



# COOLING

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## SPECIFICATIONS

### GENERAL SPECIFICATIONS

Cooling method	Water-cooling, forced circulation type
Radiator	
Type	Pressurized corrugated fin type
Performance kcal/h	
Vehicles without an intercooler	34,800
Vehicles with an intercooler	44,200
Radiator cap	
High pressure valve opening pressure kPa (psi)	74–103 (11–15)
Vacuum valve opening pressure kPa (psi)	–5 or less (–0.7 or less)
Radiator fan motor No. 1	
Type	Direct current ferrite magnet type
Rated load torque Ncm (in.lbs.)	35.6 (2.6)
rpm (with the fan attached) rpm	1,750–2,250
Current A	9–11
Radiator fan motor No. 2	
Type	Direct current ferrite magnet type
Rated load torque Ncm (in.lbs.)	20 (1.4)
rpm (with the fan attached) rpm	1,750–2,250
Current A	5.7–7.7
Thermosensor No. 1	
Operating temperature °C (°F)	
OFF → ON	82–88 (180–190)
ON → OFF	78–87 (172–189)
Thermosensor No. 2	
Operating temperature °C (°F)	
OFF → ON	97–103 (207–217)
ON → OFF	93–102 (199–216)
Radiator fan motor relay	
Exciting coil rated current A	0.074–0.106
Maximum contact current capacity A	20
Range of voltage used V	10–15
Voltage drop between terminals V	0.2 or less
Water pump	Impeller of centrifugal type
Cooling fan	
Diameter mm (in.)	410 (16.1)
No. of blades	7
Fan clutch	
Type	Thermostatic controlled fluid coupling
Fan speed	2,800 rpm at pulley speed of 4,000 rpm, 65°C (149°F) or higher 900 rpm at pulley speed of 4,000 rpm, 55°C (131°F) or lower

# SPECIFICATIONS



<b>Thermostat</b>		
Type		Wax type with jiggle valve
Valve opening temperature		88°C (190°F)
Full-opening temperature		100°C (212°F) at valve lift of 8 mm (.31 in.) or more
Identification mark		88 (Stamped on flange)
<b>Drive belt</b>		
Length	mm (in.)	964 (37.95) HM type
<b>Water temperature gauge unit</b>		
Type		Thermistor type
Resistance		104 Ω at 70°C (158°F) 38 Ω at 100°C (212°F)
<b>Coolant temperature sensor for ECI system</b>		
Type		Thermistor type
Resistance		16,200 Ω at -20°C (-4°F) 2,450 Ω at 20°C (68°F) 296 Ω at 80°C (176°F)
<b>Engine oil cooler</b>		
Performance		5,500 kcal/h
<b>Automatic transmission oil cooler</b>		
Performance		4,000 kcal/h

## SERVICE SPECIFICATIONS

<b>Standard value</b>		
Opening pressure of radiator cap high pressure valve	kPa (psi)	75–105 (11–15)
Coolant concentration	%	30–60
<b>Limit</b>		
Opening pressure of radiator cap high pressure valve	kPa (psi)	65 (9.2)

## TORQUE SPECIFICATIONS

Nm (ft.lbs.)

Shroud to radiator	11–14 (8–10)
Thermosensor	14–16 (10–12)
Alternator support bolt nut	20–24 (15–18)
Alternator brace bolt	12–14 (9–10)
Water pump to timing chain case	12–14.5 (9–10.5)
Water temperature gauge unit	30–39 (22–28)
Water temperature sensor	30–39 (22–28)
Engine oil cooler eye bolt	30–35 (22–25)
Automatic transmission oil cooler eye bolt	30–50 (22–36)
Intercooler bracket to body	30–42 (22–30)
Intercooler to intercooler bracket	18–25 (13–18)
Air pipe A and B to body	12–15 (9–11)
Air hoses to air pipes clamp	3–5 (2–4)



## TROUBLESHOOTING

Symptom	Probable cause	Remedy
Low coolant level	Leakage of coolant Radiator Heater or radiator hose Thermostat housing Water pump	Repair or replace Tighten clamps or replace Replace gasket or housing Replace gasket or housing
	Faulty radiator cap	Replace
Clogged radiator	Foreign material in coolant	Replace coolant
Abnormally high coolant temperature	Faulty thermostat Faulty radiator cap	Replace
	Restriction to flow in cooling system	Clear restriction or replace
	Loose or missing drive belt	Adjust or replace
	Faulty water pump	Replace
	Faulty temperature gauge or wiring	Repair or replace
Abnormally low coolant temperature	Faulty thermostat	Replace
	Faulty temperature gauge or wiring	Repair or replace
Leakage from oil cooling system	Loose connections	Retighten
	Cracked or damaged Hoses Pipes Oil cooler	Replace
Fan motor does not operate when coolant temperature is high	Burnt-out fusible link	Replace the fusible link and isolate cause
	Break in harness, or poor connection	Correct or replace the harness
	Malfunctioning relay	Replace the relay
	Malfunctioning motor	Replace the motor
	Malfunctioning thermosensor	Replace the thermosensor
Fan motor operates when coolant temperature is low	Malfunctioning thermosensor	Replace the thermosensor
	Short-circuit to body in harness	Correct or replace the harness
	Malfunctioning relay	Replace the relay



**COOLANT LEAK CHECK**

1. Loosen radiator cap.
2. Confirm that the coolant level is up to the filler neck.
3. Install a radiator cap tester to the radiator filler neck and apply 150 kPa (21 psi) pressure. Hold for two minutes in that condition, while checking for leakage from the radiator, hose or connections. (Y04505)

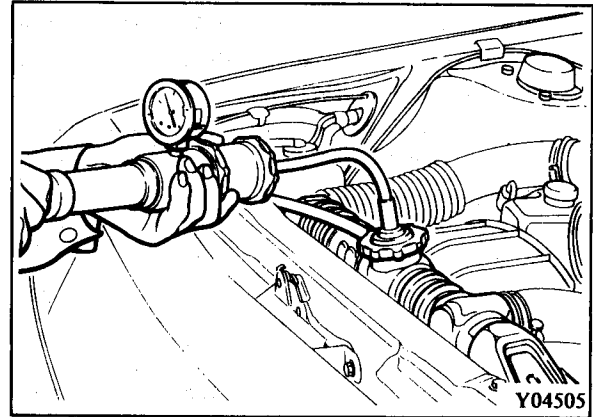
**Caution**

Be sure to completely clean away any moisture from the places checked.

When the tester is removed, be careful not to spill any coolant from it.

Be careful, when installing and removing the tester and when testing, not to deform the filler neck of the radiator.

4. If there is leakage, repair or replace the appropriate part.



**RADIATOR CAP PRESSURE TEST**

1. Use an adapter to attach the cap to the tester.
2. Increase the pressure until the indicator of the gauge stops moving. (04D008)

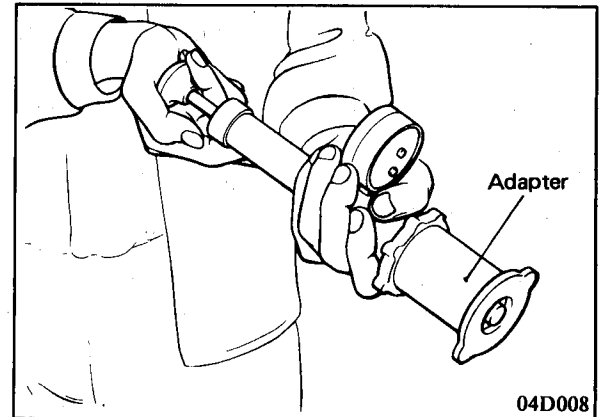
**High pressure valve opening pressure**

[Limit]	.....	65 kPa (9.2 psi)
[Standard value]	.....	75–105 kPa (11–15 psi)

3. Check that the pressure level is maintained at or above the limit.
4. Replace the radiator cap if the reading does not remain at or above the limit.

