

1989 Mazda RX-7 Factory Service Manual

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1989 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.

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**Mazda Motor Corporation
HIROSHIMA, JAPAN**

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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
------------------------------------	--------------------------------

9MU0NX-030

SST NUMBER

49 H028 301
 Installer, boot

SST NAME

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 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:

73-107 (7.4-10.9, 54-79)

17 SELECTIVE

19

20

21

22

23

69-83 (7.0-8.5, 81-81)

24 SELECTIVE

18-26 (1.8-2.6, 13-19)

128-284 (13-29, 94-110)

N·m (m·kg, ft·lb)

SHOWS EXPENDABLE PARTS

SHOWS TIGHTENING TORQUE SPECIFICATION *2

SHOWS APPLICATION POINT OF OIL, ETC.

SHOWS TIGHTENING TORQUE UNIT

SHOWS VISUAL INSPECTION INFORMATION

SHOWS RELATED PAGE FOR SERVICE

1. Bolt 2. Lock plate 3. Bearing cup 4. Adjusting screw 5. Bearing outer race 6. Locknut 7. Washer 8. Companion flange Removal page M-21 Inspect splines page M-21	16. Bearing inner race Removal page M-22 Inspect for damage or rough retain page M-24 Installation page M-24 17. Spacer 18. Drive pinion Removal page M-21 Inspect splines and teeth for wear or damage page M-22 Adjustment of height page M-22 Adjustment of height page M-24
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*1: The numbering (ex. ①) shows service procedure.

*2: Units shown in N·m (m·kg, ft·lb) unless otherwise specified.

GI HOW TO USE THIS MANUAL/FUNDAMENTAL PROCEDURES

SYMBOLS

There are 6 symbols for oil, grease, and sealant. These show the points of applying oil, grease, or sealant 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	Appropriate petroleum jelly

9MUGIX-035

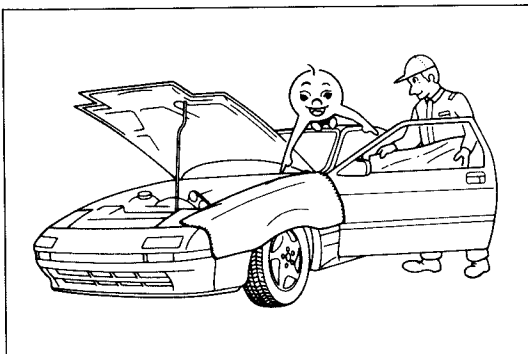
Note

When special 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

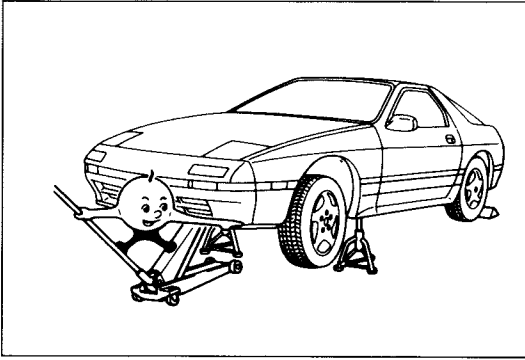


9MUGIX-037

FUNDAMENTAL PROCEDURES

PROTECTION OF THE VEHICLE

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



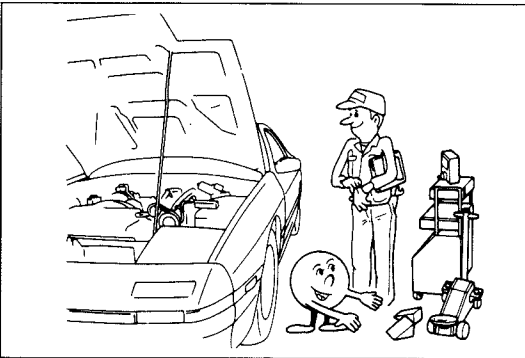
9MUGIX-003

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.

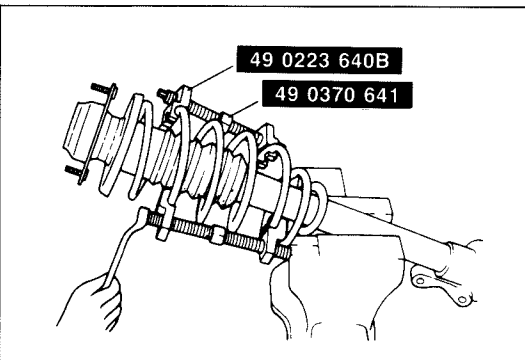
Start the engine only after making certain the engine compartment is clear of tools and people.



