from the timing for super petrol to the timing for standard petrol.
Ignition coil and power transistor unit	Fuel cut for cylinders whose ignition signal is abnormal
Oxygen sensor	No air-fuel ratio feedback control (closed loop control) achieved

READ OUT OF MALFUNCTION CODE

Precautions for Operation

- (1) When battery voltage is low, no detection of failure is possible. Be sure to check the battery for voltage and other conditions before starting the test.
- (2) Diagnosis item is erased if the battery or the engine control unit connector is disconnected. Do not disconnect the battery before the diagnosis result is completely read.
- (3) Be sure to connect or disconnect the MUT-II with the ignition switch turned off.

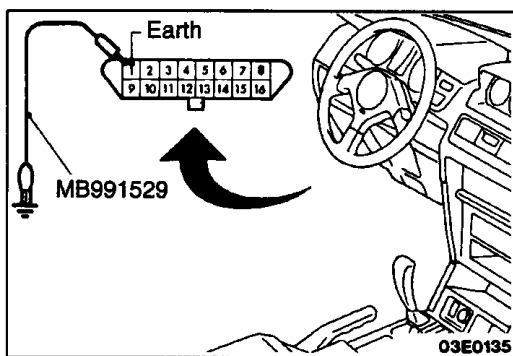


WHEN USING THE MUT-II

Caution

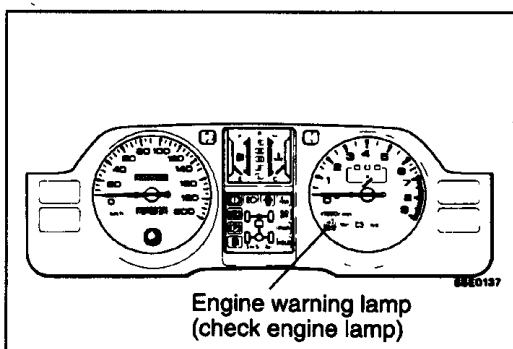
Turn off the ignition switch before disconnecting or connecting the MUT-II.

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

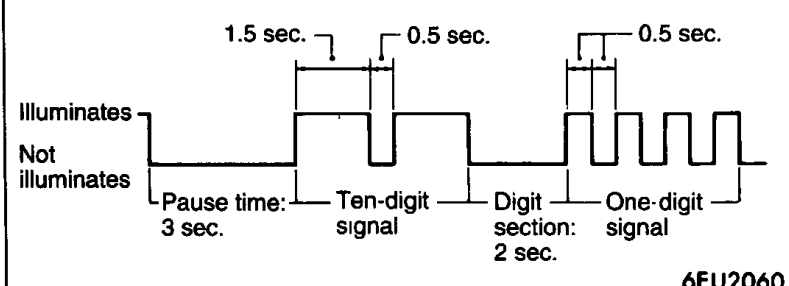
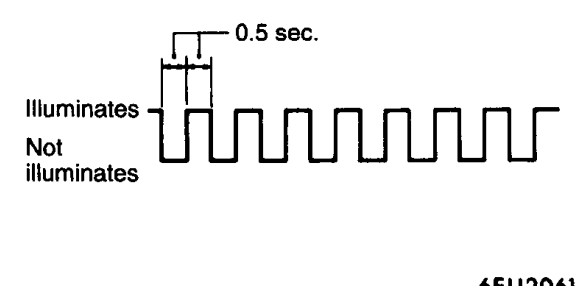


WHEN USING THE ENGINE WARNING LAMP (CHECK ENGINE LAMP)

- (1) Use the special tool (diagnosis code check harness) to earth the diagnosis test mode control terminal (terminal ①) of the diagnosis control terminal (16 pin).
- (2) Turn the ignition switch to ON.
- (3) Take a reading of a diagnosis output according to how often the engine warning lamp flashes.
- (4) Repair the problem location, referring to the diagnostic chart.
- (5) Erase the diagnostic 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 Warm up the engine and let it idle for approx. 15 minutes.
 - ④ Turn the ignition switch to ON and take a reading of the diagnostic output to check if a normal code is output.



DIAGNOSIS RESULT DISPLAY METHOD USING THE CHECK ENGINE/MALFUNCTION INDICATOR LAMP

Example of flashing patterns when diagnosis code outputs	Normal flashing pattern
Diagnostic trouble code No. 24  6FU2060	 6FU2061

NOTE

Other diagnosis items are also output as lamp flashing corresponding to MUT-II diagnosis code numbers.

Diagnosis by DIAGNOSIS 2 MODE

- (1) Using the MUT-II, changeover the diagnosis mode of the engine control unit to DIAGNOSIS 2 MODE.
- (2) Carry out a road test.
- (3) Read the diagnosis code in the same manner as “READ OUT OF MALFUNCTION CODE” and repair the malfunctioning part.
- (4) Turn the ignition switch OFF and then turn it ON again.

NOTE

By turning the ignition switch OFF, the engine control unit will changeover the diagnosis mode from DIAGNOSIS 2 MODE to DIAGNOSIS 1 MODE.

- (5) Erase the malfunction codes.

13-18 FUEL SYSTEM <6G72-SOHC 24 Valve Engine, 6G74-SOHC 24 Valve Engine> – Troubleshooting

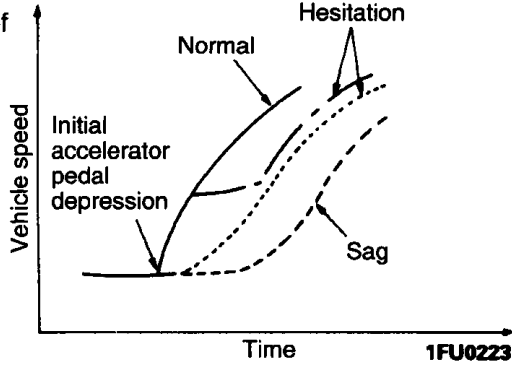
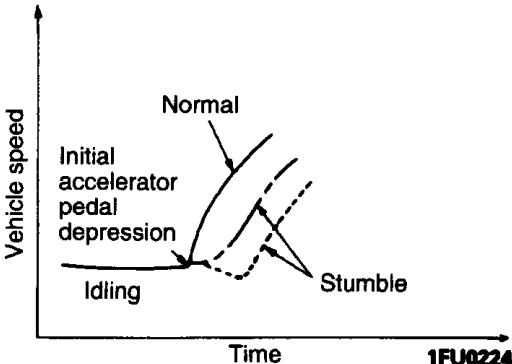
CHECK CHART CLASSIFIED BY PROBLEM SYMPTOMS

Problem symptoms Check Items	Start- ing		Idling stability			Driving						Stopping	Reference page
	Will not start	Starting problem	Idling instability (Rough idling)	Incorrect idling speed	Improper idling continuity	Hesitation, sag	Poor acceleration	Stumble	Shock	Surge	Knocking	Run-on (Dieseling)	
Power Supply and Ignition Switch-IG	①①												P.13-29
Engine Control Unit Power Earth	②②												P.13-31
Fuel Pump	③③	①①			①①	①①	①①						P.13-32
Air Flow Sensor					⑪⑪	⑨⑨		⑤⑤	⑤⑤		④④		P.13-35
Intake Air Temperature Sensor			⑤			⑤⑤	④④				②②		P.13-40
Barometric Pressure Sensor			⑦			⑧⑧	⑥⑥				③③		P.13-43
Engine Coolant Temperature Sensor		③	⑥⑤	①①	⑤⑤	⑦⑦	⑤⑤	④④		③③			P.13-45
Throttle Position Sensor						⑥⑥		③③	④④				P.13-48
Idle Position Switch			③③	②②	④④								P.13-51
Cam Position Sensor	⑤⑤	⑥⑦			⑧⑦				②②				P.13-54
Crank Angle Sensor	⑥⑥	⑦⑧			⑨⑧				③③				P.13-58
Ignition Switch-ST <M/T>	④④	③④											P.13-61
Ignition Switch-ST and Inhibitor Switch <A/T>	④④	③④		⑤									P.13-62
Vehicle Speed Sensor					⑥				⑥				P.13-64
Power Steering Fluid Pressure Switch				③									P.13-66
Air Conditioner Switch and Power Relay				④									P.13-68
Detonation Sensor <6G74-SOHC 24 Valve Engine>											①①		P.13-70
Oxygen Sensor			⑨										<6G72> 13-72 <6G74> 13-75
Injectors	⑧⑧	②②	②②		③③	②②	②②	①①		①①		①	P.13-79
Idle Speed Control Servo (Stepper Motor)		④⑤	①①	⑥③	②②				⑧⑥				P.13-84
Ignition Coil and Power Transistor	⑦⑦				⑩⑨		⑥⑥		①①		⑤⑤		P.13-89
Purge Solenoid			⑧										P.13-95
EGR Control Solenoid Valve						④④		⑥⑥		④④			P.13-97
Anti-skid Brake Signal									⑦				P.13-99
Fuel Pressure		⑤⑥	④④		⑦⑥	③③	③③	②②		②②			P.13-100

○: Warm engine (figures inside the ○ indicate the checking sequence.)

□: Cold engine (figures inside the □ indicate the checking sequence.)

PROBLEM SYMPTOMS TABLE (FOR YOUR INFORMATION)

Item		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 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 r/min 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 engine continues to run even after the switch is turned OFF. This is called dieseling.

SERVICE ADJUSTMENT PROCEDURES

ACCELERATOR CABLE INSPECTION AND ADJUSTMENT <VEHICLES WITHOUT AUTOCRUISE CONTROL SYSTEM>

Refer to Basic Manual.

FUEL FILTER REPLACEMENT

Refer to Basic Manual.

FUEL GAUGE UNIT REPLACEMENT

Refer to Basic Manual.

2-WAY VALVE REPLACEMENT

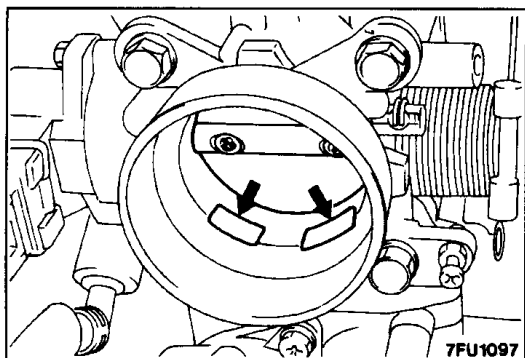
Refer to Basic Manual.

FUEL PUMP OPERATION CHECK

Refer to Basic Manual.

HOW TO REDUCE THE FUEL LINE INTERNAL PRESSURE

Refer to Basic Manual.



THROTTLE BODY (THROTTLE VALVE AREA) CLEANING

1. Start the engine and warm it up until the coolant is heated to 80°C 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.

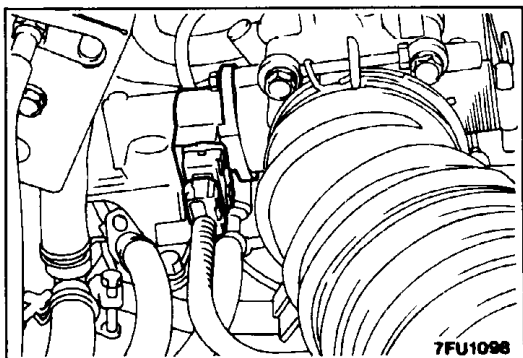
Caution

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 diagnosis code.
10. Adjust the basic idle speed.

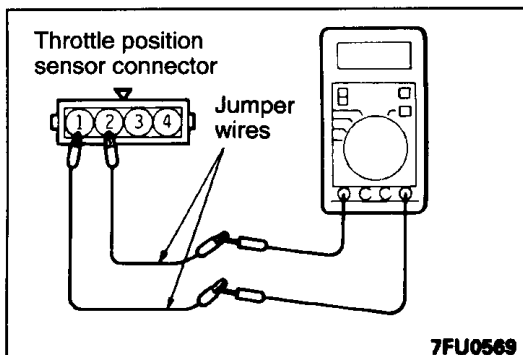
NOTE

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.

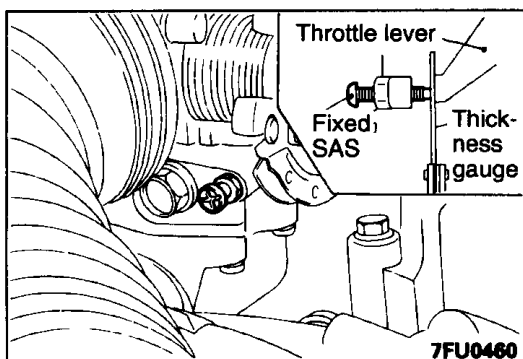


IDLE POSITION SWITCH AND THROTTLE POSITION SENSOR ADJUSTMENT

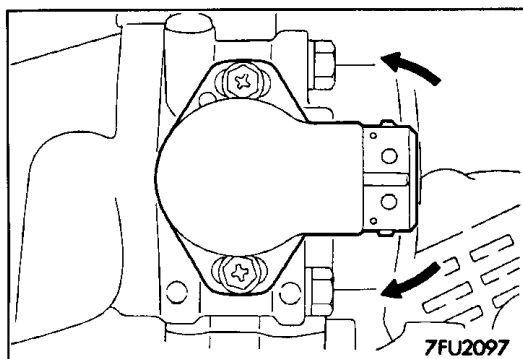
1. Connect the MUT-II to the diagnosis connector.
When not using the MUT-II, proceed as follows;
(1) Disconnect the connector of the throttle position sensor.



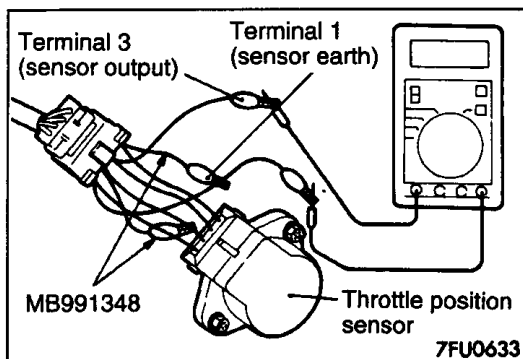
- (2) Connect an ohmmeter between terminal 2 (idle position switch) and terminal 1 (sensor earth) by using jumper wires.



2. Insert a thickness gauge as follows:
Insert a thickness gauge with a thickness of 0.65 mm between the fixed SAS and the throttle lever.
3. Turn the ignition switch to ON (but do not start the engine).



4. Loosen the throttle position sensor mounting bolt, and then turn the throttle position sensor clockwise as far as it will go.
5. Check that the idle position switch is ON at this position.
6. Slowly turn the throttle position sensor counterclockwise and find the point where the idle position switch turns off. Securely tighten the throttle position sensor mounting bolt at this point.



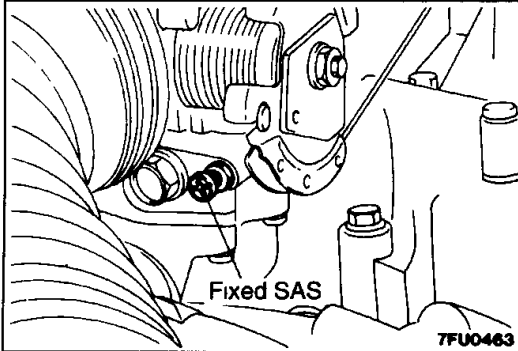
7. When not using the MUT-II, proceed as follows;
(1) Disconnect the throttle position sensor connector, and connect the special tool (test harness: MB991348) in between.
(2) Connect digital voltmeter between terminal 3 (sensor output) and terminal 1 (sensor earth).
(3) Turn the ignition switch to ON (but do not start the engine).

8. Check the throttle position sensor output voltage.

Standard value: 400 – 1,000 mV

9. If there is a deviation from the standard value, check the throttle position sensor and the related harness.
10. Remove the thickness gauge.
11. Turn the ignition switch to OFF.
12. Disconnect the MUT-II.

When the MUT-II is not used, remove the special tool, and connect the throttle position sensor.



FIXED SAS ADJUSTMENT

NOTE

1. The fixed SAS should not be moved unnecessarily; it has been precisely adjusted by the manufacturer.
2. If the adjustment is disturbed for any reason, 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 throttle position sensor.

BASIC IDLE SPEED ADJUSTMENT

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) If the adjustment has been changed by mistake, the idle speed may become too high or the idle speed may drop too low when loads from components such as the A/C are placed on the engine. If this occurs, adjust by the following procedure.
- (3) 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. Perform inspection, with the vehicles in the following condition.
 - Engine coolant temperature: 80 – 95°C
 - Lights and all accessories: OFF
 - Transmission: Neutral (P range for vehicles with automatic transmission)
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. Start the engine and run at idle.
4. Select the item No. 30 of the MUT-II Actuator test.

NOTE

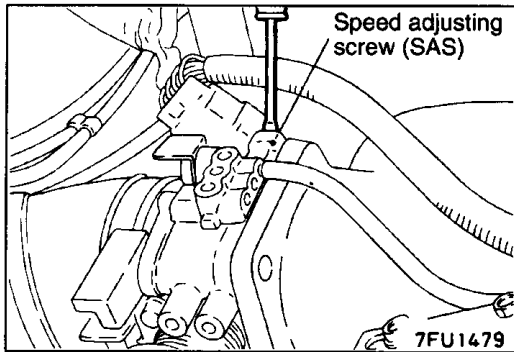
This holds the ISC servo at the basic step to adjust the basic idle speed.

5. Check the idle speed.

Standard value: 700 ± 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 engine speed 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.



6. 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.

7. Press the MUT-II clear key, and release the ISC servo from the Actuator test mode.

NOTE

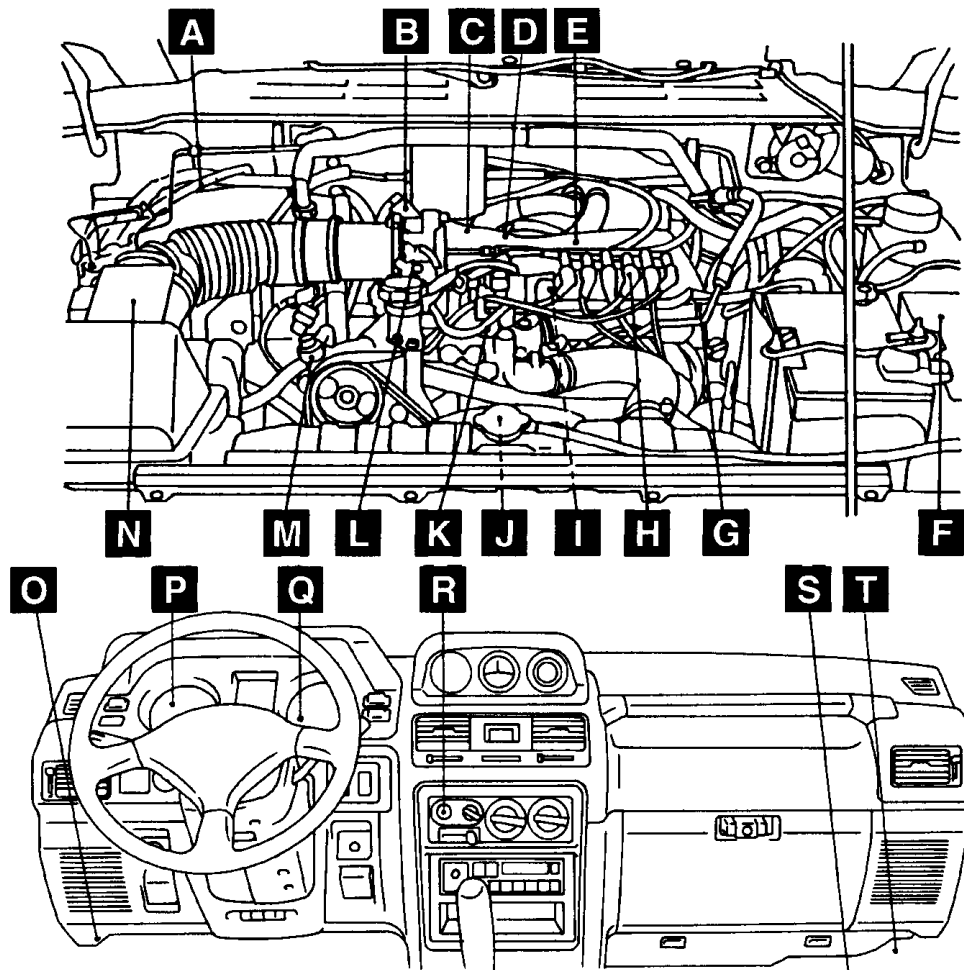
Unless the ISC servo is released, the Actuator test mode will continue 27 minutes.

8. Switch OFF the ignition switch.
9. Disconnect the MUT-II.
10. Start the engine again and let it run at idle speed for about 10 minutes; check that the idling condition is normal.

ON-VEHICLE INSPECTION OF MPI COMPONENTS

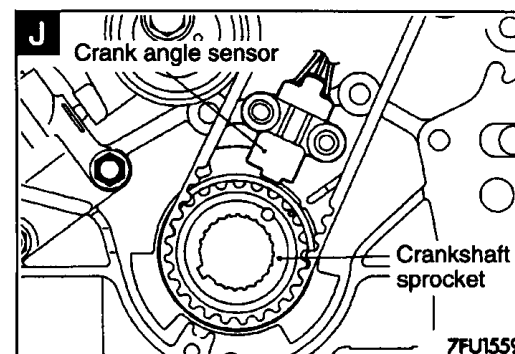
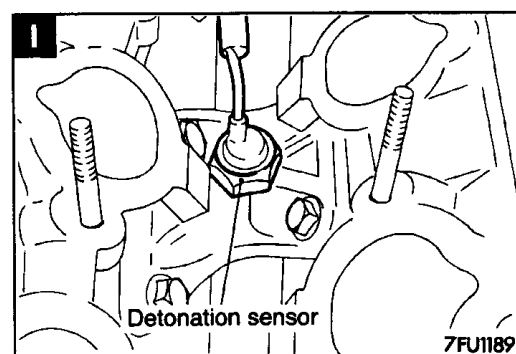
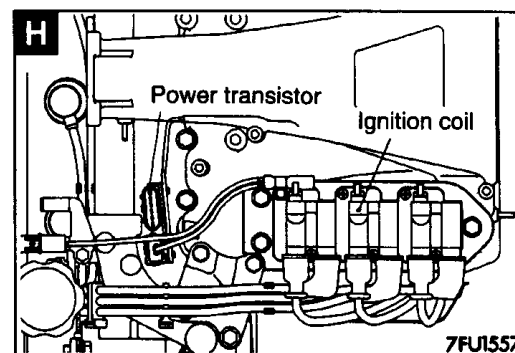
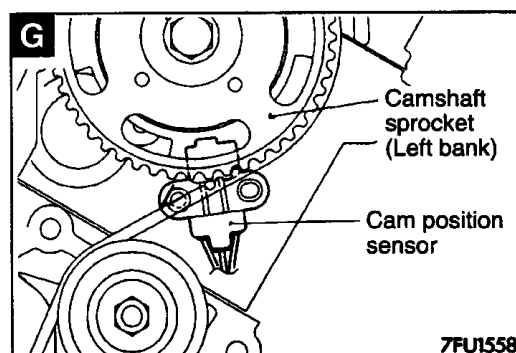
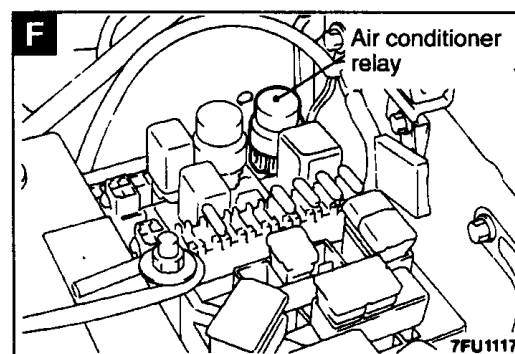
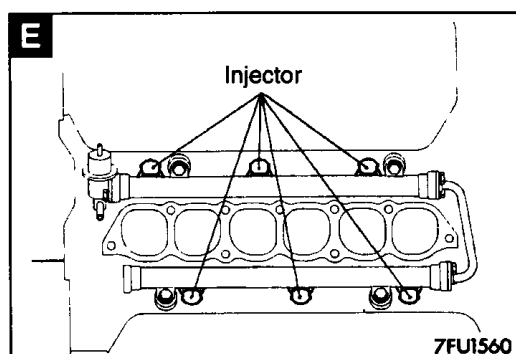
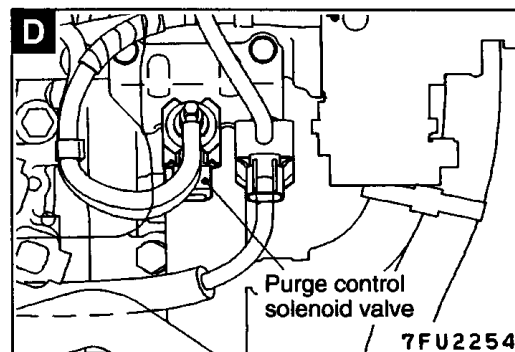
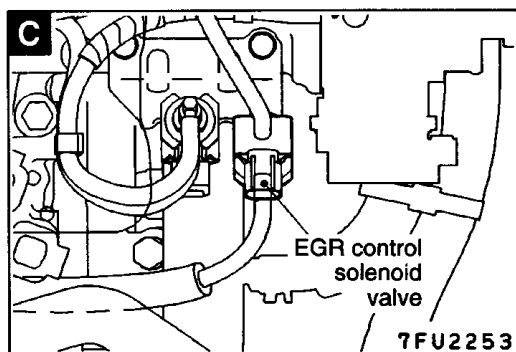
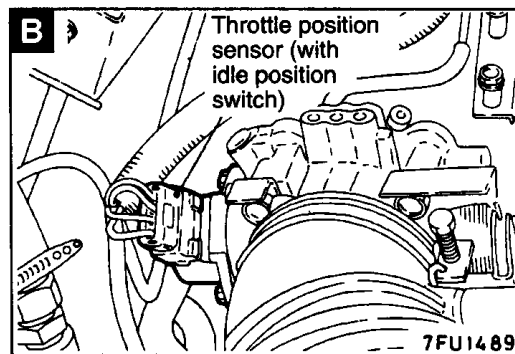
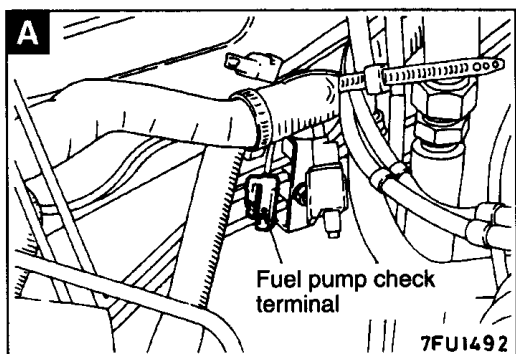
COMPONENT LOCATION

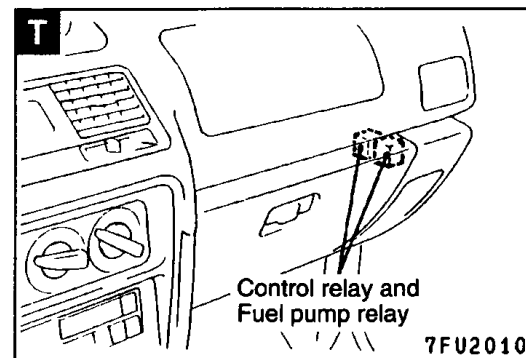
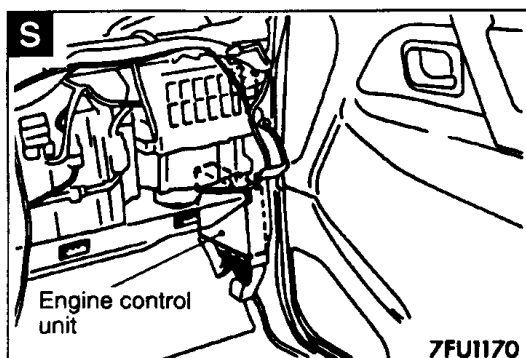
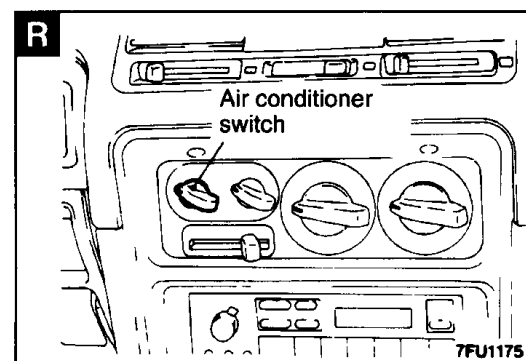
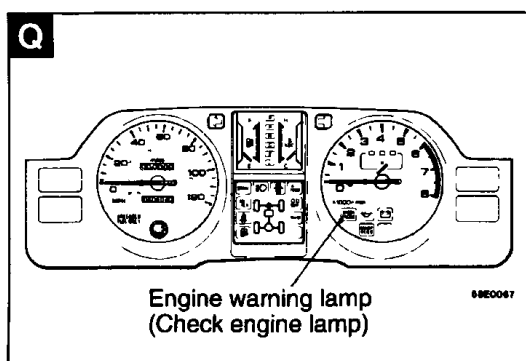
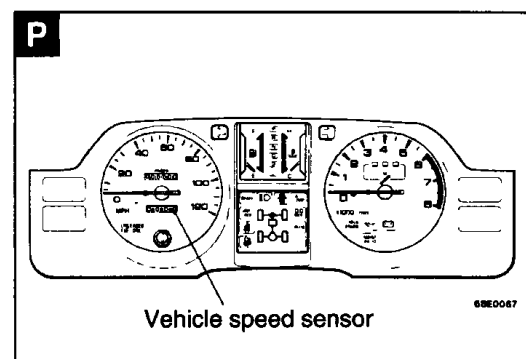
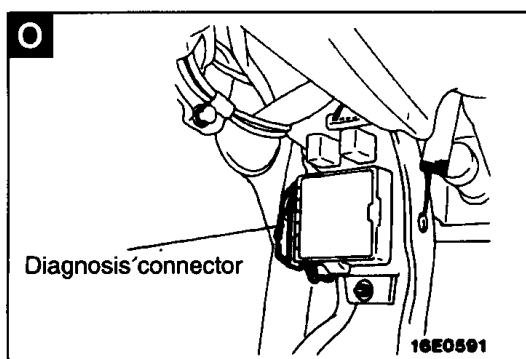
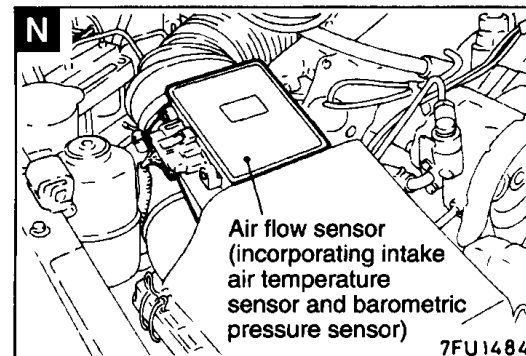
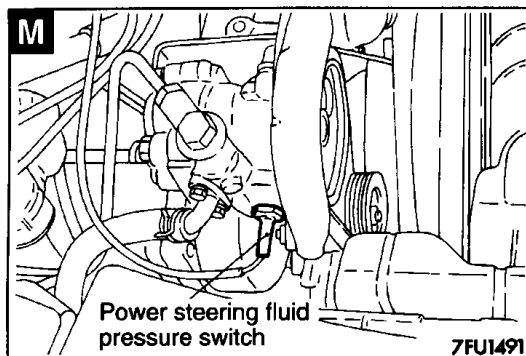
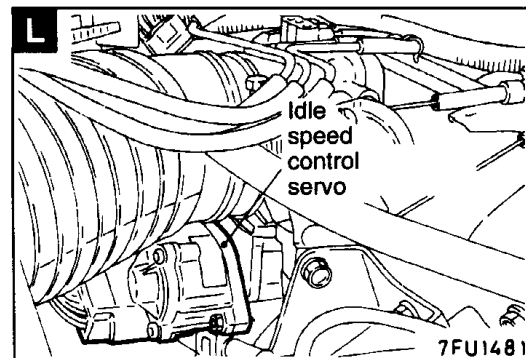
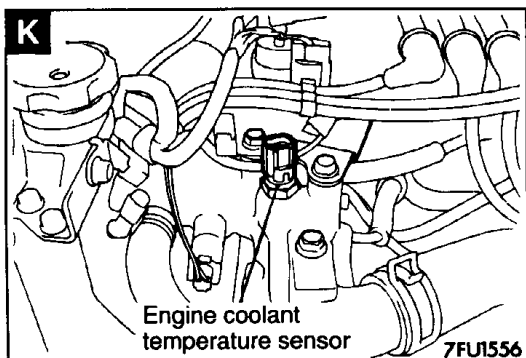
Name	Symbol	Name	Symbol
Air conditioner relay	F	Fuel pump check terminal	A
Air conditioner switch	R	Idle speed control servo	L
Air flow sensor (incorporating intake air temperature sensor and barometric pressure sensor)	N	Ignition coil (power transistor)	H
		Inhibitor switch	U
Cam position sensor	G	Injector	E
Control relay/Fuel pump relay	T	Oxygen sensor <6G72-SOHC 24 Valve Engine>	V
Crank angle sensor	J	Oxygen sensor <6G74-SOHC 24 Valve Engine>	W
Detonation sensor <6G74-SOHC 24 Valve Engine>	I	Power steering fluid pressure switch	M
Diagnosis connector	O	Purge control solenoid valve	D
EGR control solenoid valve	C	Throttle position sensor (with idle position switch)	B
Engine control unit	S		
Engine coolant temperature sensor	K	Vehicle speed sensor	P
Engine warning lamp (check engine lamp)	Q		

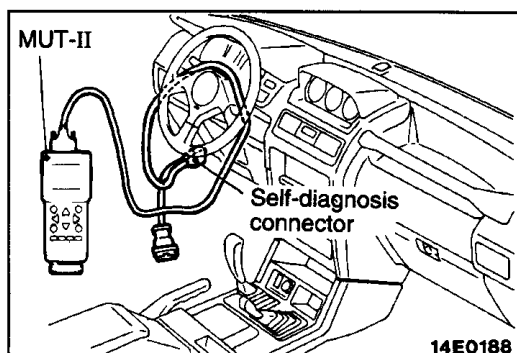
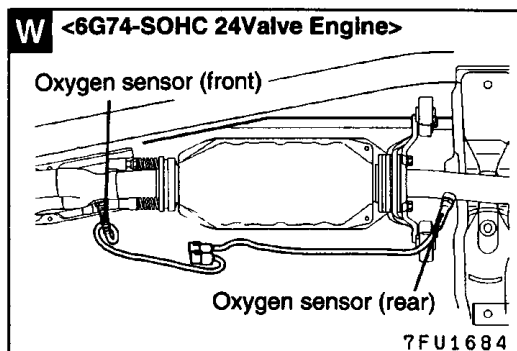
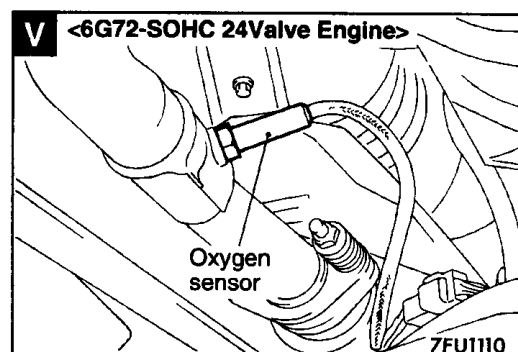
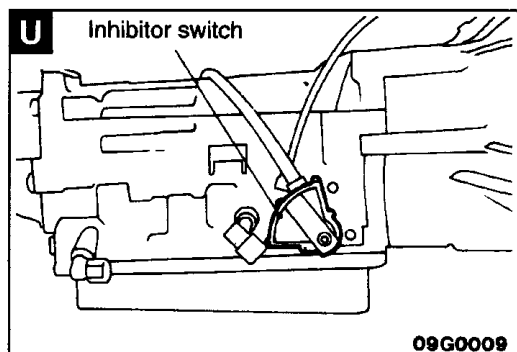


7FU2256

7FU1167



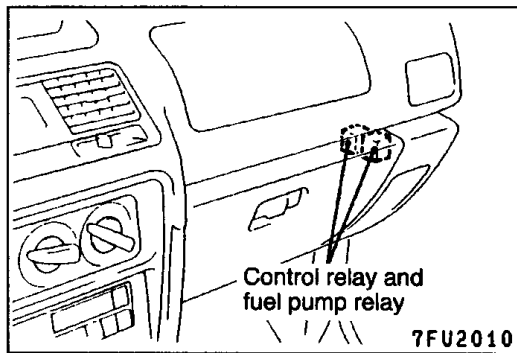




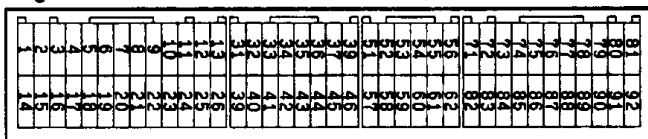
COMPONENT INSPECTION PROCEDURE USING MUT-II

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

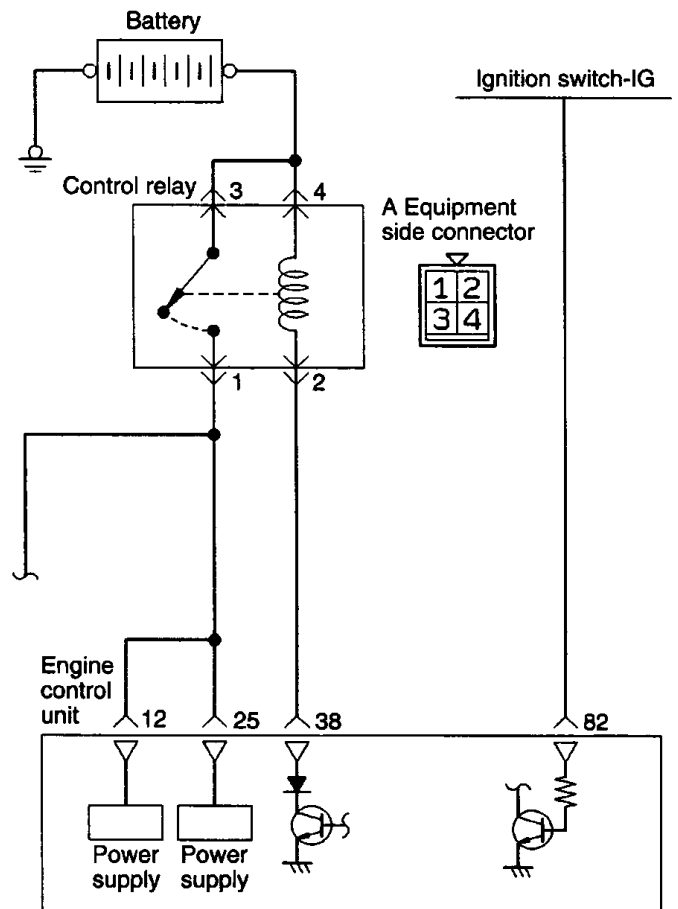
POWER SUPPLY (Control relay) AND IGNITION SWITCH-IG



Engine control unit connector



9FU0393



7FU1943

OPERATION

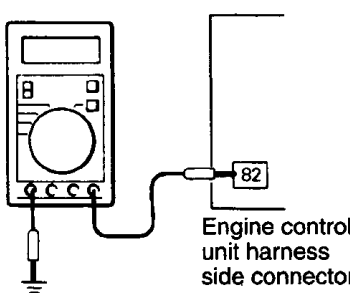
- While the ignition switch is ON, battery power is supplied to the engine control unit, the injector, the air flow sensor, etc.
- When the ignition switch is turned ON, the battery voltage is applied from the ignition switch to the engine control unit, which then turns ON the power transistor to energize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

1



Engine control unit harness side connector

01L0427

Measure the ignition switch (IG) terminal input voltage.

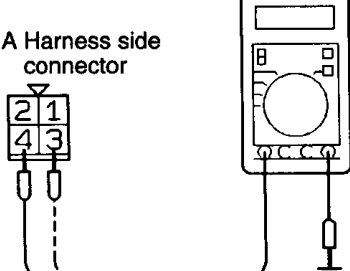
- Engine control unit connector: Disconnected

Ignition switch	Voltage (V)
OFF	0 – 1
ON	SV

OK → **2**

✗ → Repair the harness. (Ignition switch – 82) or check the ignition switch.

2



A Harness side connector

7FU1928

Measure the power supply voltage of the control relay.

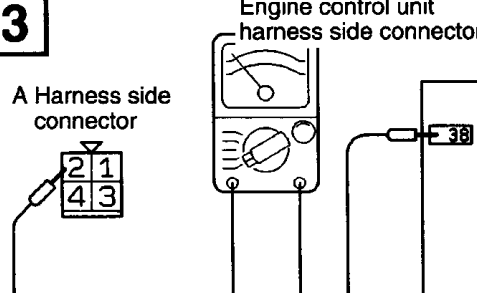
- Ignition switch: OFF
- Control relay connector: Disconnected

Voltage (V)
SV

OK → **3**

✗ → Repair the harness. (Battery – 3, 4)

3



A Harness side connector

Engine control unit harness side connector

7FU2012

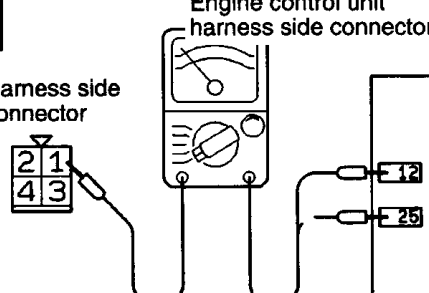
Check for an open-circuit, or a short-circuit to earth, between the engine control unit and the control relay.

- Engine control unit connector: Disconnected
- Control relay connector: Disconnected

OK → **4**

✗ → Repair the harness. (3 – 38)

4



A Harness side connector

Engine control unit harness side connector

7FU2013

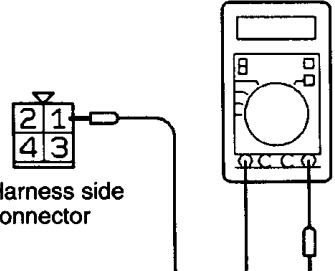
Check for an open-circuit, or a short-circuit to earth between the engine control unit and the control relay.

- Control relay connector: Disconnected
- Engine control unit connector: Disconnected

OK → **5**

✗ → Repair the harness. (1 – 12, 25)

5



A Harness side connector

7FU1930

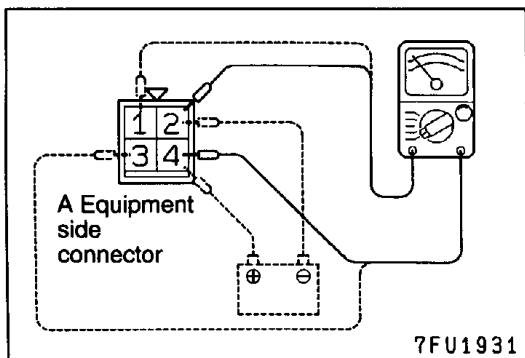
Measure power voltage to the actuator.

- Control relay connector: Connected
- Engine control unit connector: Connected

Engine	Voltage (V)
Cranking	8 V or higher
Racing	SV

OK → **STOP**

✗ → Replace the control relay or defective engine control unit



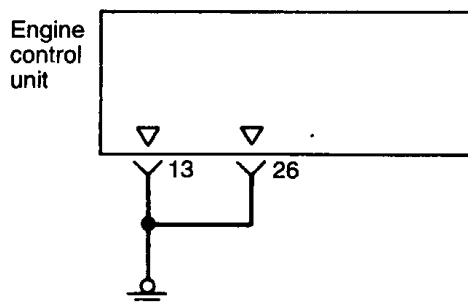
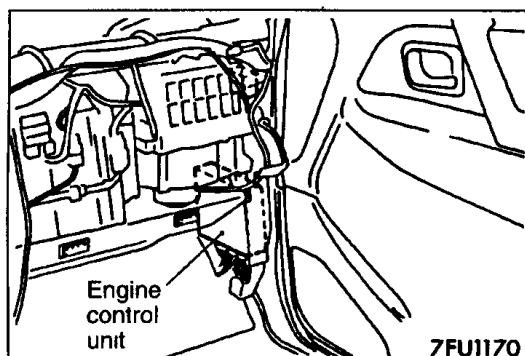
CONTROL RELAY INSPECTION

(1) Check for continuity between the control relay terminals.

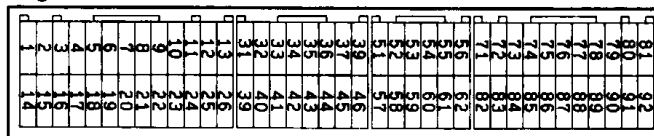
Battery voltage	Terminal No.			
	1	2	3	4
Not supplied		○		○
Supplied	○	⊖	○	⊕

(2) If there is a problem, replace the control relay.