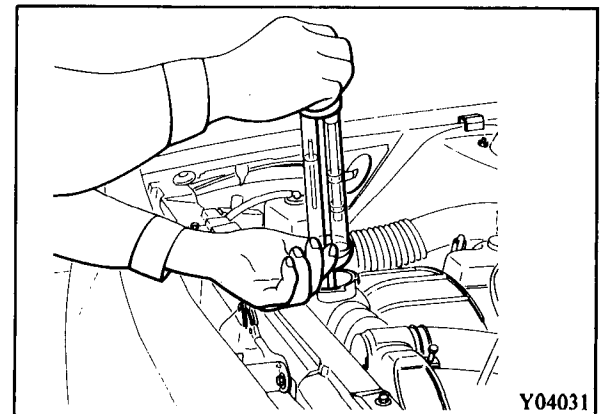
**NOTE**

Be sure that the cap is clean before testing, since rust or other foreign material on the cap seal will cause an improper indication.



**SPECIFIC GRAVITY TEST**

1. Measure the specific gravity of the coolant with a hydrometer. (Y04031)
2. Measure the coolant temperature, and calculate the concentration from the relation between the specific gravity and temperature, using the following table for reference.





## SERVICE ADJUSTMENT PROCEDURES

### Relation Between Coolant Concentration and Specific Gravity

The following table is applicable only to the specified coolant, HIGH QUALITY ETHYLENE GLYCOL (ANTIFREEZE) COOLANT.

Coolant temperature °C (°F) and specific gravity					Freezing temperature °C (°F)	Safe operating temperature °C (°F)	Coolant concentration (Specific volume)
10 (50)	20 (68)	30 (86)	40 (104)	50 (122)			
1.054	1.050	1.046	1.042	1.036	-16 (3.2)	-11 (12.2)	30 %
1.063	1.058	1.054	1.049	1.044	-20 (-4)	-15 (5)	35 %
1.071	1.067	1.062	1.057	1.052	-25 (-13)	-20 (-4)	40 %
1.079	1.074	1.069	1.064	1.058	-30 (-22)	-25 (-13)	45 %
1.087	1.082	1.076	1.070	1.064	-36 (-32.8)	-31 (-23.8)	50 %
1.095	1.090	1.084	1.077	1.070	-42 (-44)	-37 (-35)	55 %
1.103	1.098	1.092	1.084	1.076	-50 (-58)	-45 (-49)	60 %

#### Example:

The safe operating temperature is  $-15^{\circ}\text{C}$  ( $5^{\circ}\text{F}$ ) when the measured specific gravity is 1.058 at the coolant temperature of  $20^{\circ}\text{C}$  ( $68^{\circ}\text{F}$ ).

### Recommended Coolant

Antifreeze	Allowable concentration [Standard value]
HIGH QUALITY ETHYLENE GLYCOL (ANTIFREEZE) COOLANT	30 – 60%

### Caution

If the concentration of the coolant is below 30%, the anti-corrosion property will be adversely affected. In addition, if the concentration is above 60%, both the anti-freeze and engine cooling properties will decrease, affecting the engine adversely. For these reasons, be sure to maintain the concentration level within the specified range.



**DRIVE BELT DEFLECTION CHECK AND ADJUSTMENT**

1. Depress the belt at a midway between water pump pulley and alternator pulley with a force of 100 N (22 lbs.).
2. Measure the belt deflection while depressing for belt tension.
3. If the deflection is not within the specification, adjust as follows:

---

Drive belt deflection ..... 7–10 mm (1/4–3/8 in.)

---

4. Loosen nut of alternator support bolt “A” and brace bolt “B”.
5. Move alternator in direction of arrow “T” to tension belt to specifications.
6. Tighten first bolt “B” and then tighten bolt “A” to specified torque.

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**Tightening torque**

Alternator brace bolt (bolt B) .....  
 12 – 14 Nm (9 – 10 ft.lbs.)

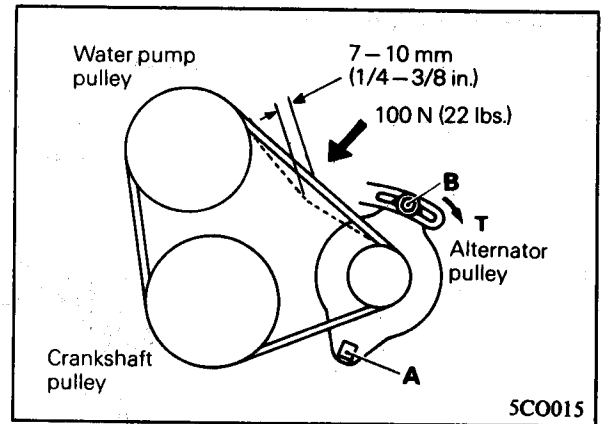
Alternator support bolt nut (bolt A) .....  
 20 – 24 Nm (15 – 18 ft.lbs.)

---

**Caution**

An overtensioned belt could cause not only premature belt wear but also noise and damage to water pump bearing and alternator bearing.

A loose belt also could cause failure of the alternator to generate enough power and consequently a rundown battery.

