

1989 Mazda RX-7 Factory Service Manual

This Online/PC version of the Manual has been brought to you by “Scott 89t2” and www.1300cc.com

Thanks to those who are hosting it for me.



Some parts of the manual may be hard to read or see on the screen, but if you print the pages out it's perfect. Well except for the crookedness ☺.

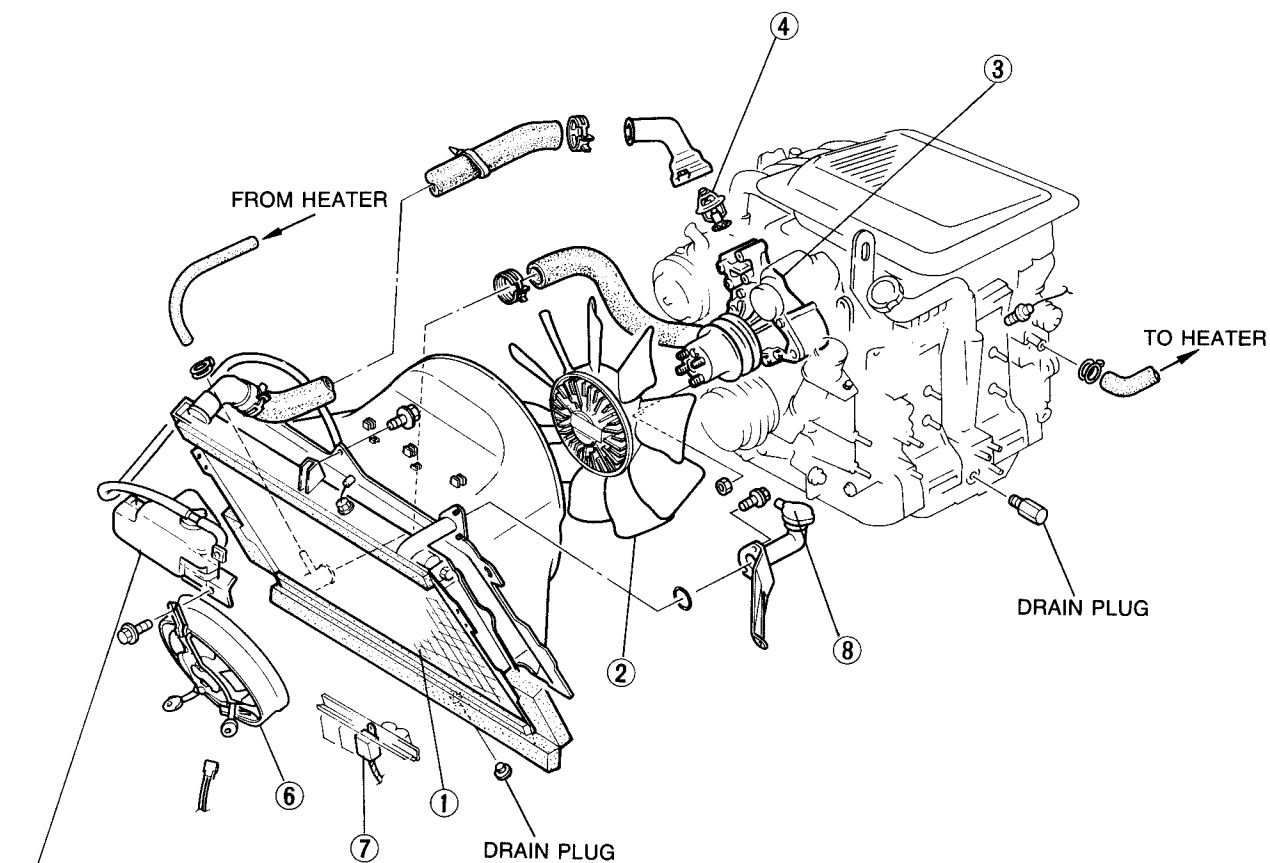
***Terms of Use:** This online/PC copy of the manual is only to be used and in your possession if you already own the printed version. It is for backup purposes only in case yours (or part of) is lost or damaged. If you downloaded this manual by mistake, Please Remove it from your possession. I also take no responsibility for what you do to yourself or your car while you use this manual.

COOLING SYSTEM

INDEX	E- 2
OUTLINE	E- 3
COOLANT FLOW CHART	E- 3
SPECIFICATIONS	E- 4
TROUBLESHOOTING GUIDE	E- 4
ON-VEHICLE INSPECTION	E- 5
ENGINE COOLANT	E- 5
RADIATOR CAP	E- 6
COOLING FAN	E- 6
ON-VEHICLE MAINTENANCE	E- 7
RADIATOR	E- 7
WATER PUMP	E- 8
THERMOSTAT	E-12
ELECTRIC COOLING FAN	E-13

97U0EX-001

INDEX



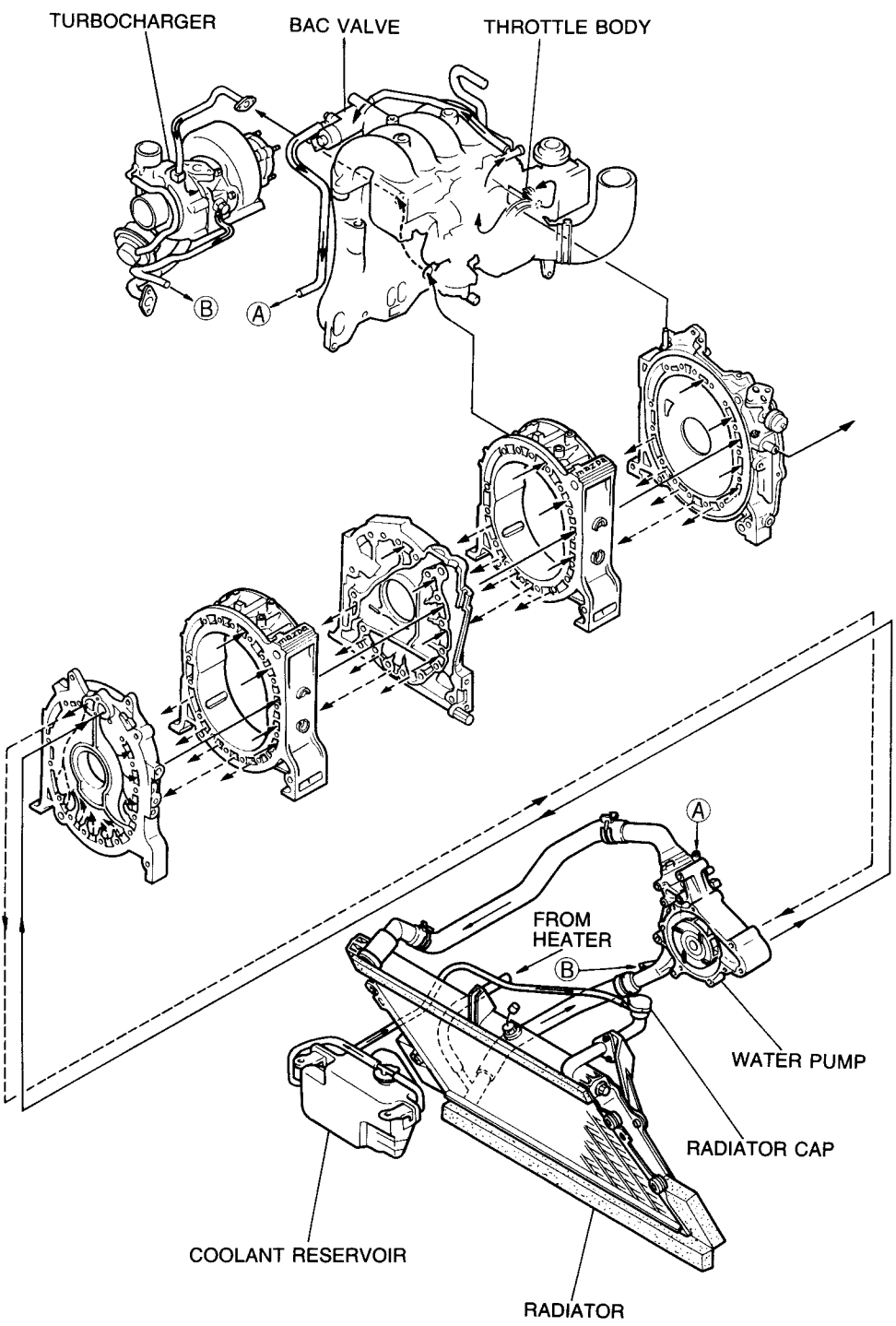
⑤
ENGINE COOLANT
 TURBO: 8.7 liters (9.2 US qt, 7.7 Imp qt)
 NON-TURBO: 7.3 liters (7.7 US qt, 6.4 Imp qt)

