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.

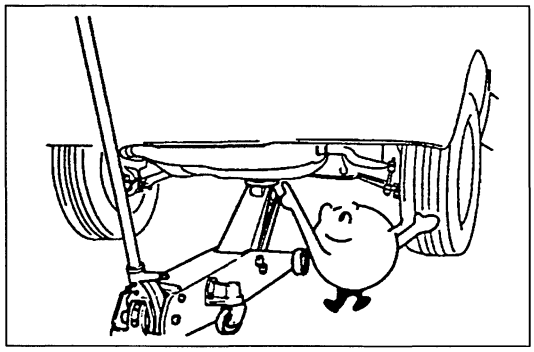
JACKING POSITIONS

Warning

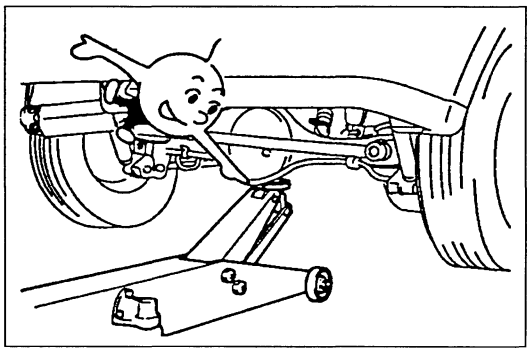
- **Improperly jacking a vehicle is dangerous. The vehicle can slip off the jack and cause serious injury. Use only the correct front and rear jacking positions and block the wheels.**

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

Front
At the center of the crossmember

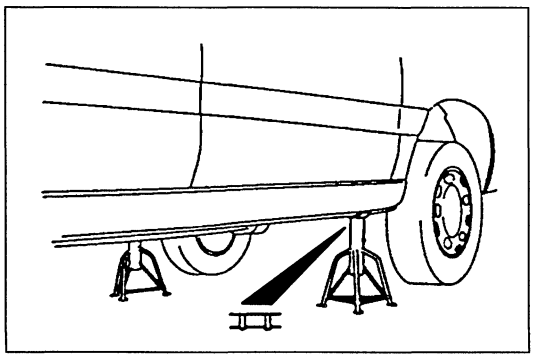


Rear
At the center of the crossmember

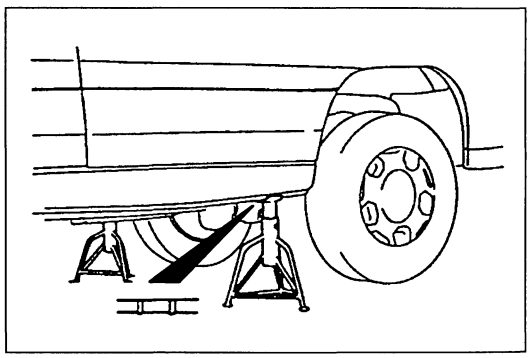


SAFETY STAND AND VEHICLE LIFT POSITIONS

Front
Both sides of the vehicle



Rear
Both sides of the vehicle

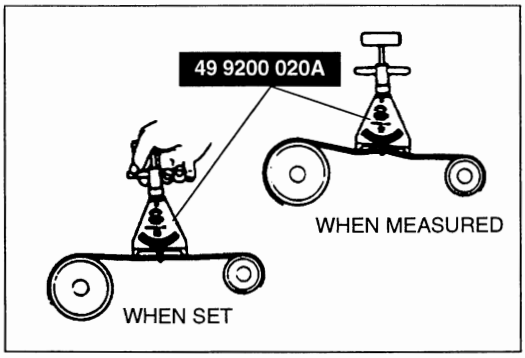


SAE STANDARDS

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		SAE 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 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 engine and powertrain.



Drive Belt Tension Check

1. Belt tension can be checked in place of belt deflection. Check the drive belt tension when the engine is cold, or at least 30 minutes after the engine has stopped. Using the **SST**, check the belt tension between any two pulleys.

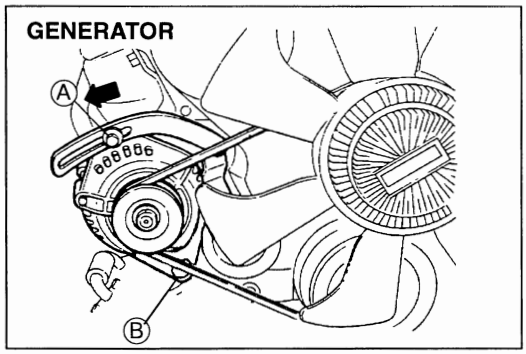
Tension

N { kgf , lbf }

Drive belt	*New	Used	Limit
Generator	550—637 { 56—65 , 124—143 }	461—549 { 47—56 , 104—123 }	265 { 27 , 59 }
P/S oil pump	344—382 { 35—39 , 77—85 }	295—333 { 30—34 , 66—74 }	245 { 25 , 55 }
A/C compressor	540—617 { 55—63 , 121—138 }	452—539 { 46—55 , 102—121 }	245 { 25 , 55 }

*A belt that has been on a running engine for less than five minutes.

2. If the tension is not within the specification, adjust it. (Refer to below.)

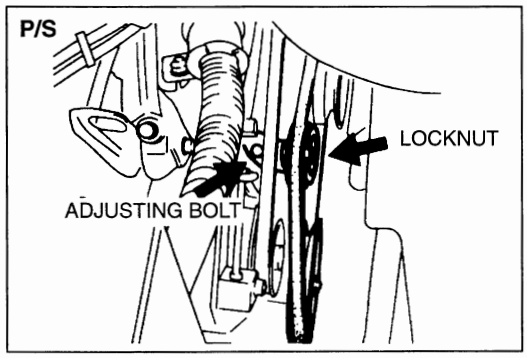


Adjustment

Generator

1. Loosen generator bolts Ⓐ and Ⓑ.
2. Lever the generator outward and apply tension to the belt.

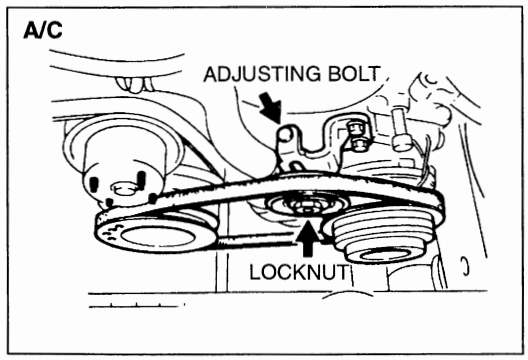
Tightening torque
Ⓐ: 19—25 N·m { 1.9—2.6 kgf·m , 14—18 ft·lbf }
Ⓑ: 38—51 N·m { 3.8—5.3 kgf·m , 28—38 ft·lbf }



P/S oil pump

Loosen the locknut and adjust the belt deflection by turning the adjusting bolt.

