



# **RX-7**

## *Twin - Turbo* **1993 Factory Service Manual**

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# 1993 Mazda RX-7 Workshop Manual

## FOREWORD

This workshop manual is intended for use by service technicians of Authorized Mazda Dealers to help them service Mazda vehicles. It can also be useful to owners and operators of Mazda vehicles in diagnosing some problems and performing limited repair and maintenance on Mazda vehicles.

For proper repair and maintenance, a thorough familiarization with this manual is important, and it should always be kept in a handy place for quick and easy reference.

All the contents of this manual, including drawings and specifications, are the latest available at the time of printing. As modifications affecting repair or maintenance occur, relevant information supplementary to this volume will be made available at Mazda dealers. This manual should be kept up-to-date.

Mazda Motor Corporation reserves the right to alter the specifications and contents of this manual without obligation or advance notice.

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**Mazda Motor Corporation  
HIROSHIMA, JAPAN**

## APPLICATION:

This manual is applicable to vehicles beginning with the Vehicle Identification Numbers (VIN) shown on the following page.

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\* Refer to the 1993 RX-7 Body Electrical Troubleshooting manual (form No. 1312-10-91L) for servicing of the body electrical components.

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(9999-95-018B-93)

**VEHICLE IDENTIFICATION NUMBERS (VIN)**

**JM1FD 331\*PO 200001 ~**

**JM1FD 332\*PO 200001 ~**

## GENERAL INFORMATION

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**IMPORTANT INFORMATION****BASIC ASSUMPTIONS**

This workshop manual assumes that you have certain special tools that are necessary for the safe and efficient performance of service operations on Mazda vehicles and that you know how to use them properly. It also assumes that you are familiar with automobile systems and basic service and repair procedures. You should not attempt to use this manual unless these assumptions are correct and you understand the consequences described below.

**SAFETY RISK**

This manual contains certain notes, warnings, and other precautionary information that you should carefully read and follow to reduce the risk of personal injury to yourself or others and the risk of improper service that may damage the vehicle or render it unsafe. If there is no such information in regard to any specific service method, this does not mean there is no possibility that personal safety or vehicle safety will be jeopardized by the use of incorrect methods or tools.

**POSSIBLE LOSS OF WARRANTY**

The manufacturer's warranty on Mazda vehicles and engines can be voided if improper service or repairs are performed by persons other than those at an Authorized Mazda Dealer.

**WARNING ON LUBRICANTS AND GREASES**

Avoid all prolonged and repeated contact with mineral oils, especially used oils. Used oils contaminated during service (e.g., engine sump oils) are more irritating and more likely to cause serious effects, including skin cancer, in the event of gross and prolonged skin contact.

Wash skin thoroughly after work involving oil.

Protective hand cleaners may be of value provided they can be removed from the skin with water. Do not use gasoline, paraffin, or other solvents to remove oil from the skin.

Lubricants and greases may be slightly irritating to the eyes.

Repeated or prolonged skin contact should be avoided by wearing protective clothing if necessary. Particular care should be taken with used oils and greases containing lead. Do not allow work clothing to be contaminated with oil. Dry clean or launder such clothing at regular intervals.

9MUGIX-002

HOW TO USE THIS MANUAL



PREPARATION

PREPARATION points out the needed SST for the service operation that follows. It is best to gather all necessary SST before beginning work.

Example:

**N ENGINE SPEED SENSING POWER STEERING**  
**ENGINE SPEED SENSING POWER STEERING**


**PREPARATION**

49 0118 850C Puller, ball joint		49 H028 301 Installer, boot	
------------------------------------	---	--------------------------------	---

9MAJDNX-030

**SST NUMBER**  
49 H028 301

**SST NAME**  
Installer, boot

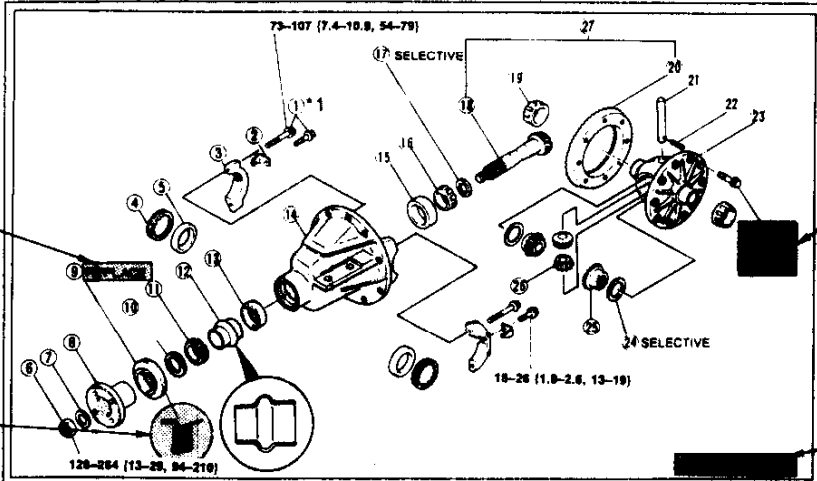
**SST ILLUSTRATION**  


9MUGIX-033

REPAIR PROCEDURE

1. Most repair operations begin with an overview illustration. It identifies the components, shows how the parts fit together, and describes visual parts inspections. If a damaged or worn part is found, repair or replace it as necessary.
2. Expendable parts, tightening torques, and symbols for oil, grease, and sealant are shown in the overview illustration.
3. Pages related to service procedures are shown under the illustration. Refer to this information when servicing the related part.

Example:



**SHOWS EXPENDABLE PARTS**

**SHOWS APPLICATION POINT OF OIL, ETC.**

**SHOWS TIGHTENING TORQUE SPECIFICATION \*2**

**SHOWS TIGHTENING TORQUE UNIT**

**SHOWS VISUAL INSPECTION INFORMATION**

1. Bolt	16. Bearing inner race	Removal..... page M-22
2. Lock plate	17. Spacer	Installation..... page M-24
3. Bearing cup	18. Drive pinion	Removal..... page M-21
4. Adjusting screw	Inspect splines and teeth for wear or damage	Adjustment of height..... page M-22
5. Bearing outer race	Adjust..... page M-24	
6. Locknut		
7. Washer		
8. Companion flange		







\* 1: The numbers (① ex.) refer to parts identification and where necessary servicing procedure.  
 \* 2: Units are in N·m {kgf·m, ft·lb} unless otherwise specified.

# GI

## HOW TO USE THIS MANUAL/FUNDAMENTAL PROCEDURES

### SYMBOLS

There are six symbols indicating oil, grease, and sealant. These symbols show the points of applying such materials during servicing.

