
SECTION 1D

ENGINE COOLING

CAUTION: *Disconnect the negative battery cable before removing or installing any electrical unit or when a tool or equipment could easily come in contact with exposed electrical terminals. Disconnecting this cable will help prevent personal injury and damage to the vehicle. The ignition must also be in LOCK unless otherwise noted.*

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DESCRIPTION AND OPERATION

GENERAL DESCRIPTION

The cooling system maintains the engine temperature at an efficient level during all engine operating conditions. When the engine is cold, the cooling system cools the engine slowly or not at all. This slow cooling of the engine allows the engine to warm up quickly.

The cooling system includes a radiator and recovery subsystem, cooling fans, a thermostat and housing, a water pump, and a water pump drive belt. The timing belt drives the water pump.

All components must function properly for the cooling system to operation. The water pump draws the coolant from the radiator. The coolant then circulates through water jackets in the engine block, the intake manifold, and the cylinder head. When the coolant reaches the operating temperature of the thermostat, the thermostat opens. The coolant then goes back to the radiator where it cools.

This system directs some coolant through the hoses to the heat core. This provides for heating and defrosting. The coolant reservoir is connected to the radiator to recover the coolant displaced by expansion from the high temperatures. The coolant reservoir maintains the correct coolant level.

The cooling system for this vehicle has no radiator cap or filler neck. The coolant is added to the cooling system through the coolant reservoir.

RADIATOR

This vehicle has a lightweight tube-and-fin aluminum radiator. Plastic tanks are mounted on the upper and the lower sides of the radiator core.

On vehicles equipped with automatic transaxles, the transaxle fluid cooler lines run through the radiator tank. A radiator drain plug is on this radiator.

To drain the cooling system, open the drain plug.

COOLANT RESERVOIR

The coolant reservoir is a transparent plastic reservoir, similar to the windshield washer reservoir.

The coolant reservoir is connected to the radiator by a hose and to the engine cooling system by another hose. As the vehicle is driven, the engine coolant heats and expands. The portion of the engine coolant displaced by this expansion flows from the radiator and the engine into the coolant reservoir. The air trapped in the radiator and the engine is degassed into the coolant reservoir.

When the engine stops, the engine coolant cools and contracts. The displaced engine coolant is then drawn back into the radiator and the engine. This keeps the radiator filled with the coolant to the desired level at all times and increases the cooling efficiency.

Maintain the coolant level between the MIN and MAX marks on the coolant reservoir when the system is cold.

WATER PUMP

The belt-driven centrifugal water pump consists of an impeller, a drive shaft, and a belt pulley.

The impeller is supported by a completely sealed bearing.

The water pump is serviced as an assembly and, therefore, cannot be disassembled.

THERMOSTAT

A wax pellet-type thermostat controls the flow of the engine coolant through the engine cooling system. The thermostat is mounted in the thermostat housing to the front of the cylinder head.

The thermostat stops the flow of the engine coolant from the engine to the radiator to provide faster warm-up, and to regulate the coolant temperature. The thermostat remains closed while the engine coolant is cold, preventing circulation of the engine coolant through the radiator. At this point, the engine coolant is allowed to circulate only throughout the heater core to warm it quickly and evenly.

As the engine warms, the thermostat opens. This allows the engine coolant to flow through the radiator where the heat is dissipated. This opening and closing of the thermostat permits enough engine coolant to enter the radiator to keep the engine within proper engine temperature operating limits.

The wax pellet in the thermostat is hermetically sealed in a metal case. The wax element of the thermostat expands when it is heated and contracts when it is cooled.

As the vehicle is driven and the engine warms, the engine coolant temperature increases. When the engine coolant reaches a specified temperature, the wax pellet element in the thermostat expands and exerts pressure against the metal case, forcing the valve open. This allows the engine coolant to flow through the engine cooling system and cool the engine.

As the wax pellet cools, the contraction allows a spring to close the valve.

The thermostat begins to open at 82 °C (180 °F) and is fully open at 95 °C (203 °F). The thermostat closes at 80 °C (176 °F).

ELECTRIC COOLING FAN

Caution: *Keep hands, tools, and clothing away from the engine cooling fans to help prevent personal injury. This fan is electric and can turn on even when the engine is not running.*

Caution: *If a fan blade is bent or damaged in any way, no attempt should be made to repair or reuse the damaged part. A bent or damaged fan assembly should always be replaced with a new one to prevent possible injury.*

The cooling fans are mounted behind the radiator in the engine compartment. The electric cooling fans increase the flow of air across the radiator fins and across the condenser on air conditioned (A/C)-equipped vehicles.

This helps to speed cooling when the vehicle is at idle or moving at low speeds.

All models have two fans. The main fan is 320 mm (12.6 inches) in diameter with seven blades to aid the airflow through the radiator and the condenser. An electric motor attached to the radiator support drives the fan. The auxiliary fan is 320 mm (12.6 inches) in diameter.

A/C Off or Non-AC Model

- The cooling fans are actuated by the engine control module (ECM) using a low-speed cooling fan relay, a high-speed cooling fan relay and a cooling fan motor relay.
- The ECM will turn the cooling fans on at low speed when the coolant temperature reaches 95 °C (203 °F) and at high speed when the coolant temperature reaches 105 °C (221 °F).
- The ECM will change the cooling fans from high speed to low speed at 100 °C (212 °F) and will turn the cooling fans off at 90 °C (194 °F).

A/C On

- The ECM will turn the cooling fans on at low speed when the A/C system is on. The ECM will change to high speed when the high side A/C pressure reaches 1860 kPa (269.8 psi).
- The cooling fans will return to low speed when the high side A/C pressure reaches 1378 kPa (199.8 psi).

ENGINE COOLANT TEMPERATURE SENSOR

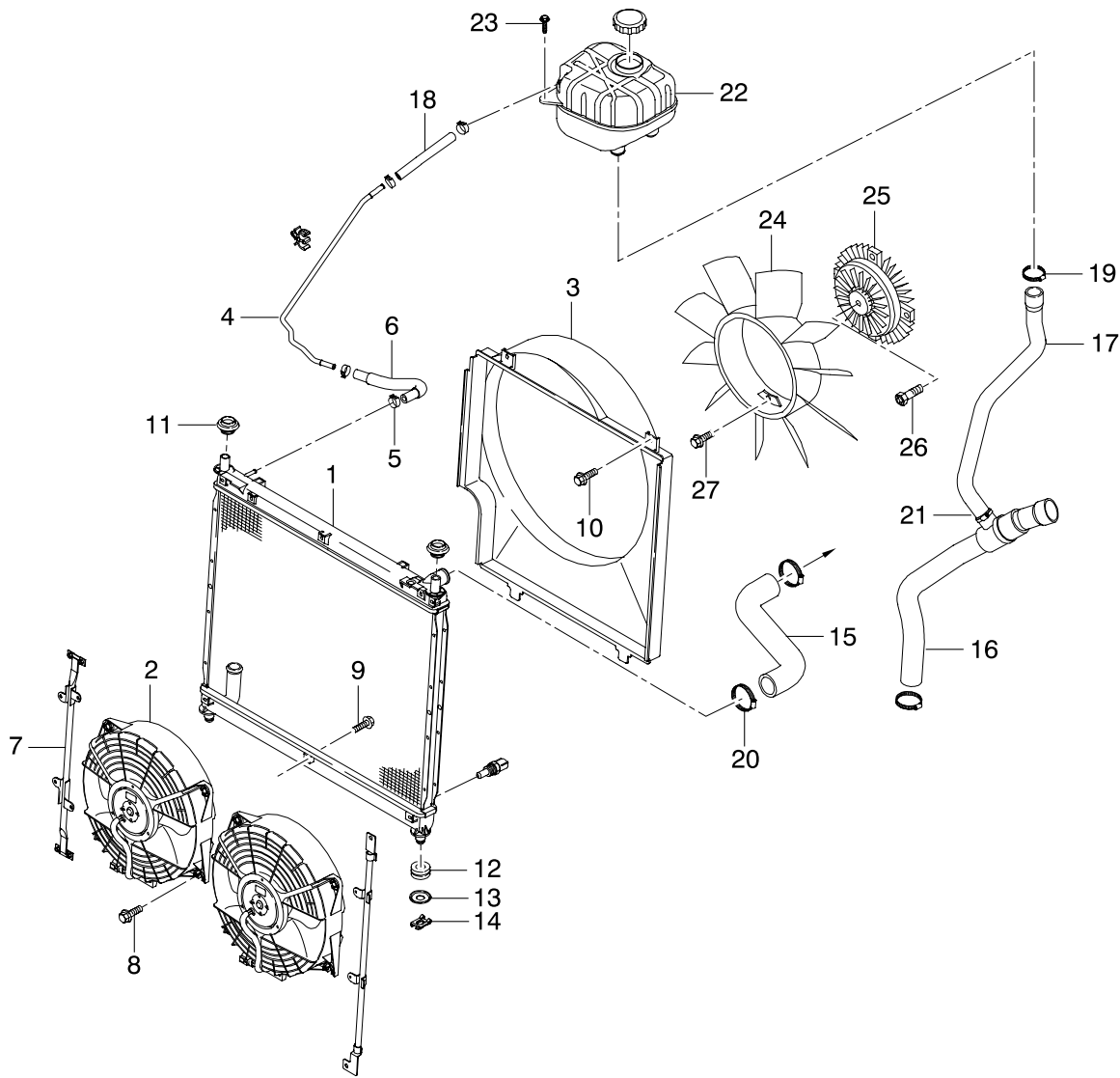
The Engine Coolant Temperature (ECT) sensor uses a temperature to control the signal voltage to the Engine Control Module (ECM).

