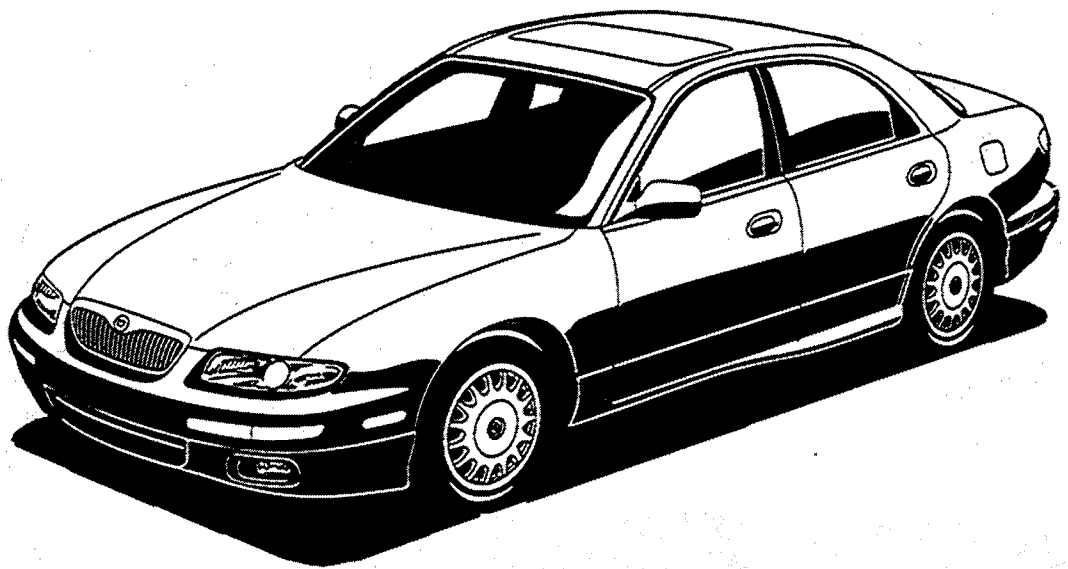


millenia



WARNING

Servicing a vehicle can be dangerous. If you have not received service-related training, the risks of injury and property damage increase. The recommended servicing procedures for the vehicle in this workshop manual were developed with Mazda-trained technicians in mind. This manual may be useful to non-Mazda trained technicians, but a technician with our service-related training and experience will be at less risk when performing servicing operations. However, all users of this manual are expected to know general safety procedures.

This manual contains "Warnings" and "Cautions" applicable to risks not normally encountered in a general technician's experience. They should be followed to reduce the risk of injury and the risk that improper service or repair may damage the vehicle or render it unsafe. It is also important to understand that the "Warnings" and "Cautions" are not exhaustive. It is impossible to warn of all the hazardous consequences that might result from failure to follow the procedures.

The procedures recommended and described in this manual are effective methods of performing service and repair. Some require tools specifically designed for a specific purpose. Nonrecommended procedures and tools should include consideration for safety of the technician and continued safe operation of the vehicle.

Parts should be replaced with genuine Mazda replacement parts, not parts of lesser quality. Use of a nonrecommended replacement part should include consideration for safety of the technician and continued safe operation of the vehicle.

1996 Mazda Millenia Workshop Manual

FOREWORD

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

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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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.

Mazda Motor Corporation
HIROSHIMA, JAPAN

APPLICATION:

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

CONTENTS

Title		Section
General Information		GI
Engine	KL	B1
	KJ	B2
Lubrication System	KL, KJ	D
Cooling System	KL, KJ	E
Fuel and Emission Control Systems	KL	F1
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Automatic Transaxle	GF4A-EL	K1
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Steering System		N
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Wheels and Tires		Q
Suspension		R
Body		S
Body Electrical System		T
Heater and Air Conditioning Systems		U

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Part No. 9999-95-058B-96

VEHICLE IDENTIFICATION NUMBERS (VIN)

JM1 TA221*T1 200001—

JM1 TA222*T1 200001—

RELATED MATERIALS

MILLENNIA Service Highlights	9999-95-095F-95
1996 Protegé, MX-3, MX-5, 626/MX-6, 929, MPV, Millenia Service Highlights	9999-95-MODL-96
MILLENNIA Wiring Diagram	9999-95-036G-96
Engine Workshop Manual KL	9999-95-EWKL-95
Engine Workshop Manual KJ	9999-95-EWKJ-95
ATX Workshop Manual GF4A-EL	9999-95-GF4A-95
ATX Workshop Manual LJ4A-EL	9999-95-LJ4A-95