Symbol	Meaning	Kind
	Apply oil	New engine oil or gear oil as appropriate
	Apply brake fluid	Only brake fluid
	Apply automatic transmission fluid	Only ATF
	Apply grease	Appropriate grease
	Apply sealant	Appropriate sealant
	Apply petroleum jelly	Petroleum jelly

07UGIX-002

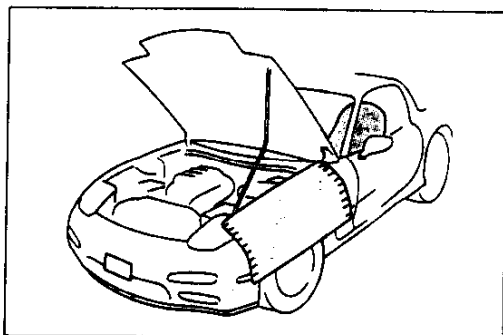
#### Note

- When specific oil or grease is needed, this is shown in the illustration.

### NOTES, CAUTIONS, AND WARNINGS

As you read through the procedures, you will come across NOTES, CAUTIONS, and WARNINGS. Each one is there for a specific purpose. **NOTES** give you **added information** that will help you to complete a particular procedure. **CAUTIONS** are given to prevent you from making an error that could **damage the vehicle**. **WARNINGS** remind you to be especially careful in those areas where carelessness can cause **personal injury**. The following list contains some general **WARNINGS** you should follow when you work on a vehicle.

9MUGIX-036

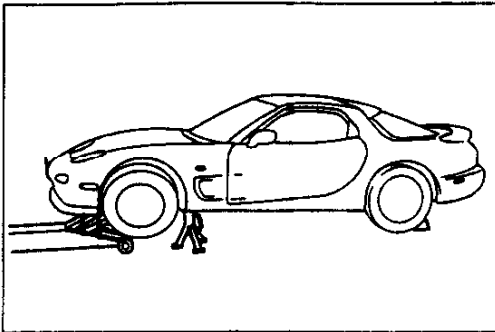


9MUGIX-037

### FUNDAMENTAL PROCEDURES

#### PROTECTION OF THE VEHICLE

Always be sure to cover fenders, seats, and floor areas before starting work.



9MUGIX-003

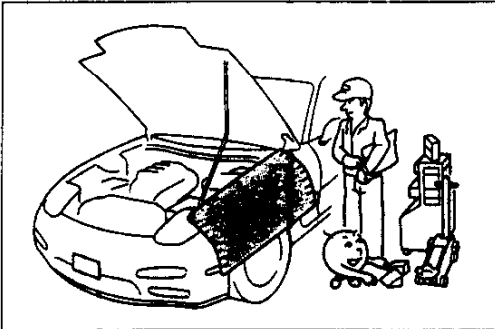
**A WORD ABOUT SAFETY**

The following precautions must be followed when jacking up the vehicle.

1. Block the wheels.
2. Use only the specified jacking positions.
3. Support the vehicle with safety stands.



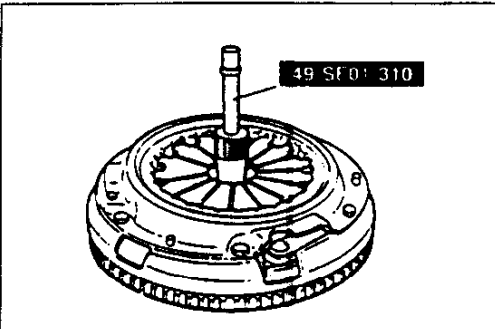
Start the engine only after making certain the engine compartment is clear of tools and people.



9MUGIX-038

**PREPARATION OF TOOLS AND MEASURING EQUIPMENT**

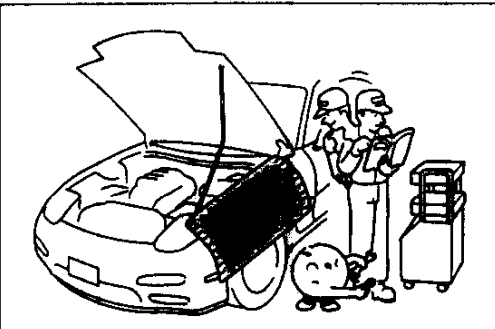
Be sure that all necessary tools and measuring equipment are available before starting any work.



9MUGIX-003

**SPECIAL TOOLS**

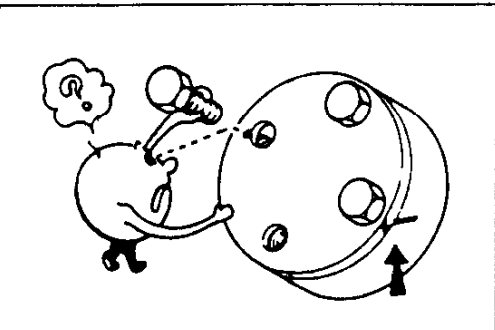
Use Special Service Tools (**SST**) when they are required.



47UGIX-006

**REMOVAL OF PARTS**

While correcting a problem, try also to determine its cause. Begin work only after first learning which parts and subassemblies must be removed and disassembled for replacement or repair.

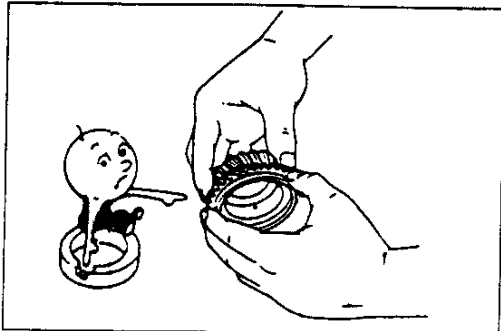


9MUGIX-039

**DISASSEMBLY**

If the disassembly procedure is complex, requiring many parts to be disassembled, all parts should be disassembled in a way that will not affect their performance or external appearance and identified so that reassembly can be performed easily and efficiently.

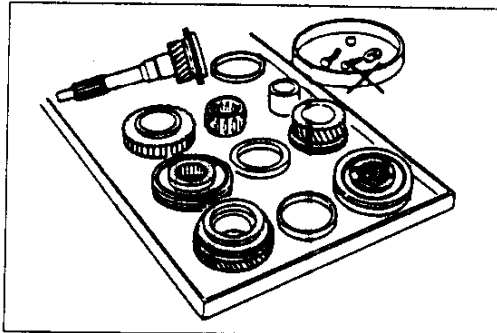




9MUGIX-040

### 1. Inspection of parts

When removed, each part should be carefully inspected for malfunctioning, deformation, damage, and other problems.

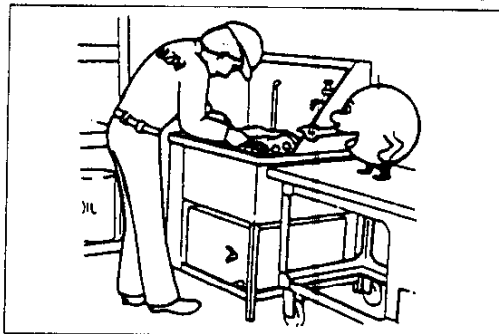


9MUGIX-041

### 2. Arrangement of parts

All disassembled parts should be carefully arranged for reassembly.

