Engine Workshop Manual 13B–MSP (Multi Side Port)

CONTENTS

PRINTED IN U.S.A., OCTOBER 2008
Form No. 1773–1U–03C
Part No. 9999-95-E13B-MSP09

FOREWORD

This manual explains the disassembly, inspection, repair, and reassembly procedures for the above-indicated engine.

In order to do these procedures safely, quickly, and correctly, you must first read this manual and any other relevant service materials carefully.

The information in this manual is current up to October, 2008. Any changes that occur after that time will not be reflected in this particular manual. Therefore, the contents of this manual may not exactly match the mechanism that you are currently servicing.

Mazda Motor Corporation
HIROSHIMA, JAPAN

GENERAL INFORMATION

00
SECTION

00–00 GENERAL INFORMATION

HOW TO USE THIS MANUAL

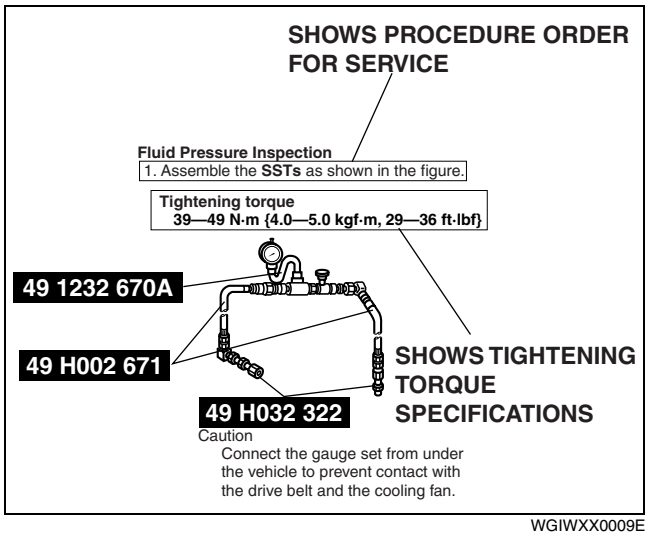
CHU000000001E01

Range of Topics

- This manual contains procedures for performing all required service operations. The procedures are divided into the following five basic operations:
  - — Removal/Installation
  - — Disassembly/Assembly
  - — Replacement
  - — Inspection
  - — Adjustment
- Simple operations which can be performed easily just by looking at the vehicle (i.e., removal/installation of parts, jacking, vehicle lifting, cleaning of parts, and visual inspection) have been omitted.