COOLANT TEMPERATURE GAUGE

The coolant temperature gauge controls the instrument panel temperature indicator. The coolant temperature gauge is located with ECT sensor.

COMPONENT LOCATOR

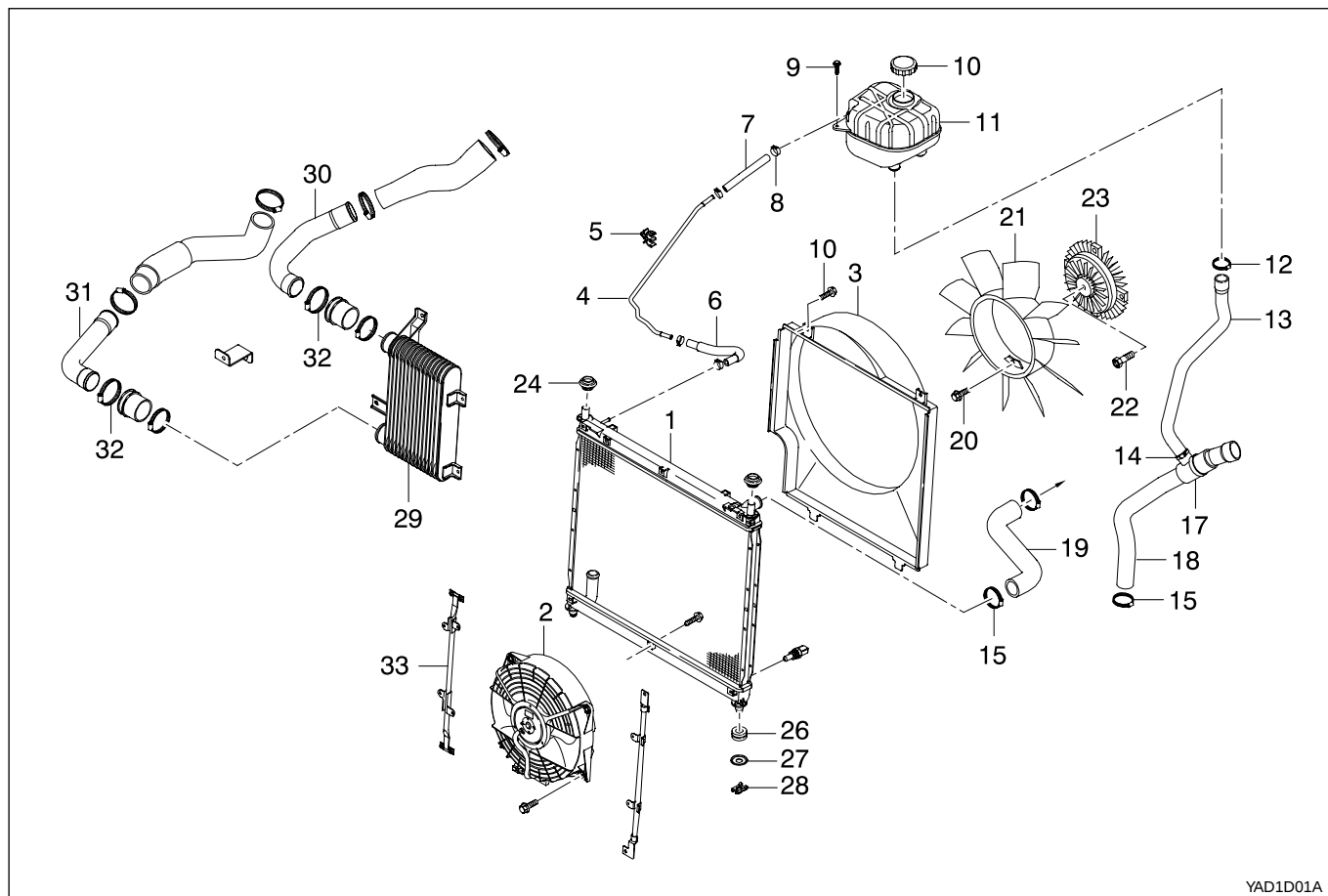
GASOLINE ENGINE



YAD1D010

- | | |
|---------------------------------|------------------------------------|
| 1 Radiator | 15 Inlet Hose |
| 2 Electric Fan | 16 Outlet Hose |
| 3 Shroud | 17 3 way Hose |
| 4 Deaeration Tube | 18 Deaeration Hose (Reserver Tank) |
| 5 Clamp | 19 Clamp |
| 6 Deaeration Hose (Radiator) | 20 Clamp |
| 7 Electric Fan Mounting Bracket | 21 Make Up Hose Holder |
| 8 Bolt (M6, 8 pieces) | 22 Reserver Tank |
| 9 Bolt (M6, 4 pieces) | 23 Bolt (M6, 2 piece) |
| 10 Bolt (M6, 4 pieces) | 24 Cooling Fan |
| 11 Upper Radiator Insulator | 25 Viscous Clutch |
| 12 Lower Radiator Insulator | 26 Bolt (M6, 1 piece) |
| 13 Plate | 27 Bolt (M6, 3 piece) |
| 14 Clip | |

DIESEL ENGINE



YAD1D01A

- | | |
|-----------------------------------|----------------------------------|
| 1 Radiator | 18 Outlet Hose |
| 2 Electric Fan | 19 Inlet Hose |
| 3 Shroud | 20 Bolt |
| 4 Deaeration Tube | 21 Cooling Fan |
| 5 Clip | 22 Bolt |
| 6 Deaeration Hose (Radiator) | 23 Viscous Clutch |
| 7 Deaeration Hose (Reserver Tank) | 24 Upper Radiator Insulator |
| 8 Clip | 25 Bolt |
| 9 Bolt (M6, 2 pieces) | 26 Lower Radiator Insulator |
| 10 Reserver Cap | 27 Plate |
| 11 Reserver Tank | 28 Clip |
| 12 Clamp | 29 Intercooler |
| 13 3 way Hose | 30 Intercooler Outlet Duct |
| 14 Clamp | 31 Intercooler Inlet Duct |
| 15 Clamp | 32 Clamp |
| 16 - | 33 Electric Fan Mounting Bracket |
| 17 Connector | |

DIAGNOSTIC INFORMATION AND PROCEDURE

COOLING SYSTEM DIAGNOSIS

Engine Overheats

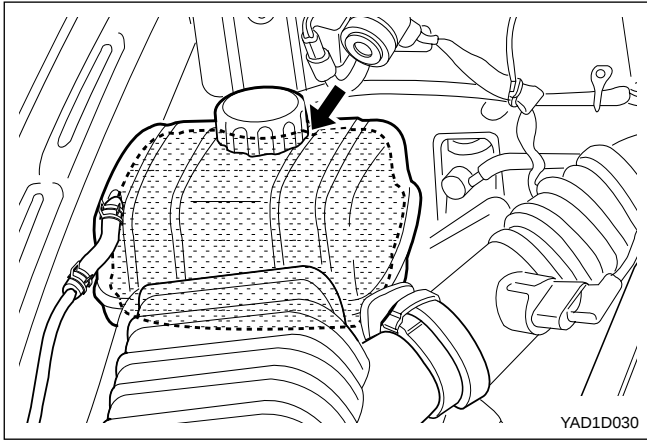
Checks	Action
Check for a loss of the coolant	Add the coolant.
Check for a weak coolant solution.	Confirm that the coolant solution is a 50/50 mixture of ethylene glycol and water.
Check the front of the radiator for any dirt, any leaves, or any insects.	Clean the front of the radiator.
Check for leakage from the hoses, the water pump, the heater, the thermostat housing, the radiator, the core plugs, or the head gasket.	Replace any damaged components.
Check for a faulty thermostat.	Replace a damaged thermostat.
Check for retarded ignition timing.	Perform an ECM code diagnosis. Confirm the integrity of the timing chain.
Check for an improperly operating electric cooling fan.	Replace the electric cooling fan.
Check for radiator hoses that are plugged or rotted.	Replace any damaged radiator hoses.
Check for a faulty water pump.	Replace a faulty water pump.
Check for a faulty coolant reservoir cap.	Replace a faulty coolant reservoir cap.
Check for a cylinder head or an engine block that is cracked or plugged.	Repair the damaged cylinder head or the damage engine block.