ENGINE CONTROL UNIT POWER EARTH



Engine control unit connector



OPERATION

Earth 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

01P0150

Check for continuity of the earth circuit

- Engine control unit connector:
Disconnected

OK

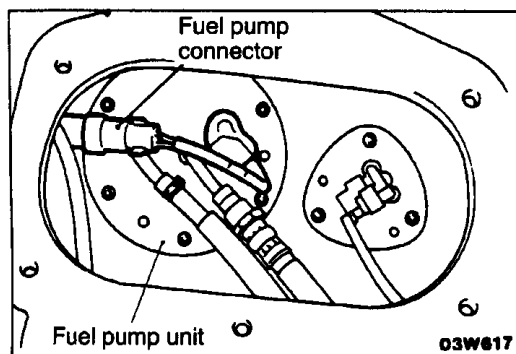
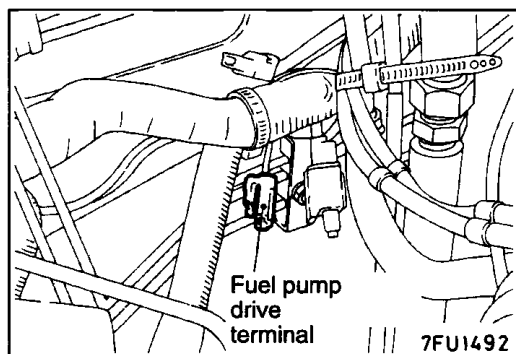
✗

→

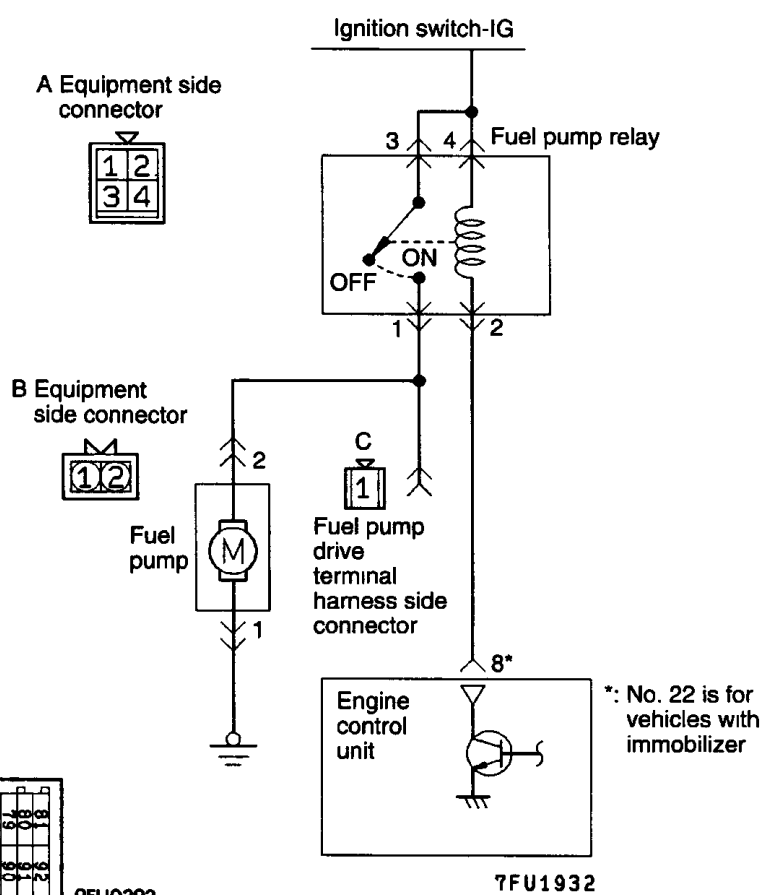
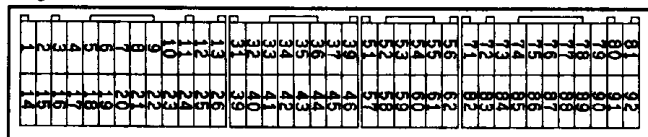
STOP

Repair the harness.
(13 – Earth)
(26 – Earth)

FUEL PUMP



Engine control unit connector



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

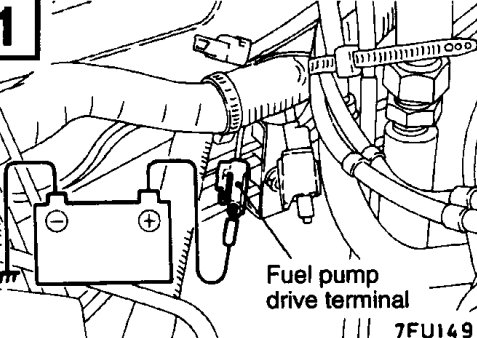
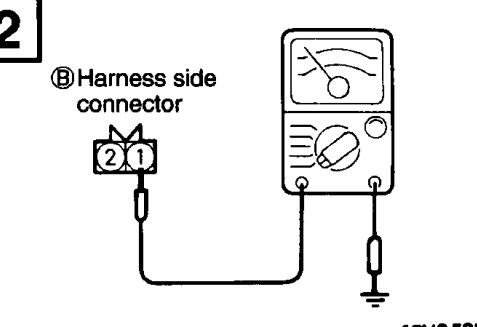
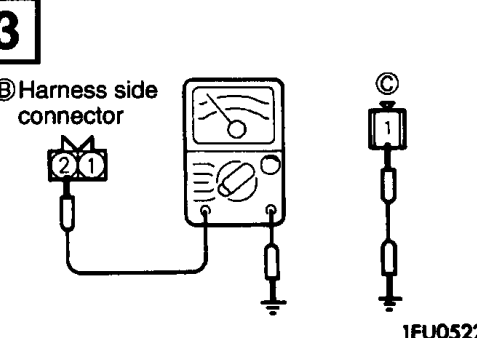
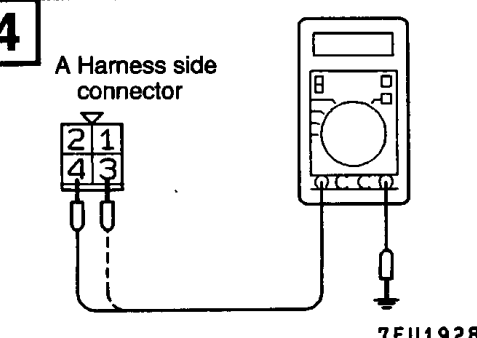
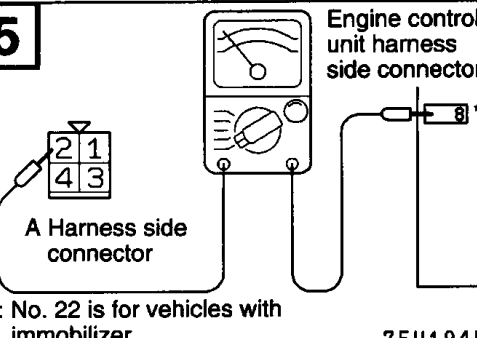
fuel pump relay coil. This causes the fuel pump relay switch to turn ON, and current is supplied from the ignition switch via the fuel pump relay switch to drive the fuel pump.

INSPECTION

Using MUT-II

Function	Item No.	Activation	Check conditions	Check description	Normal condition
Actuator test	07	Activates the fuel pump and circulates the fuel.	• Engine cranking • Fuel pump forced activation Make the check under both of the above conditions.	Pinch the return hose and feel the pulsations of the fuel flow.	Pulsations can be felt.
				Listen close to the fuel tank for the sound of the pump operating.	Sound can be heard.

HARNESS INSPECTION

1  Fuel pump drive terminal 7FU1493	Check the fuel pump. Apply battery voltage to the fuel pump drive terminal and operate the pump.	OK → 4 ✗ → 2						
2  ② Harness side connector 1FU0521	Check for continuity of the fuel pump earthing line. Fuel pump connector: Disconnected	OK → 3 ✗ → Repair the harness. (② 1 – Earth)						
3  ② Harness side connector 1FU0522	Check for open-circuit or short-circuit between the fuel pump and the fuel pump drive terminal. - Fuel pump connector: Disconnected - Fuel pump relay connector: Disconnected	OK → 4 ✗ → Repair the harness. (② 2 – ③ 1)						
4  A Harness side connector 7FU1928	Measure the power supply voltage of the fuel pump relay Fuel pump relay connector: Disconnected <table border="1" data-bbox="630 1478 1053 1601"> <thead> <tr> <th>Ignition switch</th> <th>Voltage (V)</th> </tr> </thead> <tbody> <tr> <td>OFF</td> <td>0 – 1</td> </tr> <tr> <td>ON</td> <td>SV</td> </tr> </tbody> </table>	Ignition switch	Voltage (V)	OFF	0 – 1	ON	SV	OK → 5 ✗ → Repair the harness. (Ignition switch – ③ 3, ④ 4 or check for ignition switch.)
Ignition switch	Voltage (V)							
OFF	0 – 1							
ON	SV							
5  A Harness side connector Engine control unit harness side connector *: No. 22 is for vehicles with immobilizer 7FU1945	Check for an open-circuit, or a short-circuit to earth between the fuel pump relay and the engine control unit. - Fuel pump relay connector: Disconnected - Engine control unit connector: Disconnected	OK → 6 ✗ → Repair the harness. (③ 2 – ⑧ 8 or 22)						

6

A Harness side connector

7FU1934

Check for continuity between the fuel pump drive terminal and the control relay.

- Fuel pump relay connector: Disconnected
- Fuel pump connector: Disconnected

OK → **7**

✗ → Repair the harness.
(A 1) - (C 1)

7

A Harness side connector

B harness side connector

7FU1935

Check for an open-circuit, or a short-circuit to earth between the fuel pump relay and the fuel pump.

- Fuel pump relay connector: Disconnected
- Fuel pump connector: Disconnected

OK → **8**

✗ → Repair the harness.
(A 1) - (B 2)

8

A Harness side connector

7FU1930

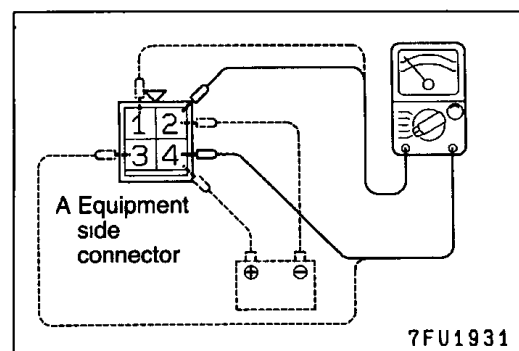
Measure the power supply voltage of the fuel pump.

- Fuel pump relay connector: Connected
- Engine control unit connector: Connected

Engine	Voltage (V)
Cranking	8 V or more
Racing	SV

OK → **STOP**

✗ → Fuel pump relay or engine control unit is defective.



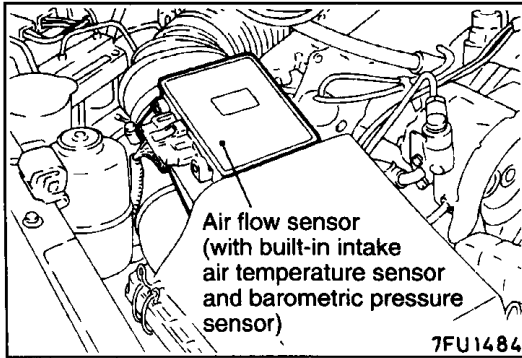
FUEL PUMP RELAY CHECK

(1) Check for continuity between the fuel pump relay terminals.

Battery voltage	Terminal No.			
	1	2	3	4
Not supplied		○		○
Supplied	○	⊖	○	⊕

(2) If there is a problem, replace the fuel pump relay.

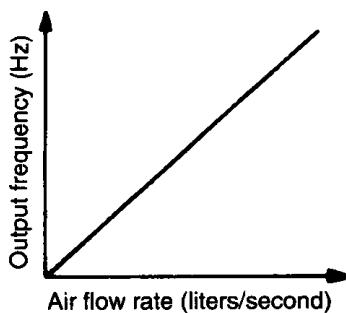
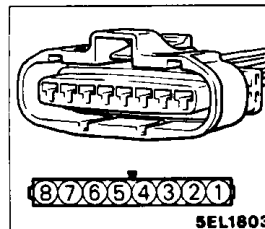
AIR FLOW SENSOR



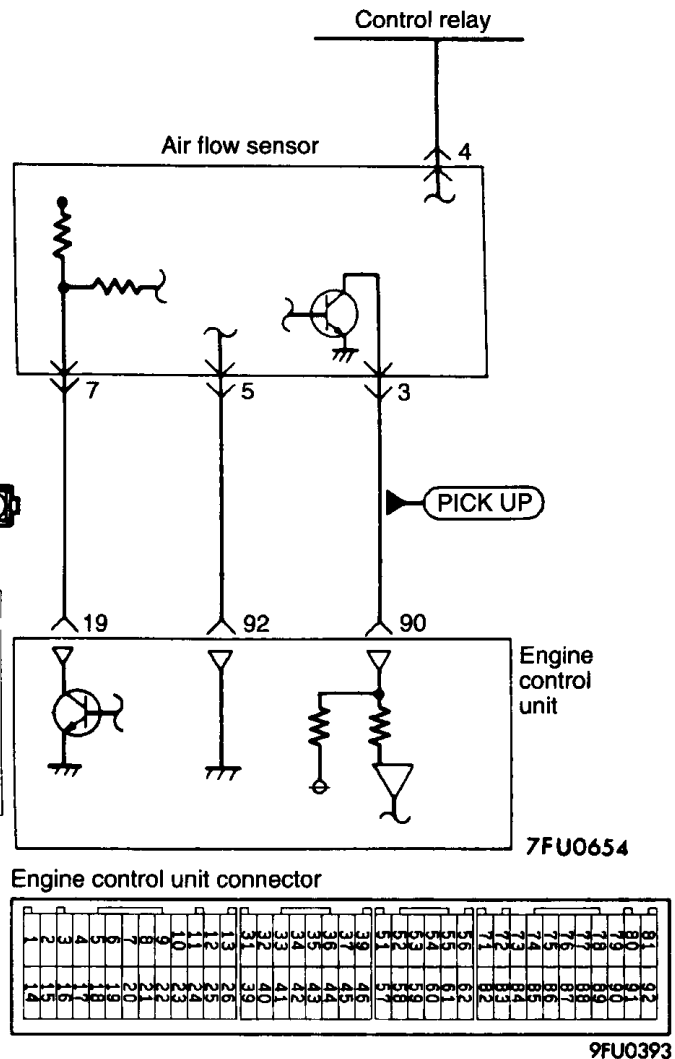
Ⓐ Equipment side connector



Ⓐ Harness side connector



16Z451



OPERATION

- The air flow sensor located in the air cleaner converts the engine intake air volume into a pulse signal of frequency proportional to the air volume and inputs it to the engine control unit, which then computes the fuel injection rate, etc. based on the input signal.
- The air flow sensor power is supplied from the control relay to the air flow sensor and is earthed in the engine control unit. The air flow sensor generates a pulse signal as it repeatedly opens and closes 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 MUT-II
<Air Flow Sensor>

Function	Item No.	Data display	Check condition	Engine state	Standard value
Data reading	12	Sensor air volume (frequency)	- Engine coolant temperature: 80 – 95°C - Lamps and accessories: OFF - Transmission: Neutral (P range for vehicles with A/T)	700 r/min (Idle)	25 – 51 Hz
				2500 r/min	74 – 114 Hz
				Racing	Frequency increases with racing

NOTE

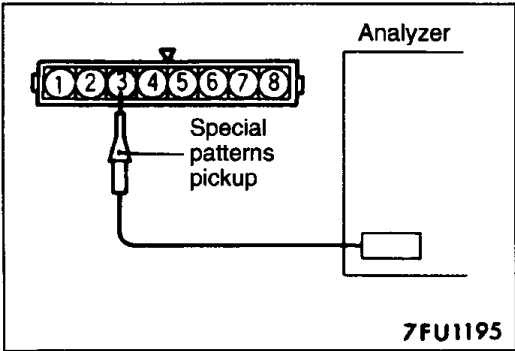
When the vehicle is new [within initial operation of about 500 km] the air flow sensor output frequency may be about 10 % higher.

<Air Flow Sensor Reset Signal>

Function	Item No.	Data display	Check condition	Engine state	Standard value
Data list	34	Reset signal condition	Warm up the engine	700 r/min (Idle)	ON
				2500 r/min	OFF

<Volumetric Efficiency>

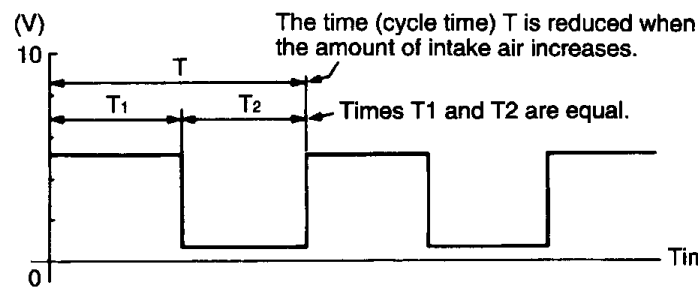
Function	Item No.	Data display	Check condition	Engine state	Standard value
Data list	37	Volumetric efficiency	- Engine coolant temperature: 80 – 95°C - Lamps, accessory operation: OFF - Transmission: Neutral (P range for vehicles with A/T)	700 r/min (Idle)	15 – 35 %
				2500 r/min	15 – 35 %
				Sudden racing	Frequency increases with racing



Wave Pattern Inspection Using an Analyzer
Measurement method

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

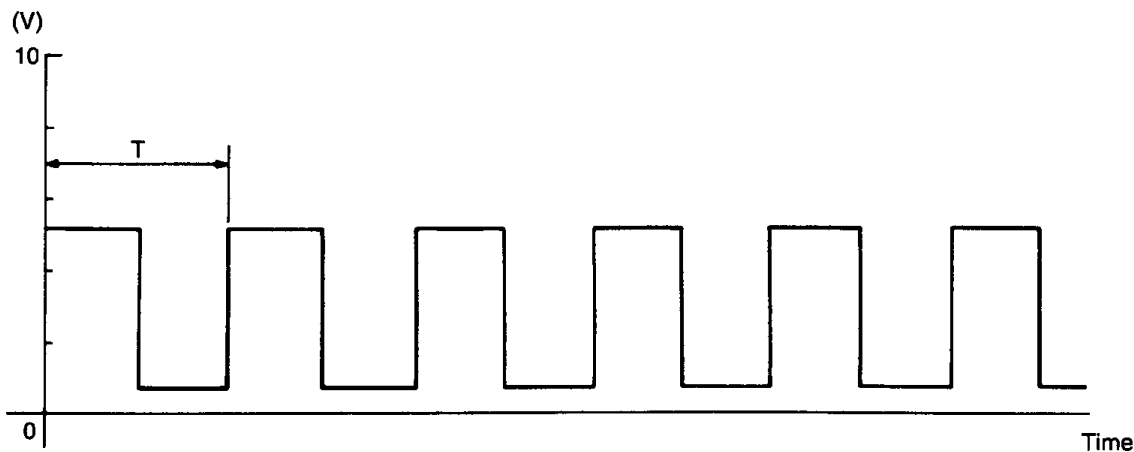
Standard wave pattern



Observation conditions

Function	Special patterns
Pattern height	Low
Pattern selector	Display
Engine r/min	Idle speed (700 r/min)

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



Wave pattern observation points

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

Examples of abnormal wave patterns

- **Example 1**

Cause of problem

Sensor interface malfunction

Wave pattern characteristics

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

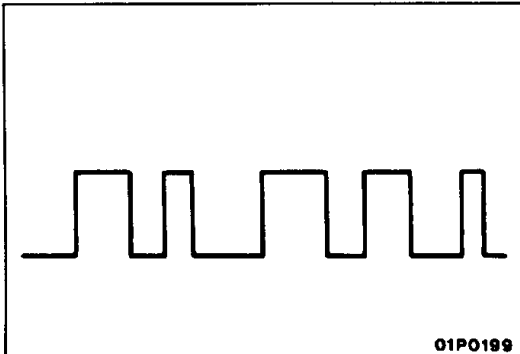
- **Example 2**

Cause of problem

Damaged rectifier or vortex generation column

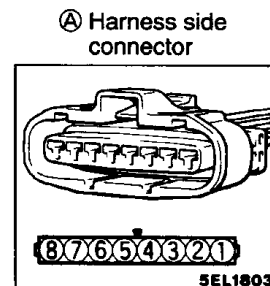
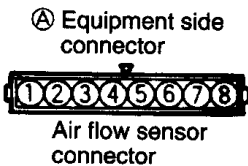
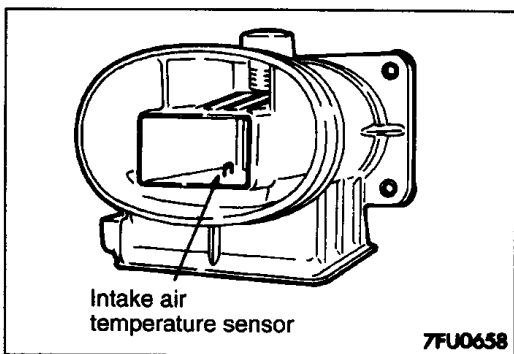
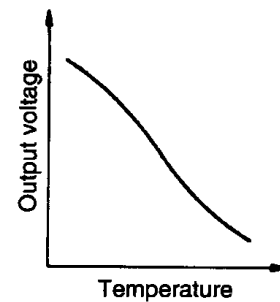
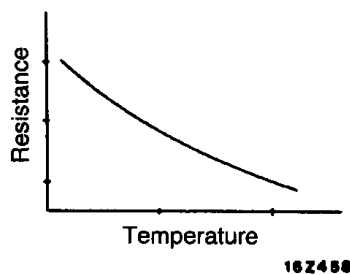
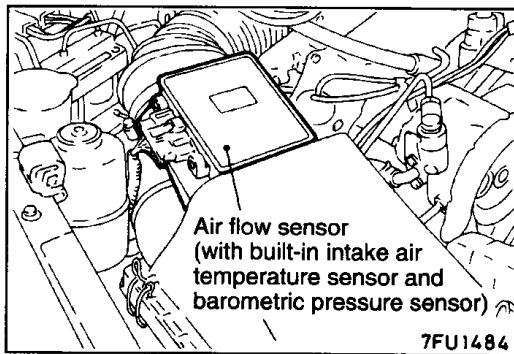
Wave pattern characteristics

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

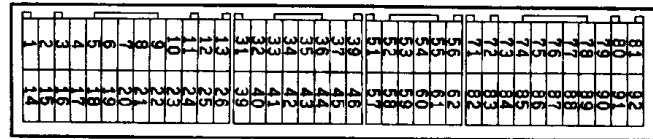


1 A Harness side connector B Control relay harness side connector 7FU1946	Check the continuity between the air flow sensor and the control relay. - Control relay connector: Disconnected - Air flow sensor connector: Disconnected NOTE Touch the circuit tester probes to both ends of the harness.	OK → 2 ✗ → Repair the harness. (A 4 – B 1)		
2 A Harness side connector 7FU0657	Check for continuity of the earth circuit. Air flow sensor connector: Disconnected	OK → 3 ✗ → Repair the harness. (A 5 – 92)		
3 A Harness side connector Engine control unit harness side connector 7FU2102	Check for open-circuit or short-circuit between the air flow sensor and the engine control unit. - Air flow sensor connector: Disconnected - Engine control unit connector: Disconnected	OK → 4 ✗ → Repair the harness. (A 3 – 90) (A 7 – 19)		
4 A Harness side connector 7FU0656	Measure the applied voltage. - Air flow sensor connector: Disconnected - Engine control unit connector: Connected - Ignition switch: ON <table border="1"> <thead> <tr> <th>Voltage (V)</th> </tr> </thead> <tbody> <tr> <td>4.8 – 5.2</td> </tr> </tbody> </table>	Voltage (V)	4.8 – 5.2	OK → STOP ✗ → Replace the engine control unit.
Voltage (V)				
4.8 – 5.2				

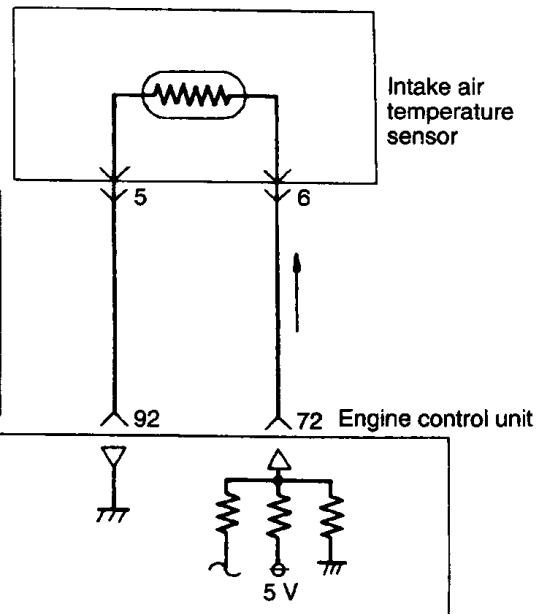
INTAKE AIR TEMPERATURE SENSOR



Engine control unit connector



9FU0393



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 earthed 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

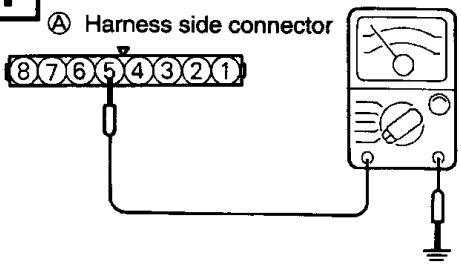
Using MUT-II

Function	Item No.	Data display	Check condition	Intake air temperature °C	Standard value °C
Data reading	13	Sensor temperature	Ignition switch: ON or engine running	At – 20	–20
				At 0	0
				At 20	20
				At 40	40
				At 80	80

HARNESS INSPECTION

1

Ⓐ Harness side connector



7FU0657

Check for continuity of the earth circuit.

- Air flow sensor connector: Disconnected

OK

→

2

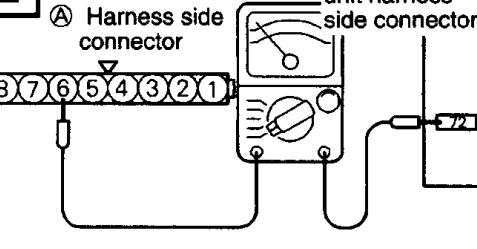
✗

→

Repair the harness.
(Ⓐ 5 – 92)

2

Ⓐ Harness side connector



7FU2103

Check for open-circuit or short circuit between the intake air temperature sensor and the engine control unit.

- Air flow sensor connector: Disconnected
- Engine control unit connector: Disconnected

OK

→

3

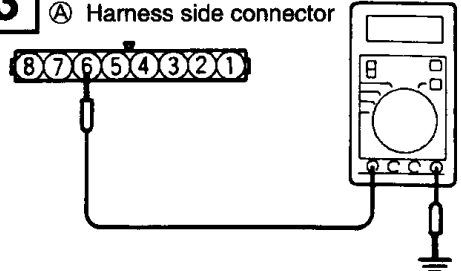
✗

→

Repair the harness.
(Ⓐ 6 – 72)

3

Ⓐ Harness side connector



7FU0660

Measure the power supply voltage.

- Air flow sensor connector: Disconnected
- Ignition switch: ON
- Engine control unit connector: Connected

Voltage (V)
4.5 – 4.9

OK

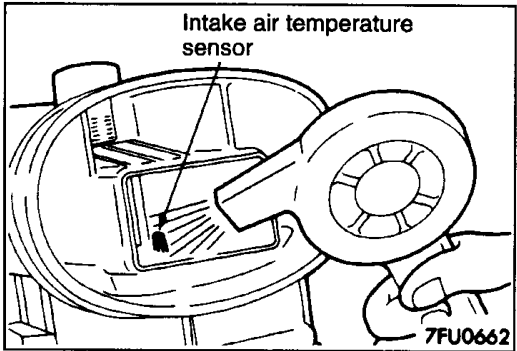
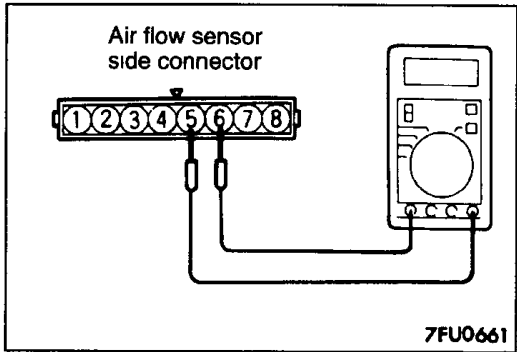
→

STOP

✗

→

Repair the engine control unit



SENSOR INSPECTION

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

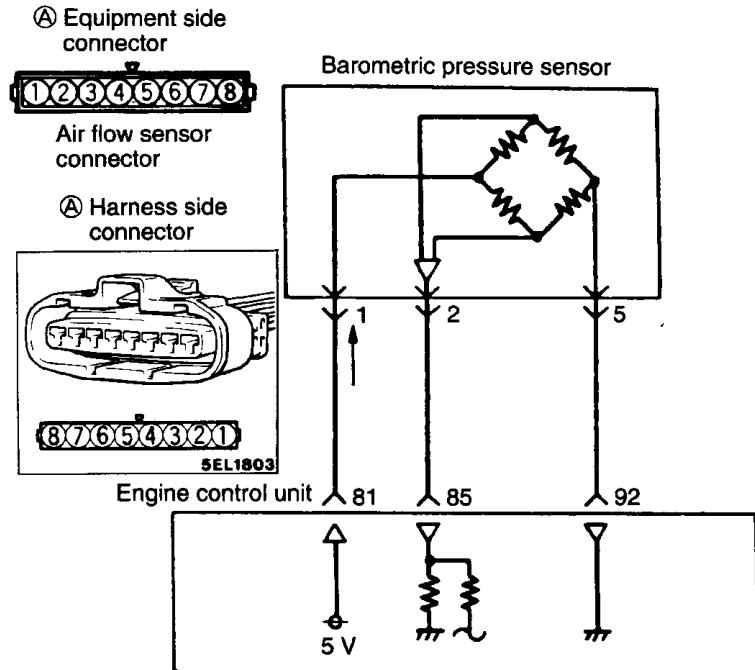
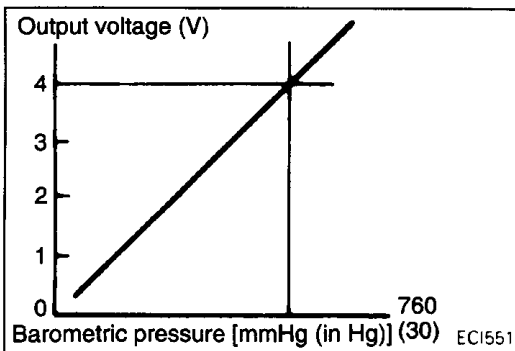
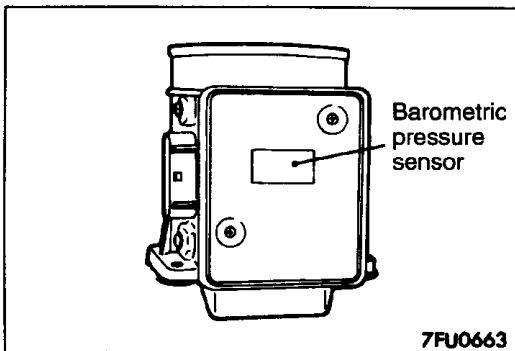
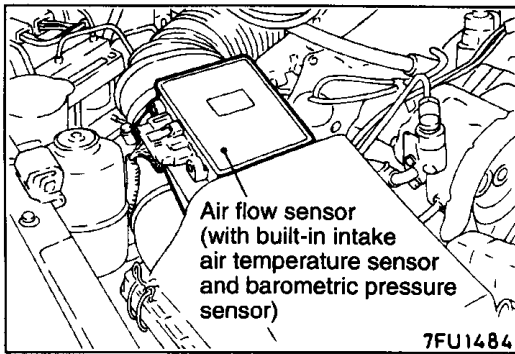
Temperature °C	Resistance kΩ
0	6.0
20	2.7
80	0.4

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

Temperature	Resistance
Higher	Smaller

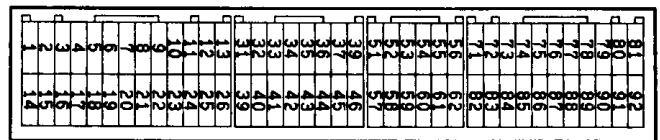
- (4) If the value deviates from the standard value or the resistance remains unchanged, replace the air flow sensor assembly.

BAROMETRIC PRESSURE SENSOR



7FU0664

Engine control unit connector



9FU0393

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.
- Through the circuit in the sensor, it is earthed in the engine control unit.
- The barometric pressure sensor output voltage which is proportional to the barometric pressure (absolute pressure) is supplied to the engine control unit.

TROUBLESHOOTING HINTS

Hint 1: If the barometric pressure sensor is faulty, poor driveability is caused at high altitude, in particular.

pressure sensor drops significantly during high speed driving, check the air cleaner for clogging.

Hint 2: If the pressure indication of the barometric

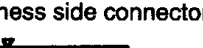
INSPECTION

Using MUT-II

Function	Item No.	Data display	Check condition	Altitude m	Standard value kPa
Data reading	25	Sensor pressure	Ignition switch: ON	At 0	101
				At 600	95
				At 1,200	88
				At 1,800	81

HARNESS INSPECTION

1 (A) Harness side connector



7FU0657

Check for continuity of the earth circuit.

- Air flow sensor connector: Disconnected

OK →

OK →

2

Repair the harness.
(A) 5 - 92)

2



Engine control unit harness side connector

85

81

8 7 6 5 4 3 2 1

A Harness side connector

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

7FU2104



→

3



→

Repair the harness.

(A) 2 - 85

(A) 1 - 81

3

Ⓐ Harness side connector

7FU0665

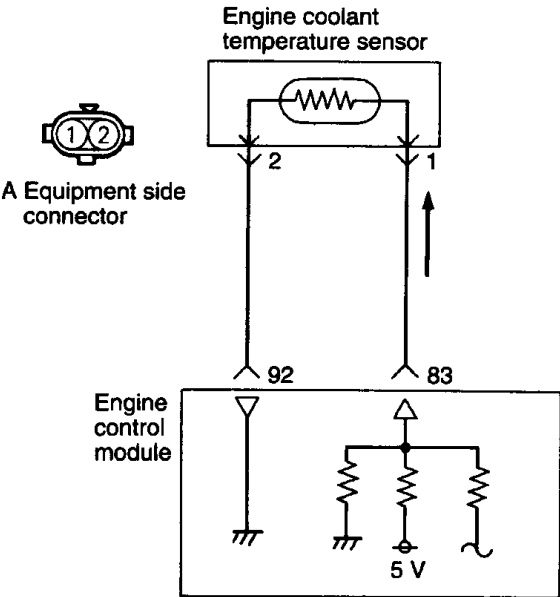
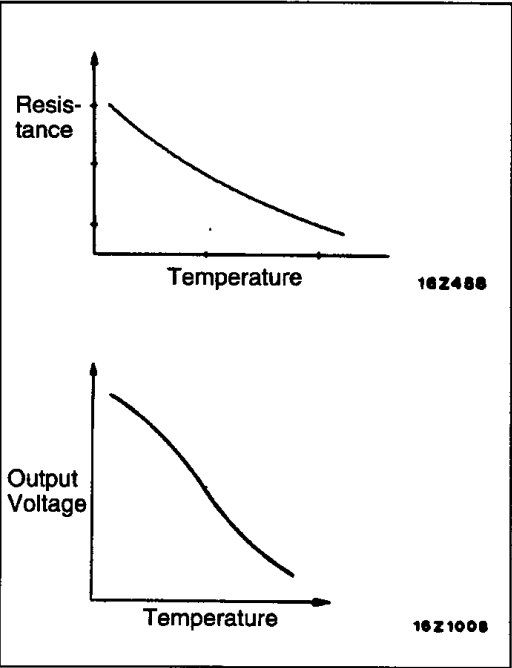
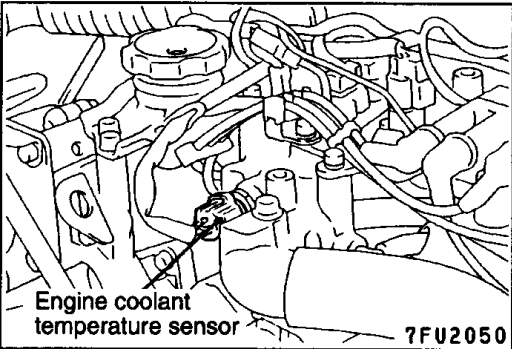
Measure the power supply voltage of the barometric pressure sensor.

- Air flow sensor connector: Disconnected
- Ignition switch: ON
- Engine control unit connector: Connected

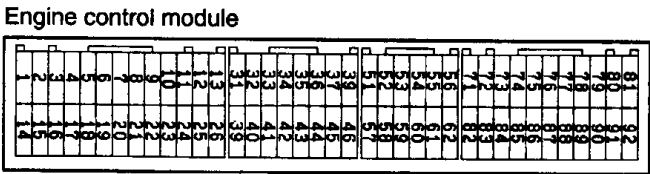
Voltage (V)
4.8 – 5.2

Replace the engine control unit

ENGINE COOLANT TEMPERATURE SENSOR



9FU0106



9FU0393

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. Through the sensor which is a kind of resistor, it is earthed in the engine control unit. The engine coolant temperature sensor resistor has such characteristic that its resistance decreases as the coolant temperature rises.
- The engine coolant temperature sensor terminal voltage increases or decreases as the sensor resistance increases or decreases. Therefore, the engine coolant temperature sensor terminal voltage changes with the 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.

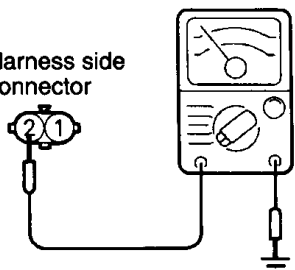
INSPECTION

Using MUT-II

Function	Item No.	Data display	Check condition	Coolant temperature °C	Standard value °C
Data reading	21	Sensor temperature	Ignition switch: ON or engine operating	At -20	-20
				At 0	0
				At 20	20
				At 40	40
				At 80	80

HARNESS INSPECTION

1



A Harness side connector

9FU0112

Check for continuity of the earth circuit.

- Engine coolant temperature sensor connector: Disconnected

OK

→

2

NG

→

Repair the harness.
 (A 2 - 92)

2

A Harness side connector

Engine control unit harness side connector

9FU0113

Check for open-circuit or short circuit between the engine coolant temperature sensor and the engine control unit.

- Engine coolant temperature sensor connector: Disconnected
- Engine control unit connector: Disconnected

OK → **3**

✗ → Repair the harness. (A 1 – 83)

3

A Harness side connector

9FU0114

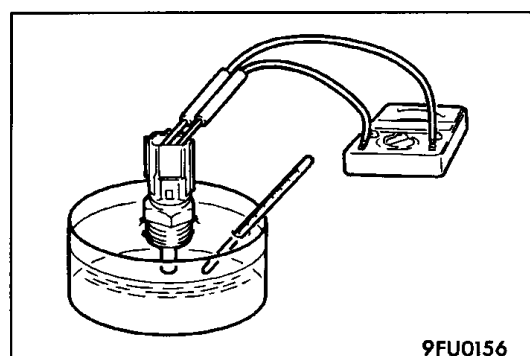
Measure the power supply voltage.

- Engine coolant temperature sensor connector: Disconnected
- Ignition switch: ON
- Engine control unit connector: Connected

Voltage (V)
4.5 – 4.9

OK → **STOP**

✗ → Replace the engine control unit



SENSOR INSPECTION

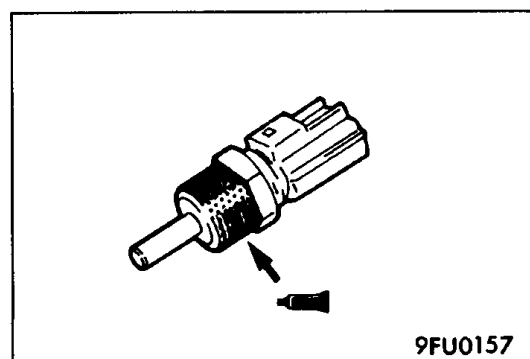
- (1) Remove engine coolant temperature sensor from the intake manifold.
- (2) With temperature sensing portion of engine coolant temperature sensor immersed in hot water, check resistance.

Temperature °C	Resistance kΩ
0	5.8
20	2.4
40	1.1
80	0.3

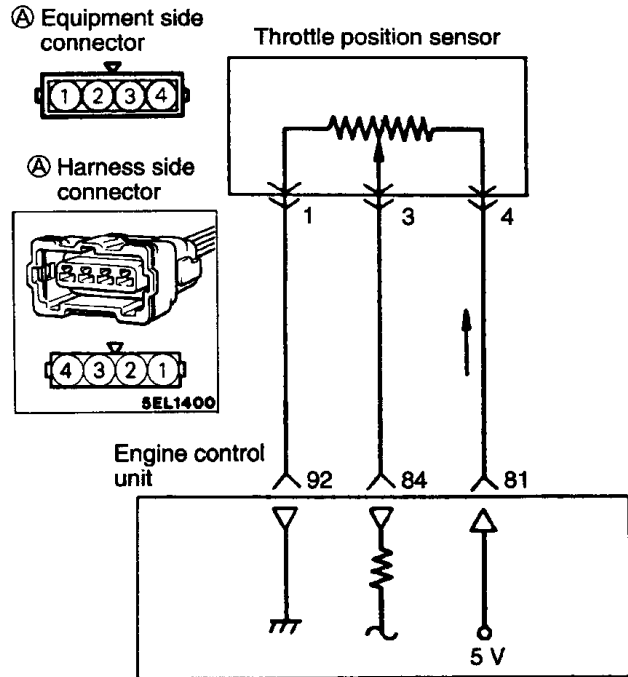
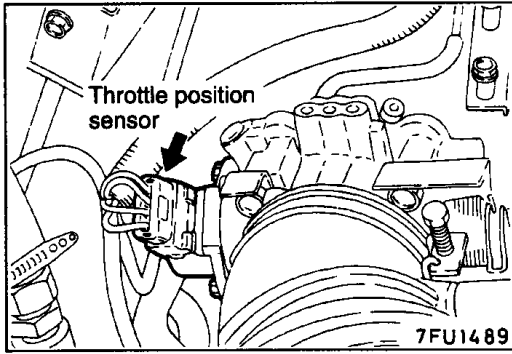
- (3) If the resistance deviates from the standard value greatly, replace the sensor.

INSTALLATION

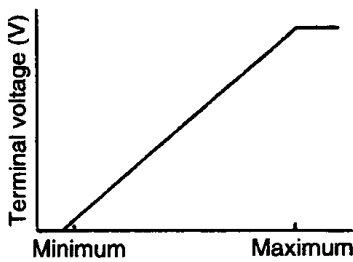
- (1) Apply sealant to threaded portion.
Specified sealant: 3M NUT locking Part No. 4171 or equivalent
- (2) Install engine coolant temperature sensor and tighten it to specified torque.
Sensor tightening torque: 29 Nm
- (3) Fasten harness connectors securely.



THROTTLE POSITION SENSOR



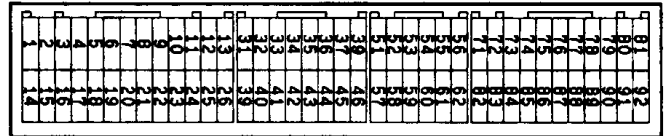
7FU0672



Throttle shaft turning angle

16Z481

Engine control unit connector



9FU0393

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. Through the resistor in the sensor, it is earthed 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 variable resistance terminal also increases.

TROUBLESHOOTING 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. If there is an evidence of disturbed fixed SAS setting, adjust the fixed SAS.

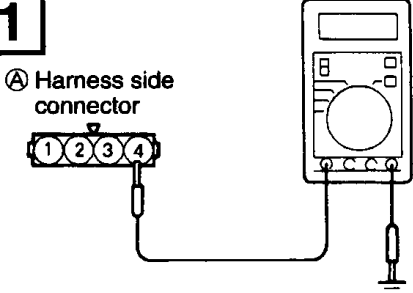
INSPECTION

Using MUT-II

Function	Item No.	Data display	Check conditions	Throttle valve	Standard value mV
Data reading	14	Sensor voltage	Ignition switch: left ON for 15 seconds 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



Ⓐ Harness side connector

6FU1241

Check for continuity of the earth circuit.