9MUGIX-038

PREPARATION OF TOOLS AND MEASURING EQUIPMENT

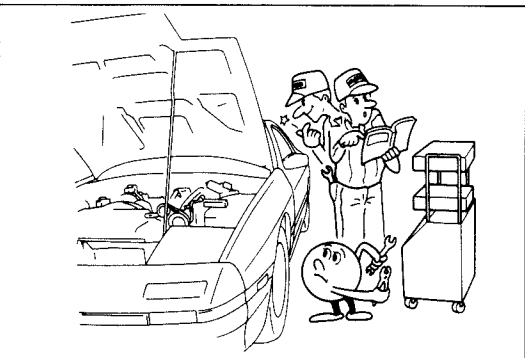
Be sure that all necessary tools and measuring equipment are available before starting any work.



47U0GX-005

SPECIAL TOOLS

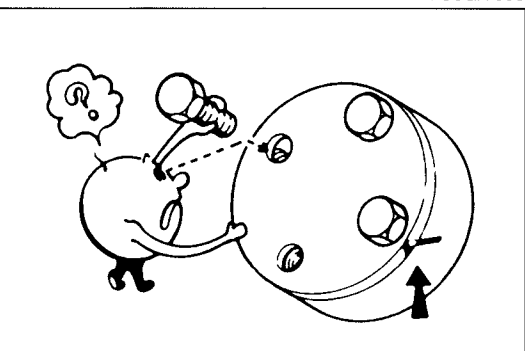
Use special tools when they are required.



47U0GX-006

REMOVAL OF PARTS

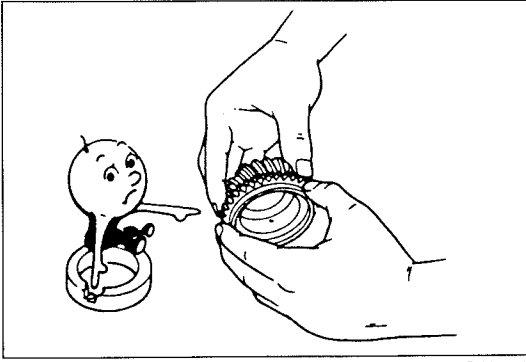
While correcting a problem, try also to determine its cause. Begin work only after first learning which parts and subassemblies must be removed and disassembled for replacement or repair.



9MUGIX-039

DISASSEMBLY

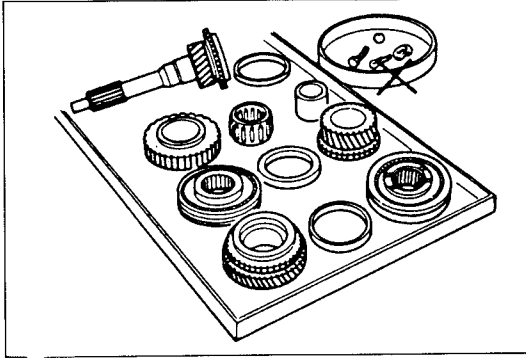
If the disassembly procedure is complex, requiring many parts to be disassembled, all parts should be disassembled in a way that will not affect their performance or external appearance and identified so that reassembly can be performed easily and efficiently.



9MUGIX-040

1. Inspection of parts

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

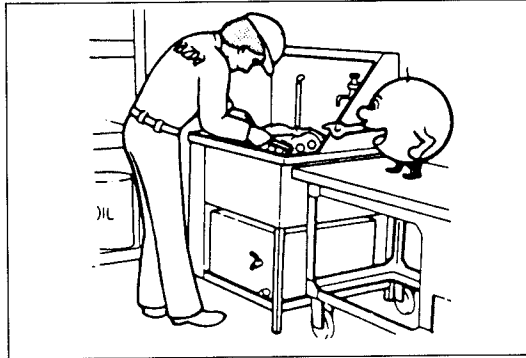


9MUGIX-041

2. Arrangement of parts

All disassembled parts should be carefully arranged for re-assembly.

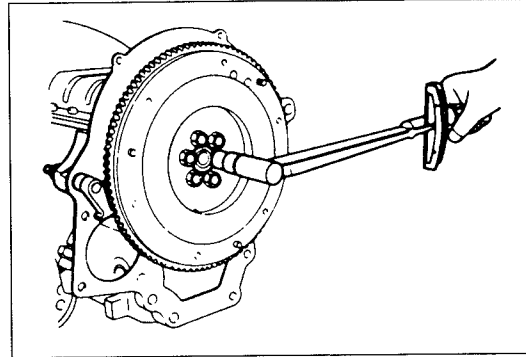
Be sure to separate or otherwise identify the parts to be replaced from those that will be reused.