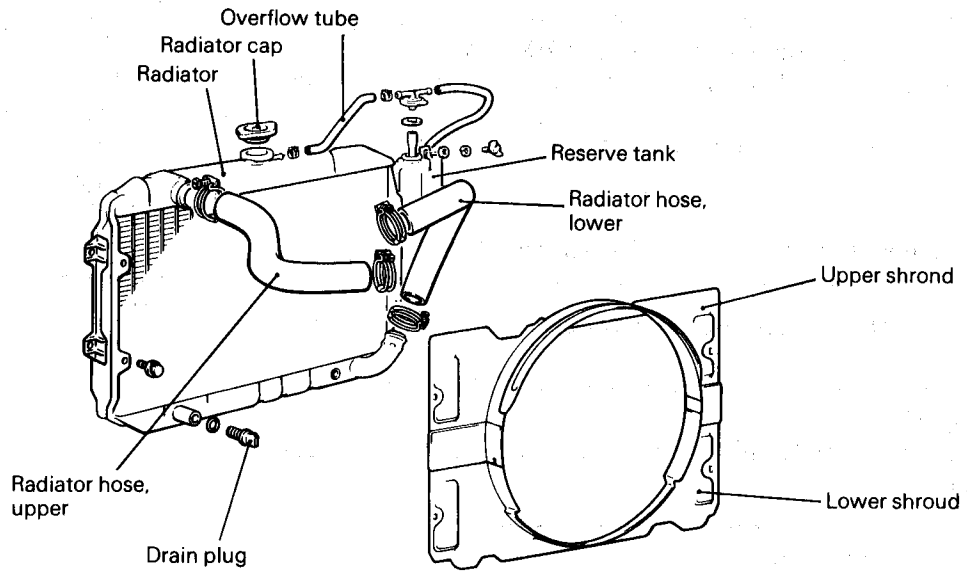




# COMPONENT SERVICE – RADIATOR

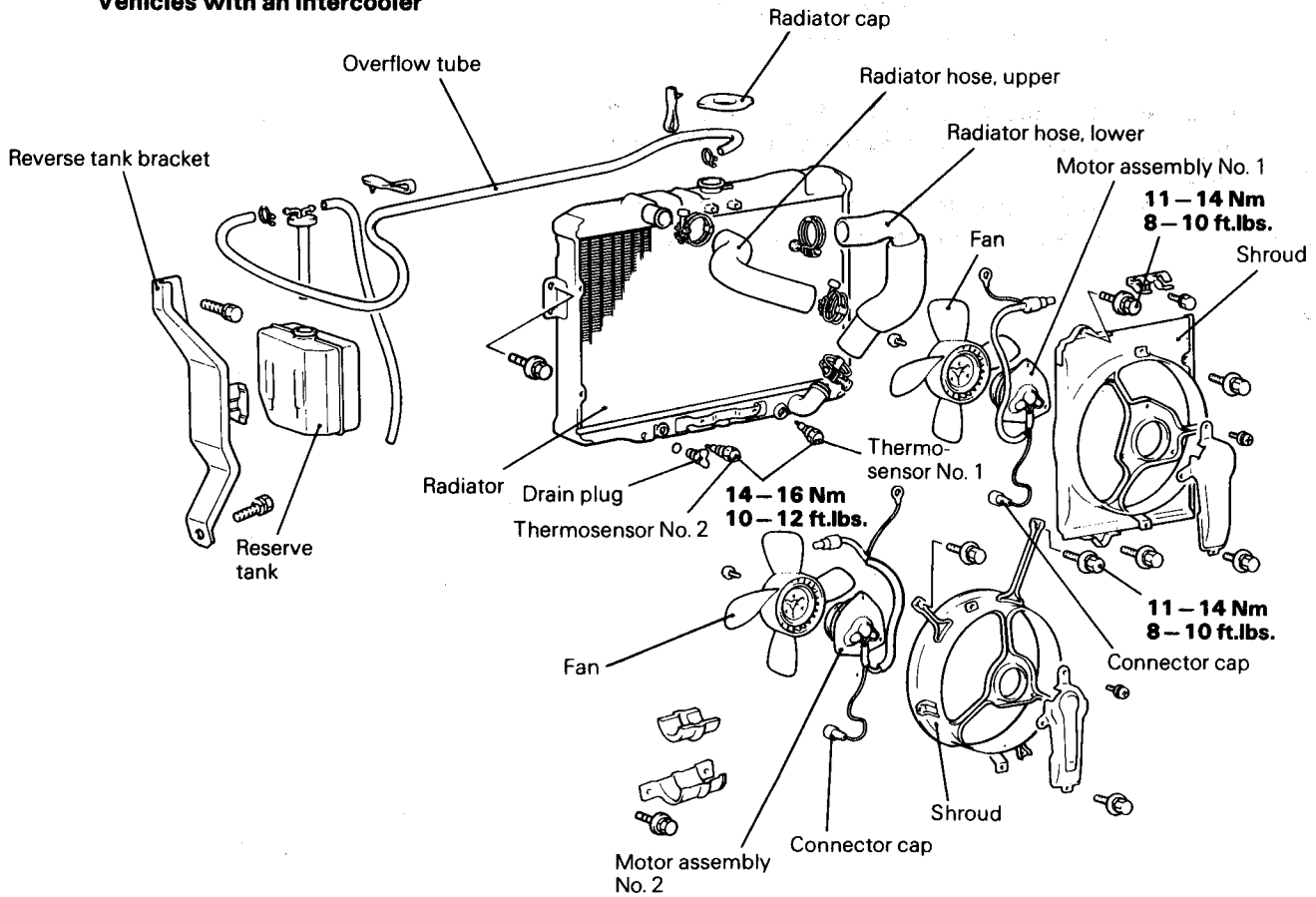
## COMPONENTS

### Vehicles without an intercooler



04Y626

### Vehicles with an intercooler



04Y646



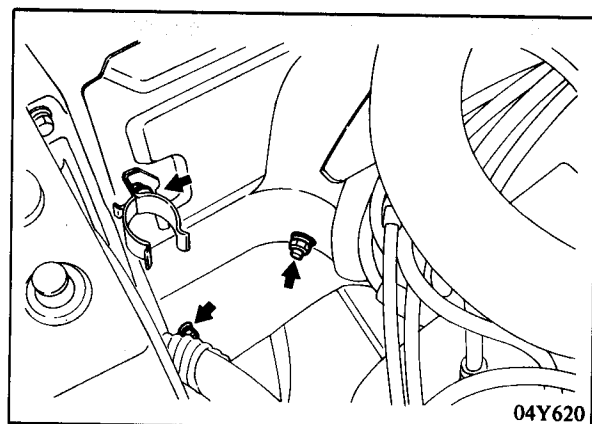


**REMOVAL**

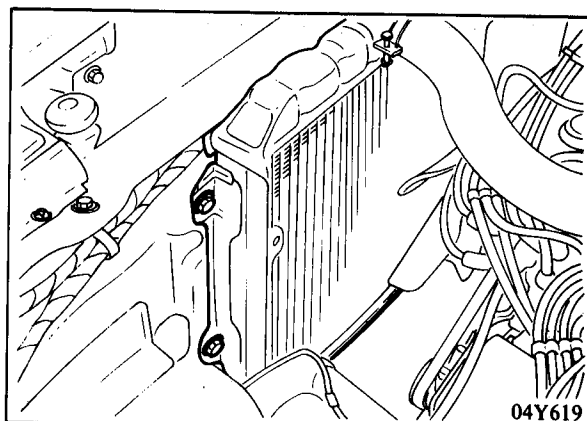
**Radiator**

**VEHICLES WITHOUT AN INTERCOOLER**

1. Remove the battery.
2. Set the warm water flow control lever to the hot position.
3. Loosen the radiator drain plug to drain coolant.
4. Disconnect the upper and lower hoses.
5. Remove the upper and lower shrouds. (04Y620)

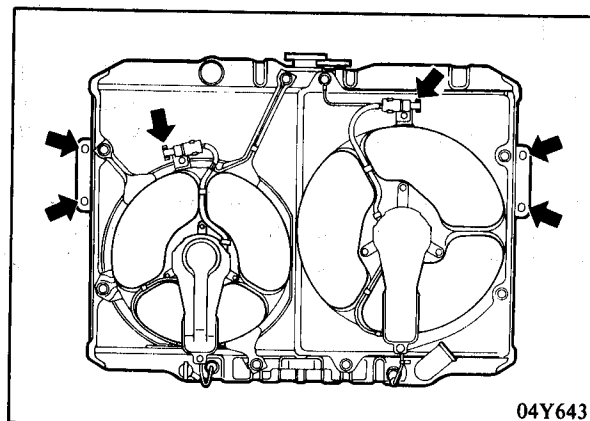


6. Remove the radiator mounting bolts. (04Y619)
7. Remove the radiator.



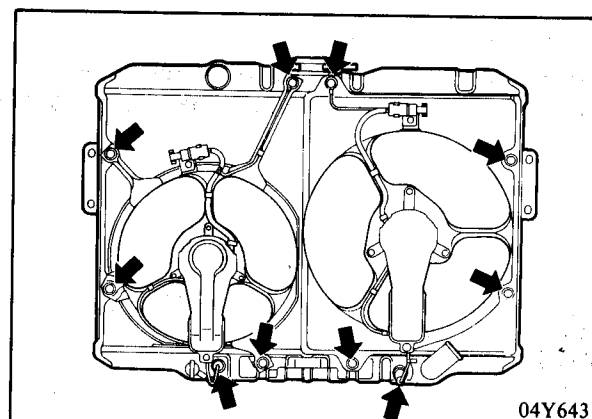
**VEHICLES WITH AN INTERCOOLER**

1. Disconnect the radiator fan motor connectors.
2. Set the warm flow control lever to the hot position.
3. Loosen the radiator drain plug to drain coolant.
4. Disconnect the upper and lower hoses.
5. Remove the radiator mounting bolts.
6. Remove the radiator together with the radiator fan motor assembly.



**Radiator Fan Motor**

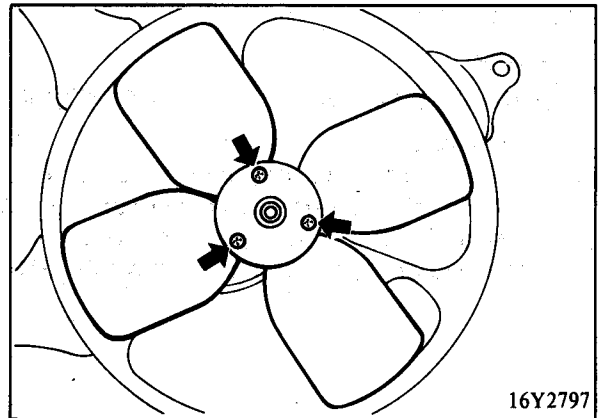
1. Disconnect the thermosensor and radiator fan motor connectors, remove the shroud mounting bolts, then remove the radiator fan motor from the radiator.



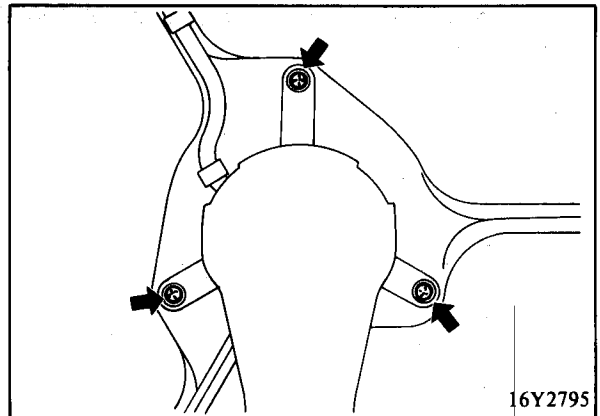


## COMPONENT SERVICE – RADIATOR

2. Separate the fan from the fan motor.



3. Remove the motor from the shroud.

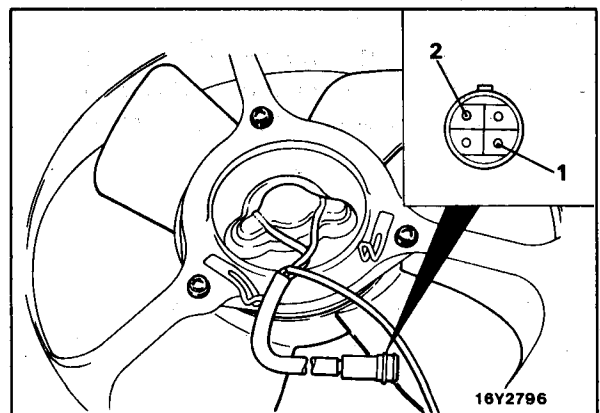


### INSPECTION

1. Check radiator fins for bend, breakage or plugging.
2. Check radiator for corrosion, damage, rust and scale.
3. Check radiator hoses for cracks, damage and deterioration.
4. Check reserve tank for damage.
5. Check radiator cap spring for damage.
6. Check radiator cap seal for cracks or damage.