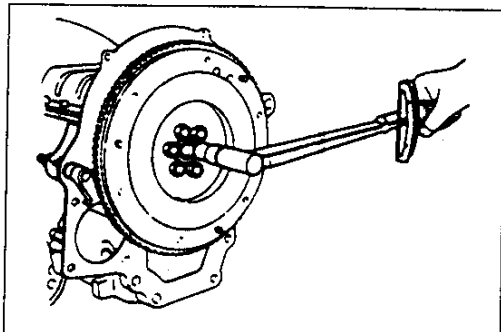
Be sure to separate or otherwise identify the parts to be replaced from those that will be reused.



47U0GX-010

### 3. Cleaning parts for reuse

All parts to be reused should be carefully and thoroughly cleaned in the appropriate method.



9MUGIX-004

### REASSEMBLY

Standard values, such as torques and certain adjustments, must be strictly observed in the reassembly of all parts.

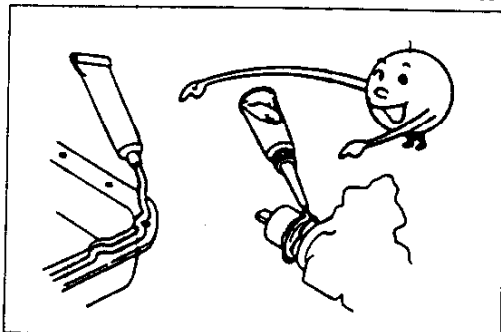
Refer to STANDARD BOLT AND NUT TIGHTENING TORQUE in Section TD for tightening torques not mentioned in the main text.

If removed, these parts should be replaced with new ones:

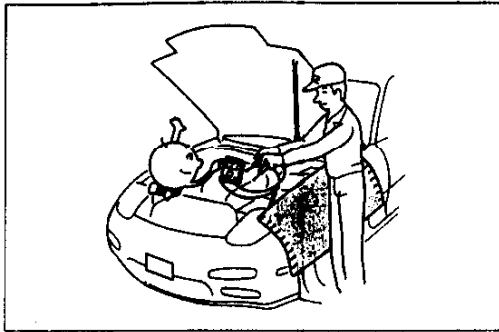
- |                |                 |
|----------------|-----------------|
| 1. Oil seals   | 2. Gaskets      |
| 3. O-rings     | 4. Lock washers |
| 5. Cotter pins | 6. Nylon nuts   |

Depending on location:

1. Sealant should be applied to gaskets.
2. Oil should be applied to the moving components of parts.
3. Specified oil or grease should be applied at the prescribed locations (such as oil seals) before reassembly.



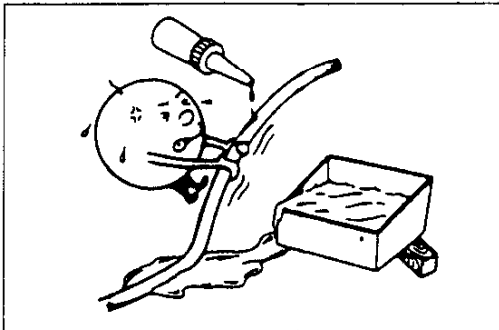
9MUGIX-042



67UGIX-002

**ADJUSTMENTS**

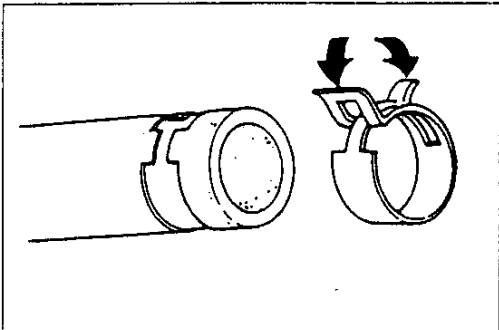
Use suitable gauges and/or testers when making adjustments.



9MUGIX-005

**RUBBER PARTS AND TUBING**

Prevent gasoline or oil from getting on rubber parts or tubing.



19GGIX-008

**HOSE CLAMPS**

When reinstalling, position the hose clamp in the original location on the hose, and squeeze the clamp lightly with large pliers to ensure a good fit.

**CAUTIONS ON USE OF CHASSIS ROLLER**

Observe the following when test-running a vehicle on a dynamometer.

- Place a cooling fan with adequate capacity in front of the vehicle.  
(A vehicle speed proportional type is desirable.)
- Connect an exhaust gas ventilation unit.
- Cool around the exhaust pipes with a cooling fan.  
Exhaust heat could cause thermal deformation in the rear bumper fascia.  
Bumper surface temperature: 70°C {158°F} max.
- Allow adequate space in front and rear of the vehicle.  
Do not let heat built up around the vehicle.
- Pay attention to the water temperature gauge readings.  
Do not allow the engine to overheat.
- Avoid excessively loaded running.  
Run the vehicle at a constant speed.