- Throttle position sensor connector: Disconnected

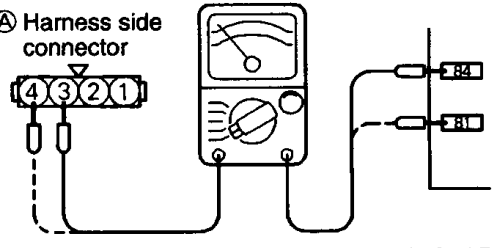

→

2


→

Repair the harness.
(Ⓐ 1 – 92)

2



Ⓐ Harness side connector

7FU2117

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
- Disconnect all other control unit connectors which are connected to the throttle position sensor.

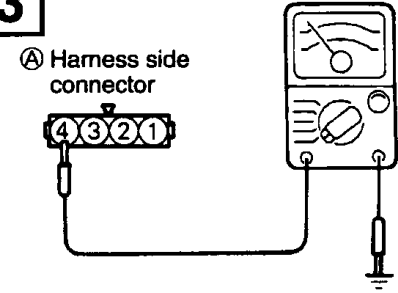

→

3


→

Repair the harness.
(Ⓐ 3 – 84)
(Ⓐ 4 – 81)

3



Ⓐ Harness side connector

6FU1242

Measure the impressed voltage.

- Throttle position sensor connector: Disconnected
- Engine control unit connector: Connected
- Ignition switch: ON

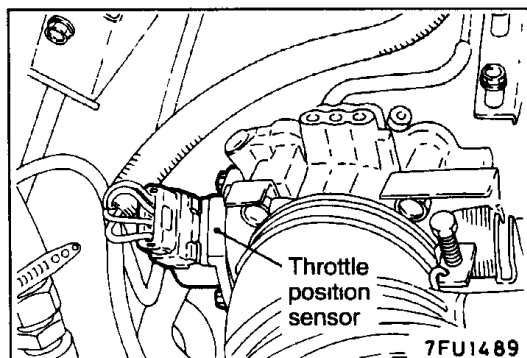
Voltage (V)
4.8 – 5.2


→

STOP

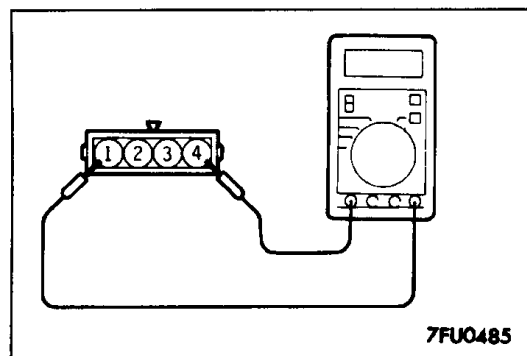

→

Replace the engine control unit.



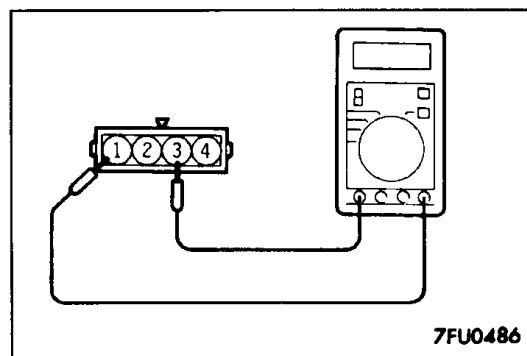
SENSOR INSPECTION

- (1) Disconnect the throttle position sensor connector.



- (2) Measure resistance between terminal ① (sensor earth) and terminal ④ (sensor power).

Standard value: 3.5 – 6.5 k Ω

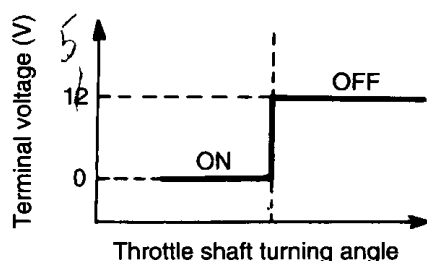
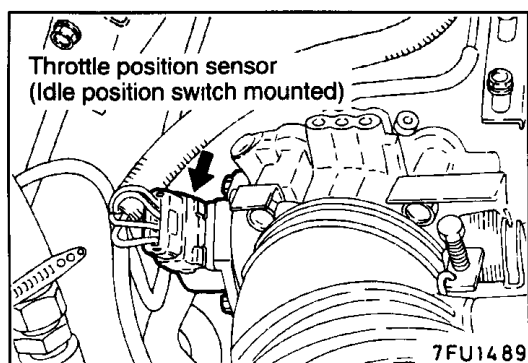


- (3) Connect a pointer type ohmmeter between terminal ① (sensor earth) and terminal ③ (sensor output).
- (4) Operate the throttle valve slowly from the idle position to the full open position and check that the resistance changes smoothly in proportion with the throttle valve opening angle.
- (5) If the resistance is out of specification, or fails to change smoothly, replace the throttle position sensor.

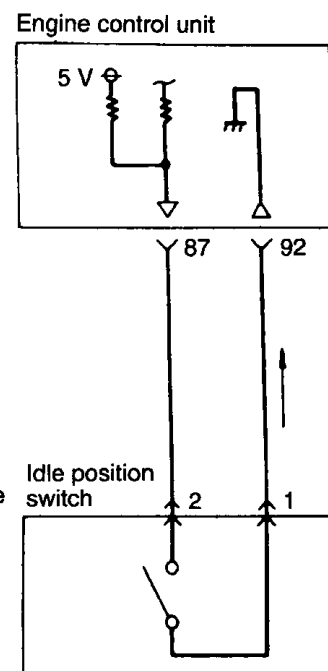
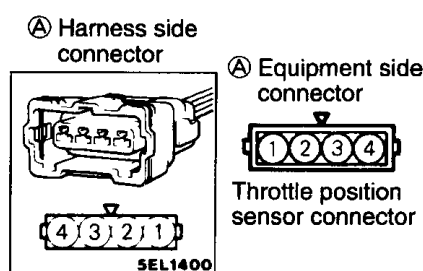
TPS installation torque: 2.0 Nm

For the idle position switch and throttle position sensor adjusting procedure, refer to P.13-21.

IDLE POSITION SWITCH

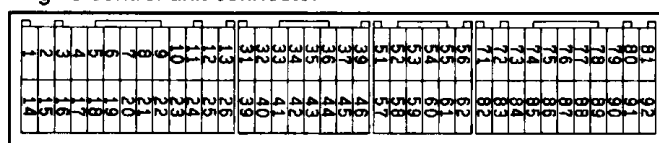


01Z092



7FU0674

Engine control unit connector



9FU0393

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 controls the idle speed control servo based on the input signal.
- The voltage in the engine control unit is applied to the idle position switch through a resistor. 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 part check results are normal but the idle position switch output is abnormal, the following troubles are suspected.

- Poorly adjusted accelerator cable or auto-cruise control cable
- Poorly adjusted fixed SAS

INSPECTION

Using 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*

NOTE

The idle position switch normally turns off when the voltage of the throttle position sensor is 50 – 100 mV higher than the voltage at the idle position. If the idle position switch turns back on after the throttle position sensor voltage has risen by 100 mV and the throttle valve has opened, the idle position switch and the throttle position sensor need to be adjusted.

HARNESS INSPECTION

1

Engine control unit
harness side connector

Ⓐ Harness side connector

6FU1243

Check for open or short circuit between the idle position switch and the engine control unit.

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

OK → **2**

✗ → Repair the harness.
(Ⓐ 2 – 87)

2

Ⓐ Harness side connector

7FU0483

Check for continuity of the earth circuit.

- Throttle position sensor connector: Disconnected

OK → **3**

✗ → Repair the harness.
(Ⓐ 1 – 92)

3

Ⓐ Harness side connector

7FU0489

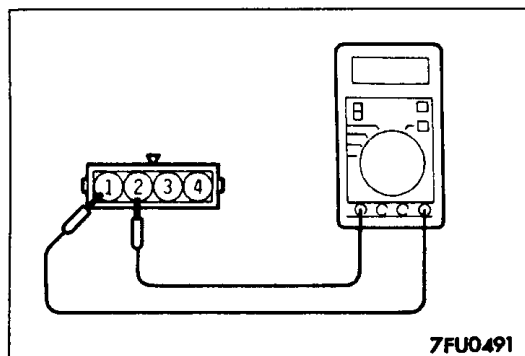
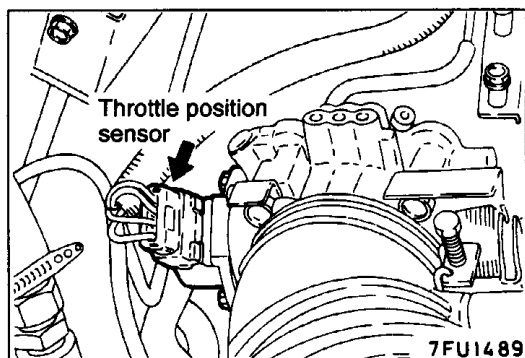
Measure the power supply voltage of the idle position switch.

- Throttle position sensor connector: Disconnected
- Engine control unit connector: Connected
- Ignition switch: ON

Voltage (V)
4 or higher

OK →

✗ → Replace the engine control unit.



SENSOR INSPECTION

- (1) With the accelerator pedal released, check to be sure that the throttle valve lever or the fixed SAS is pushed.

NOTE

If it is not pushed, adjust the fixed SAS (Refer to P.13-22.)

- (2) Disconnect the throttle position sensor connector.
- (3) Check the continuity across the throttle position sensor connector terminal ① (Sensor earth) and ② (Idle position switch).

Accelerator pedal	Continuity
Depressed	Non-conductive ($\infty\Omega$)
Released	Conductive (0Ω)

NOTE

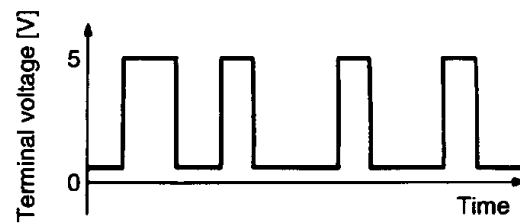
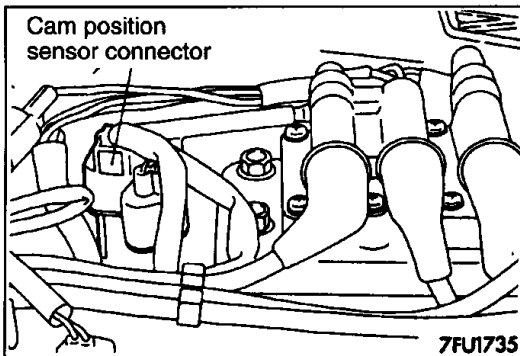
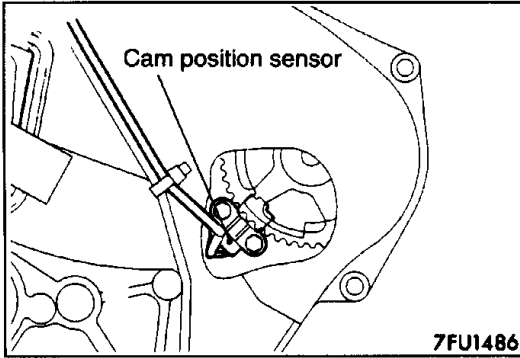
If there is no continuity when the accelerator pedal is returned, loosen the throttle position sensor installation screw; then, after turning all the way in the clockwise direction, check again.

- (4) Replace the throttle position sensor (idle position switch incorporated) if there is a malfunction.

NOTE

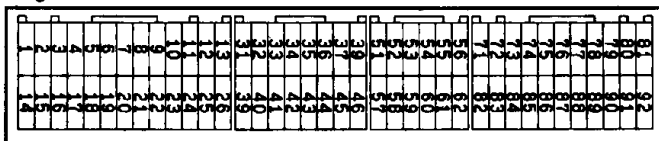
For the idle position switch and throttle position sensor adjusting procedure, refer to P.13-21.

CAM POSITION SENSOR



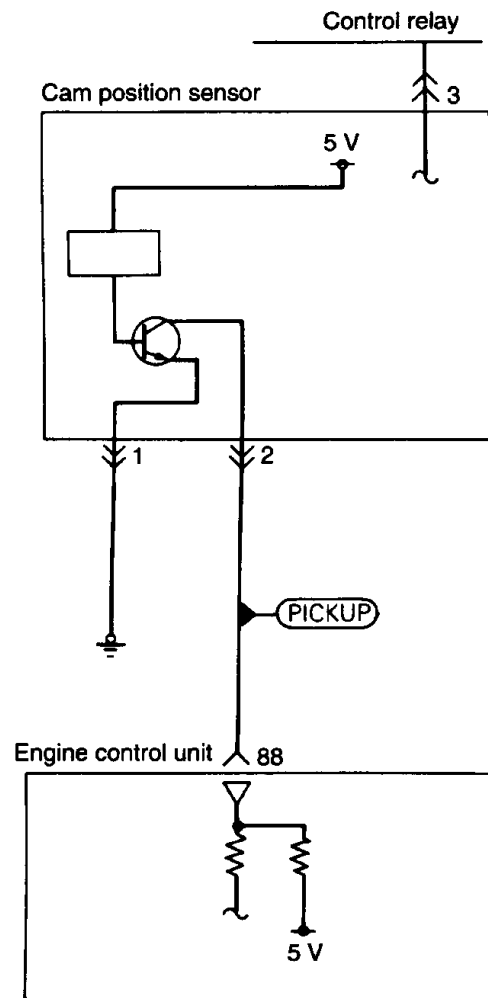
7FU0677

Engine control unit connector



9FU0393

Ⓐ Equipment side connector



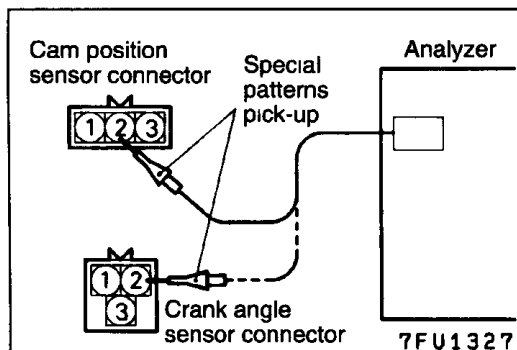
6AF0054

OPERATION

- The cam position sensor senses the top dead center on compression stroke, 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 cam position sensor is supplied from the control relay and is earthed to the body. The cam position sensor generates a pulse signal as it repeatedly connects and disconnects between 5 V voltage supplied from the engine control unit and earth.

INSPECTION

Waveform inspection with analyzer



TROUBLESHOOTING HINTS

Hint 1: If the cam position 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.

Hint 2: If the sensor outputs a pulse signal when the ignition switch is turned ON (with the engine no running), a faulty cam position sensor or engine control unit is suspected.

Measuring method

- (1) Disconnect the connector of the cam position sensor, and connect the special tool (test harness: MB991348) across the disconnected connector parts. (Connect the tool to all terminals.)
- (2) Connect the special patterns pick-up of the analyzer to the terminal ② of the cam position sensor connector (in order to inspect the signal waveform of the cam position sensor.)
- (3) Disconnect the connector of the crank angle sensor, and connect the special tool (test harness: MD998478) across the disconnected connector parts.
- (4) Connect the special patterns pick-up of the analyzer to the terminal ② of the crank angle sensor connector (in order to inspect the signal waveform of the crank angle sensor).

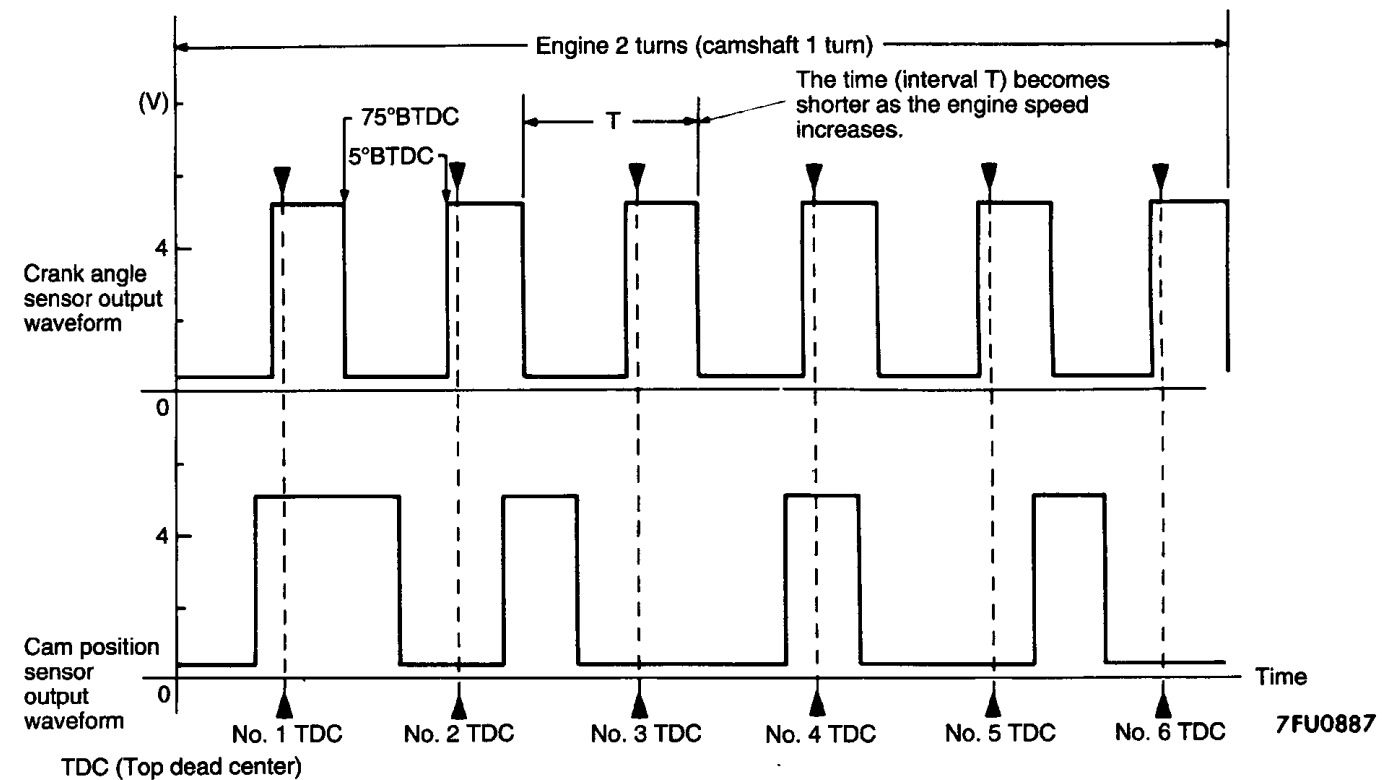
Alternative method (when test harness is not available)

- (1) Connect the analyzer special patterns pickup to ECU terminal (88) for the cam position sensor.
- (2) Connect the analyzer special patterns pickup to ECU terminal (89) for the crank angle sensor.

Standard waveform

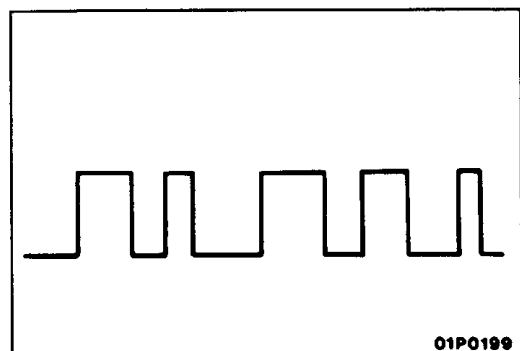
Observation conditions

Function	Special patterns
Pattern height	Low
Pattern selector	Display
Engine speed	Idling speed (700 r/min)



Waveform observing point

Confirm that cycle T becomes shorter as the engine speed increases.



Abnormal waveform example

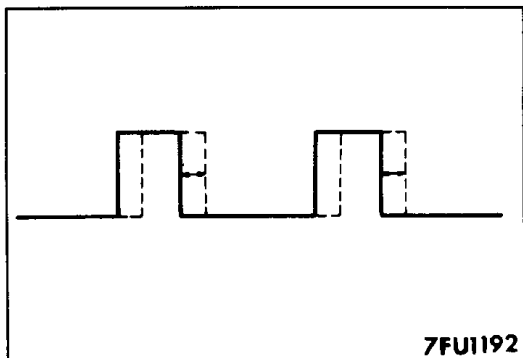
- Example 1

Trouble cause

The sensor interface is troubled.

Waveform feature

The engine does not start, but the rectangular waveform is output.



● Example 2

Trouble cause

The timing belt is loose.

The sensor disc is abnormal.

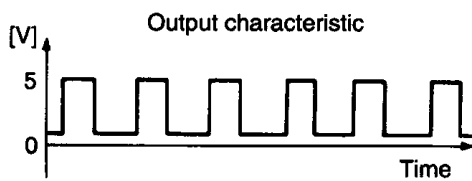
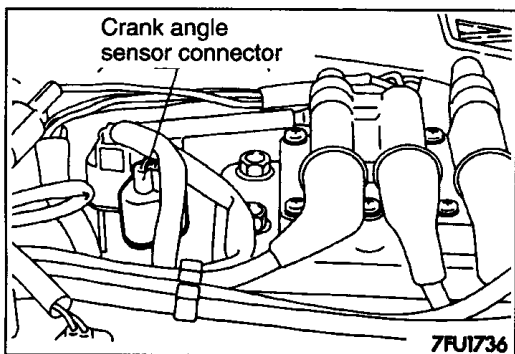
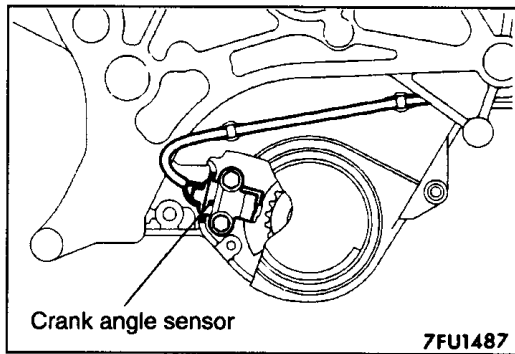
Waveform feature

The waveform fluctuates fore and aft.

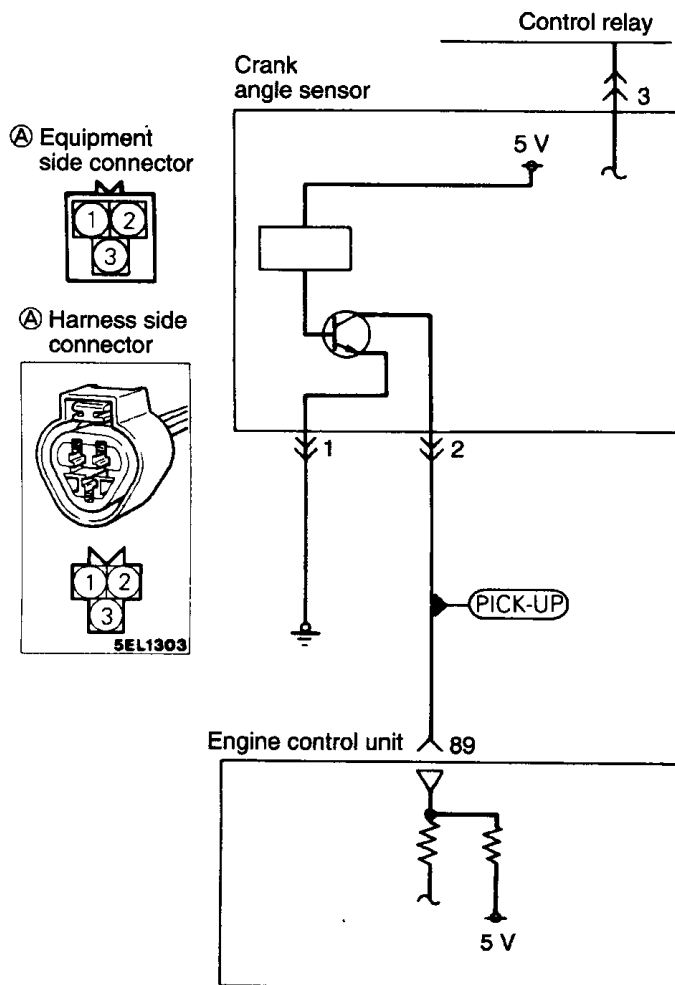
HARNESS INSPECTION

1 ① Harness side connector ② Control relay harness side connector 7FU1947	Check for continuity between the cam position sensor and control relay. - Cam position sensor connector: Disconnected - Control relay connector: Disconnected NOTE Touch ohmmeter probes to both ends of the harness.	OK → 2 ✗ → Repair the harness. (A ③ – B ①)		
2 ① Harness side connector 6AF0057	Check for continuity of the earth circuit. Cam position sensor connector: Disconnected	OK → 3 ✗ → Repair the harness. (A ① – Earth)		
3 ① Harness side connector Engine control unit harness side connector 7FU1313	Check for an open-circuit, or a short-circuit to earth between the cam position sensor and the engine control unit. - Engine control unit connector: Disconnected - Cam position sensor connector: Disconnected	OK → 4 ✗ → Repair the harness. (A ② – 88)		
4 ① Harness side connector 6AF0059	Measure the impressed voltage - Cam position sensor connector: Disconnected - Engine control unit connector: Connected - Ignition switch: ON <table border="1"> <thead> <tr> <th>Voltage (V)</th> </tr> </thead> <tbody> <tr> <td>4.8 – 5.2</td> </tr> </tbody> </table>	Voltage (V)	4.8 – 5.2	OK → STOP ✗ → Replace the engine control unit.
Voltage (V)				
4.8 – 5.2				

CRANK ANGLE SENSOR

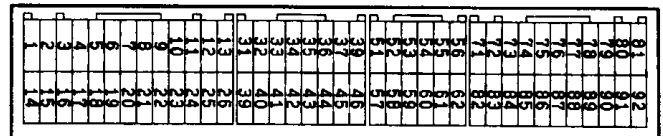


7FU0682



6AF0060

Engine control unit connector



9FU0393

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 control relay and is earthed 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 crank angle sensor outputs a pulse signal when the ignition switch is turned ON (with the engine not running), a faulty crank angle sensor or engine control unit is suspected.
- 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 reference 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	Compare cranking speed and MUT-II reading	Indicated speed to agree

NOTE

- (1) The tachometer indicates a third of the actual engine speed. Therefore, 3 times the tachometer indication is the actual engine speed.
- (2) When the tachometer is set to the 2-cylinder range, it indicates actual engine speed.

Function	Item No.	Data display	Check condition	Engine coolant temperature °C	Standard value r/min
Data reading	22	Idle speed	• Engine: Running at idle • Idle position switch: ON	At – 20	1275 – 1475
				At 0	1225 – 1425
				At 20	1100 – 1300
				At 40	950 – 1150
				At 80	600 – 800

Waveform inspection with analyzer

Refer to cam position sensor section (P.13-54.)

HARNESS INSPECTION

1

Ⓐ Harness side connector

Ⓑ Control relay harness side connector

7FU1948

Check for continuity between the crank angle sensor and the control relay.

- Crank angle sensor connector: Disconnected
- Control relay connector: Disconnected

NOTE
Touch ohmmeter probes to both ends of the harness

OK → **2**

✗ → Repair the harness.
(Ⓐ 3) – (Ⓑ 1)

2

Ⓐ Harness side connector

6AF0062

Check for continuity of the earth circuit.

- Crank angle sensor connector: Disconnected

OK → **3**

✗ → Repair the harness.
(Ⓐ 1) – Earth)

3

Ⓐ Harness side connector

Engine control unit harness side connector

7FU1318

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

- Engine control unit connector: Disconnected
- Crank angle sensor connector: Disconnected

OK → **4**

✗ → Repair the harness.
(Ⓐ 2) – 89)

4

Ⓐ Harness side connector

6AF0064

Measure the impressed voltage.

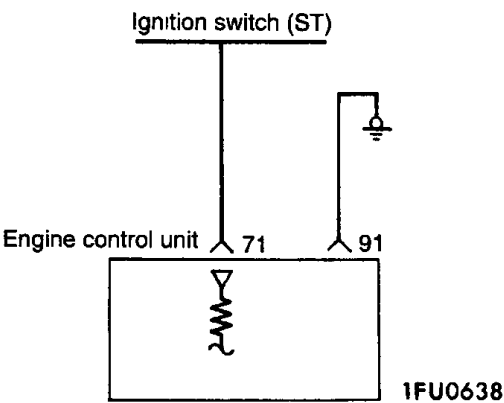
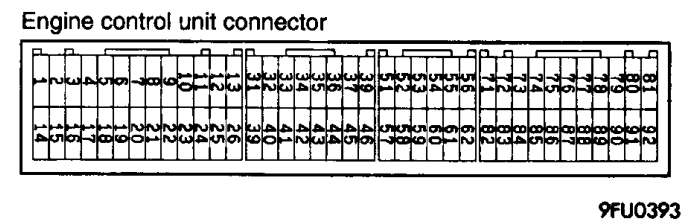
- Crank angle sensor connector: Disconnected
- Engine control unit connector: Connected
- Ignition switch: ON

Voltage (V)
4.8 – 5.2

OK → **STOP**

✗ → Replace the engine control unit.

IGNITION SWITCH-ST [M/T only]



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 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

Engine control unit harness side connector

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

✗

→

Repair the harness.
(71 – Ignition switch)

2

Engine control unit harness side connector

6FU1259

Check for continuity of the earth circuit.

- Engine control unit connector: Disconnected

OK

→

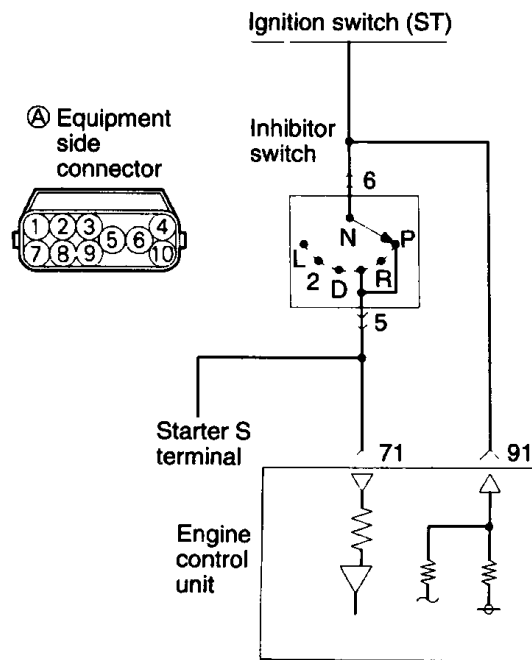
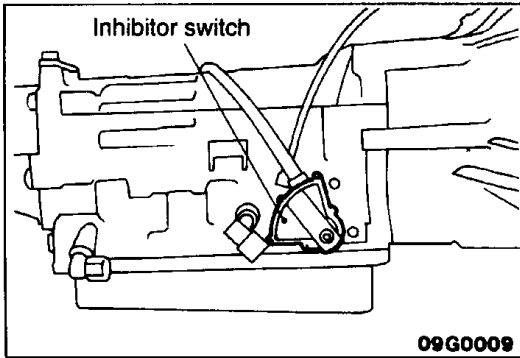
STOP

✗

→

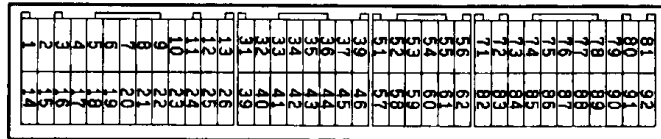
Repair the harness.
(91 – Earth)

IGNITION SWITCH-ST AND INHIBITOR SWITCH [A/T only]



7FU1528

Engine control unit connector



9FU0393

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

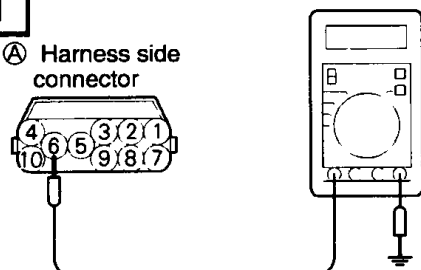
INHIBITOR SWITCH

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

HARNESS INSPECTION

1

Ⓐ Harness side connector



7FU1529

Measure the power supply voltage of the inhibitor switch

- Engine control unit connector: Disconnected
- Inhibitor switch connector: Disconnected
- Ignition switch: ON

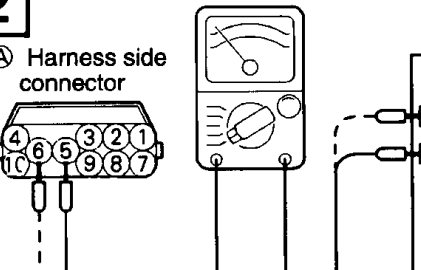
Voltage (V)
SV

OK → **2**

✗ → Check the power supply circuit.

2

Ⓐ Harness side connector



7FU1530

Check for continuity between the inhibitor switch and the engine control unit.

- Engine control unit connector: Disconnected
- Inhibitor switch connector: Disconnected

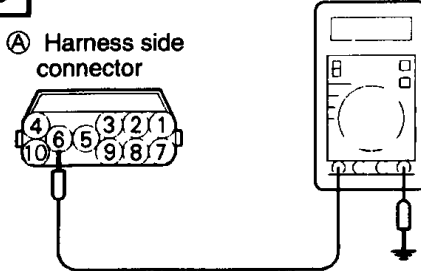
NOTE
Touch the ohmmeter probes to both ends of the harness.

OK → **3**

✗ → Repair the harness.
(Ⓐ 5 - 71)
(Ⓐ 6 - 91)

3

Ⓐ Harness side connector



7FU1529

Measure the inhibitor switch terminal input voltage.

- Engine control unit connector: Connected
- Inhibitor switch connector: Disconnected
- Ignition switch: ON

Voltage (V)
SV

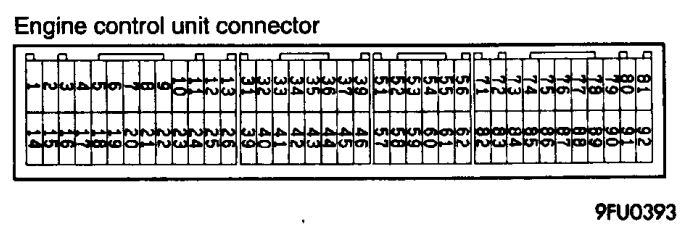
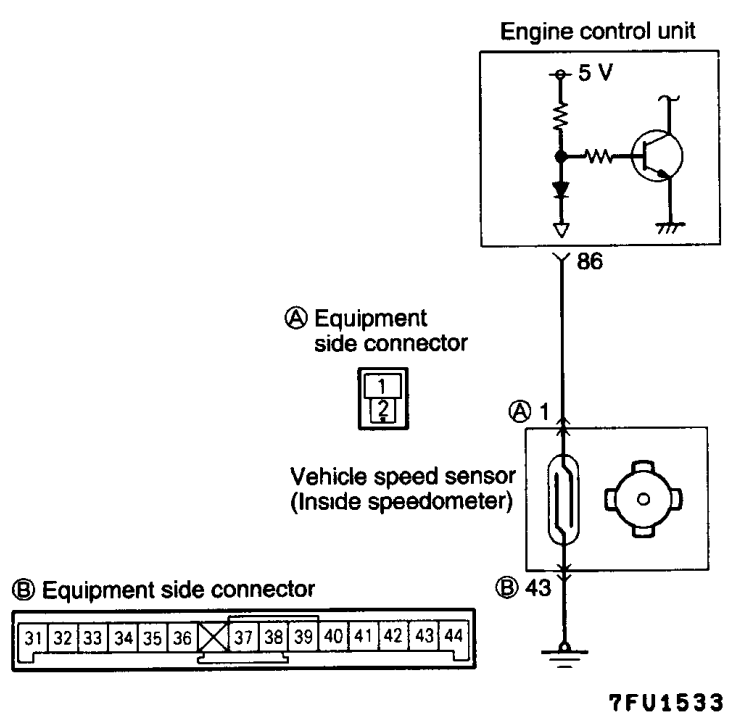
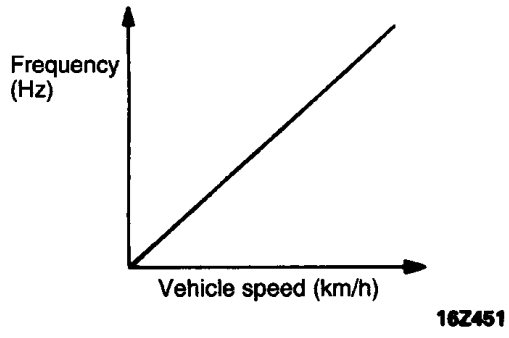
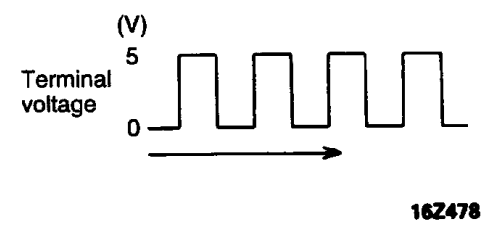
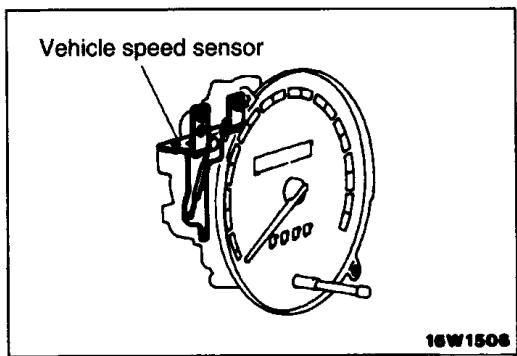
OK → **STOP**

✗ → Repair the engine control unit.

INHIBITOR SWITCH INSPECTION

Refer to GROUP 23 – Service Adjustment Procedures.

VEHICLE SPEED SENSOR



OPERATION

- The vehicle-speed sensor is incorporated within the speedometer; it converts vehicle-speed data to pulse signals and inputs those signals to the engine control unit. The engine control unit, based upon those signals, regulates the idle-speed servo, etc.
- The vehicle speed sensor, by intermitting by the reed switch the flow (to earth) of the

approximately 5 V voltage applied from the engine control unit, produces vehicle speed signals.

TROUBLESHOOTING HINTS

If there is damaged or disconnected wiring, or a short-circuit, of the vehicle speed sensor signal circuit, the engine may stall when the vehicle speed is reduced and the vehicle is stopped.

HARNESS INSPECTION

1

Engine control unit harness side connector

86

01A0508

Check the vehicle speed sensor output circuit for continuity.

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

Continuity

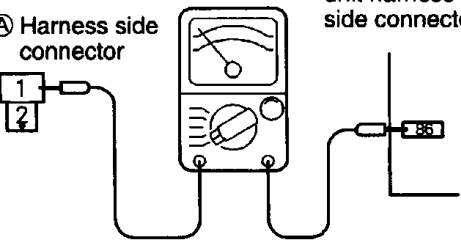
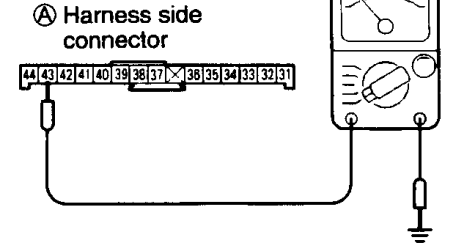
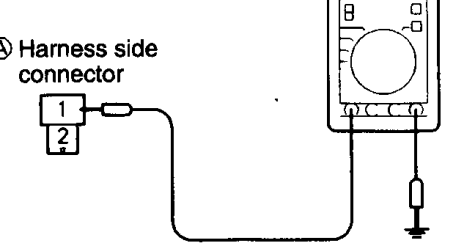
Continuity

Non-continuity

One rotation

OK → **4**

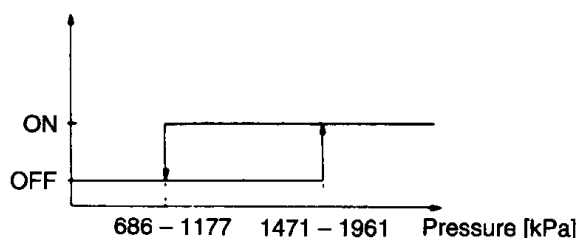
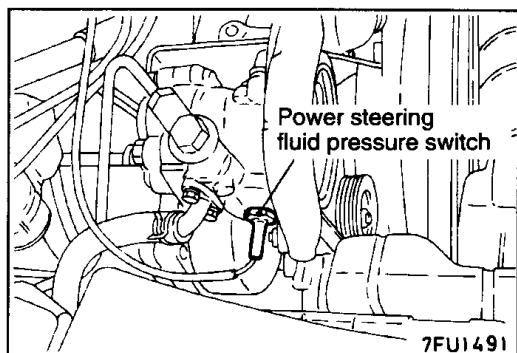
✗ → **2**

2 Ⓐ Harness side connector  Engine control unit harness side connector 7FU2105	Check for an open-circuit or a short-circuit to earth, between the engine control unit and the vehicle speed sensor. - Vehicle speed sensor connector: Disconnected - Engine control unit connector: Disconnected	OK → 3 ✗ → Repair the harness. (Ⓐ 1 – 86)		
3 Ⓐ Harness side connector  7FU1532	Check for continuity of the earth circuit. Vehicle speed sensor connector: Disconnected	OK → 4 ✗ → Repair the harness. (Ⓐ 43 – Earth)		
4 Ⓐ Harness side connector  7FU1531	Measure the impressed voltage. - Vehicle speed sensor connector: Disconnected - Engine control unit connector: Connected - Ignition switch: ON <table border="1" data-bbox="635 1144 1050 1227"> <tr> <td>Voltage (V)</td> </tr> <tr> <td>4.5 – 4.9</td> </tr> </table>	Voltage (V)	4.5 – 4.9	OK → STOP ✗ → Replace the engine control unit.
Voltage (V)				
4.5 – 4.9				

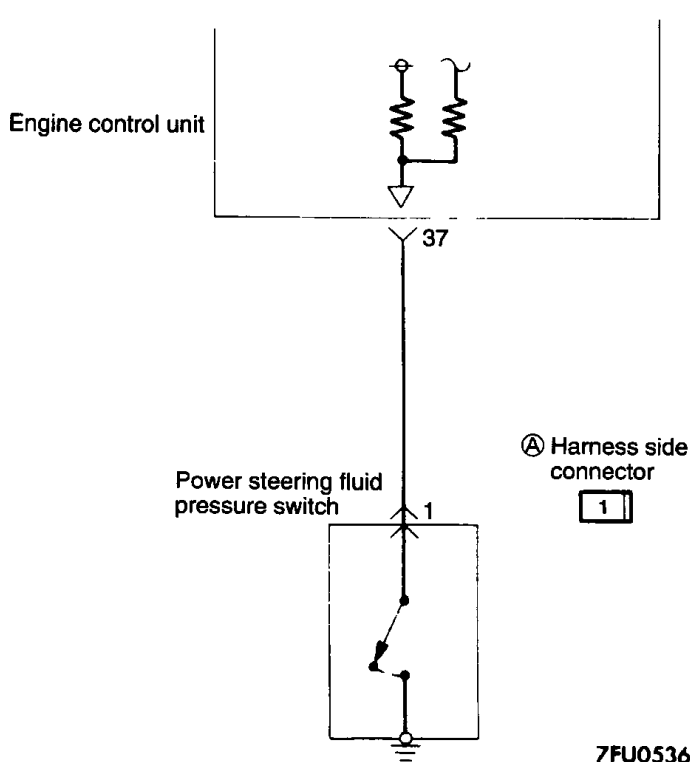
SENSOR INSPECTION

Refer to GROUP 54 – Meters and Gauges.

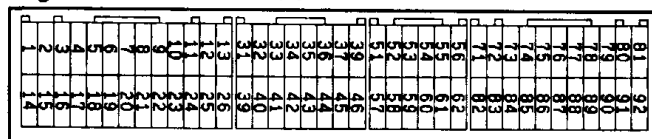
POWER STEERING FLUID PRESSURE SWITCH



01L0430



Engine control unit connector



9FU0393

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 operation 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	Steering wheel neutral position (wheels straight-ahead direction)	OFF
				Steering wheel half turn	ON

Checking Fluid Pressure

Steering wheel	Fluid pump delivery pressure (ref. value)	
Straight forward	kPa	686 – 1,177
Turned	kPa	1,471 – 1,961

HARNESS INSPECTION

1

① Harness side connector

Engine control unit harness side connector

7FU2106

Check for open-circuit or short circuit between the power steering fluid pressure switch and the engine control unit.

- Power steering fluid pressure switch connector: Disconnected
- Engine control unit connector: Disconnected

OK → **2**

✗ → Repair the harness. (① 1 – 37)

2

① Harness side connector

7FU0505

Measure the applied voltage.

