HOW TO USE THIS MANUAL

MAINTENANCE, REPAIR AND SERVICING EXPLANATIONS

This manual provides explanations, etc. concerning procedures for the inspection, maintenance, repair and servicing of the subject model, for Australian vehicles.

ON VEHICLE SERVICE

"On Vehicle Service" are procedures for performing inspections and adjustments of particularly important locations with regard to the construction and for maintenance and servicing, but other inspections (for looseness, play, cracking, damage, etc.) must also be performed.

INSPECTION

Items described under this heading are inspection and checking procedures to be performed by using special tools and measuring instruments and by feeling. For actual maintenance and servicing procedures, visual inspections should always be performed as well.

DEFINITION OF TERMS

STANDARD VALUE

Indicates the value used as the standard for judging the quality of a part or assembly, or the value to which the part or assembly is corrected and adjusted. It is given by tolerance.

LIMIT

Shows the standard for judging the quality of a part or assembly on inspection and means the maximum or minimum value within which the part or assembly must be kept functionally or in strength. It is a value established outside the range of standard value.

REFERENCE VALUE

Indicates the adjustment value prior to starting the work,it is provided to facilitate assembly and adjustment procedures so they can be completed more efficiently.

CAUTION

Indicates information particularly vital to the technician during the performance of maintenance and servicing procedures in order to avoid the possibility of injury to the technician, or damage to component parts, or a reduction of component or vehicle function or performance, etc.

INDICATION OF TIGHTENING TORQUE

The tightening torque shown in this manual is a basic value with a tolerance of ± 10% except the following cases when the upper and lower limits of tightening torque are given.

(1) The tolerance of the basic value is within ± 10%.
(2) Special bolts or the like are in use.
(3) Special tightening methods are used.

ABBREVIATIONS

The following abbreviations are used in this manual for classification of model types.

M/T: Indicates manual transmission, or models equipped with a manual transmission.
A/T: Indicates automatic transmission, or models equipped with an automatic transmission.
MPI: Indicates multipoint fuel injection.
S4: Indicates an engine with a single overhead camshaft and 4 valves per cylinder.

EXPLANATION OF MANUAL CONTENTS

Main Index

00 Index

Indicates procedures to be performed before the work in that section is started, and procedures to be performed after the work in that section is finished.

Component Diagram

A diagram of the component parts is provided near the front of each section in order to give the reader a better understanding of the installed condition of component parts.

Indicates (by symbols) where lubrication is necessary.

Maintenance and Servicing Procedures

The numbers provided within the diagram indicate the sequence for maintenance and servicing procedures.

- Removal steps :
  The part designation number corresponds to the number in the illustration to indicate removal steps.
- Disassembly steps :
  The part designation number corresponds to the number in the illustration to indicate disassembly steps.
- Installation steps :
  Specified in case installation is impossible in reverse order of removal steps. Omitted if installation is possible in reverse order of removal steps.
- Reassembly steps :
  Specified in case reassembly is impossible in reverse order of disassembly steps. Omitted if reassembly is possible in reverse order of disassembly steps.

Classifications of Major Maintenance / Service points

When there are major points relative to maintenance and servicing procedures (such as essential maintenance and service points, maintenance and service standard values, information regarding the use of special tools, etc.), these are arranged together as major maintenance and service points and explained in detail.

◀A▶ : Indicates that there are essential points for removal or disassembly.

▶A◀ : Indicates that there are essential points for installation or reassembly.

Symbols for Lubrication, Sealants and Adhesives

Information concerning the locations for lubrication and for application of sealants and adhesives is provided, by using symbols, in the diagram of component parts or on the page following the component parts page, and explained.

 : Grease
(multipurpose grease unless there is a brand or type specified)

 : Sealant or adhesive

 : Brake fluid or automatic transmission fluid

 : Engine oil, gear oil or air conditioner compressor oil

 : Adhesive tape or butyl rubber tape

Indicates the group title.

Indicates the section title.

Indicates the group number.

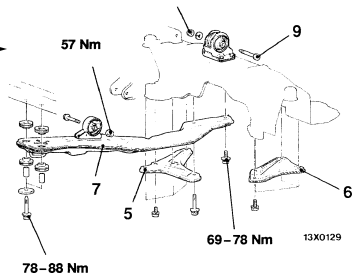
Indicates the page number.

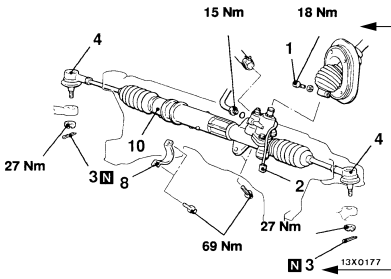
POWER STEERING GEAR BOX

110000526

REMOVAL AND INSTALLATION

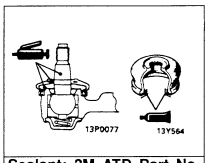
Pre-removal Operation
- Power Steering Fluid Draining (Refer to P.37A-15.)
- Stabilizer Bar Removal (Refer to GROUP 33A – Stabilizer Bar)



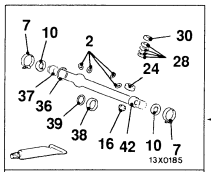


Denotes tightening torque.

Denotes non-reusable part.



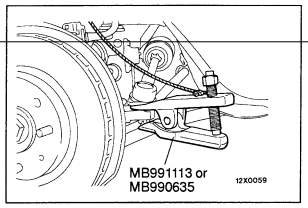
Sealant: 3M ATD Part No. 8663 or equivalent



Steering gear seal kit

Repair kit or set parts are shown. (Only very frequently used parts are shown.)

Removal steps
1. Joint assembly and gear box connecting bolt
2. Solenoid valve connector <Vehicles with EPS>
3. Cotter pin
- ◀A▶ ▶A◀ 4. Connection for tie-rod end and knuckle
5. Stay (L.H.)
6. Stay (R.H.)
7. Center member assembly
8. Clamp
- ◀B▶ 9. Bolt
- ◀C▶ 10. Gear box assembly

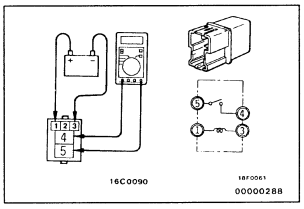


REMOVAL SERVICE POINTS

◀A▶ TIE-ROD END DISCONNECTION

Caution
1. **Be sure to tie the cord of the special tool to the nearby part.**
2. **Loosen the nut but do not remove it.**

Operating procedures, cautions, etc. on removal, installation, disassembly and reassembly are described.



FOG LIGHT RELAY CONTINUITY CHECK

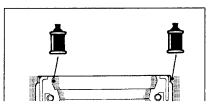
Battery voltage	Terminal			
	1	3	4	5
Power is not supplied	○	○		
Power is supplied	⊕	⊖	○	○

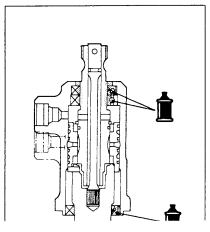
○—○ indicates that there is continuity between the terminals.
⊕—⊖ indicates terminals to which battery voltage is applied.

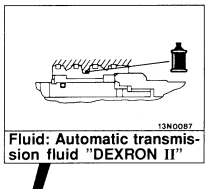
The title of the page (following the page on which the diagram of Component parts is presented) indicating the locations of lubrication and sealing procedures.

LUBRICATION AND SEALING POINTS

<Conventional power steering gear box>







Fluid: Automatic transmission fluid "DEXRON II"

Main Index
00 Index

HOW TO USE TROUBLESHOOTING/INSPECTION SERVICE POINTS

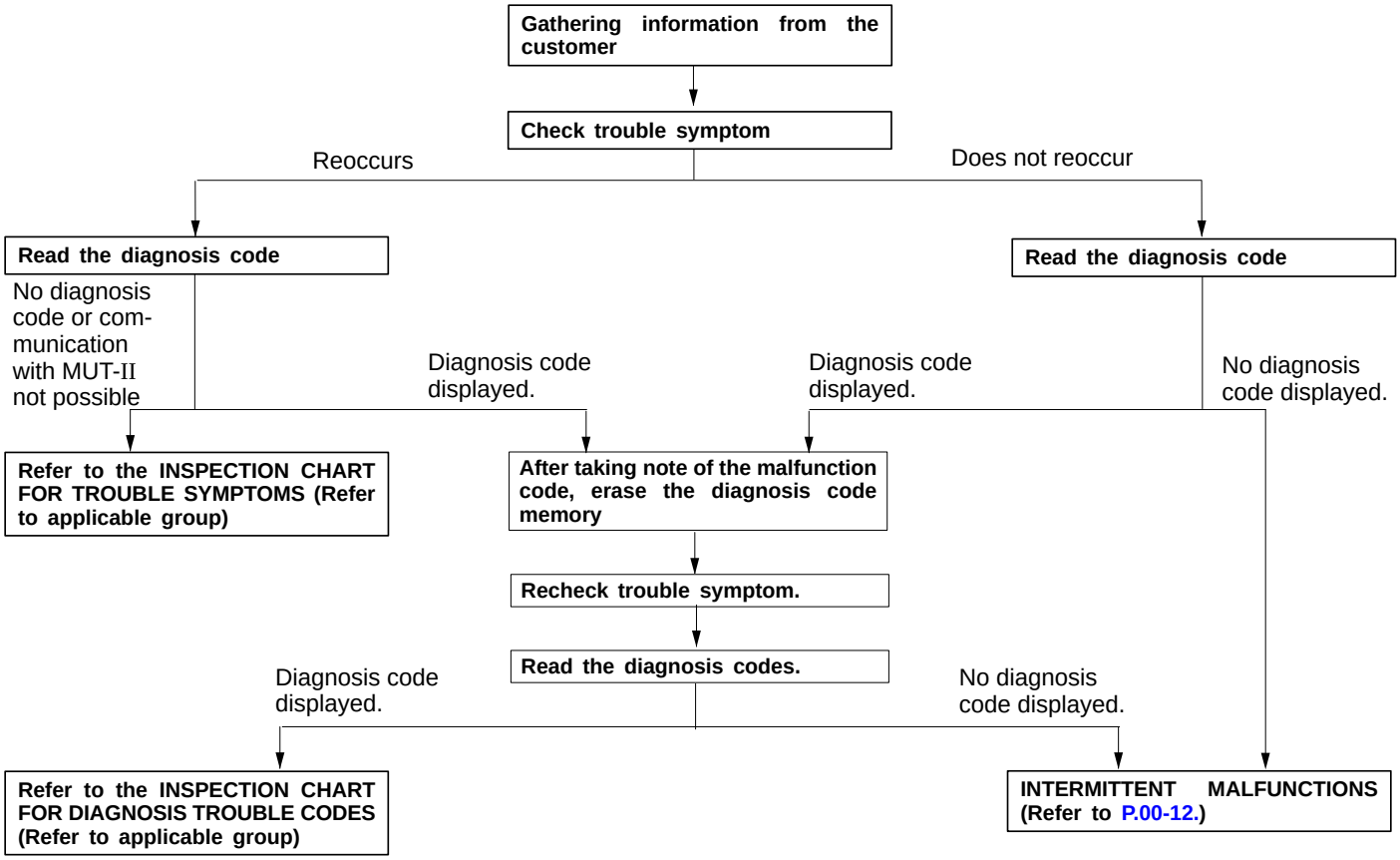
Troubleshooting of electronic control systems for which the MUT-II can be used follows the basic outline described below. Furthermore, even in systems for which the MUT-II cannot be used, part of these systems still follow this outline.

TROUBLESHOOTING CONTENTS

1. STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING

The troubleshooting sections follow the basic diagnosis flow which is given below. If the diagnosis flow is different from that given below, or if additional explanation is required, the details of such differences or additions will also be listed.

Diagnosis method



2. SYSTEM OPERATION AND SYMPTOM VERIFICATION TESTS

If verification of the trouble symptoms is difficult, procedures for checking operation and verifying trouble symptoms are shown.

3. DIAGNOSIS FUNCTION

Details which are different from those in the “Diagnosis Function” section on the next page are listed.

Main Index
00 Index

4. INSPECTION CHART FOR DIAGNOSIS CODES

5. INSPECTION PROCEDURE FOR DIAGNOSIS CODES

Indicates the inspection procedures corresponding to each diagnosis code (Refer to How to Use the Inspection Procedures.)

6. INSPECTION CHART FOR TROUBLE SYMPTOMS

If there are trouble symptoms even though the results of inspection using the MUT-II show that all diagnosis codes are normal, inspection procedures for each trouble symptom will be found by means of this chart.

7. INSPECTION PROCEDURE FOR TROUBLE SYMPTOM

Indicates the inspection procedures corresponding to each trouble symptoms classified in the Inspection Chart for Trouble Symptoms. (Refer to How to Use the Inspection Procedures.)

8. SERVICE DATA REFERENCE TABLE

Inspection items and normal judgement values have been provided in this chart as reference information.