Service Procedure
Inspection, adjustment

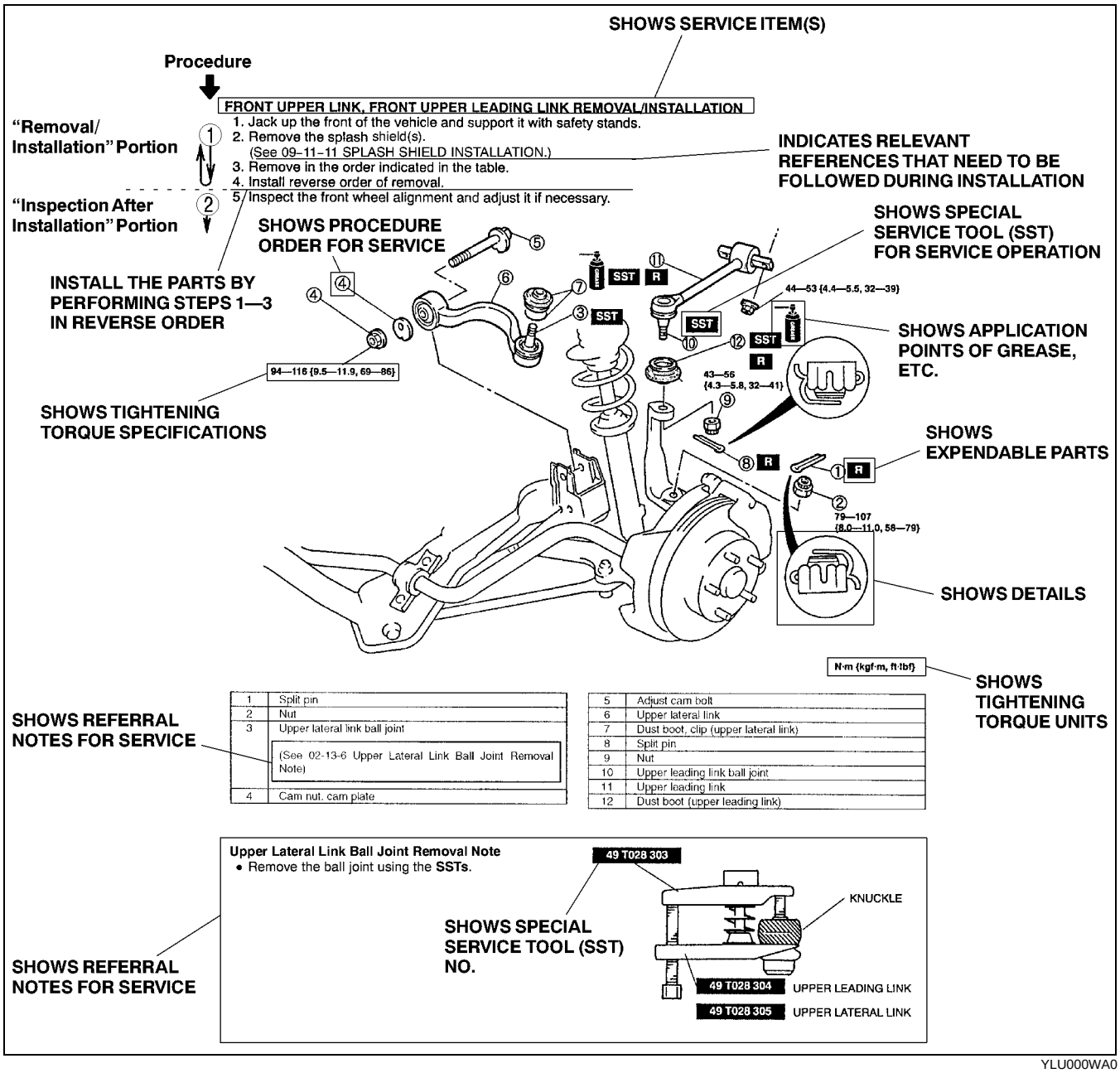
- Inspection and adjustment procedures are divided into steps. Important points regarding the location and contents of the procedures are explained in detail and shown in the illustrations.



WGIWXX0009E

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. However, only removal/installation procedures that need to be performed methodically have written instructions.
2. Expendable parts, tightening torques, and symbols for oil, grease, and sealant are shown in the overview illustration. In addition, symbols indicating parts requiring the use of special service tools or equivalent are also shown.
3. Procedure steps are numbered and the part that is the main point of that procedure is shown in the illustration with the corresponding number. Occasionally, there are important points or additional information concerning a procedure. Refer to this information when servicing the related part.



YLU000WA0

Symbols

- There are eight symbols indicating oil, grease, fluids, sealant, and the use of **SST** or equivalent. These symbols show application points or use of these materials during service.

Symbol	Meaning	Kind
	Apply oil	New appropriate engine oil or gear oil
	Apply brake fluid	New appropriate brake fluid
	Apply automatic transaxle/ transmission fluid	New appropriate automatic transaxle/ transmission fluid
	Apply grease	Appropriate grease
	Apply sealant	Appropriate sealant
	Apply petroleum jelly	Appropriate petroleum jelly
R	Replace part	O-ring, gasket, etc.
SST	Use SST or equivalent	Appropriate tools

Advisory Messages

- You will find several **Warnings**, **Cautions**, **Notes**, **Specifications** and **Upper and Lower Limits** 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 or parts could result if the caution is ignored.

Note

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

Specification

- The values indicate the allowable range when performing inspections or adjustments.

Upper and lower limits

- The values indicate the upper and lower limits that must not be exceeded when performing inspections or adjustments.