- Power steering fluid pressure switch connector: Disconnected
- Engine control unit connector: Connected
- Ignition switch: ON

Voltage (V)
SV

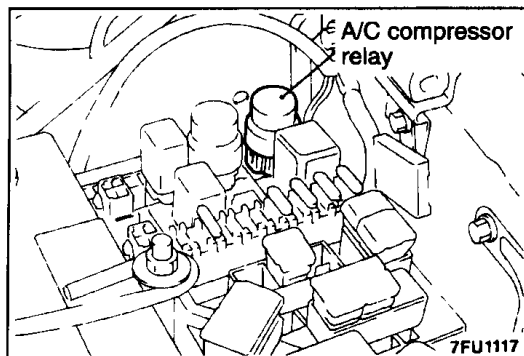
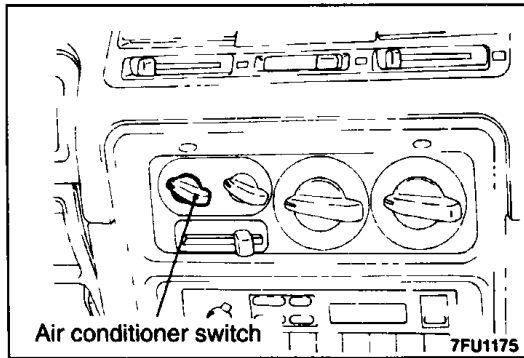
OK → **STOP**

✗ → Replace the engine control unit.

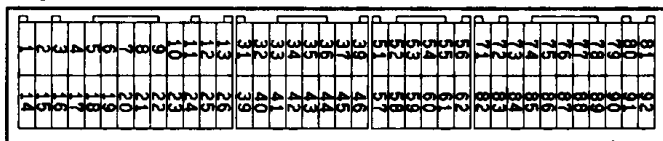
SENSOR INSPECTION

Refer to GROUP 37 – Service Adjustment Procedures.

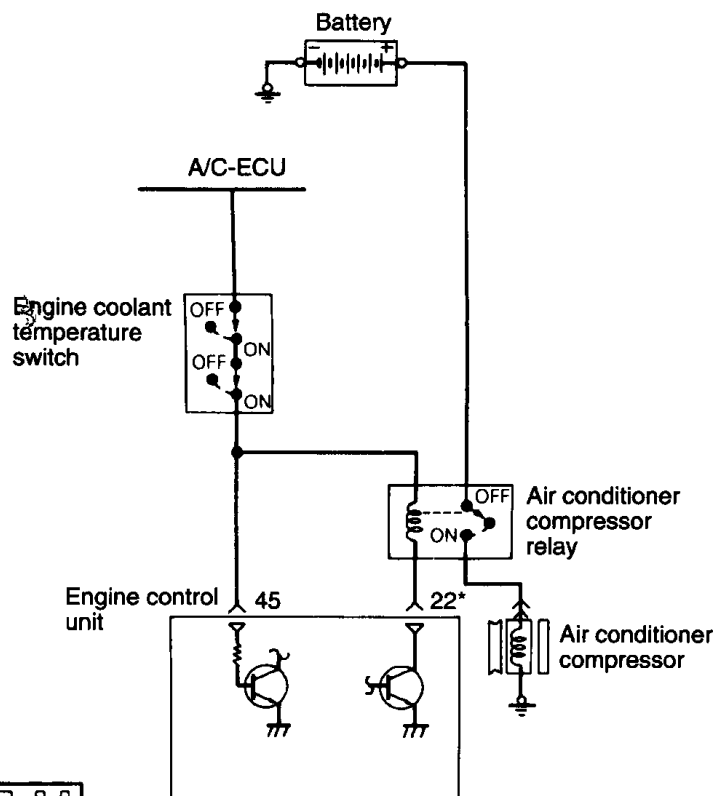
AIR CONDITIONER SWITCH AND POWER RELAY



Engine control unit connector



9FU0393



7FU0821

*: No. 8 is for vehicle with immobilizer

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 MUT-II

Air conditioner switch

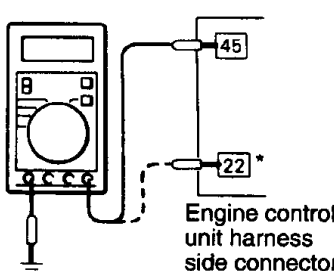
Function	Item No.	Data display	Check conditions	Air conditioner switch	Normal display
Data reading	28	Switch status	● Engine idling (The air conditioner compressor should be activated when the air conditioner switch is switched ON.)	OFF	OFF
				ON	ON

Air conditioner compressor 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



Engine control unit harness side connector

*: No. 8 is for vehicle with immobilizer 01R0863

Measure the power supply voltage of the air conditioner circuit.

- Engine control unit connector: Disconnect
- Ignition switch: ON
- Air conditioner switch: ON

Voltage (V)
SV





→



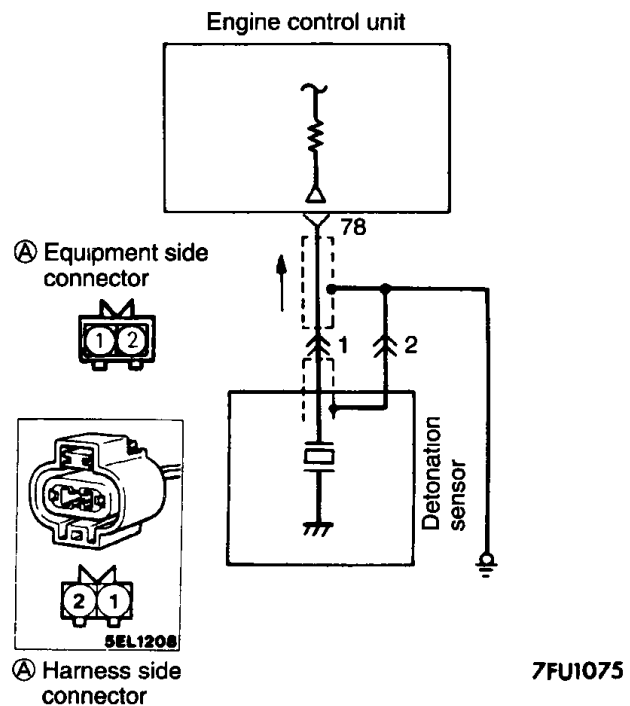
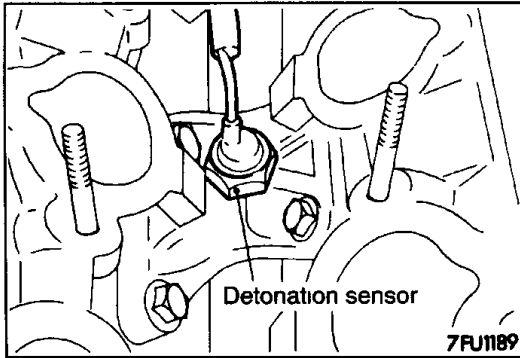
→

Check the Air conditioner circuit.

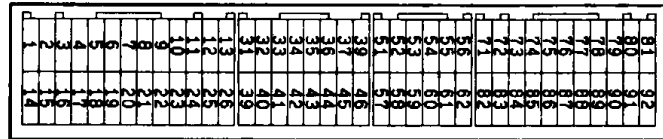
AIR CONDITIONER INSPECTION

Refer to GROUP 55.

DETONATION SENSOR <6G74-SOHC 24Valve Engine>



Engine control unit connector



9FU0393

OPERATION

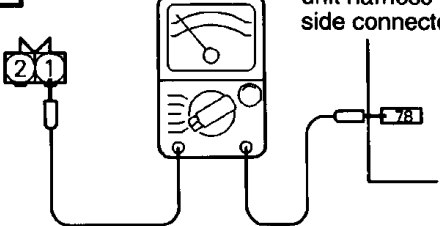
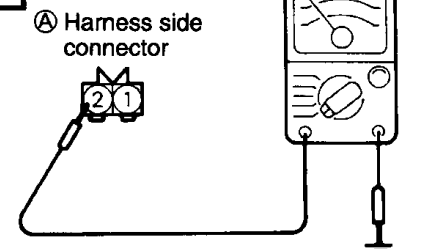
The detonation sensor generates a voltage proportional to the magnitude of cylinder block vibration due to knocking and inputs it to the engine control unit. Based on this signal, the engine control unit provides retard control of the ignition timing.

TROUBLESHOOTING HINTS

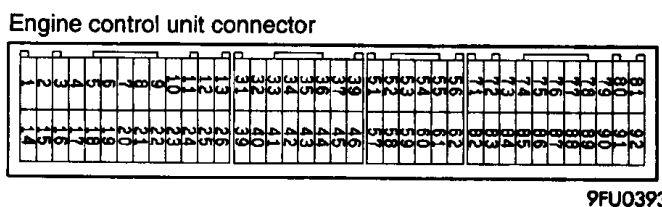
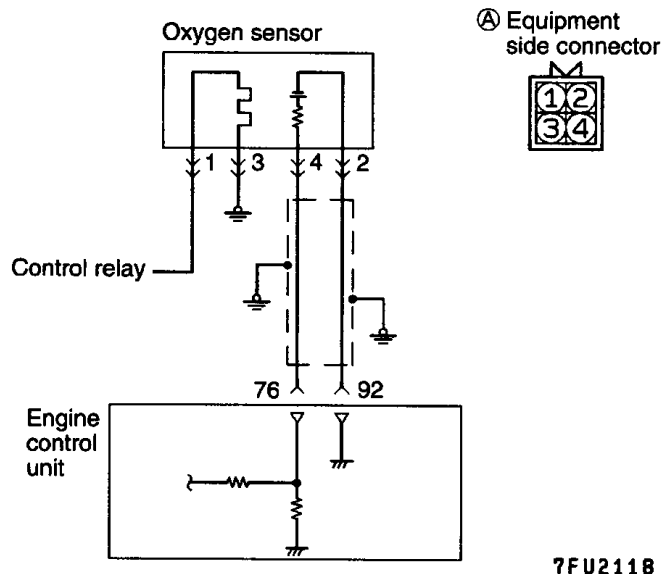
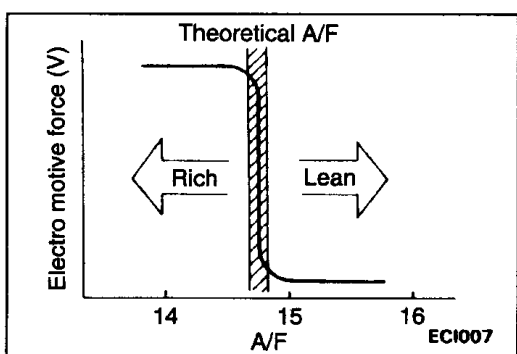
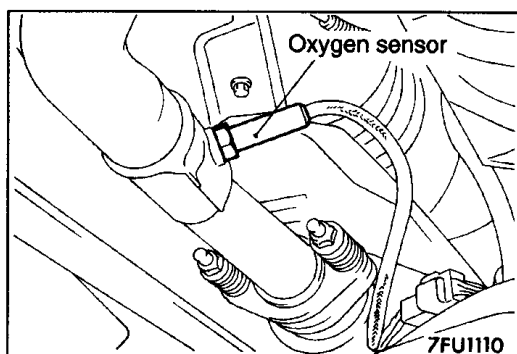
When knocking occurs while driving under high-load conditions, the following problems are suspected in addition to the detonation sensor itself.

- (1) Inappropriate ignition plug heat range
- (2) Inappropriate gasoline
- (3) Incorrectly adjusted reference ignition timing

HARNESS INSPECTION

1  Engine control unit harness side connector Ⓐ Harness side connector 7FU2257	Check for an open-circuit or a short-circuit to earth, between the engine control unit and detonation sensor. • Detonation sensor connector: Disconnected • Engine control unit connector: Disconnected OK ✗	2 Repair the harness. (Ⓐ 1 – 78)
2  Ⓐ Harness side connector 6FU1302	Check for continuity of the earth circuit. • Connector. Disconnected OK ✗	STOP Repair the harness. (Ⓐ 2 – Earth)

OXYGEN SENSOR <6G72-SOHC 24Valve Engine>



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 1 V 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 0 V is output.
- The engine control unit, based upon those signals, regulates the amount of fuel injection so that the air/fuel mixture ratio becomes the theoretical air/fuel mixture ratio.
- Battery power supply is applied, by way of the control relay, to the oxygen sensor heater. As a result, the sensor element is heated by the heater, so that the oxygen sensor shows excellent response even if the temperature of the exhaust gas is low.

TROUBLESHOOTING HINTS

Hint 1: The exhaust gas purification performance will worsen if there is a malfunction of the oxygen sensor.

Hint 2: If the oxygen sensor output voltage deviates from the standard value even though the results of the checking of the oxygen sensor are normal, the cause is probably a malfunction of a component related to air/fuel mixture ratio control.

[Examples]

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

Using MUT-II

Function	Item No.	Data display	Check conditions	Engine condition r/min	Standard value mV
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	200 or lower
				When engine is suddenly raced	600 – 1,000
			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	700 (Idling)	400 or lower ↓ (changes) 600 – 1,000
				2,500	

HARNESS INSPECTION

1

Ⓐ Harness side connector

Ⓑ Control relay harness side connector

Check for continuity between the oxygen sensor and the control relay.

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

NOTE
Touch the ohmmeter probes to both ends of the harness.

OK

OK

→

→

2

Repair the harness.

Ⓐ **1** -

Ⓑ **1**

7FU2107

2

Ⓐ Harness side connector





Engine control unit harness side connector



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



3



Repair the harness.
(Ⓐ 4 - 76)

7FU2108

3

Ⓐ Harness side connector



Check for continuity of the earth circuit.

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



→



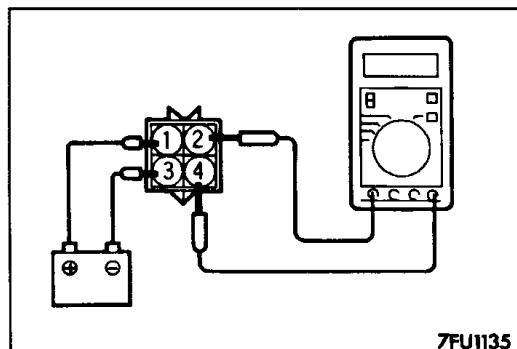
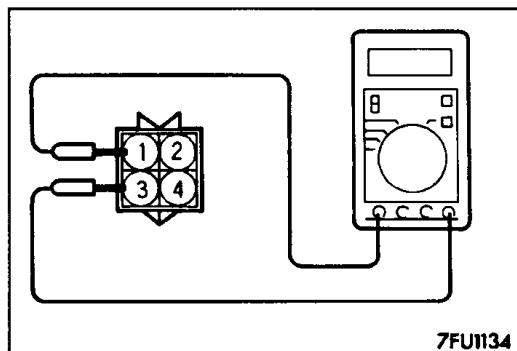


→

Repair the harness.

(Ⓐ 2 - ②)

(Ⓐ 3 - Earth)



SENSOR INSPECTION

- (1) Disconnect the oxygen sensor connector.
- (2) Check that there is continuity [$4.5 - 8.0\Omega$ at 20°C] between oxygen sensor connector terminal ① and terminal ③.
- (3) If there is no continuity, replace the oxygen sensor.

- (4) Warm the engine until the engine coolant temperature reaches 80°C or more.
- (5) Use the jumper leads to connect the oxygen sensor terminal ① (connect (+) terminal) and terminal ③ (connect (-) terminal) to the battery (+) and (-) terminals respectively.

Caution

Be careful when connecting the jumper leads, as connecting the terminals incorrectly will damage the oxygen sensor.

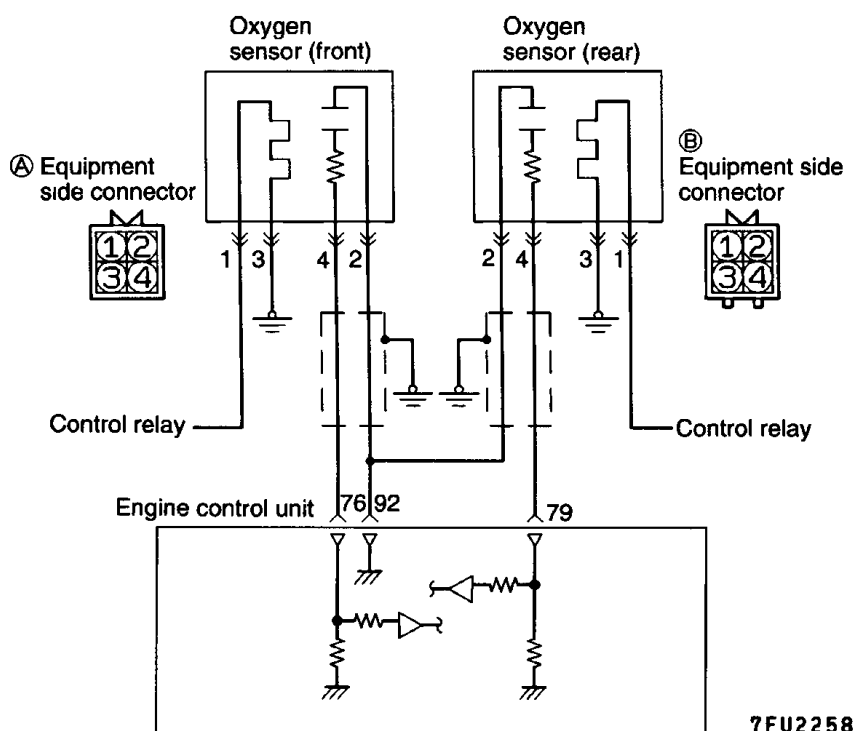
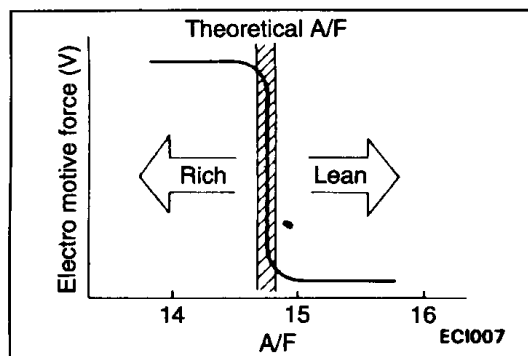
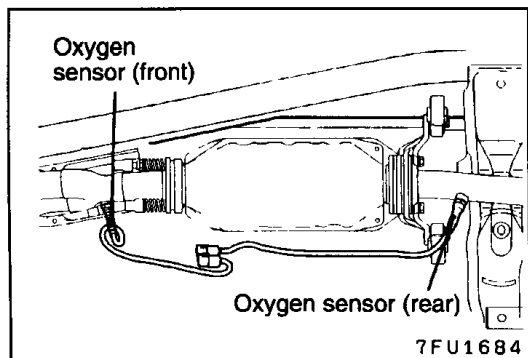
- (6) Connect a digital-type voltmeter to terminal ② and terminal ④.
- (7) While repeatedly racing the engine, measure the oxygen sensor output voltage.

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

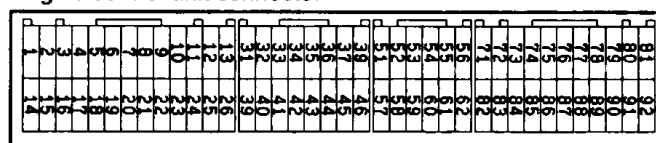
NOTE

For removal and installation of the oxygen sensor, refer to GROUP 15 – Exhaust Pipe, Main Muffler and Catalytic Converter.

OXYGEN SENSOR <6G74-SOHC 24Valve Engine>



Engine control unit connector



9FU0393

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 1 V 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 0 V is output.
- The engine control unit, based upon those signals, regulates the amount of fuel injection so that the air/fuel mixture ratio becomes the theoretical air/fuel mixture ratio.
- Battery power supply is applied, by way of the control relay, to the oxygen sensor heater. As a result, the sensor element is heated by the heater, so that the oxygen sensor shows excellent response even if the temperature of the exhaust gas is low.

TROUBLESHOOTING HINTS

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

[Examples]

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

INSPECTION
Using MUT-II
<Oxygen Sensor (front)>

Function	Item No.	Data display	Check condition	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.	Idle speed	Changes repeatedly between 400 mV or lower and 600 – 1,000 mV
				2,500 r/min	

<Oxygen sensor (rear)>

Function	Item No.	Data display	Check condition	Engine state	Standard value
Data reading	59	Sensor voltage	- Transmission: Second <M/T>, L range <A/T> - Accelerate the vehicle with wide open throttle.	3,500 r/min	600 – 1,000 mV

HARNESS INSPECTION

1

Ⓐ, Ⓑ Harness side connector

Ⓒ Control relay harness side connector

7FU2107

Check for continuity between the oxygen sensor and the control relay.

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

NOTE
Touch the ohmmeter probes to both ends of the harness.

OK → **2**

✗ → Repair the harness.
(Ⓐ 1 – Ⓒ 1)
(Ⓑ 1 – Ⓒ 1)

2

Ⓐ, Ⓑ Harness side connector

Engine control unit harness side connector

7FU2108

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

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

OK → **3**

✗ → Repair the harness.
(Ⓐ 4 – 76)
(Ⓑ 4 – 79)

3

Ⓐ, Ⓑ Harness side connector

7FU1133

Check for continuity of the earth circuit.

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

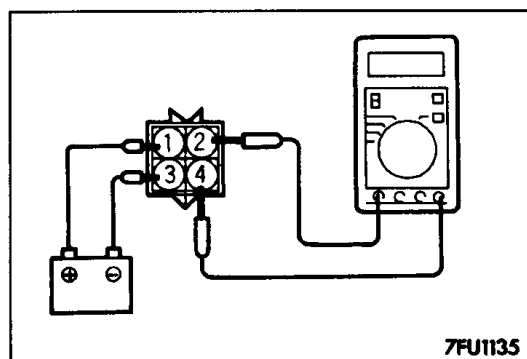
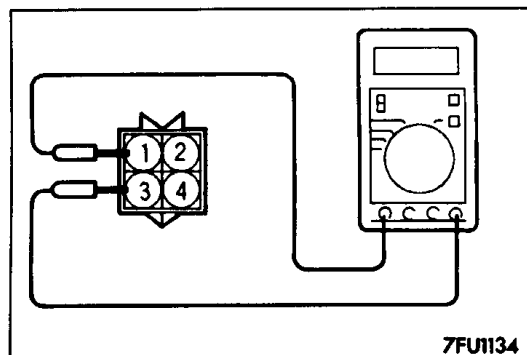
OK →

✗ →

STOP

Repair the harness.

(Ⓐ 2) – 92,
 (Ⓐ 3) – Earth)
 (Ⓑ 2) – 92,
 (Ⓑ 3) – Earth)



SENSOR INSPECTION <OXYGEN SENSOR (FRONT)>

- (1) Disconnect the oxygen sensor connector.
- (2) Check that there is continuity [$4.5 - 8.0\Omega$ at 20°C] between oxygen sensor connector terminal ① and terminal ③.
- (3) If there is no continuity, replace the oxygen sensor.

- (4) Warm the engine until the engine coolant temperature reaches 80°C or more.
- (5) Use the jumper leads to connect the oxygen sensor terminal ① (connect (+) terminal) and terminal ③ (connect (-) terminal) to the battery (+) and (-) terminals respectively.

Caution

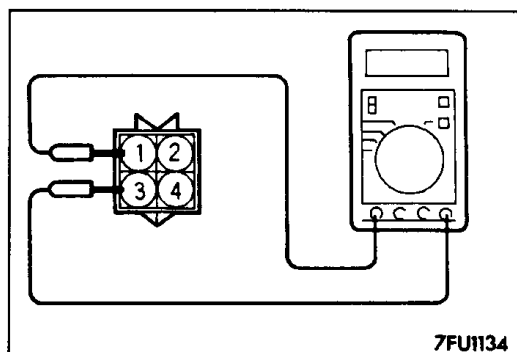
Be careful when connecting the jumper leads, as connecting the terminals incorrectly will damage the oxygen sensor.

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

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

NOTE

For removal and installation of the oxygen sensor, refer to GROUP 15 – Exhaust Pipe, Main Muffler and Catalytic Converter.



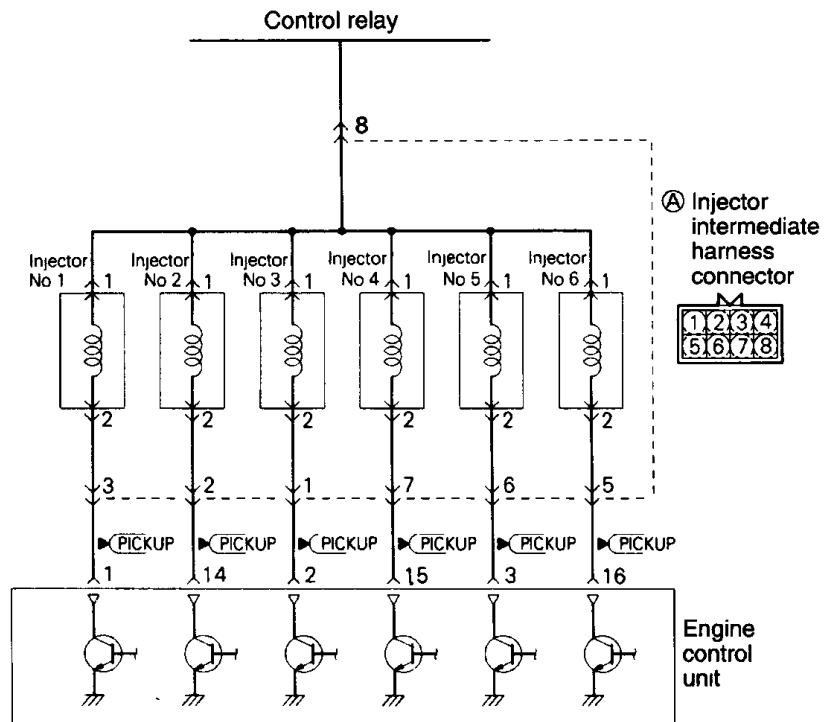
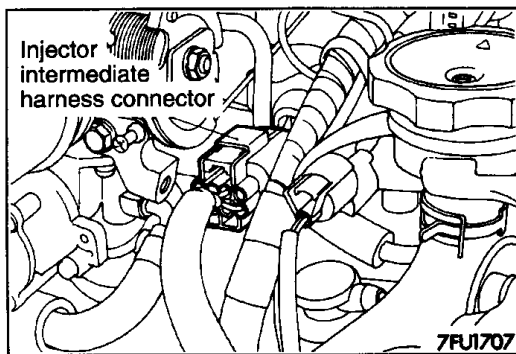
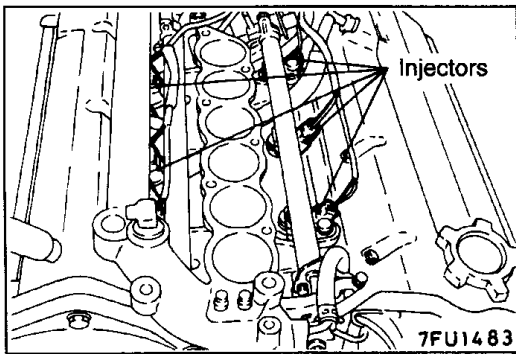
SENSOR INSPECTION <OXYGEN SENSOR (REAR)>

- (1) Disconnect the oxygen sensor connector.
- (2) Check that there is continuity [$4.5 - 8.0\Omega$ at 20°C] between oxygen sensor connector terminal ① and terminal ③.
- (3) If there is no continuity, replace the oxygen sensor.

NOTE

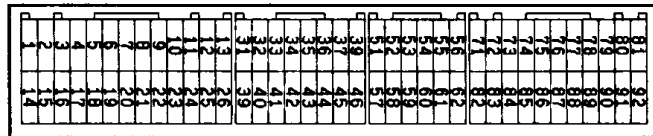
1. If the MUT-II does not display the standard value although no abnormality is found by the abovementioned continuity test and harness check, replace the oxygen sensor (rear).
2. For removal and installation of the oxygen sensor, refer to GROUP 15 – Exhaust Pipe, Main Muffler and Catalytic Converter.

INJECTORS



7FU1472

Engine control unit connector



9FU0393

OPERATION

- The injectors are electromagnetic-valve-equipped injection nozzles that function to inject fuel based upon injection signals from the engine control unit.
- Because the surface area of the injection ports is fixed and because the pressure of the fuel relative to the pressure within the manifold is also regulated to a fixed pressure, the amount of fuel injection by injectors is determined by

the length of time that the needle valve is open, or, in other words, by the length of time of current flow to the solenoid coil.

- Battery power supply is supplied, by way of the control relay, to the injectors. When the engine control unit switches ON the power transistor within the unit and current flows to the solenoid coil, the injectors open and fuel is injected.

TROUBLESHOOTING HINTS

Hint 1: If there is a problem with starting while the engine is warm, perform the combustion test and check for leakage of the injectors.

Hint 2: If the engine can't be started, and the injectors are not activated during cranking, the cause is probably a malfunction such as described below, not with the injectors.

- (1) Malfunction of the circuit for supply of power to the engine control unit, or of the earth circuit.
- (2) Malfunction of the control relay.
- (3) Malfunction of the crank angle sensor.

13-80 FUEL SYSTEM <6G72-SOHC 24Valve Engine, 6G74-SOHC 24Valve Engine> – On-Vehicle Inspection of MPI Components

Hint 3: If there is a cylinder for which the idling condition does not change when, during idling, the fuel injection of the injectors is cut off in sequence, check that cylinder as described below.

- (1) Check the injector and harness.
- (2) Check the spark plugs and the high-tension cable.
- (3) Check the compression pressure.

Hint 4: If the injector activation time deviates from the standard value even though the results of the checking of the injector's harness and of the injector itself are normal, the cause may be presumed to be one of the following.

- (1) Incomplete combustion within the cylinder.
(Malfunction of the spark plugs, the ignition coil, the compression pressure, etc.)
- (2) Improper adhesion of EGR valve seat.
- (3) Increased engine resistance.

INSPECTION

Using MUT-II

Function	Item No.	Data Display	Check conditions	Engine coolant temperature °C	Standard value ms
Data reading	41	Activation time* ¹	Engine cranking	When 0* ²	15.5 – 19
				When 20	38 – 46.5
				When 80	10 – 12

Function	Item No.	Data Display	Check conditions	Engine condition r/min	Standard value ms
Data reading	41	Activation time* ³	● Engine coolant temperature: 89 – 95°C ● Lamps and accessories: OFF ● Transmission: neutral (P range for vehicles with A/T) ● Steering wheel: neutral position	700 (idling)	2.6 – 3.8
				2,500	2.3 – 3.5
				When raced suddenly	Increases

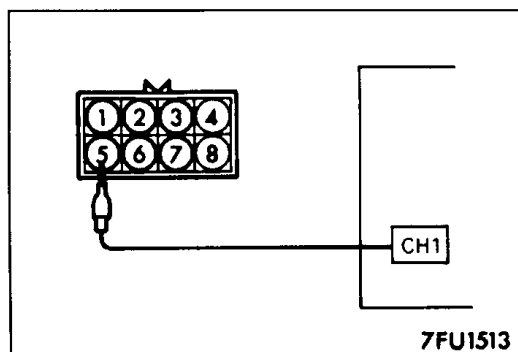
NOTE

*¹: Indicates the injector-activation time when the power source voltage is 11 V and the cranking speed is 250 r/min or less.

*²: At a coolant temperature of 0°C, there is synchronous injection for all six cylinders.

*³: For a new vehicle [driven approximately 500 km or less)] the injector-activation may be about ten percent longer than indicated above.

Function	Item No.	Drive content	Check condition	Normal condition
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		
	05	No. 5 injector shut off		
	06	No. 6 injector shut off		

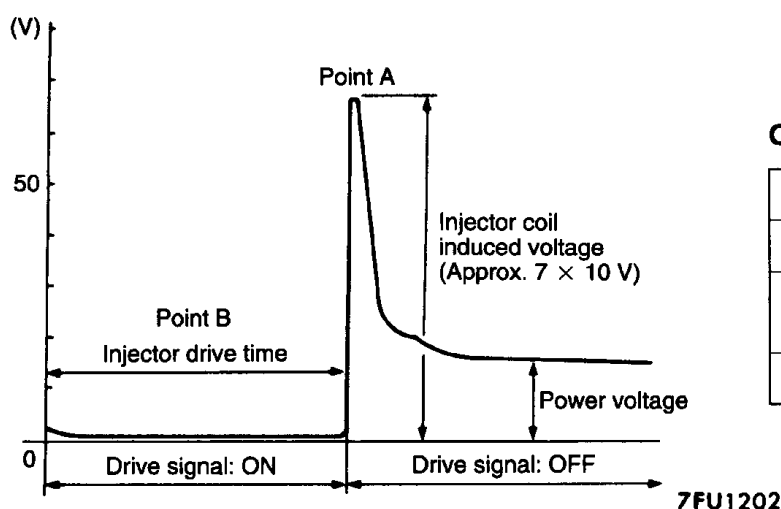


Wave Pattern Inspection Using An Analyzer

- (1) Remove the injector intermediate connector and connect the special tool (harness connector: MD998474).
- (2) Connect the probe of an oscilloscope as follows.

	No. 1 cylinder	No. 2 cylinder	No. 3 cylinder	No. 4 cylinder	No. 5 cylinder	No. 6 cylinder
Male connector terminal No.	3	2	1	7	6	5
Clip colour (lead wire)	Green (Green/ black)	White (White)	Blue (Blue)	Yellow (Yellow)	Red (Red)	Black (Black)

Standard wave pattern



Observation conditions

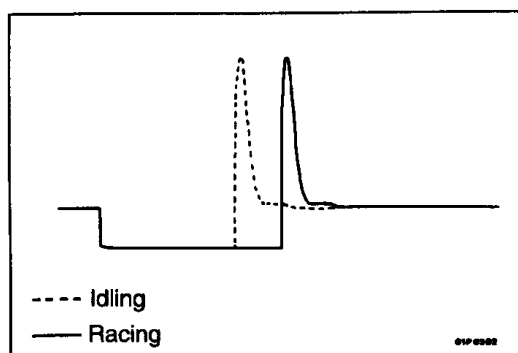
Function	Special patterns
Pattent height	Variable
Variable knob pattern selector	Display
Engine r/min	Idle speed (700 r/min)

Wave pattern observation points

Point A): Height of back electromotive force in the solenoid coil

Contrast with standard wave pattern	Probable cause
Solenoid coil back electromotive force is low or doesn't appear at all.	Short in the injector solenoid

Point B): Injector drive time



- The injector drive timing will be synchronized with the MUT-II display.
- When the engine is suddenly raced, the drive time will be greatly extended at first, but the drive time will soon match the engine speed.

HARNESS INSPECTION

1

Ⓐ Injector intermediate harness female connector

Ⓑ Control relay harness side connector

7FU1950

Check for continuity between the injectors and the control relay.

- Injector intermediate connector: Disconnected
- Control relay connector: Disconnected

NOTE
Touch the ohmmeter probes to both ends of the harness.

OK → **2**

✗ → Repair the harness.
(Ⓐ 8) – (Ⓑ 1)

2

Ⓐ Injector intermediate harness female connector

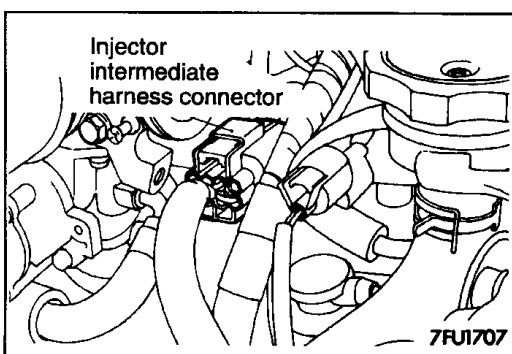
7FU2109

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 intermediate connector: Disconnected

OK → **STOP**

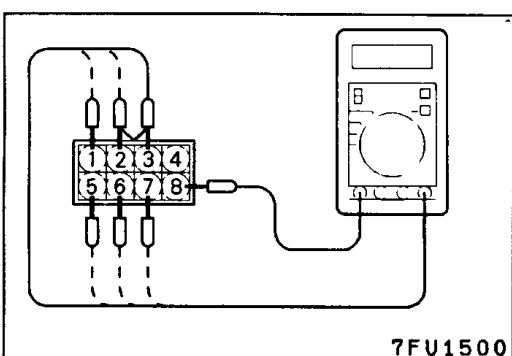
✗ → Repair the harness.
(Ⓐ 1 – 2)
(Ⓐ 2 – 14)
(Ⓐ 3 – 1)
(Ⓐ 5 – 16)
(Ⓐ 6 – 3)
(Ⓐ 7 – 15)



ACTUATOR INSPECTION

Measuring Resistance Between Terminals

(1) Disconnect the injector intermediate harness connector.



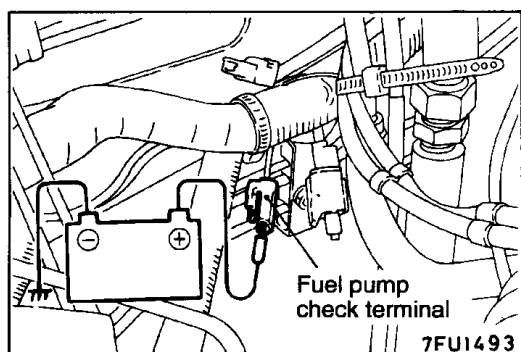
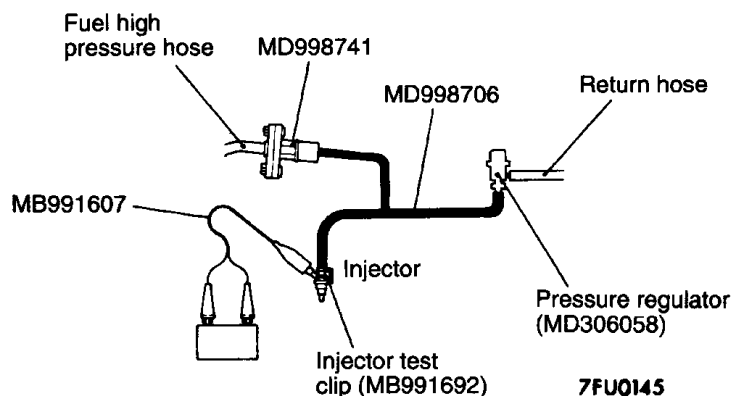
(2) Measure resistance value between terminals.

Injector	Terminals	Resistance value
No. 1	8 – 3	13 – 16Ω
No. 2	8 – 2	
No. 3	8 – 1	
No. 4	8 – 7	
No. 5	8 – 6	
No. 6	8 – 5	

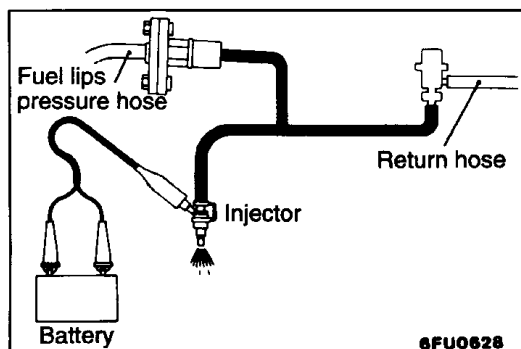
(3) Connect the injector intermediate harness connector.

Checking the Injection Condition

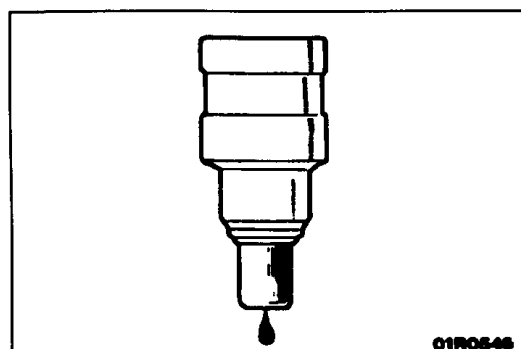
- (1) Following the steps below, bleed out the residual pressure within the fuel pipe line to prevent flow of the fuel.
- (2) Remove the injector.
- (3) Arrange the special tool (injector test set), adaptor, fuel pressure regulator and injector test clip as shown in the illustration below.



- (4) Connect the battery's negative (–) terminal.
- (5) Apply battery voltage to the fuel pump check terminal and activate the fuel pump.



- (6) Activate the injector and check the atomized spray condition of the fuel. The condition can be considered satisfactory unless it is extremely poor.

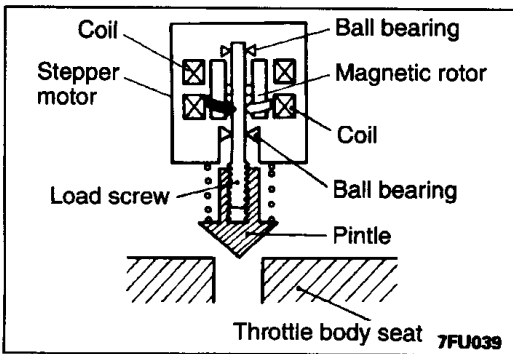
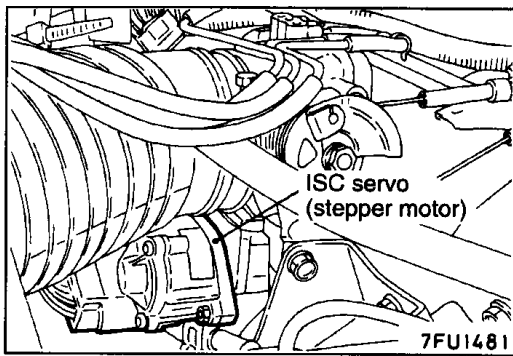


- (7) Stop the actuation of the injector, and check for leakage from the injector's nozzle.

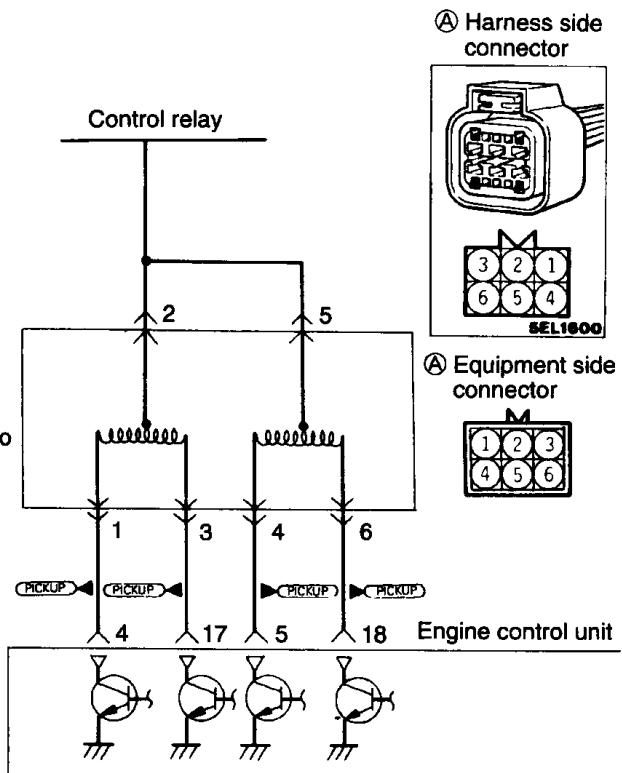
Standard value: 1 drop or less per minute

- (8) Activate the injector without activating the fuel pump; then, when the spray emission of fuel from the injector stops, disconnect the special tool and restore it to its original condition.

IDLE SPEED CONTROL SERVO (STEPPER MOTOR TYPE)



Idle speed control servo



7FU0518

9FU0393

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 normal 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) Loose EGR valve seat
- (5) Poor combustion in the cylinder (faulty ignition plug, ignition coil, injector, low compression pressure, etc.)

INSPECTION

Using MUT-II

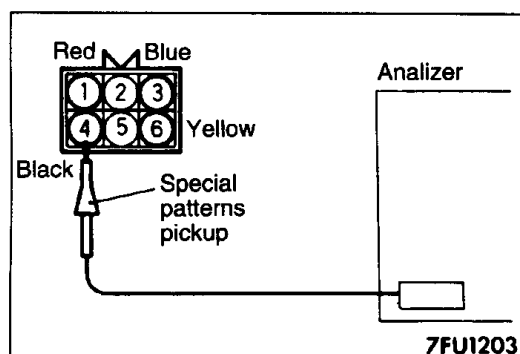
Function	Item No.	Data display	Check condition	Load state	Standard value
Data reading	45	Stepper motor steps	- Engine coolant temperature: 80 – 95°C (176 – 205°F) - Lamps, accessory units: OFF - Transmission: Neutral (P range for vehicles with A/T) - Idle position switch: ON (compressor clutch to be ON if air conditioner switch is ON) - Engine: Idling	Air conditioner switch: OFF	2 – 25 steps
				Air conditioner switch: ON	Increase by 10 – 70 steps
				Air conditioner switch: OFF Selector lever: N → D position	Increase by 5 – 50 steps

NOTE

When the vehicle is new [within initial operation of about 500 km], the stepper motor steps may be about 30 steps more than standard.

Caution

When the select lever is shifted to the D position, the brakes must be used to prevent the vehicle from moving forward.