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LUBRICANTS	GI- 2	TOOLS	GI-14
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SAFETY STAND POSITIONS	GI- 2	JUMPER WIRE	GI-14
VEHICLE LIFT POSITIONS	GI- 3	VOLTMETER	GI-14
DYNAMOMETER	GI- 3	OHMMETER	GI-14
COMPRESSED AIR	GI- 3	ELECTRICAL PARTS	GI-15
HOW TO USE THIS MANUAL	GI- 4	BATTERY CABLE	GI-15
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SAFETY INFORMATION

LUBRICANTS

Avoid prolonged and repeated contact with petroleum-based oils. Used oil may irritate the skin, and can cause skin cancer and other skin disorders.

Wash thoroughly after working with oil. We recommend water-soluble hand cleaners. Do not use kerosene, gasoline, or any other solvent to remove oil from your skin.

If repeated or prolonged contact with oil is necessary, wear protective clothing. Soiled clothing, particularly those soiled with used oils and greases containing lead, should be cleaned at regular intervals.

JACKING POSITIONS

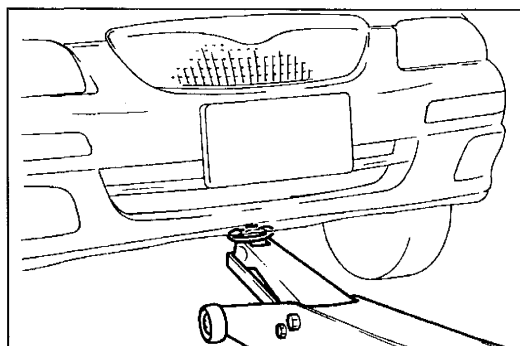
Warning

- **Improperly jacking a vehicle is dangerous. The vehicle can slip off the jack and cause serious injury. Use only the correct front and rear jacking positions and block the wheels.**

Use safety stands to support the vehicle after it has been lifted.