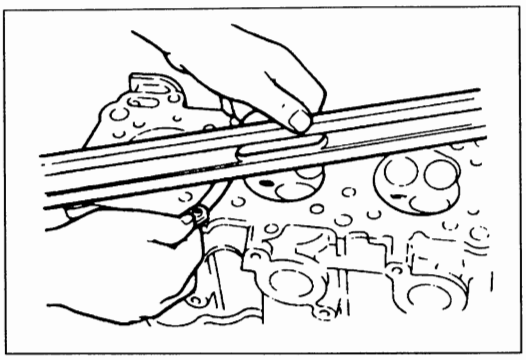
Tightening torque:
38—51 N·m { 3.8—5.3 kgf·m , 28—38 ft·lbf }

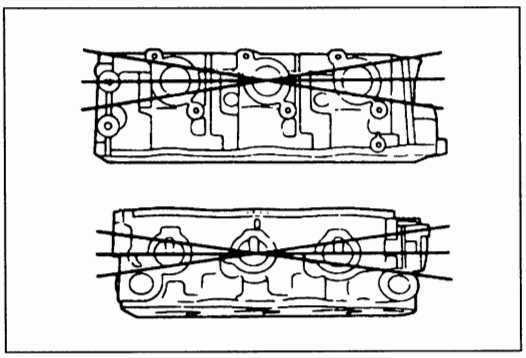


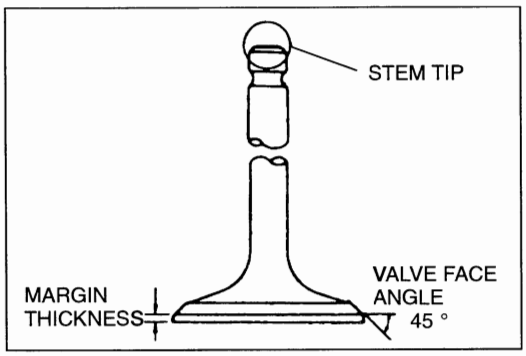
A/C compressor

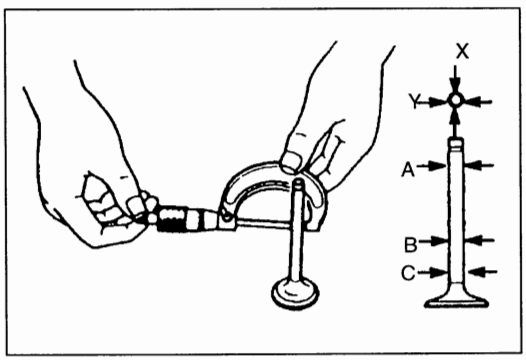
Loosen the locknut and adjust the belt deflection by turning the adjusting bolt.

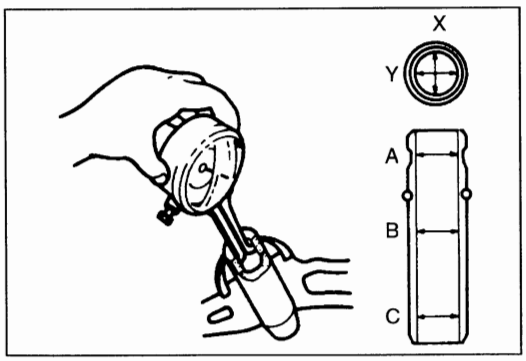
Tightening torque:
38—51 N·m { 3.8—5.3 kgf·m , 28—38 ft·lbf }











3. Inspect for the following and repair or replace.
   (1) Sunken valve seats
   (2) Damaged intake and exhaust manifold contact surfaces
   (3) Excessive camshaft oil clearances and end play
4. If the cylinder head distortion exceeds the specification, grind the cylinder head surface.

   Grinding: 0.15 mm { 0.006 in } max.

5. If the cylinder head height is not within the specification, replace it.

   Height: 125.25—125.35 mm { 4.932—4.935 in }

6. Using a straightedge, measure the manifold contact surface distortion in the six directions as shown.

   Distortion: 0.10 mm { 0.004 in } max.

7. If distortion exceeds the specification, grind the surface or replace the cylinder head.

   Grinding: 0.15 mm { 0.006 in } max.

VALVE MECHANISM
Valve and Valve Guide

1. Inspect each valve for the following. Replace or resurface if necessary.
   (1) Damaged or bent stem
   (2) Roughness or damage to face
   (3) Damage or uneven wear of stem tip
2. Check the valve head margin thickness. Replace the valve if necessary.

   Margin thickness
   IN: 0.75—1.25 mm { 0.030—0.049 in }
   EX: 1.2—1.8 mm { 0.048—0.070 in }

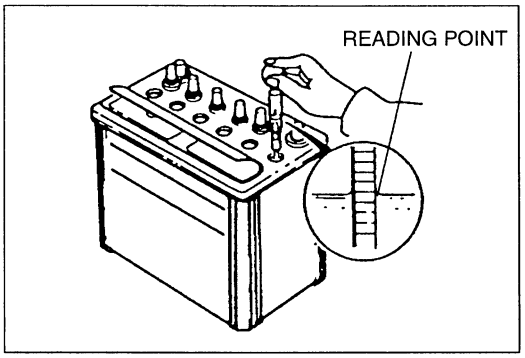
3. Measure the valve length. Replace the valve if necessary.

   Length
   Standard
   IN: 121.31 mm { 4.7760 in }
   EX: 122.63 mm { 4.8279 in }
   Minimum
   IN: 120.91 mm { 4.7602 in }
   EX: 122.23 mm { 4.8122 in }

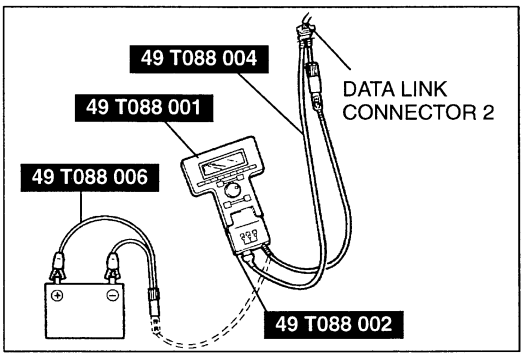
4. Measure the valve stem diameter in X and Y directions at three points (A, B and C) as shown. Replace the valve if necessary.

   Diameter
   IN: 6.970—6.985 mm { 0.2745—0.2750 in }
   EX: 8.025—8.040 mm { 0.3160—0.3165 in }

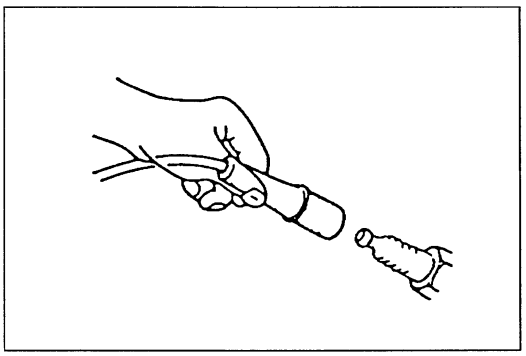
STEP 1



STEP 2



STEP 3

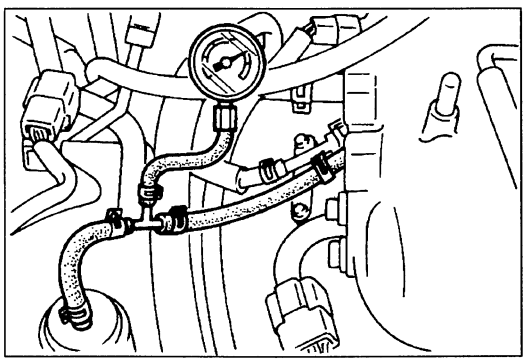


STEP 4 (1)