97U0EX-002

- | | | | |
|--|-----------|---|-----------|
| 1. Radiator
Removal, Inspection, and
Installation..... | page E- 7 | 5. Coolant reservoir | |
| 2. Cooling fan
Removal and Installation | page E- 7 | 6. Electric cooling fan
Inspection | page E-13 |
| Inspection | page E- 6 | 7. Fan relay
Inspection | page E-13 |
| 3. Water pump
Removal, Inspection, and
Installation..... | page E- 8 | 8. Radiator cap
Inspection | page E- 8 |
| 4. Thermostat
Removal..... | page E-12 | | |
| Inspection | page E-12 | | |
| Installation..... | page E-12 | | |

OUTLINE

COOLANT FLOW CHART



E OUTLINE, TROUBLESHOOTING GUIDE

SPECIFICATIONS

Item		Engine model	Turbo	Non-Turbo
Cooling method			Water-cooled, forced circulation	
Coolant capacity	With heater	liters (US qt, Imp qt)	8.7 (9.2, 7.7)	7.3 (7.7, 6.4)
Water pump	Type		Centrifugal	
	Pulley ratio (speed)		1:1.22	
Thermostat	Type		Wax, bottom bypass	
	Opening temperature	°C (°F)	80.5—83.5 (177—182)	
	Full open temperature	°C (°F)	95 (203)	
	Full-open lift min.	mm (in)	8—10 (0.31—0.39)	
Radiator	Type		Corrugated fin	
Filler cap	Relief pressure	kPa (kg/cm ² , psi)	74—103 (0.75—1.05, 11—15)	
Cooling fan	Type		Thermo-modulated	
	Number of blades		10	
	Outer diameter	mm (in)	390 (15.35)	
Electric cooling fan	Type		Electrical	
	Capacity	W	90	
	Number of blades		5	
	Outer diameter	mm (in)	255 (10.04)	

97U0EX-004

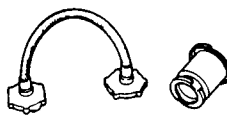
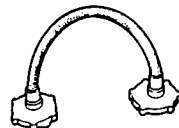

TROUBLESHOOTING GUIDE

Problem	Possible Cause	Action	Page
Coolant leakage	Damaged radiator core seam	Replace	E- 7
	Damaged or loose radiator hose or heater hose	Repair or replace	E- 5
	Damaged or loose water temperature switch	Repair or replace	-
	Malfunction of water pump seal	Replace	E- 8
	Damaged or loose thermostat cover or water pump case	Repair or replace	E-12
	Malfunction of gasket	Replace	-
	Damaged or loose tension bolt		Section C
	Damaged sealing rubber		Section C
	Damaged side housing		Section C
Damaged rotor housing		Section C	
Corrosion	Impurities in coolant	Replace	E- 5
Overheating	Water passage clogged	Clean	E- 5
	Thermostat malfunction	Replace	E-12
	Radiator fins clogged	Clean	E- 7
	Water pump malfunction	Repair or replace	E- 8
	Insufficient coolant	Add	E- 5
	Thermo-modulated fan malfunction	Replace	E- 6
	Electric cooling fan malfunction (A/T)	Repair or replace	E-13
	Radiator cap malfunction	Replace	E- 6

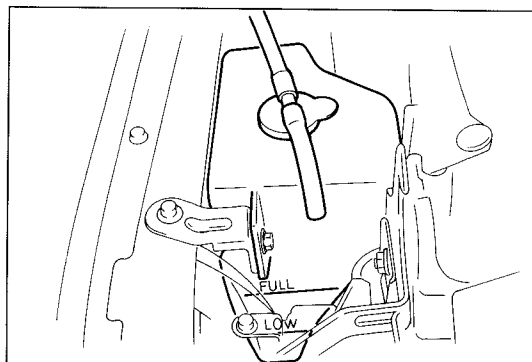
97U0EX-005

ON-VEHICLE INSPECTION

PREPARATION SST

<p>49 9200 145</p> <p>Radiator cap tester adapter set</p> 	<p>49 9200 146</p> <p>Adapter A (Part of 49 9200 145)</p> 	<p>49 9200 147</p> <p>Adapter B (Part of 49 9200 145)</p> 
---	--	---

9MU0EX-006



9MU0EX-007

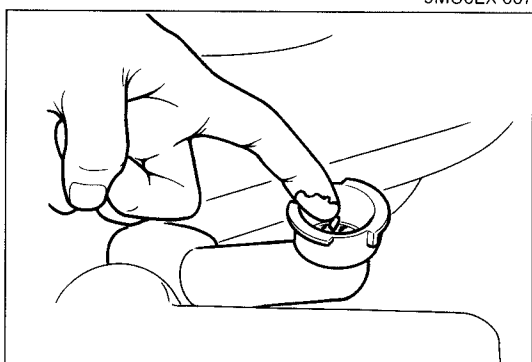
ENGINE COOLANT

Coolant Level (Engine cold)

1. Check that the coolant level is near the radiator inlet port.
2. Check that the coolant level in the coolant reservoir is between the FULL and LOW marks.
Add coolant if necessary.