Wave Pattern Inspection Using an Analyzer

Measurement method

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

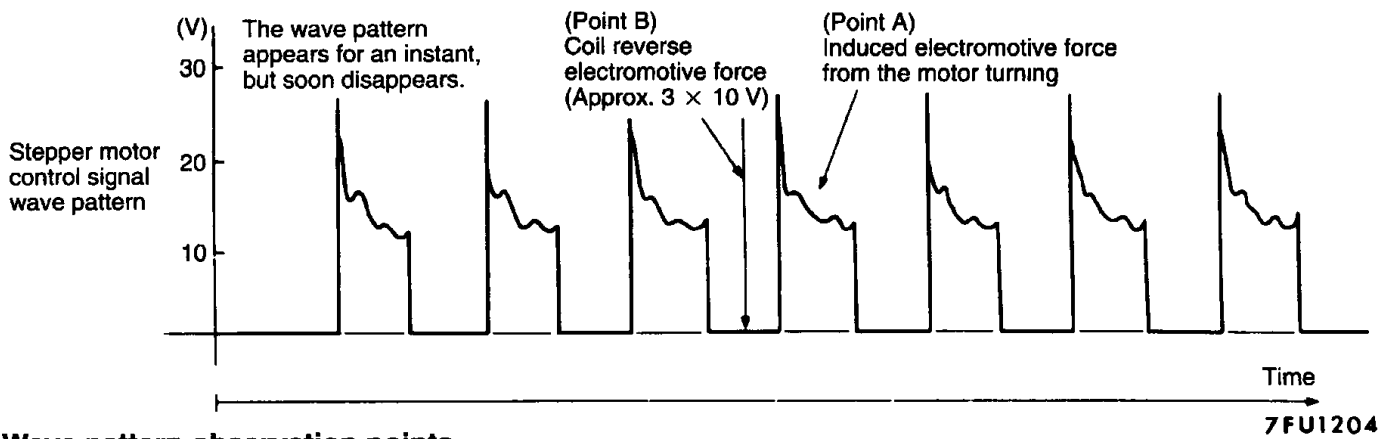
Alternative method (when test harness is not available)

Connect the analyzer special patterns pickup to ECU terminals (4), (5), (17) and (18).

Standard wave pattern

Observation conditions

Function	Special patterns
Pattern height	High
Pattern selector	Display
Engine condition	Turn the ignition switch from OFF to ON (without starting the engine).
	While the engine is idling, turn the air conditioner switch to ON.
	Immediately after starting the warm engine (approx. 1 minute).



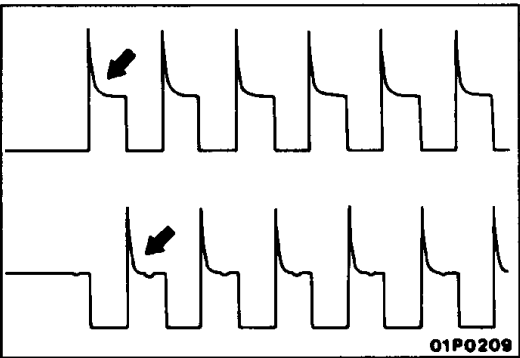
Wave pattern observation points

Check that the standard wave pattern appears when the stepper motor is operating.
(Point A): Presence or absence of induced electromotive force from the motor turning. (Refer to the abnormal wave pattern.)

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

(Point B): Height of coil reverse electromotive force

Contrast with standard wave pattern	Probable cause
Coil reverse electromotive force does not appear or is extremely small.	Short in the coil



Abnormal wave pattern

Cause of problem

Motor is malfunctioning. (Motor is not operating.)

Wave pattern characteristics

Induced electromotive force from the motor turning does not appear.

HARNESS INSPECTION

1

Ⓐ Harness side connector

Ⓑ Control relay harness side connector

7FU1951

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**

✗ → Repair the harness.
(Ⓐ 2 5) – (Ⓑ 1)

2

Ⓐ Harness side connector

Engine control unit harness side connector

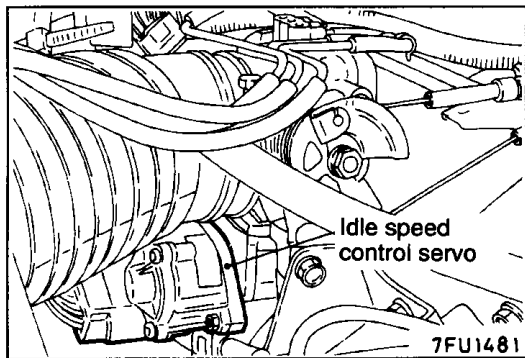
7FU2110

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**

✗ → Repair the harness.
(Ⓐ 1 – 4)
(Ⓐ 3 – 17)
(Ⓐ 4 – 5)
(Ⓐ 6 – 18)



ACTUATOR INSPECTION

Checking the Operation Sound

- Check that the operation sound of the stepper motor can be heard after the ignition is switched ON (but without starting the motor).
- 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.

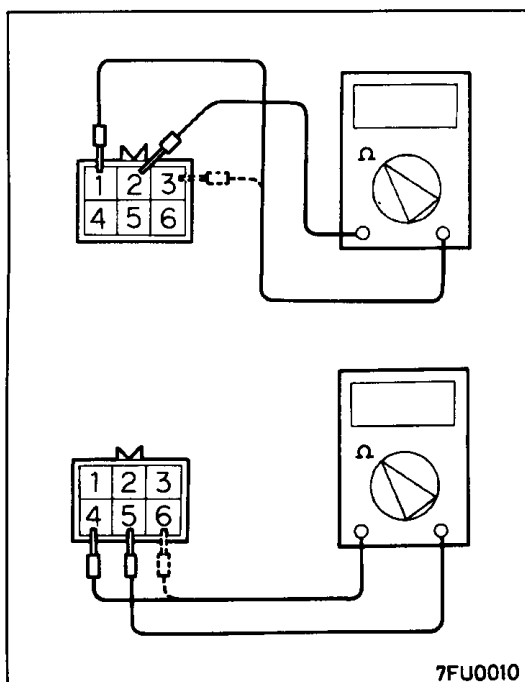
Checking the Coil Resistance

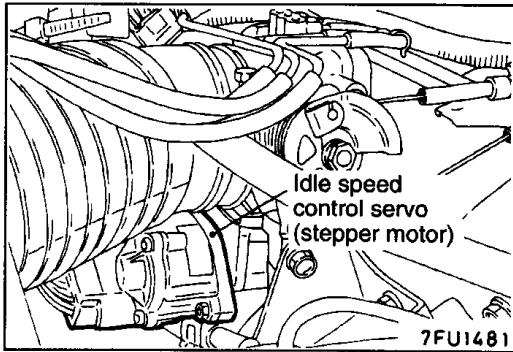
- Disconnect the idle speed control servo connector and connect the special tool (test harness).
- Measure the resistance between terminal ② (white clip of the special tool) and either terminal ① (red clip) or terminal ③ (blue clip) of the connector at the idle speed control servo side.

Standard value: 28 – 33Ω [at 20°C]

- 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.

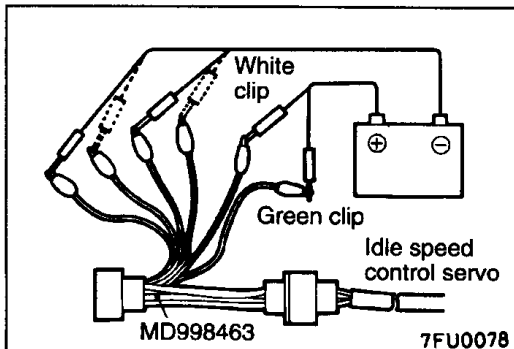
Standard value: 28 – 33Ω [at 20°C]



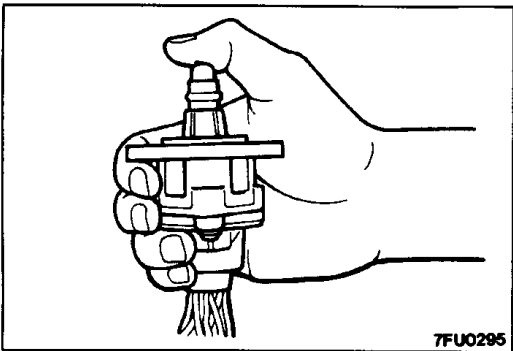


Operation Check

- (1) Remove the throttle body.
- (2) Remove the stepper motor.

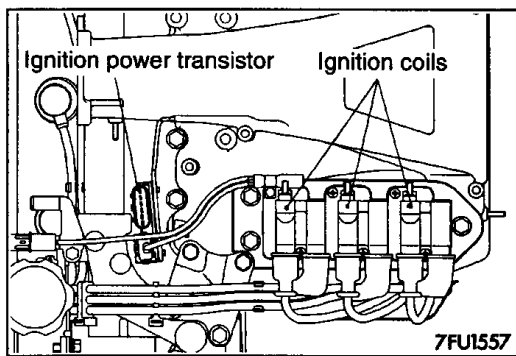


- (3) Connect the special tool (test harness) to the idle speed control servo connector.
- (4) Connect the positive $\oplus$ terminal of a power supply (approx. 6 V) to the white clip and the green clip.

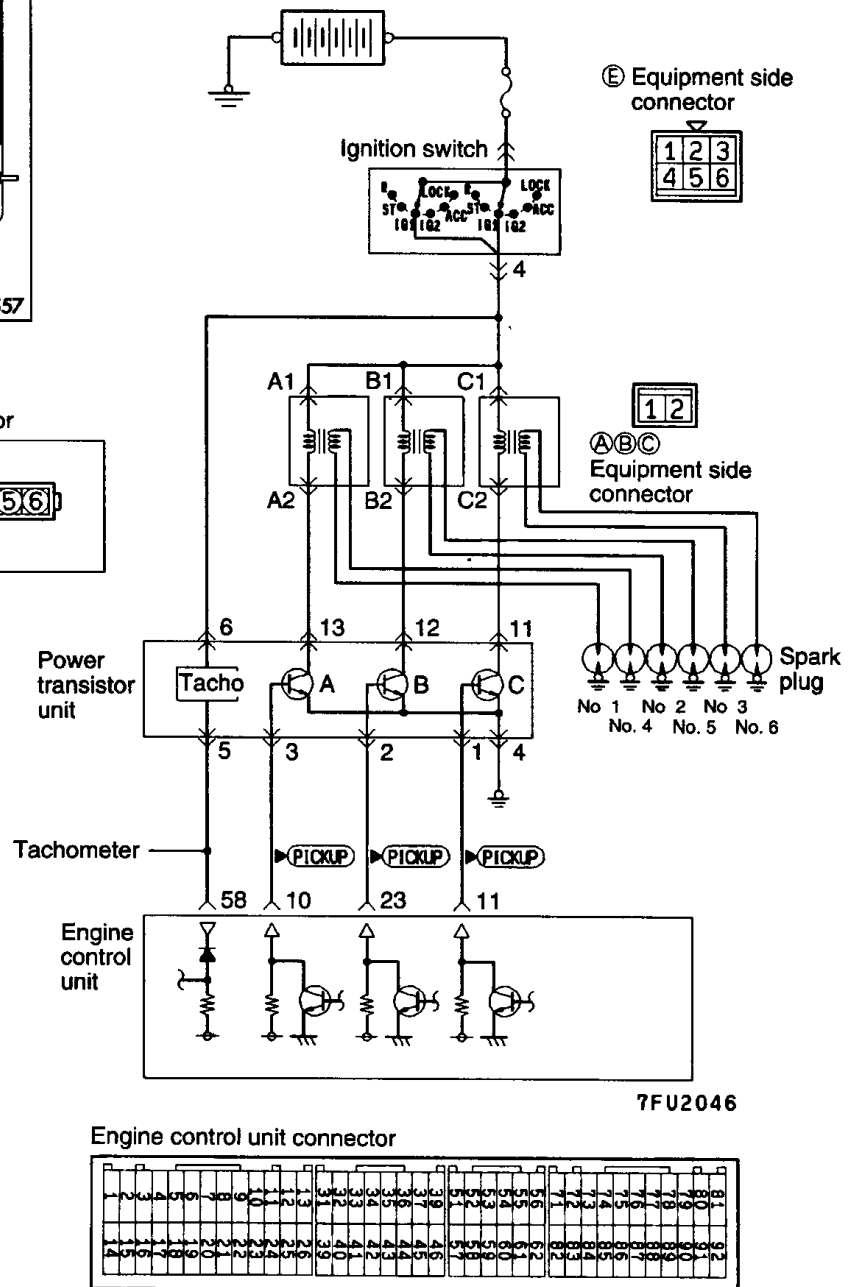
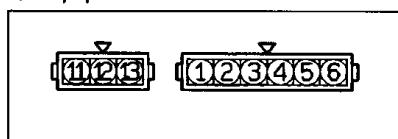


- (5) With the idle speed control servo as shown in the illustration, connect the negative $\ominus$ terminal of the power supply to each clip as described in the following steps, and check whether or not a vibrating feeling (a feeling of very slight vibration of the stepper motor) is generated as a result of the activation of the stepper motor.
 - ① Connect the negative $\ominus$ terminal of the power supply to the red and black clip.
 - ② Connect the negative $\ominus$ terminal of the power supply to the blue and black clip.
 - ③ Connect the negative $\ominus$ terminal of the power supply to the blue and yellow clip.
 - ④ Connect the negative $\ominus$ terminal of the power supply to the red and yellow clip.
 - ⑤ Connect the negative $\ominus$ terminal of the power supply to the red and black clip.
 - ⑥ Repeat the tests in sequence from ⑤ to ①.
- (6) If, as a result of these tests, vibration is detected, the stepper motor can be considered to be normal.

IGNITION COIL AND POWER TRANSISTOR



① Equipment side connector



OPERATION

- When the power transistor unit A is turned ON by the signal from the engine control unit, primary current flows to the ignition coil A. When the power transistor unit A is turned OFF, the primary current is shut off and a high voltage is induced in the secondary coil A, causing the ignition plugs of No. 1 and No. 4 cylinders to spark. When the power transistor unit B is turned OFF, the ignition plugs of No. 2 and No. 5 cylinders spark. In addition, when the power transistor unit C is turned OFF, the ignition plugs of No. 3 and No. 6 cylinders spark.
- When the engine control unit turns OFF the transistor in the unit, the battery voltage in the unit is applied to the power transistor unit to turn it ON. When the engine control unit turns ON the transistor in the unit, the power transistor unit is turned OFF.

13-90 FUEL SYSTEM <6G72-SOHC 24Valve Engine, 6G74-SOHC 24Valve Engine> – On-Vehicle Inspection of MPI Components

INSPECTION

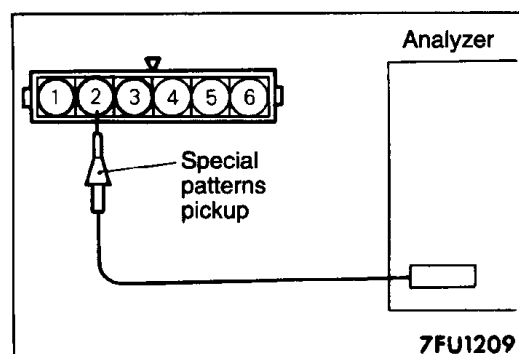
Using MUT-II

<Spark Advance>

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)	700 r/min (Idle)	7 – 23° BTDC
				2,500 r/min	27 – 47° BTDC

<Standard Ignition Timing>

Function	Item No.	Drive	Check condition	Normal condition
Actuator test	17	Set to ignition timing adjustment mode	- Engine: idling - Timing lamp: set	5° BTDC $\pm$ 3°



Wave Pattern Inspection Using an Analyzer

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

<Measurement method>

- Disconnect the power transistor connector, and connect the special tool (test harness: MB991348) in between. (All terminals should be connected.)
- Connect the analyzer special patterns pickup to the connector terminals ① (No. 3 – No. 6), ② (No. 2 – No. 5) and ③ (No. 1 – No. 4) in that order.

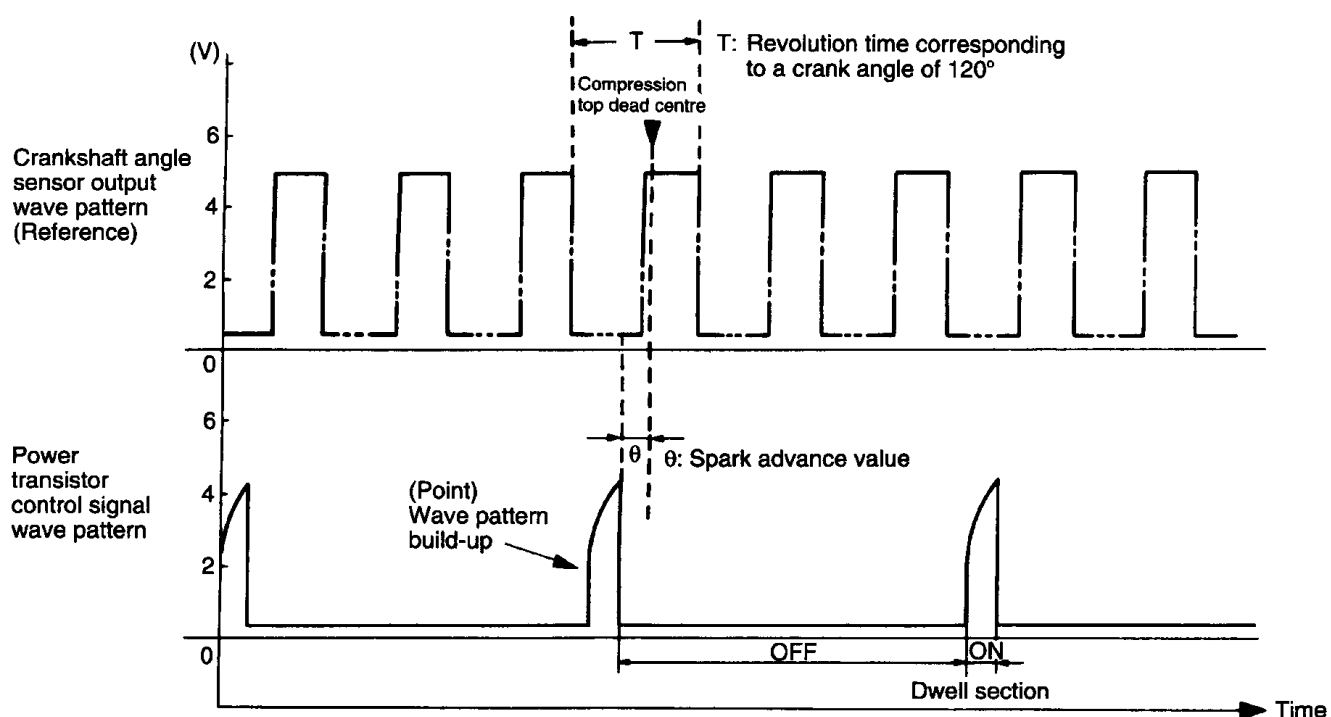
Alternative method (when test harness is not available)

Connect the analyzer special patterns pickup to engine control unit terminals (10), (11), (23) and (31) for the ignition power transistor.

Standard wave pattern

Observation conditions

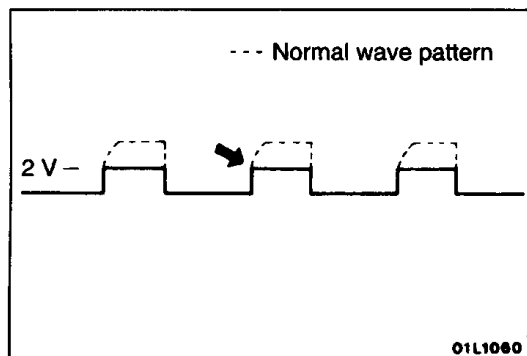
Function	Special patterns
Pattern height	Low
Pattern selector	Display
Engine revolutions	Approx. 1,200 r/min



Wave pattern observation points

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

Condition of wave pattern build-up and maximum voltage	Probable cause
Rise to the right to approximately 4.5 V from around 2 V.	Normal
Becomes a rectangular wave at approx. 2 V	Broken wire in ignition primary circuit
Becomes a rectangular wave at power voltage	Malfunction of the power transistor



Examples of abnormal wave patterns

● Example 1

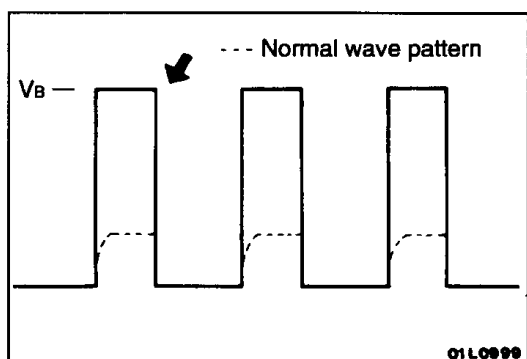
Wave pattern during engine cranking

Cause of problem

Broken wire in ignition primary circuit

Wave pattern characteristics

Top-right part of the build-up section cannot be seen, and voltage value is approximately 2 V too low.



● Example 2

Wave pattern during engine cranking

Cause of problem

Malfunction in power transistor

Wave pattern characteristics

Power voltage results when the power transistor is ON.

HARNESS INSPECTION

1 Ⓔ Harness side connector ABC Harness side connector 7FU2021	Check for continuity between the ignition coil and the ignition switch [IG]. - Ignition switch connector: Disconnected - Ignition coil connector: Disconnected NOTE Touch the ohmmeter probes to both ends of the harness.	OK → 2 ✗ → Repair the harness. (Ⓔ 4 – Ⓐ Ⓑ Ⓒ 1)		
2 Ⓓ Harness side connector ABC Harness side connector 7FU2022	Check for continuity between the power transistor unit and ignition coil. - Ignition coil connector: Disconnected - Power transistor connector: Disconnected	OK → 3 ✗ → Repair the harness. (Ⓓ 6 – Ⓐ Ⓑ Ⓒ 1)		
3 Ⓓ Harness side connector 7FU1729	Measure the power supply voltage of the ignition coil - Power transistor connector: Disconnected - Ignition switch: ON <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>Voltage (V)</td> </tr> <tr> <td>SV</td> </tr> </table>	Voltage (V)	SV	OK → 4 ✗ → Repair the harness. (Ⓓ 11, Ⓓ 12, Ⓓ 13 – Ignition coil)
Voltage (V)				
SV				
4 Ⓓ Harness side connector Engine control unit harness side connector 7FU2111	Check for open-circuit or short-circuit to earth between the power transistor and engine control unit. - Power transistor connector: Disconnected - Engine control unit connector: Disconnected	OK → 5 ✗ → Repair the harness. (Ⓓ 1 – 11) (Ⓓ 2 – 23) (Ⓓ 3 – 10) (Ⓓ 5 – 31)		
5 Ⓓ Harness side connector 7FU0700	Check for continuity of the earth circuit of the power transistor. Power transistor connector: Disconnected	OK → 6 ✗ → Repair the harness. (Ⓓ 4 – Earth)		

6

Measure the power transistor control signal voltage.

- Power transistor connector: Disconnected
- Ignition switch: ON

Voltage (V)
0.5 – 4.0

OK

→

✗

→

STOP

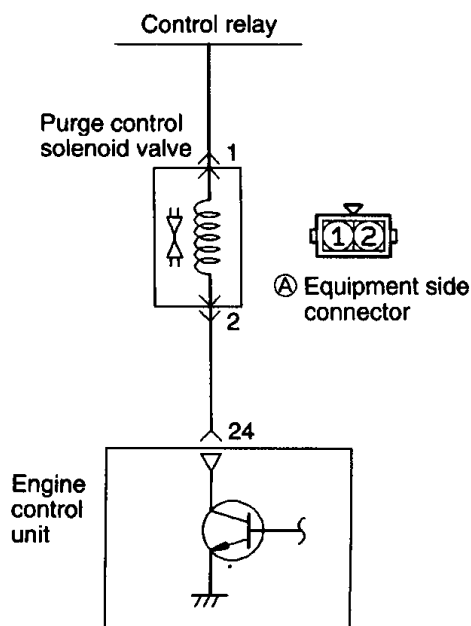
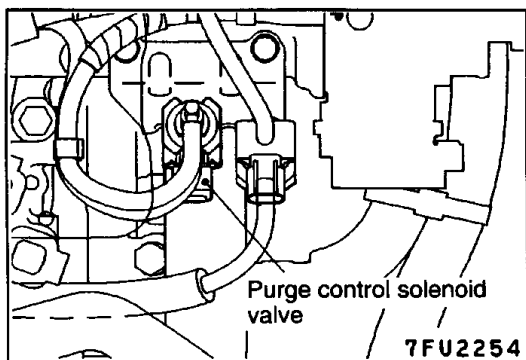
Repair the harness.

(D 1 – 11)
(D 2 – 23)
(D 3 – 10)

ACTUATOR INSPECTION

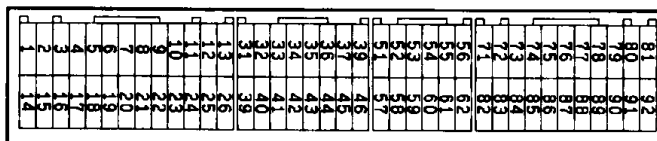
Refer to GROUP 16 – Ignition System.

PURGE CONTROL SOLENOID VALVE



7FU1851

Engine control unit connector



9FU0393

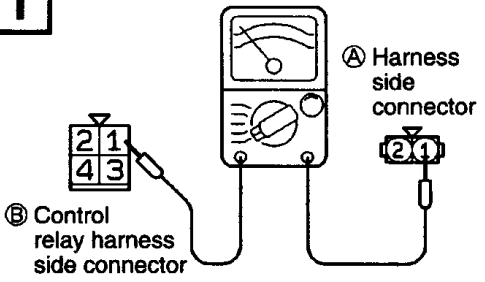
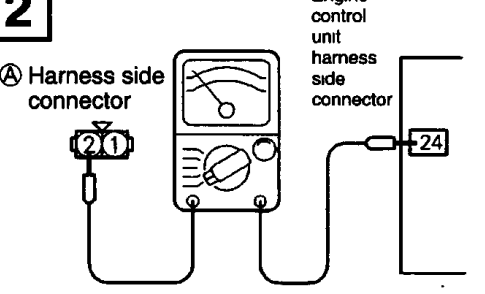
OPERATION

- The purge solenoid is an ON/OFF type of solenoid valve; it functions to regulate the introduction of purge air from the canister to the intake manifold plenum.
- Battery power supply is supplied, by way of the control relay, to the purge solenoid. When the engine control unit switches ON the power transistor within the unit, current flows to the coil, and purge air is introduced.

INSPECTION

Using MUT-II

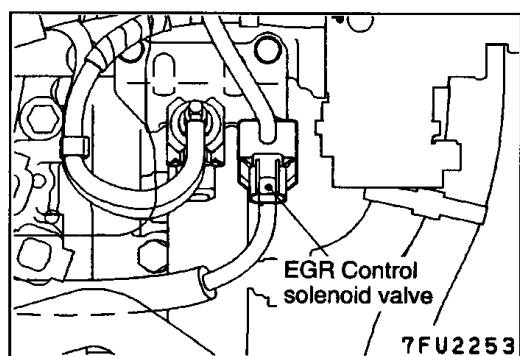
Function	Item No.	Drive contents	Check condition	Normal condition
Actuator test	08	Solenoid valve is switched from OFF to ON.	• Ignition switch: ON	Operating sound is heard when driven

1  Ⓐ Harness side connector Ⓑ Control relay harness side connector 7FU2024	Check for continuity between the purge solenoid and the control relay. • Purge solenoid connector: Disconnected • Control relay connector: Disconnected NOTE • Touch the ohmmeter probes to both ends of the harness.	OK → 2 ✗ → Repair the harness. (Ⓐ 1 – Ⓑ 1)
2  Ⓐ Harness side connector Engine control unit harness side connector 7FU2114	Check for an open-circuit, or a short-circuit to earth, between the purge solenoid and the engine control unit. • Purge solenoid connector: Disconnected • Engine control unit connector: Disconnected	OK → STOP ✗ → Repair the harness. (Ⓐ 2 – 24)

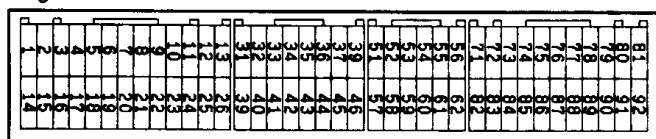
ACTUATOR INSPECTION

Refer to GROUP 17 – Service Adjustment Procedures.

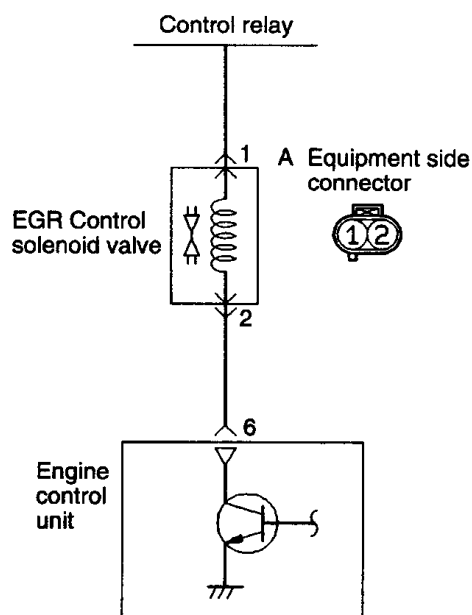
EGR CONTROL SOLENOID VALVE



Engine control unit connector



9FU0393



7FU2047

OPERATION

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

TROUBLESHOOTING HINTS

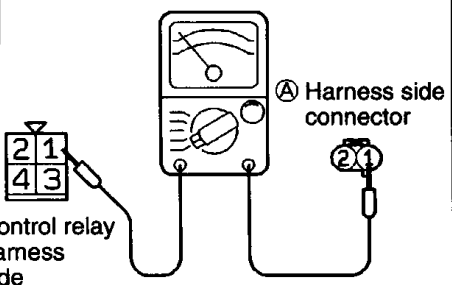
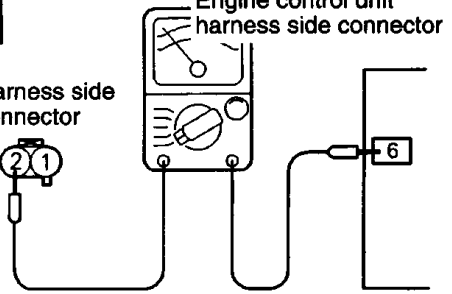
If the results of EGR control solenoid valve on-vehicle and off-vehicle inspections are normal but the self-diagnosis code for EGR system failure is displayed, check the EGR valve, vacuum hose and EGR passage for blocking.

INSPECTION

Using MUT-II

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

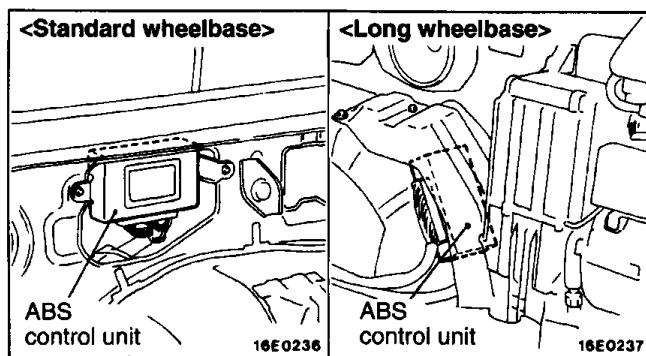
HARNESS INSPECTION

1  Ⓐ Harness side connector Ⓑ Control relay harness side connector 7FU2115	Check for continuity between EGR control solenoid valve and control relay • EGR control solenoid valve connector: Disconnected • Control relay connector: Disconnected NOTE Touch the ohmmeter probes to both ends of the harness OK ✗	2 Repair the harness. (Ⓐ 1 – Ⓑ 1)
2  Ⓐ Harness side connector Engine control unit harness side connector 7FU2116	Check for an open-circuit, or a short-circuit to earth, between the EGR control solenoid valve and the engine control unit. • EGR control solenoid valve connector: Disconnected • Engine control unit connector: Disconnected OK ✗	STOP Repair the harness. (Ⓐ 2 – 6)

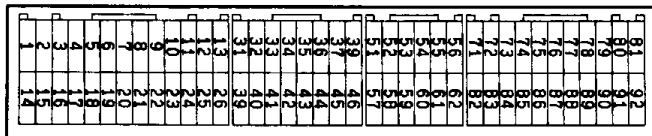
ACTUATOR INSPECTION

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

ANTI-SKID BRAKE SIGNAL

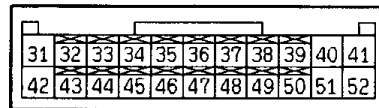


Engine control unit connector

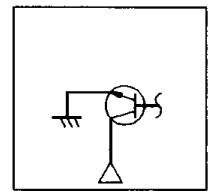


9FU0393

ABS control unit equipment side connector



ABS ECU

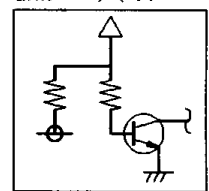


39

ABS HU

Engine control unit

44



7FU2299

OPERATION

- The anti-skid braking signal is output by the anti-skid braking system (ABS) control unit to the engine control unit as a signal to indicate whether the motor relay is being driven or not. The engine control unit controls the idle speed control servo by means of this signal, and gives accurate anti-skid braking effectiveness.
- The ABS control unit turns the power transistor ON when the motor relay is being driven, and the output terminal which has battery voltage applied is shorted to the earth. This causes the anti-skid braking signal to change from HIGH to LOW.

HARNESS INSPECTION

1

ABS control unit harness side connector

Engine control unit harness side connector

6FU1543

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

- ABS control unit connector: Disconnected
- Engine control unit connector: Disconnected

OK → **STOP**

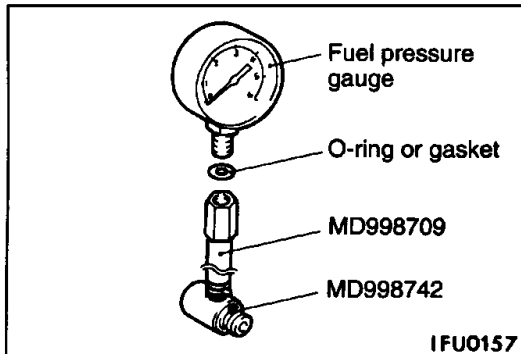
✗ → Repair the harness. (A 39 - 44)

FUEL PRESSURE TEST

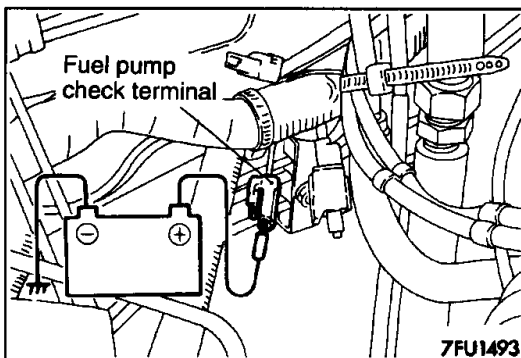
- (1) Reduce the internal pressure of the fuel pipes and hoses.
- (2) Remove the fuel pressure regulator at the delivery pipe side.

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.

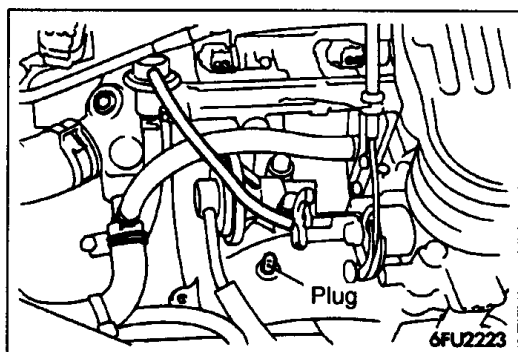


- (3) Set a fuel pressure gauge on the special tool, placing an adequate O-ring or gasket between the gauge end special tool to prevent fuel leaks.
- (4) Install the special tool set in the step (3) between the delivery pipe and the fuel pressure gauge.



- (5) Connect a jumper wire to the terminal for activation of the fuel pump and to the positive (+) terminal of the battery to activate the fuel pump. With fuel pressure applied, check to be sure that there is no fuel leakage from the fuel pressure gauge and the special tool connection part.
- (6) Disconnect the jumper wire from the terminal for activation of the fuel pump to stop the fuel pump.
- (7) Start the engine and let it idle.
- (8) Measure the fuel pressure during idling.

Standard value: Approx. 270 kPa at curb idle



- (9) Disconnect the vacuum hose (blue stripe) from the intake manifold and plug the nipple. Then measure fuel pressure.

Standard value: 330 – 350 kPa at curb idle speed

- (10) Check to be sure that the fuel pressure during idling does not decrease even after the engine is raced a few times.
 (11) Use a finger to gently press the fuel return hose while repeatedly racing the engine, and check to be sure that there is fuel pressure in the return hose also.

NOTE

There will be no fuel pressure in the return hose if there is insufficient fuel flow.

- (12) If the fuel pressure measured in steps (8) to (11) deviates from the standard value range, check for the probable cause by referring to the table below, and then make the appropriate repair.

Condition	Probable cause	Remedy
- Fuel pressure is too low. - Fuel pressure drops during racing. - No fuel pressure in fuel return hose.	Fuel filter is clogged.	Replace the fuel filter.
	Malfunction of the valve seat within the fuel pressure regulator, or fuel leakage to return side caused by spring deterioration.	Replace the fuel pressure regulator.
Fuel pressure is too high	Fuel pump low discharge pressure.	Replace the fuel pump.
	The valve within the fuel pressure regulator is sticking.	Replace the fuel pressure regulator.
	Clogging of the fuel return hose and/or the pipe.	Clean or replace the hose and/or pipe.
No change of the fuel pressure when vacuum hose is connected and when not connected.	Damaged vacuum hose or nipple clogging.	Replace the vacuum hose, or clean the nipple.

(13) Stop the engine and check for a change of the value indicated by the fuel pressure gauge. The condition is normal if there is no decrease of the indicated value within two minutes.

If there is a decrease of the indicated value, monitor the speed of the decrease, and, referring to the table below, determine the cause of the problem and make the appropriate repair.

Condition	Probable cause	Remedy
After the engine is stopped, the fuel pressure drops gradually.	Injector leakage.	Replace the injector.
	Leakage at the fuel pressure regulator valve seat.	Replace the fuel pressure regulator.
There is a sudden sharp drop of the fuel pressure immediately after the engine is stopped.	The check valve (within the fuel pump) is not closed.	Replace the fuel pump.

(14) Remove all remaining pressure from inside the fuel pipe.

(15) Disconnect the fuel pressure gauge and the special tool from the delivery pipe.

Caution

Because there will be a slight amount of remaining pressure in the fuel pipe line, use rags to cover so that fuel doesn't splatter.

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

(17) After connecting the fuel high-pressure hose to the delivery pipe, tighten the installation bolt at the specified torque.

Tightening torque: 5 Nm

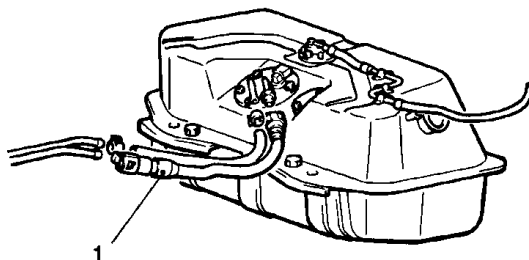
(18) Check to be sure that there is no fuel leakage.

① Apply battery voltage to the terminal for activation of the fuel pump so as to activate the fuel pump.

② With fuel pressure applied, check for leakage of the fuel line.

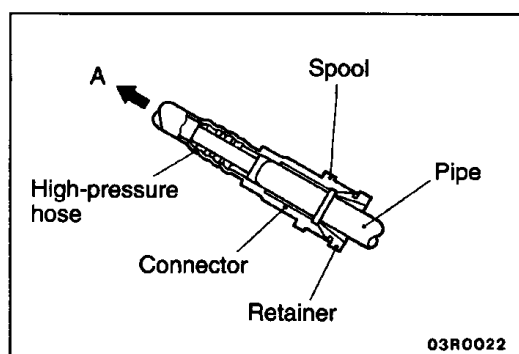
FUEL TANK

REMOVAL AND INSTALLATION



03E0209

►A◄ 1. High pressure fuel hose



03R0022

INSTALLATION SERVICE POINT

►A◄ HIGH-PRESSURE HOSE CONNECTION

- (1) Insert the high-pressure hose connector securely into the pipe until the retainer goes past the spool of the pipe.
- (2) After inserting, gently pull the connector in the direction of A in the illustration and check that the connector does not pull out.

FUEL SYSTEM <4D56 Engine>

GENERAL

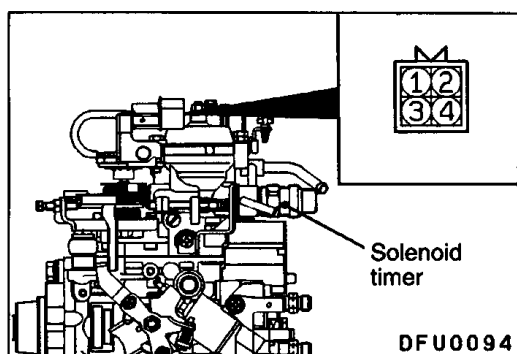
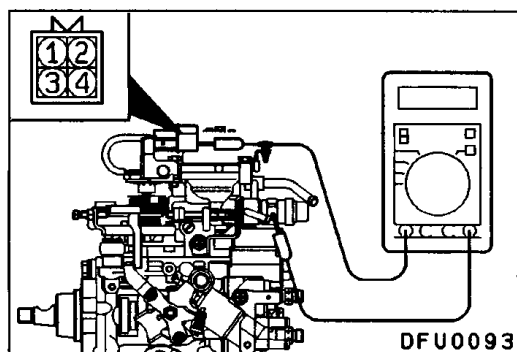
OUTLINE OF CHANGES

- The injection timing control solenoid (solenoid timer) has been added to some models. To correspond to this, only the maintenance service procedures which are different from the previous type of fuel system are given below.

SPECIFICATIONS

SERVICE SPECIFICATIONS

Item	Specifications
Standard valve Injection timing control solenoid coil resistance Ω	8 – 10



SERVICE ADJUSTMENT PROCEDURES

FUEL INJECTION PUMP INSPECTION

1. INSPECTION OF INJECTION TIMING CONTROL SOLENOID COIL RESISTANCE

- (1) Measure the resistance between the injection pump connector terminal No. 4 (injection timing control solenoid terminal) and the injection pump body.

Standard value: 8 – 10 Ω (at 20°C)

2. INJECTION TIMING CONTROL SOLENOID OPERATION CHECK

- (1) Check that operation sound of the injection timing control solenoid can be heard when connecting the injection pump connector terminal No. 4 (injection timing control solenoid terminal) and the battery positive terminal.

GROUP 14

COOLING

GENERAL

OUTLINE OF CHANGES

- A 6G74-SOHC 24-valve engine has been added, and the thermostat for 6G72-SOHC 24-valve engine has been changed. To correspond to this, the maintenance service procedures which are different from the previous type of cooling system are given below.

SPECIFICATIONS

SERVICE SPECIFICATIONS

Items	Standard value
Thermostat <6G72-SOHC 24 Valve, 6G74-SOHC 24 Valve> Valve opening temperature of thermostat °C Full-opening temperature of thermostat °C	88 100 or more

THERMOSTAT <6G72-SOHC 24 Valve, 6G74-SOHC 24 Valve>

INSPECTION

- Check that valve closes tightly at room temperature.
- Check for defects or damage.
- Check for rust or encrustation on valve. Remove if any.
- Immerse the thermostat in water. Stir to raise water temperature and check that thermostat valve opening temperature and the temperature at which valve fully opens valve lift amount (8 mm) are at the standard value.

Standard value:

Valve opening temperature 88°C
Temperature at which the valve fully opens
 100°C or more

NOTE

Measure valve height when fully closed. Calculate lift by measuring the height when fully open.

GROUP 15

INTAKE AND EXHAUST

GENERAL

OUTLINE OF CHANGE

A 6G74-SOHC 24-valve engine has been added. To correspond to this, the maintenance service procedures for the intake manifold are given below.