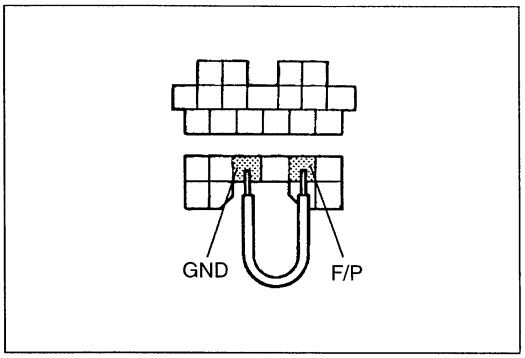
Warning

- **BEFORE CONNECTING FUEL PRESSURE GAUGE, RELEASE FUEL PRESSURE FROM FUEL SYSTEM TO REDUCE POSSIBILITY OF INJURY OR FIRE (REFER TO PAGE F–10)**

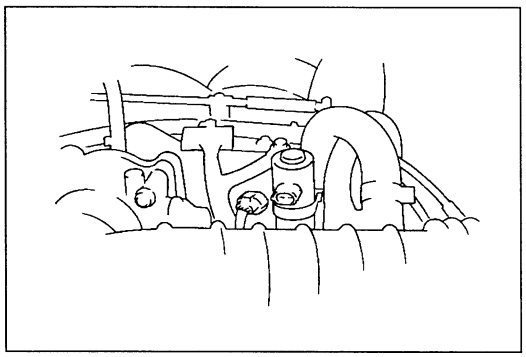
STEP 4 (2)



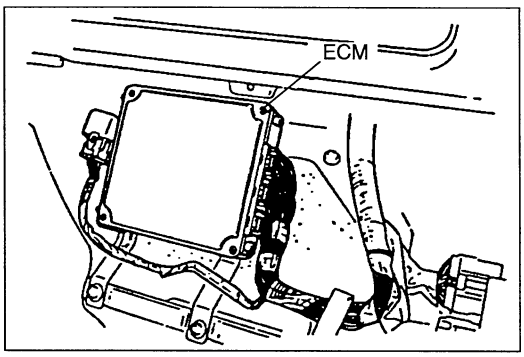
STEP 4 (3)