Warning

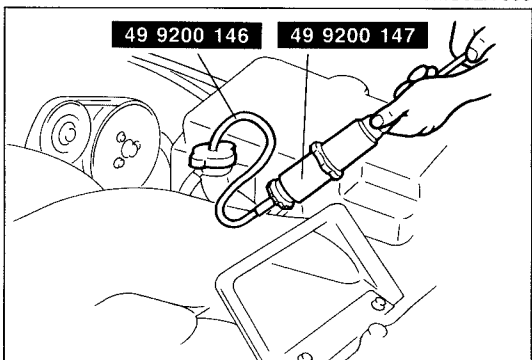
- a) Never remove the radiator cap while the engine is hot.
- b) Wrap a thick cloth around the cap when removing it.



9MU0EX-008

Coolant Quality

1. Check that there is no build up of rust or scales around the radiator cap or radiator filler neck.
2. Check that coolant is free of oil.
3. Replace the coolant if necessary.



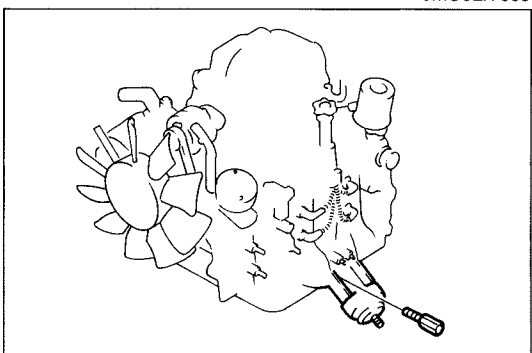
9MU0EX-009

Coolant Leakage

1. Connect a tester and **SST** to the radiator inlet port.
2. Apply **103 kPa (1.05 kg/cm², 15 psi)** pressure to the system.
3. Check that the pressure is held.
If not, check for coolant leakage.

Warning

- When removing either the radiator cap or the tester, loosen it slowly until the pressure in the radiator is released, and then remove it.**



97U0EX-006

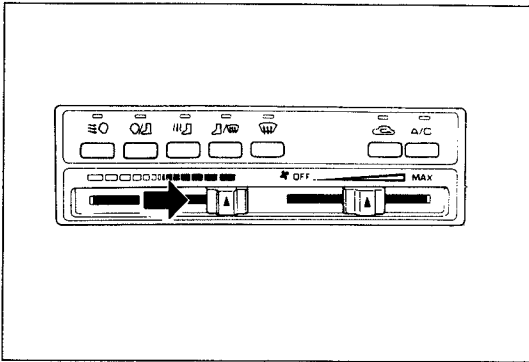
Replacement

1. Remove the radiator cap and loosen the drain plug in the radiator and in the intermediate housing.
2. Drain the coolant into a suitable container.

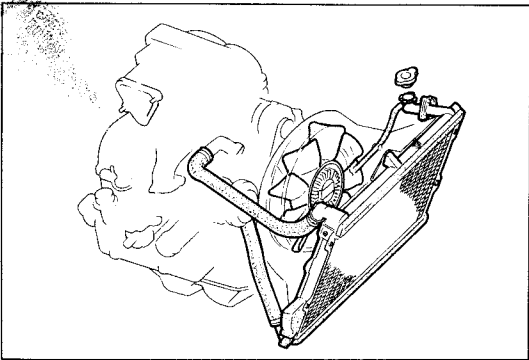
Warning

- a) Never open the radiator cap while the engine is hot.
- b) Wrap a thick cloth around the cap when loosening.
- c) Use caution when draining hot coolant.

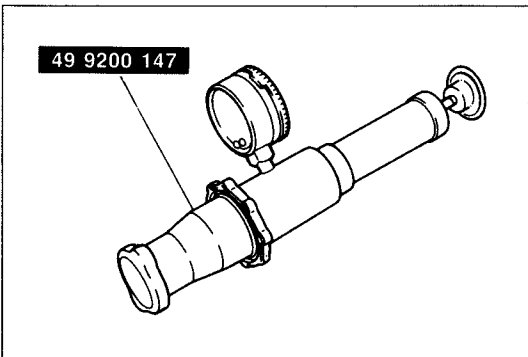
E ON-VEHICLE INSPECTION (RADIATOR CAP, COOLING FAN)



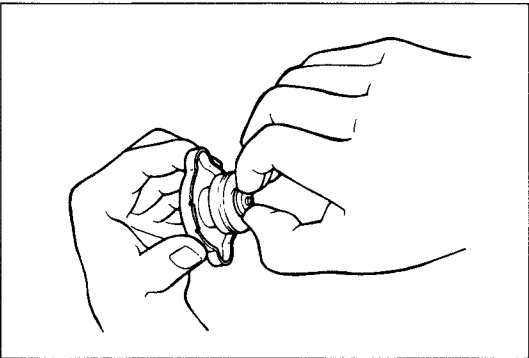
9MU0EX-011



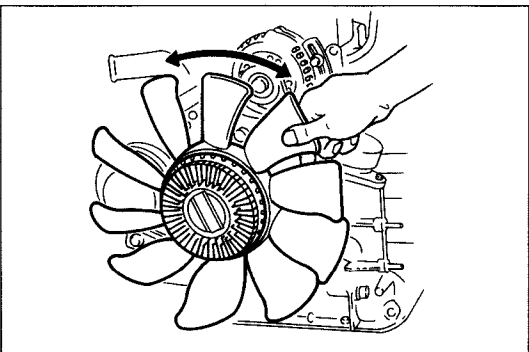
9MU0EX-012



9MU0EX-013



97U0EX-007



9MU0EX-015

3. Set the heater control to the maximum heat position.
4. Flush the cooling system with water until all traces of color are gone, then let the system drain completely.
5. Fill with the proper amount and mixture of ethylene glycol-based coolant.

Caution

- a) Do not use alcohol- or methanol-based coolant.
- b) Use only soft (demineralized) water in the coolant mixture.

Antifreeze solution mixture percentage

Protection	Volume percentage		Gravity at 20°C (68°F)
	Water	Solution	
Above -16°C (3°F)	65	35	1.054
Above -26°C (-15°F)	55	45	1.066
Above -40°C (-40°F)	45	55	1.078

6. Run the engine at idle with the radiator cap removed. Let any air bleed from the system, and add more coolant.
7. Install the radiator cap, and inspect all connections for leakage.

RADIATOR CAP

Radiator Cap Valve

1. Remove foreign material (such as water residue) from between the radiator cap valve and the valve seat.
2. Attach the radiator cap to a tester with the **SST**. Apply pressure gradually to **74—103 kPa (0.75—1.05 kg/cm², 11—15 psi)**.
3. Wait about 10 seconds; then check that the pressure has not decreased.