Front

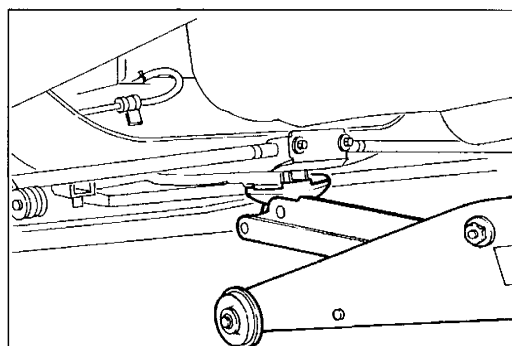
At the center of the crossmember



46UGIX-004

Rear

At the center of the crossmember

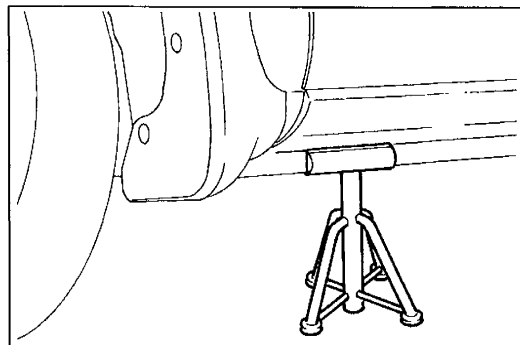


46UGIX-005

SAFETY STAND POSITIONS

Front

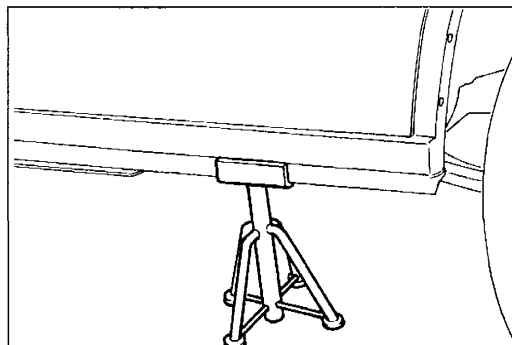
Both sides of the vehicle



46UGIX-006

Rear

Both sides of the vehicle

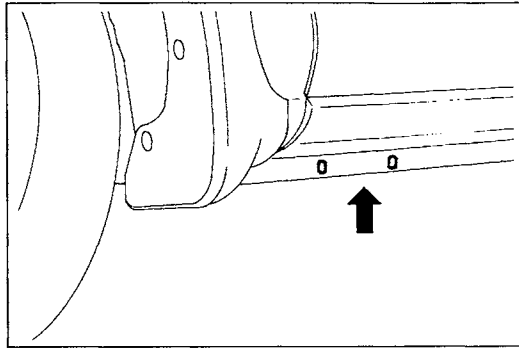


46UGIX-007

VEHICLE LIFT POSITIONS

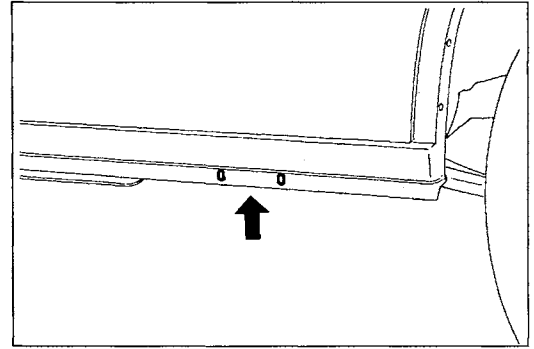
GI

Front



46UGIX-008

Rear



46UGIX-009

DYNAMOMETER

When test-running a vehicle on a dynamometer;

- Place a fan, preferably a vehicle-speed proportional type, in front of the vehicle.
- Connect an exhaust gas ventilation unit.
- Cool the exhaust pipes with a fan.
- Keep the area around the vehicle uncluttered.
- Watch the water temperature gauge.

COMPRESSED AIR

When using compressed air to clean or remove parts;

- Wear protective eye wear.
- Hold a rag over the opening to prevent parts from shooting out.
- Take precautions so that people around you are not struck by flying debris.

HOW TO USE THIS MANUAL

ADVISORY MESSAGES

You'll find several **Warnings**, **Cautions**, and **Notes** in this manual.

Warning

- A **Warning** indicates a situation in which serious injury or death could result if the warning is ignored.

Caution

- A **Caution** indicates a situation in which damage to the vehicle could result if the caution is ignored.

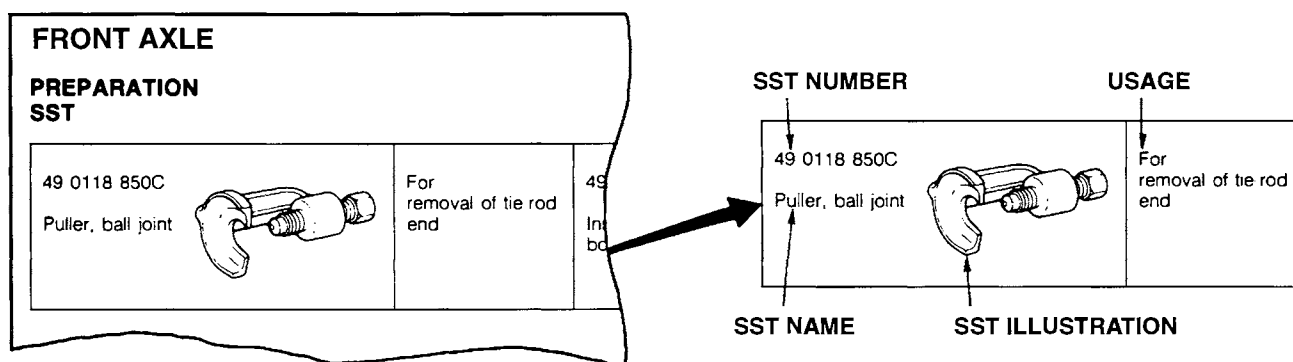
Note

- A **Note** provides added information that will help you to complete a particular procedure.

PREPARATION

This points out the needed **SSTs** for the service operation. It is best to gather all necessary **SSTs** before beginning work.