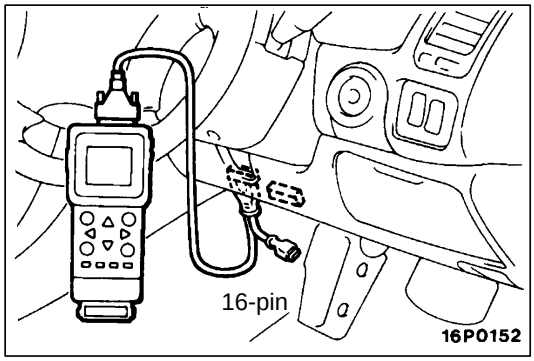
9. CHECK AT ECU TERMINALS

Terminal numbers for the ECU connectors, inspection items and standard values have been provided in this chart as reference information.

10. INSPECTION PROCEDURES USING AN OSCILLOSCOPE

When there are inspection procedures using an oscilloscope, these are listed here.

Main Index
00 Index

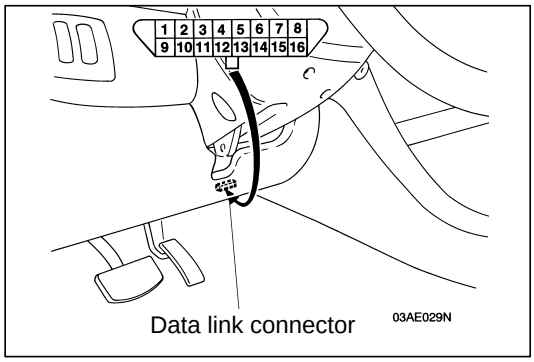


DIAGNOSIS FUNCTION

METHOD OF READING DIAGNOSIS CODES WHEN USING THE MUT-II

Connect the MUT-II to the data link connector and take a reading of the diagnosis codes.

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



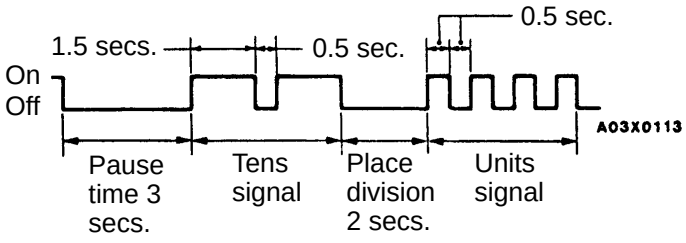
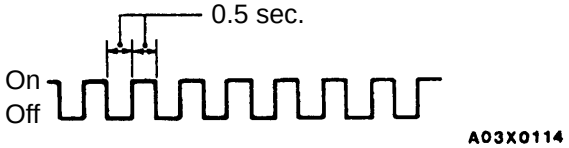
WHEN USING THE WARNING LAMP

1. Use the special tool to earth No.1 terminal (diagnosis control terminal) of the data link connector.
2. Turn the ignition switch on.
3. Read out a diagnosis code by observing how the warning lamp flashes.

Applicable system

System name	Warning lamp name
MPI	Engine warning lamp
A/T	Neutral position indicator lamp
ABS	ABS warning lamp
TCL	TCL warning lamp
Cruise control	Cruise warning lamp

Indications of diagnosis code by warning lamp

When the diagnosis code No.24 is output	When no diagnosis code is output
	

METHOD OF ERASING DIAGNOSIS CODES WHEN USING THE MUT-II

Connect the MUT-II to the data link connector and erase the diagnosis code.

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

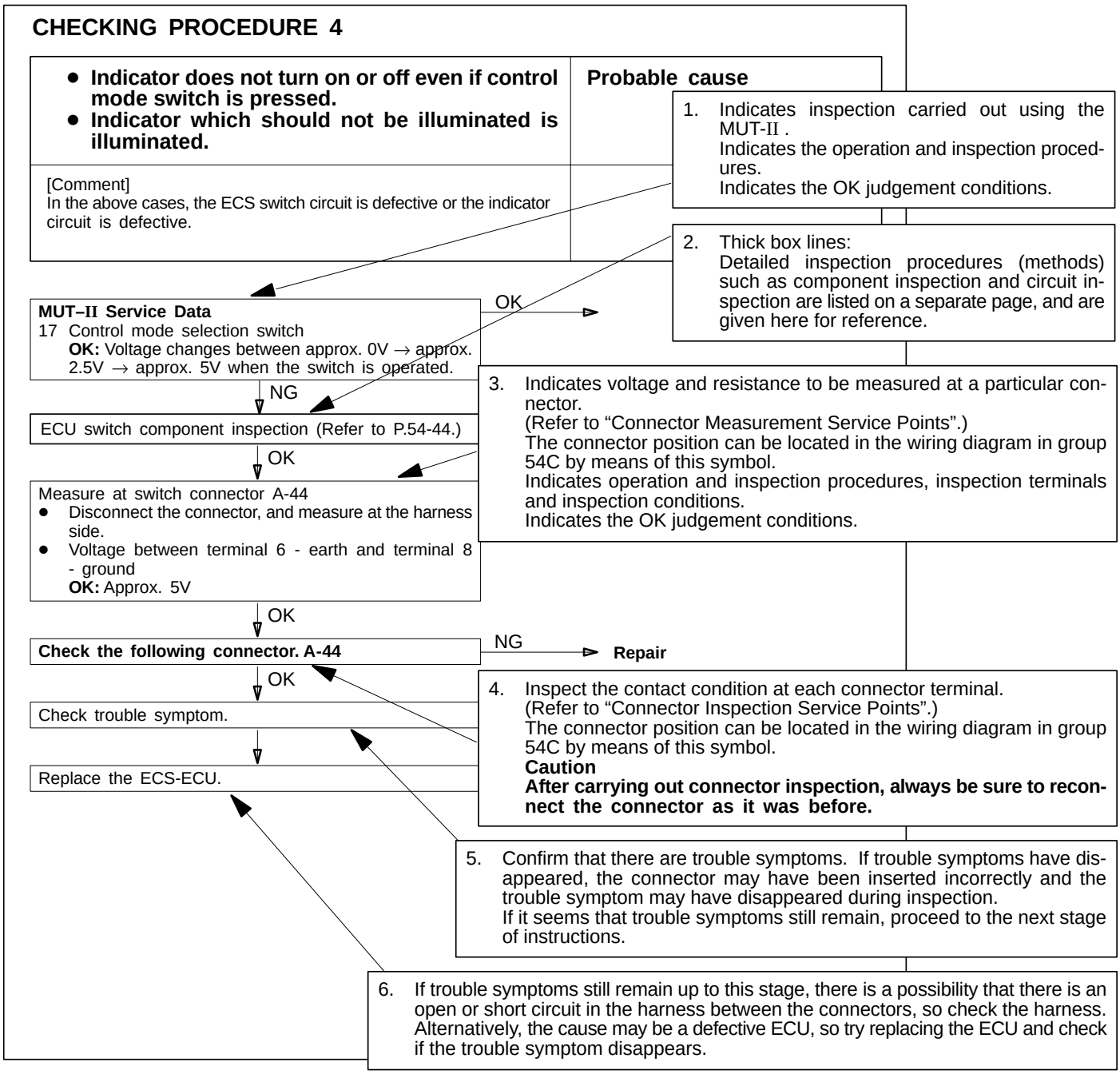
WHEN NOT USING THE MUT-II <MPI, TCL, ABS AND A/T>

1. Turn the ignition switch to OFF.
2. After disconnecting the battery cable from the battery (–) terminal for 10 seconds or more, reconnect the cable.
3. After the engine has warmed up, run it at idle for about 15 minutes.

Main Index
00 Index

HOW TO USE THE INSPECTION PROCEDURES

The causes of a high frequency of problems occurring in electronic circuitry are generally the connectors, components, the ECU and the harnesses between connectors, in that order. These inspection procedures follow this order, and they first try to discover a problem with a connector or a defective component.



HARNESS INSPECTION

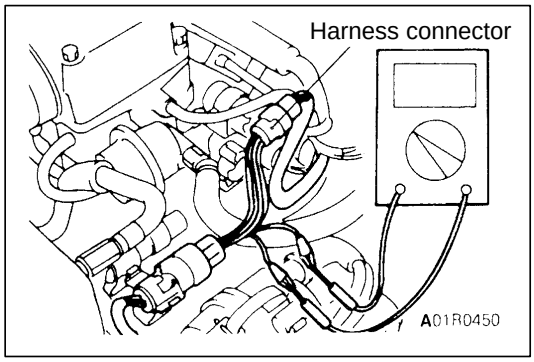
Check for an open or short circuit in the harness between the terminals which were defective according to the connector measurements. Carry out this inspection while referring to group 54 electrical. Here, “Check harness between power supply and terminal xx” also includes checking for blown fuses. For inspection service points when there is a blown fuse, refer to Inspection Service Points for a Blown Fuse.

MEASURES TO TAKE AFTER REPLACING THE ECU

If the trouble symptoms have not disappeared even after replacing the ECU, repeat the inspection procedure from the beginning.

CONNECTOR MEASUREMENT SERVICE POINTS

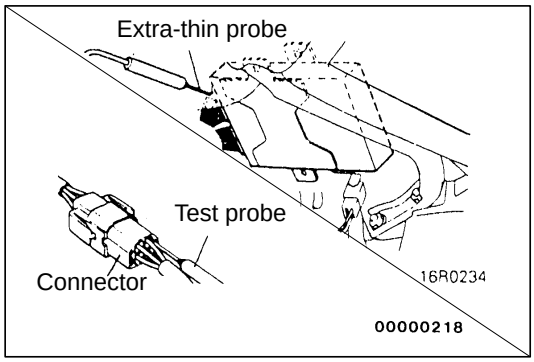
Turn the ignition switch to OFF when connecting and disconnecting the connectors, and turn the ignition switch to ON when measuring if there are no instructions to the contrary.



IF INSPECTING WITH THE CONNECTOR CONNECTED (WITH CIRCUIT IN A CONDITION OF CONTINUITY)

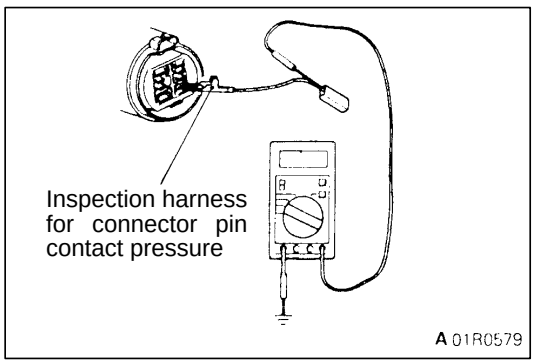
Waterproof Connectors

Be sure to use the special tool (harness connector). Never insert a test probe from the harness side, because to do so will reduce the waterproof performance and result in corrosion.



Ordinary (non-waterproof) Connectors

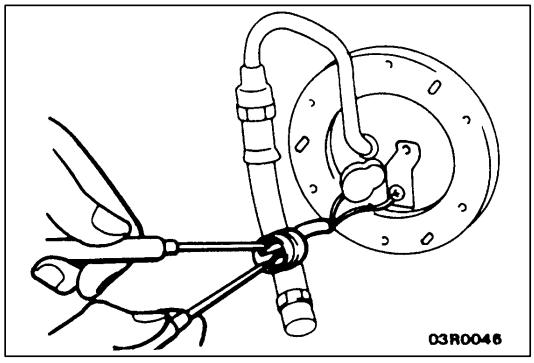
Check by inserting the test probe from the harness side. Note that if the connector (control unit, etc.) is too small to permit insertion of the test probe, it should not be forced; use a special tool (the extra–thin probe in the harness set for checking) for this purpose.



IF INSPECTING WITH THE CONNECTOR DISCONNECTED

<When Inspecting a Female Pin>

Use the special tool (inspection harness for connector pin contact pressure in the harness set for inspection).
The inspection harness for connector pin contact pressure should be used. The test probe should never be forcibly inserted, as it may cause a defective contact.



<When Inspecting a Male Pin>

Touch the pin directly with the test bar.

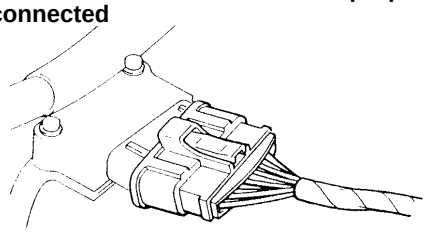
Caution

At this time, be careful not to short the connector pins with the test probes. To do so may damage the circuits inside the ECU.

Main Index

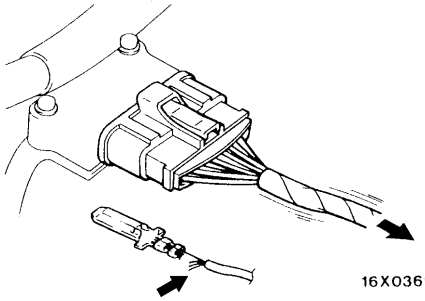
00 Index

Connector disconnected or improperly connected



16S0256

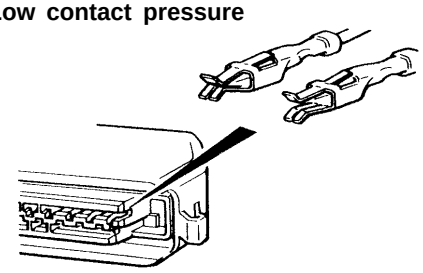
Defective connector contact



16X0369

Harness wire breakage at terminal section

Low contact pressure

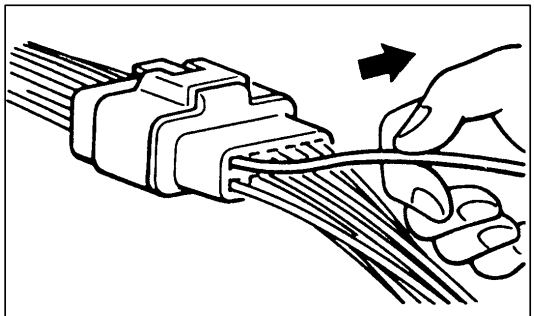


16S0254
00000219

CONNECTOR INSPECTION

VISUAL INSPECTION

- Connector is disconnected or improperly connected.
- Connector pins are pulled out due to harness tension at terminal section.
- Low contact pressure between male and female terminals.
- Low connection pressure due to rusted terminals or foreign matter lodged in terminals.