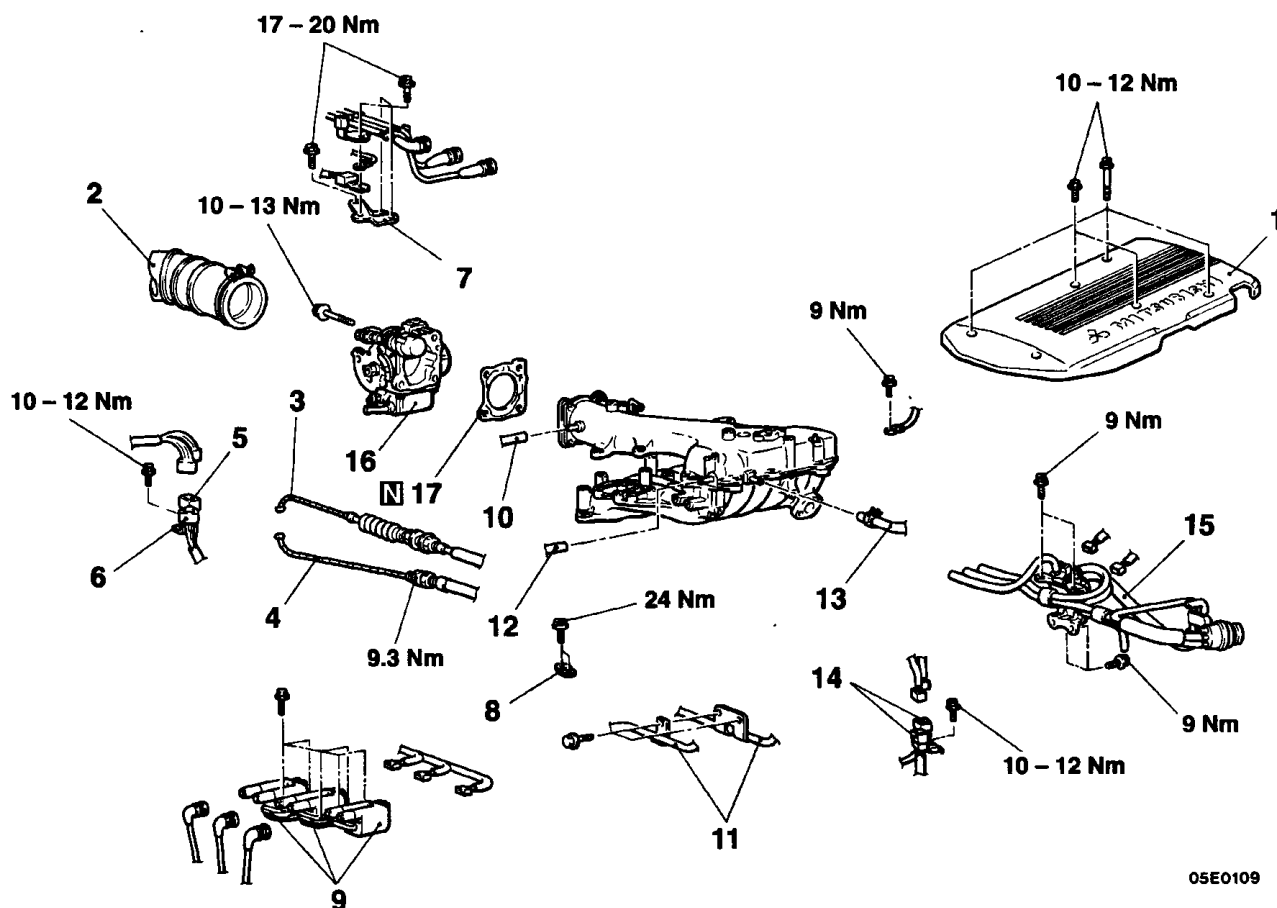
AIR INTAKE PLENUM

REMOVAL AND INSTALLATION

Post-installation Operation

- Accelerator Cable Adjustment

- Throttle Cable Adjustment <A/T>

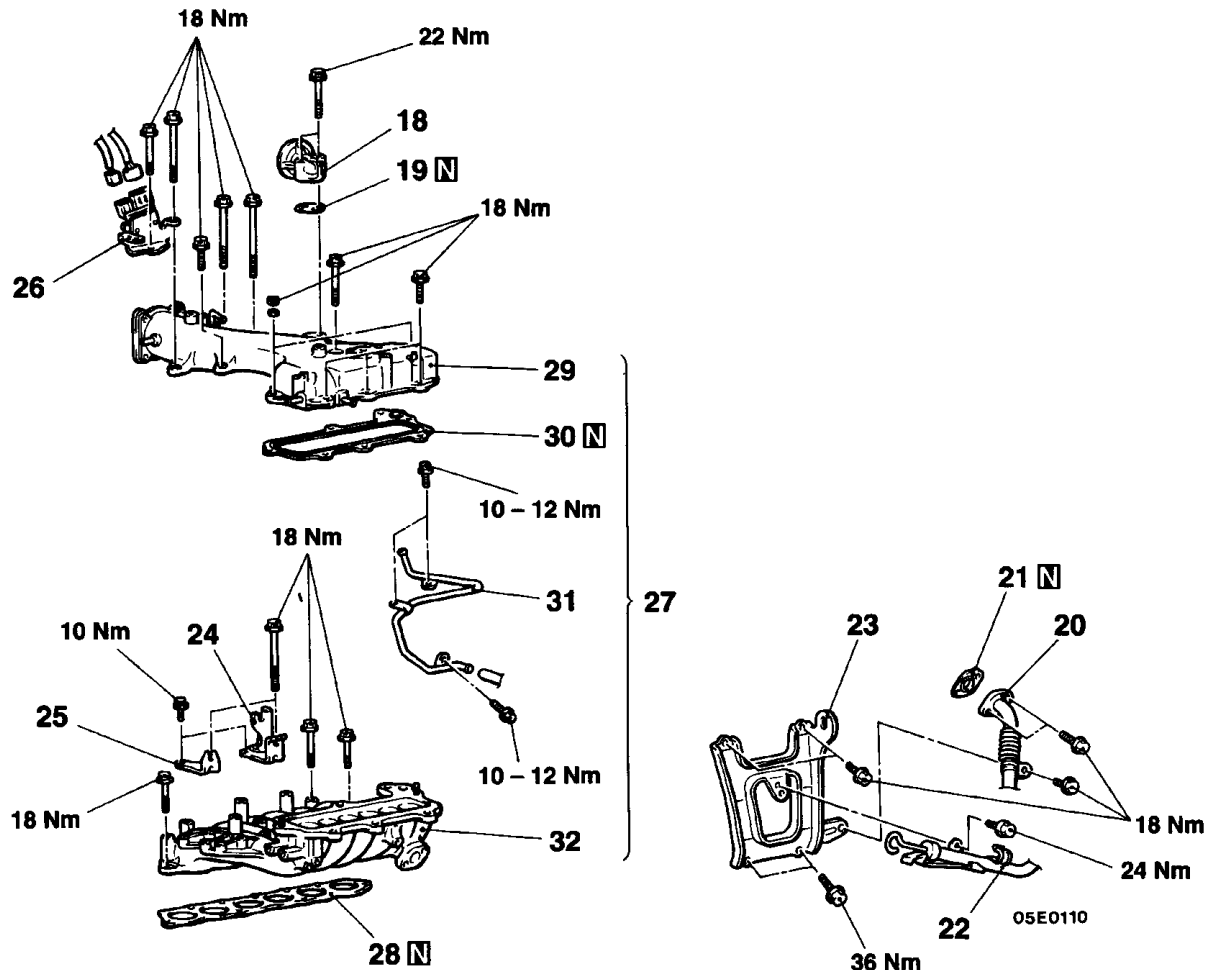


05E0109

Removal steps

1. Air intake plenum cover
2. Air intake hose connection
3. Throttle cable connection <A/T>
4. Accelerator cable connection
5. Crank angle sensor connector
6. Camshaft position sensor connector
7. Water outlet fitting bracket
8. Water pump stay
9. Ignition coils
10. Vacuum hose connection
11. Fuel pipe connection
12. PCV hose connection
13. Brake booster vacuum hose connection
14. Oxygen sensor connector
15. Solenoid valve assembly and vacuum hose assembly
16. Throttle body assembly
17. Throttle body gasket





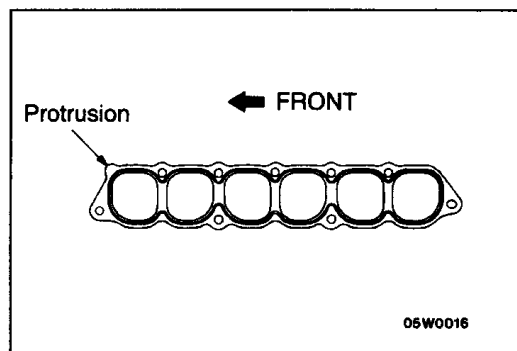
- 18. EGR valve
- 19. EGR valve gasket
- 20. EGR pipe connection
- 21. EGR pipe gasket
- 22. Fluid filler pipe connection <A/T>
- 23. Air intake plenum stay
- 24. Throttle cable bracket <A/T>
- 25. Accelerator cable bracket <M/T>

- 26. Power transistor
- 27. Air intake plenum assembly
- 28. Air intake plenum gasket
- 29. Air intake fitting
- 30. Air intake fitting gasket
- 31. Vacuum pipe
- 32. Upper intake manifold

REMOVAL SERVICE POINT

◀A▶ THROTTLE BODY ASSEMBLY REMOVAL

Leave the water hoses attached to the throttle body assembly.

**INSTALLATION SERVICE POINT****►A◄ AIR INTAKE PLENUM GASKET INSTALLATION**

Install the gasket with the protrusion in the position illustrated.

INSPECTION

Check the air intake plenum for damage and cracks and replace it if any defects are found.

INTAKE MANIFOLD

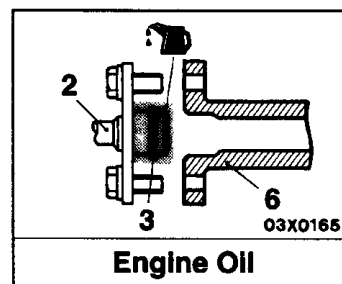
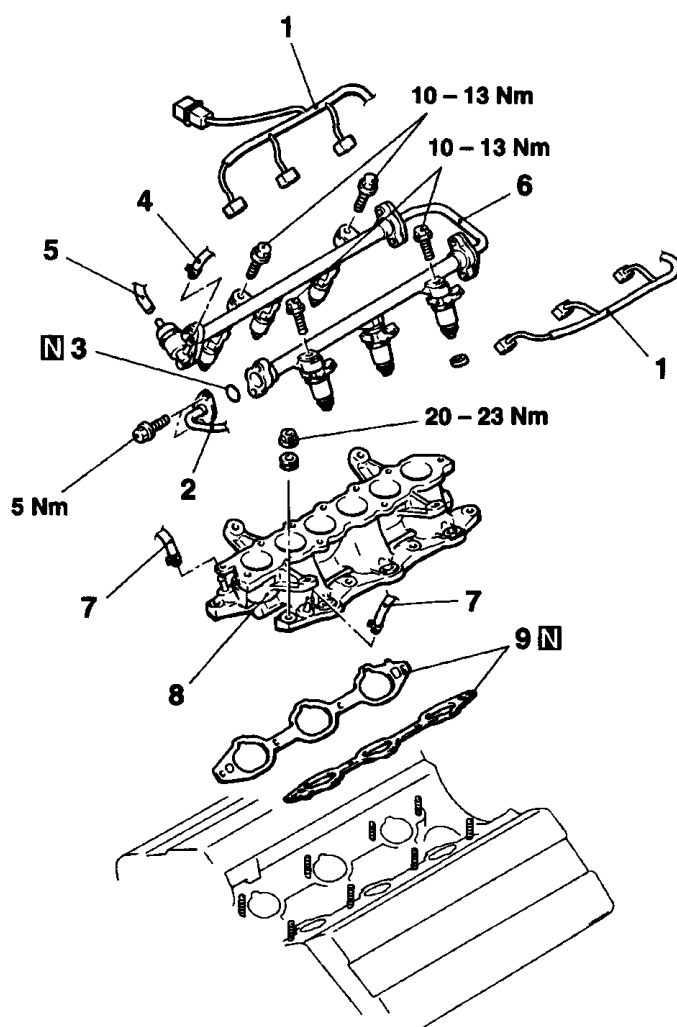
REMOVAL AND INSTALLATION

Pre-removal Operation

- Residual Pressure Release from High Pressure Hose
- Engine Coolant Draining
- Air Intake Plenum Removal (Refer to P.15-1.)

Post-installation Operation

- Air Intake Plenum Installation (Refer to P.15-1.)
- Engine Coolant Filling
- Accelerator Cable Adjustment
- Throttle Cable Adjustment
- Fuel Leakage Checking

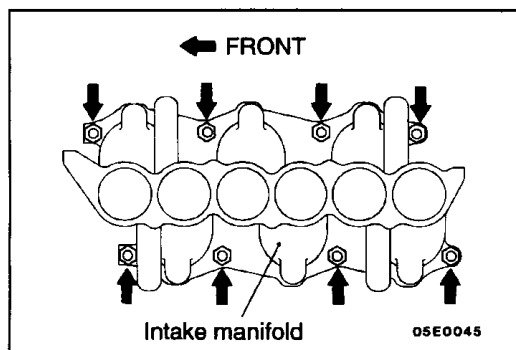
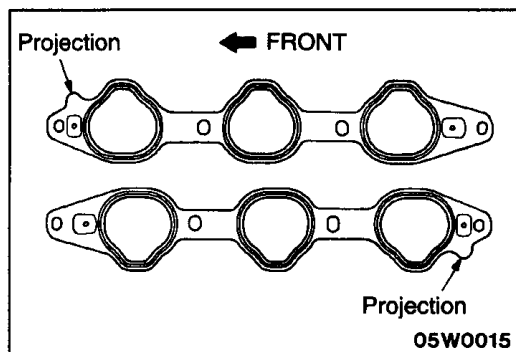


05E0094

Removal steps

1. Injector harness connection
2. High-pressure fuel hose connection
3. O-ring
4. Fuel return hose connection
5. Vacuum hose connection

6. Fuel rail (with injectors)
7. Water hose connection
8. Intake manifold
9. Intake manifold gasket



INSTALLATION SERVICE POINTS

►A◄ INTAKE MANIFOLD GASKET INSTALLATION

Install the gaskets so that the projections face in the directions shown in the illustration.

►B◄ INTAKE MANIFOLD INSTALLATION

Tighten the intake manifold mounting nuts one bank after the other by the following procedure.

- (1) Tighten the nuts in the right bank to 7 Nm.
- (2) Tighten the nuts in the left bank to 20 to 23 Nm.
- (3) Tighten the nuts in the right bank to 20 to 23 Nm.
- (4) Repeat steps (2) and (3) again in the same order.

►C◄ HIGH-PRESSURE FUEL HOSE INSTALLATION

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 high-pressure fuel hose to the right and left, install the delivery pipe, while being careful not to damage the O-ring.
3. If it does not turn smoothly, the O-ring may be trapped, remove the high-pressure fuel hose and then re-insert it into the delivery pipe and check once again.
4. Tighten the high-pressure fuel hose to the specified torque.

Tightening torque: 5 Nm

INSPECTION

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

- (1) Damage or cracking of any part.
- (2) Clogging of the negative pressure (vacuum) outlet port, or clogging of the water or gas passages.

GROUP 16

ENGINE ELECTRICAL

GENERAL

OUTLINE OF CHANGES

- A 6G74-SOHC 24-valve engine has been added, and the alternator and ignition coil for 6G72-SOHC 24-valve engine have been changed. To correspond to this, the maintenance service procedures which are different from the previous type of engine electrical system are given below.

CHARGING SYSTEM

SPECIFICATIONS

GENERAL SPECIFICATIONS

ALTERNATOR

Item	Specifications
Type Rated output V/A Voltage regulator	Battery voltage sensing 12/100 Electronic built in type

IGNITION SYSTEM

SPECIFICATIONS

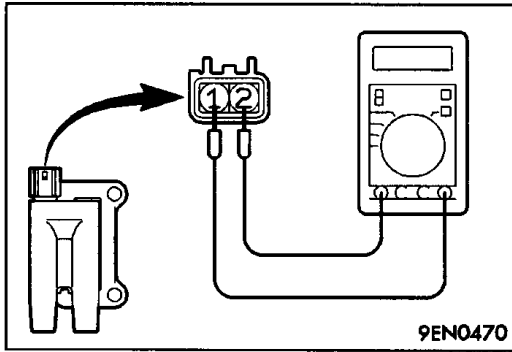
GENERAL SPECIFICATIONS

IGNITION COIL

Item	Specification
Type Identification No.	Mold 3-coil FC0020, FC0021

SERVICE SPECIFICATIONS

Item	Standard value
Ignition coil Primary coil resistance Ω Secondary coil resistance $k\Omega$	0.74 – 0.90 20.1 – 27.3

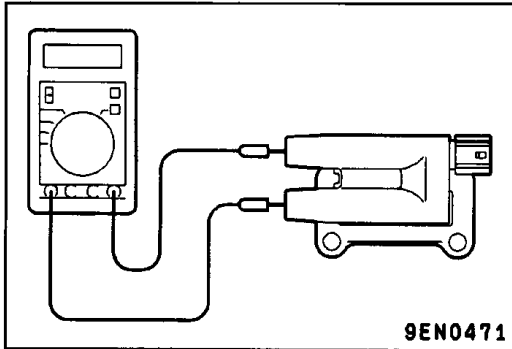


SERVICE ADJUSTMENT PROCEDURES IGNITION COIL INSPECTION

MEASUREMENT OF PRIMARY COIL RESISTANCE

Measure the resistance between the terminals for each cylinder (No.1 – No.4, No.2 – No.5, No.3 – No.6) of the ignition coil as shown in the illustration.

Standard value: 0.74 – 0.90 Ω



MEASUREMENT OF SECONDARY COIL RESISTANCE

Measure the resistance between the high-voltage terminals for each cylinder (No.1 – No.4, No.2 – No.5, No.3 – No.6) of the ignition coil as shown in the illustration.

Standard value: 20.1 – 27.3 k Ω

EMISSION CONTROL

CONTENTS

GENERAL	2	Cautions on Inspection	6
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EMISSION CONTROL

GENERAL

OUTLINE OF CHANGES

- A 6G74-SOHC 24-valve engine has been added. To correspond to this, the maintenance service procedures are given below.
- The specifications for 6G72-SOHC 24-valve engine has been changed. To correspond to this, the maintenance service procedures are given below.
- The lever position sensor (LPS) for 4D56 engine (some models) has been changed. To correspond to this, the maintenance service procedures which are different from the previous type of emission control system are given below.

SPECIFICATIONS

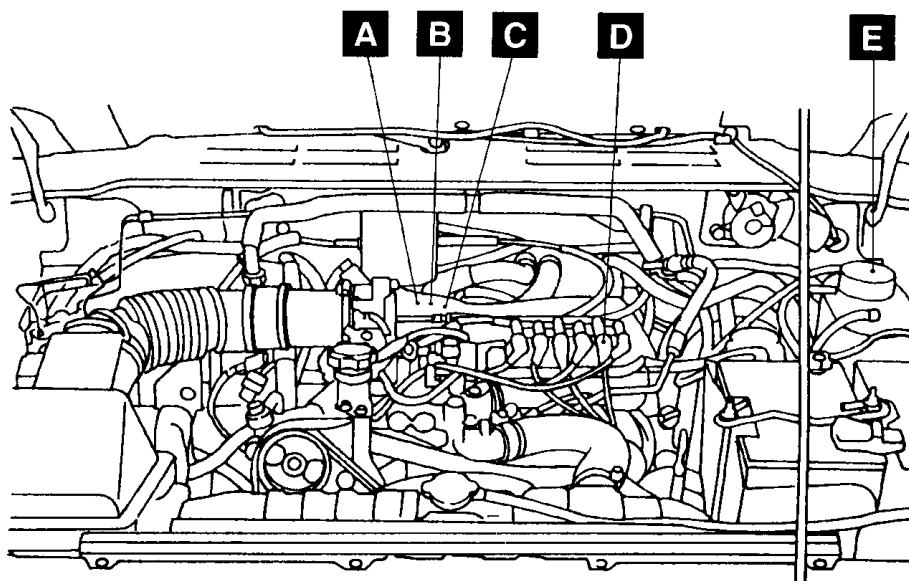
SERVICE SPECIFICATIONS

Item	Standard value
<6G72-SOHC 24 Valve, 6G74-SOHC 24 Valve> Purge control solenoid valve coil resistance [at 20°C] Ω	21 – 27
EGR solenoid valve coil resistance [at 20°C] Ω	28 – 36
<4D56> Lever position sensor output voltage V	
Idle position	0.8 – 1.0
Fully open	3.7 – 5.0

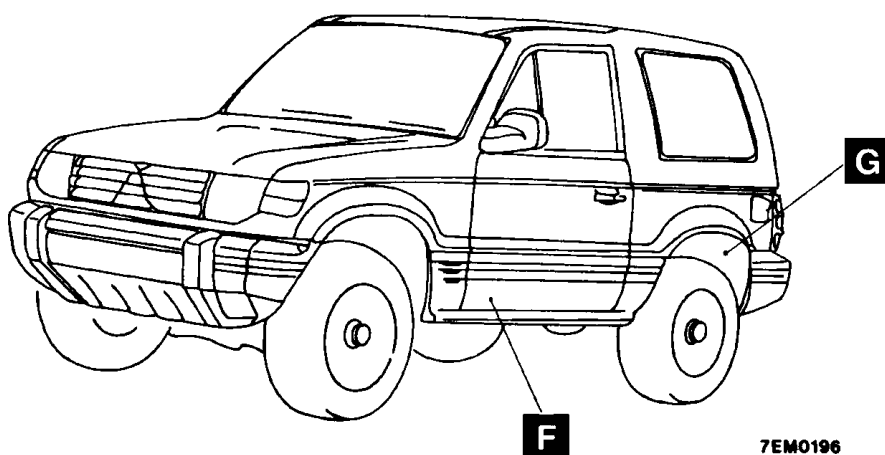
SERVICE ADJUSTMENT PROCEDURES

COMPONENT LAYOUT

<6G72-SOHC 24 Valve Engine, 6G74-SOHC 24 Valve Engine>

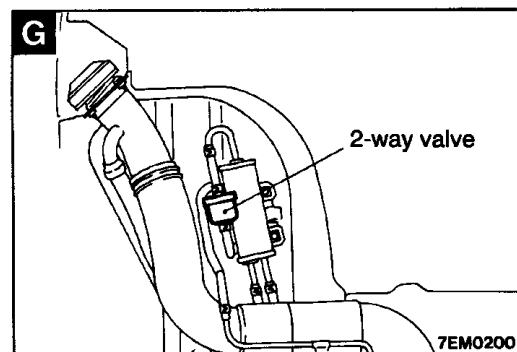
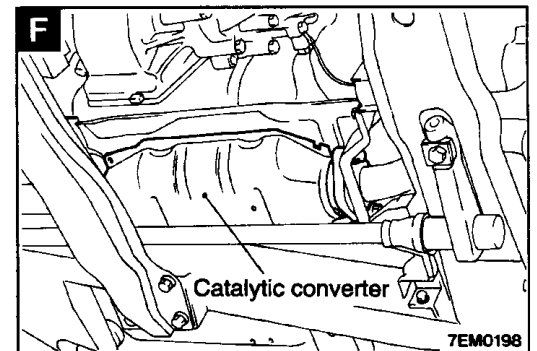
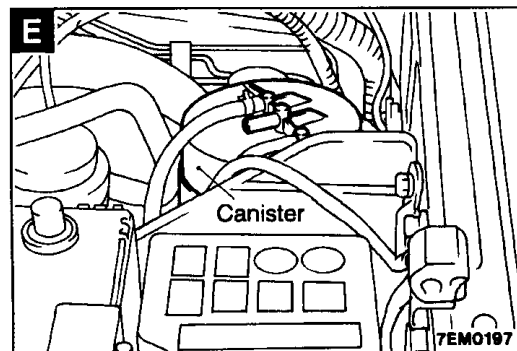
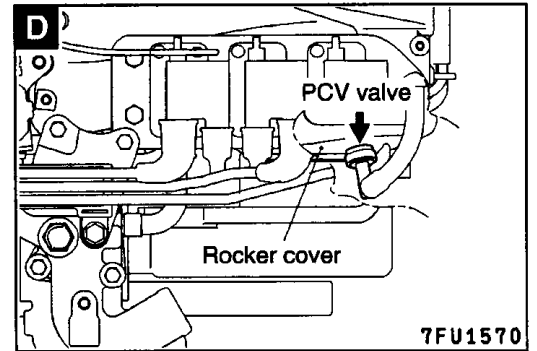
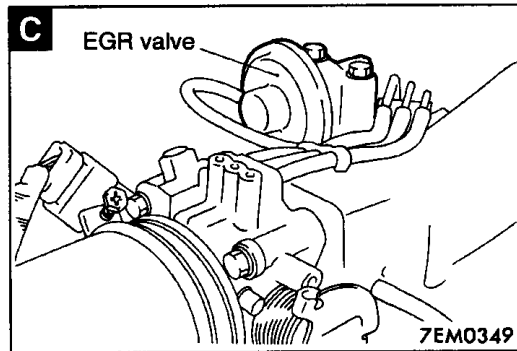
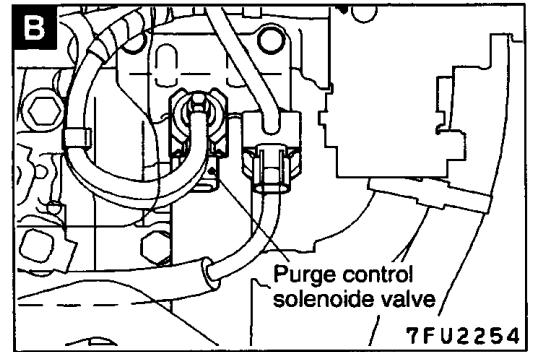
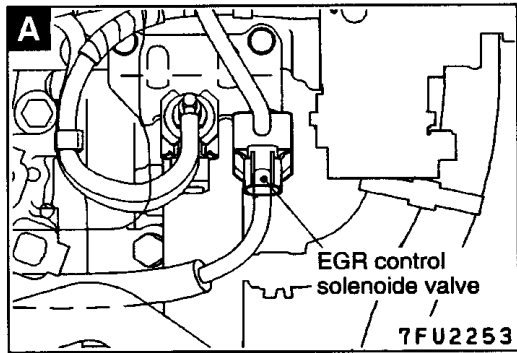


7EM0348



7EM0196

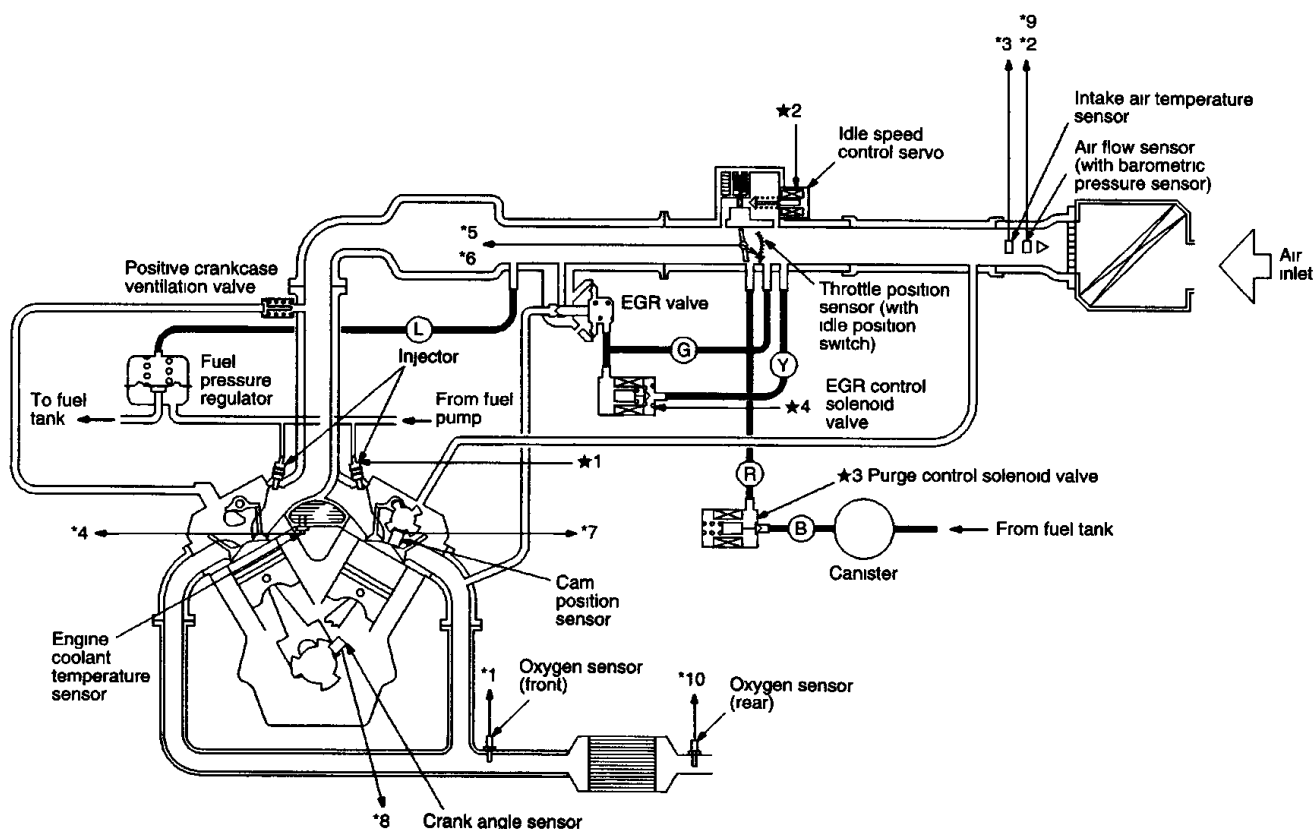
Parts name	Symbol
Canister	E
Catalytic converter	F
EGR valve	C
PCV valve	D
Purge control solenoid valve	B
EGR control solenoid valve	A
2-way valve	G



VACUUM HOSE PIPING DIAGRAM

<6G74-SOHC 24 Valve Engine>

*1 Oxygen sensor (front) *2 Air flow sensor *3 Intake air temperature sensor *4 Engine coolant temperature sensor *5 Throttle position sensor *6 Idle position switch *7 Cam position sensor *8 Crank angle sensor *9 Barometric pressure sensor *10 Oxygen sensor (rear)	● Ignition switch-ST ● Ignition switch-IG1 ● Power supply ● Vehicles speed sensor ● Air conditioner switch ● Power steering fluid pressure switch ● Inhibitor switch ● Detonation sensor	Engine control unit	★1 Injector ★2 Idle speed control motor ★3 Purge control solenoid valve ★4 EGR control solenoid valve ● Fuel pump relay ● Control relay ● Air conditioner power relay ● Ignition coil, Power transistor ● Diagnosis signal ● Engine warning lamp
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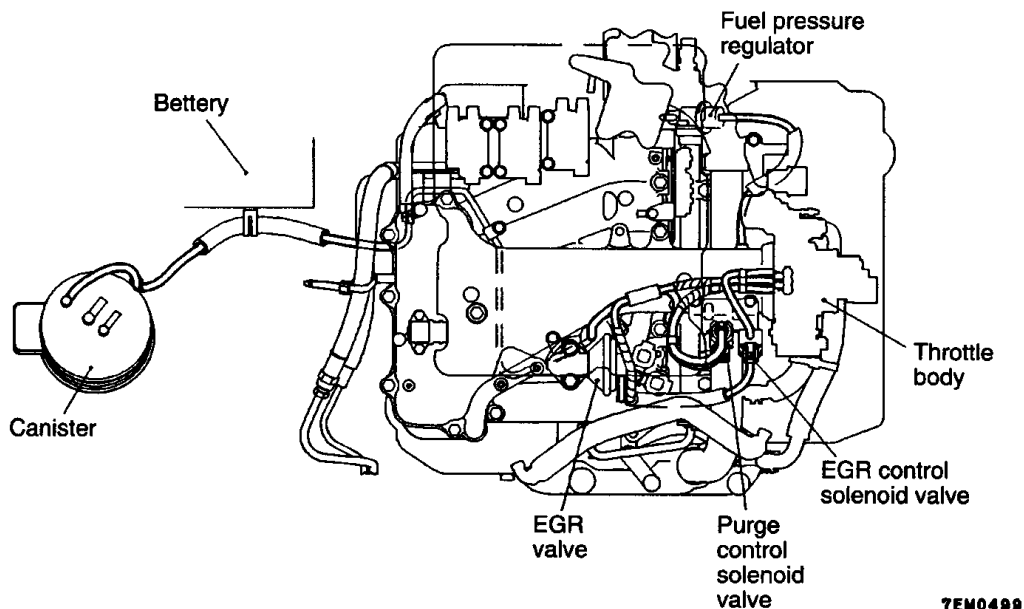
7FU2255

Vacuum hose color

B: Black
 G: Green
 L: Light blue
 R: Red
 Y: Yellow

VACUUM HOSE LAYOUT

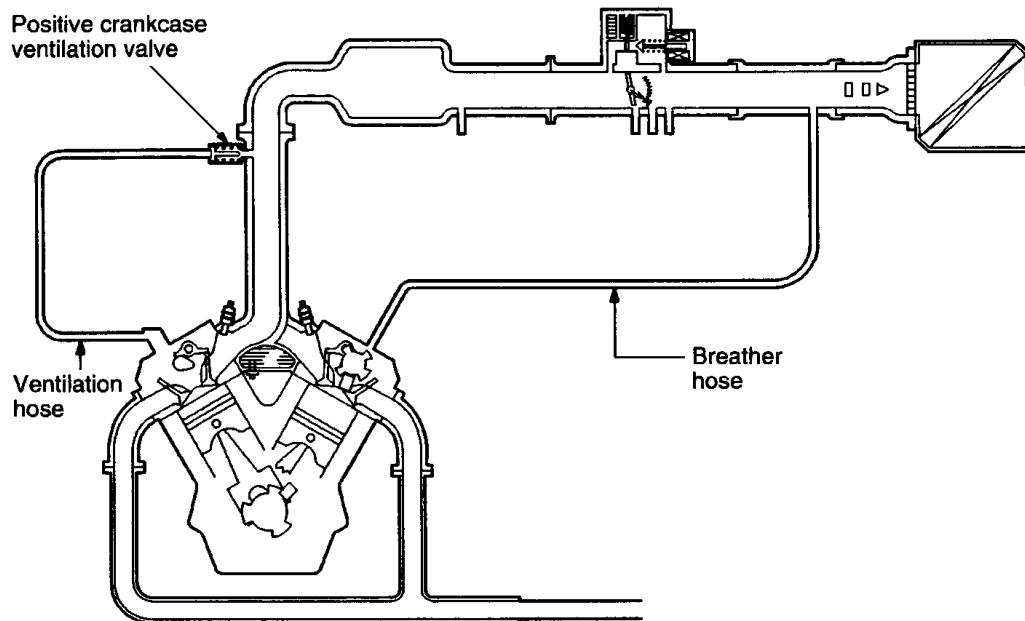
<6G72-SOHC 24 Valve Engine, 6G74-SOHC 24 Valve Engine>

**CAUTIONS ON INSPECTION**

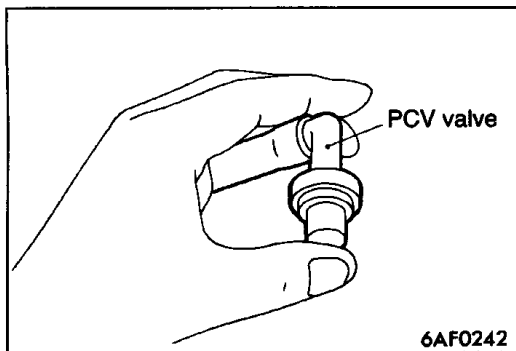
1. Inspect the various devices only after completing engine adjustment.
2. Inspect the hoses to make sure there are no disconnections, connection errors or damage.
3. Make sure there is no hose, pipe or port clogging, or cracks or damage in the hoses and pipes.
4. When replacing device hoses, always mount the replacement hose in the same position (direction) as the original.
5. When finished, check the connections as described in the service manual or service label.

CRANKCASE EMISSION CONTROL SYSTEM

<6G72-SOHC 24 Valve Engine, 6G74-SOHC 24 Valve Engine>



7EM0465

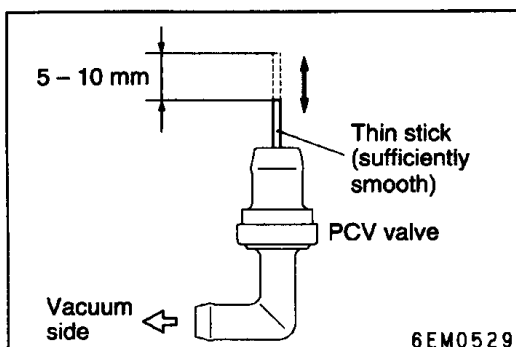
**CRANKCASE VENTILATION SYSTEM****System Inspection**

- (1) Remove the positive crankcase ventilation (PCV) valve from the rocker cover, then reconnect the PCV valve to the vacuum supply hose.
- (2) With the engine idling, put finger on the open end of the PCV valve, and check for negative pressure (vacuum) with finger.

NOTE

At this time, the plunger in the PCV valve should move back and forth as the open end is covered and uncovered.

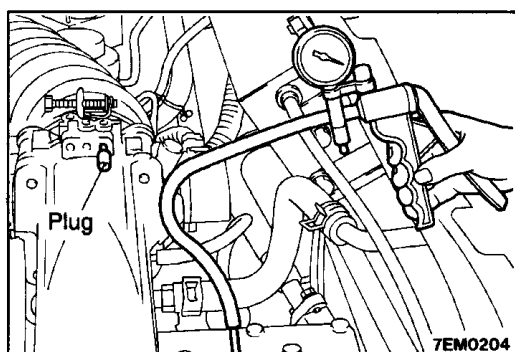
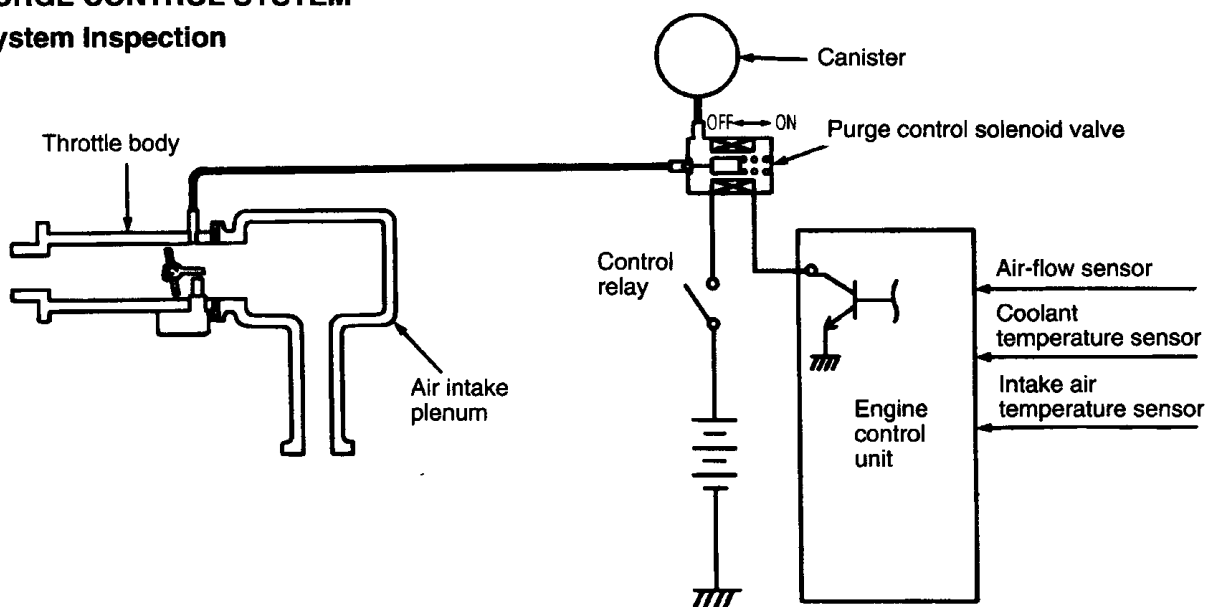
- (3) If negative pressure is not felt, clean or replace the PCV valve. Inspect the vacuum supply hose and vacuum supply hose port for restriction or plugged condition.

**Positive Crankcase Ventilation (PCV) Valve Inspection**

- (1) Hold the PCV valve vacuum side down. Using light pressure, depress the PCV valve spring with the thin stick 5 - 10 mm. Release pressure on the stick to see if the PCV valve spring will lift the stick to its original position.
- (2) If the stick returns quickly to its original position, the PCV valve is OK. If the stick does not return quickly, clean or replace the PCV valve.

EVAPORATIVE EMISSION CONTROL SYSTEM

<6G72-SOHC 24 Valve Engine, 6G74-SOHC Engine>

PURGE CONTROL SYSTEM**System Inspection****INSPECTION**

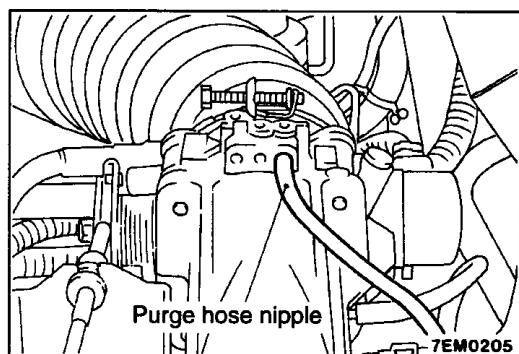
- (1) Disconnect the vacuum hose (red stripes) from the throttle body and connect it to a hand vacuum pump.
- (2) Plug the nipple from which the vacuum hose was removed.
- (3) Check the following points when the engine is cold [coolant temperature at 40°C or below] and when it is warm [coolant temperature at 80°C or higher].

When engine is cold

Engine operating condition	Applying vacuum	Result
Idling	53 kPa	Vacuum is maintained
3,000 r/min		

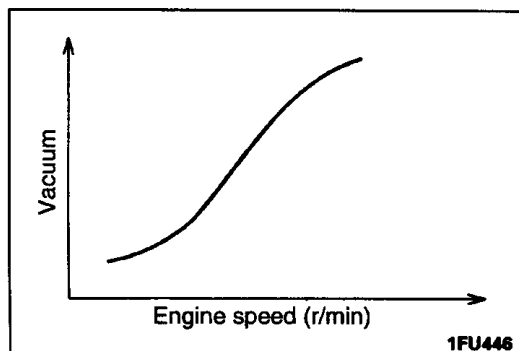
When engine is warm

Engine operating condition	Applying vacuum	Result
Idling	53 kPa	Vacuum is maintained
Within 3 minutes after engine start 3,000 r/min	Try applying vacuum	Vacuum leaks
After 3 minutes have passed after engine start 3,000 r/min	53 kPa	Vacuum will be maintained momentarily, after which it will leak. NOTE The vacuum will leak continuously if the altitude is 2,200 m or higher, or the intake air temperature is 50°C or higher.

**Purge Port Vacuum Inspection****Check Condition**

Engine coolant temperature: 80 – 95°C

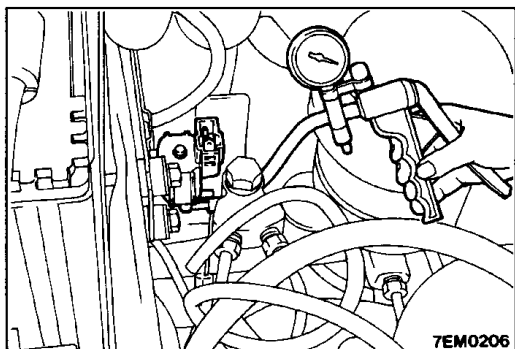
- (1) Disconnect the vacuum hose (red) from the throttle body purge hose nipple and connect a hand vacuum pump to the nipple.



Start the engine and check to see that, after raising the engine speed by racing the engine, vacuum raises proportionately with the rise in engine speed.

NOTE

If there is a problem with the change in vacuum, it is possible that the throttle body port may be clogged and require cleaning.



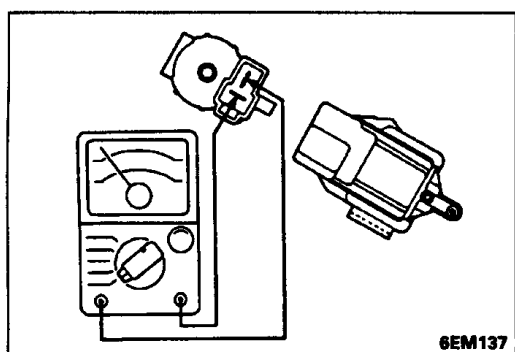
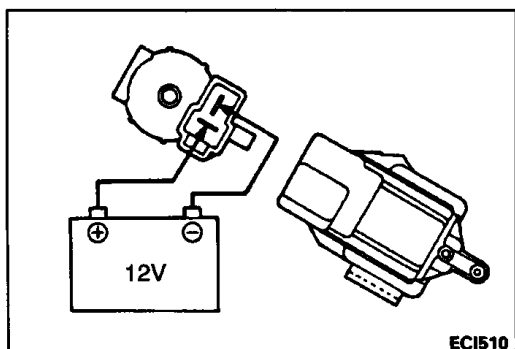
Purge Control Solenoid Valve Inspection

NOTE

When disconnecting the vacuum hose, make an identification mark on it so that it can be reconnected to the original position.