19GGIX-009

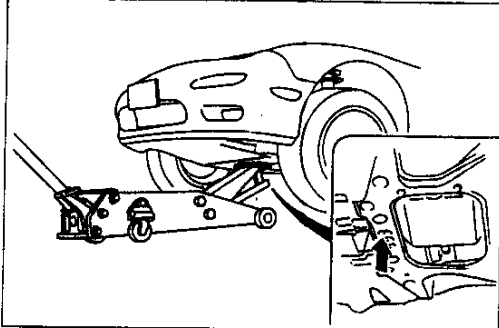
# GI JACK AND SAFETY STAND POSITIONS/VEHICLE LIFT (2-SUPPORT TYPE) POSITIONS

## JACK AND SAFETY STAND POSITIONS

### FRONT

#### Jack position:

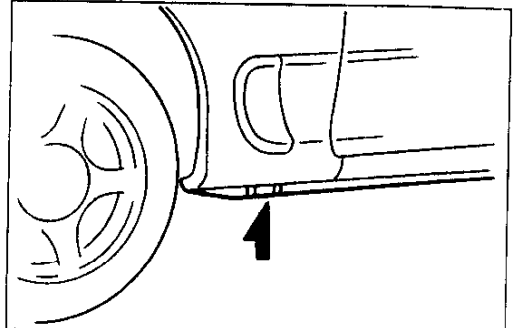
At center of crossmember



07UGIX-004

#### Safety stand positions:

At both sides of body frame

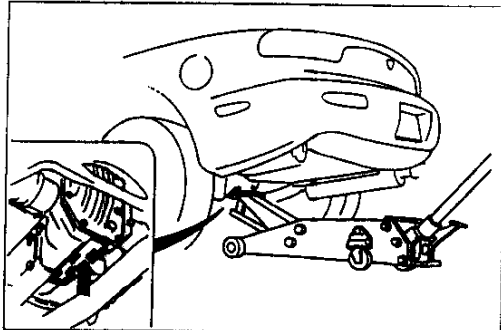


07UGIX-005

### REAR

#### Jack position:

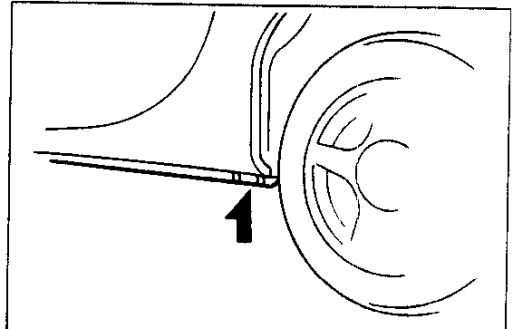
At the center of the differential



07UGIX-006

#### Safety stand positions:

At both sides of body frame



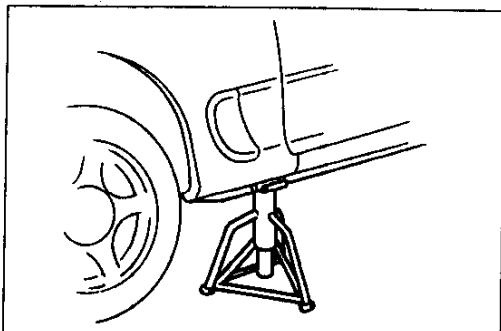
07UGIX-007

## VEHICLE LIFT (2-SUPPORT TYPE) POSITIONS

### FRONT END

#### Frame

Side sills

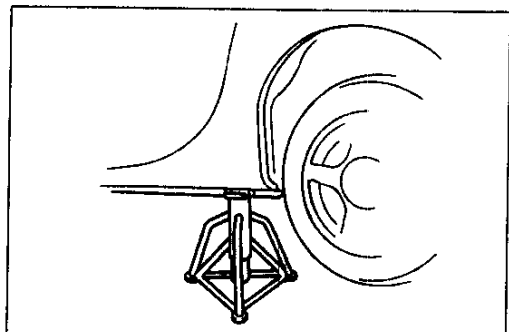


9MUGIX-010

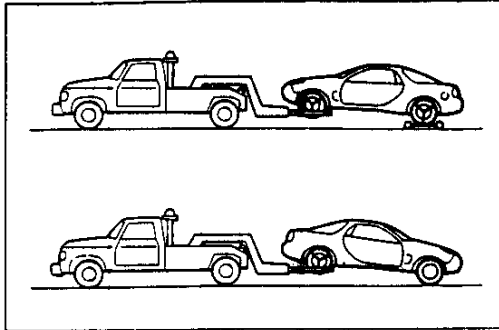
### REAR END

#### Frame

Side sills



9MUGIX-011



07UGIX-008

## TOWING

Proper towing equipment is necessary to prevent damage to the vehicle during any towing operation.

Laws and regulations applicable to vehicles in tow must always be observed.

Release the parking brake, place the shift lever/selector lever in neutral, and set the ignition switch in the ACC position. As a rule, towed vehicles should be pulled with the driving wheels raised off the ground or on a towing dolly.

### WITH MANUAL TRANSMISSION

If the transmission, rear axle, and steering system are not damaged, the vehicle may be towed on all wheels if necessary. If any of these components are damaged, use a towing dolly.

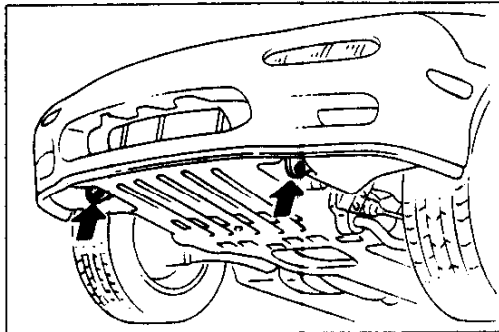
### WITH AUTOMATIC TRANSMISSION

If the vehicle is towed with all wheels on the ground, it may be towed only forward. In this case, do not exceed 56 km/h {35 mph} or a distance of 56 km {35 miles} or transmission damage could result.

If towing speed will exceed 56 km/h {35 mph}, or if towing distance will exceed 56 km {35 miles}, one of these methods must be used:

1. Place the rear wheels on a dolly.
2. Tow with the rear wheels off the ground.
3. Disconnect the propeller shaft.

If the transmission or rear axle is inoperative, tow the vehicle with its rear wheels off the ground or disconnect the propeller shaft.



### Caution

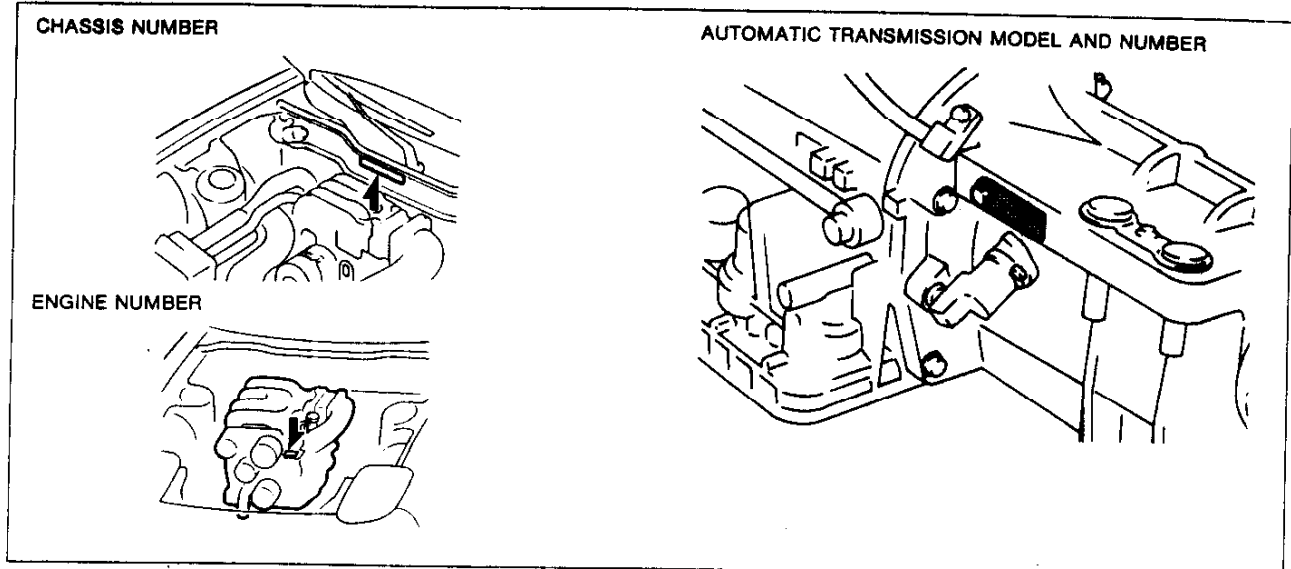
- The following points are important when the vehicle is towed with all wheels on the ground. The transmission must be in **NEUTRAL**, the ignition switch in "ACC" position, and the parking brake released. Remember that the power assist for the brakes and the steering will not be available when the engine is inoperative.