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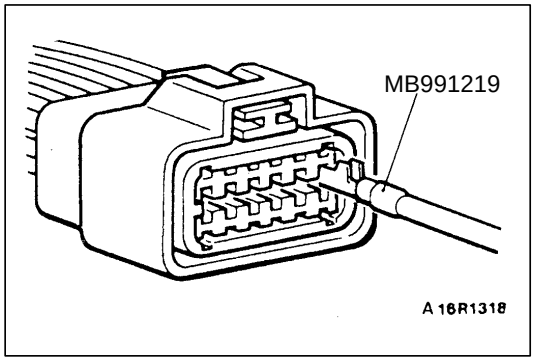
CONNECTOR PIN INSPECTION

If the connector pin stopper is damaged, the terminal connections (male and female pins) will not be perfect even when the connector body is connected, because the pins may pull out of the back side of the connector. Therefore, gently pull the wires one by one to make sure that no pins pull out of the connector.



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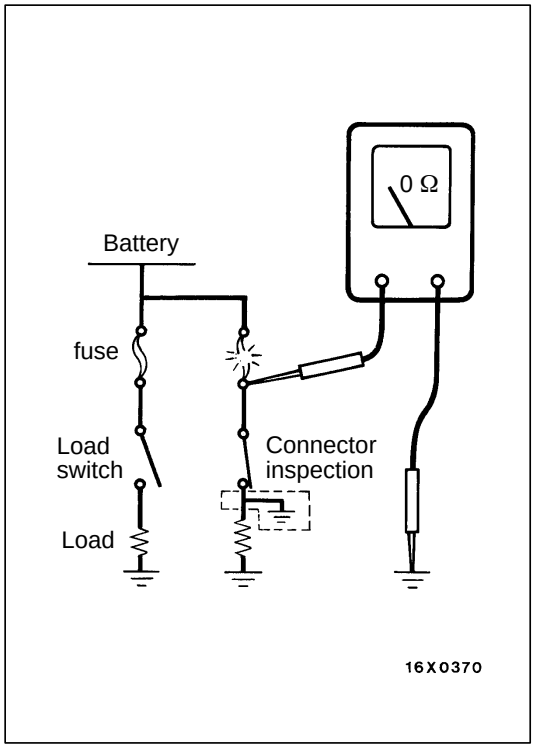
CONNECTOR ENGAGEMENT INSPECTION

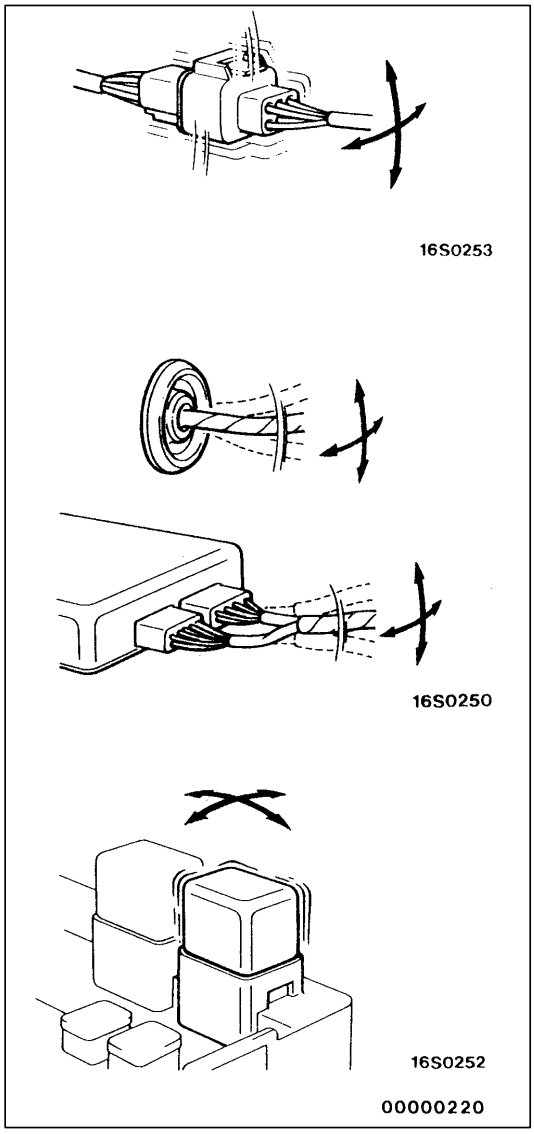
Use the special tool (connector pin connection pressure inspection harness of the inspection harness set) to inspect the engagement of the male pins and female pins. [Pin drawing force : 1 N or more]



INSPECTION SERVICE POINTS FOR A BLOWN FUSE

Remove the fuse and measure the resistance between the load side of the fuse and ground. Set the switches of all circuits which are connected to this fuse to a condition of continuity. If the resistance is almost 0 Ω at this time, there is a short somewhere between these switches and the load. If the resistance is not 0 Ω, there is no short at the present time, but a momentary short has probably caused the fuse to blow.

The main causes of a short circuit are the following.
- Harness being clamped by the vehicle body.
- Damage to the outer casing of the harness due to wear or heat.
- Water getting into the connector or circuitry.
- Human error. (mistakenly shorting a circuit, etc.)



POINTS TO NOTE FOR INTERMITTENT MALFUNCTIONS

Intermittent malfunctions often occur under certain conditions, and if these conditions can be ascertained, determining the cause becomes simple. In order to ascertain the conditions under which an intermittent malfunction occurs, first ask the customer for details about the driving conditions, weather conditions, frequency of occurrence and trouble symptoms, and then try to recreate the trouble symptoms. Next, ascertain whether the reason why the trouble symptom occurred under these conditions is due to vibration, temperature or some other factor. If vibration is thought to be the cause, carry out the following checks with the connectors and components to confirm whether the trouble symptom occurs.
The objects to be checked are connectors and components which are indicated by inspection procedures or given as probable causes (which generates diagnosis codes or trouble symptoms.)
- Gently shake the connector up, down and to the left and right.
- Gently shake the wiring harness up, down and to the left and right.
- Gently rock each sensor and relay, etc. by hand.
- Gently shake the wiring harness at suspensions and other moving parts.

NOTE
If determining the cause is difficult, the flight recorder function of the MUT-II can also be used.

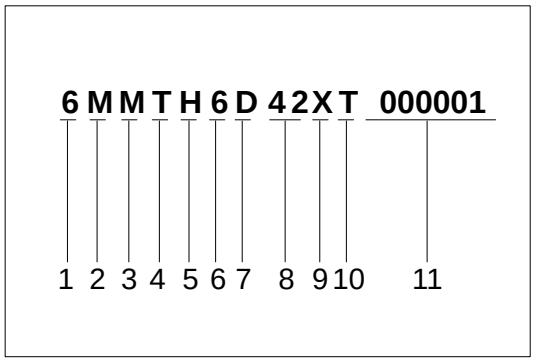
Main Index

00 Index

VEHICLE IDENTIFICATION

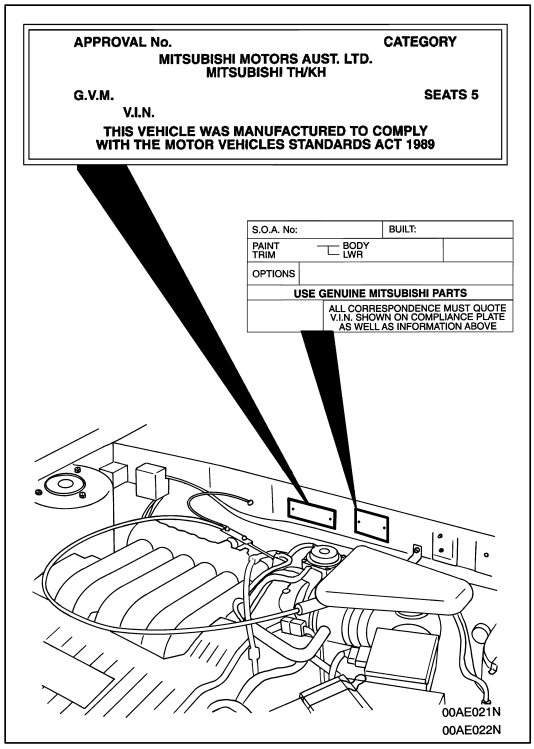
VEHICLE IDENTIFICATION NUMBER (VIN)

This number is stamped on the engine bulkhead next to the compliance plate and also on the compliance plate itself. It provides information for vehicle identification purposes and should be quoted when ordering parts or in any correspondence related to the vehicle.



No.	Items	Contents
1	Geographic Area	6: Australia
2	Country within Geographic area	M: Australia
3	Manufacturer	Mitsubishi Motors
4	Car line	T–Magna / K–Verada
5	Series	H–series
6	Engine / Transmission combinations	3: 3.0 litre MPI <leaded fuel> (Man)
		4: 3.0 litre MPI <leaded fuel> (Auto)
		5: 3.0 litre MPI <unleaded fuel> (Man)
		6: 3.0 litre MPI <unleaded fuel> (Auto)
		7: 3.5 litre MPI <unleaded fuel> (Auto)
7	Price class	A: V6 Advance
		D: Executive
		K: Altera LS
		U: V6 Altera
		M: Executive (NZ)
		S: Sports
		W: V6 Xi (Pacific)
		W: SEi (NZ)
		Z: Super Saloon/Elite (NZ)
		H: 3.5 Ei
		X: 3.5 Xi
8	Body type	42: Sedan / 46: Wagon
9	Year	W: 1998 / X: 1999 / Y: 2000 / 1: 2001
10	Assembly Plant	T: Tonsley Park
11	Body number	000001 to 999999

Main Index
00 Index



COMPLIANCE PLATE

All vehicles are manufactured to confirm to specific safety, environmental or consumer protective requirements as defined by the Australian Design Rules (ADR).

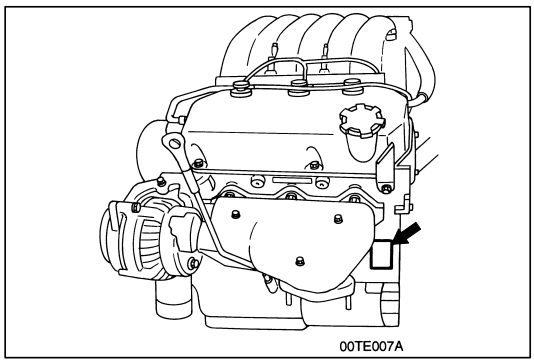
NOTE
The Compliance Plate is attached to the right hand side of the bulkhead in the engine compartment and must never be removed from the vehicle.

DATA PLATE

The Data Plate is attached to the right hand side of the bulkhead (adjacent to the compliance plate) in the engine compartment and is stamped with vehicle option codes, trim codes and a daily body sequential build number.

AUSTRALIAN DESIGN RULES

Australian Design Rules require the manufacturer of components and/or a complete vehicle to conform to specific safety, environmental or consumer protective requirements as defined by that particular rule. There is legislation that requires, amongst other things, that no modifications be made to a vehicle that would cause that vehicle not to comply with the Design Rules of that vehicle (parts replacement using approved Mitsubishi Motors Australia Limited components is permissible). Before interchanging or adding optional equipment or using non–Genuine Parts, it is recommended that advice be sought from an Authorised Mitsubishi Motors Australia Limited Dealer or from a Mitsubishi Motors Australia Limited Regional Office, because it is possible to inadvertently cause a vehicle not to comply with a Design Rule.