- (1) Disconnect the vacuum hose (black with red stripe) from the solenoid valve.
- (2) Disconnect the harness connector.
- (3) Connect a hand vacuum pump to the nipple to which the red-striped vacuum hose was connected.
- (4) Apply a vacuum and check for air-tightness when voltage is applied directly to the purge-control solenoid valve and when the voltage is discontinued.

Battery voltage	Normal condition
When applied	Vacuum leaks
When discontinued	Vacuum is maintained



- (5) Measure the resistance between the terminals of the solenoid valve.

Standard value: 21 – 27 Ω [at 20°C]

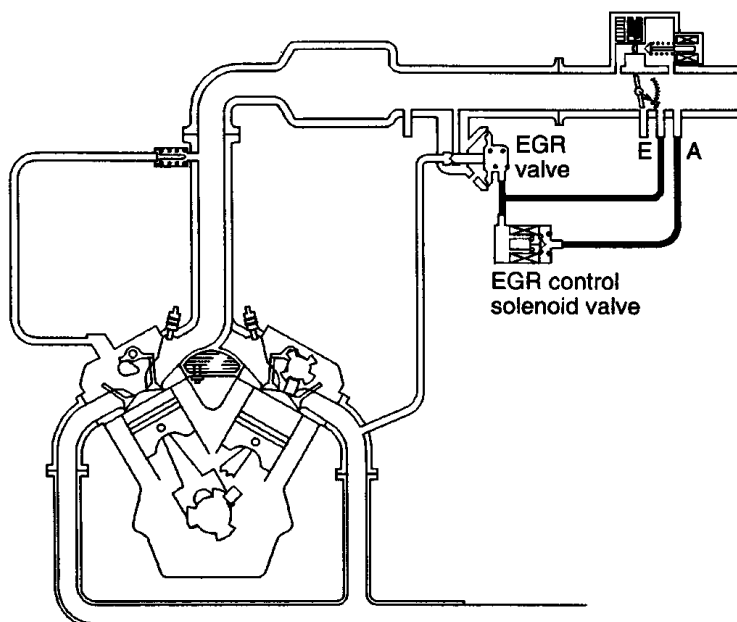
EXHAUST EMISSION CONTROL SYSTEM

AIR FUEL RATIO CONTROL SYSTEM

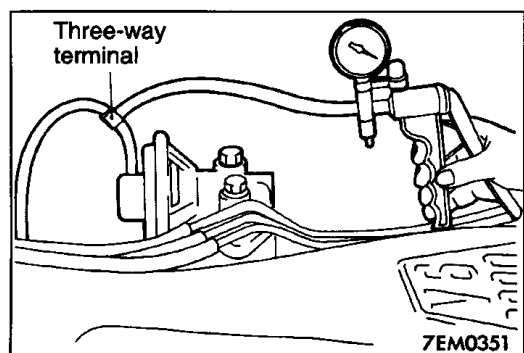
- To inspect the air-fuel ratio control system, refer to GROUP 13.
- For detailed information concerning the illumination pattern of the malfunction-indicator light and other aspects of the self-diagnosis function, refer to GROUP 13.

EXHAUST GAS RECIRCULATION (EGR) SYSTEM

<6G72-SOHC 24 Valve Engine, 6G74-SOHC 24 Valve Engine>

System Inspection

7EM0466



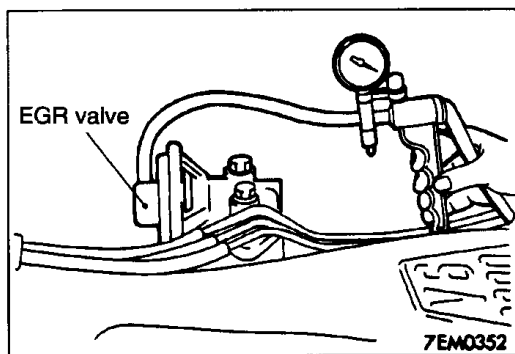
- (1) Disconnect the vacuum hose (green stripe) from the exhaust gas recirculation (EGR) valve, and then connect a hand vacuum pump via the three-way terminal.
- (2) Check the following points when the engine is cold [engine coolant temperature is 20°C or below] and when the engine is warm [engine coolant temperature is 80°C or higher].

When engine is cold

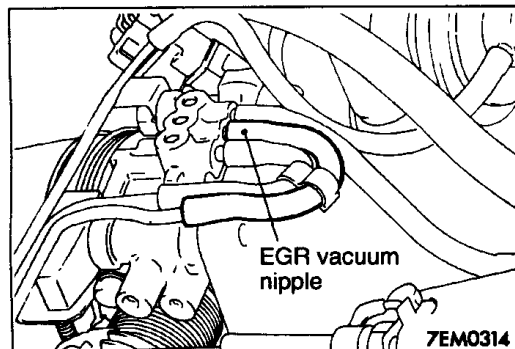
Engine condition	Normal condition
Press the accelerator pedal suddenly and race the engine.	Vacuum: no change (atmospheric pressure)

When engine is warm

Engine condition	Normal condition
Press the accelerator pedal suddenly and race the engine.	Vacuum rises temporarily to 13 kPa



- (3) Disconnect the three-way terminal and connect the hand vacuum pump directly to the EGR valve.
- (4) Check whether or not the engine stalls or shows idling instability when a negative pressure (Vacuum) of 30 kPa or higher is applied during idling.

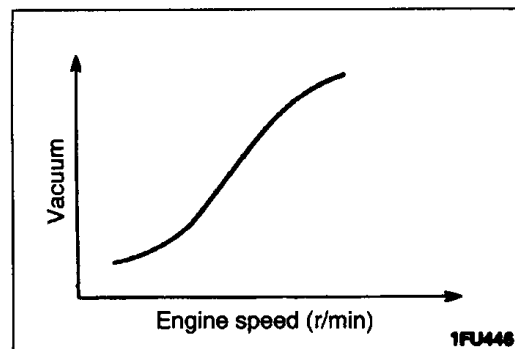


EGR Valve Control Vacuum Inspection

Check Condition

Engine coolant temperature: 80 – 95°C

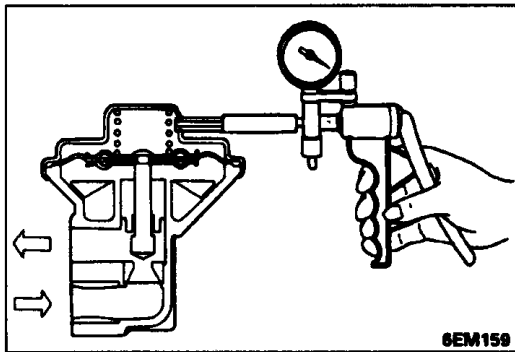
- (1) Disconnect the vacuum hose (green) from the throttle body EGR vacuum nipple and connect a hand vacuum pump to the nipple.



- (2) Start the engine and check to see that, after raising the engine speed by racing the engine, the vacuum raises proportionately with the rise in engine speed.

NOTE

If there is a problem with the change in vacuum, it is possible that the throttle body vacuum port may be clogged and require cleaning.

**EGR Valve Inspection**

- (1) Remove the EGR valve and check it for sticking, deposit of carbon, etc.
If such condition exists, clean with adequate solvent to ensure tight valve seat contact.
- (2) Connect a hand vacuum pump to the EGR valve.
- (3) Apply a vacuum of 67 kPa and check air tightness.
- (4) Blow in air from one passage of the EGR to check condition as follows:

Applying vacuum	Result
40 kPa	Air does not blow through
31 kPa	Air blows through

INSTALLATION

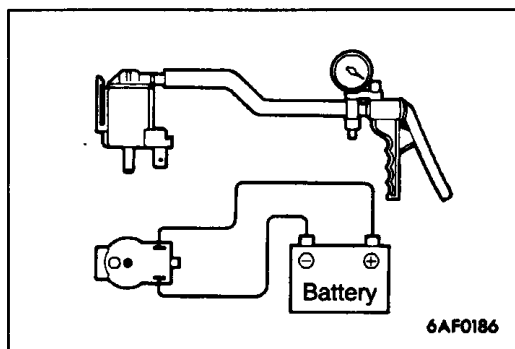
- (1) Install a new gasket and EGR valve, tighten bolts to specified torque.

Specified tightening torque: 22 Nm

EGR Control Solenoid Valve Inspection**NOTE**

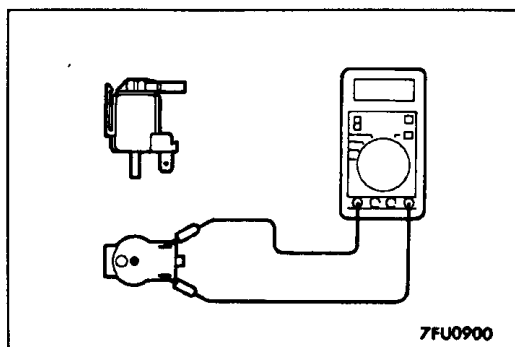
When disconnecting the vacuum hose, always make a mark so that it can be reconnected at original position.

1. Disconnect the vacuum hose (yellow stripe, green stripe) from the solenoid valve.
2. Disconnect the harness connector.



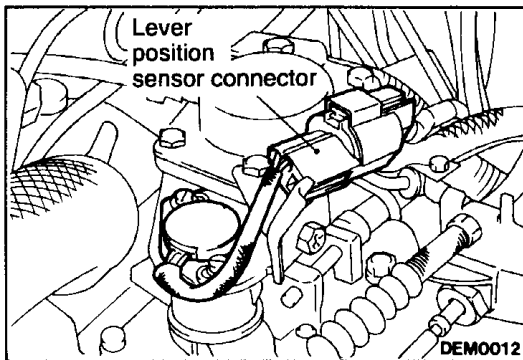
3. Connect a hand vacuum pump to the nipple to which the green-striped vacuum hose was connected.
4. Check airtightness by applying a vacuum with voltage applied directly from the battery to the EGR control solenoid valve and without applying voltage.

Battery voltage	Normal condition
Not applied	Vacuum leaks
Applied	Vacuum maintained



5. Measure the resistance between the terminals of the solenoid valve.

Standard value: 28 – 36Ω (at 20°C)



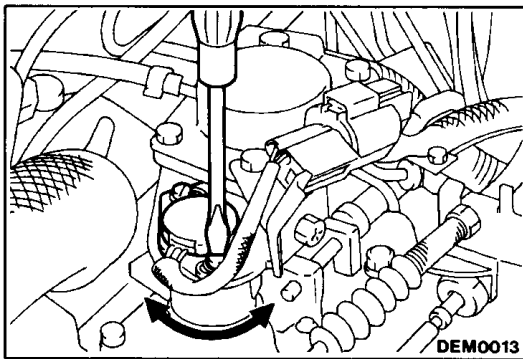
EXHAUST GAS RECIRCULATION (EGR) SYSTEM

<4D56 Engine>

LEVER POSITION SENSOR (LPS) ADJUSTMENT

[Condition before adjustment]

- Engine coolant temperature 80 – 95°C
- (1) Loosen the accelerator cable tension sufficiently
- (2) Connect the special tool to the lever position sensor connector shown in the figure. For 3-pin connector use MD998478, for 4-pin connector use MD998464.
- (3) Connect a digital-type voltmeter between the red clip (output) and blue clip (earth) of the connected special tool.



- (4) Turn the ignition switch to ON. (Do not start the engine.)
- (5) Measure the output voltage of the lever position sensor.

Standard value:

Lever condition	Voltage V
Idle position	0.8 – 1.0
Fully open	3.7 – 5.0

- (6) If the voltage is outside the standard value, adjust by loosening the lever position sensor mounting screw and turning the lever position sensor body. After adjusting, securely tighten the screw.

NOTE

The output voltage will increase if the lever position sensor body is turned in an anti-clockwise direction.

- (7) Turn the ignition switch to "OFF".
- (8) Adjust the accelerator cable play.

GROUP 23

AUTOMATIC TRANSMISSION

GENERAL

OUTLINE OF CHANGES

- A 6G74-SOHC 24-valve engine has been added. To correspond to this, the maintenance service procedures which are different from the previous V4AW3-7-type automatic transmission are given below.
- The shift pattern for V4AW3-type automatic transmission for vehicles with 6G72-SOHC 24-valve engine has been changed. To correspond to this, the maintenance service procedures which are different from the previous V4AW3-type automatic transmission are given below.

SPECIFICATIONS

TRANSMISSION MODEL TABLE

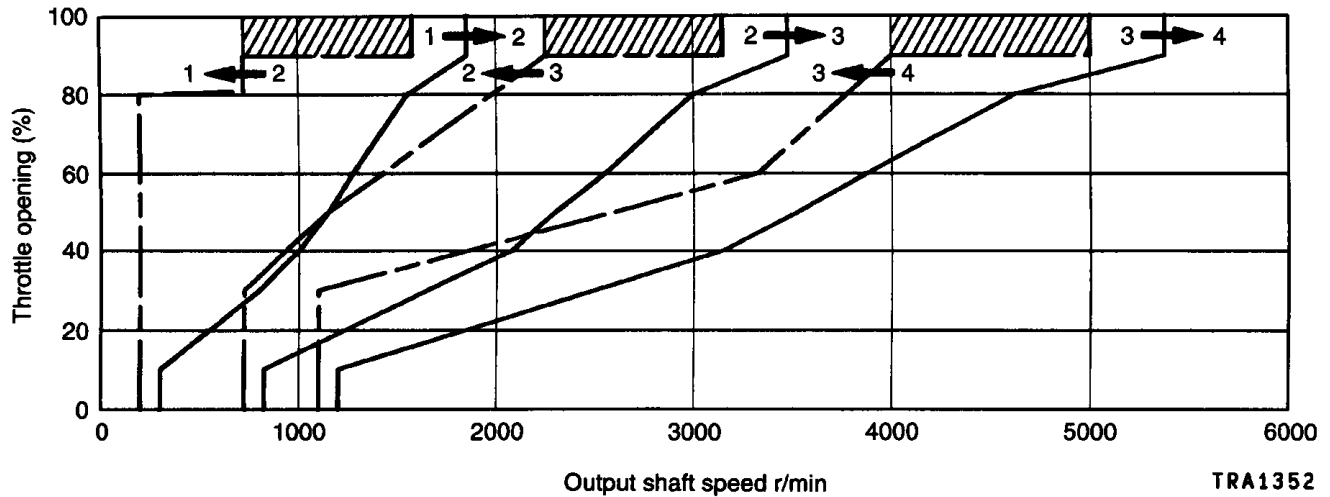
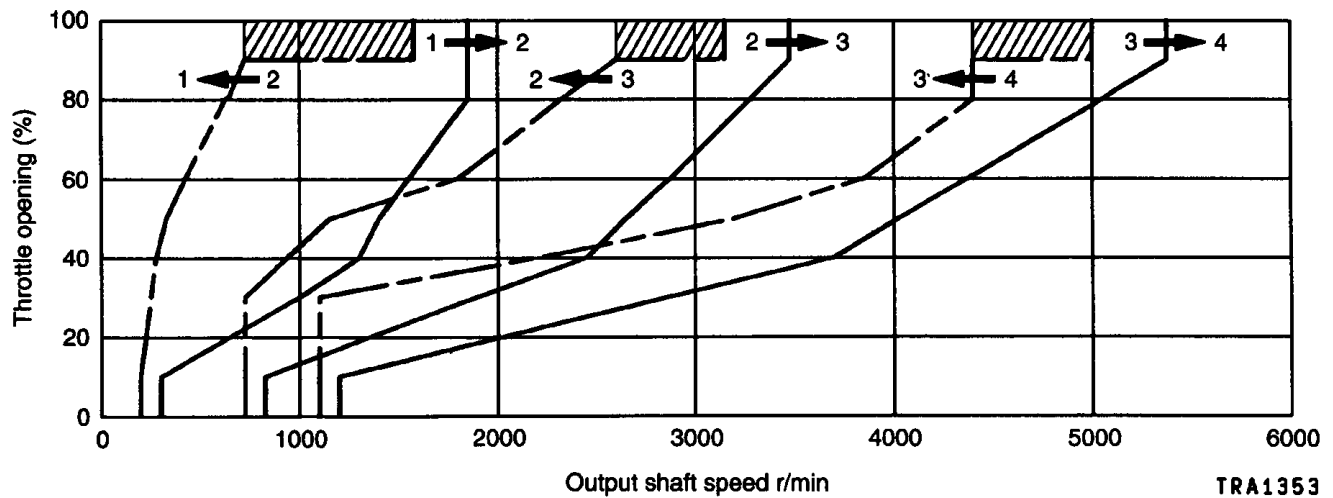
Transmission model	Speedometer gear ratio	Vehicle model	Engine model (Engine displacement)
V4AW3-B-LIA	29/9	V43W	6G72-SOHC 24 Valve (3,000)
V4AW3-7-LILA	29/9	V43W	6G72-SOHC 24 Valve (3,000)
V4AW3-B-LHA	28/9	V23C, V23W	6G72-SOHC 24 Valve (3,000)
V4AW3-B-LHLA	28/9	V23C, V23W	6G72-SOHC 24 Valve (3,000)
V4AW3-B-MFA	26/9	V25W, V45W	6G74-SOHC 24 Valve (3,500)
V4AW3-B-MFLA	26/9	V25W, V45W	6G74-SOHC 24 Valve (3,500)

SERVICE SPECIFICATIONS

Item	6G72-SOHC 24 Valve	6G74-SOHC 24 Valve
Stall speed r/min	2,000 – 2,500	2,200 – 2,700
Dimensions of inner cable stopper and outer cable end mm	34 – 35	34 – 35

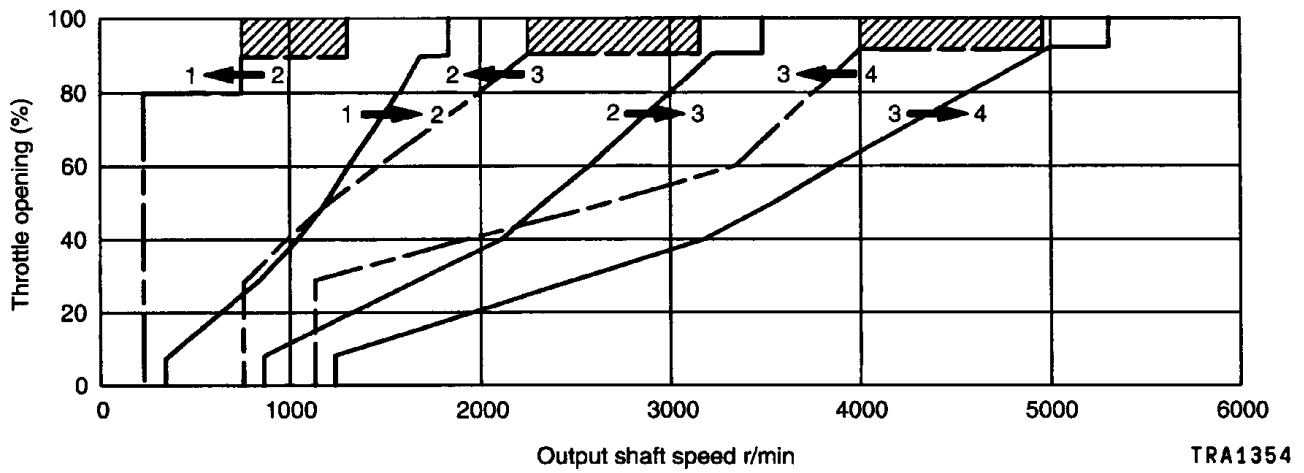
LUBRICANTS

Item	Specified lubricants	Quantity /
Automatic transmission fluid	DIA QUEEN ATF-SP, ATF DEXRON II or equivalent	Approx. 9.8

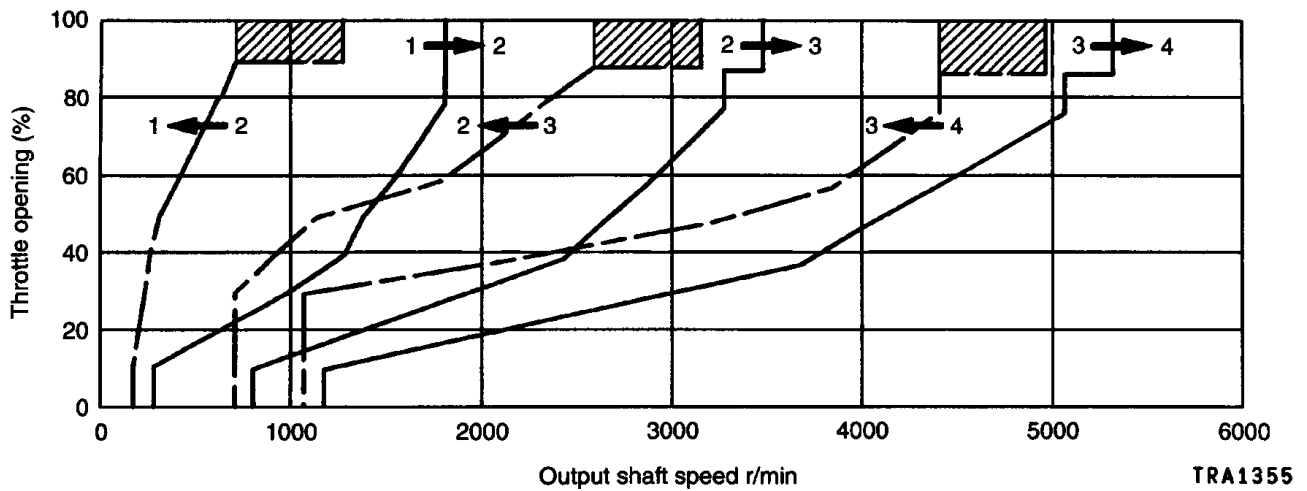
TROUBLESHOOTING <V4AW3>**ROAD TEST****SIFT PATTERN****<6G72-SOHC 24 Valve Engine>****Normal pattern****Power pattern**

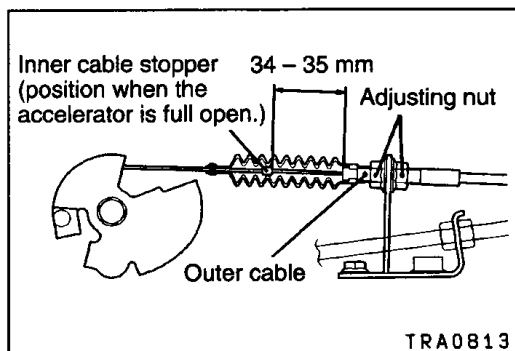
<6G74-SOHC 24 Valve Engine>

Normal pattern



Power pattern





SERVICE ADJUSTMENT PROCEDURES

THROTTLE CABLE CHECK AND ADJUSTMENT

- (1) Make sure that the throttle lever and the bracket have no transformations.
- (2) Remove the boot at the outer cable so that the inner cable stopper can be seen.
- (3) Measure the dimension between the end of the inner cable stopper and that of the outer cable with throttle lever full open.

Standard value: 34 – 35 mm

- (4) If the distance is outside the standard value, adjust using the adjusting nut.

CONVERTER STALL TEST

The stall speeds are as given below. The test procedures are the same as before.

Standard value

- : 2,000 – 2,500 r/min <6G72-SOHC 24 Valve>
- : 2,200 – 2,700 r/min <6G74-SOHC 24 Valve>

BODY

CONTENTS

GENERAL.....	2	DOOR	2
Outline of Change	2	Service Specification.....	2
		Troubleshooting	2
		On-vehicle Service	7
		Door Glass and Regulator.....	9

GENERAL

OUTLINE OF CHANGE

The power windows with safety mechanism have been adopted. To correspond to this, the maintenance service procedures have been established.

DOOR

SERVICE SPECIFICATION

Items	Standard value
Power window operating current A	5 ± 1 (for 14 – 15 V power supply at 25°C)

TROUBLESHOOTING

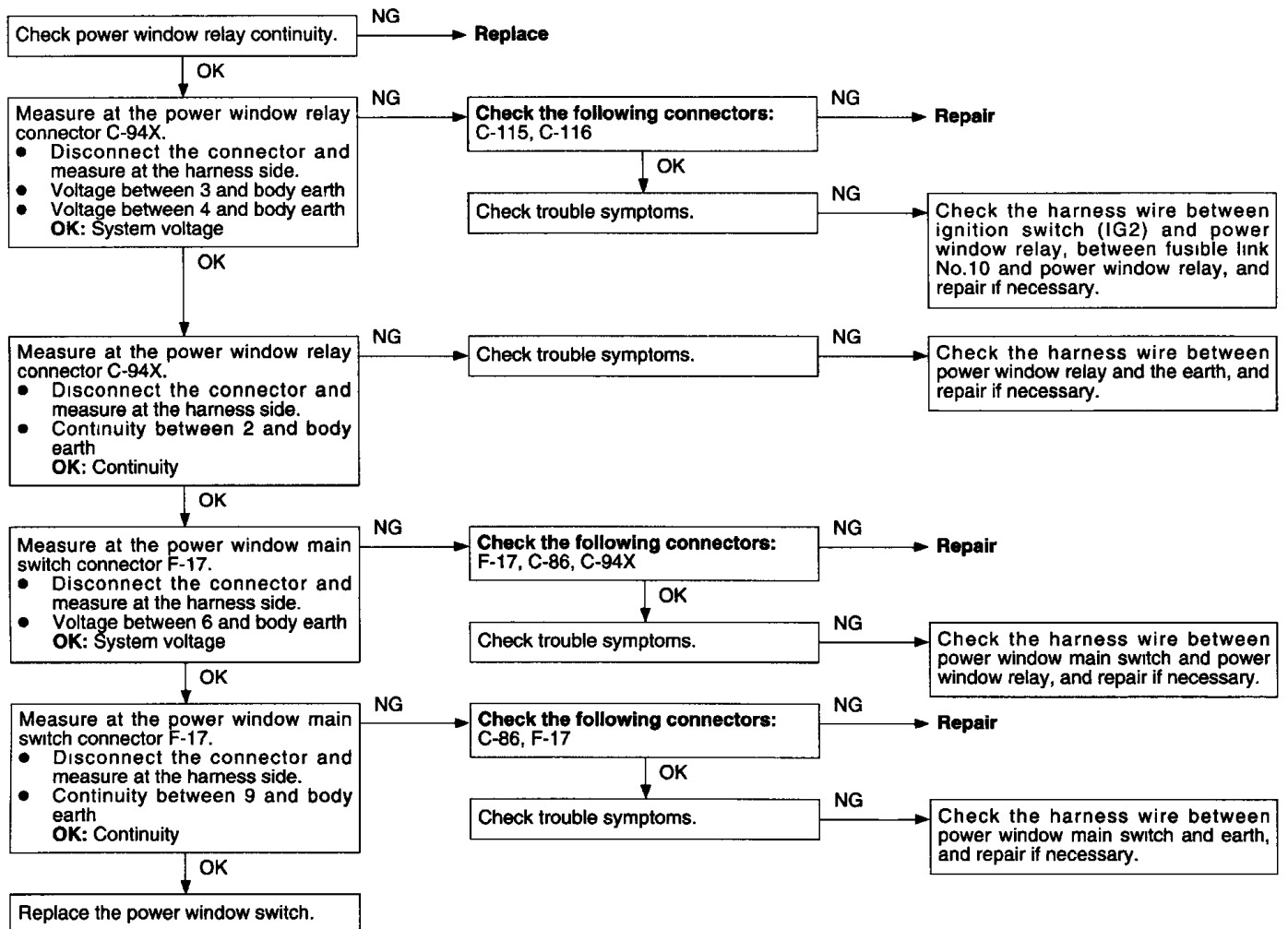
INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom		Inspection procedure	Reference page
Power windows	The power windows cannot be operated by any of the power window switches.	1	42-3
	Driver's side power window cannot be operated by the power window main switch.	2	42-4
	Passenger's side and rear power windows cannot be operated by the power window main switch. (However, they can be operated by the power window sub-switches.)	3	42-5
	Passenger's side and rear power windows cannot be operated by the power window sub-switches. (However, they can be operated by the power window main switch.)	4	42-5
	When the glass is raised, it then lowers automatically.	5	42-5
	The glass is not lowered when something is jammed in the window.	6	42-6
	When the glass is fully raised, it then lowers automatically.	7	42-6

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

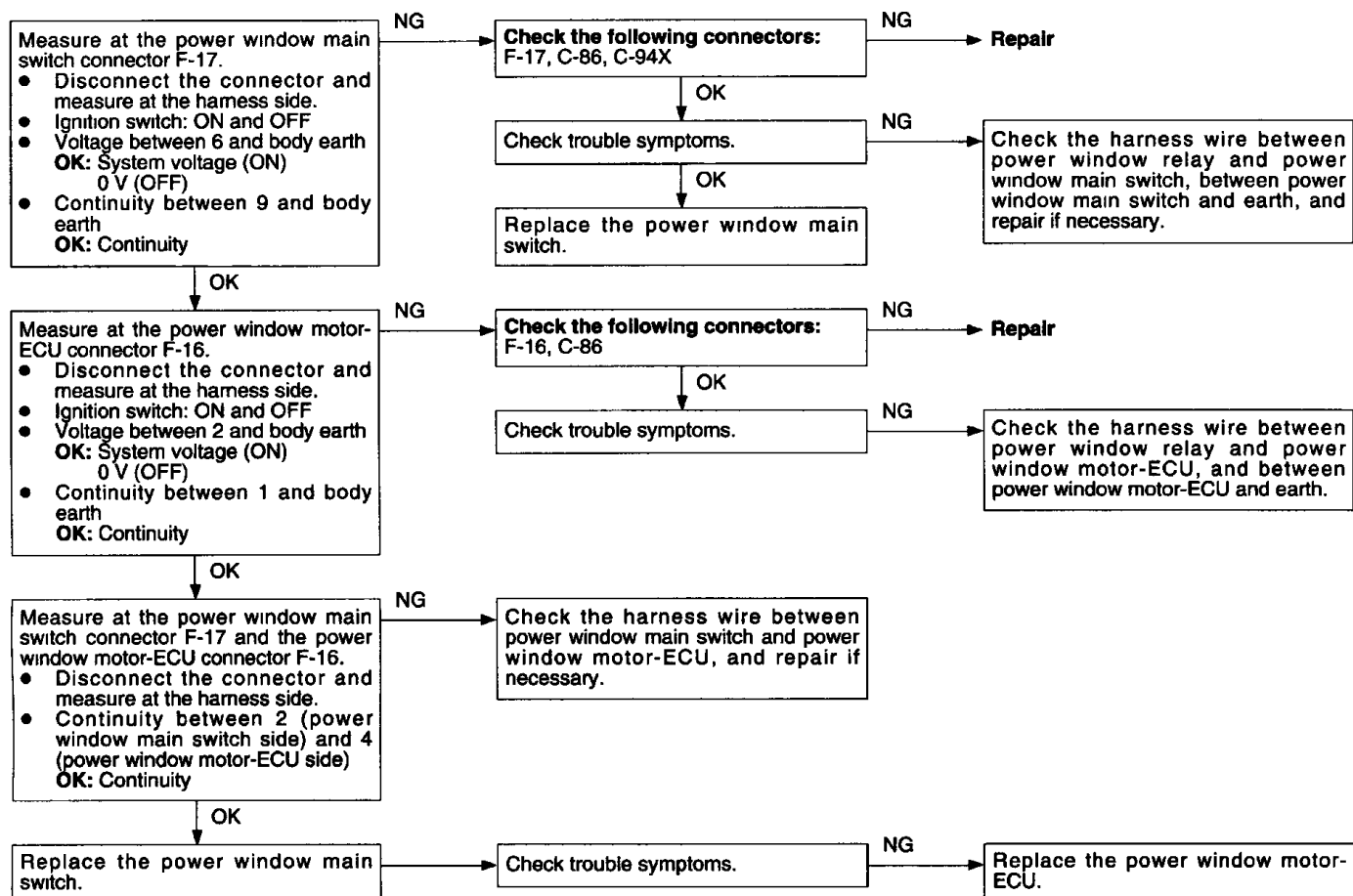
Inspection Procedure 1

The power windows cannot be operated by any of the power window switches.	Probable cause
The cause may be a malfunction of the power window relay and of the power window relay drive circuit.	● Malfunction of power window relay ● Malfunction of wiring harness or connector



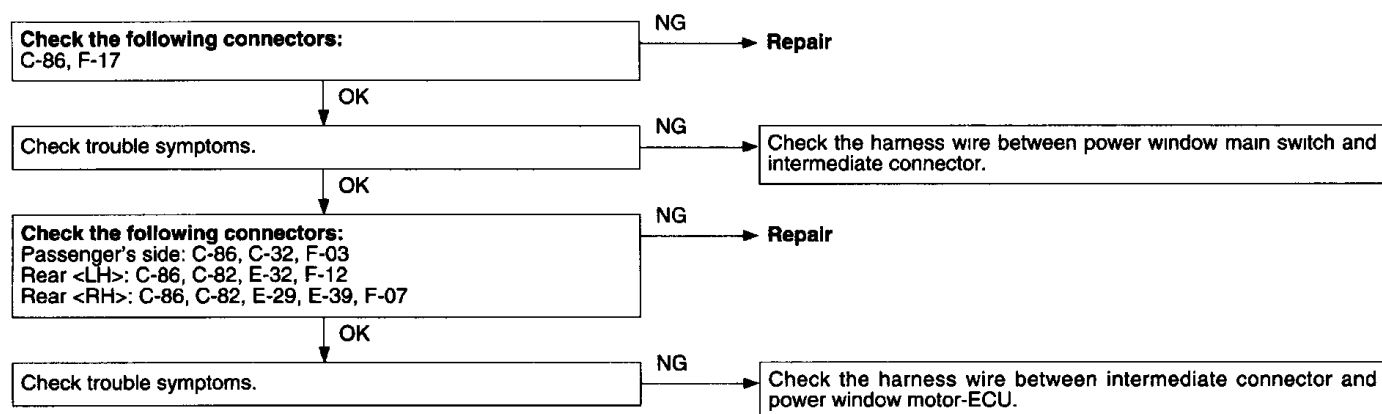
Inspection Procedure 2

Driver's side power window cannot be operated by the power window main switch.	Probable cause
The cause may be a malfunction of power window main switch, power window motor-ECU, or open circuit or short circuit in the communication line between power window main switch and power window motor-ECU.	• Malfunction of power window main switch • Malfunction of power window motor-ECU • Malfunction of wiring harness or connector



Inspection Procedure 3

Passenger's side and rear power windows cannot be operated by the power window main switch. (However, they can be operated by the power window sub-switches.)	Probable cause
The cause may be open circuit or short circuit in the communication line between power window main switch, passenger's side power window motor-ECU and rear power window motor-ECU.	Malfunction of wiring harness or connector



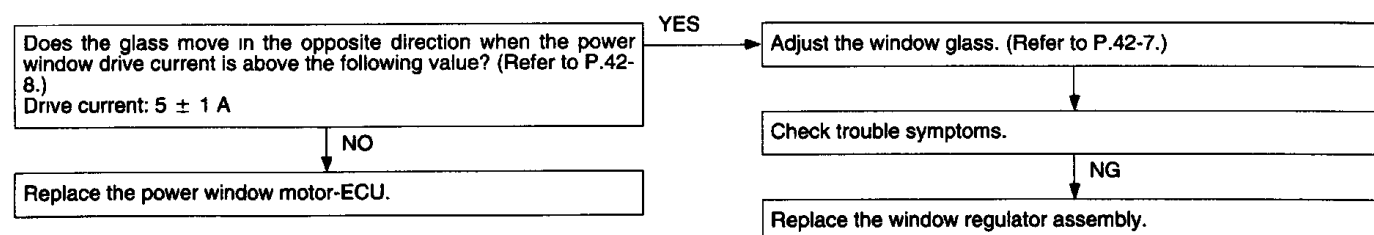
Inspection Procedure 4

Passenger's side and rear power windows cannot be operated by the power window sub-switches. (However, they can be operated by the power window main switch.)	Probable cause
The cause may be a malfunction of the power window sub-switch.	Malfunction of power window sub-switch

Replace the power window sub-switch.

Inspection Procedure 5

When the glass is raised, it then lowers automatically.	Probable cause
If the sliding resistance is too large when the glass is being raised, it is judged that something is jammed in the window, and the window is lowered by approximately 150 mm.	- Incorrect window glass adjustment - Glass slider is incorrectly installed or warped



Inspection Procedure 6

The glass is not lowered when something is jammed in the window.	Probable cause
The cause may be a malfunction of the revolution detection sensor in the power window motor-ECU.	● Malfunction of power window motor-ECU

Replace the power window motor-ECU.

Inspection Procedure 7

When the glass is fully raised, it then lowers automatically.	Probable cause
When the window is within 15 mm of being fully closed, the limit switch turns off to prevent the window from being lowered. However, the above problem can occur if there is a malfunction of the limit switch in the power window motor-ECU.	● Malfunction of the power window motor-ECU

Limit switch operation position adjustment (Refer to P.42-13.)

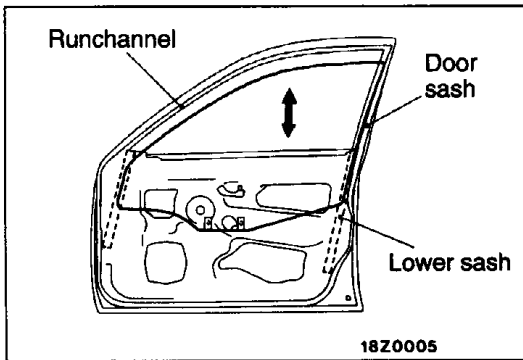


Check trouble symptoms.

NG



Replace the power window motor-ECU.



ON-VEHICLE SERVICE

ADJUSTMENT AND REPLACEMENT WHEN THERE IS A MALFUNCTION OF THE POWER WINDOWS

If the window glass automatically starts moving downwards at the wrong time while it is being raised, carry out the following adjustment or replacement procedures.

1. Remove the door trim and waterproof film.
2. Remove the window regulator assembly from the door window glass, and then raise and lower the door window glass by hand to check the operation force.

NOTE

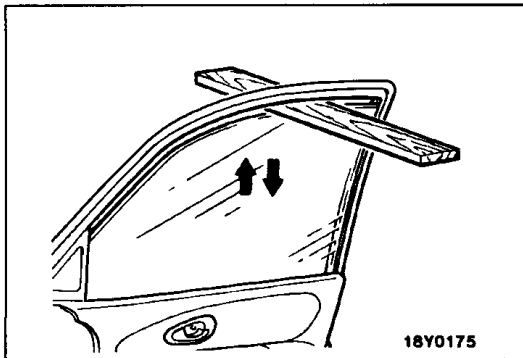
Insert a cushion or similar object to prevent damage to the glass if it should happen to fall down.

3. If the door window glass does not move up and down smoothly, check or repair the following points.
 - Check the installation condition of the runchannel.
 - Repair the twisting in the door sash.
 - Check the installation condition of the lower sash or the center sash.

NOTE

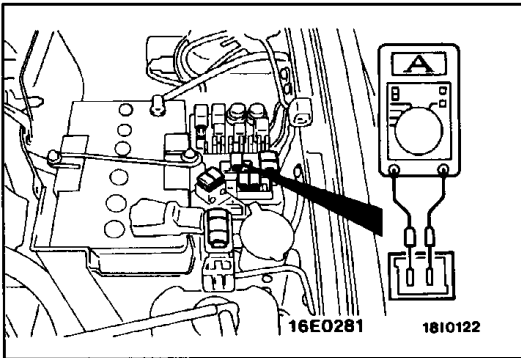
The lower sash cannot normally be adjusted, but it may be possible to adjust the sash span slightly within the range allowed by manufacturing tolerances by pushing the lower sash outwards while re-installing it.

4. If repair or adjustment is not possible, replace the door assembly.



POWER WINDOW SAFETY MECHANISM CHECK

1. Place a wooden board with a thickness of approximately 10 mm as shown in the illustration, and then raise the window glass.
2. Check that the window lowers by a distance of approximately 150 mm when the window clamps the wooden board. If this doesn't happen, refer to "Troubleshooting" (P.42-2).



POWER WINDOW OPERATION CURRENT INSPECTION

1. Remove the power window fuse and connect a circuit analyser as shown in the illustration.
2. When the power window switch is pressed to the UP position, a large amount of current flows at the time the window starts to close and when it is fully closed, so measure the operation current in the interval between these two points.

Standard value:

5 ± 1 A (for 14 – 15 V power supply voltage at 25°C)

3. If the operation current is outside the standard value, refer to "Troubleshooting" (P.42-2).

CIRCUIT BREAKER (INCORPORATED IN THE POWER WINDOW MOTOR) INSPECTION

1. Press the power window switch to the UP position to fully close the window glass, and keep pressing the switch for a further 10 seconds.
2. Release the power window switch from the UP position and immediately press it to the DOWN position. The condition of the circuit breaker is good if the power window glass starts to move downwards within 60 seconds.

DOOR GLASS AND REGULATOR REMOVAL AND INSTALLATION

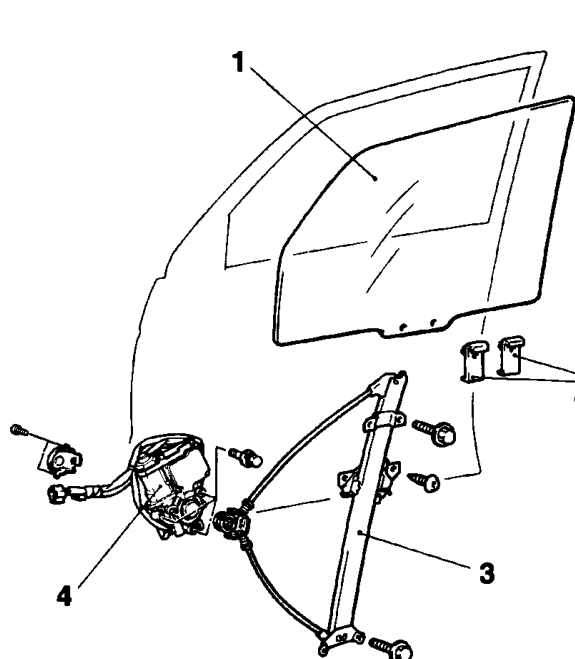
Pre-removal operation

- Door Trim and Waterproof Film Removal

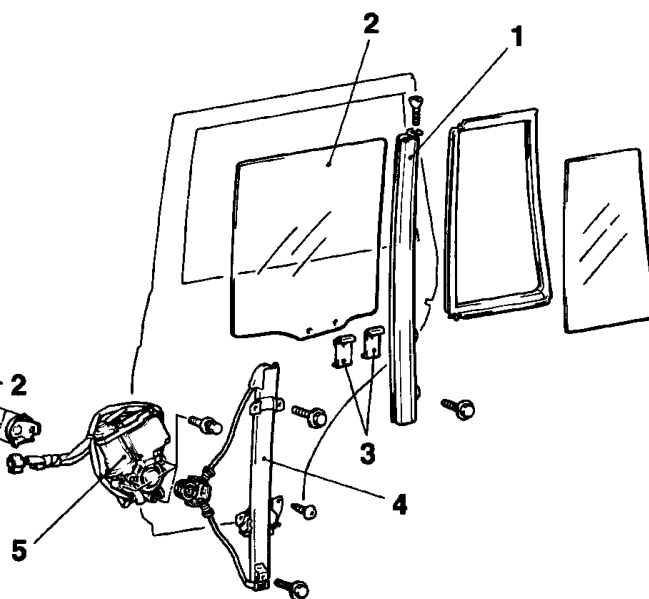
Post-installation Operation

- Door Window Glass Adjustment
- Door Trim and Waterproof Film Installation

Front door



Rear door



18E0468

Front window regulator assembly removal steps

- ▶B◀ 1. Door window glass
▶A◀ 2. Door window glass holder
◀A▶ 3. Window regulator assembly
▶A◀ 4. Power window motor

Rear window regulator assembly removal steps

- ▶B◀ 1. Rear door center sash
▶A◀ 2. Door window glass
▶A◀ 3. Door window glass holder
▶A◀ 4. Window regulator assembly
▶A◀ 5. Power window motor

REMOVAL SERVICE POINT

◀A▶ POWER WINDOW MOTOR ASSEMBLY

Caution

Be careful when handling the power window motor assembly, as the force of the spring may cause the wires to pull out of the drum.

INSTALLATION SERVICE POINTS

▶A◀ POWER WINDOW MOTOR ASSEMBLY/WINDOW REGULATOR ASSEMBLY

POWER WINDOW MOTOR ASSEMBLY AND WINDOW REGULATOR ASSEMBLY INSTALLATION PROCEDURE

1. Connect the power window motor assembly to the harness connector of body side, and then turn the ignition switch to the ON position.
2. Hold the UP side of power window switch for 10 seconds to drive the power window motor.