Example:

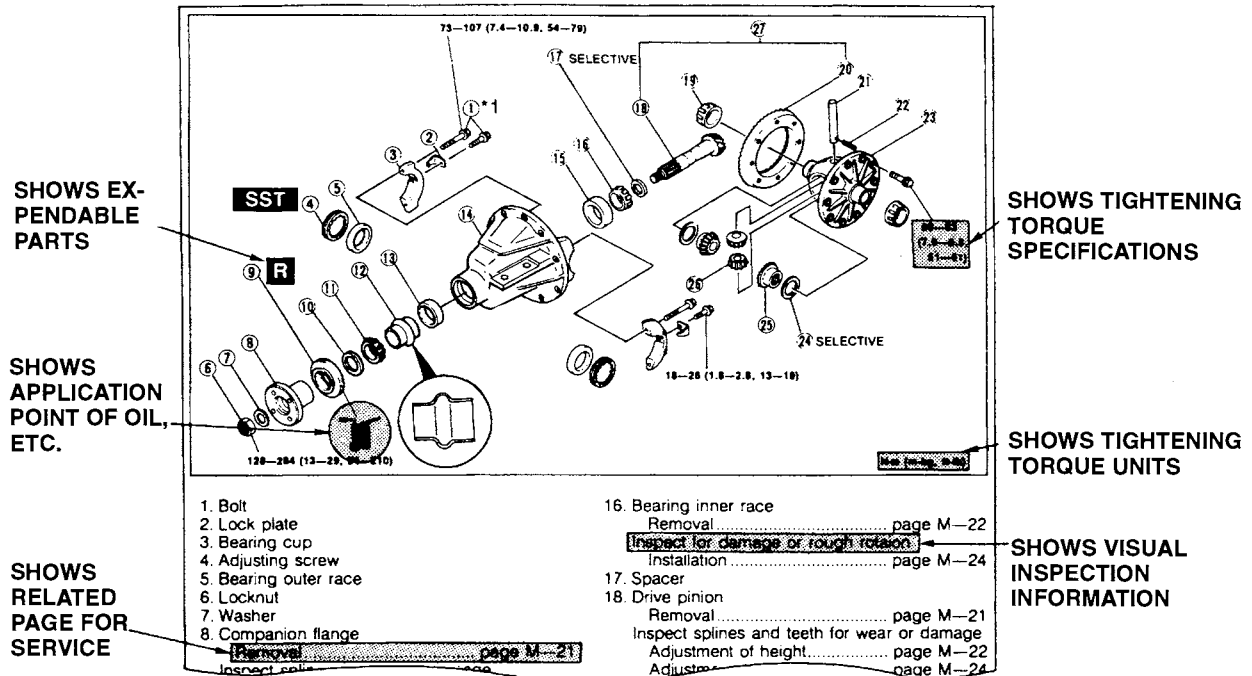


REPAIR PROCEDURE

1. Most repair operations begin with an overview illustration. It identifies the components, shows how the parts fit together, and describes visual part inspection. 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:

GI



*1: The numbers (①, etc.) refer to part identification and servicing procedures.

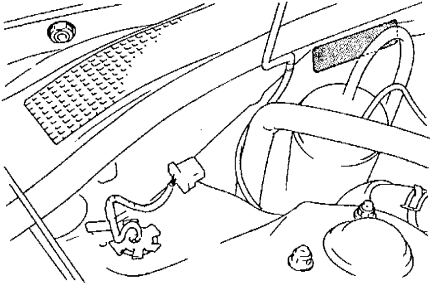
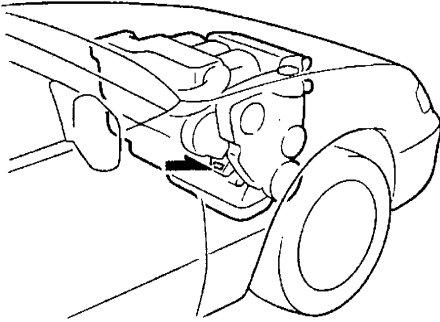
SYMBOLS

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

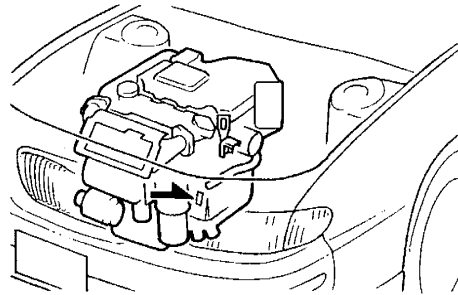
Symbol	Meaning	Kind
	Apply oil	New engine oil or gear oil as appropriate
	Apply brake fluid	FMVSS116: DOT-3
	Apply automatic transaxle fluid	M-III or Dexron®II
	Apply grease	Appropriate grease
	Apply sealant	Appropriate sealant
	Apply petroleum jelly	Appropriate petroleum jelly
	Replace part	O-ring, gasket, etc.