UNITS

CHU000000002E01

Electric current	A (ampere)
Electric power	W (watt)
Electric resistance	ohm
Electric voltage	V (volt)
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)
Number of revolutions	rpm (revolutions per minute)
Torque	N·m (Newton meter)
	kgf·m (kilogram force meter)
	kgf·cm (kilogram force centimeter)
	ft·lbf (foot pound force)
	in·lbf (inch pound force)
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/cm^2 in the following specifications:

  210—260 kPa {2.1—2.7 kgf/cm^2, 30—38 psi}
  270—310 kPa {2.7—3.2 kgf/cm^2, 39—45 psi}

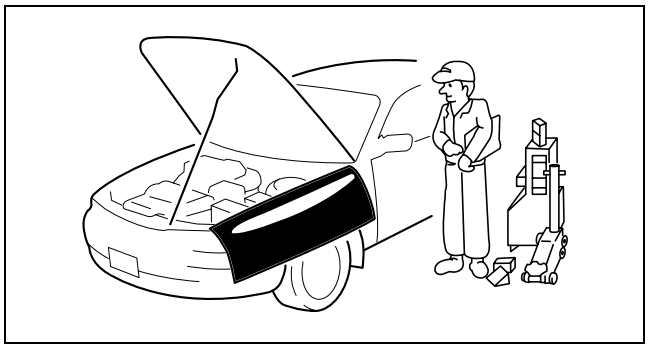
- The actual converted values for 2.7 kgf/cm^2 are 264 kPa and 38.4 psi. In the first specification, 2.7 is used as an upper limit, so the converted values are rounded down to 260 and 38. In the second specification, 2.7 is used as a lower limit, so the converted values are rounded up to 270 and 39.

FUNDAMENTAL PROCEDURES

CHU000000004E01

Preparation of Tools and Measuring Equipment

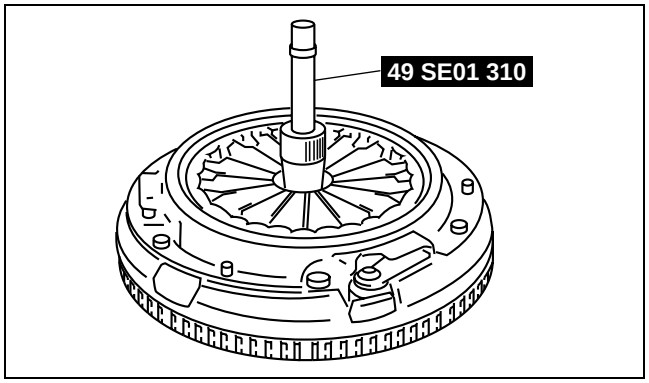
- Be sure that all necessary tools and measuring equipment are available before starting any work.



CHU0014W003

Special Service Tools

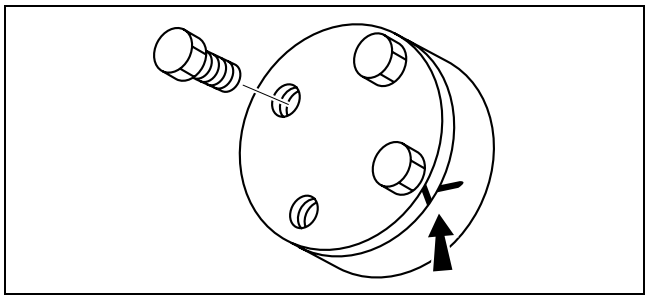
- Use special service tools or equivalent when they are required.



WGIWXX0024E

Disassembly

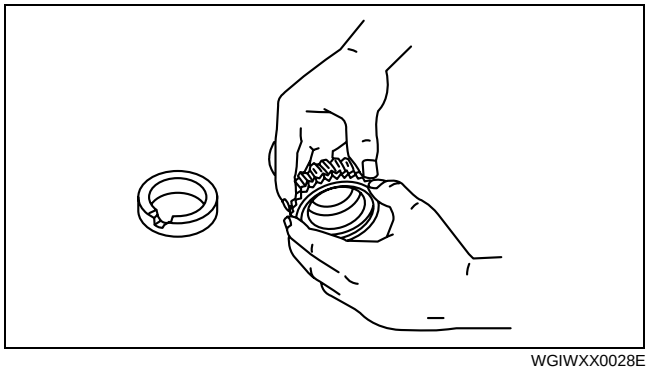
- If the disassembly procedure is complex, requiring many parts to be disassembled, all parts should be marked in a place that will not affect their performance or external appearance and identified so that reassembly can be performed easily and efficiently.