STEP 5



STEP 6

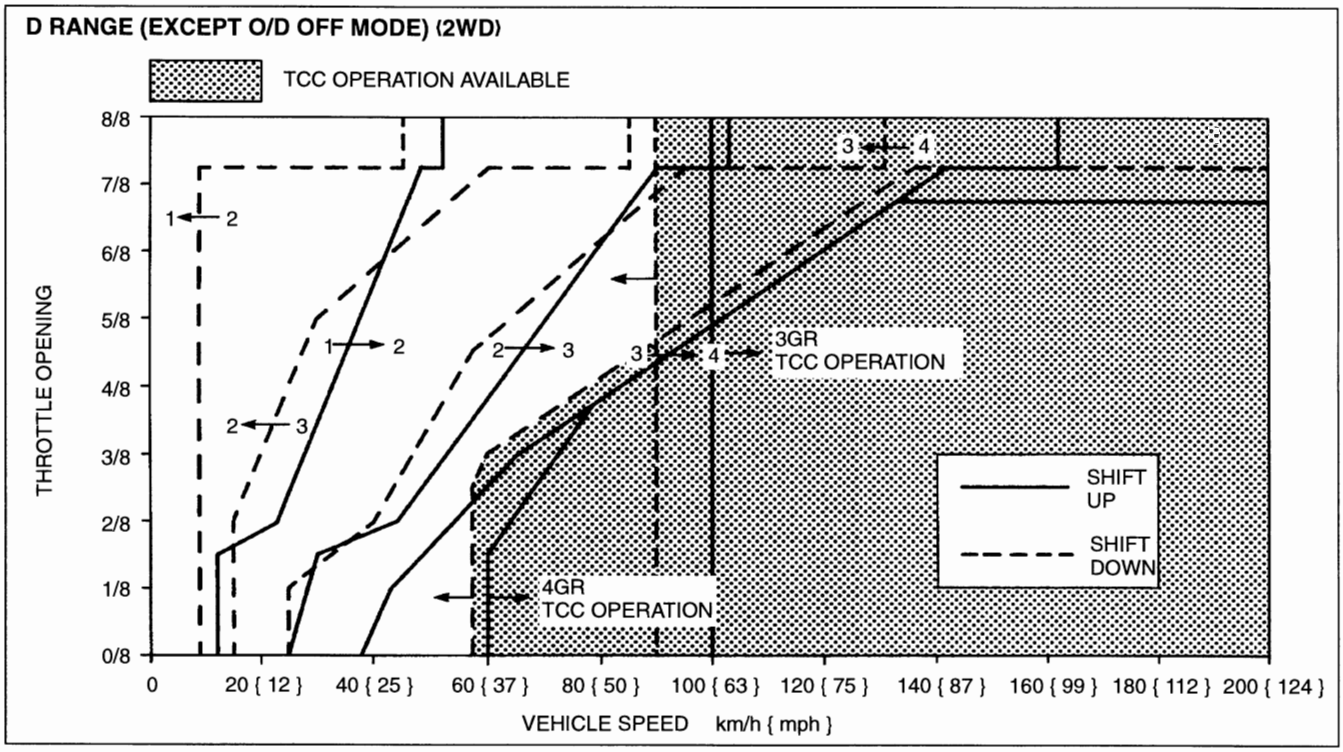


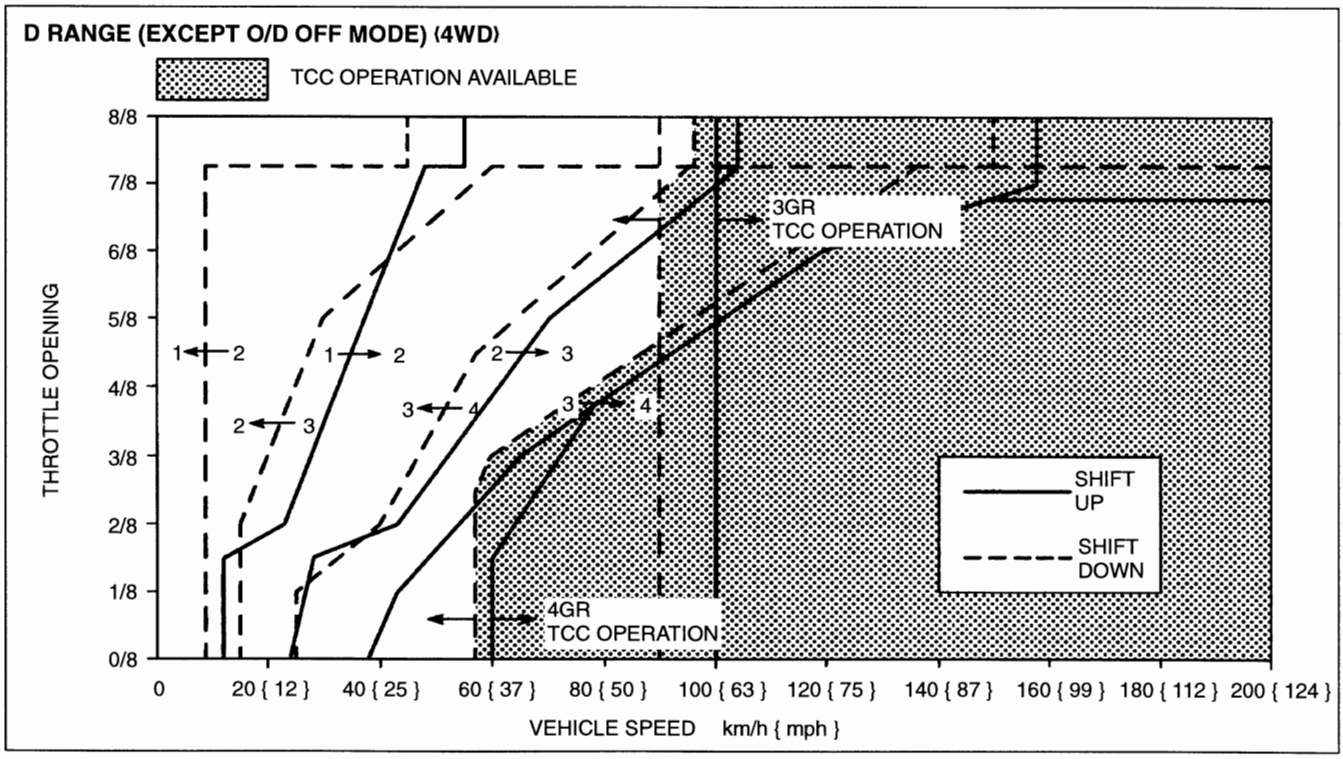
ROAD TEST

ROAD TEST PREPARATION

1. Check the engine coolant. (Refer to section E.)
2. Check the engine oil. (Refer to section B.)
3. Check the ATF level. (Refer to page K1–30.)
4. Check the idle speed and ignition timing in P position. (Refer to section F.)

SHIFT DIAGRAM

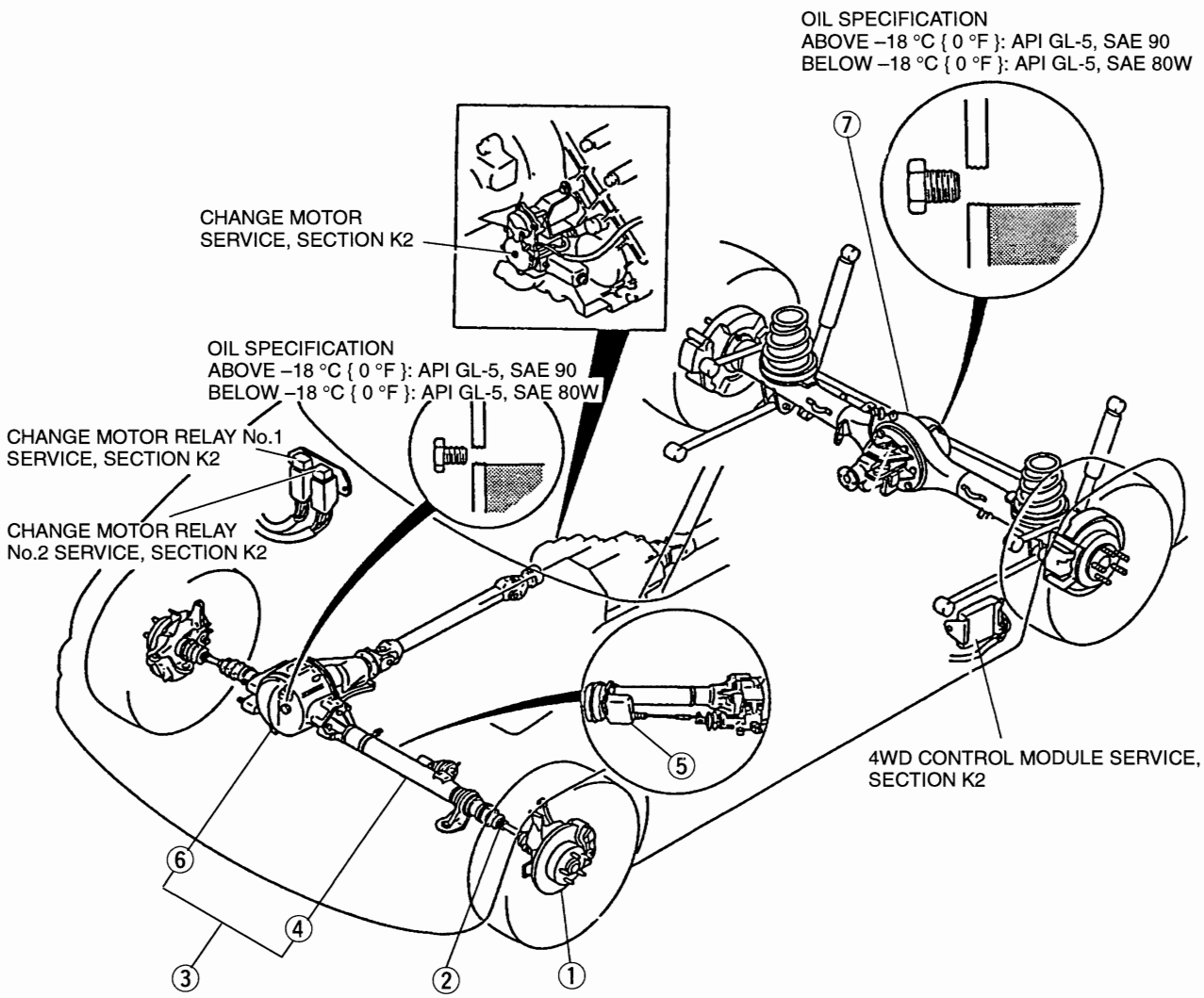




DIAGNOSTIC TROUBLE CODE P1743	SOLENOID TCC—OPEN OR SHORT (Torque converter clutch solenoid valve)
DETAILS	• Damaged wiring or connectors between torque converter clutch solenoid valve and transmission control module • Short or open circuit in torque converter clutch solenoid valve • Short or open circuit in transmission control module internal transistors
POSSIBLE CAUSE	• Damaged wiring or connectors between torque converter clutch solenoid valve and transmission control module • Short or open circuit in torque converter clutch solenoid valve • Short or open circuit in transmission control module internal transistors

STEP	INSPECTION		ACTION
1	Are transmission control module and torque converter clutch solenoid valve connections at connector and connector pins OK?	**Yes**	Go to next step
		No	Repair or replace connector(s) Go to step 5 • When **Yes**, go to next step • When **No**, end of flowchart
2	Check EC-AT tester display • Connect EC-AT tester to transmission control module • Is light for torque converter clutch solenoid valve normally off and illuminated when valve is on? ☞ **page K1–17**	**Yes**	Go to step 5
		No	Go to next step
3	Check for continuity between terminals of torque converter clutch solenoid valve and transmission control module • Disconnect negative battery cable • Disconnect solenoid connector and transmission control module connector • Is there continuity between terminals?	**Yes**	Go to next step
		No	Repair or replace connectors and wiring Go to step 2 • When **Yes**, go to step 5 • When **No**, go to next step
4	Measure resistance at torque converter clutch solenoid valve terminal • Disconnect nagative battery cable • Disconnect solenoid connector • Is resistance correct? **Resistance: 10—20 Ω** ☞ **page K1–26**	**Yes**	Go to next step
		No	Replace torque converter clutch solenoid valve ☞ **page K1–26**
5	After diagnostic trouble code has been cleared, recheck if diagnostic trouble code is shown ☞ **page K1–141**	**Yes**	Replace transmission control module
		No	Problem is a temporary poor connection of wiring or connectors, and should be investigated further