Loss of Coolant

Checks	Action
Check for a leak in the radiator.	Replace a damaged radiator.
Check for a leak in the following locations: • Coolant reservoir. • Hose.	Replace the following parts, as needed. • Coolant reservoir. • Hose.
Check for loose or damaged radiator hoses, heater hoses, and connections.	Reseat the hoses. Replace the hoses or the clamps.
Check for leaks in the water pump seal.	Replace the water pump seal.
Check for leaks in the water pump gasket.	Replace the water pump gasket.
Check for an improper cylinder head torque.	Tighten the cylinder head bolts to specifications. Replace the cylinder head gasket, if needed.
Check for leaks in the following locations: • Intake manifold. • Cylinder head gasket. • Cylinder block plug. • Heater core. • Radiator drain plug.	Repair or replace any components, as needed, to correct the leak.

Engine Fails to Reach Normal Operating Temperature or Cool Air from the Heater

Checks	Action
Check to determine if the thermostat is stuck open or is the wrong type of thermostat.	Install a new thermostat of the correct type and heat range.
Check the coolant level to determine if it is below the LOW mark on the coolant reservoir.	Add sufficient coolant to raise the fluid to the specified mark on the coolant reservoir.



SYSTEM LEAKAGE TEST

Tools Required

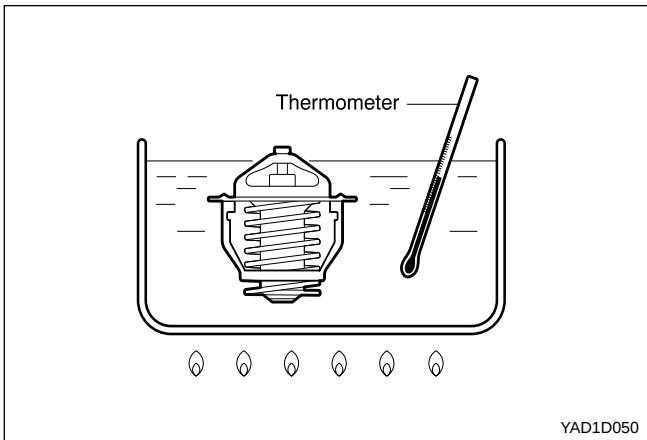
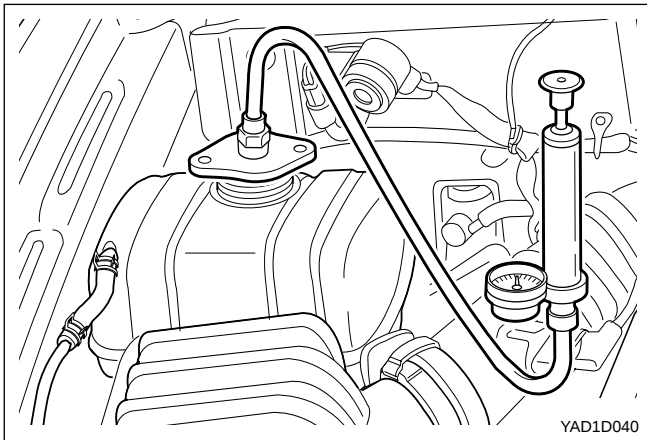
124 589 15 21 00 Leakage Tester

Test Procedure

1. Loosen the cap a little and release pressure and remove the cap.

Notice: For the risk of scalding, cap must not be opened unless the coolant temperature is below 90 °C (194 °F).

2. Fill coolant up to upper edge (arrow) of reservoir.
3. Connect the leakage tester 124 589 15 21 00 to the reservoir filler cap and apply 1.4 bar of pressure.
4. If the pressure on the tester drops, check leakage at the all coolant hoses and pipes and each connections. Replace or retighten if necessary.



THERMOSTAT TEST

Test Procedure

1. Remove the thermostat from the vehicle. Refer to "Thermostat" in this section.
2. Make sure the valve spring is tight when the thermostat is closed. If the spring is not tight, replace the thermostat.
3. Suspend the thermostat and a thermometer in a pan of 50/50 mixture of ethylene glycol and water. Do not let the thermostat or the thermometer rest on the bottom of the pan. The uneven concentration of heat on the bottom could result in inaccurate temperature measurements.
4. Heat the pan on a burner.
5. Use the thermometer to measure the temperature of the heated solution.
6. The thermostat should begin to open at 82 °C (180 °F) and it should be fully open at 95 °C (203 °F). If it does not open at these temperatures, replace the thermostat.

REPAIR INSTRUCTIONS

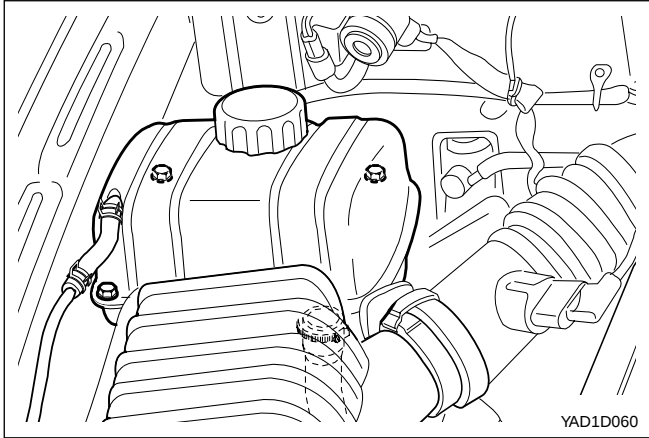
ON-VEHICLE SERVICE

COOLANT DRAIN AND FILL UP

Draining & Filling up Procedure (Gasoline Engine)

1. Loosen the cap a little and release pressure and remove the cap.

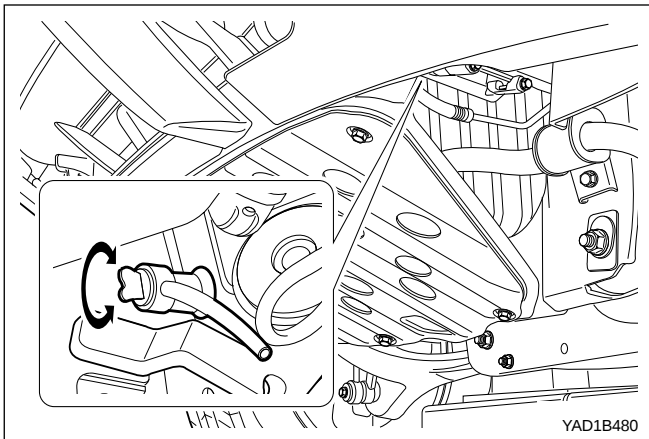
Notice: For the risk of scalding, the cap must not be opened unless the coolant temperature is below 90 °C (194 °F).



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2. Loosen the radiator lower drain cock and drain the coolant.

Notice: Collect coolant by using a proper container.



YAD1B480

3. Drain the coolant from the crankcase by inserting a hose (dia. 14 mm) onto the drain bolt on the side of crankcase (exhaust manifold) and by loosening the plug.

Notice:

- Just loosen the drain plug to drain the coolant and do not remove the plug completely.
- Collect coolant by using proper container.