Negative Pressure Valve

1. Pull the negative-pressure valve to open it. Check that it closes completely when released.
2. Check for damage on the contact surfaces and for cracked or deformed seal packing.
3. Replace the radiator cap if necessary.

Caution

Before installing the radiator cap, remove dirt or other foreign materials on the sealing surfaces.

COOLING FAN

Inspection

1. Inspect the following items. Replace if necessary.
 - (1) Fluid leakage from the fan-drive clutch
 - (2) Deformation of the bimetal
 - (3) Excessive play of the cooling fan bearing
 - (4) Grease leakage from the cooling fan bearing
2. When the engine is warm, turn the cooling fan by hand and check that resistance is felt. Replace the fan-drive clutch if necessary.

ON-VEHICLE MAINTENANCE

RADIATOR

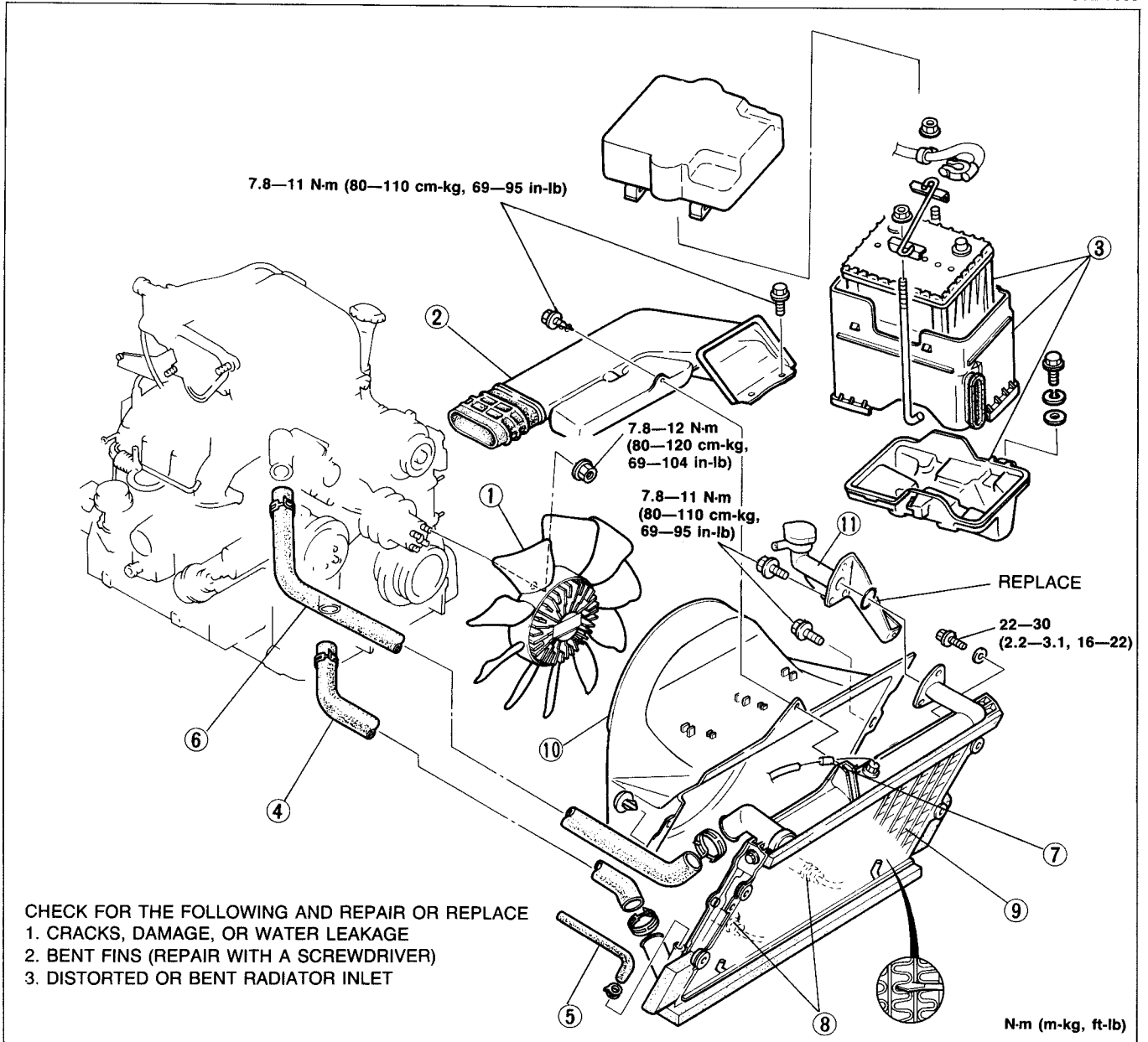
Removal, Inspection and Installation

1. Drain the engine coolant.
2. Remove in the sequence shown in the figure.
3. Inspect all parts and repair or replace as necessary.
4. Install in the reverse order of removal, referring to **Installation Note**.

Note

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

97U0EX-008

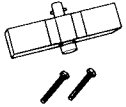

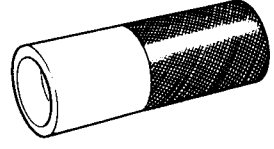


97U0EX-009

- | | |
|------------------------|---|
| 1. Cooling fan | 7. Coolant level sensor connector |
| 2. Air intake pipe | 8. ATF hose (only for A/T — Plug hoses) |
| 3. Battery and bracket | 9. Radiator |
| 4. Lower radiator hose | 10. Radiator cowl |
| 5. Heater hose | 11. Coolant filler neck |
| 6. Upper radiator hose | |

E ON-VEHICLE MAINTENANCE (WATER PUMP)