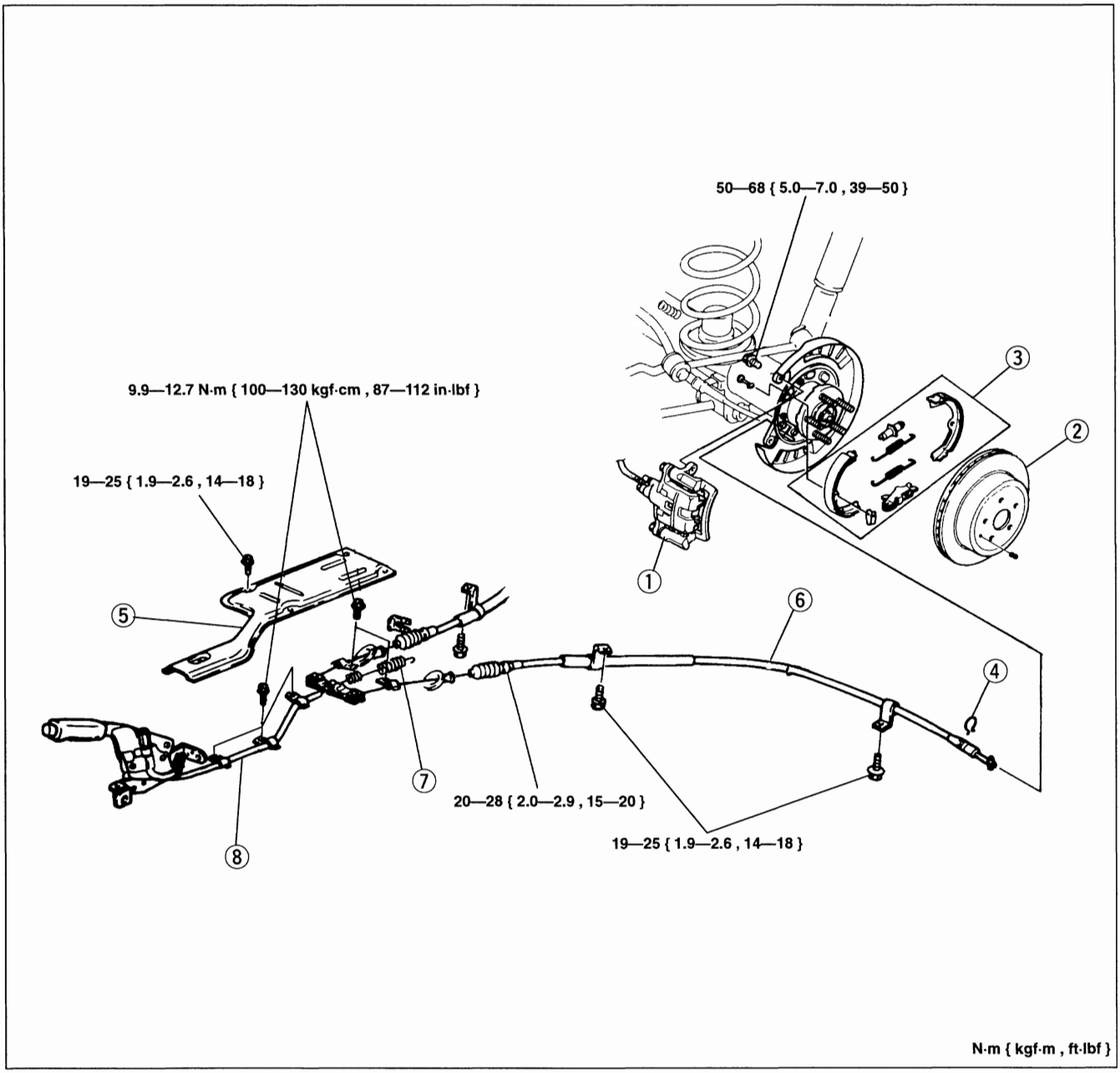
(4WD)



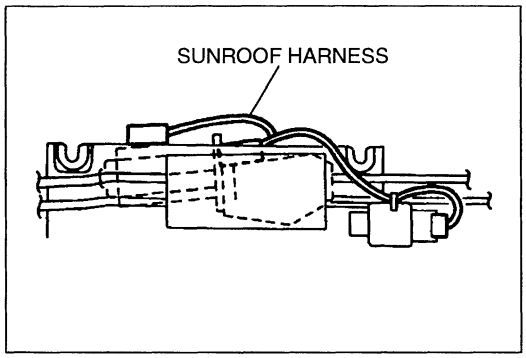
PARKING BRAKE CABLE

Removal / Inspection / Installation

1. Block the wheels firmly.
2. Release the parking brake and remove the parking brake lever adjusting nut. (Refer to page P–28.)
3. Remove rear seat No.1, front floormat. (Refer to section S.)
4. Jack up the vehicle and support it on safety stands.
5. Remove the parking brake cable in the order shown in the figure.
6. Install in the reverse order of removal.
7. After installation, check the following.
   - Adjust the parking brake lever stroke. (Refer to page P–27.)



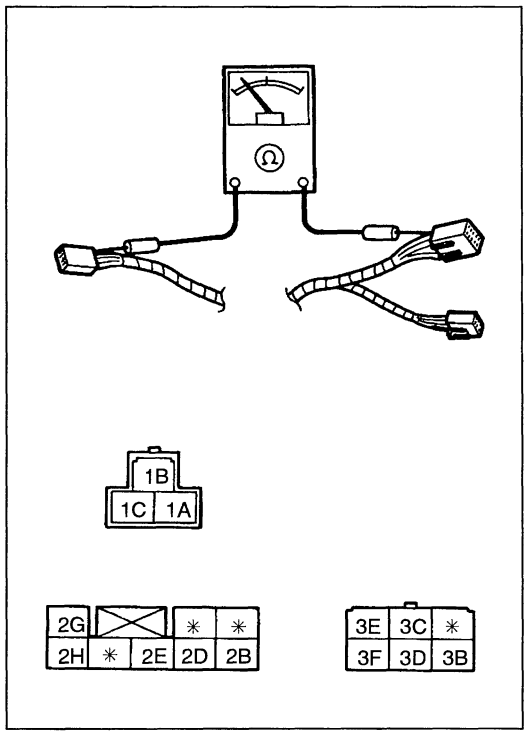
1. Caliper
   Removal Note ..... page P–30
2. Disc plate
3. Parking brake shoes
   Removal / Inspection / Installation ..... page P–29
4. Clip
5. Cover
6. Rear parking cable
   Inspect for damage and wear
7. Return spring
8. Front parking cable
   Inspect the damage and wear



SUNROOF HARNESS

Removal / Installation

1. Disconnect the negative battery cable.
2. Remove the front headliner. (Refer to page S–67.)
3. Remove the sunroof harness installation clip and remove the sunroof harness.
4. Install in the reverse order of removal.



Inspection

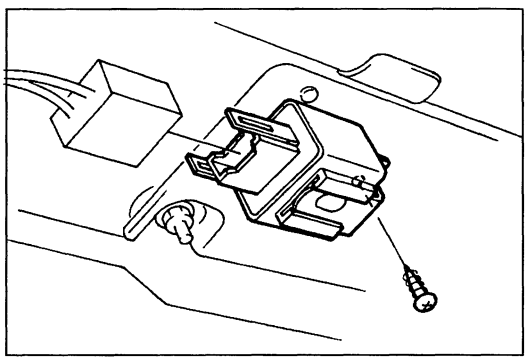
1. Remove the sunroof harnes. (Refer above.)
2. Check for continuity between the terminals of the sunroof harness connectors by using an ohmmeter.