WGIWXX0027E

Inspection During Removal, Disassembly

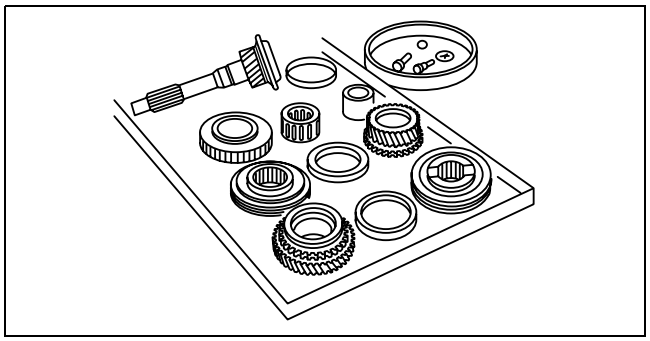
- When removed, each part should be carefully inspected for malfunction, deformation, damage and other problems.



WGIWXX0028E

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.



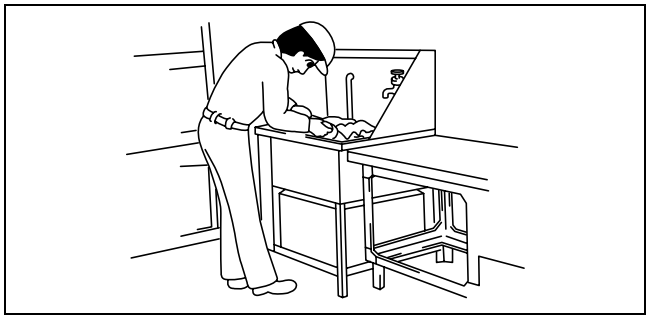
WGIWXX0029E

Cleaning of Parts

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

  Warning

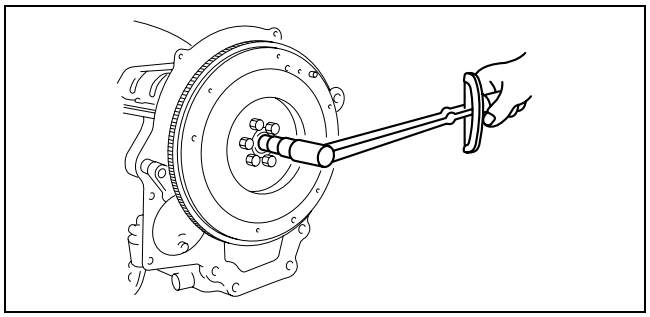
  - **Using compressed air can cause dirt and other particles to fly out causing injury to the eyes. Wear protective eye wear whenever using compressed air.**



WGIWXX0030E

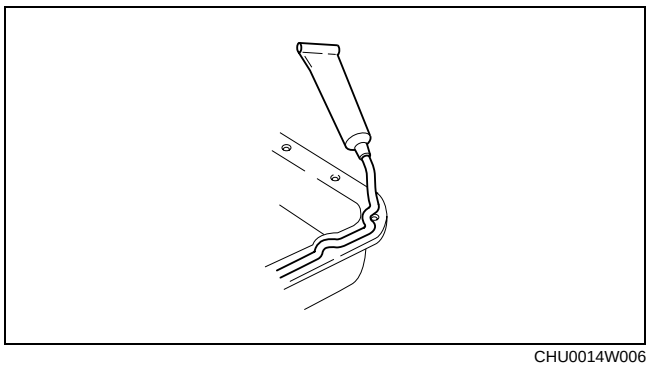
Reassembly

- Standard values, such as torques and certain adjustments, must be strictly observed in the reassembly of all parts.
- If removed, the following parts should be replaced with new ones:
  - — Oil seals
  - — Gaskets
  - — O-rings
  - — Lock washers
  - — Cotter pins
  - — Nylon nuts



WGIWXX0031E

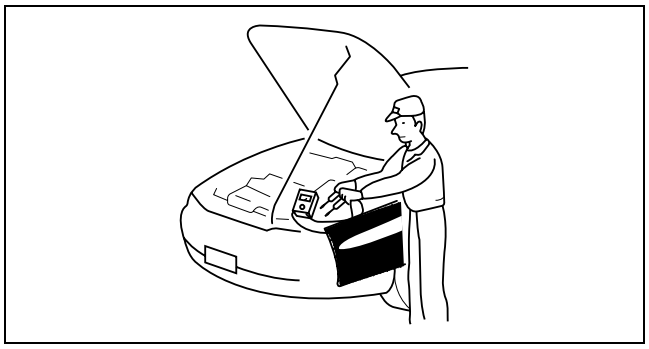
- Depending on location:
  - — Sealant and gaskets, or both, should be applied to specified locations. When sealant is applied, parts should be installed before sealant hardens to prevent leakage.
  - — Oil should be applied to the moving components of parts.
  - — Specified oil or grease should be applied at the prescribed locations (such as oil seals) before reassembly.