WATER PUMP PREPARATION SST

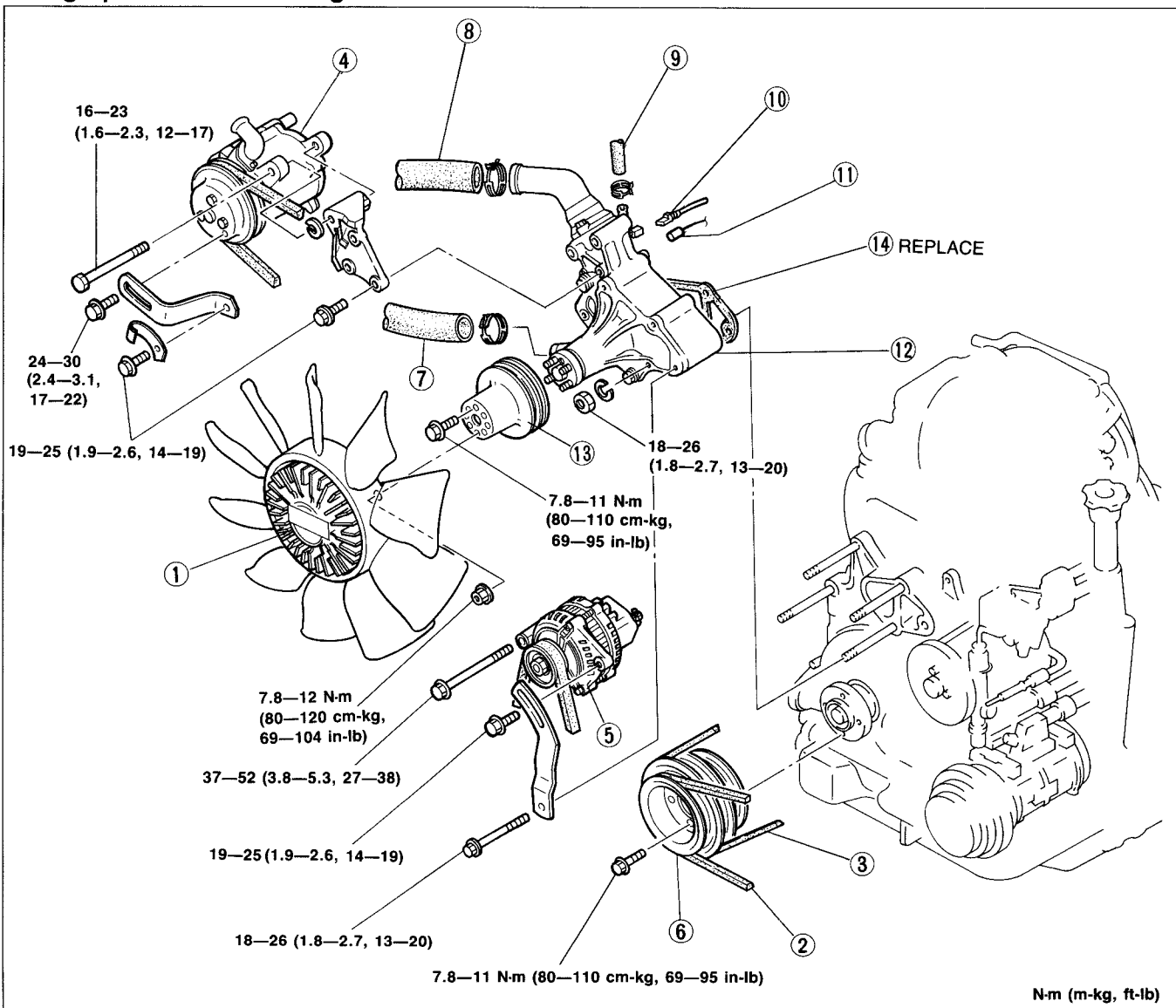
49 F015 001 Pulley boss puller and installer		49 0823 146 Support block		49 F015 002 Water seal installer	
--	---	------------------------------	---	--	---

Removal and Installation

1. Disconnect the negative battery cable.
2. Turn the eccentric shaft so that the top mark of the pulley is aligned with the indicator pin.
3. Drain the engine coolant from the radiator drain plug.
4. Remove in the sequence shown in the figure.
5. Install in the reverse order of removal, referring to **Installation Note**.

Note

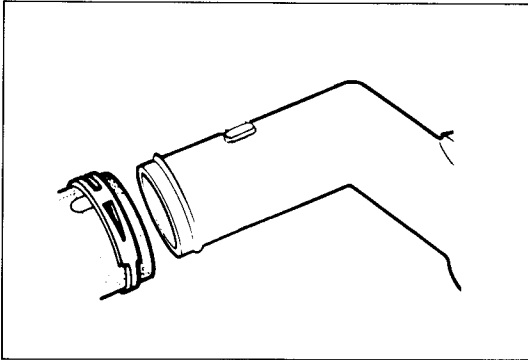
Position the hose clamp in the original location on the hose, and squeeze the clamp lightly with large pliers to ensure a good fit.



97U0EX-010

- | | | | |
|------------------------------|-----------|---|-----------|
| 1. Cooling fan | | 8. Upper radiator hose | |
| 2. P/S pump drive belt | | 9. Coolant bypass hose | |
| Adjustment..... | Section C | 10. Water thermosensor connector | |
| 3. A/C compressor drive belt | | 11. Water thermostwitch connector (A/T) | |
| Adjustment..... | Section C | 12. Water pump | |
| 4. Air pump and drive belt | | Disassembly | page E-10 |
| Adjustment..... | Section C | Inspection | page E-10 |
| 5. Alternator and drive belt | | Assembly | page E-10 |
| Adjustment..... | Section C | 13. Water pump pulley | |
| 6. Eccentric shaft pulley | | 14. Gasket | |
| 7. Lower radiator hose | | | |

97U0EX-011

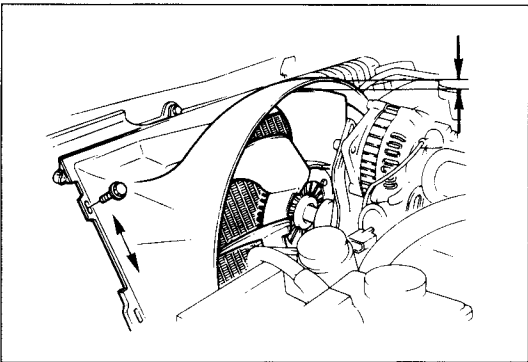


97U0EX-012

Installation note

Upper and lower radiator hoses

1. Install the hoses with the alignment marks aligned.
2. Squeeze the hose clamp lightly with large pliers to ensure a good fit.

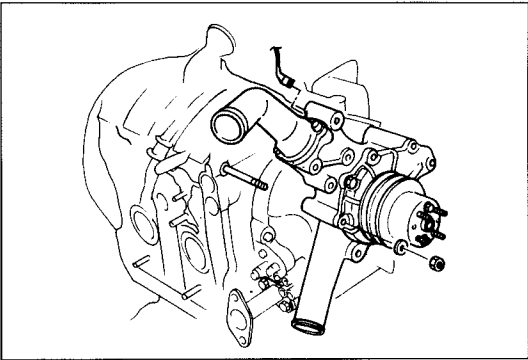


97U0EX-013

Cooling fan

Check for cooling fan clearance. Move the radiator cowl and adjust the clearance if necessary.

Cooling fan clearance: 16—24mm (0.63—0.94 in)



97U0EX-014

Water pump

Install the water pump and a new gasket.

Tightening torque:

18—26 N·m (1.8—2.7 m·kg, 13—20 ft·lb)

Steps After Installation

1. Add engine coolant to the specified levels.
2. Connect the negative battery cable.
3. Start the engine and do the following:
 - (1) Check for leakage of engine coolant.
 - (2) Perform engine adjustments if necessary.
 - (3) Recheck the coolant levels.