O—O: Continuity

TERMINAL						
1A	1B	1C	2B	2E	3B	3F
O—O			O—O			
	O—O				O—O	
		O—O		O—O		O—O

TERMINAL					
2G	2H	2D	3D	3E	3C
O—O				O—O	
	O—O		O—O		
		O—O			O—O

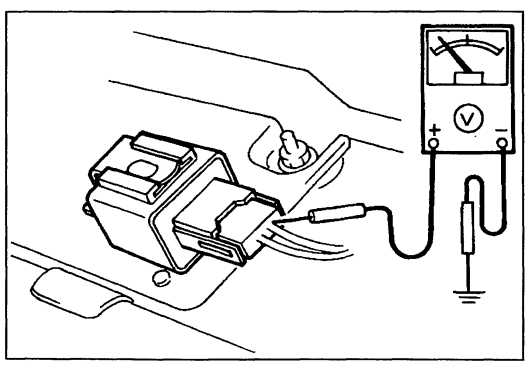
3. If not as specified, replace the sunroof harness.



SUNROOF RELAY

Removal / Installation

1. Disconnect the negative battery cable.
2. Remove the front headliner. (Refer to page S–67.)
3. Remove the sunroof relay bracket mounting screw and remove the sunroof relay.
4. Install in the reverse order of removal.

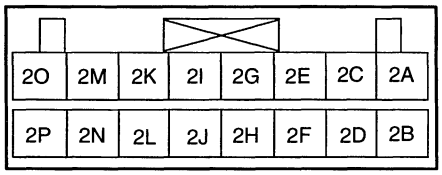


Inspection

1. Measure the voltage at the sunroof relay terminals by using a voltmeter. (Refer to page S–53.)
2. If not as specified, replace the sunroof relay.

B+: Battery positive voltage

CONNECTOR B

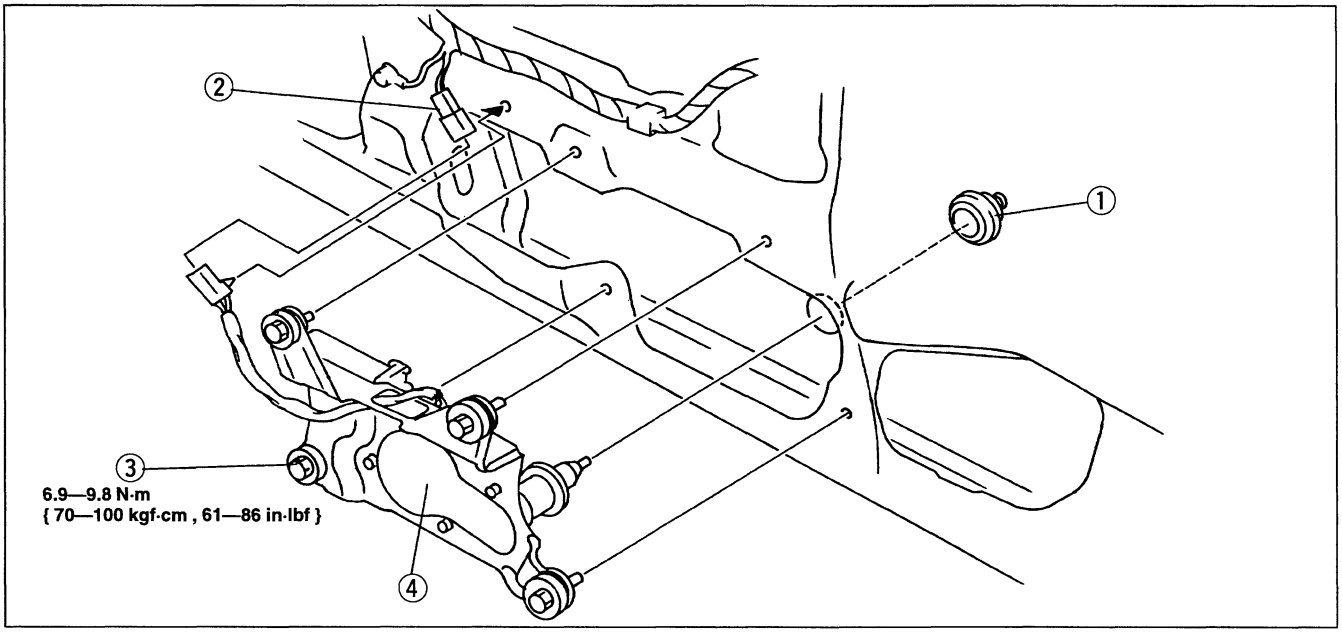


Terminal	Signal		Connection	Test condition		Voltage/ Continuity	Inspection area
2A	Door lock input		Door lock-link switch (driver)	Continuity inspection	Locked	Yes	Door lock-link switch
					Unlocked	No	
2B	—		—	—		—	—
2C	Door lock output		Door lock timer unit	The moment door lock-link switch locks		0 V	Door lock timer unit
				Other		B+	
2D	DRL		DRL relay	IG switch at ON		0 V	DRL relay
2E	Door lock output		Door lock timer unit	The moment door lock-link switch unlocks		0 V	Door lock timer unit
				Other		B+	
2F	Horn output		Horn relay	Horn switch pushed		0 V	• HORN 10 A fuse • Horn relay
				Other		B+	
2G	Door lock input		Door lock-link switch (driver)	Continuity inspection	Locked	No	Door lock-link switch
					Unlocked	Yes	
2H	—		—	—		—	—
2I	USA	—	—	—		—	—
	Canada	Brake system warning	Parking brake switch	Continuity inspection	Parking brake switch on	Yes	Parking brake switch
					Parking brake switch off	No	
2J	—		—	—		—	—
2K	Brake system warning		Brake system warning light	IG switch at ON and parking brake switch off		B+	• METER 10 A fuse • Instrument cluster
2L	—		—	—		—	—
2M	Rear wiper		Rear wiper switch	Continuity inspection	Rear wiper switch on	Yes	Rear wiper switch
2N	Keyless		Keyless unit	No operation by keyless unit		5 V	keyless unit
2O	Rear washer		Rear washer switch	Continuity inspection	Rear washer switch on	Yes	Rear washer switch
2P	R range		TR switch	IG switch at ON and selector lever at R range		B+	• METER 10 A fuse • TR switch