ENGINE MODEL NUMBER

1. The engine model number is stamped at the front side on the top edge of the cylinder block as shown in the following.

Engine model	Engine displacement
6G72	2,972cc
6G74	3,497cc

2. The engine serial number is stamped near the engine model number.

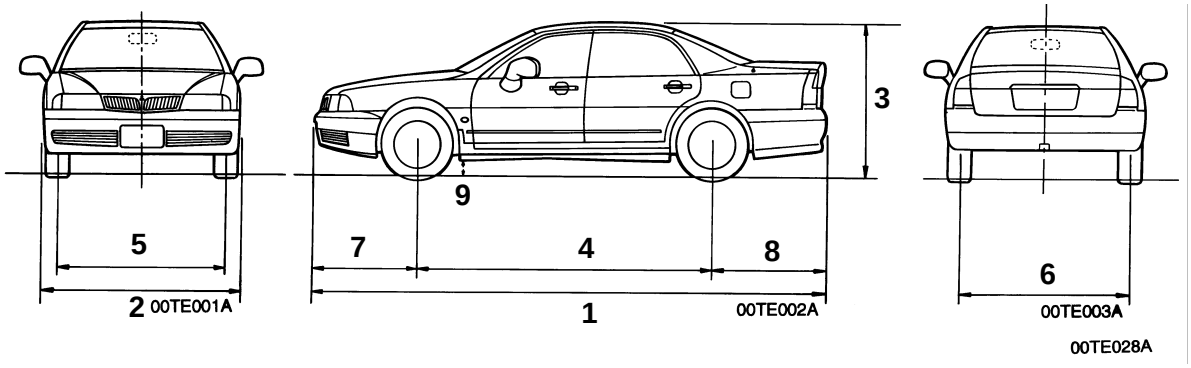
Engine serial number	6G72M:000000 to 999999
Engine serial number	6G74M:000000 to 999999

Main Index

00 Index

MAJOR SPECIFICATIONS

<VEHICLES FOR AUSTRALIA>

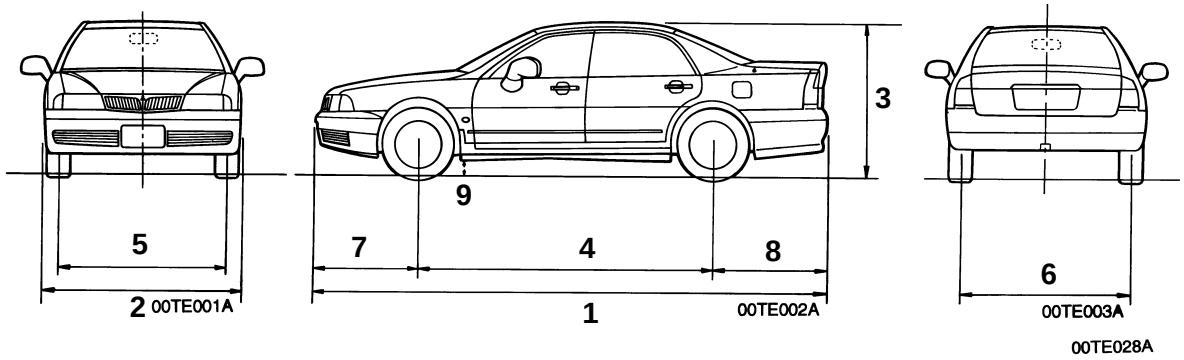


Items			Magna V6 Executive		Magna V6 Advance		Sports	
Vehicle dimensions	Overall length mm	1	4,785		4,785		4,785	
	Overall width mm	2	1,785		1,785		1,785	
	Overall height (Unladen) mm	3	1,435		1,435		1,435	
	Wheelbase mm	4	2,720		2,720		2,720	
	Track–front mm	5	1,545		1,545		1,545	
	Track–rear mm	6	1,535		1,535		1,535	
	Overhang–front mm	7	970		970		970	
	Overhang–rear mm	8	1,103		1,103		1,103	
	Minimum running ground clearance mm	9	165		165		165	
Vehicle weight kg	Kerb weight		Man	Auto	Man	Auto	Man	Auto
			1,461	1,482	1,466	1,499	1,465	1,498
	Gross vehicle weight rating		1,869	1,890	1,871	1,907	1,870	1,906
	Gross axle weight –front		1,011	1,028	1,011	1,041	1,009	1,035
	Gross axle weight –rear		858	862	860	866	861	871
Seating capacity			5					
Engine	Model No.		6G72 (SOHC) 6G74 (SOHC)		6G74 (SOHC)		6G74 (SOHC)	
	Piston displacement cm^3		2,972 3,497		3,497		3,497	
Transmission	Model No.		F5M51	F4A51	F5M51	F4A51	F5M51	F4A51
	Type		5 speed man	4 speed auto	5 speed man	4 speed auto	5 speed man	4 speed auto
Fuel system	Fuel supply system		Electronic control multipoint fuel injection					

Main Index
00 Index

MAJOR SPECIFICATIONS

<VEHICLES FOR AUSTRALIA CONTINUED>

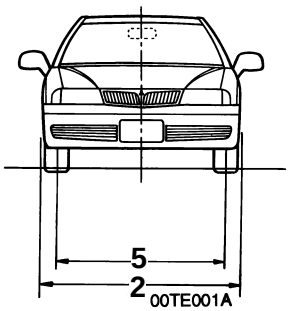


Items			Altera LS	Verada Ei	Verada Xi
Vehicle dimensions	Overall length mm	1	4,785	4,929	4,929
	Overall width mm	2	1,785	1,785	1,785
	Overall height (Unladen) mm	3	1,435	1,435	1,435
	Wheelbase mm	4	2,720	2,720	2,720
	Track–front mm	5	1,545	1,545	1,545
	Track–rear mm	6	1,535	1,536	1,536
	Overhang–front mm	7	970	1,018	1,018
	Overhang–rear mm	8	1,103	1,189	1,189
	Minimum running ground clearance mm	9	165	165	165
Vehicle weight kg	Kerb weight		Auto	Auto	Auto
			1,516	1,536	1,560
	Gross vehicle weight rating		1,924	1,944	1,968
	Gross axle weight –front		1,055	1,060	1,080
	Gross axle weight –rear		869	884	888
Seating capacity			5		
Engine	Model No.		6G74 (SOHC)	6G74 (SOHC)	6G74 (SOHC)
	Piston displacement cm^3		3,497	3,497	3,497
Transmission	Model No.		F4A51	F4A51	F4A51
	Type		4 speed auto	4 speed auto	4 speed auto
Fuel system	Fuel supply system		Electronic control multipoint fuel injection		

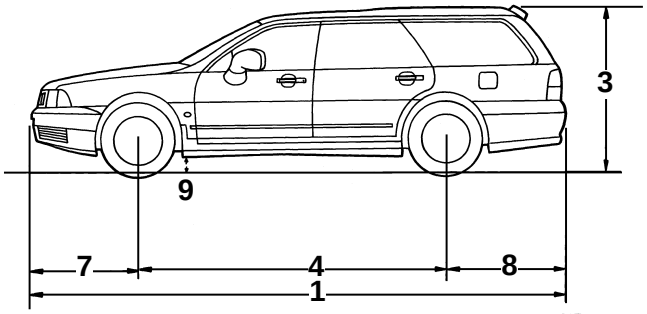
Main Index
00 Index

MAJOR SPECIFICATIONS

<VEHICLES FOR AUSTRALIA CONTINUED>



00TE001A



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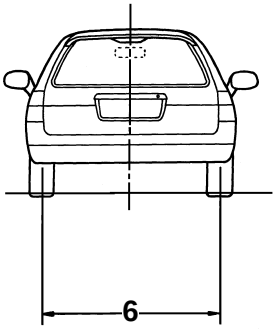


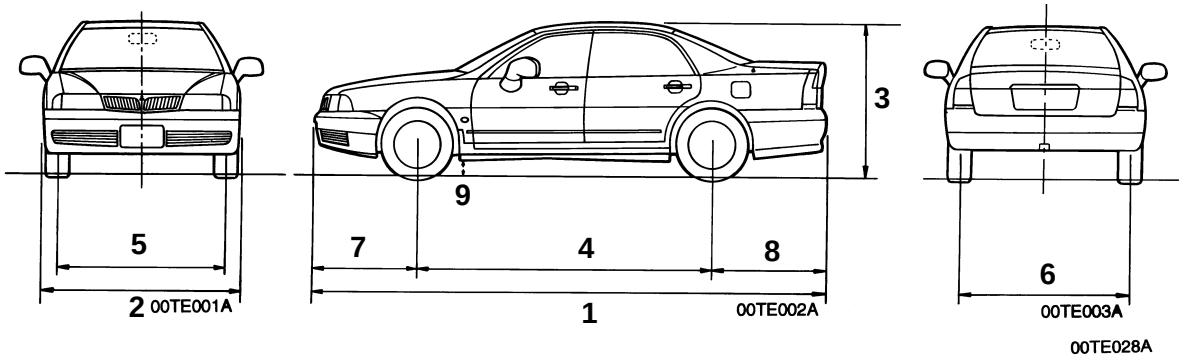
00TE030A

Items			Magna V6 Executive		Magna V6 Advance		Altera LS	Verada Ei
Vehicle dimensions	Overall length mm	1	4,812		4,812		4,812	4,878
	Overall width mm	2	1,785		1,785		1,785	1,785
	Overall height (Unladen) mm	3	1,482		1,482		1,482	1,482
	Wheelbase mm	4	2,722		2,722		2,722	2,722
	Track–front mm	5	1,545		1,545		1,545	1,545
	Track–rear mm	6	1,500		1,500		1,500	1,500
	Overhang–front mm	7	970		970		970	1,018
	Overhang–rear mm	8	1,103		1,103		1,103	1,138
	Minimum running ground clearance mm	9	165		165		165	165
Vehicle weight kg	Kerb weight		Man	Auto	Man	Auto	Auto	Auto
			1,474	1,504	1,485	1,515	1,522	1,554
	Gross vehicle weight rating		1,957	1,987	1,955	1,977	1,985	1,997
	Gross axle weight –front		991	1,021	988	1,017	1,014	1,014
	Gross axle weight –rear		966	966	967	961	971	983
Seating capacity			5					
Engine	Model No.		6G72 (SOHC) 6G74 (SOHC)		6G74 (SOHC)		6G74 (SOHC)	6G74 (SOHC)
	Piston displacement cm^3		2,972 3,497		3,497		3,497	3,497
Transmission	Model No.		F5M51	F4A51	F5M51	F4A51	F4A51	F4A51
	Type		5 speed man	4 speed auto	5 speed man	4 speed auto	4 speed auto	4 speed auto
Fuel system	Fuel supply system		Electronic control multipoint fuel injection					

Main Index
00 Index

MAJOR SPECIFICATIONS

<VEHICLES FOR NEW ZEALAND>

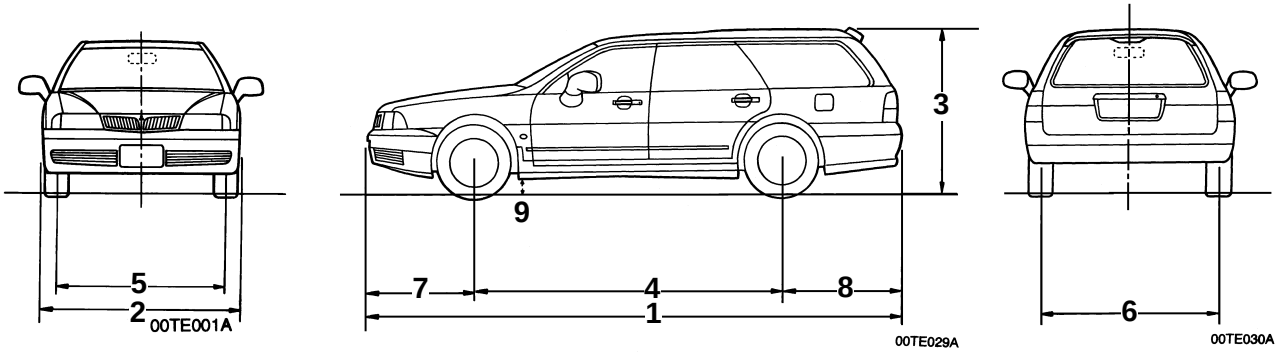


Items			Diamante Executive	Diamante Super Saloon	Diamante SEi
Vehicle dimensions	Overall length mm	1	4,785	4,785	4,929
	Overall width mm	2	1,785	1,785	1,785
	Overall height (Unladen) mm	3	1,435	1,435	1,435
	Wheelbase mm	4	2,720	2,720	2,720
	Track–front mm	5	1,545	1,545	1,545
	Track–rear mm	6	1,536	1,535	1,535
	Overhang–front mm	7	970	970	1,018
	Overhang–rear mm	8	1,103	1,103	1,189
	Minimum running ground clearance mm	9	165	165	165
Vehicle weight kg	Kerb weight		Auto	Auto	Auto
			1,456	1,536	1560
	Gross vehicle weight rating		1,898	1,944	1968
	Gross axle weight –front		1,030	1,060	1080
	Gross axle weight –rear		868	884	888
Seating capacity			5		
Engine	Model No.		6G72 (SOHC) 6G74 (SOHC)	6G74 (SOHC)	6G74 (SOHC)
	Piston displacement cm^3		2,972 3,497	3,497	3,497
Transmission	Model No.		F4A51	F4A51	F4A51
	Type		4 speed auto	4 speed auto	4 speed auto
Fuel system	Fuel supply system		Electronic control multipoint fuel injection		