### Radiator Fan Motor

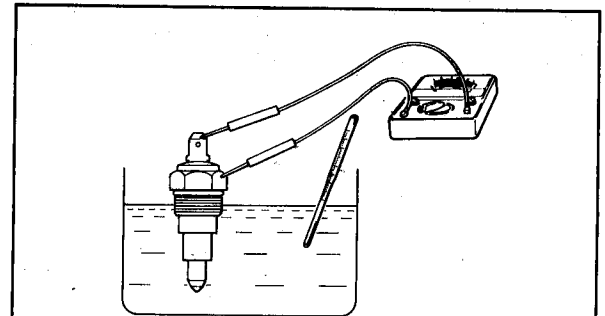
Apply the battery voltage to the terminal "1" and ground the terminal "2", then make sure that the motor turns smoothly.





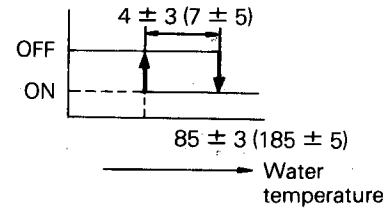
**Thermosensor**

Check for continuity with the thermosensor in hot water.

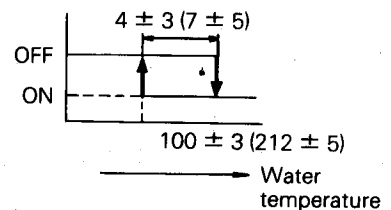


16U0328

Thermosensor No. 1



Thermosensor No. 2



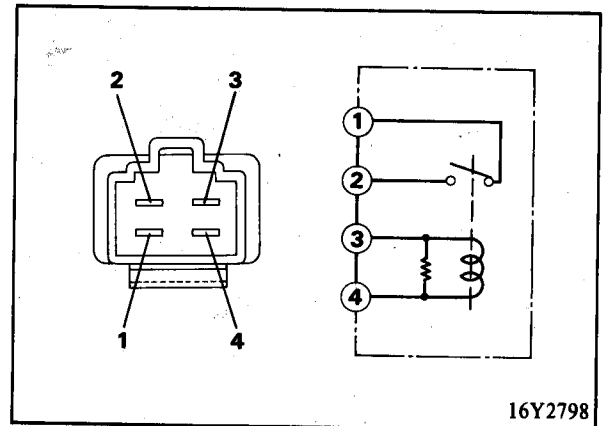
16Y1190

16Y1190

**Radiator Fan Motor Relay**

Check for continuity between the terminals while power is being supplied and while it is not.

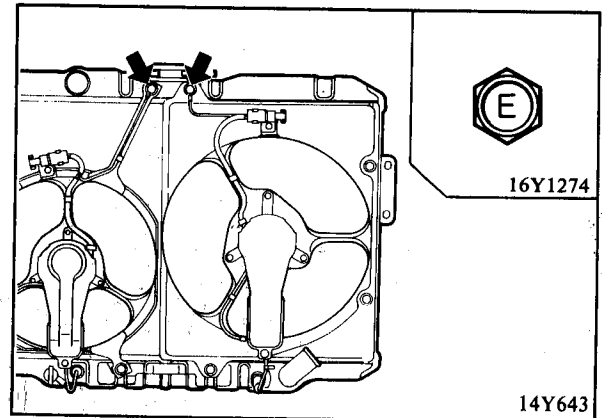
- 
- While power is not supplied:
- Between terminals 1 – 2 ..... no continuity
  - Between terminals 3 – 4 ..... continuity
- While power is supplied [Between 3 (positive) – 4]:
- Between terminals 1 – 2 ..... continuity
- 



16Y2798

**INSTALLATION**

1. On vehicles with an intercooler, when installing the shroud to the radiator, be sure to tighten the ground wire with the bolt which serves also for mounting the shroud. Connect the thermosensor to the connector and install the cap on the thermosensor to project it from water.
2. Fill the radiator and reserve tank with clean coolant.
3. Run the engine until the coolant has warmed up enough so that the thermostat valve opens, and then stop the engine.
4. Remove the radiator cap, pour in the coolant until it is up to the filler neck of the radiator, and then fill the reserve tank to the upper level.
5. Check to be sure that there is no leakage from the radiator, hose or connections. (Refer to P. 7-6.)