The towing hook should be used only in an emergency situation, (e.g., to pull the vehicle out of a ditch, snow bank, or mud).

When the towing hook is used, always pull on the cable or chain in a straight direction with respect to the hook. Do not apply side force to the hook. To prevent damage, do not take up slack in the cable or chain too quickly.

# GI IDENTIFICATION NUMBER LOCATIONS/UNITS/ABBREVIATIONS

## IDENTIFICATION NUMBER LOCATIONS



9MUGIX-015

## UNITS

N·m {kgf·m or kgf·cm,	
ft·lbf or in·lbf} .....	Torque
rpm .....	Revolution per minute
A .....	Ampere(s)
V .....	Volt(s)
Ω .....	Ohm(s) (resistance)
kPa {kgf/cm <sup>2</sup> , psi} ...	Pressure
	(usually positive)
kPa {mmHg, inHg} ...	Pressure
	(usually negative)
W .....	Watt
L {US qt, Imp qt} ...	Volume
mm {in} .....	Length

16EGIX-030

## ABBREVIATIONS

AAS .....	Auto adjusting suspension
ABDC .....	After bottom dead center
ABS .....	Anti-lock braking system
A/C .....	Air conditioner
ACC .....	Accessories
ACV .....	Air control valve
ASV .....	Air supply valve
A/T .....	Automatic transmission
ATDC .....	After top dead center
ATF .....	Automatic transmission fluid
AWS .....	Accelerated warm-up system
BAC .....	Bypass air control
BBDC .....	Before bottom dead center
BTDC .....	Before top dead center
EC-AT .....	Electronically controlled Automatic Transmission
ECPS .....	Electronically controlled power steering

ECU .....	Engine control unit
EGI .....	Electronic gasoline injection
E/L .....	Electrical load
ESA .....	Electronic spark advance
ESPS .....	Engine speed sensing power steering
EX .....	Exhaust
IC .....	Integrated circuit
IGN .....	Ignition
IN .....	Intake
INT .....	Intermittent
ISC .....	Idle speed control
LH .....	Left hand
LSD .....	Limited slip differential
M .....	Motor
MIL .....	Malfunction indicator lamp
MOP .....	Metering oil pump
M/T .....	Manual transmission
OD .....	Overdrive
OFF .....	Switch off
ON .....	Switch on
PBV .....	Proportioning bypass valve
PCV .....	Positive crankcase ventilation
PRC .....	Pressure regulator control
P/S .....	Power steering
P/W .....	Power window
RH .....	Right hand
SST .....	Special service tool
ST .....	Start
SW .....	Switch
TDC .....	Top dead center
VDI .....	Variable dynamic effect intake
VRIS .....	Variable resonance induction system

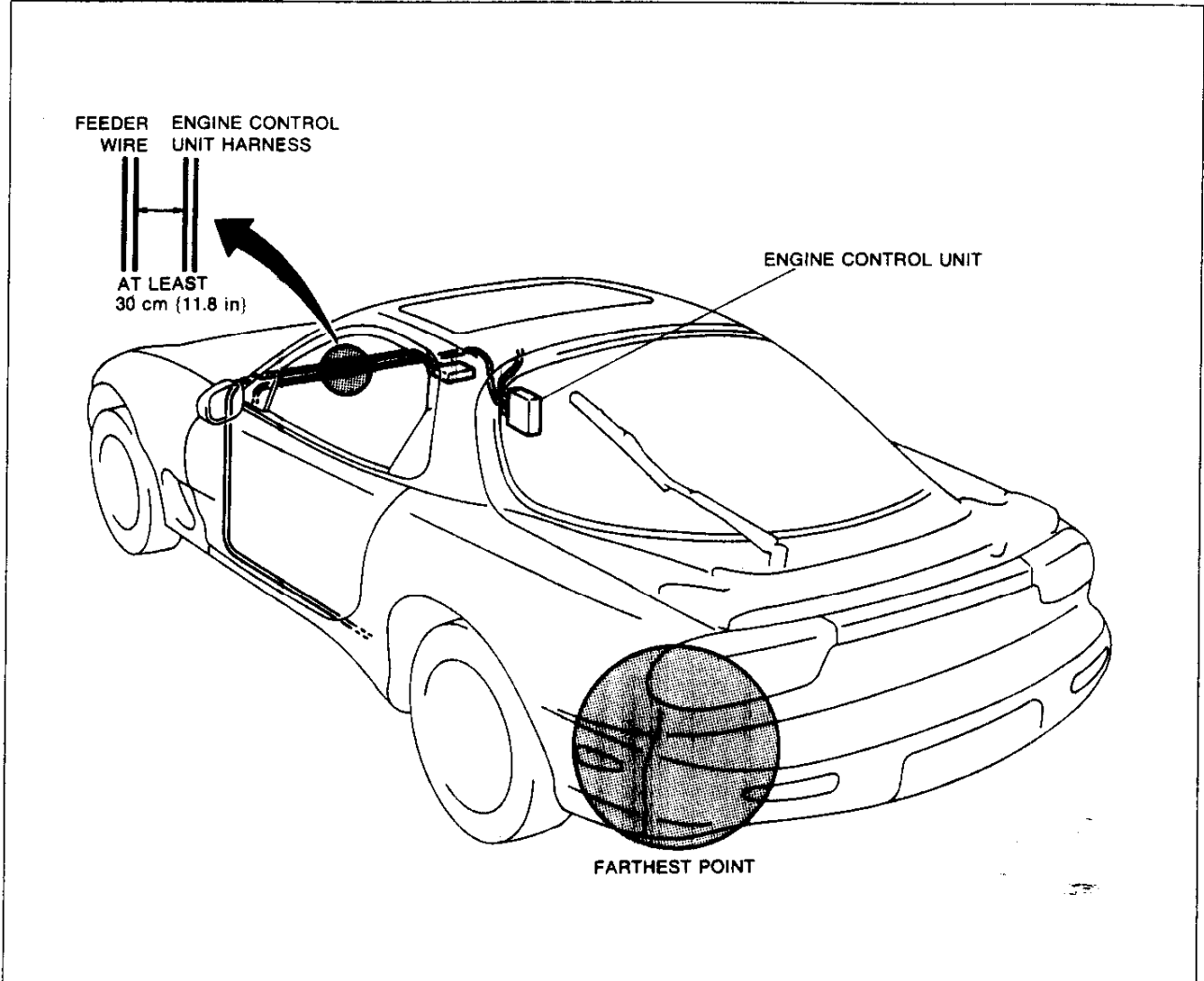
17UGIX-001

**CAUTION****INSTALLATION OF MOBILE TWO-WAY RADIO SYSTEM**

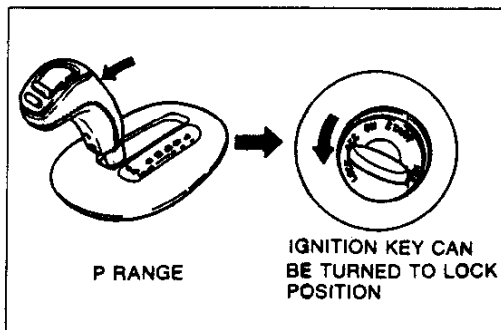
If a mobile two-way radio system is installed improperly or if a high-powered type is used, the EGI system and other systems may be affected.