CHU0014W006

Adjustment

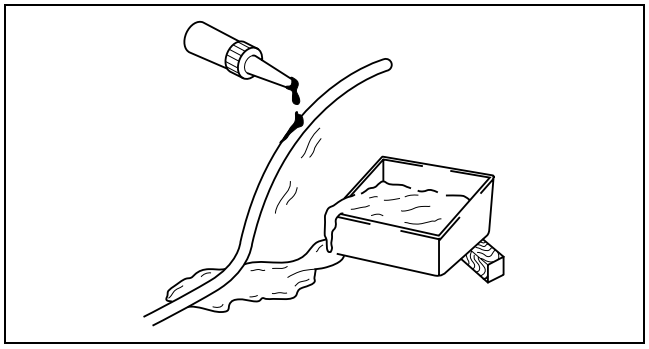
- Use suitable gauges and testers when making adjustments.



CHU0014W005

Rubber Parts and Tubing

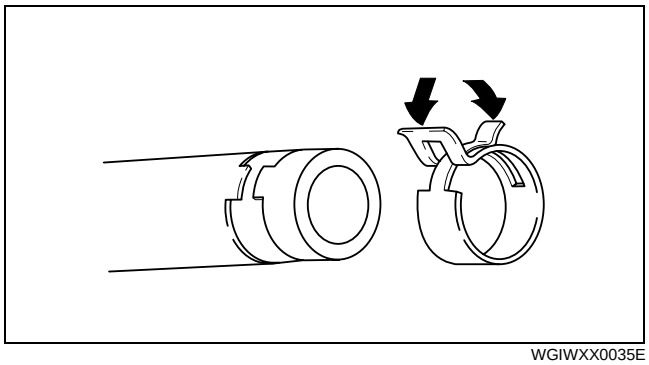
- Prevent gasoline or oil from getting on rubber parts or tubing.



WGIWXX0034E

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.

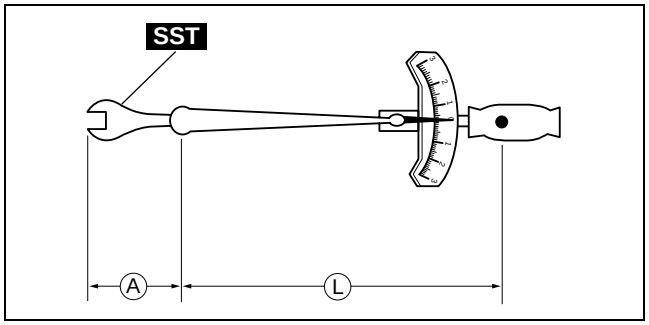


WGIWXX0035E

Torque Formulas

- When using a torque wrench-**SST** or equivalent combination, the written torque must be recalculated due to the extra length that the **SST** or equivalent adds to the torque wrench. Recalculate the torque by using the following formulas. Choose the formula that applies to you.

Torque Unit	Formula
N·m	N·m × [L/(L+A)]
kgf·m	kgf·m × [L/(L+A)]
kgf·cm	kgf·cm × [L/(L+A)]
ft·lbf	ft·lbf × [L/(L+A)]
in·lbf	in·lbf × [L/(L+A)]

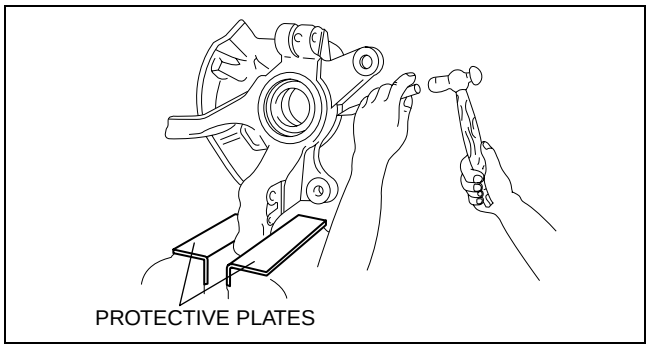


WGIWXX0036E

A : The length of the **SST** past the torque wrench drive.
L : The length of the torque wrench.