IDENTIFICATION NUMBER LOCATIONS

VEHICLE IDENTIFICATION NUMBER (VIN)

ENGINE MODEL AND NUMBER
KL

KJ



46UGIX-017

ABBREVIATIONS

ABDC	After bottom dead center
ABS	Antilock brake system
ABVVAC	ABV solenoid valve (vacuum) duty value
ABVVENT	ABV solenoid valve (vent) duty value
ACC	Accessory
A/CL V	A/C load signal voltage
A/C RLY	A/C relay
AMB	Ambient
AMP	Amplifier
ATDC	After top dead center
ATF	Automatic transaxle fluid
ATFT	Transaxle fluid temperature
ATFT V	Transaxle fluid temperature signal voltage
ATX	Automatic transaxle
BAC	Bypass air control
BARO V	Barometric pressure signal voltage
BTDC	Before top dead center
BLR SW	Fan switch
BRK SW	Brake switch
BYPAIR1	Bypass air solenoid valve No.1
BYPAIR2	Bypass air solenoid valve No.2
CACBYP	Charge air cooler bypass solenoid valve
CM	Control module
CPU	Central processing unit
CU	Control unit
DEF	Defroster
DEF SW	Rear window defroster switch
D SW	Transaxle range switch (D range)
DRL	Daytime running light
EC-AT	Electronically controlled automatic transaxle
ECT V	Engine coolant temperature signal voltage
EGR	Exhaust gas recirculation
EGRB	EGR boost
EGRB V	EGR boost signal voltage
EGRP V	EGR valve position signal voltage
EGRVAC	EGR solenoid valve (vacuum) duty value
EGRVENT	EGR solenoid valve (vent) duty value
EGRBV	EGR boost sensor solenoid valve
E/L	Electrical load
ESA	Electronic spark advance
ESPS	Engine speed sensing power steering
EX	Exhaust
FANC	Coolant fan control
FANCH	Coolant fan control (hi)
FANCLNL	Coolant fan, condenser fan control (low)
FANCN	Coolant fan, condenser fan control
FHO2SHL	Heated oxygen sensor heater (front LH)
FHO2SHR	Heated oxygen sensor heater (front RH)
FHO2S L	Heated oxygen sensor (front LH)
FHO2S R	Heated oxygen sensor (front RH)
FP RLY	Fuel pump relay
FPRR	Fuel pump resistor and relay
HACPZS	High air charging pressure zone signal
HEAT	HEATER
HDL SW	Headlight switch
HI	High
HLA	Hydraulic lash adjuster
HU	ABS hydraulic unit
IACV	Idle air control valve
IATDC	Intake air temperature (dynamic chamber)
IATDC V	Intake air temperature signal voltage (dynamic chamber)
IATLC	Intake air temperature (lysholm compressor)
IATLC V	Intake air temperature signal voltage (lysholm compressor)