16Y1274

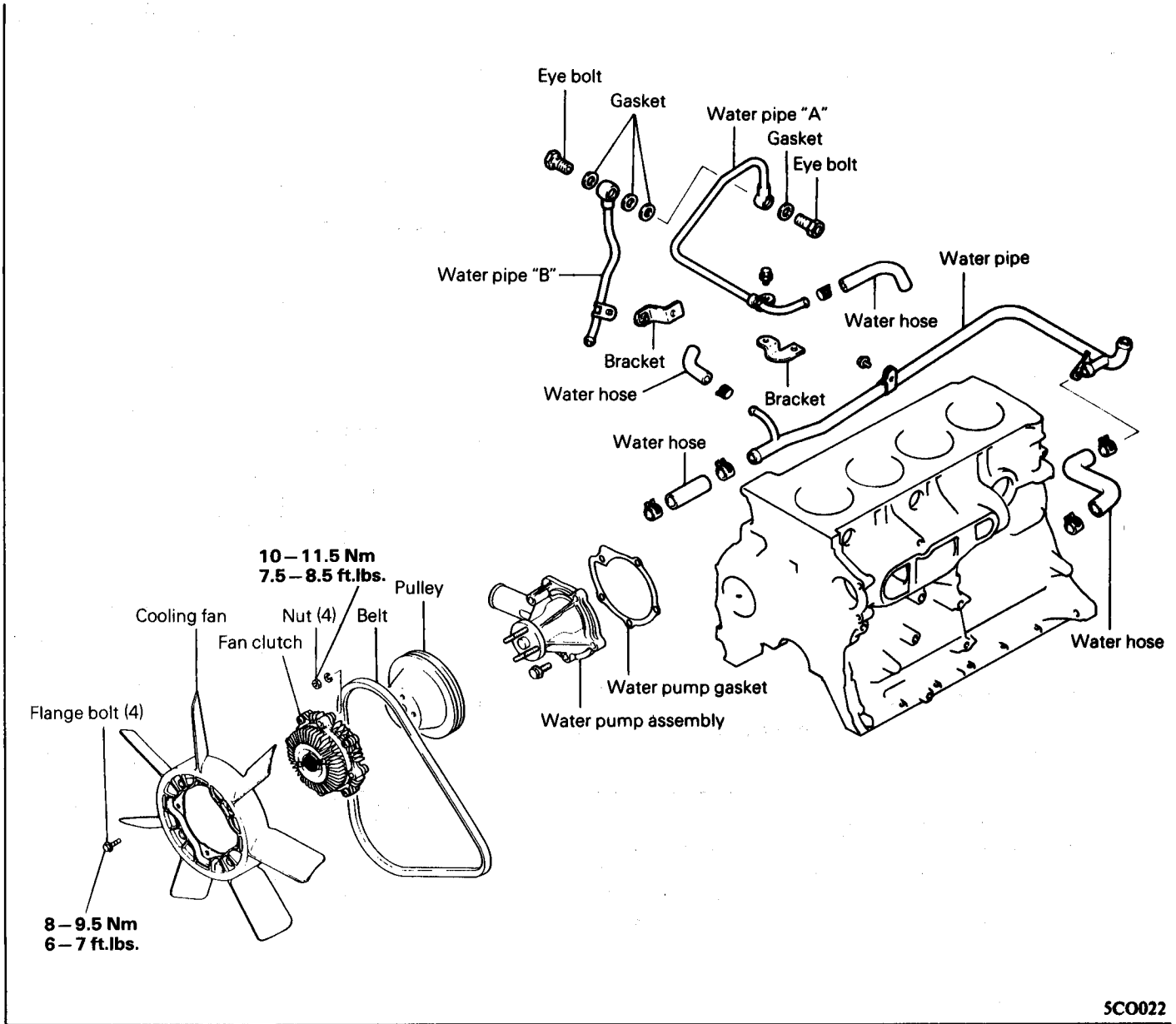
14Y643



# COMPONENT SERVICE — FAN, FAN CLUTCH AND BELT

## COMPONENTS

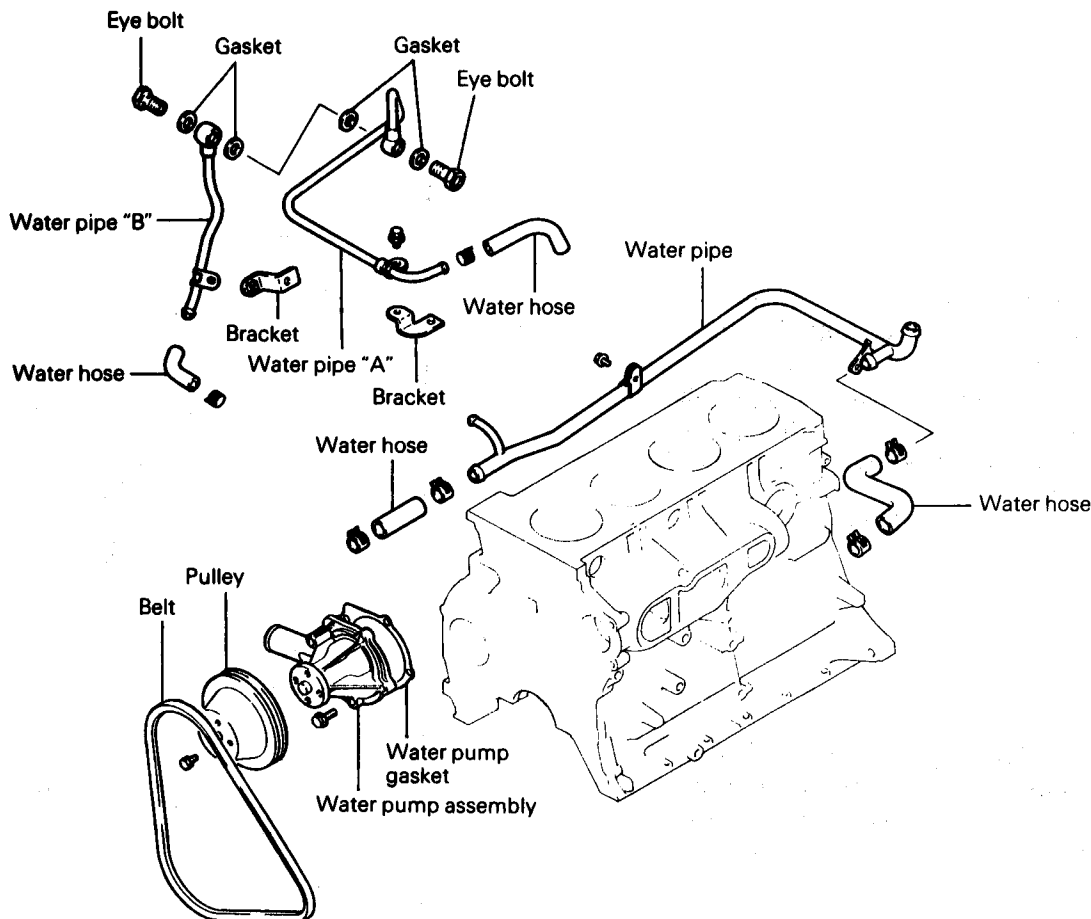
Vehicles without an Intercooler



5C0022



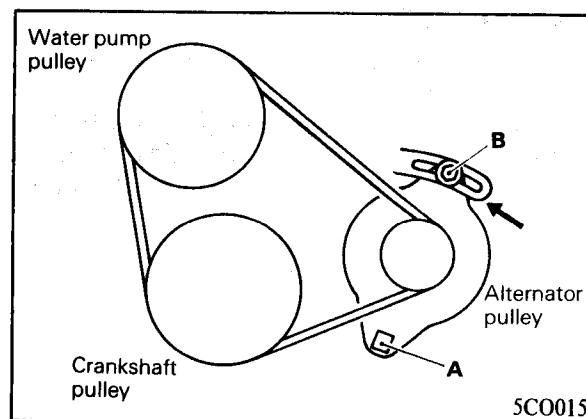
Vehicles with an Intercooler



5C0021

**REMOVAL**

1. Loosen the alternator support bolt "A" nut and the brace bolt "B".
2. Push the brace side of alternator to relieve belt tension, and remove the belt.
3. Remove the cooling fan.
4. Remove the fan clutch mounting nut, and remove the fan clutch and water pump pulley.



5C0015

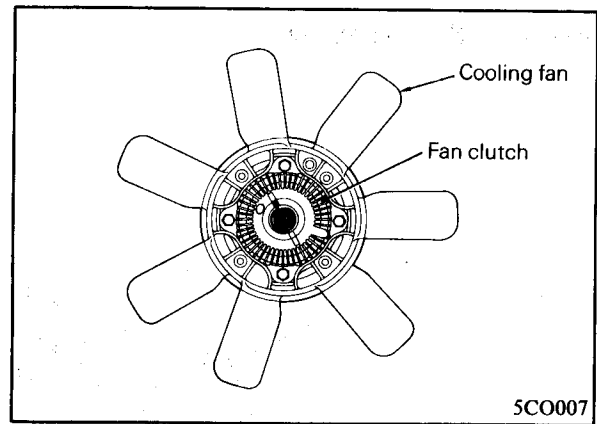


### INSPECTION

#### Cooling Fan

Check following items and replace if defective.

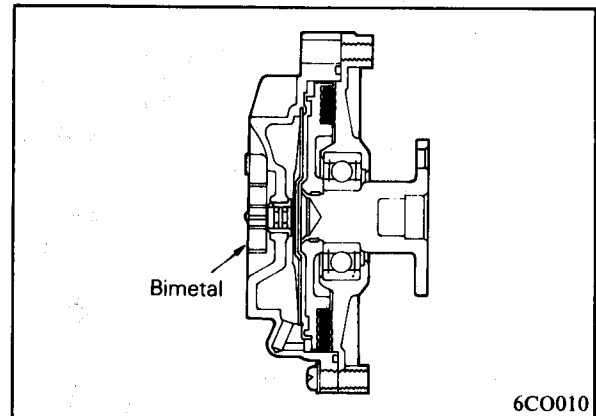
1. Check blades for damage and cracks.
2. Check bolt holes or their vicinity in fan hub for cracks and damage.



#### Fan Clutch

Check following items and replace if defective.

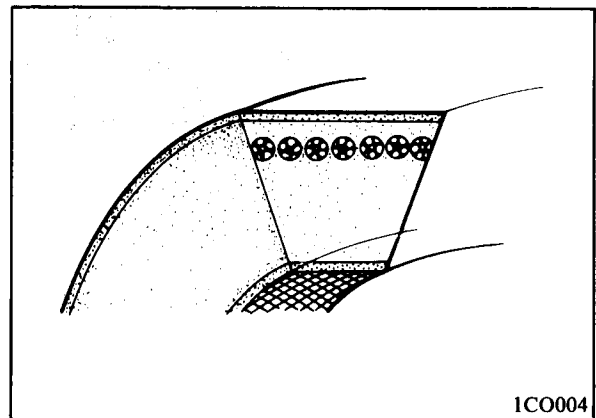
1. Check fan clutch for fluid leaks from case joint and seals. If fluid quantity decreases due to leakage, fan speed will decrease and engine overheating might result.
2. When a fan attached to an engine is turned by hand, it should give a sense of some resistance. If fan turns lightly, it is defective.
3. Check bimetal strip for damage.