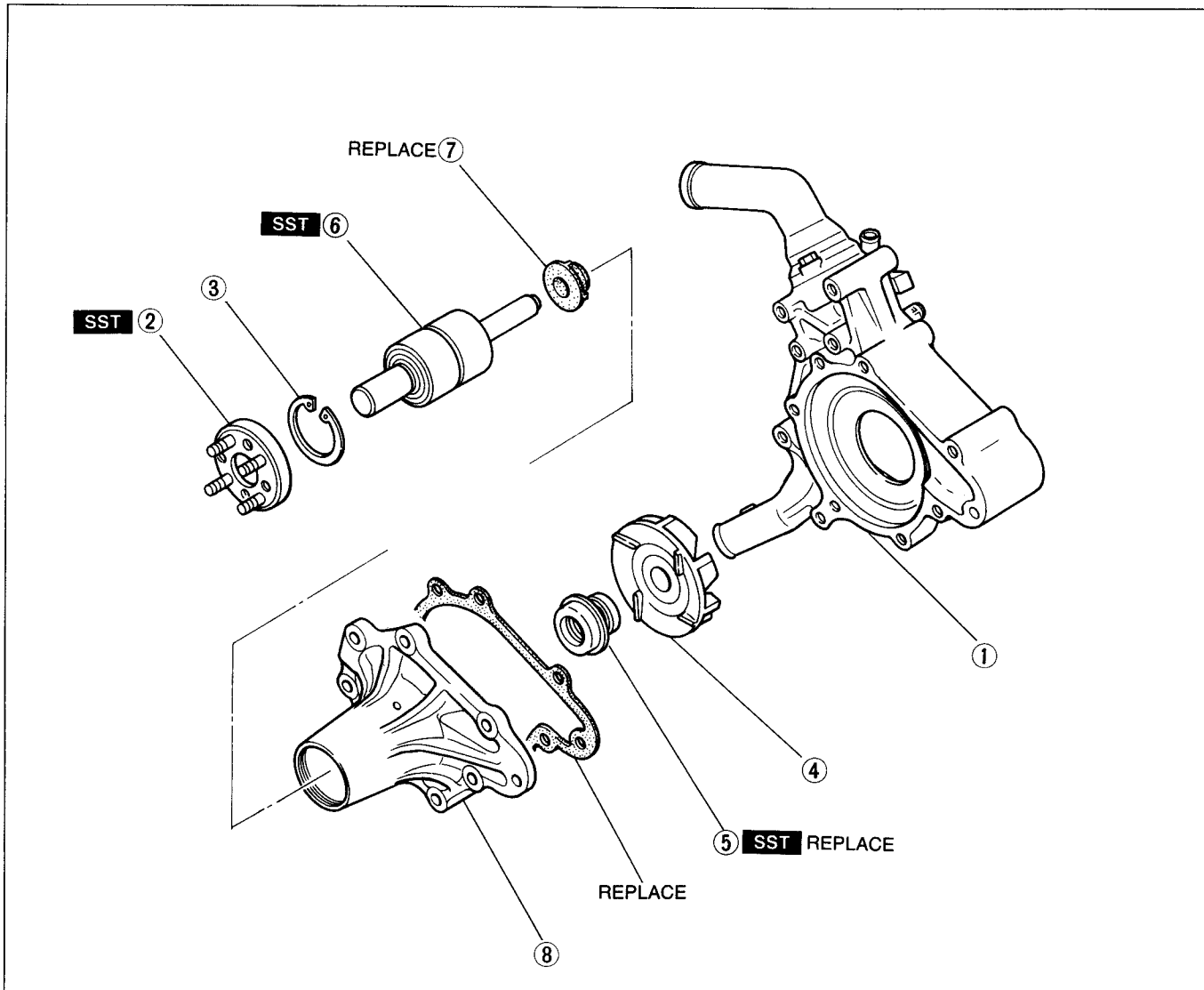
97U0EX-015

E ON-VEHICLE MAINTENANCE (WATER PUMP)

Disassembly, Inspection and Assembly

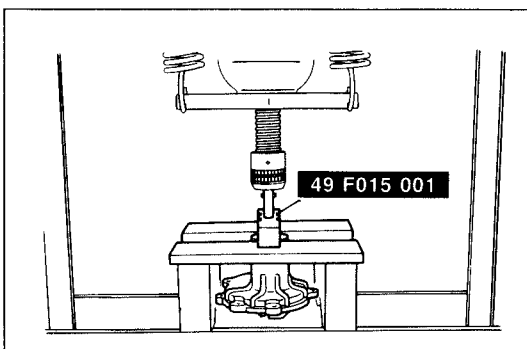
1. Disassemble in the sequence shown in the figure, referring to **Disassembly Note**.
2. Inspect all parts and repair or replace as necessary.
3. Assemble in the reverse order of disassembly, referring to **Assembly Note**.

97U0EX-016



97U0EX-017

- | | |
|--|---|
| 1. Water pump body and thermostat assembly
Inspect for body cracks and damaged gasket surface | 5. Water seal
6. Shaft bearing
Inspect for roughness and excessive end play |
| 2. Pulley boss | 7. Baffle plate |
| 3. Snap ring | 8. Bearing housing |

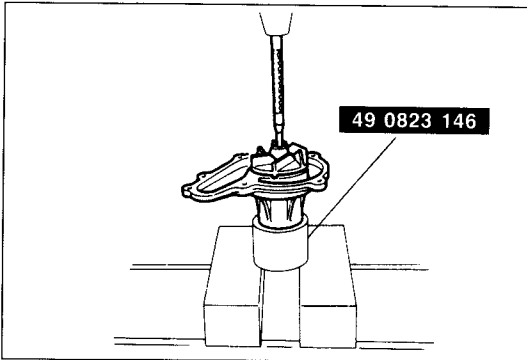


97U0EX-018

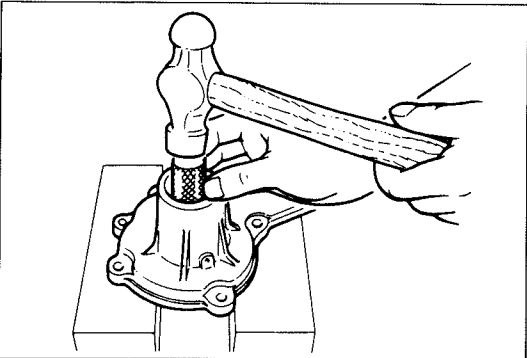
Disassembly note

Pulley boss

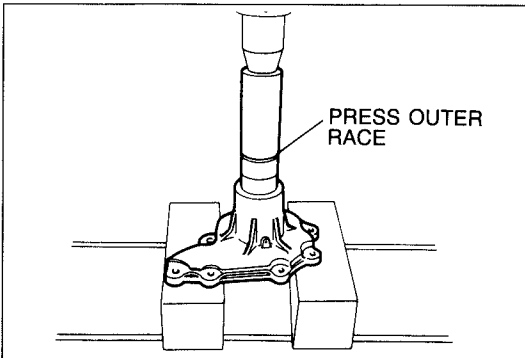
Remove the pulley hub using the **SST**.