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

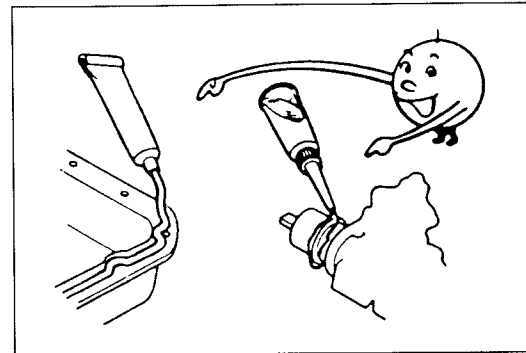
Standard values, such as torques and certain adjustments, must be strictly observed in the reassembly of all parts. Refer to STANDARD BOLT AND NUT TIGHTENING TORQUE in Section TD for tightening torques not mentioned in the main text.

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

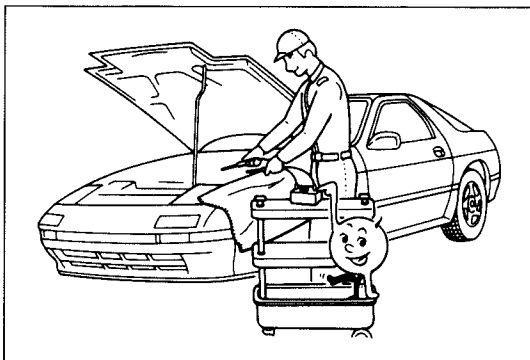
- | | |
|----------------|-----------------|
| 1. Oil seals | 2. Gaskets |
| 3. O-rings | 4. Lock washers |
| 5. Cotter pins | 6. Nylon nuts |

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.



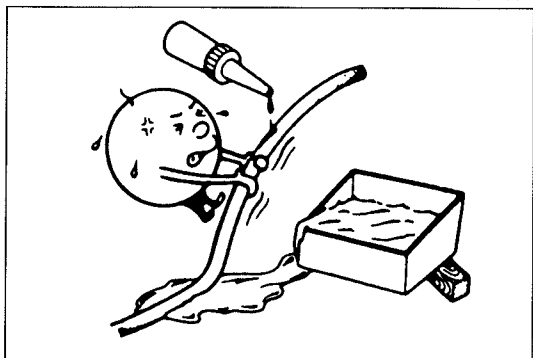
9MUGIX-042



67U0GX-002

ADJUSTMENTS

Use suitable gauges and/or testers when making adjustments.



9MUGIX-005

RUBBER PARTS AND TUBING

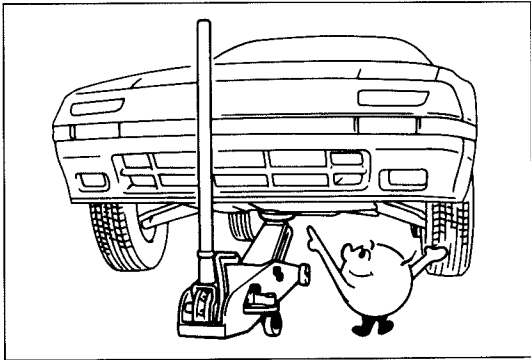
Prevent gasoline or oil from getting on rubber parts or tubing.

JACK AND SAFETY STAND POSITIONS

FRONT END

Jack position:

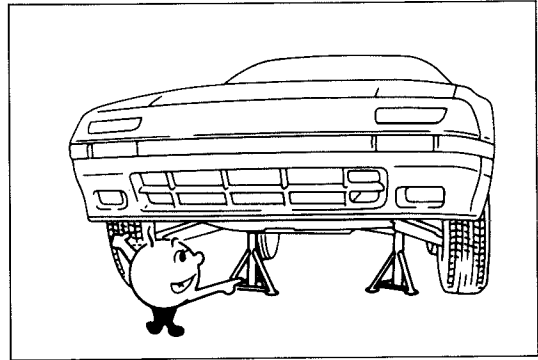
At the center of the crossmember



9MUGIX-006

Safety stand positions:

On both sides of the body frame

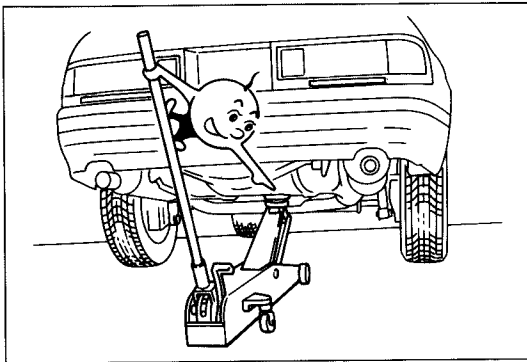


97UGIX-002

REAR END

Jack position:

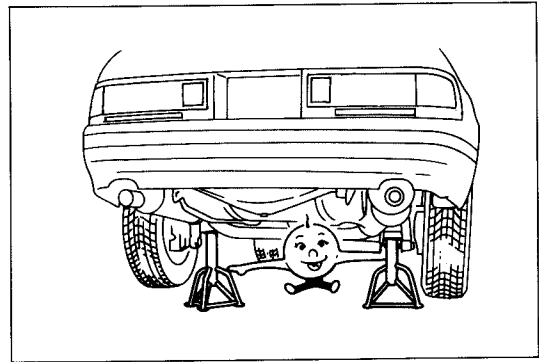
At the center of the differential



9MUGIX-008

Safety stand positions:

On both sides of the body frame



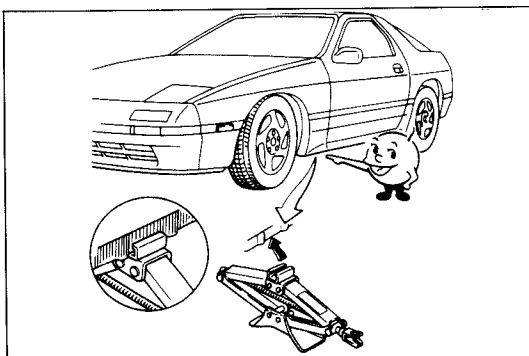
97UGIX-003

VEHICLE LIFT (2-SUPPORT TYPE) POSITIONS

FRONT END

Frame

Side sills

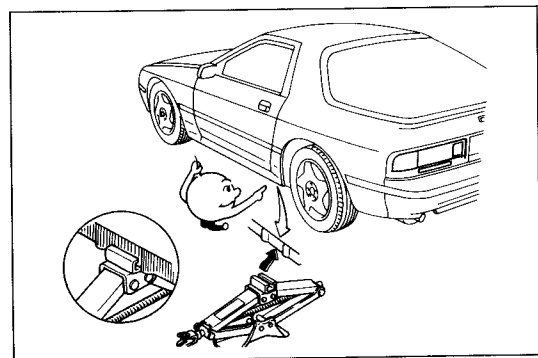


9MUGIX-010

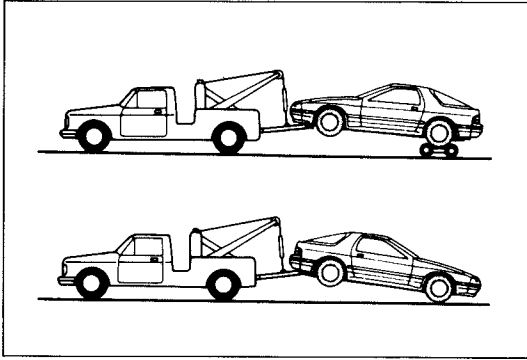
REAR END

Frame

Side sills



9MUGIX-011



97UGIX-004

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 in neutral, and set the ignition switch in the ACC position. As a rule, towed vehicles should be pulled with the driving wheels off the ground.

WITH MANUAL TRANSMISSION

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

WITH AUTOMATIC TRANSMISSION

If excessive damage or other conditions prevent towing the vehicle with the driving wheels off the ground, use a towing dolly. With all wheels on the ground, the vehicle 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.

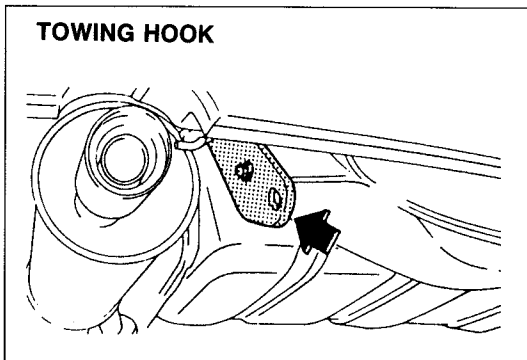
If towing speed will exceed 56 km/h (35 mph), or if towing distance will exceed 56 km (35 miles), use one of these methods:

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

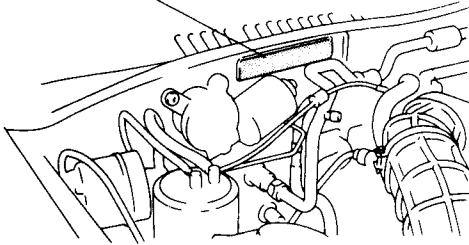
- **The following points are important when the vehicle is towed with four wheels on the ground. The transmission must be in NEUTRAL, the ignition switch in "ACC" position, and the parking brake released.**
- **Remember that the power assist for the brakes and steering will not be available when the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