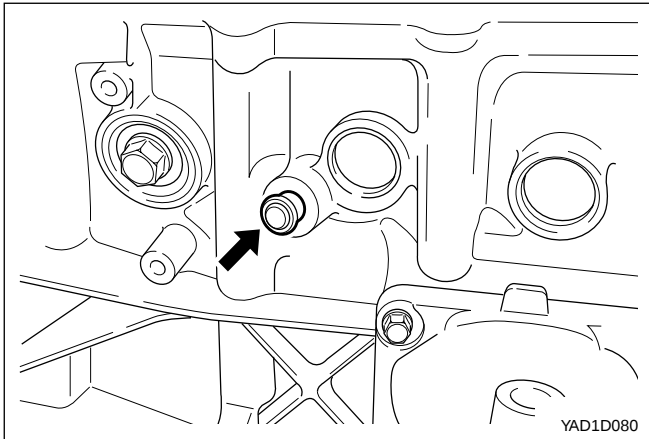
4. After complete draining of the coolant, remove the hose connector to drain plug and reinstall the drain plug.

Installation Notice

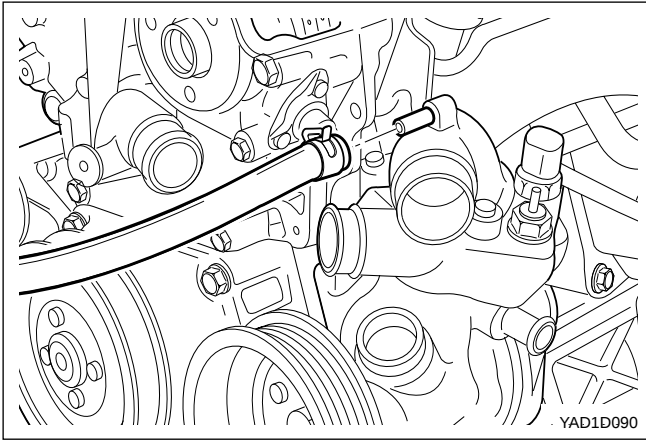
Tightening Torque

30 N•m (22 lb-ft)

5. Tighten the radiator lower drain cock.



YAD1D080

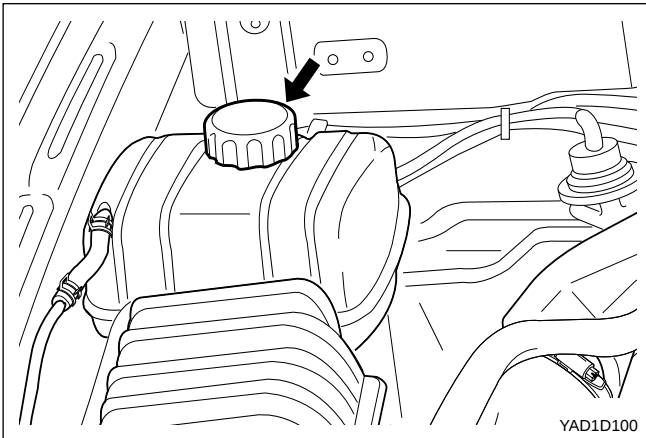


6. Remove the de-aeration hose clamp in the coolant pump and remove the de-aeration hose.
7. Fill up the coolant through the coolant reservoir tank.

Notice:

- Match the anti-freeze and the water ratio to 50 : 50.
- Supplement the coolant until the coolant overflows to the de-aeration hose.

8. Insert the de-aeration hose and completely tighten the clamp.
9. Check the coolant level in the coolant reservoir tank.
10. Warm up (until thermostat is opened) the engine and recheck the coolant level in the reservoir tank and fill up the coolant if necessary.



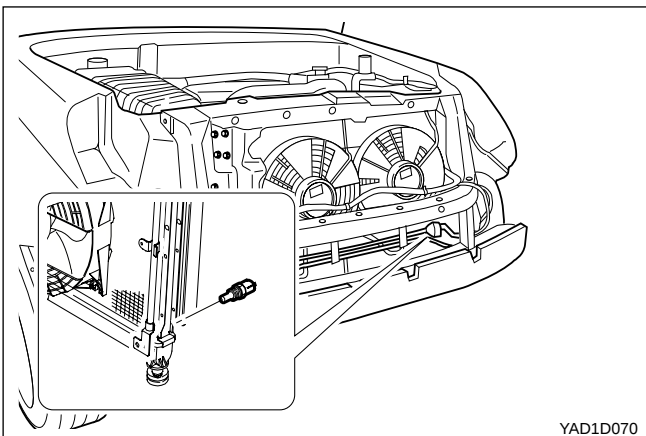
**Draining & Filling up Procedure
(Diesel Engine)**

1. Loosen the pressure cap of reservoir by 1 notch and remove pressure and then loosen the cap.

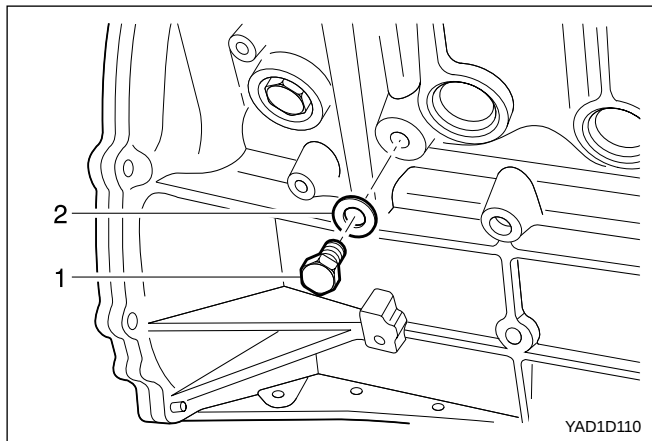
Notice: For the risk of scalding, the cap must not be opened unless the coolant temperature is below 90 °C (194 °F).

2. Open the drain plug and drain the coolant.

Notice: Collect the coolant by using a proper container.



1D-10 ENGINE COOLING



3. Remove the drain plug (1) and seal (2) of cylinder block and drain the coolant.
4. Replace the seal to new one and tighten the drain plug.

Installation Notice

Tightening Torque	30 N•m (22 lb-ft)
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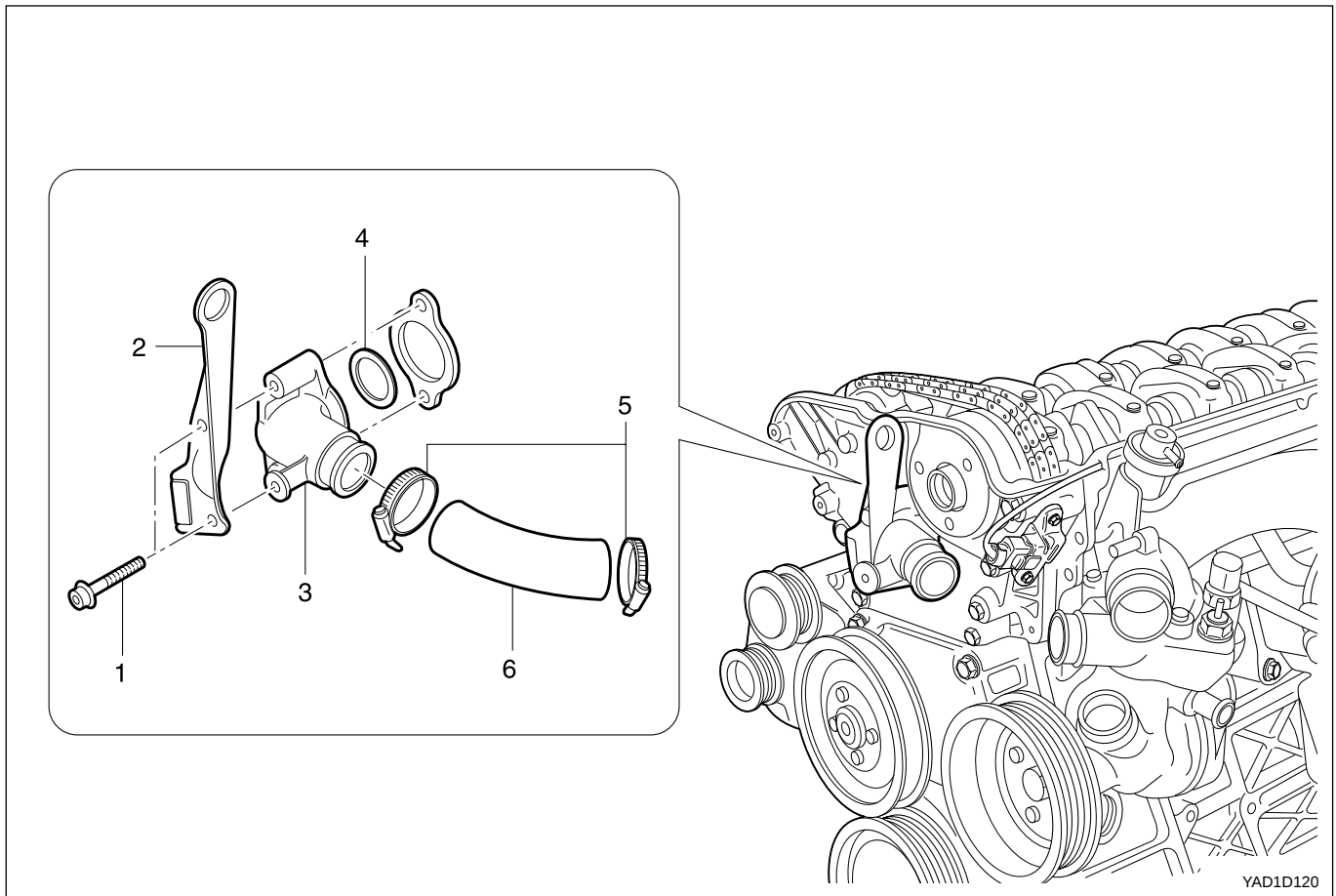
5. Tighten the drain plug of the lower radiator.
6. Fill the coolant through coolant reservoir-tank.