REAR WIPER MOTOR

Removal / Installation

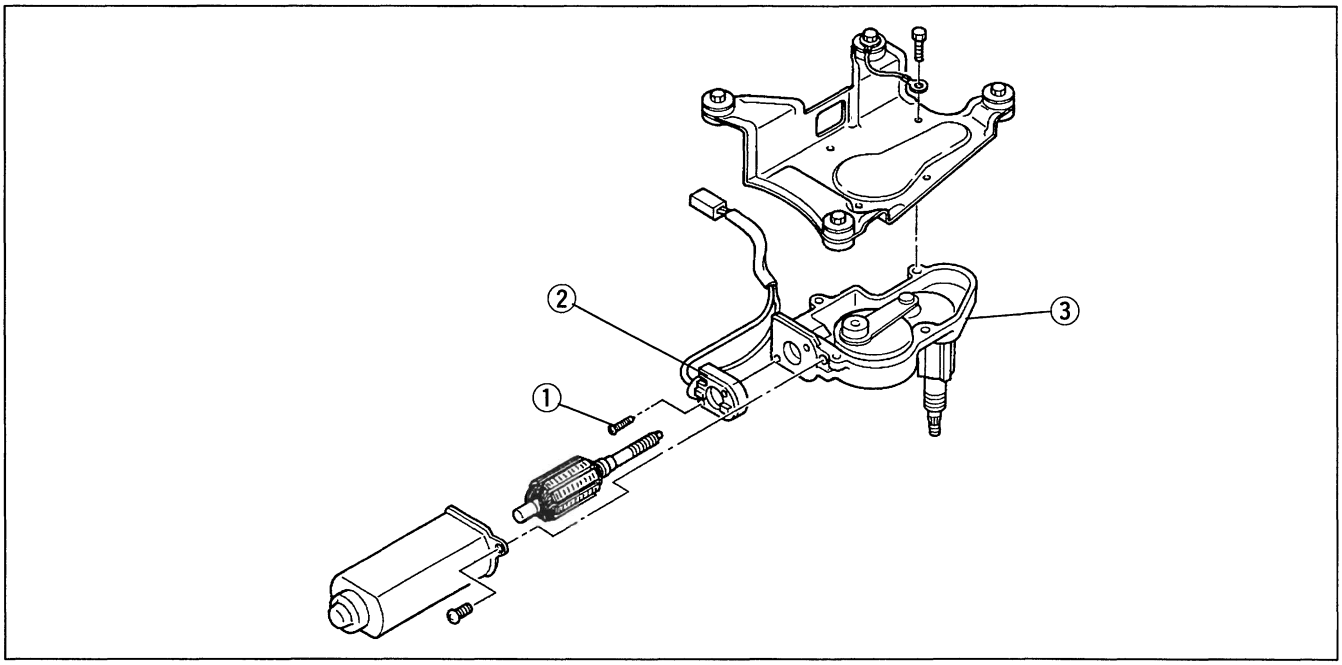
1. Remove the liftgate trim and liftgate screen. (Refer to section S.)
2. Remove in the order shown in the figure.
3. Install in the reverse order of removal.



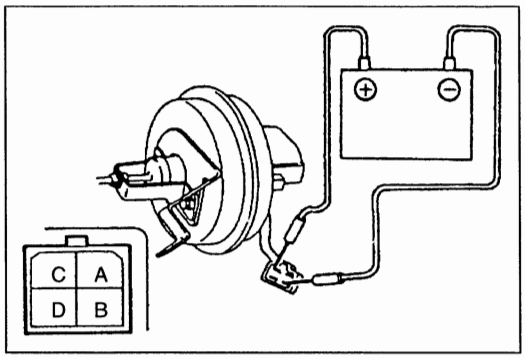
1. Outer bush
2. Connector
3. Bolt
4. Rear wiper motor
   Disassembly / Assembly ..... below
   Inspection ..... page T–34

Disassembly / Assembly

1. Disassemble in the order shown in the figure.
2. Assemble in the reverse order of disassembly.



1. Screw
2. Brush plate holder
3. Motor gear shaft



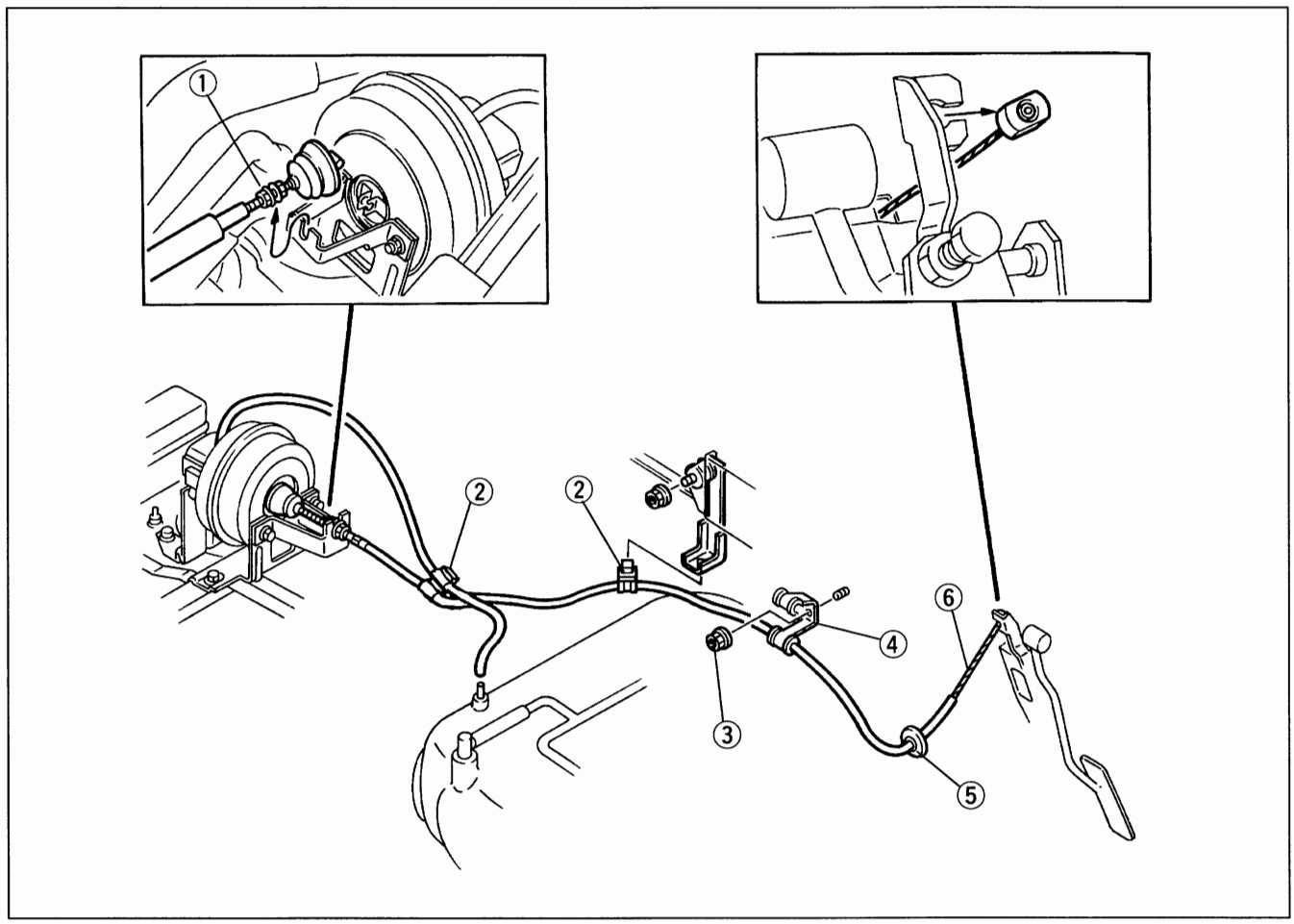
4. Disconnect the actuator cable from the accelerator pedal.
5. Run the engine at idle speed.
6. Apply battery positive voltage to the following terminals, and check the actuator cable operation.

B+: Battery positive voltage

Connection				Actuator cable operation
A	B	C	D	
GND	GND	B+	GND	Pull
GND	—	B+	GND	Hold
GND	—	B+	—	Extend
—	—	—	—	Release

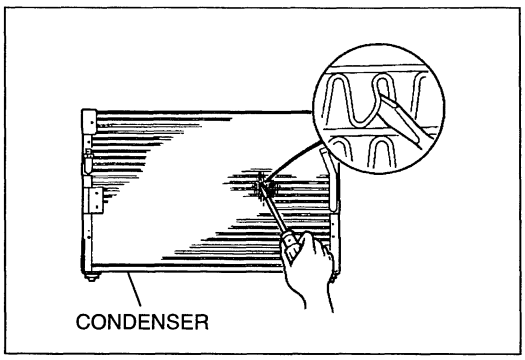
7. If not as specified, replace the cruise actuator. (Refer to page T–62.)