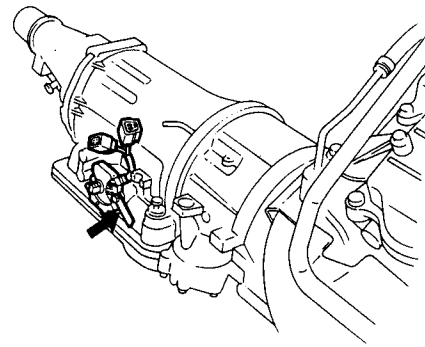
IDENTIFICATION NUMBER LOCATIONS

CHASSIS NUMBER

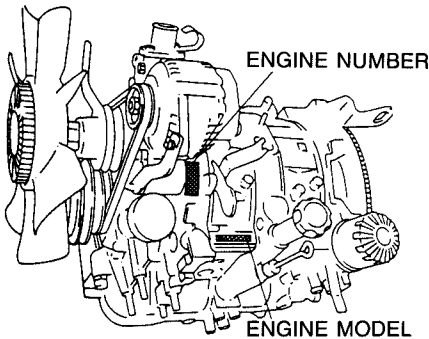
CHASSIS NUMBER



AUTOMATIC TRANSMISSION MODEL AND NUMBER



ENGINE MODEL AND NUMBER



9MUGIX-015

UNITS

Nm (m-kg or cm-kg, ft-lb or in-lb).....	Torque
rpm.....	Revolutions per minute
A.....	Ampere(s)
V.....	Volt(s)
Ω	Ohm(s) (resistance)
kPa (kg/cm ² , psi).....	Pressure (usually positive)
mmHg (inHg).....	Pressure (usually negative)
W.....	Watt
liters (US qt, Imp qt) ...	Volume
mm (in).....	Length

89U0GX-006

ECPS.....	Electronically controlled power steering
EGL.....	Electronic gasoline injection
E/L.....	Electrical load
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
M/T.....	Manual transmission
OD.....	Overdrive
OFF.....	Switch off
ON.....	Switch on
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
VRIS.....	Variable resonance induction system

97UGIX-005

ABBREVIATIONS

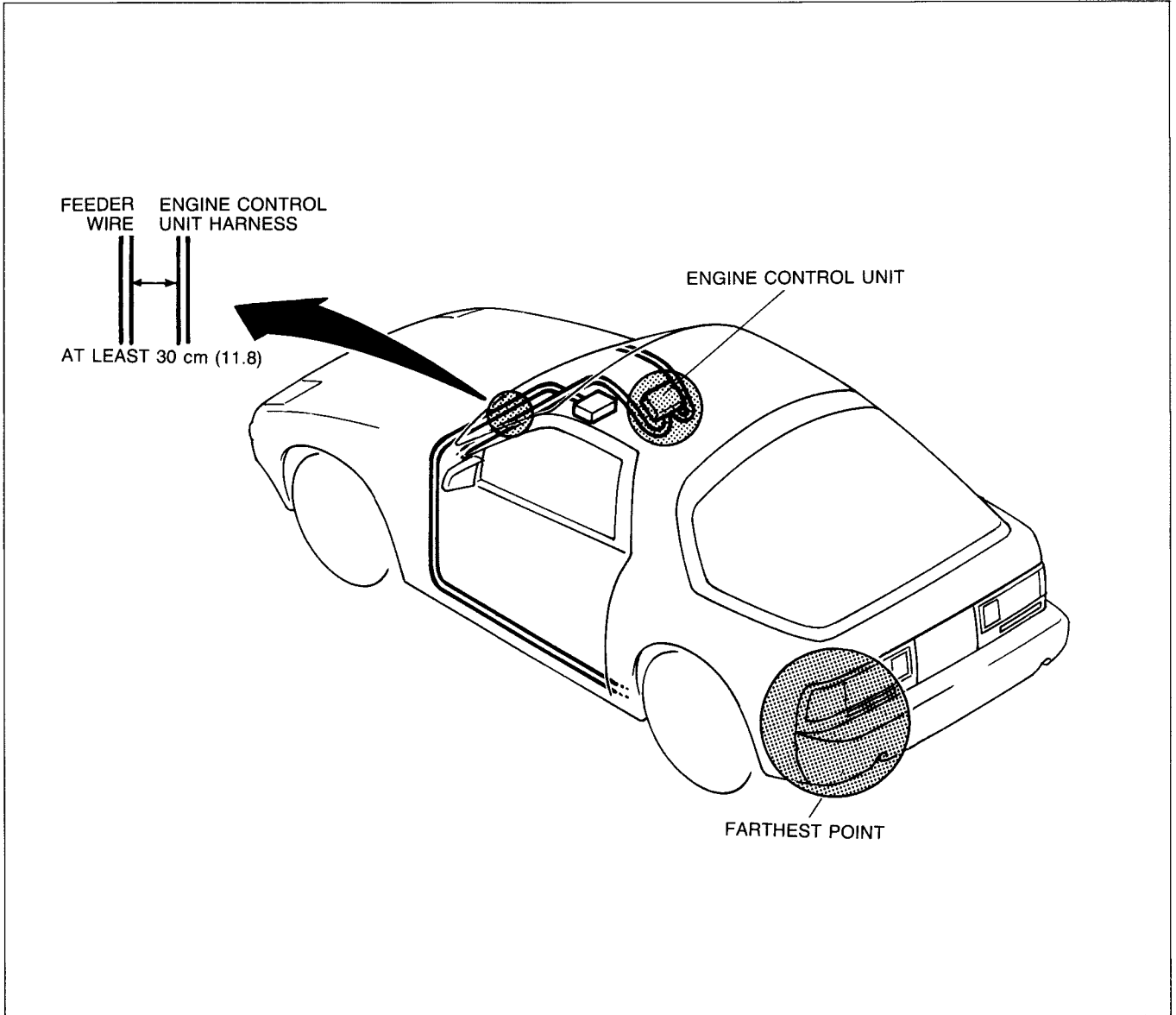
AAS.....	Auto adjusting suspension
ABDC.....	After bottom dead center
ABS.....	Anti-lock braking system
A/C.....	Air conditioner
ACC.....	Accessories
A/T.....	Automatic transmission
ATDC.....	After top dead center
ATF.....	Automatic transmission fluid
BAC.....	Bypass air control
BBDC.....	Before bottom dead center
BTDC.....	Before top dead center
EC-AT.....	Electronically controlled Automatic Transmission