Notice: Match the anti-freeze and the water ratio to 50 : 50.

7. Warm up (until thermostat is opened) the engine and recheck the coolant level in the reservoir tank and fill up the coolant if necessary.

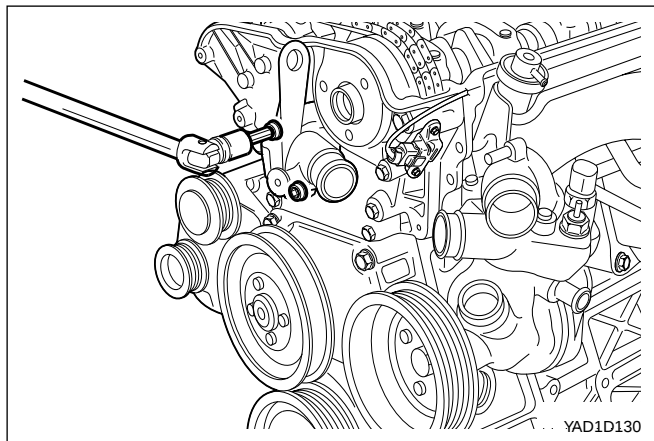
COOLANT CONNECTION FITTING (M162 ENGINE)

Preceding Work : Removal of cooling fan shroud



- | | |
|----------------------------------|---------------------|
| 1 Bolt (M8 X 100, 2 pieces)..... | 22.5 - 27.5 N•m |
| | (16.6 - 20.3 lb-ft) |
| 2 Engine Hanger Bracket | |
| 3 Coolant Outlet Port | |

- | |
|-----------------------|
| 4 O-ring |
| 5 Hose Mounting Clamp |
| 6 Hose |



Removal & Installation Procedure

1. Drain coolant from the radiator.
2. Remove the hose mounting clamp (5) and disconnect the coolant hose (6).
3. Remove the two bolts (1), the engine hanger bracket (2) and coolant outlet port (3).

Installation Notice

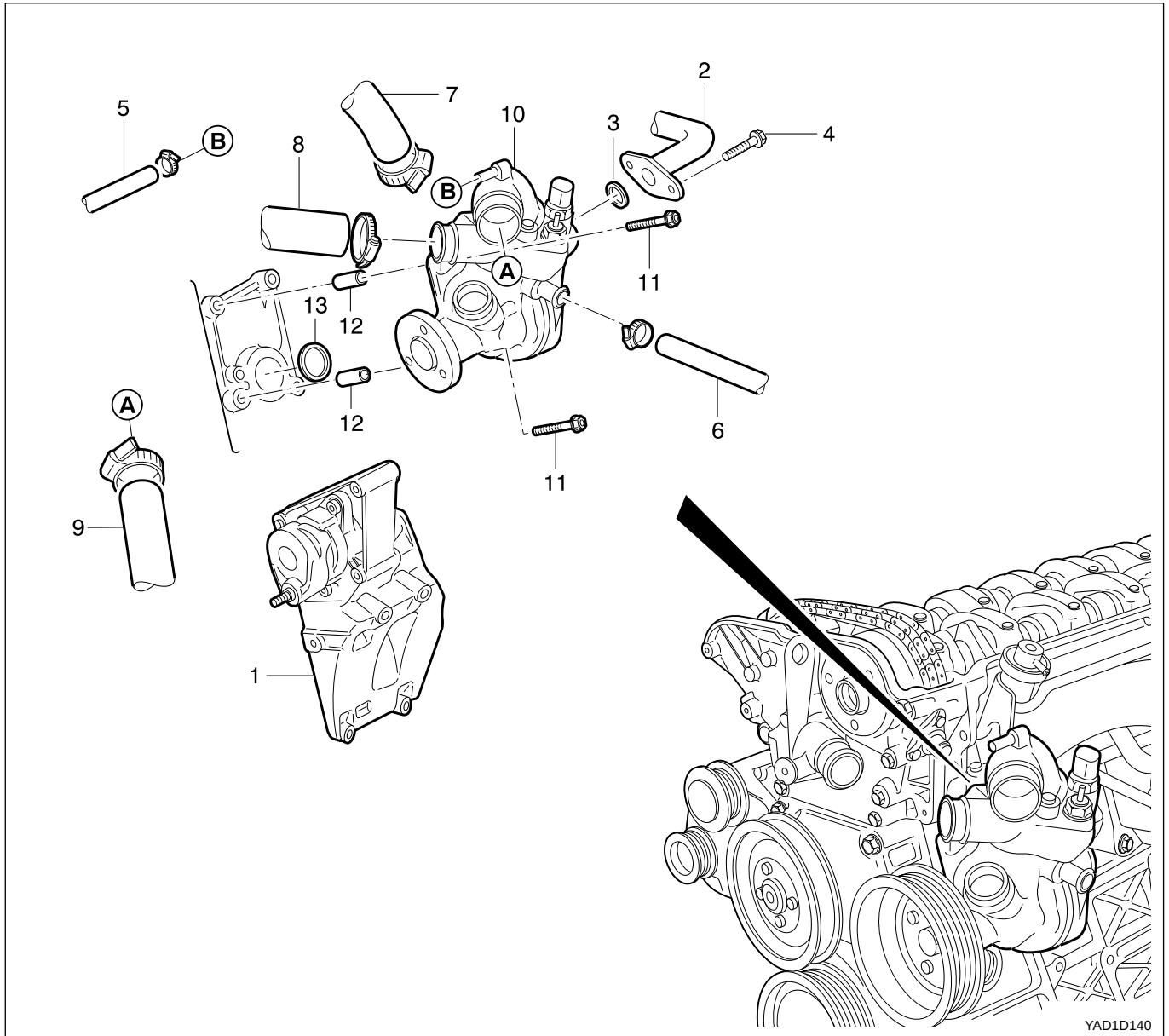
Tightening Torque	22.5 - 27.5 N•m (16.6 - 20.3 lb-ft)
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Replace the O-ring with new one.

4. Installation should follow the removal procedure in the reverse order.
5. Fill up the coolant as specified.
6. Check the leaks in the cooling system.

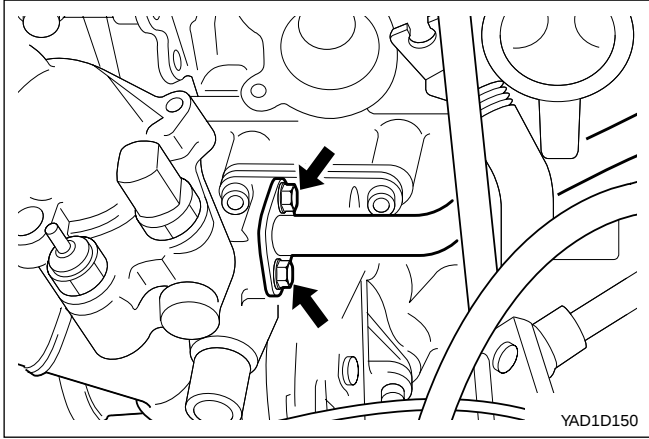
WATER PUMP (M162 ENGINE)

Preceding Work : Removal of V-belt
Removal of air admission housing



YAD1D140

- | | |
|---|---|
| 1 Air Admission Housing | 8 Coolant Hose |
| 2 Oil Cooler Pipe Line | 9 Inlet Coolant Hose |
| 3 Seal Replace | 10 Water Pump |
| 4 Bolt 9 - 11 N•m (80 - 97 lb-in) | 11 Bolt 22.5 - 27.5 N•m (16.6 - 20.3 lb-ft) |
| 5 Coolant Hose | 12 Dowel Sleeve |
| 6 Coolant Hose | 13 Seal Replace |
| 7 Outlet Coolant Hose | |