IAT V	Intake air temperature signal voltage
IC	Integrated circuit
I/F	Interface
IG	Ignition
IGT	Ignition timing
IN	Intake
INJ L	Fuel injection duration (left bank)
INJ R	Fuel injection duration (right bank)
INT	Intermittent
KR	Knocking retard
L/C	Lysholm compressor
LH	Left hand
LHD	Left hand drive
LINE	LINE pressure solenoid valve duty value
L SW	Transaxle range switch (L or 1 range)
LO	Low
M	Motor
MAP V	Manifold absolute pressure signal voltage
MAF V	Mass air flow signal voltage
NA	Not applicable
NGS	New generation star tester
O/D	Over drive
O/DF LP	O/D OFF indicator light
O/DF SW	O/D OFF switch
PCV	Positive crankcase ventilation
PRC	Pressure regulator control
PRCV	PRC solenoid valve
PRG	Purge
PRGV	Purge solenoid valve
P/S	Power steering
REC	Recirculate
RH	Right hand
RHO2SH	Heated oxygen sensor heater (rear)
RHO2S L	Heated oxygen sensor (rear LH)
RHO2S R	Heated oxygen sensor (rear RH)
RPM	Engine speed
R SW	Transaxle range switch (R position)
RTQ1	Reduce torque signal 1
RTQ2	Reduce torque signal 2
SAS	Sophisticated air bag sensor
SHIFT A	Shift solenoid A
SHIFT B	Shift solenoid B
SHIFT C	Shift solenoid C
SRS	Supplemental restraint system
SST	Special service tool
S SW	Transaxle range switch (S or 2 range)
ST	Start
SVCM	Solar ventilation control module
SW	Switch
TCC	Torque converter clutch solenoid valve
TCC CON	Torque converter clutch control solenoid valve
TCS	Traction control system
TCS INH	Torque reduction inhibit signal
TDC	Top dead center
TEN	TEN terminal (data link connector)
TNS	Tail number side lights
TP V	Throttle position sensor signal voltage
TURBIN	Input/turbine speed sensor
TQR/ECT	Torque reduced/Engine coolant temperature signal
VRIS	Variable resonance induction system
VRISV1	VRIS solenoid valve No.1
VRISV2	VRIS solenoid valve No.2
VS	Vehicle speed
1GR	First gear
2GR	Second gear
2WS	2-wheel steering
3-2TIME	3-2 Timing solenoid valve

UNITS

Electrical current	A (ampere)
Electric potential	V (volt)
Electric power	W (watt)
Length	mm (millimeter)
	in (inch)
Negative pressure	kPa (kilo Pascal)
	mmHg (millimeters of mercury)
	inHg (inches of mercury)
Positive pressure	kPa (kilo Pascal)
	kgf/cm ² (kilogram force per square centimeter)
	psi (pounds per square inch)
Resistance	Ω (ohm)
Speed	RPM (revolution per minute)
Torque	N·m (Newton meter)
	kgf·m (kilogram force per meter)
	kgf·cm (kilogram force per centimeter)
	ft·lbf (foot pound)
	in·lbf (inch pound)
Volume	L (liter)
	US qt (U.S. quart)
	Imp qt (Imperial quart)
	ml (milliliter)
	cc (cubic centimeter)
	cu in (cubic inch)
	fl oz (fluid ounce)
Weight	g (gram)
	oz (ounce)

Conversion to SI Units (Système International d'Unités)

All numerical values in this manual are based on SI units. Numbers shown in conventional units are converted from these values.

Rounding off

Converted values are rounded off to the same number of places as the SI unit value. For example, if the SI unit value is 17.2 and the value after conversion is 37.84, the converted value will be rounded off to 37.8.

Upper and lower limits

When the data indicates upper and lower limits, the converted values are rounded down if the SI unit value is an upper limit and rounded up if the SI unit value is a lower limit. Therefore, converted values for the same SI unit value may differ after conversion. For example, consider 2.7 kgf/cm² in the following specifications:

- 210—260 kPa {2.1—2.7 kgf/cm², 30—38 psi}
- 270—310 kPa {2.7—3.2 kgf/cm², 39—45 psi}

The actual converted values for 2.7 kgf/cm² are 264 kPa and 38.4 psi. In the top specification, 2.7 is used as an upper limit, so its converted values are rounded down to 260 and 38. In the bottom specification, 2.7 is used as a lower limit, so its converted values are rounded up to 270 and 39.

SAE STANDARDS

In accordance with new regulations, SAE (Society of Automotive Engineers) standard names and abbreviations are now used in this manual. The table below lists the names and abbreviations that have been used in Mazda manuals up to now and their SAE equivalents.