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

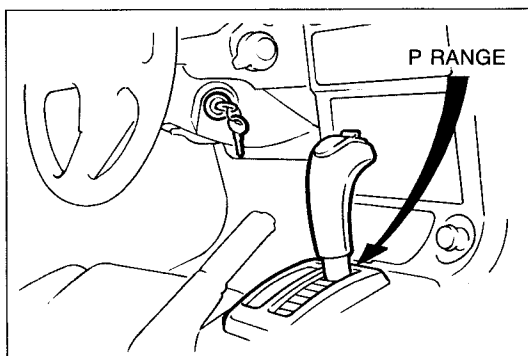
If a mobile two-way radio system is installed improperly or if a high-powered type is used, the EGI system and other systems may be affected.

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

1. Install the antenna at the farthest point from control units.
2. Keep the antenna feeder away from the control unit harnesses as far as possible (**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.



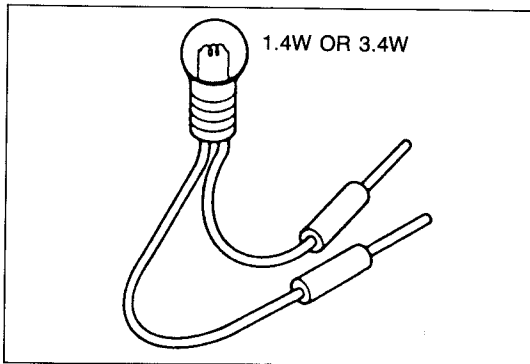
9MUGIX-017



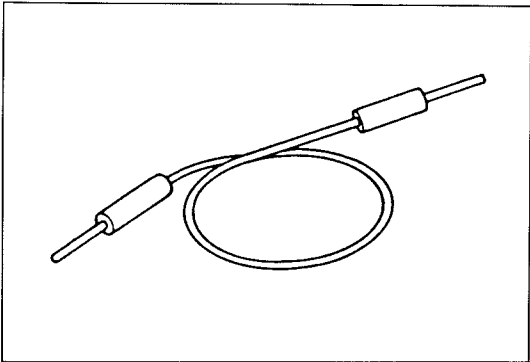
9MUGIX-018

REMOVAL OF IGNITION KEY ON AUTOMATIC TRANSMISSION MODEL

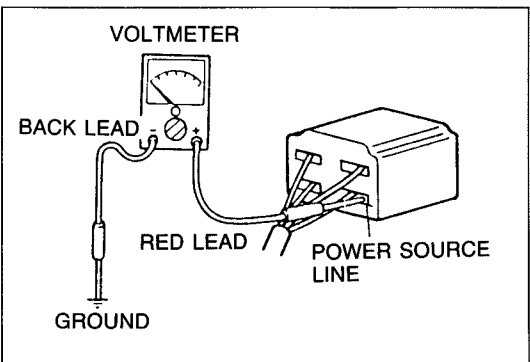
The selector lever must be in P (PARK) to turn the ignition key to the OFF position. If the switch seems to be off but the key cannot be removed, the switch may still be in the ACC position, or the selector lever may not be in P (PARK). Shift the selector lever to P (PARK), and turn the ignition key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