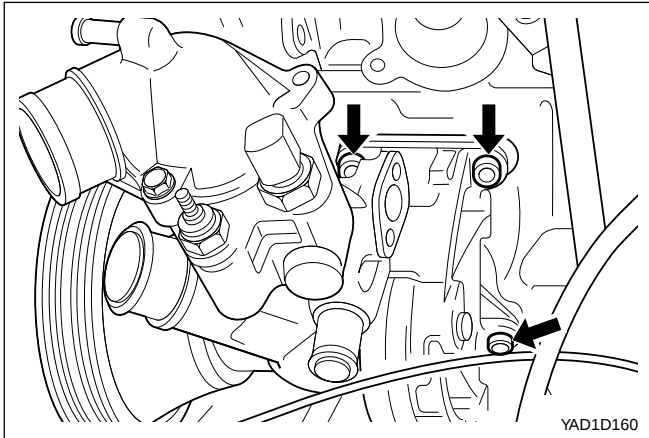
Removal & Installation Procedure

1. Drain the coolant.
2. Disconnect the water pump wire connector.
3. Loosen the hose clip and disconnect all hoses from the water pump
4. Remove the coolant line bolts (4) and then remove the coolant line (2).

Installation Notice

Tightening Torque	9 - 11 N•m (80 - 97 lb-in)
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Replace the seal (3).



5. Remove the mounting bolts (11) and carefully pull out water pump (10).

Installation Notice

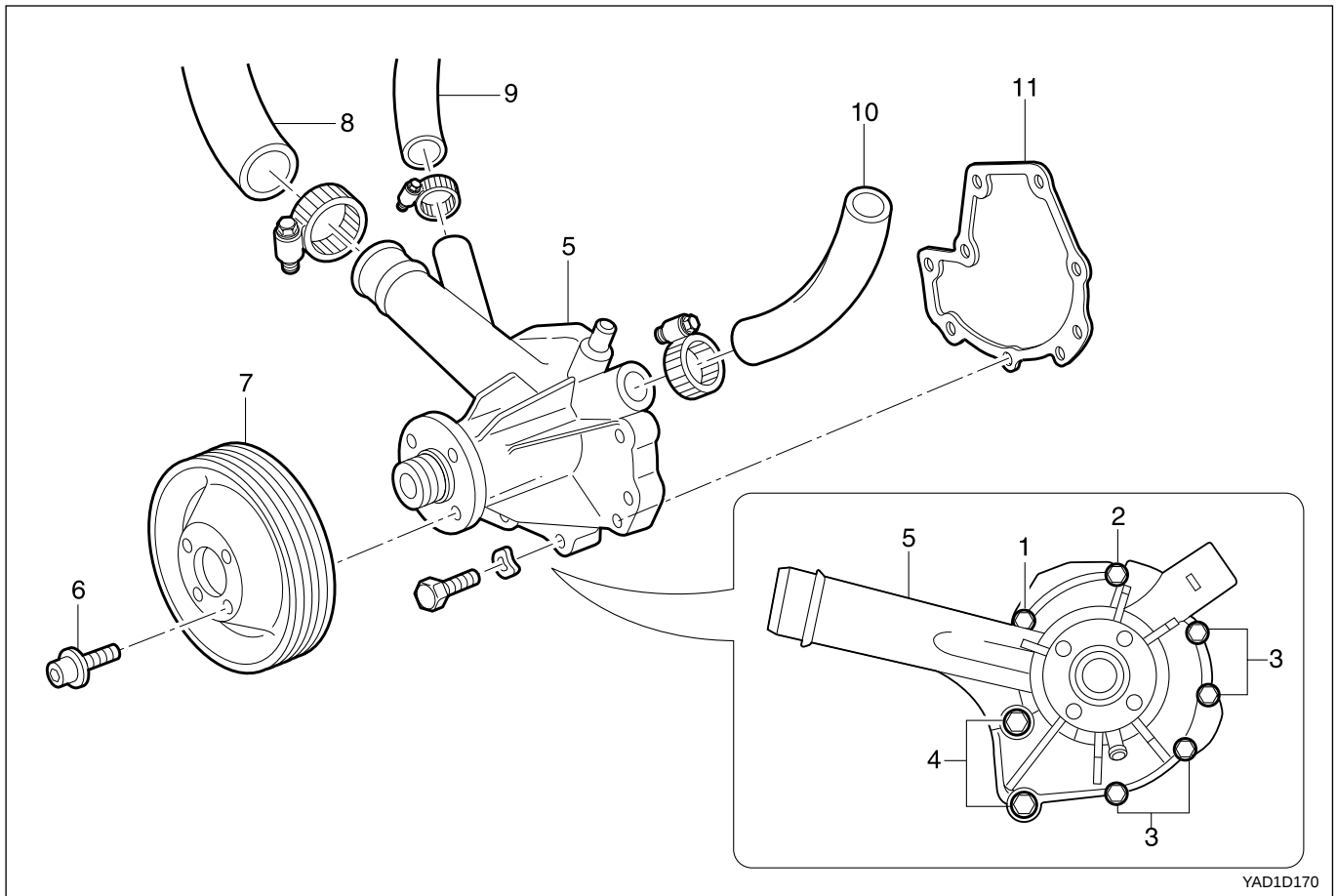
Tightening Torque	22.5 - 27.5 N•m (16.6 - 20.3 lb-ft)
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Replace the seal (13).

6. Installation should follow the removal procedure in the reverse order.
7. Fill up coolant.
8. Do coolant system leakage test.

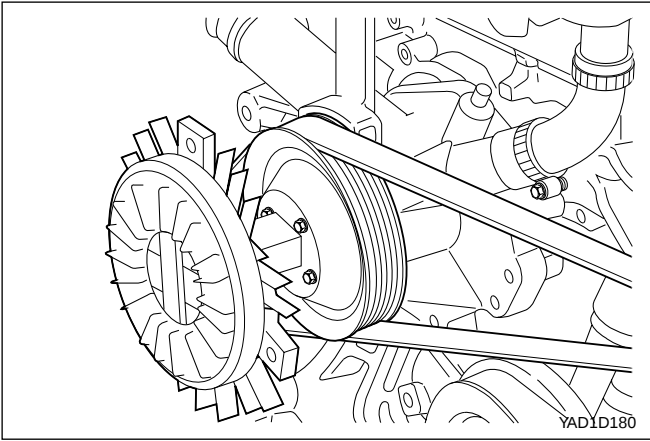
WATER PUMP (M161 ENGINE)

Preceding Work : Removal of viscous clutch



YAD1D170

- | | |
|---|----------------------------------|
| 1 Bolt (M6 X 45, 1 pieces) | 5 Water Pump Housing |
| 9 - 11 N•m (80 - 97 lb-in) | 6 Bolt (M6 X 16, 4 pieces) |
| 2 Bolt (M6 X 95, 1 pieces) | 9 - 11 N•m (80 - 97 lb-in) |
| 9 - 11 N•m (80 - 97 lb-in) | 7 Water Pump Pulley |
| 3 Bolt (M6 X 25, 4 pieces) | 8 Coolant Inlet Hose |
| 9 - 11 N•m (80 - 97 lb-in) | 9 Heater Hose |
| 4 Bolt (M6 X 85, 2 pieces) | 10 Coolant Bypass Hose |
| 22.5 - 27.5 N•m (16.6 - 20.3 lb-ft) | 11 Gasket |



Tools Required

603 589 00 40 00 Fan Clutch Holder

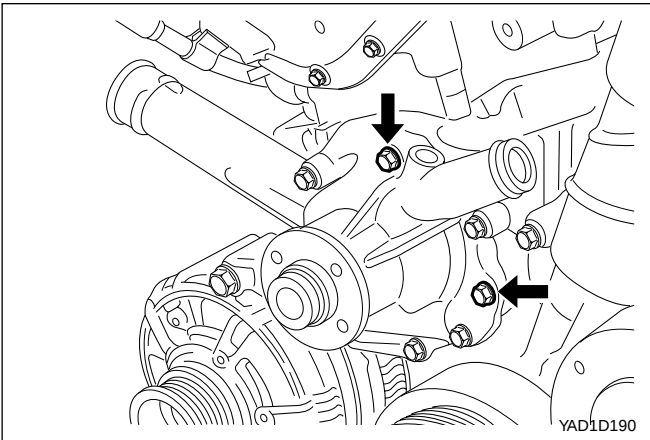
Removal & Installation Procedure

1. Drain the coolant.
2. Disconnect the coolant hoses (8, 9, 10).
3. Tak off the drive belt.
4. Unscrew the four bolts (6) from water pump pulley and remove the pulley (7).