NOTE

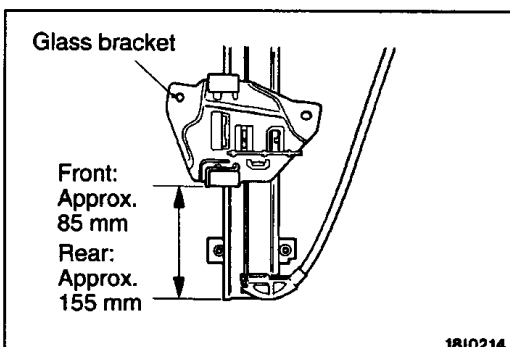
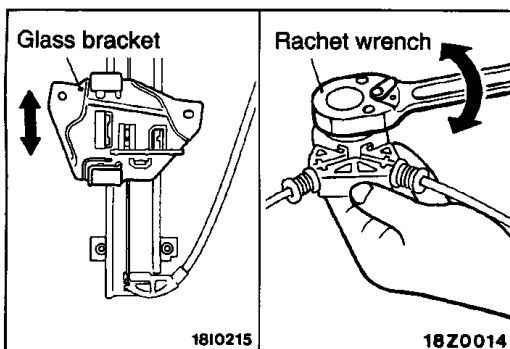
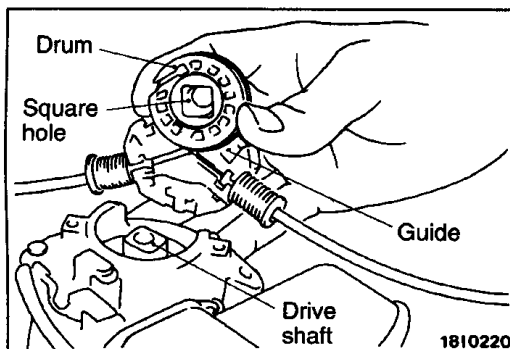
The motor stops automatically after 10 seconds, and the limit switch within the power window motor will be reset.

Caution

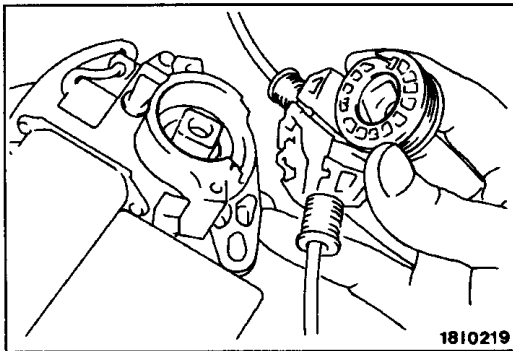
Do not drive the power window motor assembly until the door window glass installation is completed.

3. Turn the ignition switch to the OFF position, and then disconnect the power window motor assembly from the harness connector of body side.
4. Align the power window motor drive shaft and the square hole in the drum while using the guide and the opening in the motor housing as a reference for the installation position.

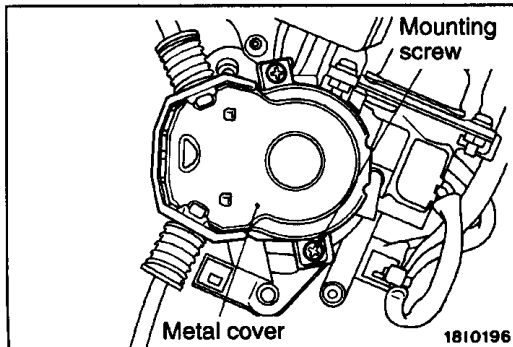
- (1) Align the square hole with the drive shaft by sliding the glass bracket (glass mounting section) or by turning the drum using a ratchet wrench (with a socket diameter of 12.7 mm).



- (2) Support the drum and the guide with your hand while turning the drum, otherwise the wires may pull out of the drum.
- (3) If the wires pull out of the drum, re-insert them by following the drum and regulator wire installation procedure.



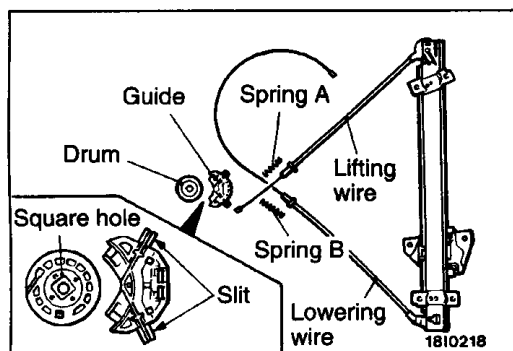
5. Align the guide and the opening of the motor housing, and slide the guide into the motor housing while holding the guide and drum.



6. Install the metal cover securely to the housing.

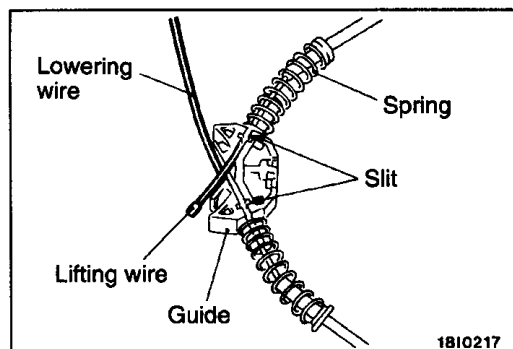
Caution

Make sure that the metal cover is installed securely and does not move, in order to stop the drum from vibrating. If the drum vibrates, the glass may not slide up and down smoothly, or it may fall down.

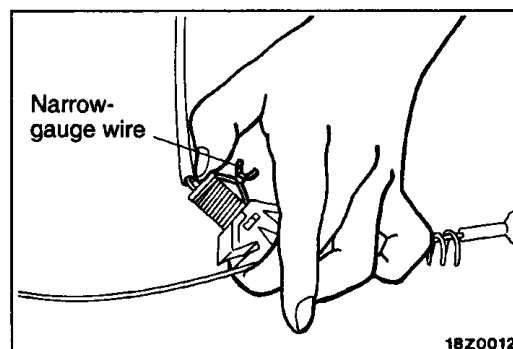


DRUM AND REGULATOR WIRE INSTALLATION PROCEDURE

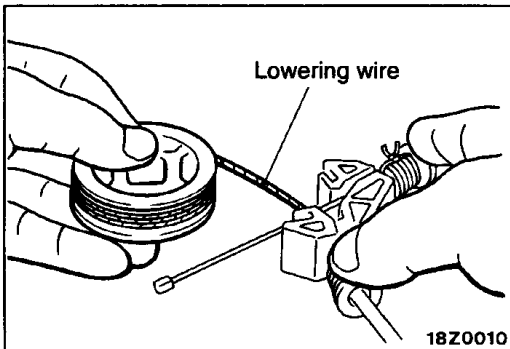
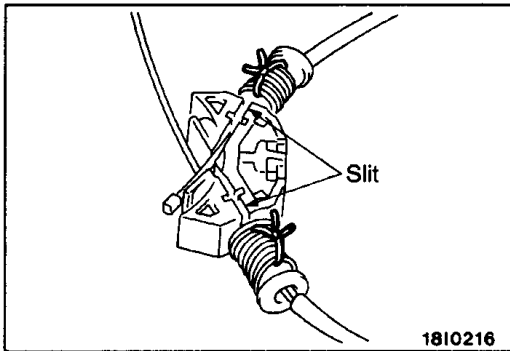
1. Place the drum, guide and regulator on a work bench as shown in the illustration.
 - (1) Place the drum so that the square hole is facing upward.
 - (2) Place the guide so that the slits are facing upward.
 - (3) Place the regulator so that the glass bracket is facing downward. Position the glass bracket so that glass is in the fully-open position.



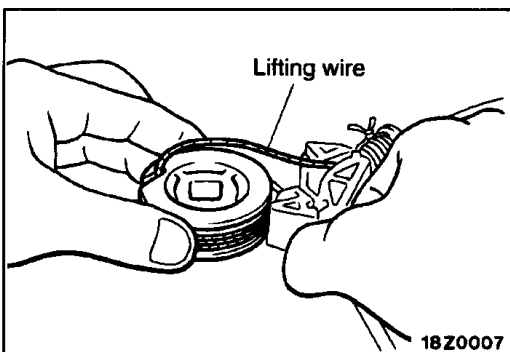
2. Pass the springs over the wires, and then install the lowering wire to the guide first, followed by the lifting wire. (The lifting wire should be on top of the lowering wire.)



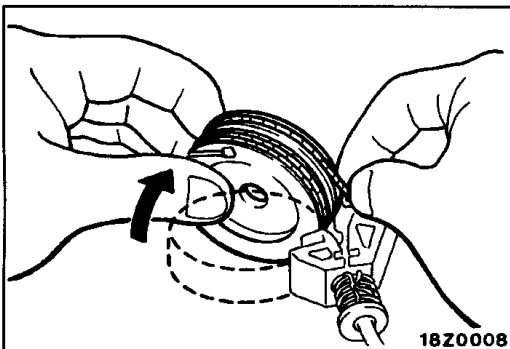
3. Use some narrow-gauge wire (approx. 0.5 mm diameter) to compress the springs, and tie the narrow-gauge wires to the slits in the guide.



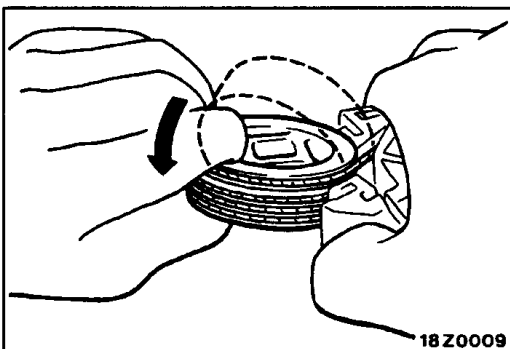
4. Insert the end of the lowering wire into the wire hole at the bottom of the drum, and then wrap the wire securely around the groove of the drum from the bottom so that there is no slackness in the wire.



5. Install the lifting wire to the drum as follows:
 - (1) Insert the end of the lifting wire into the wire hole at the top of the drum.



- (2) Raise the front of the drum until the drum is vertical, and then position the lifting wire in the groove of the drum.



- (3) Return the drum to its original position while holding the wires to make sure that they do not pull out.
6. After installing the power window motor assembly to the window regulator assembly, cut and remove the wires which are compressing the springs.

OPERATION CHECK

1. Install the door window glass to the window regulator assembly.

Caution

Do not drive the window regulator assembly before installing the door window glass; otherwise limit switch will be set.

2. Fully raise the door window glass.

NOTE

- (1) Fully raising the door window glass will complete the limit switch learning.
 - (2) When fully raising the glass at first time, the power window safety mechanism do not operate.
3. After fully raising the door window glass, check that the glass operates correctly.

►B◄ DOOR WINDOW GRASS INSTALLATION

1. Provisionally secure the door window glass to the window regulator assembly.
2. After raising the door window glass as far as it will go, fully secure the door window glass to the window regulator assembly.

EXTERIOR

CONTENTS

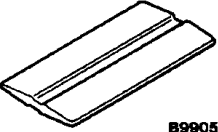
GENERAL.....	2	FRONT BUMPER	3
Outline of Changes	2	SIDE STEP	5
SPECIAL TOOL.....	2	STRIPE TAPE.....	6

GENERAL

OUTLINE OF CHANGES

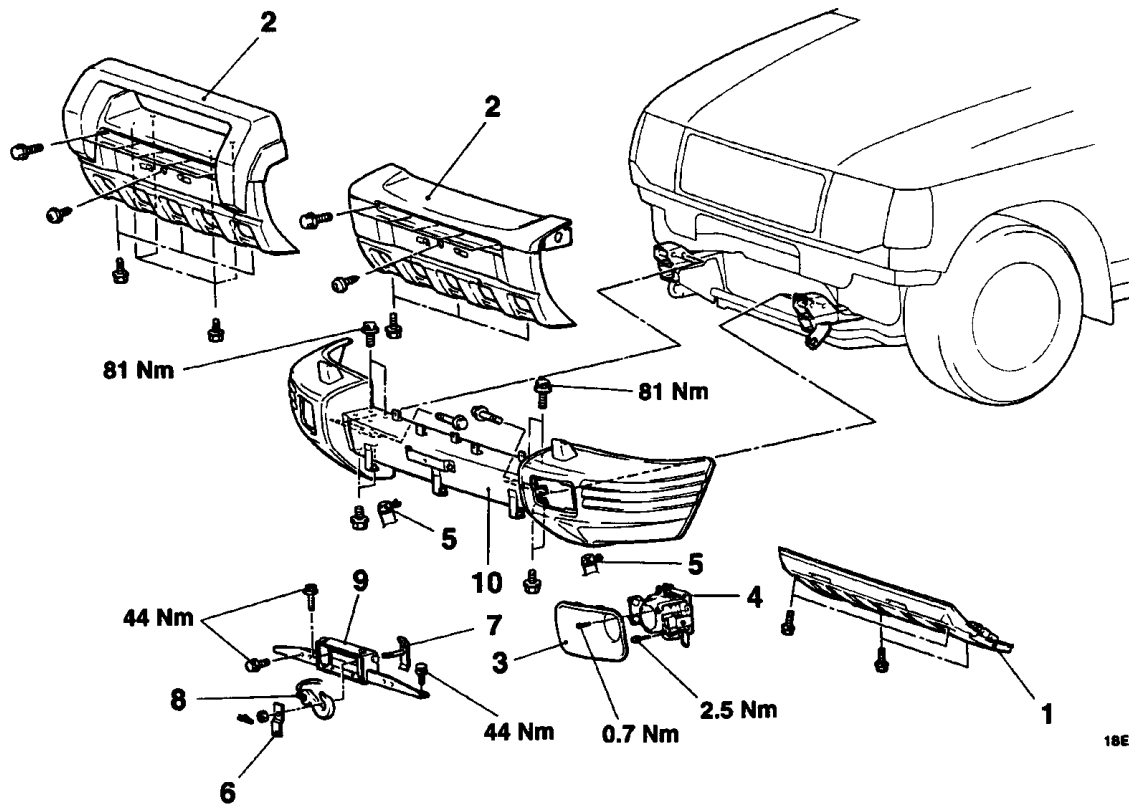
- The front bumper with built-in fog lamp has been adopted. To correspond to this, the maintenance service procedures of the front bumper have been established. <Vehicles with blistered fender>
- New type of side step has been adopted. To correspond to this, the maintenance service procedures of the side step have been established. <Vehicles with blistered fender>
- New types of side stripes have been adopted. To correspond to this, the maintenance service points of the side stripe have been established. <Vehicles with blistered fender>

SPECIAL TOOL

Tool	Number	Name	Use
 B990528	MB990528	Stripe tape spatula	Bonding of the stripe tape

FRONT BUMPER

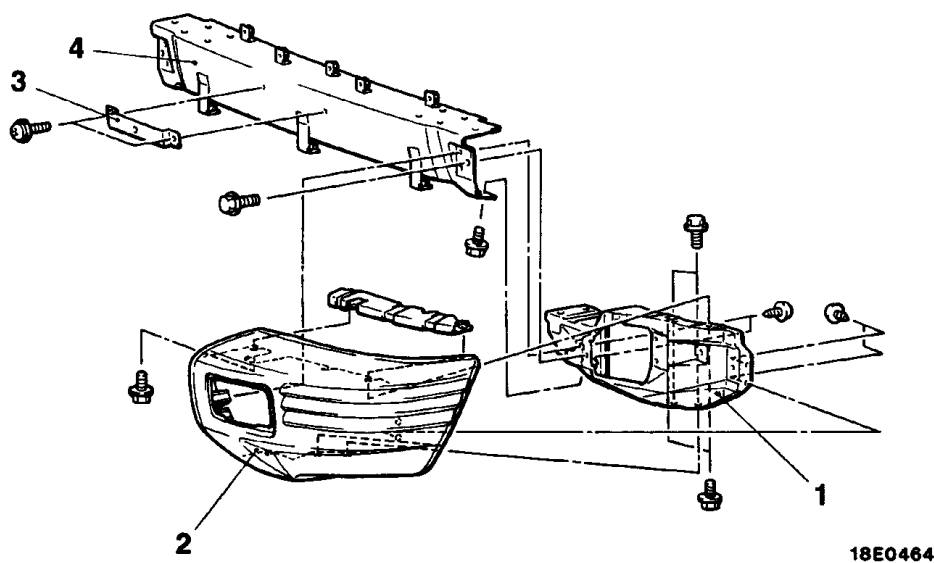
REMOVAL AND INSTALLATION



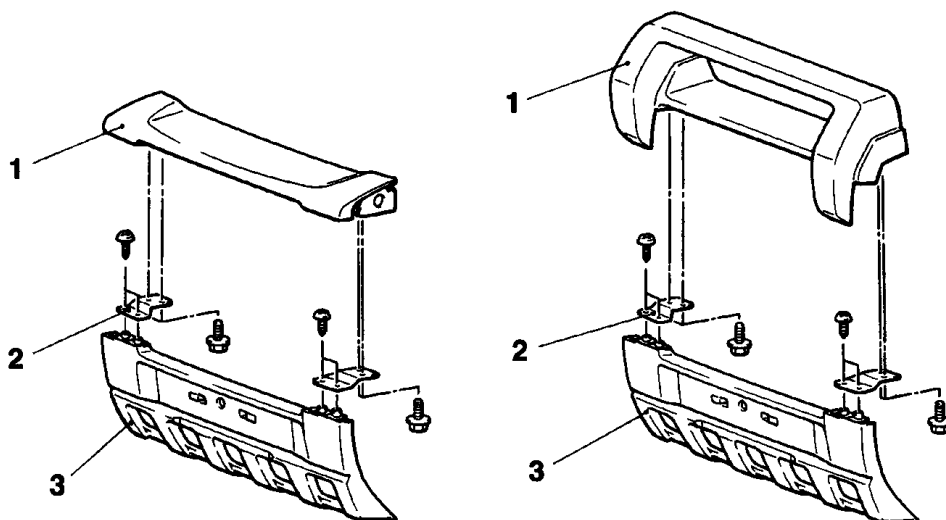
Removal steps

1. Skid plate
2. Front bumper center garnish or grille guard
3. Fog lamp bezel
4. Front fog lamp assembly
5. Nozzle assembly and hose connection
6. Stopper B <Vehicles with winch>
7. Stopper A <Vehicles with winch>
8. Rope hook <Vehicles with winch>
9. Guide roller <Vehicles with winch>
10. Front bumper assembly

DISASSEMBLY AND REASSEMBLY

**Front bumper removal steps**

1. Front bumper side stay
2. Front bumper side face
3. Center bumper lower garnish bracket
4. Front center bumper

**Front bumper center garnish removal steps**

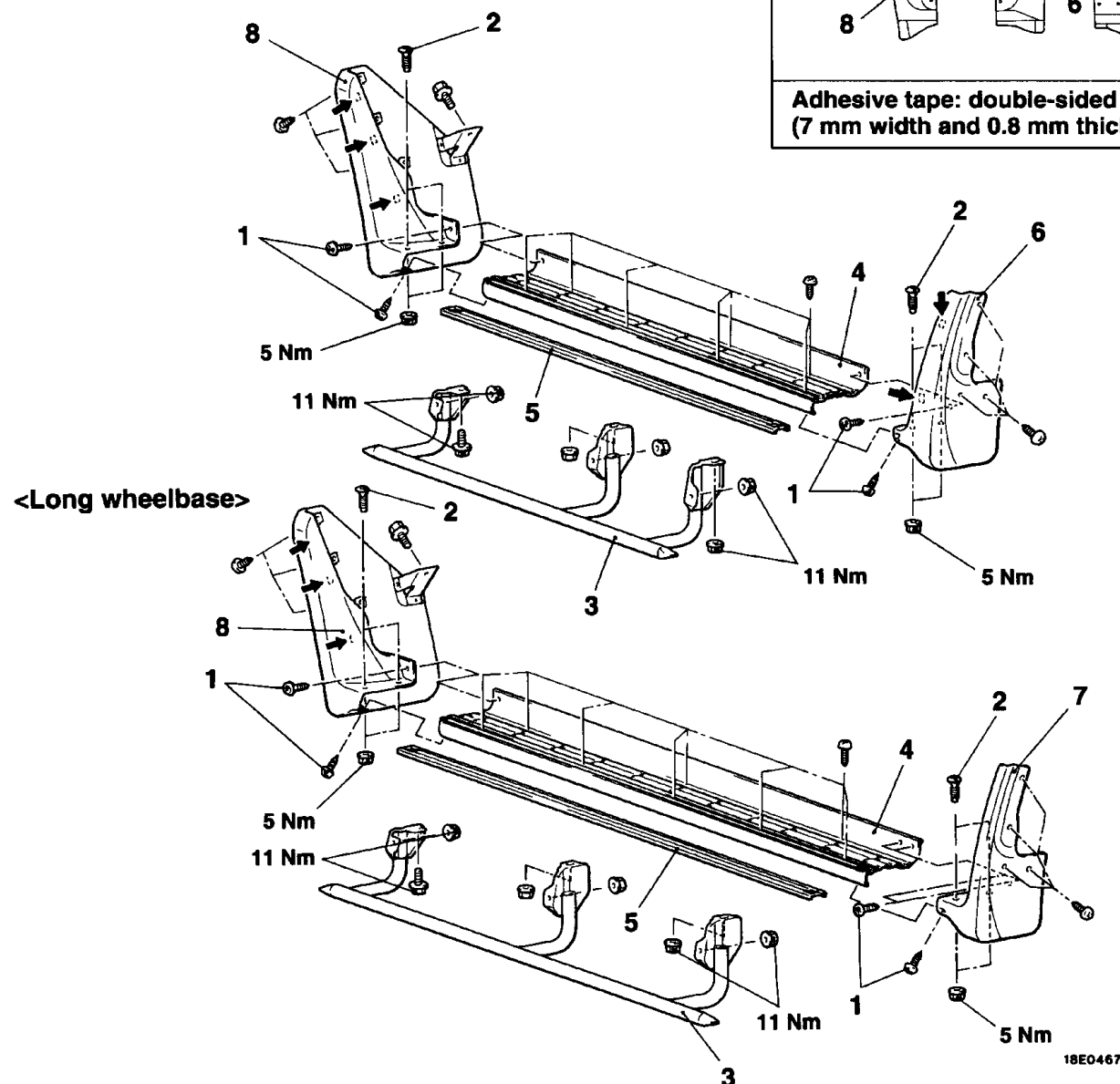
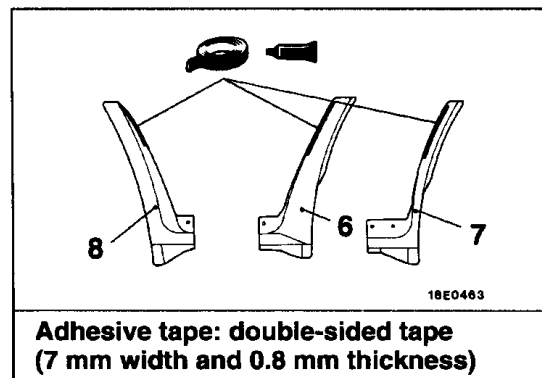
1. Front bumper center upper garnish
2. Garnish bracket
3. Front bumper center lower garnish

Grille guard removal steps

1. Grille guard
2. Garnish bracket
3. Front bumper center

SIDE STEP**REMOVAL AND INSTALLATION**

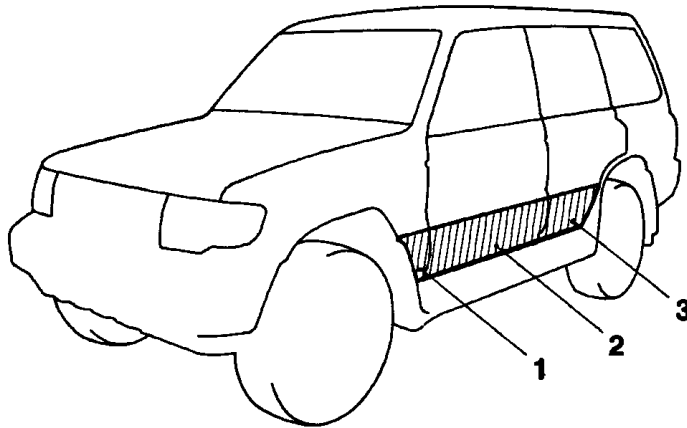
<Standard wheelbase>

**NOTE**

←: resin clip position

Removal steps

1. Screw
2. Bolt
3. Side step pipe assembly
4. Step plate
5. Non slip cover
6. Rear step cover <Standard wheelbase>
7. Rear step cover <Long wheelbase>
8. Front mud guard

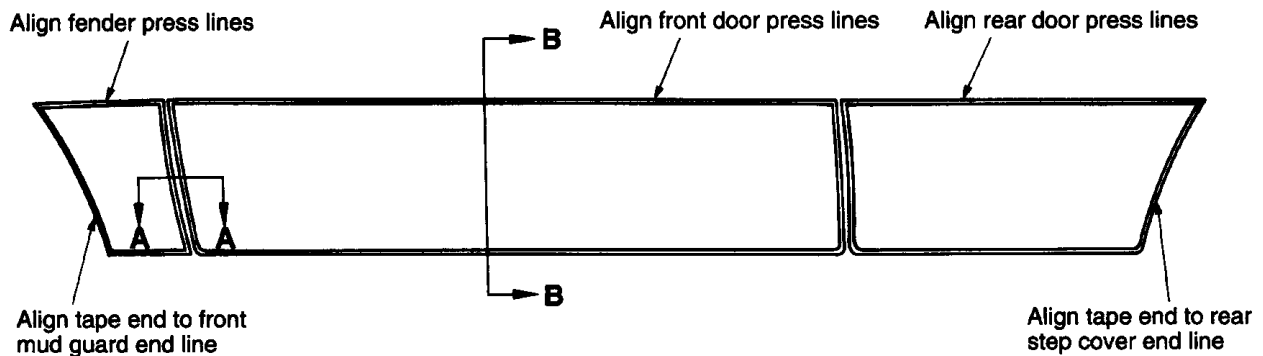
STRIPE TAPE**REMOVAL AND INSTALLATION**

18E0489

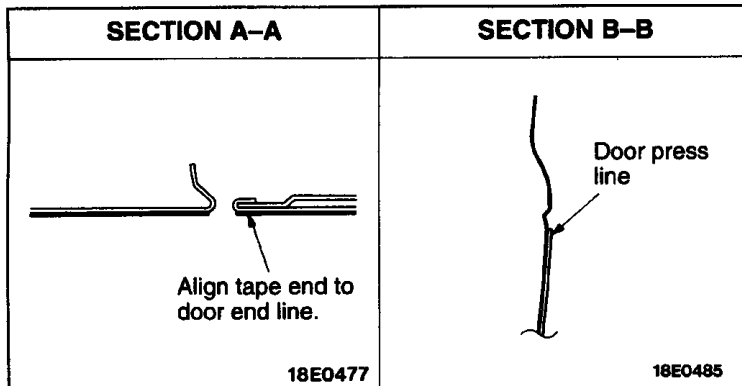
- ▶A◀ 1. Front stripe
- ▶A◀ 2. Front door stripe
- ▶A◀ 3. Rear door stripe

INSTALLATION SERVICE POINT**►A◄ STRIPES INSTALLATION**

1. Installation position
Attach to the position shown in the illustration.

STRIPE TAPE

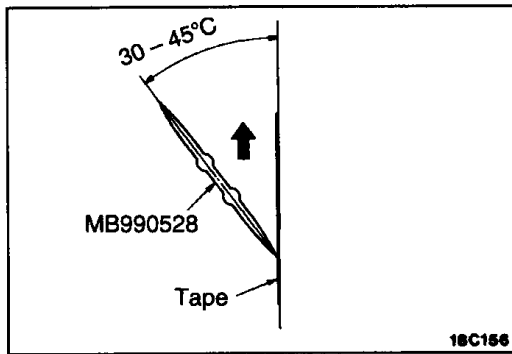
18E0483



2. Install the tape by the following procedure.
 - (1) Use unleaded gasoline or toluene to wipe off oil from stripe tape adhesion area.
 - (2) Remove protective paper from back of stripe tape and adhere entirely to indicated area.

Caution

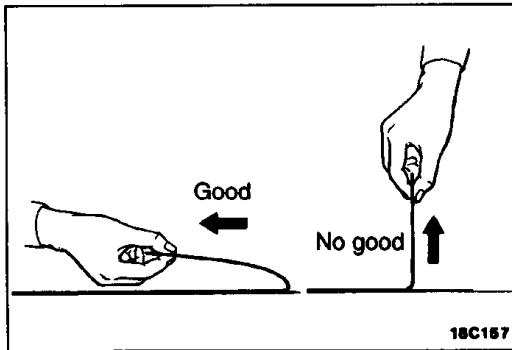
- Work in a dust-free workplace with temperature at 20 – 38°C.
- If workplace temperature is under 20°C, warm tape and vehicle body (adhesion area) to 20 – 38°C.



- (3) Use special tool and smooth out tape evenly starting from center of tape and up and then down to press out bubbles.

Caution

- Smoothing out horizontally will cause wrinkles and may displace the tape.
- Adhere tape securely to prevent tape from peeling off.



- (4) Hold one end of top protective paper and slowly peel off horizontally.
- (5) If bubbles are left under the tape, pierce slightly with needle and press out air with a spatula.

GROUP 52A

INTERIOR

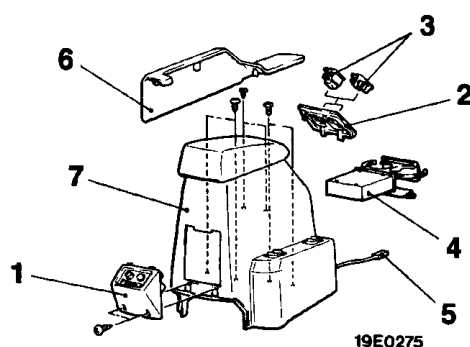
GENERAL

OUTLINE OF CHANGE

The large rear console has been adopted. To correspond to this, the maintenance service procedures have been established.

FLOOR CONSOLE

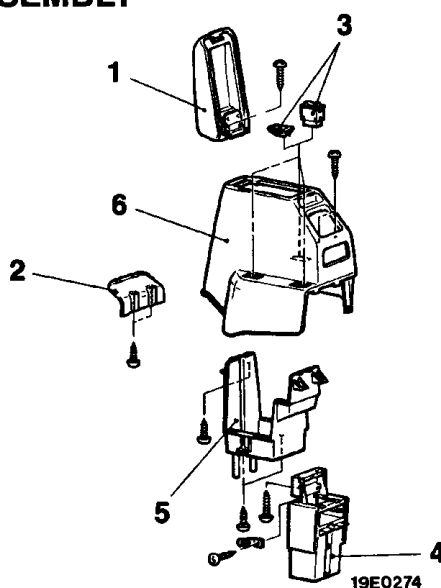
REMOVAL AND INSTALLATION



Removal steps

- | | |
|---------------------------------|--------------------------|
| 1. Rear heater control assembly | 5. Connector |
| 2. Switch panel | 6. Side panel A |
| 3. Switch or hole cover | 7. Rear console assembly |
| 4. Cup holder | |

DISASSEMBLY AND REASSEMBLY



Disassembly steps

- | | |
|-------------------------|-----------------|
| 1. Rear console lid | 4. Inner box A |
| 2. Rear cover | 5. Inner box B |
| 3. Switch or hole cover | 6. Rear console |

GROUP 54

CHASSIS ELECTRICAL

GENERAL

OUTLINE OF CHANGES

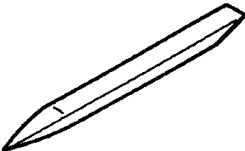
- The projector-type fog lamp has been adopted. To correspond to this, the maintenance service procedures have been established.
- The side turn signal lamp has been changed. To correspond to this, the maintenance service procedures have been established.
- The high-mounted stop lamp for the canvas top models has been adopted. To correspond to this, the maintenance service procedures have been established.

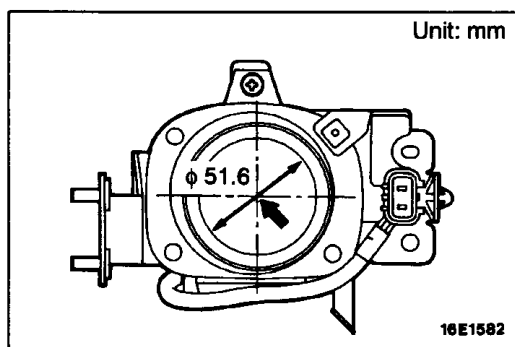
FRONT FOG LAMP

SERVICE SPECIFICATIONS

Items		Standard value
Front fog lamp aiming	Vertical direction	100 mm below horizontal (H)
	Horizontal direction	Parallel to direction of vehicle travel

SPECIAL TOOL

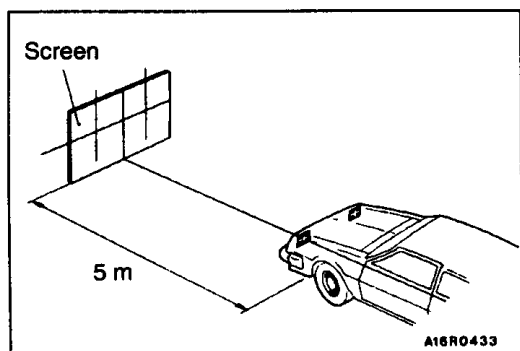
Tool	Number	Name	Use
 B990784	MB990784	Ornament remover	Removal of fog lamp bezzel



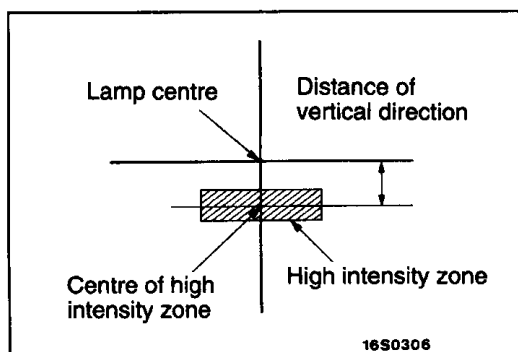
ON-VEHICLE SERVICE

FRONT FOG LAMP AIMING

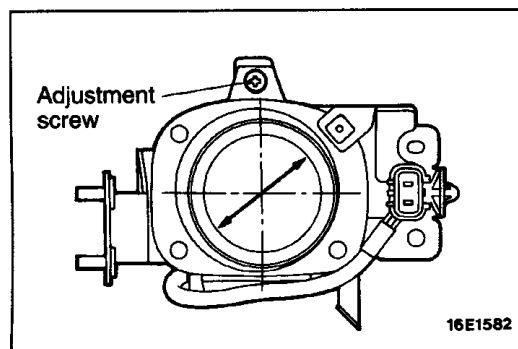
1. Remove the fog lamp bezzel.
2. Measure the centre of the fog lamps, as shown in the illustration.



3. Set the distance between the screen and the centre of the fog lamps as shown in the illustration.
4. Inflate the tyres to the specified pressures and there should be no other load in the vehicles other than driver or substituted weight of approximately 75 kg placed in the driver's position.
5. With the engine running at 2,000 r/min, aim the fog lamp.



6. Check if the beam shining onto the screen is at the standard value.

Standard value:**(Vertical direction)****100 mm below horizontal (H)****(Horizontal direction)****Parallel to direction of vehicle travel****NOTE**

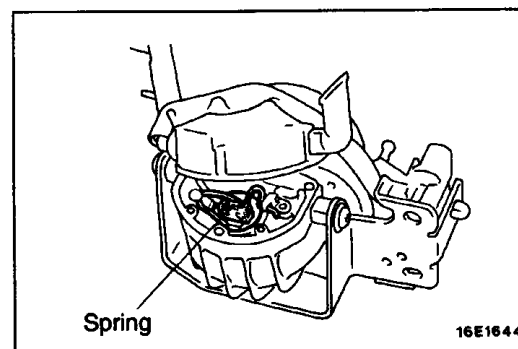
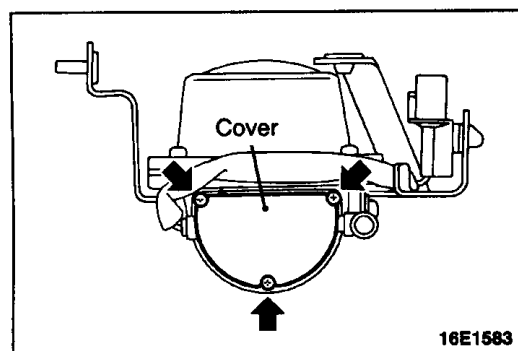
The horizontal direction is non-adjustable. If the deviation of the lamp beam axis exceeds the standard value, check to be sure that the mounting location or some other point is not defective.

Caution

When making the aiming adjustment, be sure to mask those lamps which are not being adjusted.

BULB REPLACEMENT

1. Remove the fog lamp.
2. Remove the cover.

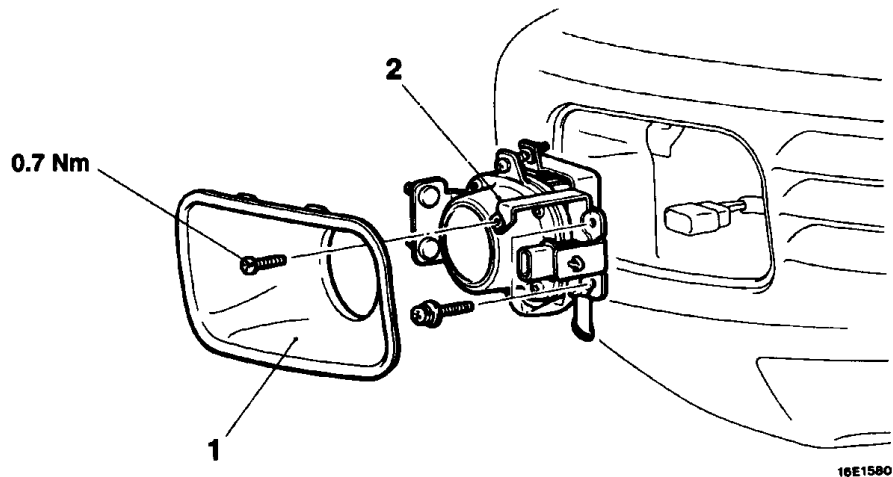


3. Unhook the spring which secures the bulb and then remove the bulb.

Caution

Do not touch the surface of the bulb with hands or dirty gloves. If the surface does become dirty, clean it with alcohol or thinner, and let it dry thoroughly before installing.

REMOVAL AND INSTALLATION

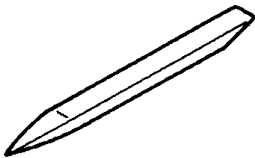


Removal steps

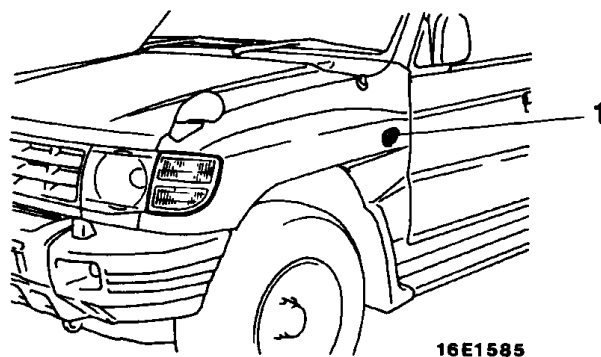
1. Fog lamp bezel
2. Front fog lamp assembly

SIDE TURN SIGNAL LAMP

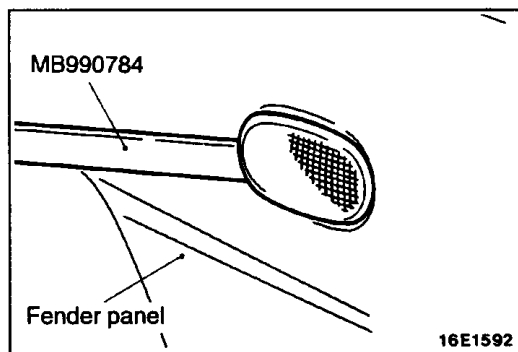
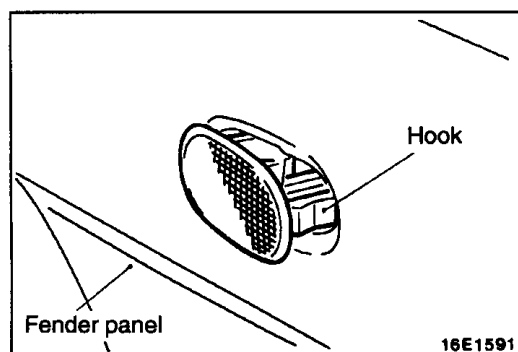
SPECIAL TOOL

Tool	Number	Name	Use
 B990784	MB990784	Ornament remover	Side turn signal lamp removal

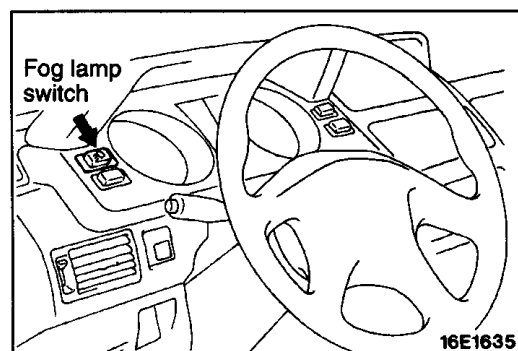
REMOVAL AND INSTALLATION



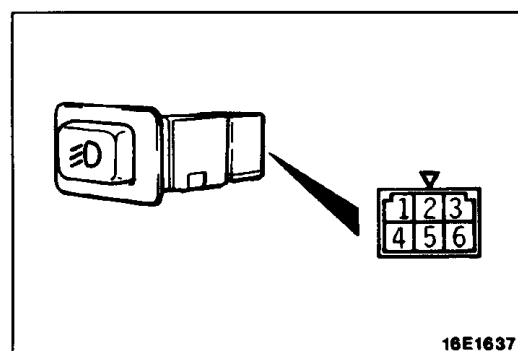
- ◀A▶ ▶A▶
1. Side turn signal lamp

**REMOVAL SERVICE POINT****◀▶ SIDE TURN SIGNAL LAMP REMOVAL****INSTALLATION SERVICE POINT****▶◀ SIDE TURN SIGNAL LAMP INSTALLATION**

Face the hook of the side turn signal lamp to the rear of vehicle.

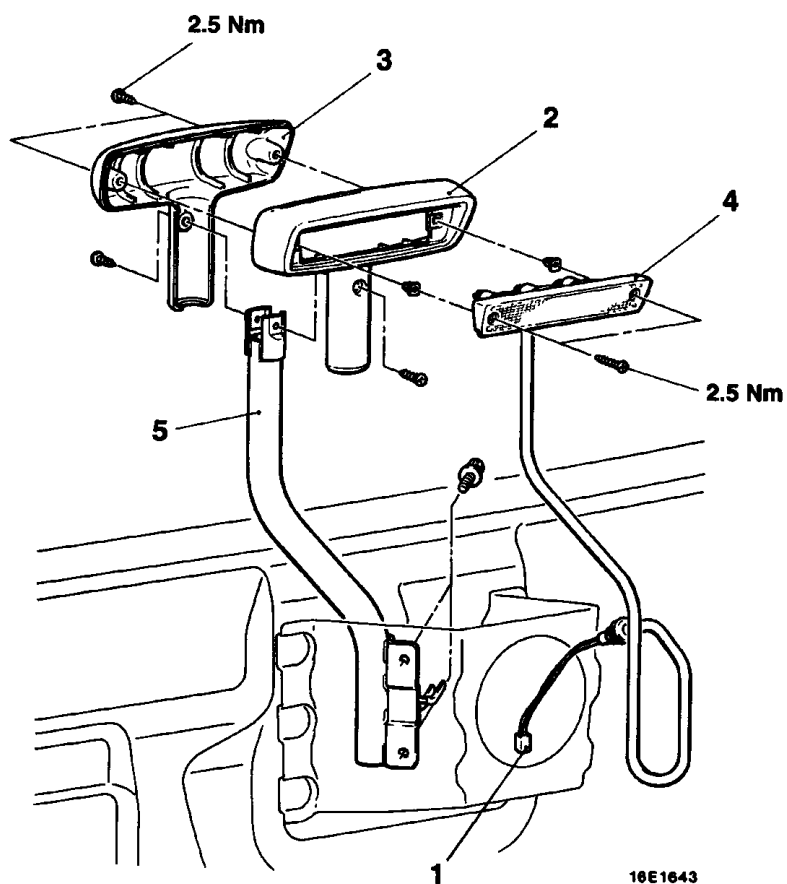
**FRONT FOG LAMP SWITCH****INSPECTION**

(1) Remove the fog lamp switch from the meter bezel.



(2) Operate the switch and check for continuity between the terminals.

Switch position	Terminal						
	1	4	3	6	2	ILL	5
OFF							
ON	○	○	○	○	○	○	○

HIGH MOUNTED STOP LAMP**REMOVAL AND INSTALLATION****Removal steps**

- Spare tyre
- Back door trim
- 1. Connector
- 2. Front cover
- 3. Rear cover
- 4. High mounted stop lamp
- 5. High mounted stop lamp pipe