#### Belt

Check following items and replace if defective.

1. Check surface for damage, peeling or cracks.
2. Check surface for presence of oil or grease.
3. Check rubber for wear or hardening.



### INSTALLATION

1. Install the water pump pulley and fan clutch and tighten the nuts firmly.
2. Install the cooling fan and tighten the bolts firmly.
3. Install the belt. After installing belt, adjust the belt tension. See "Service Adjustment Procedure".



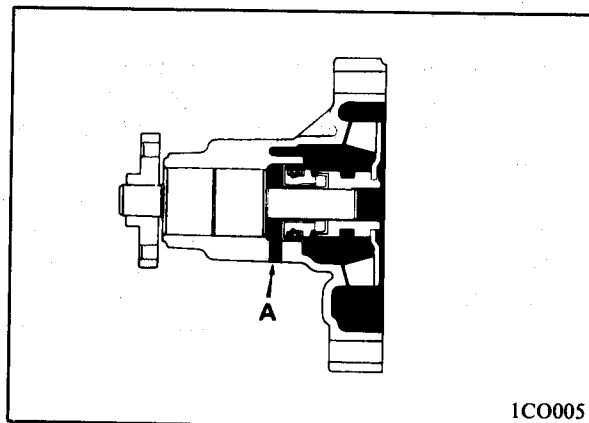
**REMOVAL**

1. Drain the cooling system.
2. Remove the fan, fan clutch and pulley. See “Fan, Fan Clutch and Belt”.
3. Remove the water pump and gasket from the chain case.

**INSPECTION**

Check the following items and replace if defective.

1. Check pump for water leakage. If water leaks from hole “A”, seal unit is defective. Replace as an assembly.
2. Check bearing for noise or roughness.



**INSTALLATION**

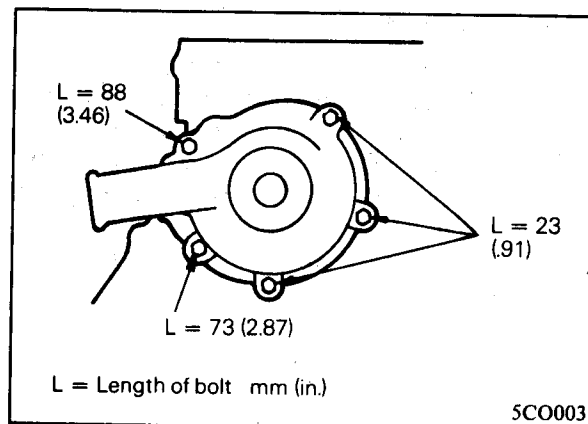
1. Clean gasket surfaces of water pump body and chain case.
2. Install the new water pump gasket and water pump assembly to the chain case, and then tighten the bolts to the specified torque.

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Water pump to chain case torque .....  
 12 – 14.5 Nm (9 – 10.5 ft.lbs.)

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3. Install the water pump pulley, fan clutch, cooling fan and drive belt, and then adjust the belt tension.
4. Refill cooling system.
5. Run the engine and check for leaks.





## REMOVAL

1. Drain cooling system down to thermostat level or below.
2. Remove the outlet fitting and gasket.
3. Remove the thermostat.

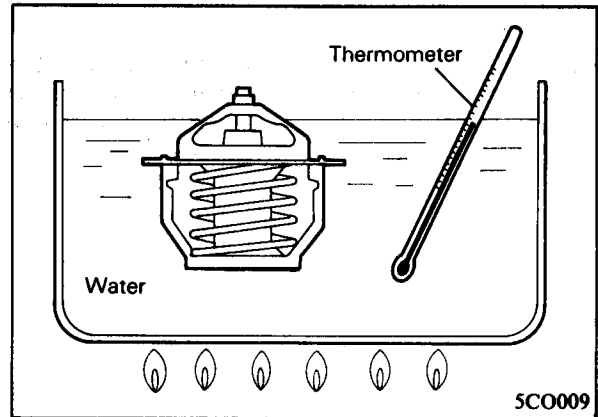
## INSPECTION

1. Heat thermostat as shown in illustration.
2. Check to see if valve operates properly.
3. Check to determine temperature at which valve begins to open.

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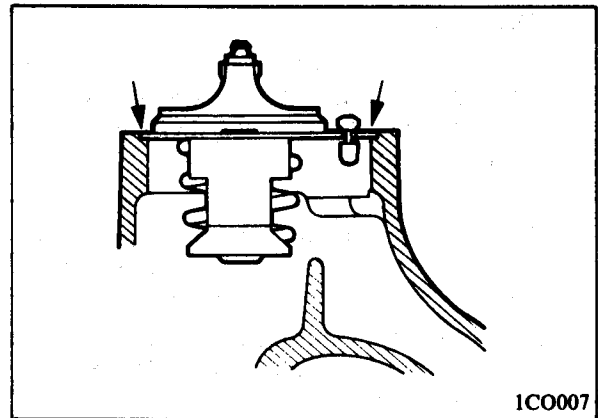
Valve opening temperature .....	88°C (190°F)
Full opening temperature .....	100°C (212°F)
Valve lift (at full open) .....	8 mm (.31 in.) or more

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## INSTALLATION

1. Install thermostat to thermostat housing of intake manifold, and check to ensure that flange of thermostat is correctly seated in socket of thermostat housing. If thermostat is installed in wrong direction, bottom of thermostat will touch rib inside inlet manifold, making it impossible to seat flange in position. (1CO007)
2. Install new gasket and water outlet fitting.
3. Refill cooling system.







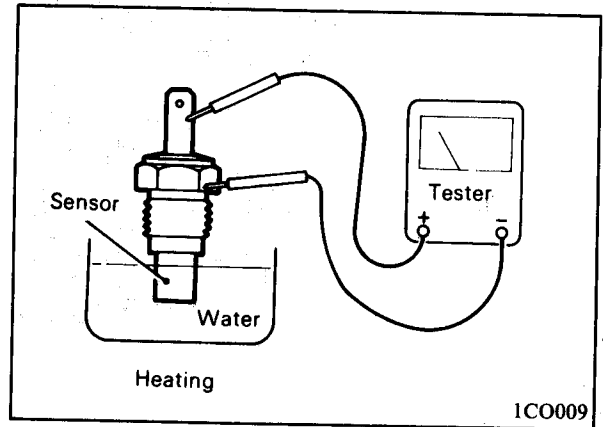
**REMOVAL**

1. Drain cooling system down to gauge unit level or below.
2. Disconnect the battery ground cable and disconnect harness from the gauge unit.
3. Remove the water temperature gauge unit from the intake manifold.

**INSPECTION**

1. Submerge sensor element in water and heat water.
2. Hook an ohmmeter to sensor terminal and ground as illustrated.
3. Observe the fall in resistance as the temperature increases.

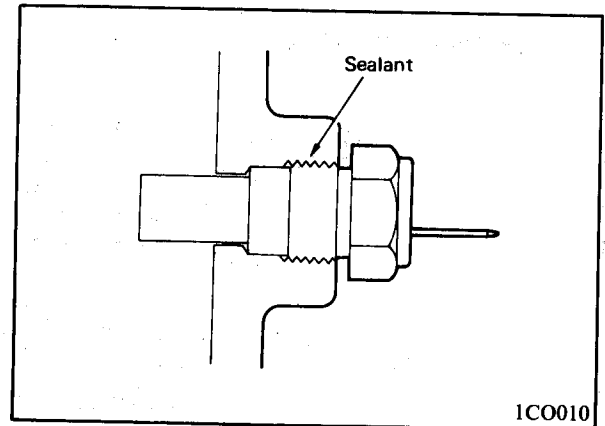
Indication point	Resistance value
70°C (158°F)	104 Ω
100°C (212°F)	38 Ω



**INSTALLATION**

Apply sealant to threaded portion and tighten to specified torque.

Water temperature gauge unit torque .....  
 30 – 39 Nm (22 – 28 ft.lbs.)