Vise

- When using a vise, put protective plates in the jaws of the vise to prevent damage to parts.



CHU0014W010

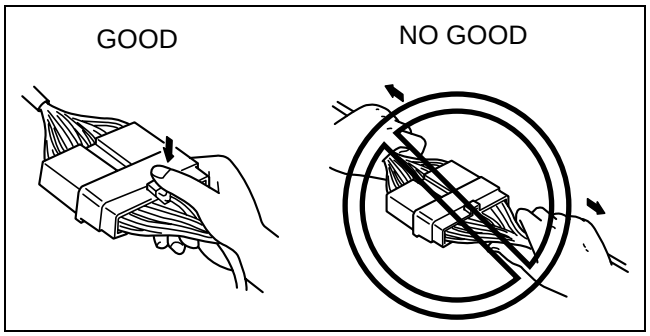
ELECTRICAL SYSTEM

CHU000000006E01

Connectors

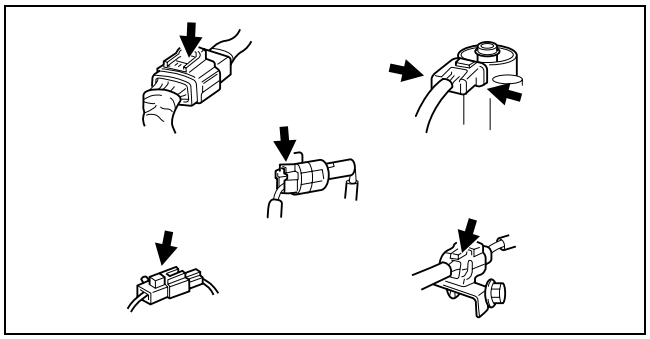
Disconnecting connectors

- When disconnecting connector, grasp the connectors, not the wires.



CHU0000W014

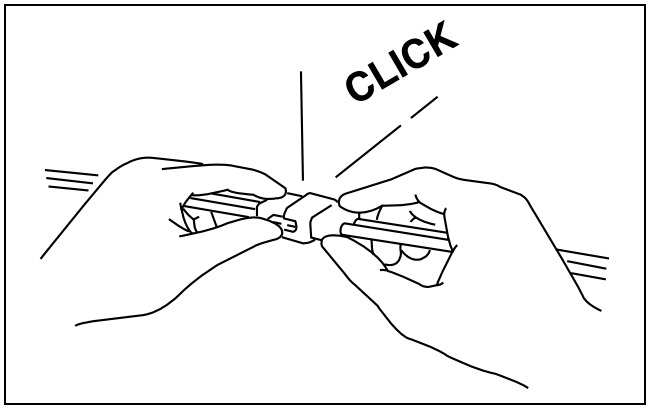
- Connectors can be disconnected by pressing or pulling the lock lever as shown.



WGIWXX0042E

Locking connector

- When locking connectors, listen for a click indicating they are securely locked.