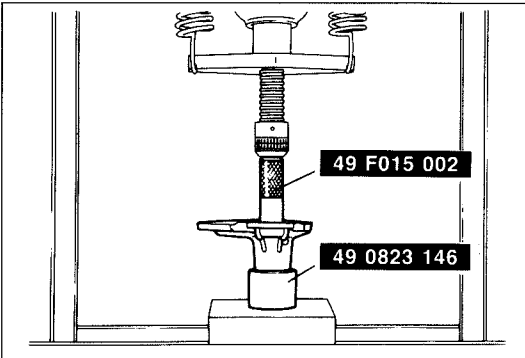
97U0EX-019



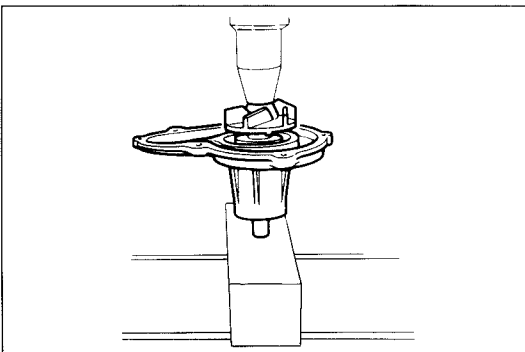
97U0EX-020



97U0EX-021



97U0EX-022



97U0EX-023

Shaft bearing, water seal and baffle plate

1. Support the bearing housing using the **SST**.
2. Press out the shaft bearing.
3. Remove the baffle plate from the shaft bearing.

4. Remove the water seal by tapping lightly with a hammer.

Assembly note

Shaft bearing

1. Install a new baffle plate on the shaft.
2. Install the shaft bearing by pressing against its outer race.
3. Install the snap ring.

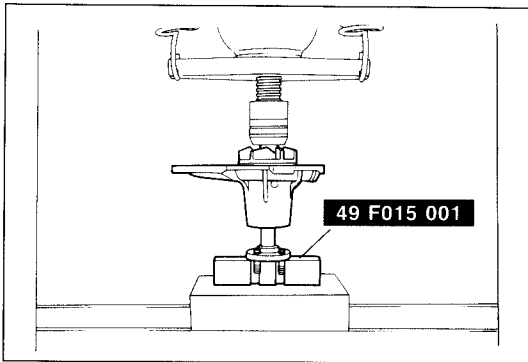
Water seal

1. Apply coolant to the new water seal and the shaft.
2. Press the water seal straight in using the **SST**.

Impeller

Support the shaft and press the impeller on until it is flush with the end of the shaft.

E ON-VEHICLE MAINTENANCE (WATER PUMP, THERMOSTAT)



97U0EX-024

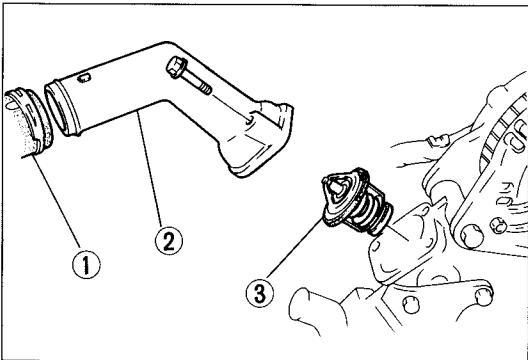
Pulley boss

Press on the pulley boss using the **SST**.
The shaft protrusion is as specified.

Protrusion: 8.3—9.1mm (0.33—0.36 in)

Caution

After assembly check that the pump shaft rotates smoothly.

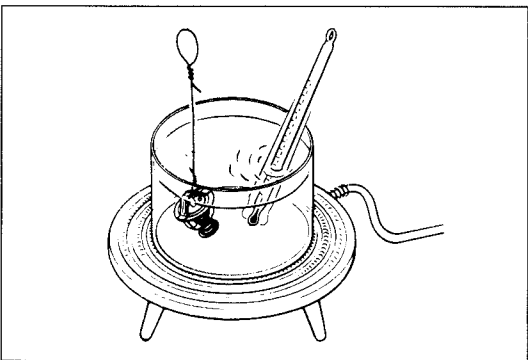


97U0EX-025

THERMOSTAT

Removal

1. Drain the coolant from the radiator drain plug.
2. Remove the following parts:
 - (1) Upper radiator hose
 - (2) Thermostat cover
 - (3) Thermostat and gasket



97U0EX-026

Inspection

Check the operation, replace if necessary.

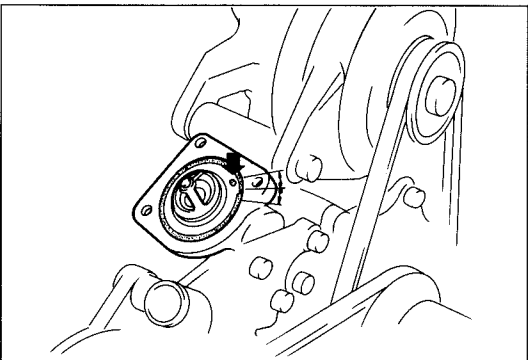
1. Visually check the valve to be sure it is air tight.
2. Place the thermostat and a thermometer in water, gradually increase the water temperature, and check the initial opening temperature, the full-open temperature, and the full-open lift.

Initial opening temperature:

80.5—83.5°C (177—182°F)

Full open temperature: 95°C (203°F)

Full open lift: 8—10mm (0.31—0.39 in) min.



97U0EX-027

Installation

1. Install the thermostat and gasket with the jiggle pin upward as shown.

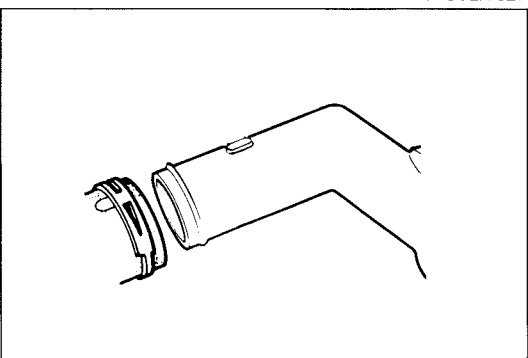
Caution

Align the gasket notch and the thermostat jiggle pin when assembling.