Main Index
00 Index

MAJOR SPECIFICATIONS

<VEHICLES FOR NEW ZEALAND CONTINUED>

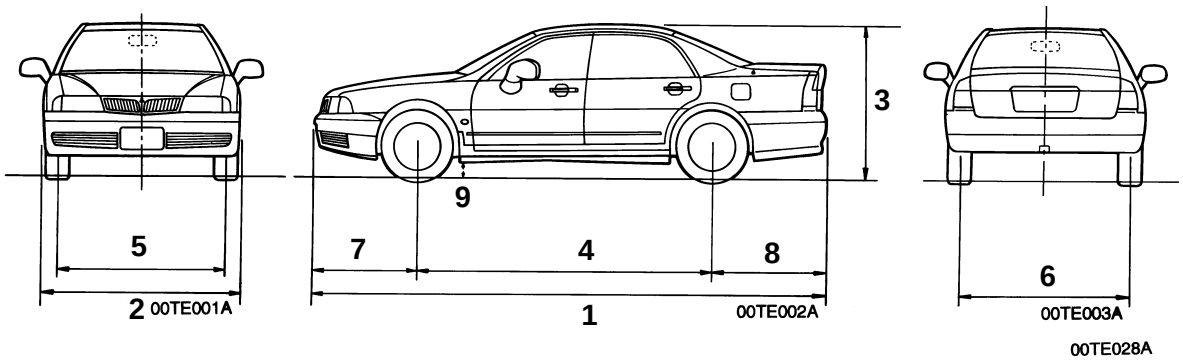


Items			Diamante Executive	Diamante Elite
Vehicle dimensions	Overall length mm	1	4,812	4,812
	Overall width mm	2	1,785	1,785
	Overall height (Unladen) mm	3	1,482	1,482
	Wheelbase mm	4	2,722	2,722
	Track–front mm	5	1,545	1,545
	Track–rear mm	6	1,500	1,500
	Overhang–front mm	7	970	1,138
	Overhang–rear mm	8	1,189	1,189
	Minimum running ground clearance mm	9	165	165
Vehicle weight kg	Kerb weight		Auto	Auto
			1,512	1,530
	Gross vehicle weight rating		1,968	1,985
	Gross axle weight –front		994	1,013
	Gross axle weight –rear		974	972
Seating capacity			5	
Engine	Model No.		6G72 (SOHC) 6G74 (SOHC)	6G74 (SOHC)
	Piston displacement cm^3		2,972 3,497	3,497
Transmission	Model No.		F4A51	F4A51
	Type		4 speed auto	4 speed auto
Fuel system	Fuel supply system		Electronic control multipoint fuel injection	

Main Index
00 Index

MAJOR SPECIFICATIONS

<VEHICLES FOR PACIFIC REGION & BRUNEI>



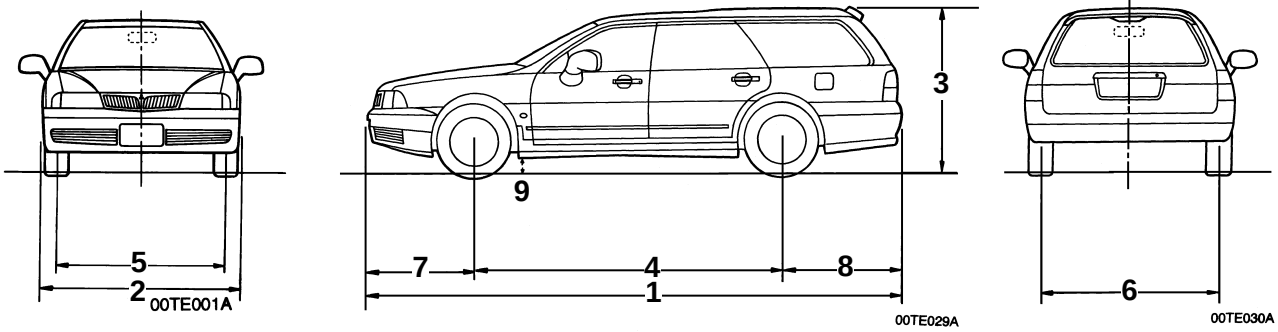
Items			Magna Altera Pacific		Magna Altera Brunei
Vehicle dimensions	Overall length mm	1	4,785		4,785
	Overall width mm	2	1,785		1,785
	Overall height (Unladen) mm	3	1,435		1,435
	Wheelbase mm	4	2,720		2,720
	Track–front mm	5	1,545		1,545
	Track–rear mm	6	1,536		1,536
	Overhang–front mm	7	970		970
	Overhang–rear mm	8	1,103		1,103
	Minimum running ground clearance mm	9	165		165
Vehicle weight kg	Kerb weight		Man	Auto	Auto
			1,436	1,462	1,478
	Gross vehicle weight rating		1,878	1,904	1,901
	Gross axle weight –front		1,010	1,036	1,029
	Gross axle weight –rear		868	868	872
Seating capacity			5		
Engine	Model No.		6G72 (SOHC)		6G72 (SOHC)
	Piston displacement cm^3		2,972		2,972
Transmission	Model No.		F5M51	F4A51	F4A51
	Type		5 speed man	4 speed auto	4 speed auto
Fuel system	Fuel supply system		Electronic control multipoint fuel injection		

Main Index

00 Index

MAJOR SPECIFICATIONS

<VEHICLES FOR BRUNEI>



Items			Magna Altera
Vehicle dimensions	Overall length mm	1	4,812
	Overall width mm	2	1,785
	Overall height (Unladen) mm	3	1,482
	Wheelbase mm	4	2,722
	Track–front mm	5	1,545
	Track–rear mm	6	1,500
	Overhang–front mm	7	970
	Overhang–rear mm	8	1,138
	Minimum running ground clearance mm	9	165
Vehicle weight kg	Kerb weight		Auto
			1,522
	Gross vehicle weight rating		1,985
	Gross axle weight –front		1014
	Gross axle weight –rear		971
Seating capacity			5
Engine	Model No.		6G72 (SOHC)
	Piston displacement cm^3		2,972
Transmission	Model No.		F4A51
	Type		4 speed auto
Fuel system	Fuel supply system		Electronic control multipoint fuel injection

Main Index
00 Index

HOW TO DIAGNOSE

The most important point in troubleshooting is to determine “Probable Causes”. Once the probable causes are determined, parts to be checked can be limited to those associated with such probable causes. Therefore, unnecessary checks can be eliminated. The determination of the probable causes must be based on a theory and be supported by facts and must not be based on intuition only.

TROUBLESHOOTING STEPS

If an attempt is made to solve a problem without going through correct steps for troubleshooting, the problem symptoms could become more complicated, resulting in failure to determine the causes correctly and making incorrect repairs. The four steps below should be followed in troubleshooting.

1 Observation of Problem Symptoms

Observe the symptom carefully. Check if there are also other problems.

2 Determination of Probable Causes

In determining the probable causes, it is necessary to check the wiring diagram to understand the circuit as a system. Knowledge of switches, relays and other parts is necessary for accurate determination. The causes of similar problems in the past must be taken into account.

3 Checking of Parts Associated with Probable Causes and Determination of Faulty Parts

Troubleshooting is carried out by making step by step checks until the true cause is found. Always go through the procedures considering what check is to be made where for the best results.

4 Repair and Confirmation

After the problems are corrected, be sure to check that the system operates correctly. Also check that new problems have not been caused by the repair.

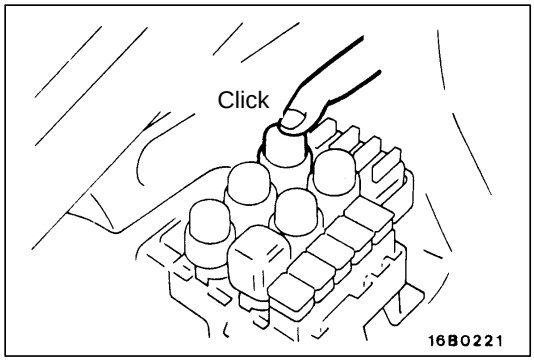
INFORMATION FOR DIAGNOSIS

This manual contains the cable diagrams as well as the individual circuit drawings, operational explanations, and troubleshooting hints for each component required to facilitate the task of troubleshooting. The information is complied in the following manner:

(1) Configuration diagrams show the connector positions, etc., on the actual vehicle as well as the harness path.
(2) Circuit drawings show the configuration of the circuit with all switches in their normal positions.

Main Index

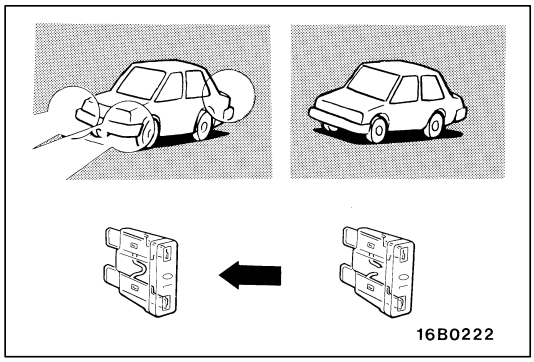
00 Index



INSPECTION

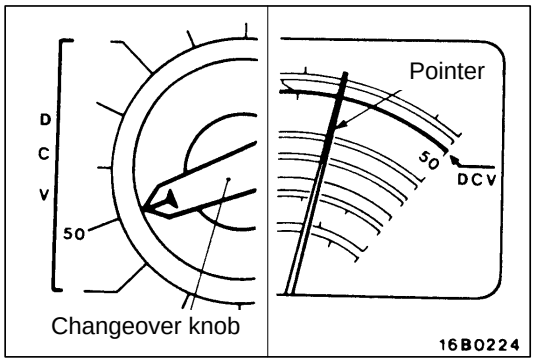
1. Visual and aural checks

Check relay operation, blower motor rotation, light illumination, etc. visually or aurally. The flow of current is invisible but can be checked by the operation of the parts.



2. Simple checks

For example, if a headlight does not come on and a faulty fuse or poor grounding is suspected, replace the fuse with a new one or ground the light to the body by a jumper wire to determine which part is responsible for the problem.

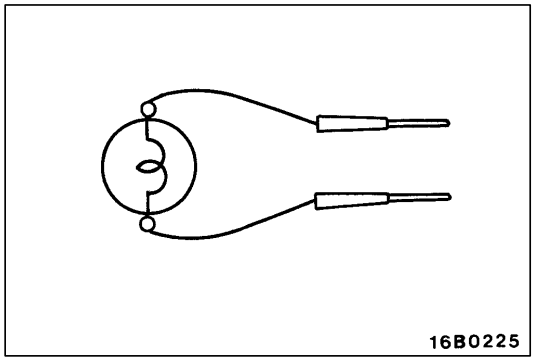


3. Checking with instruments

Use an appropriate instrument in an adequate range and read the indication correctly. You must have sufficient knowledge and experience to handle instruments correctly.

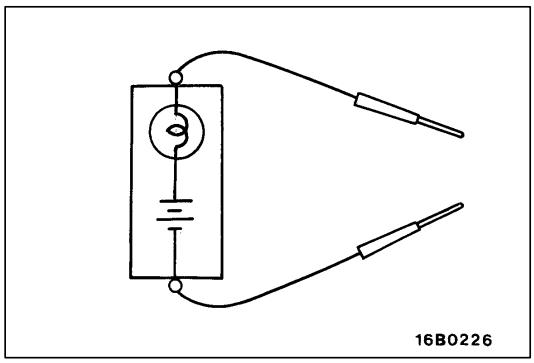
INSPECTION INSTRUMENTS

In inspection, make use of the following instruments.



1. Test lights

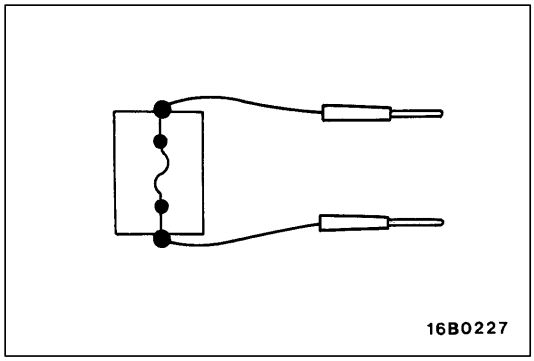
A test light consists of a 12V bulb and lead wires. It is used to check voltages or short–circuits.



2. Self-power test light

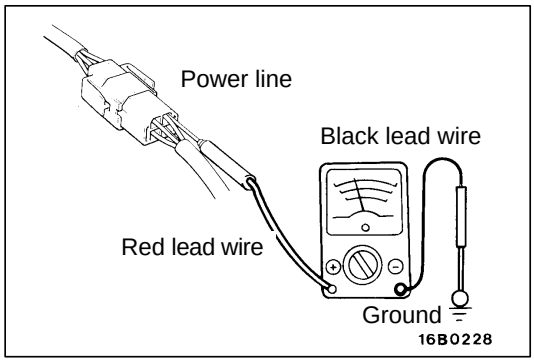
A self-power test light consists of a bulb, battery and lead wires connected in series. It is used to check continuity or grounding.

Main Index
00 Index



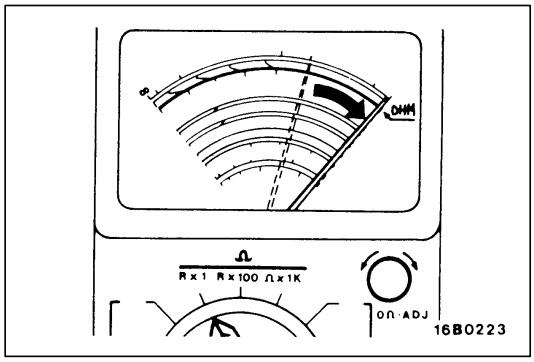
3. Jumper wire

A jumper wire is used to close an open circuit. Never use one to connect a power supply directly to a load.



4. Voltmeter

A voltmeter is used to measure the circuit voltage. Normally, the positive (red lead) probe is applied to the point of voltage measurement and the negative (black lead) probe to the body ground.