Installation Notice

Tightening Torque	9 - 11 N•m (80 - 97 lb-in)
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Hold the pulley with fan clutch holder 603 589 00 40 00 while removing the pulley.



5. Unscrew the bolts (1, 2, 3, 4) from water pump housing (5) and remove the water pump.

Installation Notice

Tightening Torque	(1, 2, 3)	9 - 11 N•m (80 - 97 lb-in)
	(4)	22.5 - 27.5 N•m (16.6 - 20.3 lb-ft)

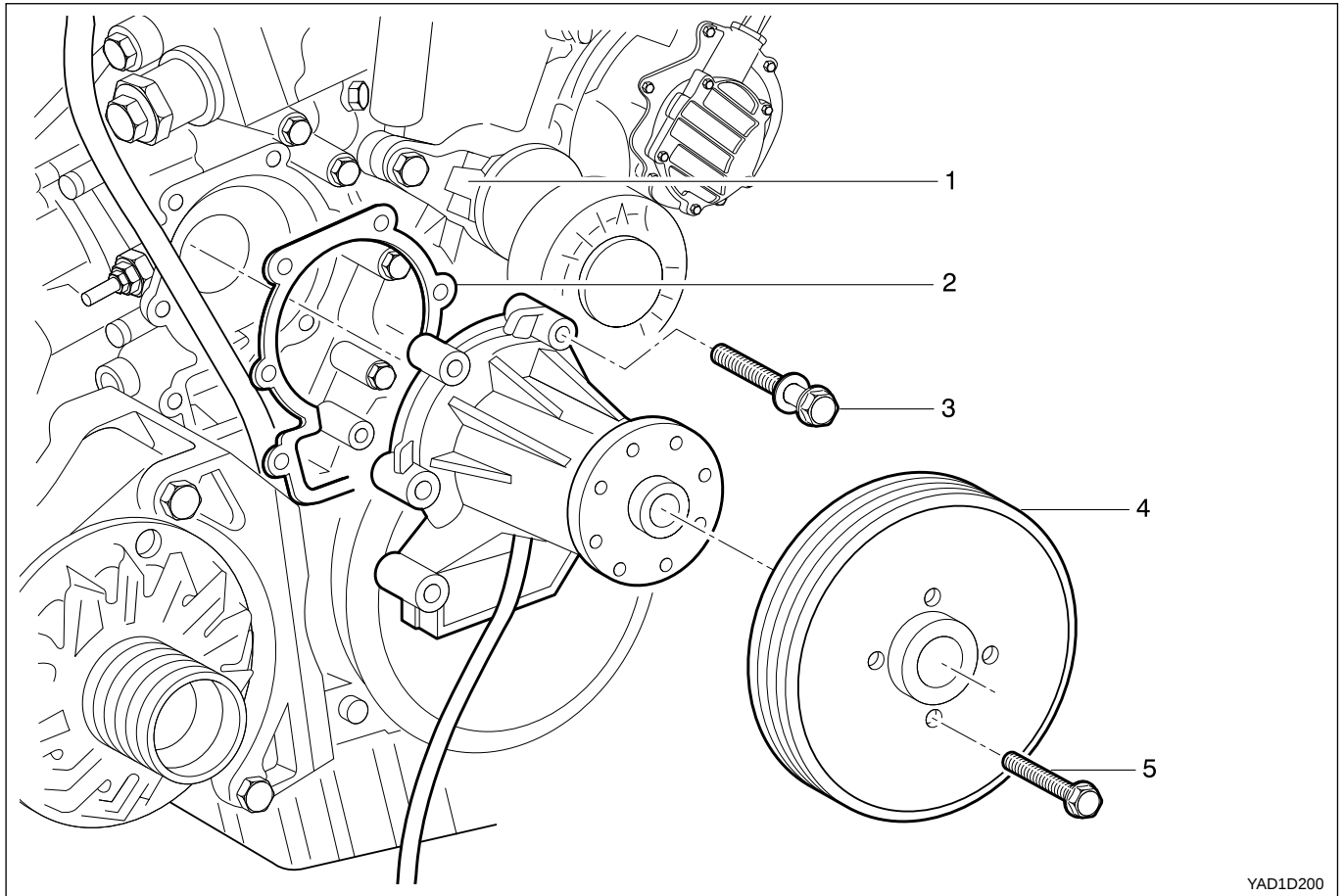
6. Clean the sealing surface.
7. Replace the gasket with new one.

Notice: Apply the sealant when the sealing surface of water pump housing and coolant mounting area is clean.

8. Installation should follow the removal procedure in the reverse order.
9. Check for leaks by starting the engine.

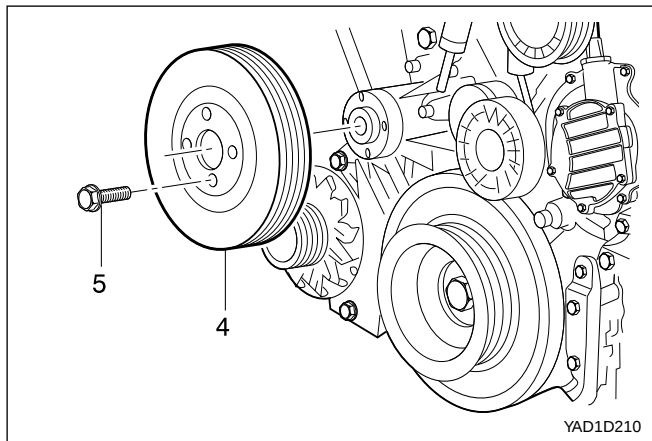
WATER PUMP (DIESEL ENGINE)

Preceding Work : Removal of cooling fan
Removal of V-belt



YAD1D200

- | | |
|---|---|
| 1 Tensioning Lever | 4 Water Pump Pulley |
| 2 Gasket Replace | 5 Bolt 9 - 11 N•m (80 - 97 lb-in) |
| 3 Bolt 9 - 11 N•m (80 - 97 lb-in) | 6 Water Pump |

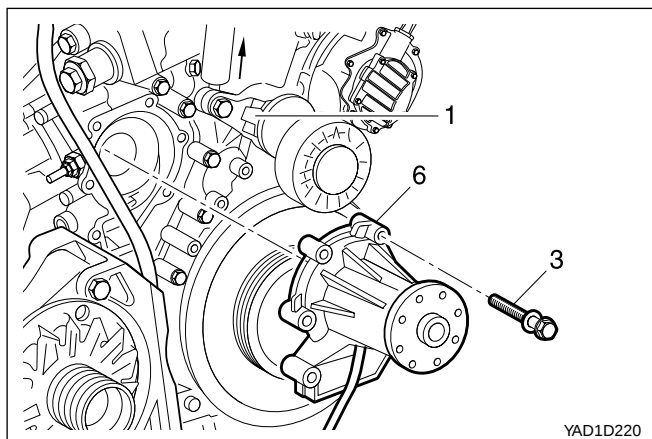


Removal & Installation Procedure

1. Loose the bolts (5) and remove the pulley (4).

Installation Notice

Tightening Torque	9 - 11 N•m (80 - 97 lb-in)
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2. Loose the bolts (3).