2. Install the thermostat cover.

Tightening torque:

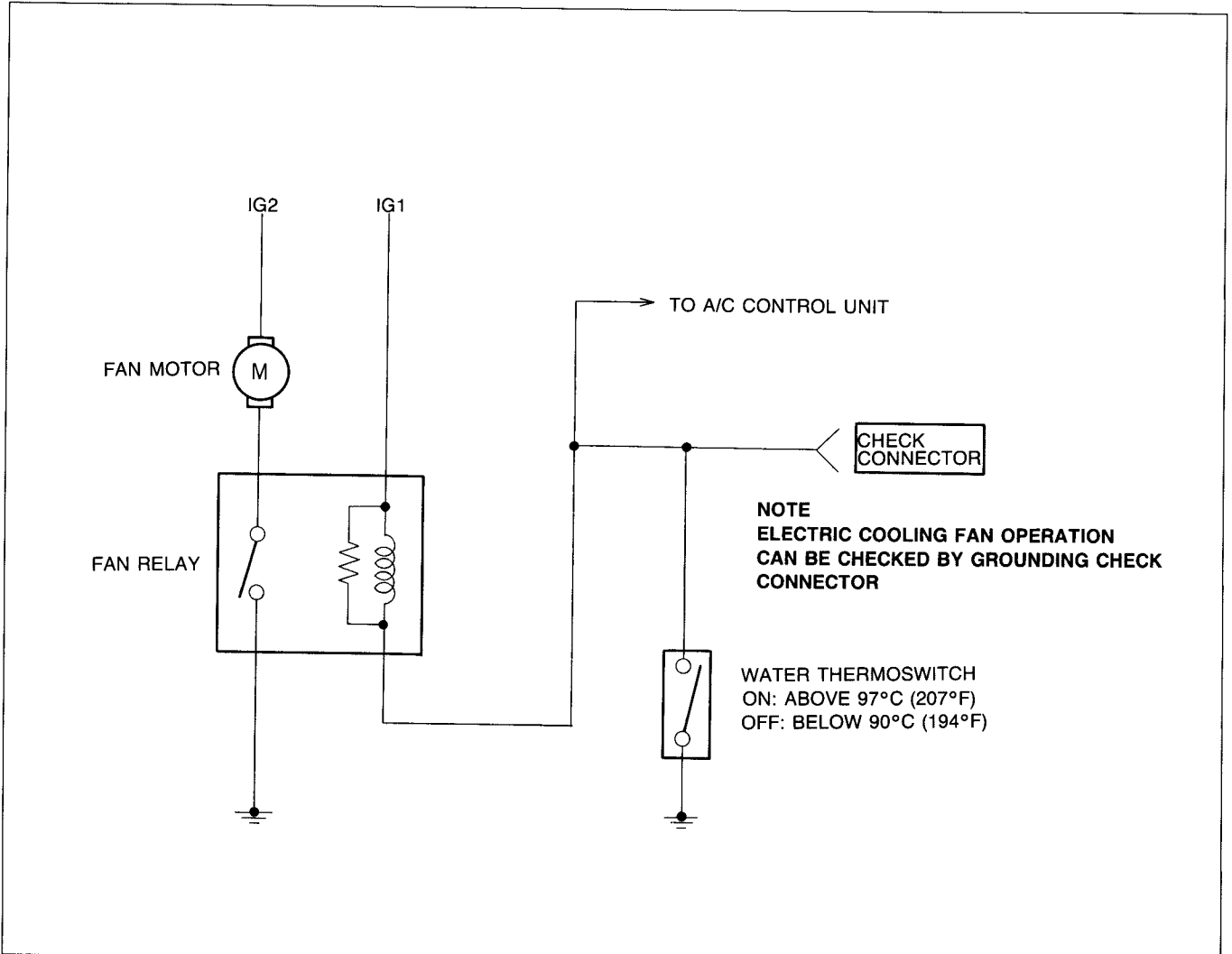
6.9—9.8 N·m (70—100 cm·kg, 61—87 in·lb)



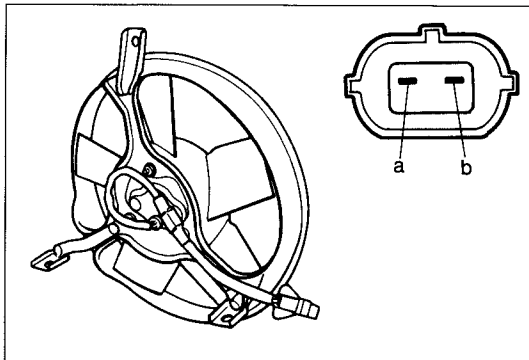
97U0EX-028

3. Install the upper radiator hose with the alignment mark aligned.
4. Refill the coolant.
5. Run the engine, check for coolant leakage.

ELECTRIC COOLING FAN System Circuit



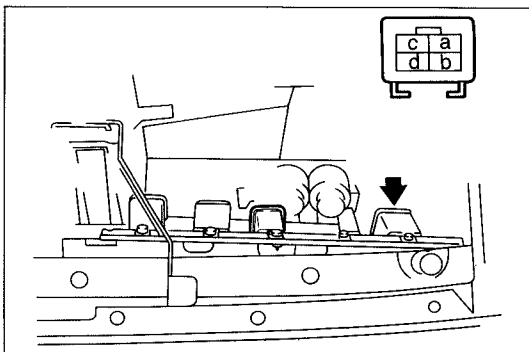
97U0EX-029



97U0EX-030

Inspection Fan motor

1. Disconnect the electric cooling fan connector.
2. Check that the fan runs when applying 12V to terminal a and grounding terminal b.
3. If the fan does not run, replace it.



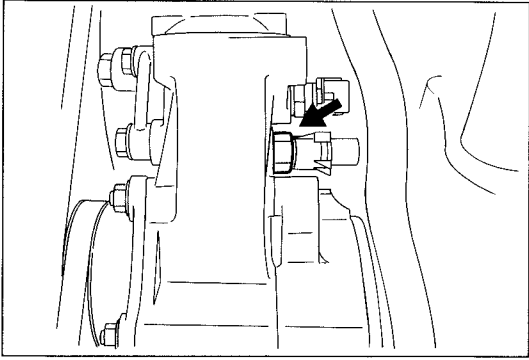
97U0EX-031

Fan relay

1. Check for continuity between terminals a and b.
2. Check for no continuity between terminals c and d.
3. Apply battery voltage between terminal a and terminal b, and check for continuity between terminals c and d.
4. If necessary, replace the fan relay.

Note

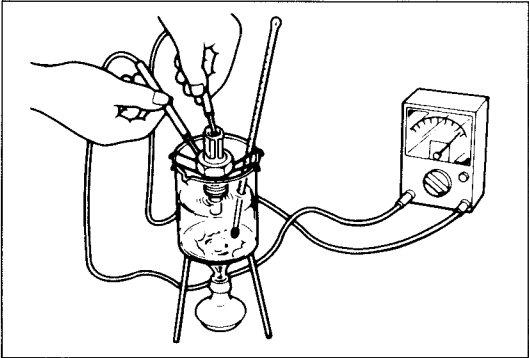
The fan relay has gray water-proof cover.



97U0EX-032

Water thermostatic switch

1. Disconnect the negative battery cable.
2. Remove the alternator drive belt and alternator.
3. Remove the water thermostatic switch for the electric cooling fan.



97U0EX-033

4. Place the water thermostatic switch in water.
5. Check the continuity with an ohmmeter.

Continuity 97°C (207°F) or more
No continuity..... 90°C (194°F) or less

6. If necessary, replace the water thermostatic switch.