5. Ohmmeter

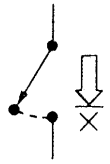
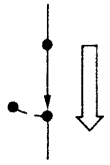
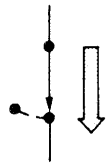
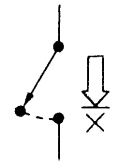
An ohmmeter is used to check continuity or measure resistance of a switch or coil. If the measuring range has been changed, the zero point must be adjusted before measurement.

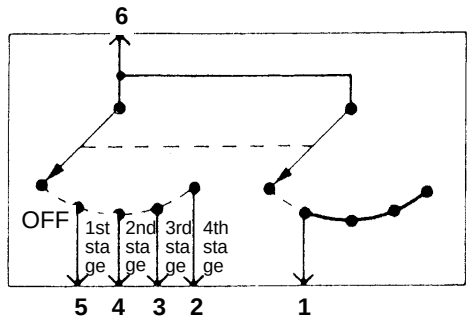
CHECKING SWITCHES

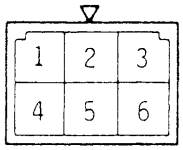
In a circuit diagram, a switch is represented by a symbol and in the idle state.

1. Normal open or normal close switch

Switches are classified into those which make the circuit open and those which make the circuit closed when off.

Normal open (NO) type	
OFF	ON
 Current does not flow 16X0690	 Current flows 16X0691 00000401
Normal close (NC) type	
OFF	ON
 Current flows 16X0691	 Current does not flow 16X0690 00000402



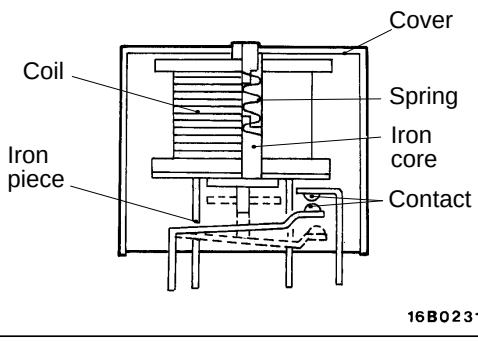


2. Switch connection

This figure illustrates a complex switch. The continuity between terminals at each position is as indicated in the table below.

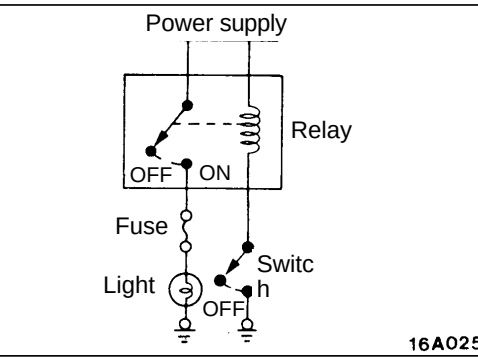
Position	Terminal No.					
	1	2	3	4	5	6
OFF						
1st stage	○				○	○
2nd stage	○			○		○
3rd stage	○		○			○
4th stage	○	○				○

NOTE
○—○ denotes continuity between terminals.

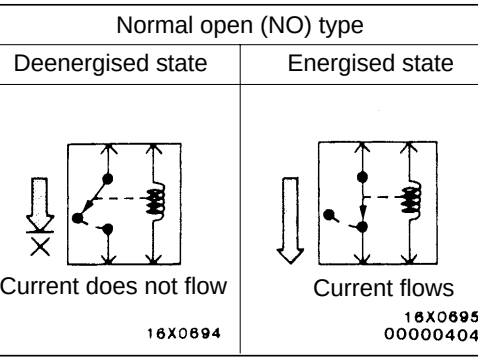


CHECKING RELAYS

1. When current flows through the coil of a relay, its core is magnetised to attract the iron piece, closing (ON) the contact at the tip of the iron piece. When the coil current is turned off, the iron piece is made to return to its original position by a spring, opening the contact (OFF).



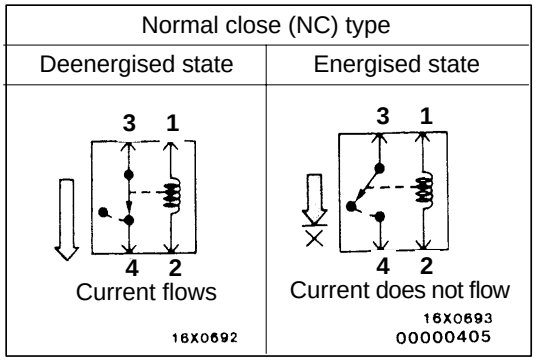
2. By using a relay, a heavy current can be turned on and off by a switch of small capacity. For example, in the circuit shown here, when the switch is turned on (closed), current flows to the coil of the relay. Then, its contact is turned on (closed) and the light comes on. The current flowing at this time to the switch is the relay coil current only and is very small.



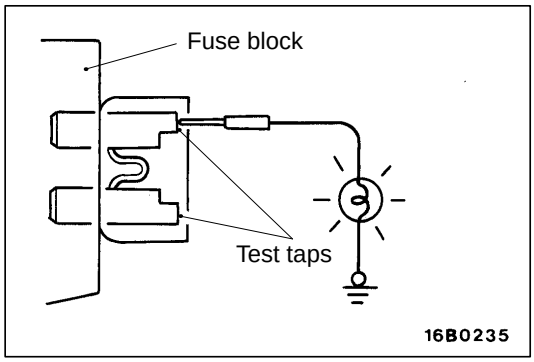
3. The relays may be classified into the normal open type and the normal close type by their contact construction.

NOTE
The deenergised state means that no current is flowing through the coil and the energised state means that current is flowing through the coil.

Main Index
00 Index

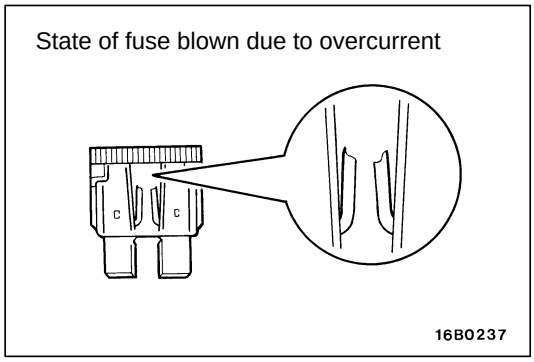


When a normal close type relay as illustrated here is checked, there should be continuity between terminals 1 and 2 and between terminals 3 and 4 when the relay is deenergised, and the continuity should be lost between terminals 3 and 4 when the battery voltage is applied to the terminals 1 and 2. A relay can be checked in this manner and it cannot be determine if a relay is okay or faulty by checking its state only when it is deenergised (or energised).



CHECKING FUSES

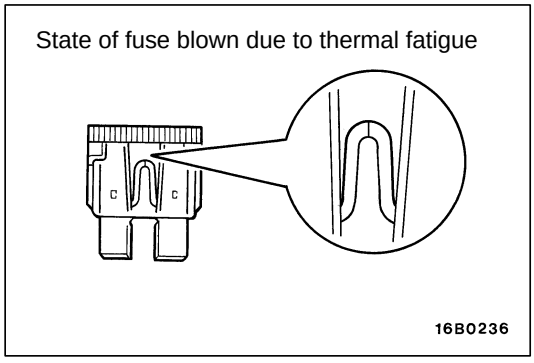
A blade type fuse has test taps provided to allow checking of the fuse itself without removing it from the fuse block. The fuse is okay if the test light comes on when its one lead is connected to the test taps (one at a time) and the other lead is grounded. (Change the ignition switch position adequately so that the fuse circuit becomes live.)



CAUTIONS IN EVENT OF BLOWN FUSE

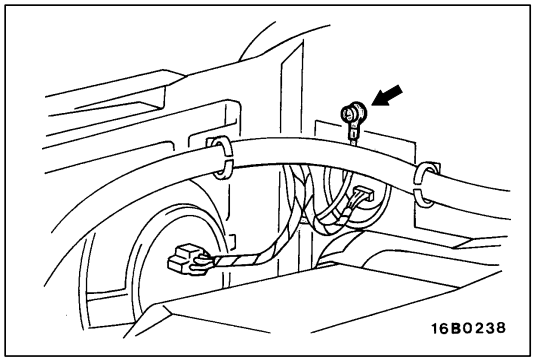
When a fuse is blown, there are two probable causes as follows: One is that it is blown due to flow of current exceeding its rating. The other is that it is blown due to repeated on/off current flowing through it. Which of the two causes is responsible can be easily determined by visual check as described below.

(1) Fuse blown due to current exceeding rating
The illustration shows the state of a fuse blown due to this cause. In this case, do not replace the fuse with a new one hastily since a current heavy enough to blow the fuse has flowed through it. First, check the circuit for shorting and check for abnormal electric parts. Only after the correction of such shorting or parts, fuse of the same capacity should be used as a replacement. Never use a fuse of larger capacity than the one that has blown. If such a fuse is used, electric parts or wirings could be damaged before the fuse blows in the event an overcurrent occurs again.



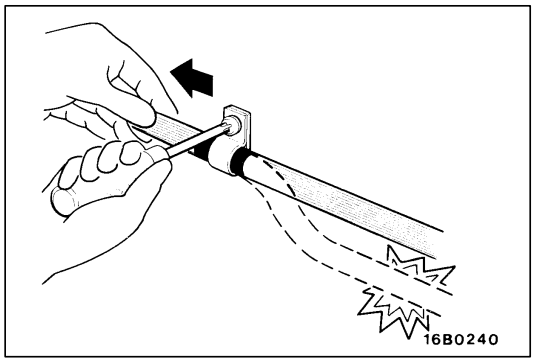
(2) Fuse blown due to repeated current on/off
The illustration shows the state of a fuse blown due to repeated current on/off. Normally, this type of problem occurs after fairly long period of use and hence is less frequent than the above type. In this case, you may simply replace with a new fuse of the same capacity.

Main Index
00 Index



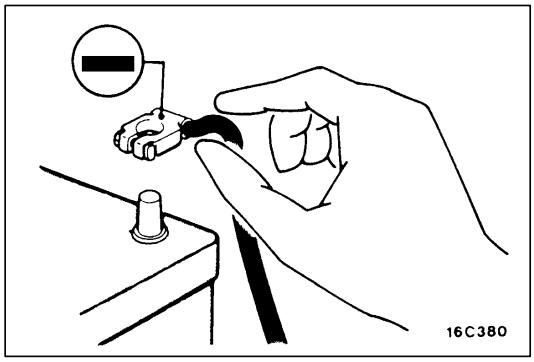
CABLES AND WIRES CHECK

1. Check connections for looseness, rust and stains.
2. Check terminals and wires for corrosion by battery electrolyte, etc.
3. Check terminals and wires for open circuit or impending open circuit.
4. Check wire insulation and coating for damage, cracks and degrading.
5. Check conductive parts of terminals for contact with other metallic parts (vehicle body and other parts).
6. Check grounding parts to verify that there is complete continuity between attaching bolt(s) and vehicle body.
7. Check for incorrect wiring.
8. Check that wirings are clamped as to prevent contact with sharp corners of the vehicle body, etc. or hot parts (exhaust manifold, pipe, etc.).
9. Check that wirings are clamped firmly to secure enough clearance from the fan pulley, fan belt and other rotating or moving parts.
10. Check that the wirings between the fixed parts such as the vehicle body and the vibrating parts such as the engine are made with adequate allowance for vibrations.



BATTERY HANDLING

When checking or servicing does not require power from the on-vehicle battery, be sure to disconnect the cable from the battery (–) terminal. This is to prevent problems that could be caused by a short circuit. Disconnect the (–) terminal first and reconnect it last.



GENERAL ELECTRICAL SYSTEM CHECK

A circuit consists of the power supply, switch, relay, load, ground, etc. There are various methods to check a circuit including an overall check, voltage check, short–circuit check and continuity check. Each of these methods is briefly described in the following.

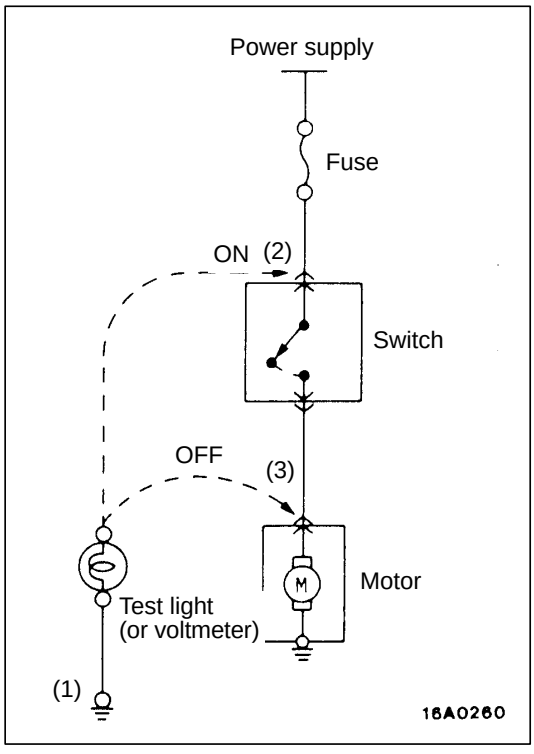
1. VOLTAGE CHECK

(1) Ground one lead wire of the test light. If a voltmeter is used instead of the test light, ground the grounding side lead wire.