When the vehicle is to be equipped with a mobile two-way radio, observe the following precautions:

1. Install the antenna at the farthest point from control units.
2. Install the antenna feeder as far as possible from the control unit harnesses (**at least 30 cm {11.8 in}**).
3. Ensure that the antenna and feeder are properly adjusted.
4. Do not install a high- powered mobile two-way radio system.



05UGIX-013

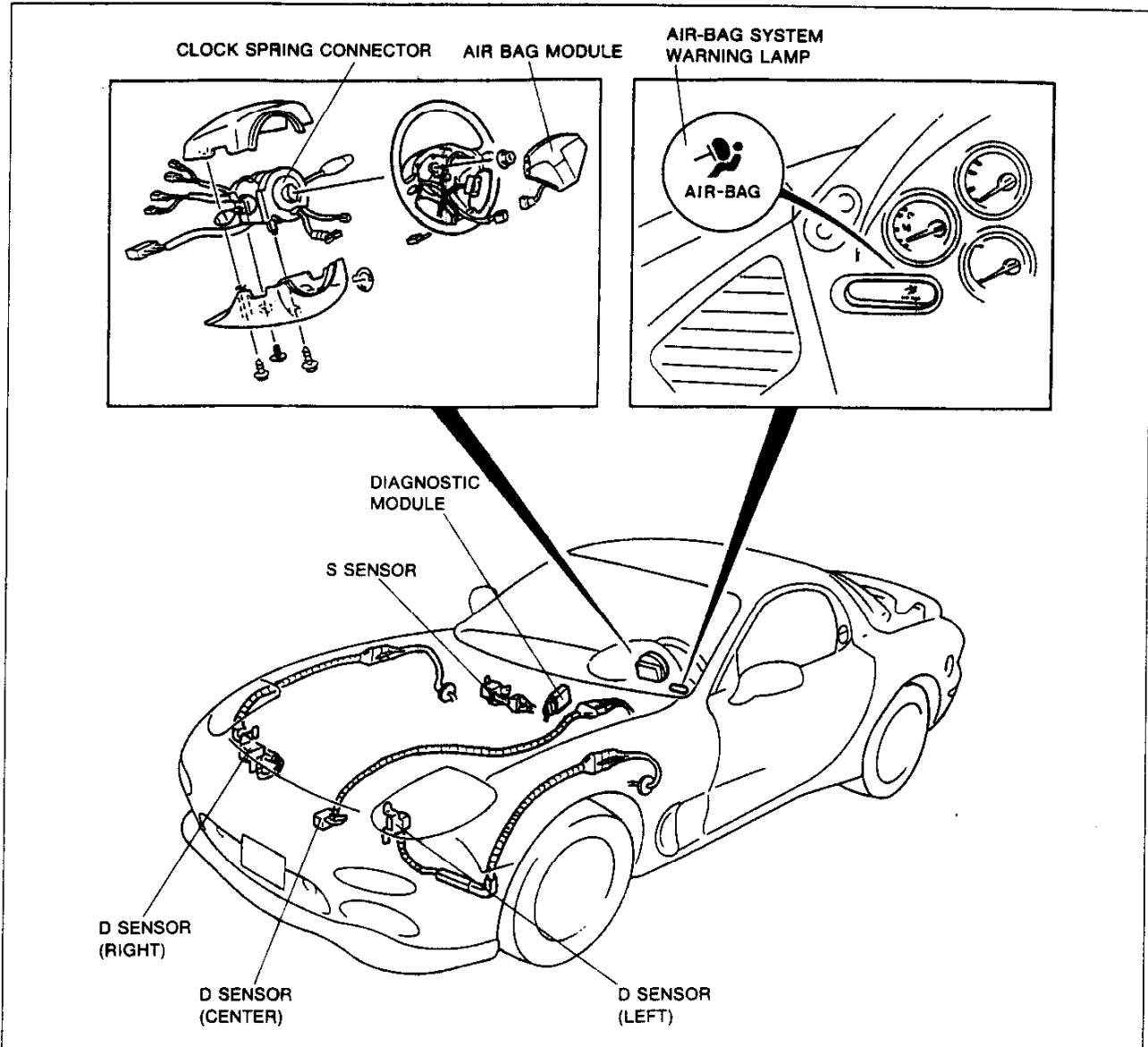


9MUGIX-018

**REMOVAL OF IGNITION KEY ON AUTOMATIC TRANSMISSION MODEL**

The selector lever must be in P (PARK) to turn the ignition key to the OFF position. If the switch seems to be off but the key cannot be removed, the switch may still be in the ACC position, or the selector lever may not be in P (PARK). Shift the selector lever to P (PARK), and turn the ignition key to the LOCK position. The key should now be free for removal.

## SERVICE PRECAUTIONS CONCERNING AIR BAG SYSTEM



07UGIX-009

**Before Replacing any Components**

Before replacing of any air bag system components, or before disconnecting any connectors of the system, first disconnect the negative battery cable. Then remove the air bag module from the vehicle even if it has not failed.

**Prohibition of Component Disassembly and Wiring Harness Repair**

The components of the air bag system are not intended to be disassembled for service.

If a component failure is indicated by the diagnostic module, replace the suspected component after verifying the condition of the connections and the wiring harness. **Do not disassemble any components.**

If an open circuit is found by a continuity test, replace the wiring harness. **Do not attempt to repair the wiring.**

**Handling of Air Bag Module**

1. Do not use an ohmmeter for inspection of the air bag module; it may cause an accidental deployment.
2. When carrying a live air bag module, make sure the trim cover is pointed away from your body to prevent injury in the event of an accidental deployment.

3. When placing a live air bag module on any surface, always face the trim cover upward. This will reduce the motion of the module if it is accidentally deployed.
4. When handling a deployed air bag module, wear gloves and safety glasses because the deployed air bag module may display deposits of sodium hydroxide, a product of the gas generant combustion.
5. An air bag module must be disposed of only by the proper procedure recommended for the specific situation. (Refer to page T-162.)

### Crash Sensor Installation

1. The angle and direction of the sensors is very important for their proper operation. If a vehicle has been involved in a crash where the front sheet metal has been damaged, inspect the body structure at the sensor mounting area for deformation. If damaged, restore it to its original shape.
2. When installing a crash sensor, be sure to tighten the mounting bolts to the specified torque to ensure proper grounding, as the ground circuit is made directly through the sensor's mounting plate.