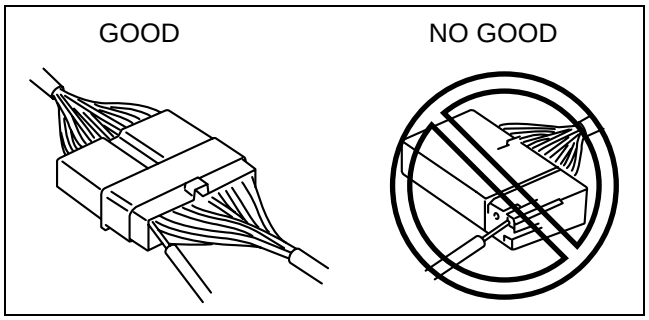
WGIWXX0043E

Inspection

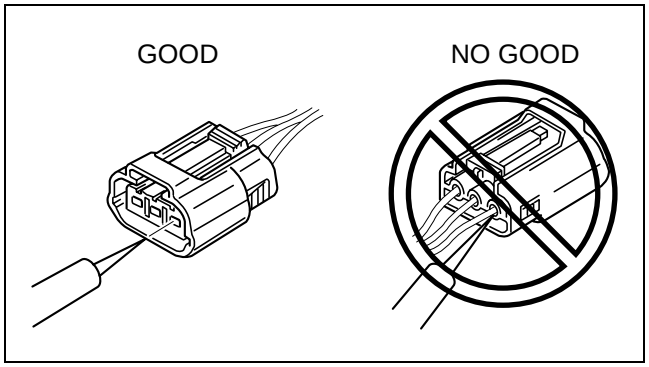
- When a tester is used to inspect for continuity or measuring voltage, insert the tester probe from the wiring harness side.
- Inspect the terminals of waterproof connectors from the connector side since they cannot be accessed from the wiring harness side.

Caution

- **To prevent damage to the terminal, wrap a thin wire around the tester probe before inserting into terminal.**



CHU0000W011



CHU0000W012

SAE STANDARDS

CHU000000003E02

- 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.

SAE Standard		Remark		SAE Standard		Remark
Abbreviation	Name			Abbreviation	Name	
AP	Accelerator Pedal			MAP	Manifold Absolute Pressure	
APP	Accelerator Pedal Position			MAF	Mass Air Flow	
ACL	Air Cleaner			MAF sensor	Mass Air Flow Sensor	
A/C	Air Conditioning			MFL	Multiport Fuel Injection	
A/F	Air Fuel Ratio			OBD	On-board Diagnostic System	
BARO	Barometric Pressure			OL	Open Loop	
B+	Battery Positive Voltage			OC	Oxidation Catalytic Converter	
CMP sensor	Camshaft Position Sensor			O2S	Oxygen Sensor	
LOAD	Calculated Load Value			PNP	Park/Neutral Position	
CAC	Charge Air Cooler			PID	Parameter Identification	
CLS	Closed Loop System			PSP	Power Steering Pressure	
CTP	Closed Throttle Position			PCM	Powertrain Control Module	#3
CPP	Clutch Pedal Position			PAIR	Pulsed Secondary Air Injection	Pulsed injection
CIS	Continuous Fuel Injection System					
CKP sensor	Crankshaft Position Sensor			AIR	Secondary Air Injection	Injection with air pump
DLC	Data Link Connector					
DTM	Diagnostic Test Mode	#1				
DTC	Diagnostic Test Code(s)			SAPV	Secondary Air Pulse Valve	
DI	Distributor Ignition			SFI	Sequential Multiport Fuel Injection	
DLI	Distributorless Ignition					
EI	Electronic Ignition	#2		3GR	Third Gear	
ECT	Engine Coolant Temperature			TWC	Three Way Catalytic Converter	
EM	Engine Modification			TB	Throttle Body	
EVAP	Evaporative Emission			TP	Throttle Position	
EGR	Exhaust Gas Recirculation			TP sensor	Throttle Position Sensor	
FC	Fan Control			TCC	Torque Converter Clutch	
FF	Flexible Fuel			TCM	Transmission (Transaxle) Control Module	
4GR	Fourth Gear					
GEN	Generator			TR	Transmission (Transaxle) Range	
GND	Ground			TC	Turbocharger	
HO2S	Heated Oxygen Sensor	With heater		VSS	Vehicle Speed Sensor	
				VR	Voltage Regulator	
IAC	Idle Air Control			VAF sensor	Volume Air Flow Sensor	
IAT	Intake Air Temperature			WU-TWC	Warm Up Three Way Catalytic Converter	#4
KS	Knock Sensor					
MIL	Malfunction Indicator Lamp			WOP	Wide Open Throttle	

#1 : Diagnostic trouble codes depend on the diagnostic test mode.
#2 : Controlled by the PCM
#3 : Device that controls engine and powertrain
#4 : Directly connected to exhaust manifold

ABBREVIATIONS

CHU000000011E01

AT	Automatic Transmission
MT	Manual Transmission
SST	Special Service Tool

IDENTIFYING SPECIFICATION

CHU000000000E01

- Because the engine construction varies depending on the vehicle's period of manufacture, determine the service specification by referring to the following identification.

Identifying Specification

	Applicable VIN
Type A	Except below
Type B	JM1 FE172*9# 400001— JM1 FE174*9# 400001— JM1 FE17M*9# 400001— JM1 FE17P*9# 400001—