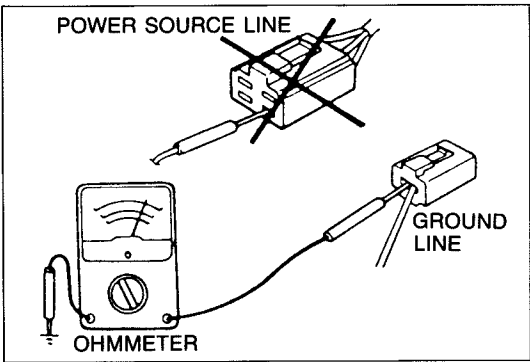
9MUGIX-019



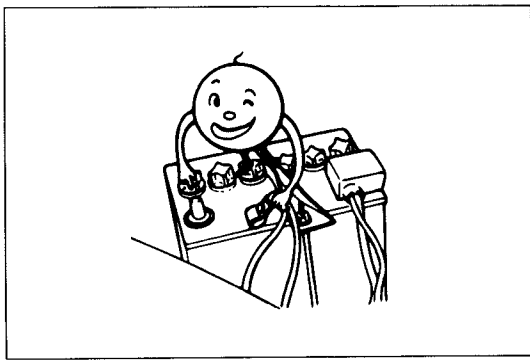
9MUGIX-020



9MUGIX-021



9MUGIX-045



9MUGIX-022

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 the control unit, never use a bulb over 3.4W.

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.

Voltmeter

The DC voltmeter is used to measure of 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.

Ohmmeter

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

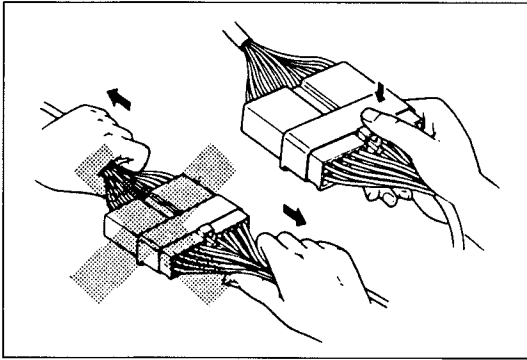
Caution

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

CAUTION WITH ELECTRICAL PARTS

Battery Cable

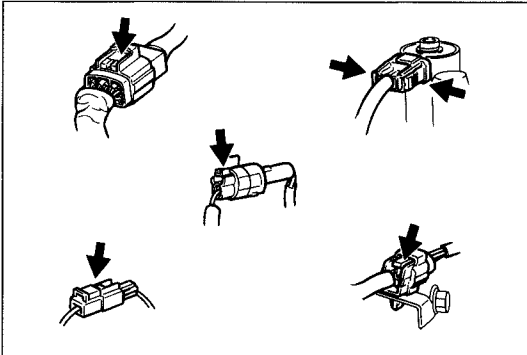
Before disconnecting connectors or replacing electrical parts, disconnect the negative battery cable.



9MUGIX-023

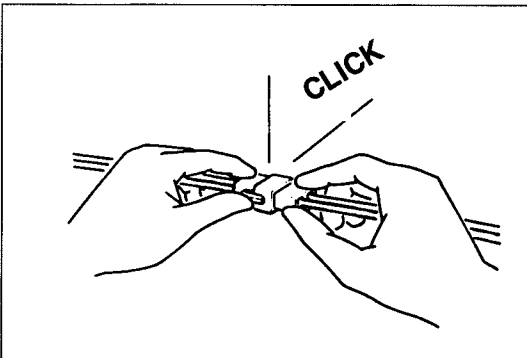
Connectors
Removal of connector

Never pull on the wiring harness when disconnecting connectors.



9MUGIX-024

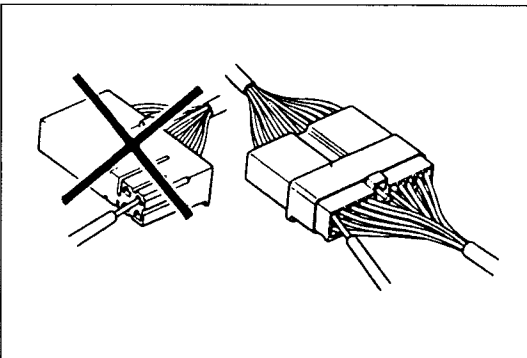
Connectors can be removed by pressing or pulling the lock lever as shown.



9MUGIX-025

Locking of connector

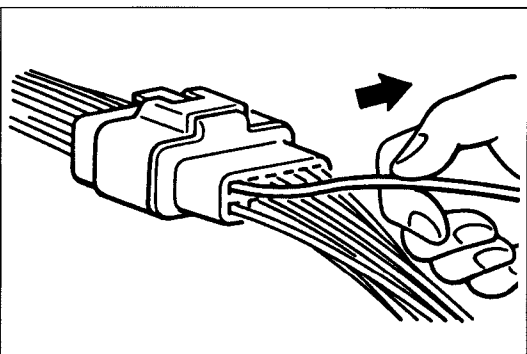
When locking connectors, make sure to listen for a click that will indicate they are securely locked.