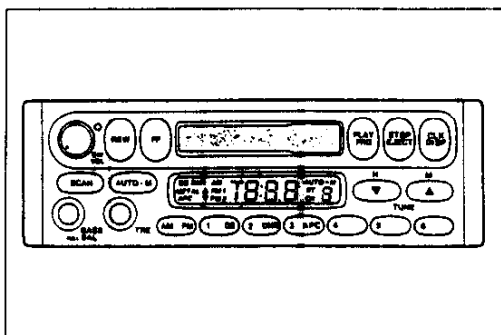
### Adjustment of Clock Spring Connector

When the steering wheel is removed or the clock spring connector is replaced, the clock spring connector must be properly aligned.

Align the clock spring connector as follows:

- (1) Set the front wheels straight ahead.
- (2) Turn the clock spring connector clockwise until it stops. **Do not force it.**
- (3) Return it 2.75 turns.
- (4) Align the mark on the clock spring connector to the outer housing.
- (5) Carefully install the steering wheel disturbing the clock spring connector.

07UGIX-010

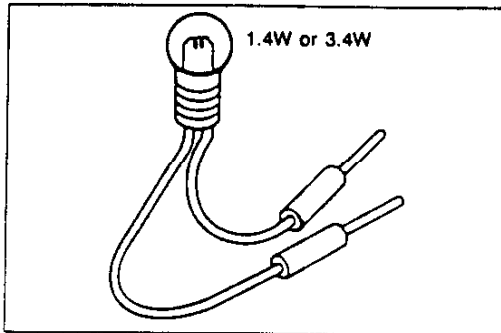


15UGIX-004

### AUDIO ANTI-THEFT SYSTEM

An audio with an anti-theft function is optionally available. Before removing the negative battery terminal or disconnecting the audio power source, obtain the code number and deactivate the audio anti-theft system. (Refer to Section T.)





05UGIX-019

### ELECTRICAL TROUBLESHOOTING TOOLS

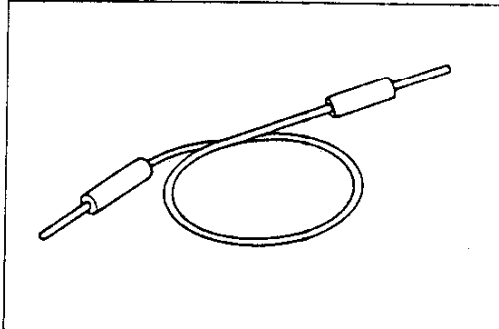
#### Test Light

The test light, as shown in the figure, uses a 12V bulb. The two lead wires should be connected to probes.

The test light is used for simple voltage checks and for checking for short circuits.

#### Caution

- When checking a control unit, never use a bulb over 3.4W.



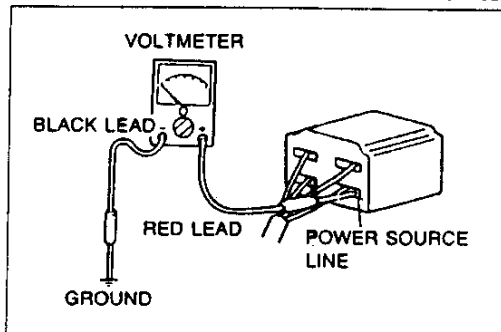
9MUGIX-020

#### Jumper Wire

The jumper wire is used for testing by shorting across switch terminals and ground connections.

#### Caution

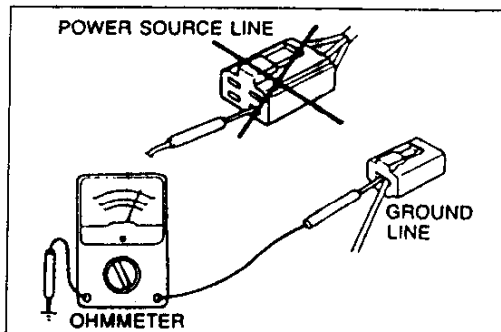
- Do not connect a jumper wire from the power source line to a body ground; this may cause burning or other damage to harnesses or electronic components.



05UGIX-020

#### Voltmeter

The DC voltmeter is used to measure circuit voltage. A voltmeter with a range of 15V or more is used by connecting the positive (+) probe (red lead wire) to the point where voltage is to be measured and the negative (-) probe (black lead wire) to a body ground.



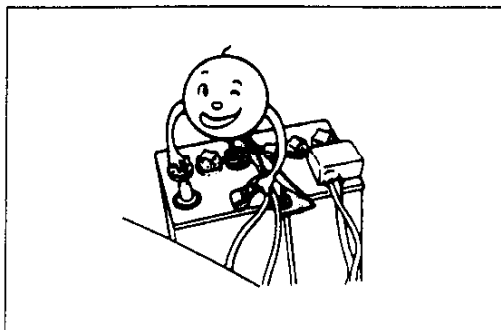
05UGIX-022

#### Ohmmeter

The ohmmeter is used to measure the resistance between two points in a circuit, and to check for continuity and short circuits.

#### Caution

- Do not attempt to connect the ohmmeter to any circuit to which voltage is applied; this may burn or otherwise damage the ohmmeter.

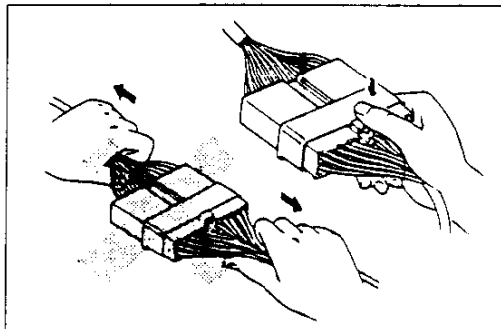


05UGIX-023

**CAUTION WITH ELECTRICAL PARTS**

**Battery Cable**

Before disconnecting connectors or removing electrical parts, disconnect the negative battery cable.

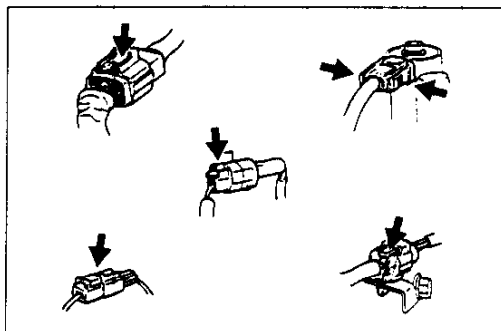


07UGIX-011

**Connectors**

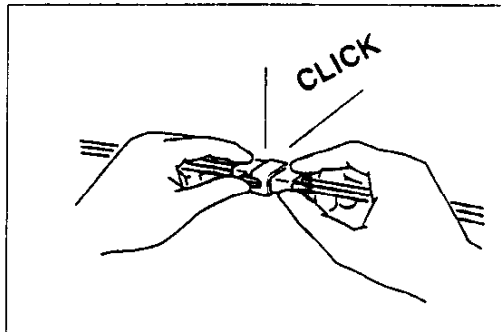
**Disconnecting connectors**

Never pull on wiring harness when disconnecting connectors.