(2) Connect the other lead wire of the test light to the power side terminal of the switch connector. The test light should come on or the voltmeter should indicate a voltage.

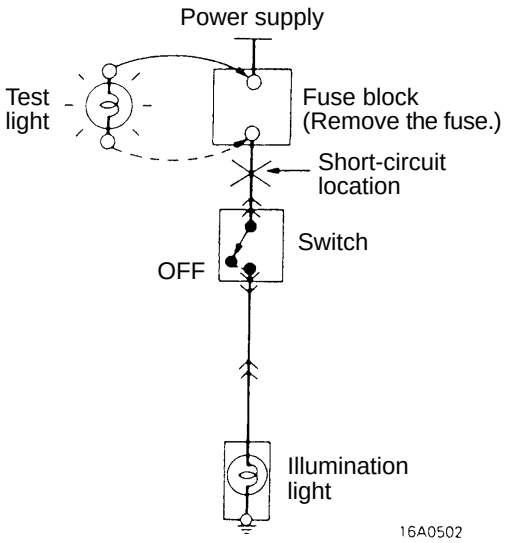
(3) Then, connect the test light or voltmeter to the motor connector. The test light should not come on, or the voltmeter should indicate no voltage. When the switch is turned on in this state, the test light should come on, or the voltmeter should indicate a voltage, with motor starting to run.

(4) The circuit illustrated here is normal but if there is any problem such as the motor failing to run, check voltages beginning at the connector nearest to the motor until the faulty part is identified.

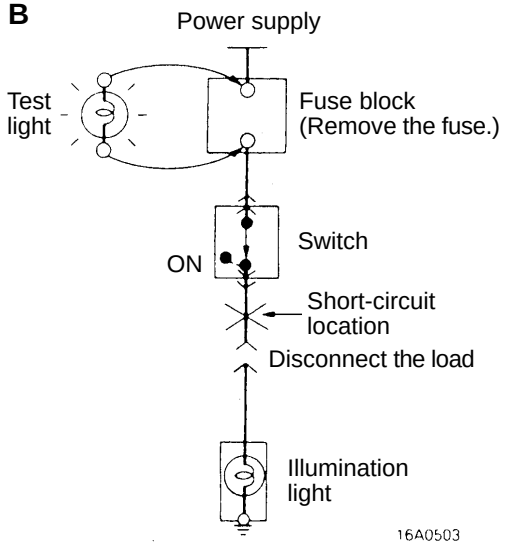


Main Index
00 Index

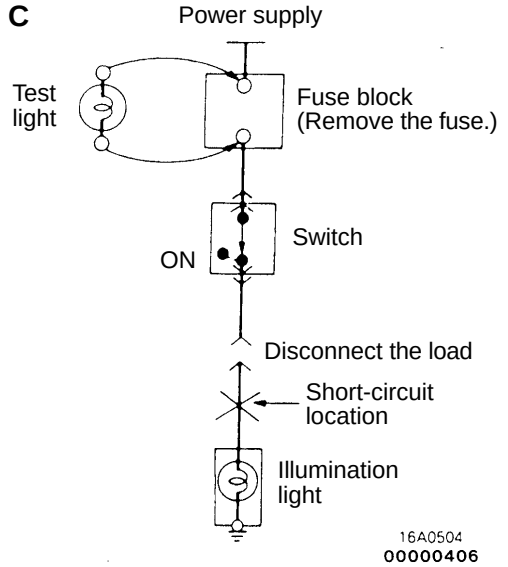
A



B

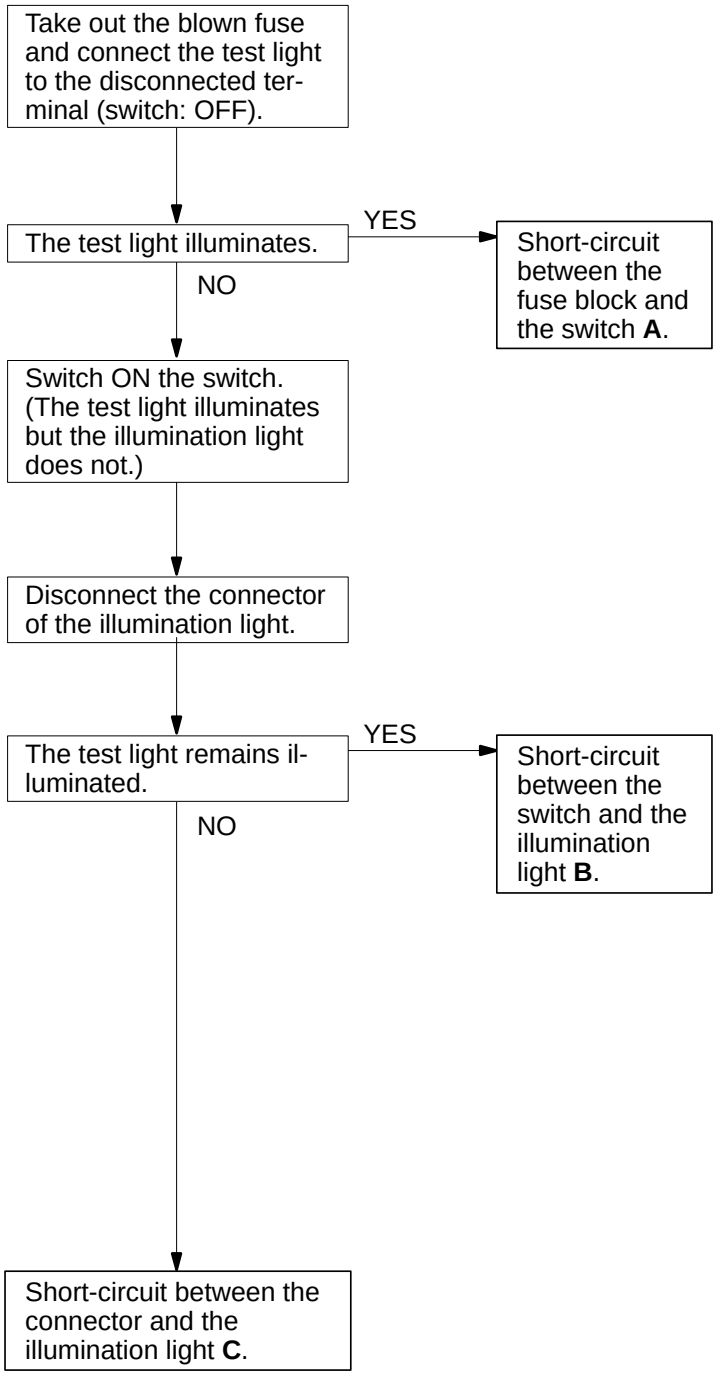


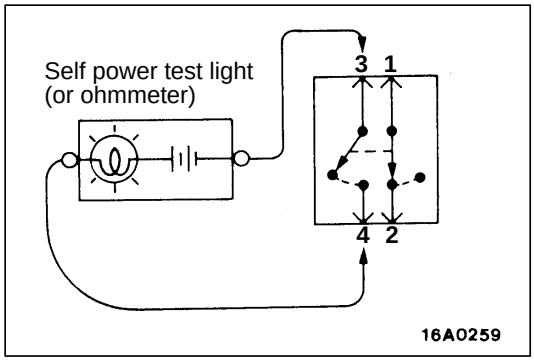
C



2. SHORT-CIRCUIT CHECK

Because the fuse has blown, it is probable that there is a short-circuited circuit. Follow the procedures below to narrow down the short-circuit location.





3. CONTINUITY CHECK

(1) When the switch is in the OFF position, the self power test light should come on or the ohmmeter should read 0 ohm only when the terminals 1 and 2 are interconnected.

(2) When the switch is the ON position, the self power test light should come on or the ohmmeter should read 0 ohm only when the terminals 3 and 4 are interconnected.

Main Index

00 Index

SERVICE PRECAUTIONS

SUPPLEMENTAL RESTRAINT SYSTEM (SRS)

1. Items to follow when servicing SRS
   (1) Be sure to read GROUP 52B – Supplemental Restraint System (SRS)
   For safe operations, please follow the directions and heed all warnings.
   (2) Always use the designated special tools and test equipment.
   (3) Wait at least 60 seconds after disconnecting the battery cable before doing any further work. The SRS system is designed to retain enough voltage to deploy the air bag even after the battery has been disconnected. Serious injury may result from unintended air bag deployment if work is done on the SRS system immediately after the battery cable is disconnected.
   (4) Never attempt to disassemble or repair the SRS Airbag components (SRS – ECU, air bag module and clock spring). If faulty, replace them.
   (5) Warning labels must be heeded when servicing or handling SRS components. Warning labels are located in the following locations.
   - Sun visor
   - SRS – ECU
   - Steering wheel
   - Air bag module
   - Clock spring
   - Steering gear and linkage clamp

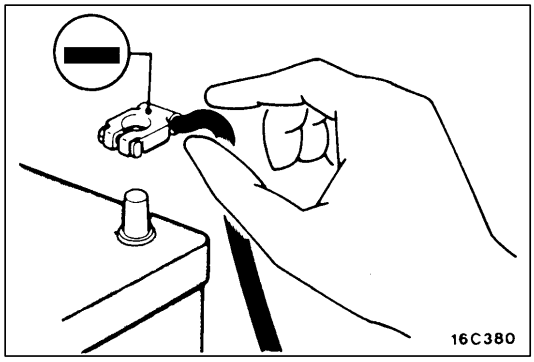
   (6) Store components removed from the SRS in a clean and dry place.
   The air bag module should be stored on a flat surface and placed so that the pad surface is facing upward.
   Do not place anything on top.
   (7) When discarding an airbag module or disposing of a vehicle with an SRS air bag, ensure that you first activate the airbag.
   (8) Whenever you finish servicing the SRS, check the SRS warning light operation to make sure that the system functions properly.
2. Observe the following when carrying out operations on places where SRS components are installed, including operations not directly related to the SRS air bag.
   (1) When removing or installing parts do not allow any impact or shock to the SRS components.
   (2) If there is any possibility that the SRS airbag component parts will be subjected to heating, remove the component parts.
   - SRS - ECU, airbag module, clockspring: 93°C

   After installing the component parts, test that the SRS warning lamp lights up to confirm that the airbag system is normal.

ENGINE-A/T ECU AND BEM/IMMOBILISER SERVICE REQUIREMENTS

When replacing Engine-A/T ECU and BEM/Immobiliser ECU, related components must be replaced as follows:–

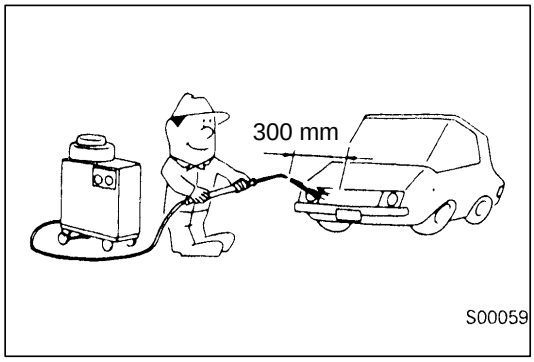
Component replacement	Additional component requirements		
	Engine-A/T ECU	BEM ECU	Ignition Keys
Engine-A/T ECU	–	Replacement required	Replacement and registration required.
Engine-A/T Reprogramming	No action required	No action required	No action required
BEM ECU	No action required	–	Re-register original keys
Ignition Key	No action required	No action required	Registration of new key and all original/other keys
RKE unit	No action required	No action required	No action required



SERVICING THE ELECTRICAL SYSTEM

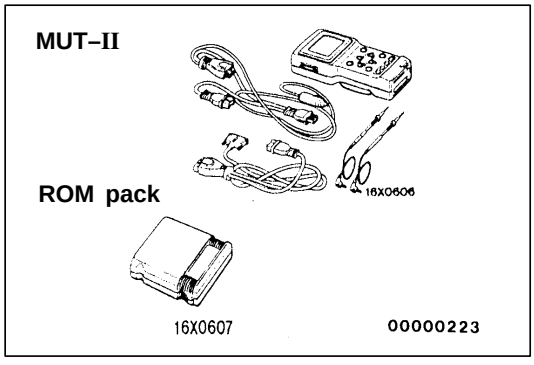
1. Note the following before proceeding with work on the electrical system.
   Note that the following must never be done:
   Unauthorised modifications of any electrical device or wiring, because such modifications might lead to a vehicle malfunction, over-capacity or short-circuit that could result in a fire in the vehicle.
2. When servicing the electrical system, disconnect the negative cable terminal from the battery.

   Caution
   1. **Before connecting or disconnecting the negative cable, be sure to turn off the ignition switch and the lighting switch.**
      (If this is not done, there is the possibility of semiconductor parts being damaged.)
   2. **After completion of the work steps [when the battery's negative (–) terminal is connected], warm up the engine and allow it to idle for approximately ten minutes under the conditions described below, in order to stabilise the engine control conditions, and then check to be sure that idling is satisfactory.**
      Engine coolant temperature: 80–95°C
      Lights, electric fans, accessories: OFF
      Transmission: "N" or "P"
      Steering wheel: neutral (centre) position



VEHICLE WASHING

If high-pressure car-washing equipment or steam car-washing equipment is used to wash the vehicle, be sure to maintain the spray nozzle at a distance of at least 300 mm from any plastic parts and all opening parts (doors, luggage compartment, etc.).