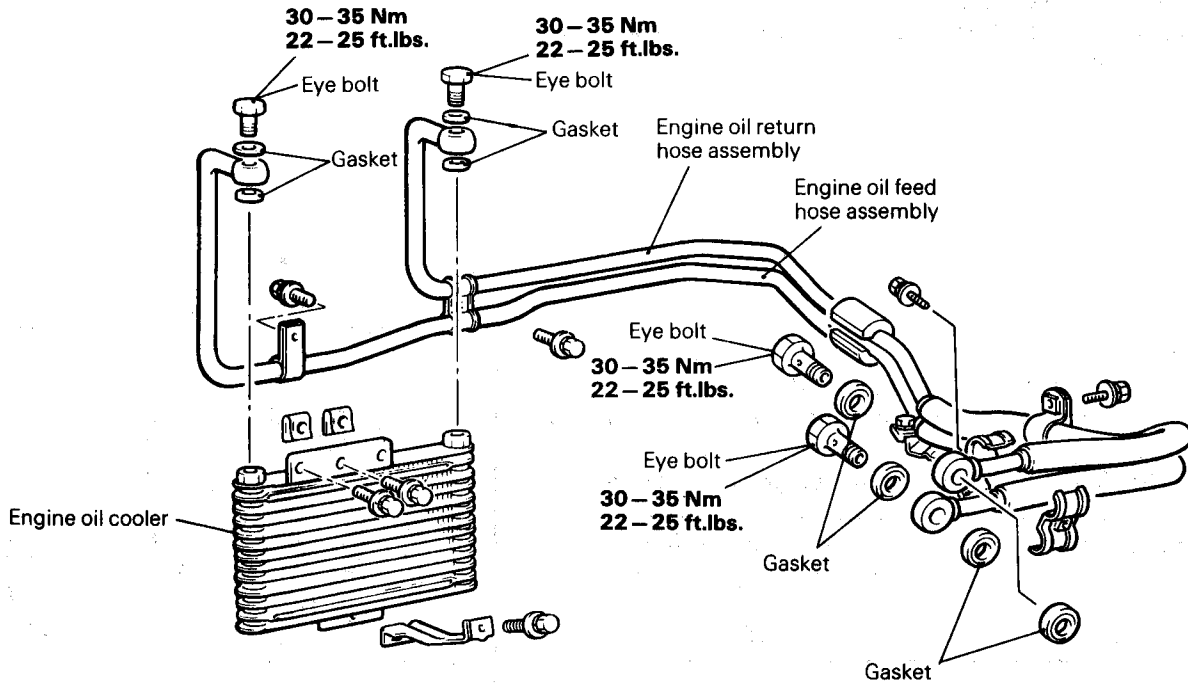




# COMPONENT SERVICE — ENGINE OIL COOLER

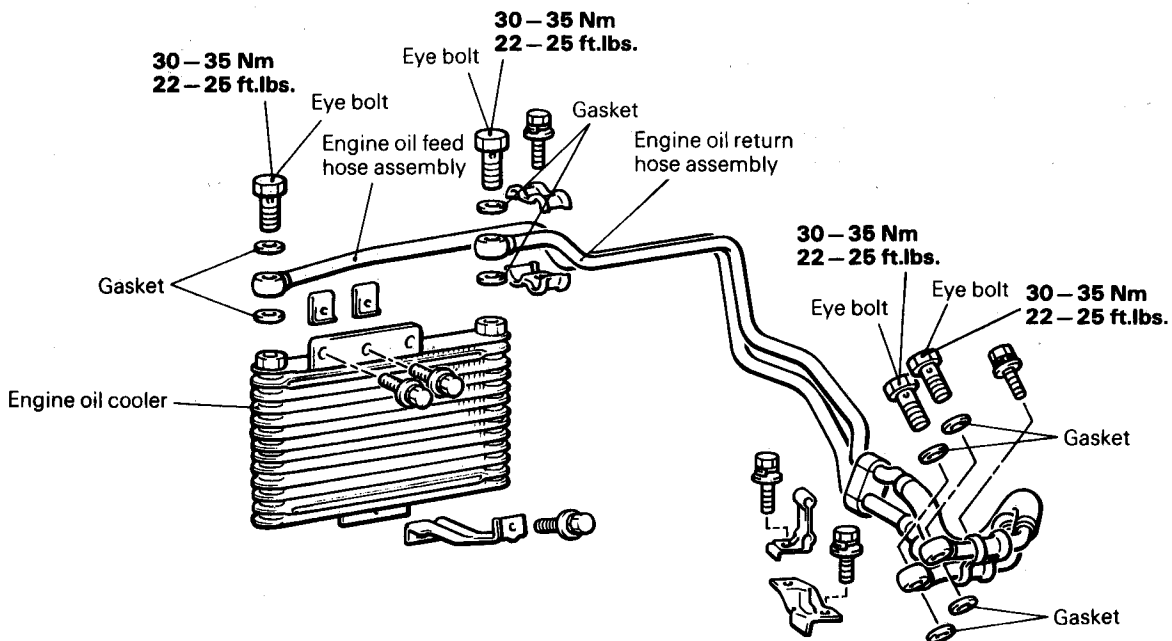
## COMPONENTS

### Vehicles without an intercooler



04Y630

### Vehicles with an intercooler



04Y642



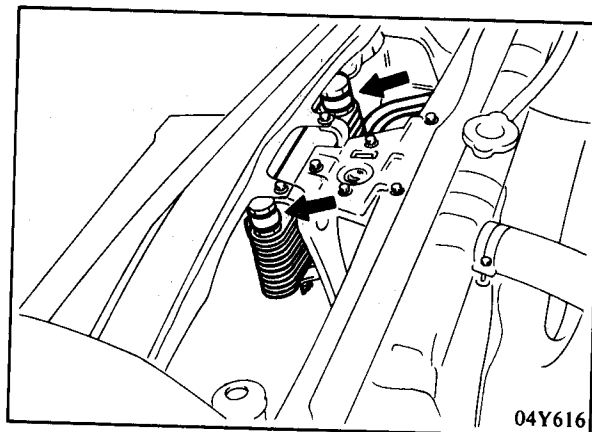
## REMOVAL

1. Remove the eye bolts and disconnect the oil cooler hoses from the oil cooler. (04Y616)

### Caution

Loosen the eye bolt while holding the weld nut of the oil cooler.

2. Remove the oil cooler mounting bolts, and then remove the oil cooler downward.



## INSPECTION

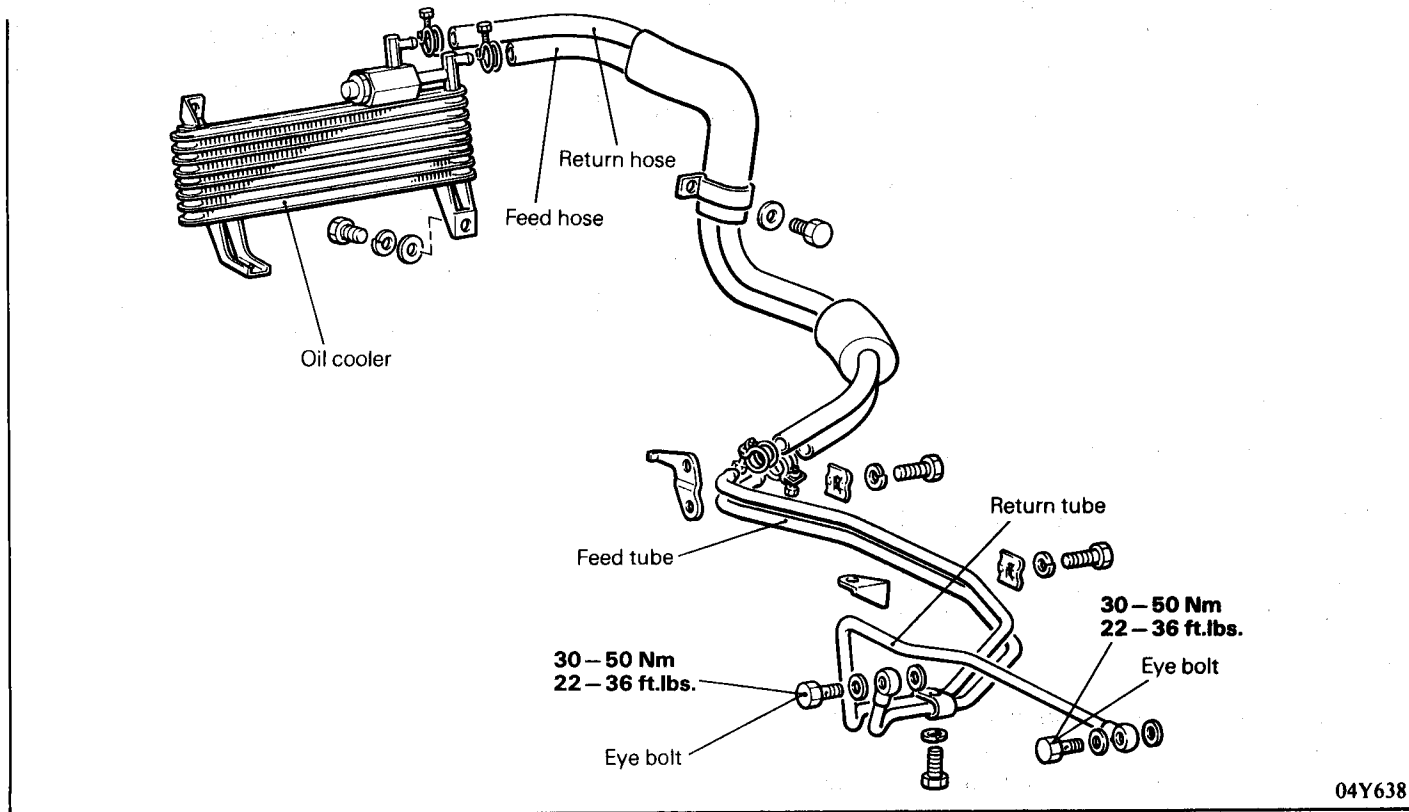
1. Check for foreign material between oil cooler fins or for bending and damage of oil cooler fins.
2. Check oil cooler tubes for cracks, damage, clogging or deterioration.
3. Check gaskets for damage or deformation.
4. Check eye bolts for clogging or deformation.