05UGIX-025

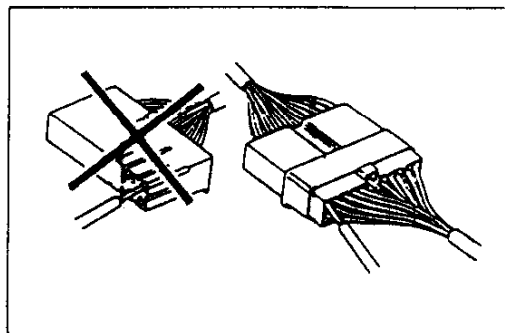
Connectors can be disconnected by pressing or pulling the lock lever as shown.



05UGIX-026

**Locking connectors**

When locking connectors, listen for a click that will indicate they are securely locked.

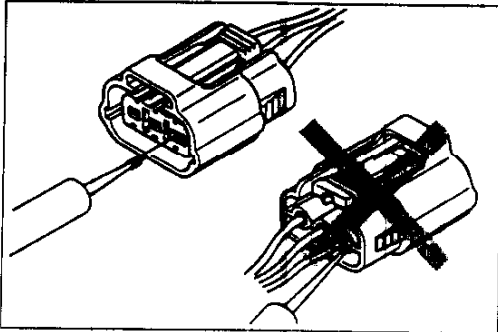


07UGIX-012

**Inspection**

1. When a tester is used to check for continuity or to measure voltage, insert the tester probe from the wiring harness side.

**CAUTION**

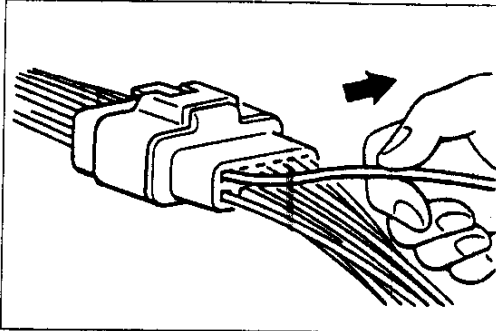


07UGIX-013

2. Check the terminals of waterproof connectors from the connector side, as they cannot be accessed from the wiring harness side.

**Caution**

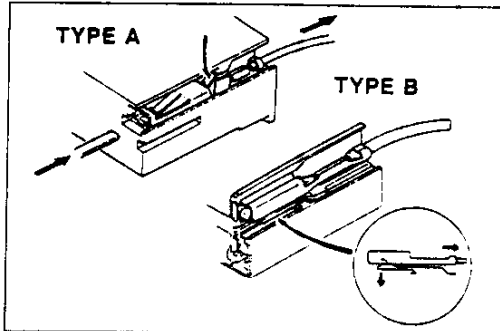
- Use fine wire to prevent damage to the terminal.
- Do not damage the terminal when inserting the tester lead.



9MUGIX-027

**Terminals Inspection**

Pull lightly on individual wires to check that they are secured in the terminal.



9MUGIX-028

**Replacement of terminals**

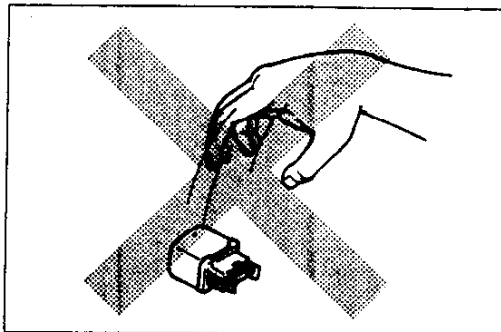
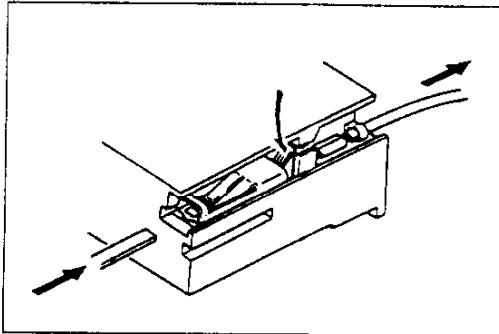
Use the appropriate tools to remove the terminal as shown. When installing the terminal, be sure to insert it until it locks securely.

**< Female >**

Insert a thin piece of metal from the terminal side of the connector, and then, with the terminal locking tab pressed down, pull the terminal out from the connector.

**< Male >**

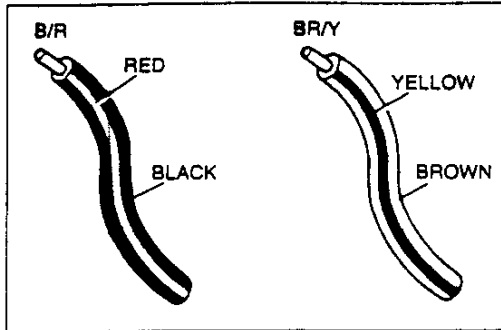
Same as the female type.



05UGIX-029

**Sensors, Switches, and Relays**

Handle sensors, switches, and relays carefully. Do not drop them or strike them against other objects.

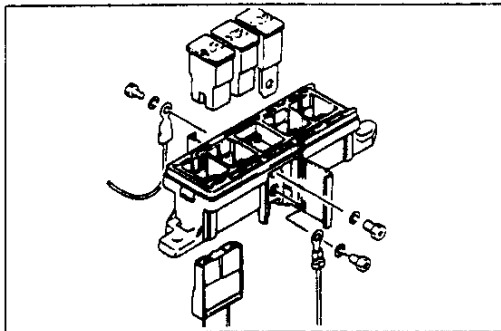


07UGIX-014

**Wiring Harness  
Wiring color codes**

Two-color wires are indicated by a two-color code symbol. The first letter indicates the base color of the wire and the second the color of the stripe.

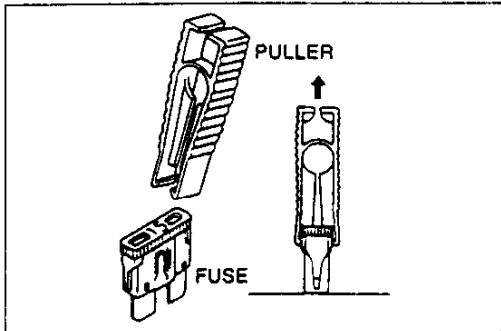
CODE	COLOR	CODE	COLOR
B	Black	O	Orange
BR	Brown	P	Pink
G	Green	R	Red
GY	Gray	V	Violet
L	Blue	W	White
LB	Light Blue	Y	Yellow
LG	Light Green	-	-



07UGIX-015

**Fuse  
Replacement**

1. When replacing a fuse, be sure to replace it with one of the specified capacity.  
If a fuse again fails after it has been replaced, the circuit probably has a short and the wiring should be checked.
2. Be sure the negative battery terminal is disconnected before replacing the main fuse (80A).
3. When replacing a pullout fuse, use the fuse puller supplied in the fuse box cover.



9MUGIX-032