MUT–II

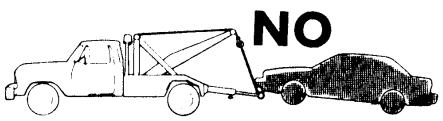
To operate the MUT–II, refer to the "MUT-II OPERATING INSTRUCTIONS".

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

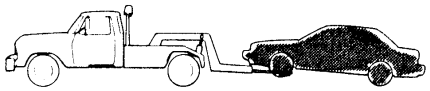
Main Index

00 Index

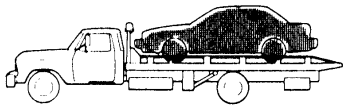
Sling type



Wheel lift type



Flat bed type



00F0027

TOWING AND HOISTING

TOWING RECOMMENDATION

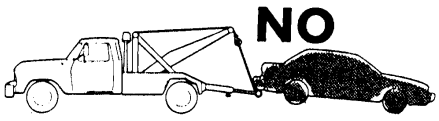
FRONT TOWING PICKUP

Caution

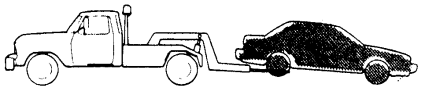
This vehicle cannot be towed by using sling-type equipment to prevent the bumper from deformation. If this vehicle is towed, use wheel lift or flat bed equipment.

The vehicle may be towed on its rear wheels for extended distances provided the parking brake is released. It is recommended that vehicles be towed using the front pickup whenever possible.

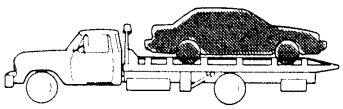
Sling type



Wheel lift type



Flat bed type



00F0026

REAR TOWING PICKUP

Caution

1. **This vehicle cannot be towed by using sling-type equipment to prevent the lower arm from deformation.**
   If this vehicle is towed, use wheel lift of flat bed equipment.
2. **Do not use steering column lock to secure front wheel position for towing.**
3. **Make sure the transmission is in Neutral if vehicle will be with drive wheels on the ground.**

Automatic transmission vehicle may be towed on the front wheels at speeds not to exceed 50 km/h for distances not to exceed 30 km.

Caution

If these limits cannot be met, the front wheels must be placed on a tow dolly.

TOWING WHEN KEYS ARE NOT AVAILABLE

When a locked vehicle must be towed and keys are not available, the vehicle may be lifted and towed from the front, provided the parking brake is released. If not released, the rear wheels should be placed on a tow dolly.

Main Index
00 Index

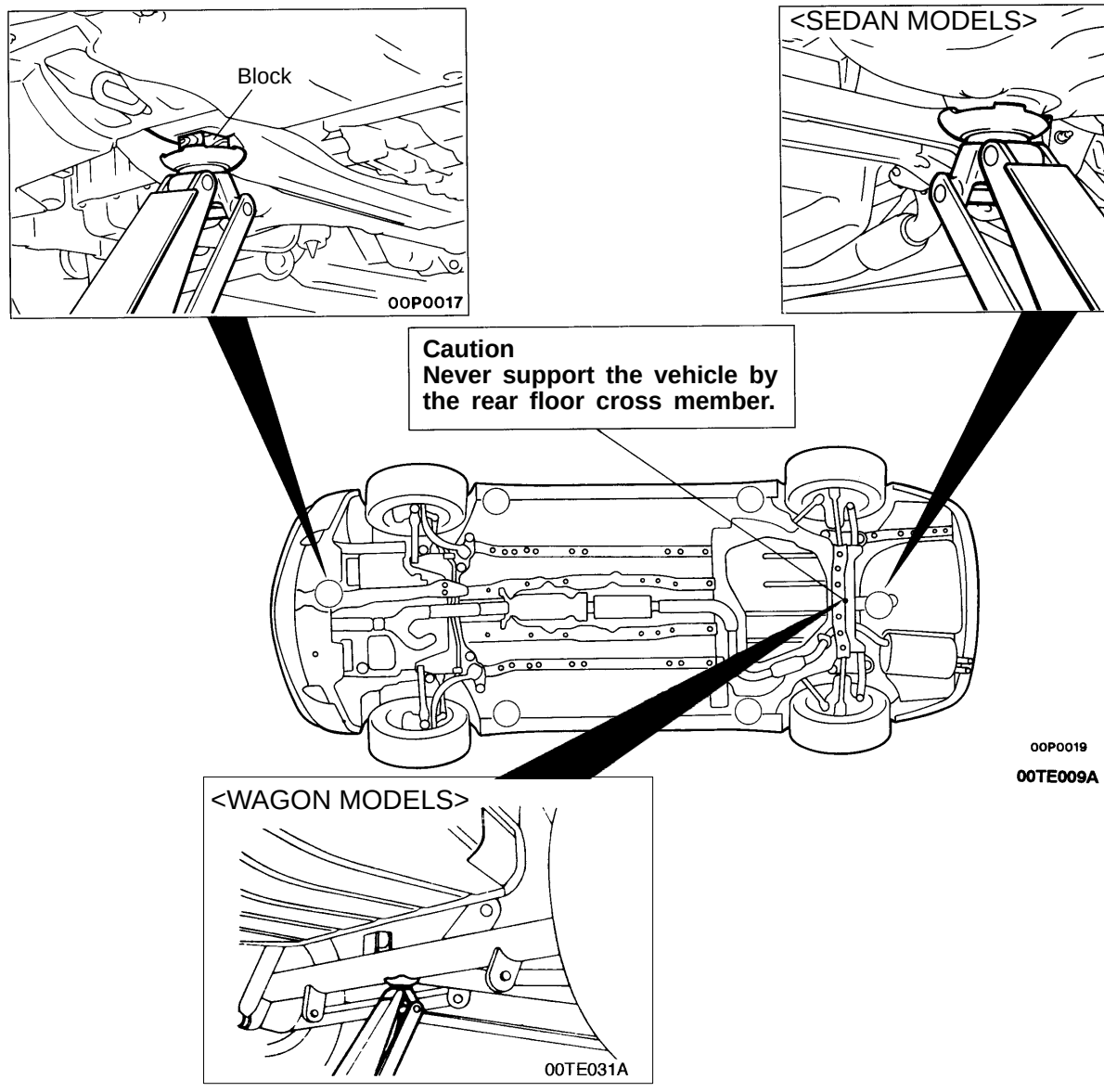
SAFETY PRECAUTIONS

The following precautions should be taken when towing the vehicle.

1. DO NOT LIFT OR TOW THE VEHICLE BY ATTACHING TO OR WRAPPING AROUND THE BUMPER.
2. Any loose or protruding parts of damaged vehicle such as hoods, doors, fenders, trim, etc., should be secured or removed prior to moving the vehicle.
3. Operator should refrain from going under a vehicle while it is lifted by the towing equipment, unless the vehicle is adequately supported by safety stands.
4. Never allow passengers to ride in a towed vehicle.
5. State and local rules and regulations must be followed when towing a vehicle.

LIFTING, JACKING SUPPORT LOCATION

FLOOR JACK

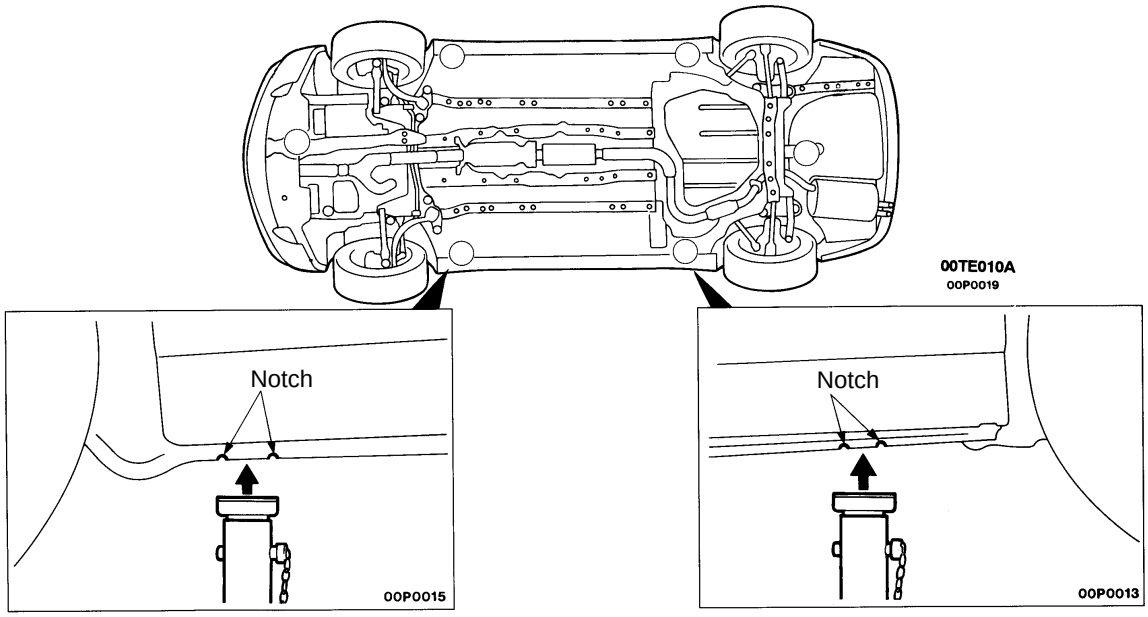


Caution
Never support any point other than the specified one, or it will be deformed.

Main Index

00 Index

RIGID RACK

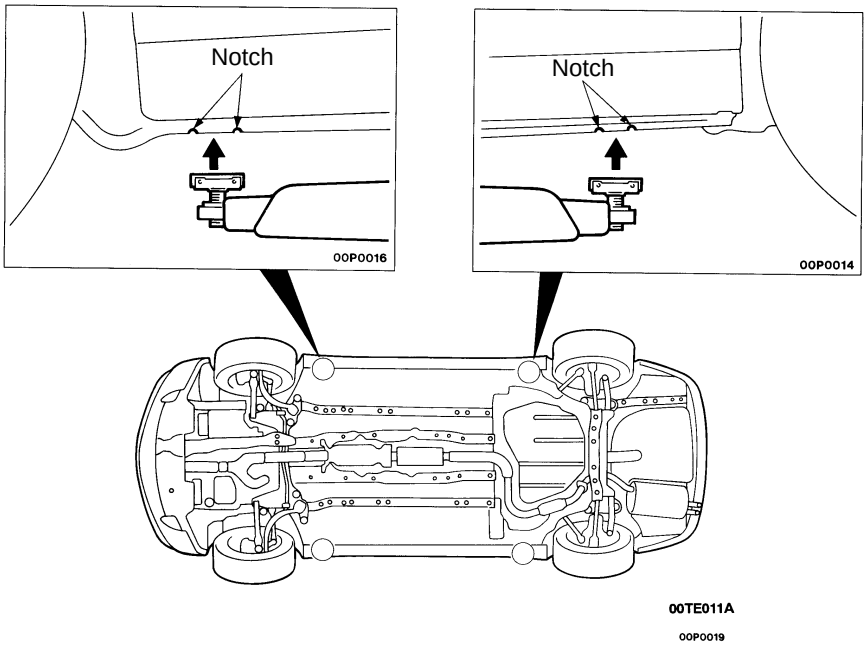


Caution
For lifting, put rubber or similar between the side sill and rigid rack, or the side sill area will be damaged.

POST TYPE

Special care should be taken when raising the vehicle on a frame contact type hoist. The hoist must be equipped with the proper adaptors in order to support the vehicle at the proper locations.

Caution
When service procedures require removing rear suspension, fuel tank and spare tire, place additional weight on rear end of vehicle or anchor vehicle to hoist to prevent tipping of centre of gravity changes.



Main Index
00 Index

TIGHTENING TORQUE

Each torque value in the table is a standard value for tightening under the following conditions.
(1) Bolts, nuts and washers are all made of steel and plated with zinc.
(2) The threads and bearing surface of bolts and nuts are all in dry condition.

The values in the table are not applicable:
(1) If toothed washers are inserted.
(2) If plastic parts are fastened.
(3) If bolts are tightened to plastic or die-cast inserted nuts.
(4) If self-tapping screws or self-locking nuts are used.

Standard bolt and nut tightening torque

Thread size		Torque Nm		
Bolt nominal diameter (mm)	Pitch (mm)	Head mark “4”	Head mark “7”	Head mark “8”
M5	0.8	2.5	5	6
M6	1.0	5	9	10
M8	1.25	12	22	25
M10	1.25	24	44	52
M12	1.25	41	81	96
M14	1.5	72	137	157
M16	1.5	111	206	235
M18	1.5	167	304	343
M20	1.5	226	412	481
M22	1.5	304	559	647
M24	1.5	392	735	853

Flange bolt and nut tightening torque

Thread size		Torque Nm		
Bolt nominal diameter (mm)	Pitch (mm)	Head mark “4”	Head mark “7”	Head mark “8”
M6	1.0	5	10	12
M8	1.25	13	24	28
M10	1.25	26	49	57
M10	1.5	24	44	54
M12	1.25	46	93	103
M12	1.75	42	81	96