## INSTALLATION

1. After installing the oil cooler and hoses, start the engine and bleed the air out of the oil cooler.
2. Confirm that the engine oil is at the proper level.



## COMPONENTS

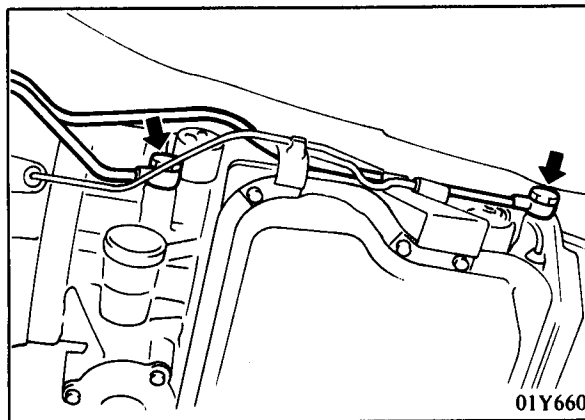


## REMOVAL

1. Remove the eye bolts and disconnect the oil cooler hoses from the transmission. (01Y660)
2. Remove each clamp and disconnect the tubes and hoses.

### Caution

**Plug the ends of the oil cooler hoses and the oil cooler and transmission ports to prevent the transmission fluid from spilling out and foreign material from getting in.**



## INSPECTION

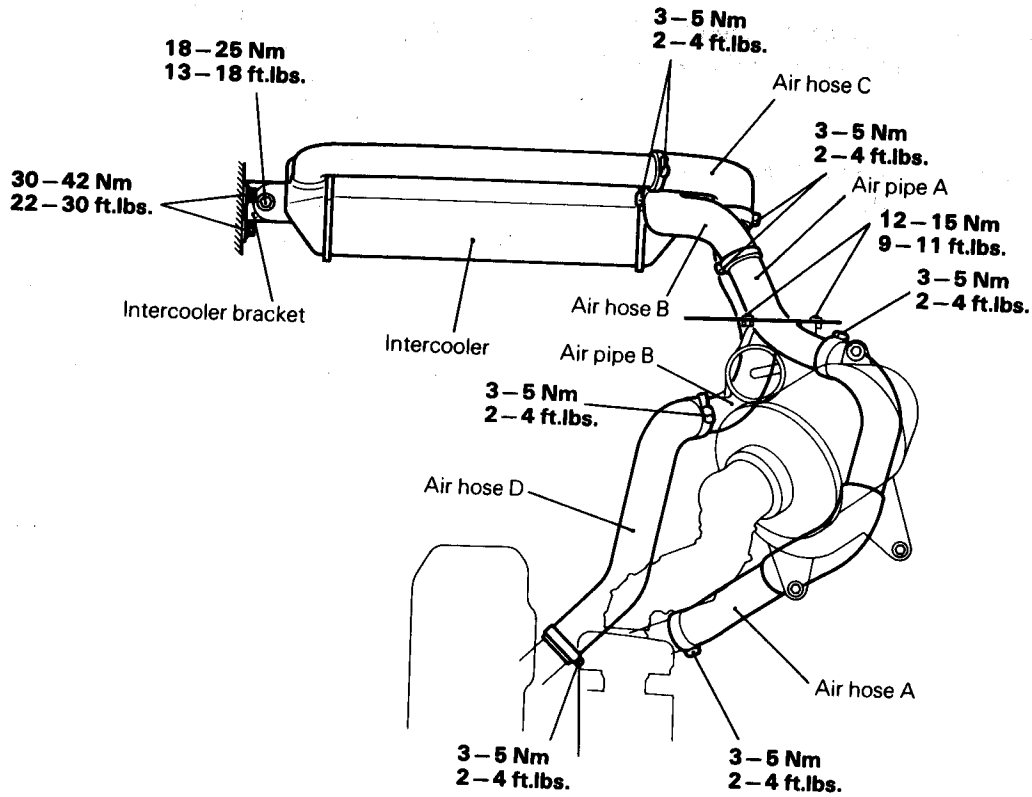
1. Check oil cooler hoses for cracks, damage and deterioration.
2. Check pad for damage and deterioration.
3. Check oil cooler for foreign material.

## INSTALLATION

Refill with automatic transmission fluid to the specified level.



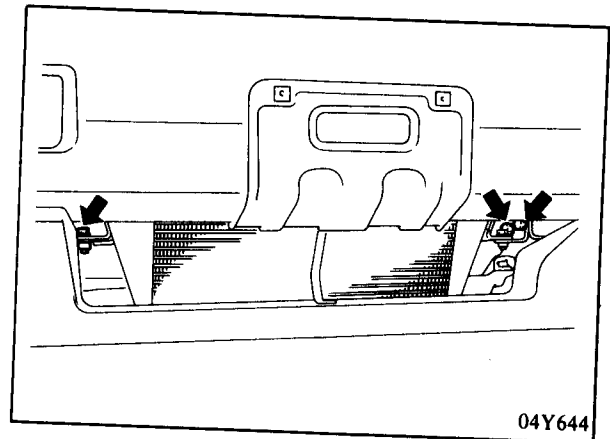
## COMPONENTS



14Y641

## REMOVAL

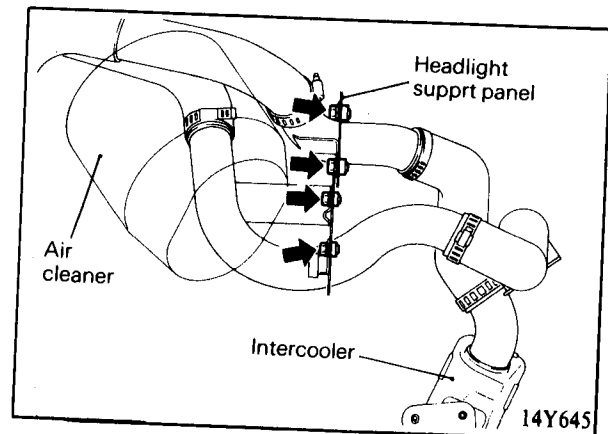
1. Remove the air guide panel and header panel.
2. Disconnect air hoses A, B, C and D.
3. Remove the bolt securing intercooler bracket to vehicle body (left side) and the bolt securing intercooler to its bracket (right side) and remove the intercooler from below.
4. Remove the air pipe A and air pipe B attaching bolts.



04Y644

## INSPECTION

1. Check the intercooler fins for bending, damage, or foreign matter.
2. Check the intercooler hoses for cracking, damage, or deterioration.



14Y645



## COMPONENT SERVICE — INTERCOOLER

### INSTALLATION

Connect the air hoses and air pipes by aligning the paint marks on the hoses with the projections and indentations on the pipes.

#### Caution

Be careful not to allow any foreign matter to get into the hoses, pipes, or the intercooler itself.