ACTUATOR CABLE
Removal / Installation
1. Remove in the order shown in the figure.
2. Install in the reverse order of removal.



1. Nut
2. Clip
3. Nut
4. Bracket
5. Grommet
6. Actuator cable

Adjustment ..... page T–64



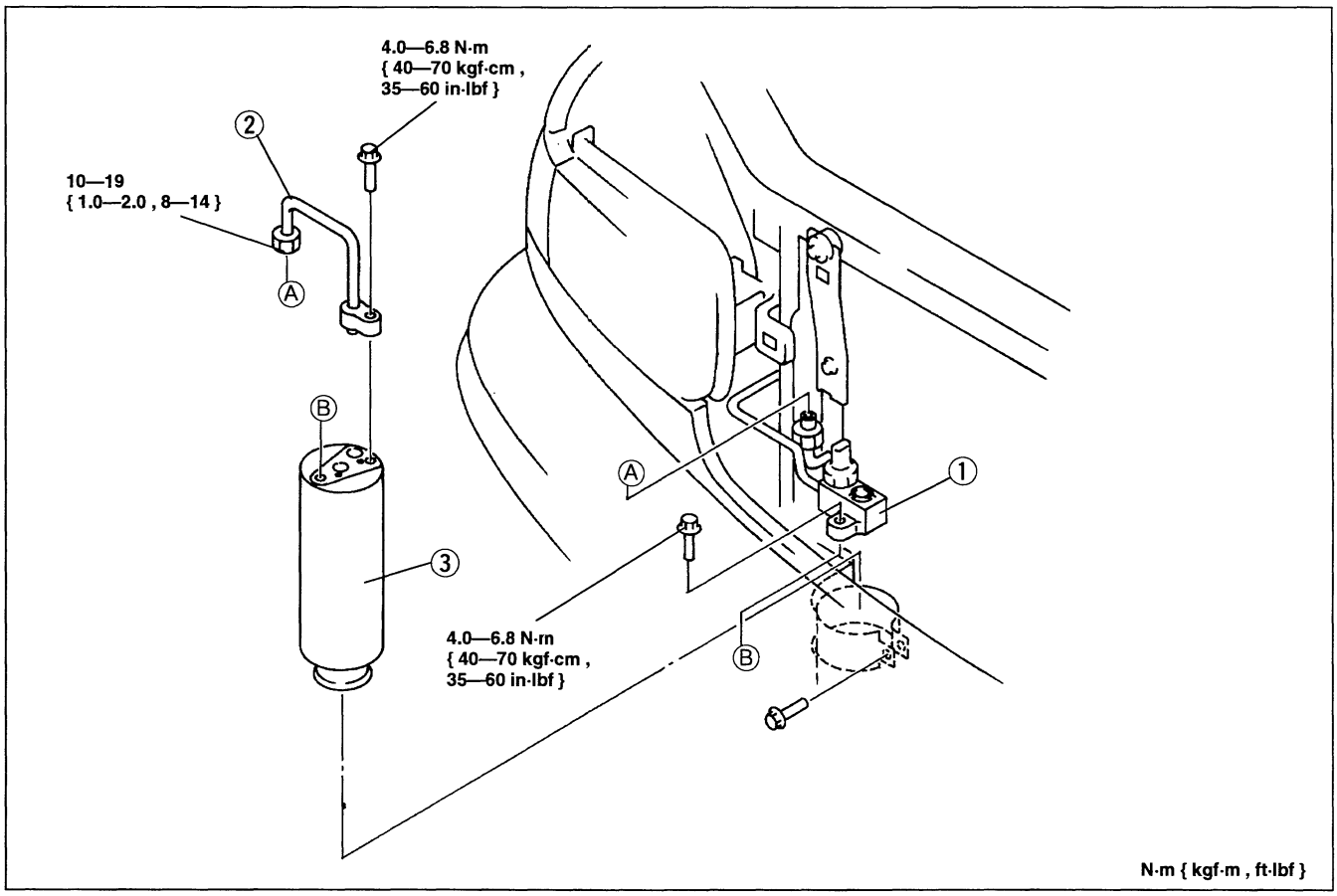
Inspection

1. Check for cracks, damage, and oil leakage. Repair or replace the condenser if necessary.
2. Check for bent fins. If they are bent, use a flathead screwdriver to straighten them.

RECEIVER/DRIER

Removal / Installation

1. Discharge the refrigerant from the system.
2. Remove the radiator grille. (Refer to section S.)
3. Remove in the order shown in the figure.
4. Install in the reverse order of removal, referring to **Installation note**.
5. Charge the system and test its performance. (Refer to page U–5, 8.)



1. Front cooler pipe No.2
   Installation note ..... page U–29
2. Front cooler pipe No.3
   Installation note ..... page U–29
3. Receiver/drier
   Installation note ..... below

Installation note

When installing a new receiver/driver, add **10 ml { 10 cc , 0.3 fl oz }** of compressor oil through the high-pressure side of the A/C compressor.

Flowchart No.	Rear cooling unit system inspection	Symptom ..... Cool air does not discharge or air cooling ability is low
16		Related parts .... Magnetic solenoid valve, Magnetic solenoid valve relay, Rear cooler main switch, Diode, Rear resistor, Wiring harness

B+: Battery positive voltage

Step	Inspection procedure	Terminal	Result	Action
1	1) Run engine at idle 2) Turn A/C switch and fan switch on 3) Verify rear cooler main switch off 4) Measure voltage at terminal of magnetic solenoid valve relay connector	A	B+	Measure voltage at terminal B
			Other	Repair wiring harness (A/C relay—Magnetic solenoid valve)
		B	B+	Go to Step 2
			Other	Check magnetic solenoid valve
2	Measure voltage at terminal of magnetic solenoid valve relay connector	A	B+	Measure voltage at terminal C
			Other	Repair wiring harness (Fuse—Magnetic solenoid valve relay: AIR CON 15 A—A)
		C	B+	Set rear cooler main switch to 1st and measure voltage at terminal D
			Other	Repair wiring harness (Magnetic solenoid valve—Magnetic solenoid valve relay)
		D	B+	Repair wiring harness (Magnetic solenoid valve relay—GND)
			Other	Measure voltage at terminal B
		B	B+	Go to Step 3
			Other	Check magnetic solenoid valve relay
3	Measure voltage at terminal of rear cooler main switch connector	C	B+	Check rear cooler main switch
			Other	Go to Step 4
4	Measure voltage at terminal of diode connector	A	B+	Measure voltage at terminal B
			Other	Repair wiring harness (Magnetic solenoid valve relay—Diode)
		B	B+	Repair wiring harness (Diode—Rear cooler main switch)
			Other	Go to Step 5
5	1) Remove diode 2) Connect ⊕ lead to terminal B and ⊖ lead of circuit tester to terminal A of diode connector 3) Check for continuity between terminals of diode connector	A—B	Yes	Go to Step 6
			No	Replace rear cooler harness
6	Measure voltage at terminal of rear resistor connector	C	B+	Repair wiring harness (Diode—Rear resistor)
			Other	Check rear resistor