Previous Standard		New Standard		
Abbreviation	Name	Abbreviation	Name	Remark
—	Accelerator Pedal	AP	Accelerator Pedal	
—	Air Cleaner	ACL	Air Cleaner	
—	Air Conditioning	A/C	Air Conditioning	
—	Airflow Meter	VAF	Volume Air Flow Sensor	
—	Airflow Sensor	MAF	Mass Air Flow Sensor	
—	Alternator	GEN	Generator	
—	ATF Thermosensor	—	Transmission (Transaxle) Fluid Temperature Sensor	
—	Atmospheric Pressure	BARO	Barometric Pressure	
Vb	Battery Voltage	B+	Battery Positive Voltage	
—	Catalytic Converter	OC	Oxidation Catalytic Converter	
		TWC	Three-way Catalytic Converter	
		WU-TWC	Warm Up Three-way Catalytic Converter	#1
—	Circuit Opening Relay	FPR	Fuel Pump Relay	#2
—	Clutch Position	CPP	Clutch Pedal Position	
—	Crank Angle Sensor	CMP	Camshaft Position Sensor	
—	Crank Angle Sensor 2	CKP	Crankshaft Position Sensor	
—	Diagnosis Connector	DLC	Data Link Connector	
—	Diagnosis/Self-Diagnosis	OBD	On-Board Diagnostic	
—	Direct Ignition	DLI	Distributorless Ignition	
—	EC-AT Control Unit	TCM	Transmission (Transaxle) Control Module	
EGI	Electronic Gasoline Injection System	CIS	Continuous Fuel Injection System	
—	Electronic Spark Ignition	EI	Electronic Ignition	#3
ECU	Engine Control Unit	PCM	Powertrain Control Module	#4
		ECM	Engine Control Module	
—	Engine Modification	EM	Engine Modification	
—	Engine RPM Signal	—	Engine Speed Input Signal	
—	Evaporative Emission	EVAP	Evaporative Emission	
—	Exhaust Gas Recirculation	EGR	Exhaust Gas Recirculation	
—	Fan Control	FC	Fan Control	
—	Feedback System	CLS	Closed Loop System	
—	Flexible Fuel	FF	Flexible Fuel	
—	Fuel Pump	FP	Fuel Pump	
—	Fully Closed	CTP	Closed Throttle Position	
—	Fully Open	WOT	Wide Open Throttle	
—	Ground/Earth	GND	Ground	

#1: Directly connected to the exhaust manifold

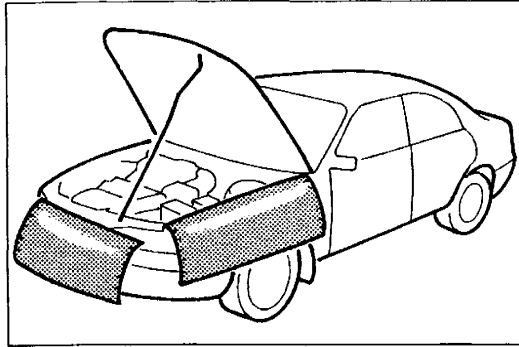
#2: In some models, there is a fuel pump relay that controls pump speed. That relay is now called the fuel pump relay (speed).

#3: Controlled by the ECM (PCM)

#4: Device that controls the engine and powertrain

Previous Standard		New Standard		
Abbreviation	Name	Abbreviation	Name	Remark
—	IC Regulator	VR	Voltage Regulator	
—	Idle Speed Control	IAC	Idle Air Control	
—	Idle Switch	—	Closed Throttle Position Switch	
—	Igniter	ICM	Ignition Control Module	
—	Inhibitor Position	TR	Transmission (Transaxle) Range	
—	Intake Air Pressure	MAP	Manifold Absolute Pressure	
—	Intake Air Thermo	IAT	Intake Air Temperature	
—	Intercooler	CAC	Charge Air Cooler	
—	Knock Sensor	KS	Knock Sensor	
—	Line Pressure Solenoid Valve	—	Pressure Control Solenoid	
—	Lock-up Position	TCC	Torque Converter Clutch	
—	Malfunction Indicator Light	MIL	Malfunction Indicator Lamp	
—	Multiport Fuel Injection	MFI	Multiport Fuel Injection	
—	Open Loop	OL	Open Loop	
—	Overdrive	4GR	Fourth Gear	
—	Oxygen Sensor	HO2S	Heated Oxygen Sensor	With heater
		O2S	Oxygen Sensor	
—	Park/Neutral Range	PNP	Park/Neutral Position	
—	Power Steering Pressure	PSP	Power Steering Pressure	
—	Pulse Generator	—	Input/Turbine Speed Sensor	
—	Reed Valve	SAPV	Secondary Air Pulse Valve	
—	Secondary Air Injection System	PAIR	Pulsed Secondary Air Injection	Pulsed injection
		AIR	Secondary Air Injection	Inject with compressor
—	Sequential Fuel Injection	SFI	Sequential Multipoint Fuel Injection	
—	Service Code(s)	DTC	Diagnostic Trouble Code(s)	
—	Spark Ignition	DI	Distributor Ignition	
—	Stoplight Switch	—	Brake Switch	
—	Test Mode	DTM	Diagnostic Test Mode	#5
—	Throttle Body	TB	Throttle Body	
—	Throttle Sensor	TP	Throttle Position Sensor	
—	Turbocharger	TC	Turbocharger	
—	Vehicle Speed Sensor	VSS	Vehicle Speed Sensor	
—	Vehicle Speed Sensor 1	—	Output Speed Sensor	
—	Water Thermo	ECT	Engine Coolant Temperature	
—	1-2 Shift Solenoid Valve	—	Shift Solenoid A	
	Shift A Solenoid Valve			
—	2-3 Shift Solenoid Valve	—	Shift Solenoid B	
	Shift B Solenoid Valve			
—	3-4 Shift Solenoid Valve	—	Shift Solenoid C	
—	3rd Gear	3GR	Third Gear	
—	—	—	Incorrect Gear Ratio	