9MUGIX-026

Inspection

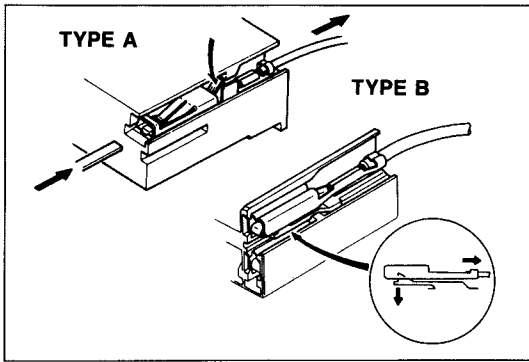
When a tester is used to check for continuity or to measure voltage, insert the tester probe from the wire harness side.



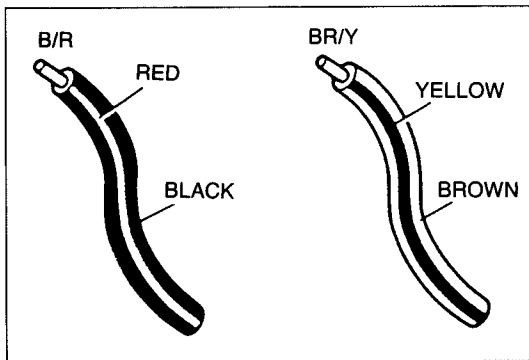
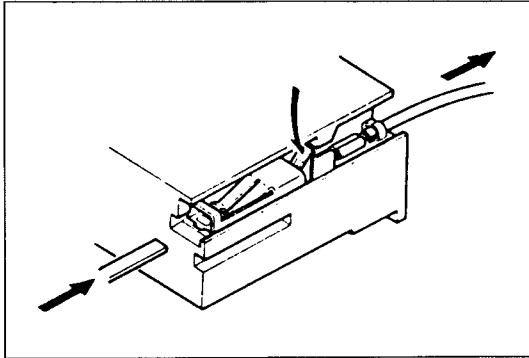
9MUGIX-027

Terminals
Inspection

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



9MUGIX-028



9MUGIX-029

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 >

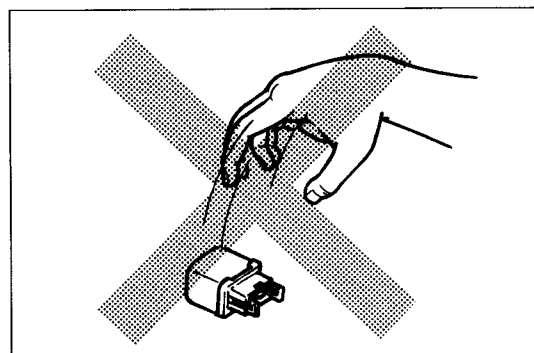
Same as the female type.

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.

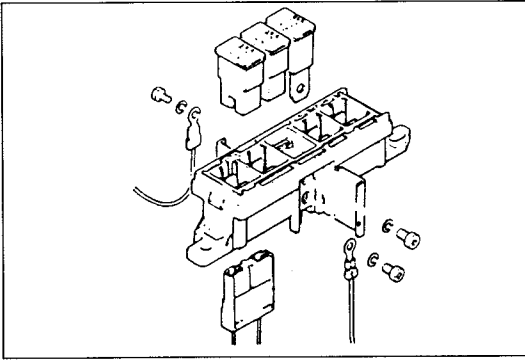
CODE	COLOR	CODE	COLOR
B	Black	O	Orange
BR	Brown	P	Pink
G	Green	R	Red
GY	Gray	V	Violet
L	Blue	W	White
LB	Light Blue	Y	Yellow
LG	Light Green	—	—



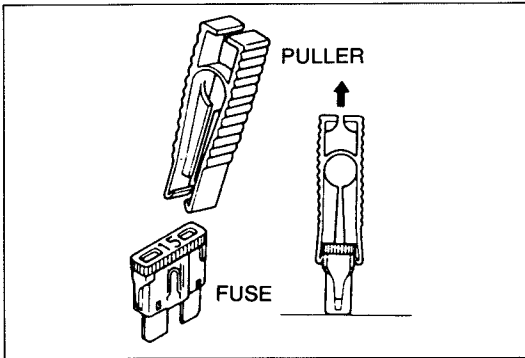
9MUGIX-030

Sensors, Switches, and Relays

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



9MUGIX-031



9MUGIX-032

Fuse Replacement

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