#5: Diagnostic trouble codes depend on the diagnostic test mode

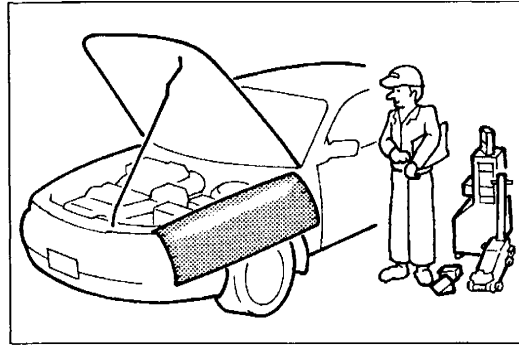


46UGIX-020

FUNDAMENTAL PROCEDURES

PROTECTION OF THE VEHICLE

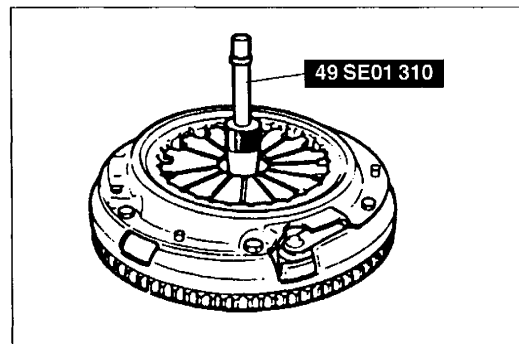
Always be sure to cover fenders, seats, and floor areas before starting work.



16EGIX-009

PREPARATION OF TOOLS AND MEASURING EQUIPMENT

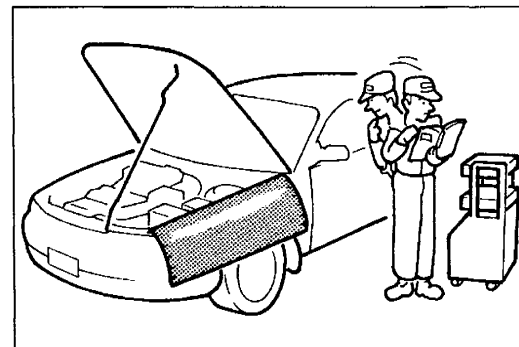
Be sure that all necessary tools and measuring equipment are available before starting any work.



16EGIX-010

SPECIAL TOOLS

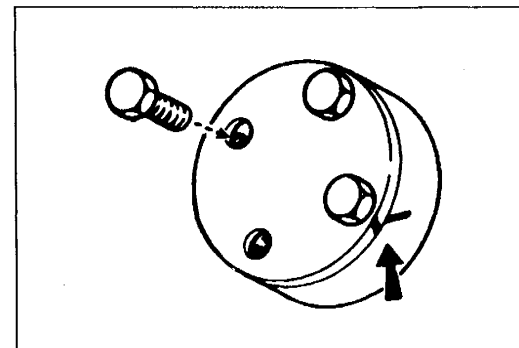
Use special tools when they are required.



46UGIX-021

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. After removing the part, plug all holes and ports to prevent foreign material from entering.



16EGIX-012

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.