Installation Notice

Tightening Torque	9 - 11 N•m (80 - 97 lb-in)
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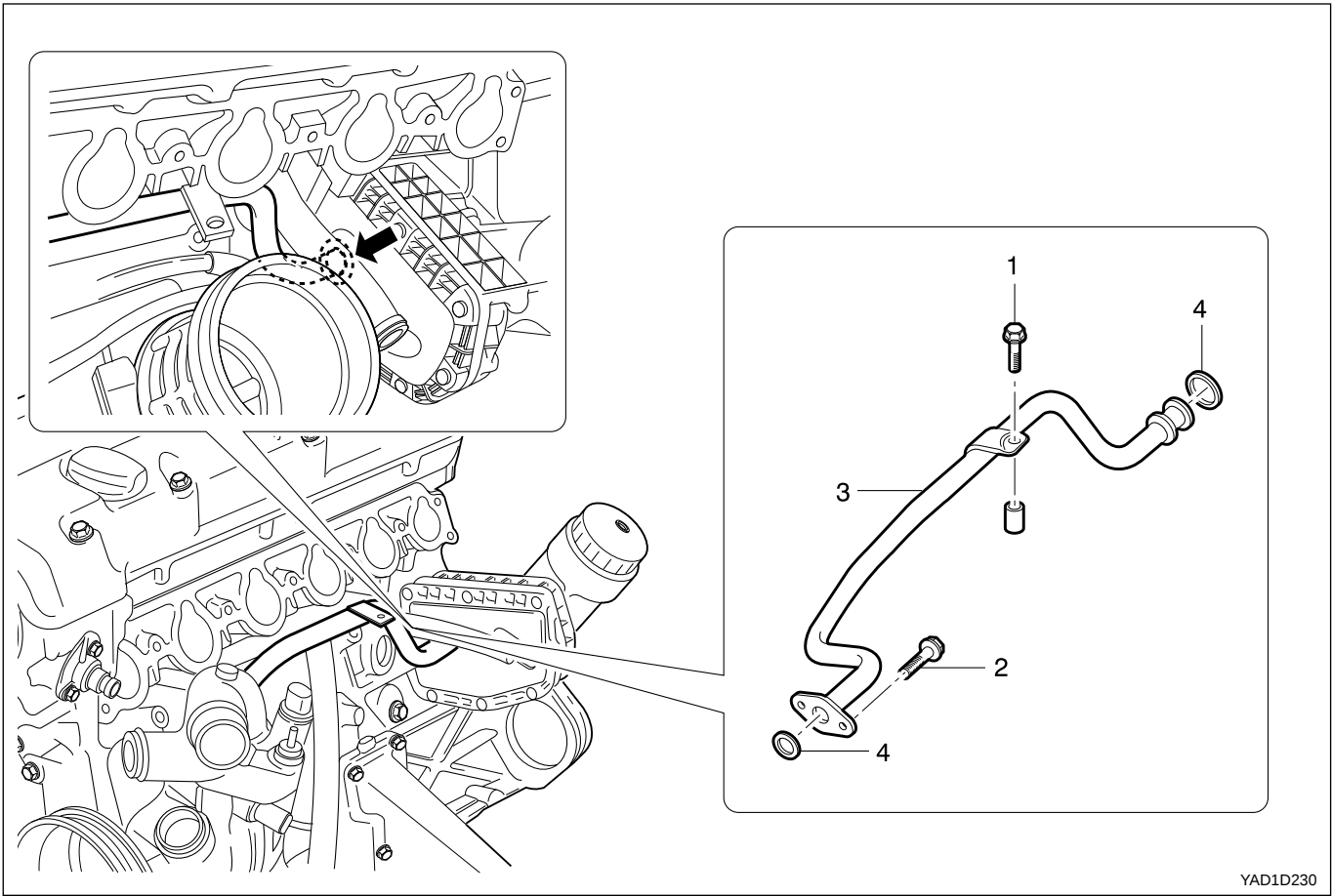
3. Pull the tensioning lever (1) to the arrow direction.
4. Remove the water pump (6).

Notice: Clean gasket residues on the sealing surface of water pump and replace the gasket.

5. Installation should follow the removal procedure in the reverse order.

OIL COOLER PIPE LINE (M162 ENGINE)

Preceding Work : Removal of upper intake manifold



- | | |
|--|------------------------|
| 1 Bolt (M6 X 35, 1 piece)
..... 9 - 11 N•m (80 - 97 lb-in) | 3 Oil Cooler Pipe Line |
| 2 Bolt (M6 X 16, 2 pieces)
..... 9 - 11 N•m (80 - 97 lb-in) | 4 O-ring Replace |

Removal & Installation Procedure

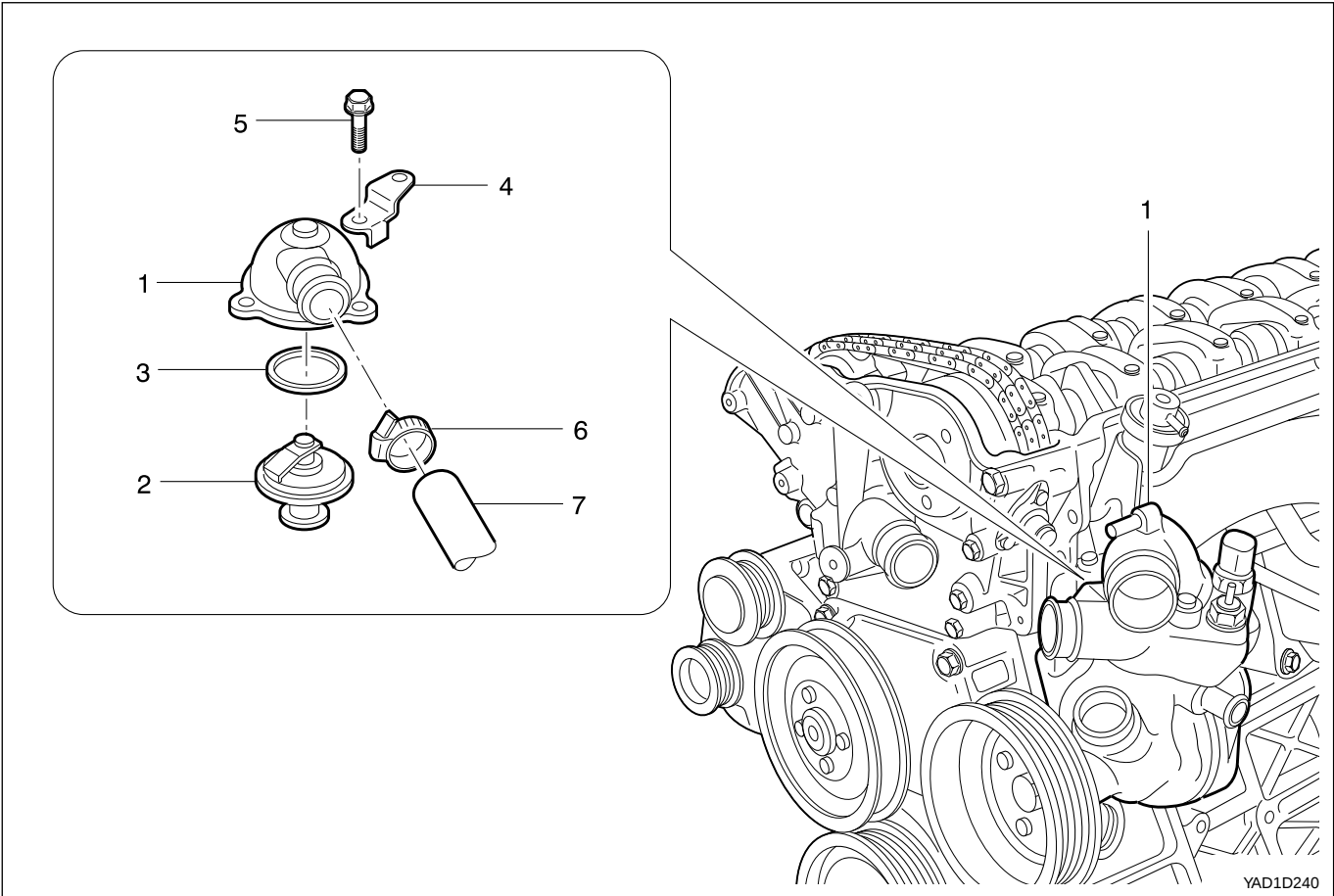
1. Drain the coolant.
2. Unscrew the bolts (1, 2) and remove the oil cooler pipe line (3).

Installation Notice

Tightening Torque	9 - 11 N•m (80 - 97 lb-in)
-------------------	-------------------------------

- Replace the O-ring with new one.
3. Installation should follow the removal procedure in the reverse order.
 4. Fill up the coolant as specified.
 5. Check the leaks in the cooling system.

THERMOSTAT (M162 ENGINE)



YAD1D240

- 1 Thermostat Cover

2 Thermostat

3 O-ring

4 Thermostat Cover Bracket
- 5 Bolt (M6 X 25, 3 pieces)

..... 9 - 11 N•m (80 - 97 lb-in)

6 Hose Mounting Clamp

7 Heater Hose

Removal & Installation Procedure

1. Drain the coolant from the radiator.
2. Loosen the hose mounting clamp (6) and remove the heater hose (7).
3. Unscrew the three bolts (5) and remove the thermostat cover bracket, thermostat cover and the thermostat in order.

Installation Notice

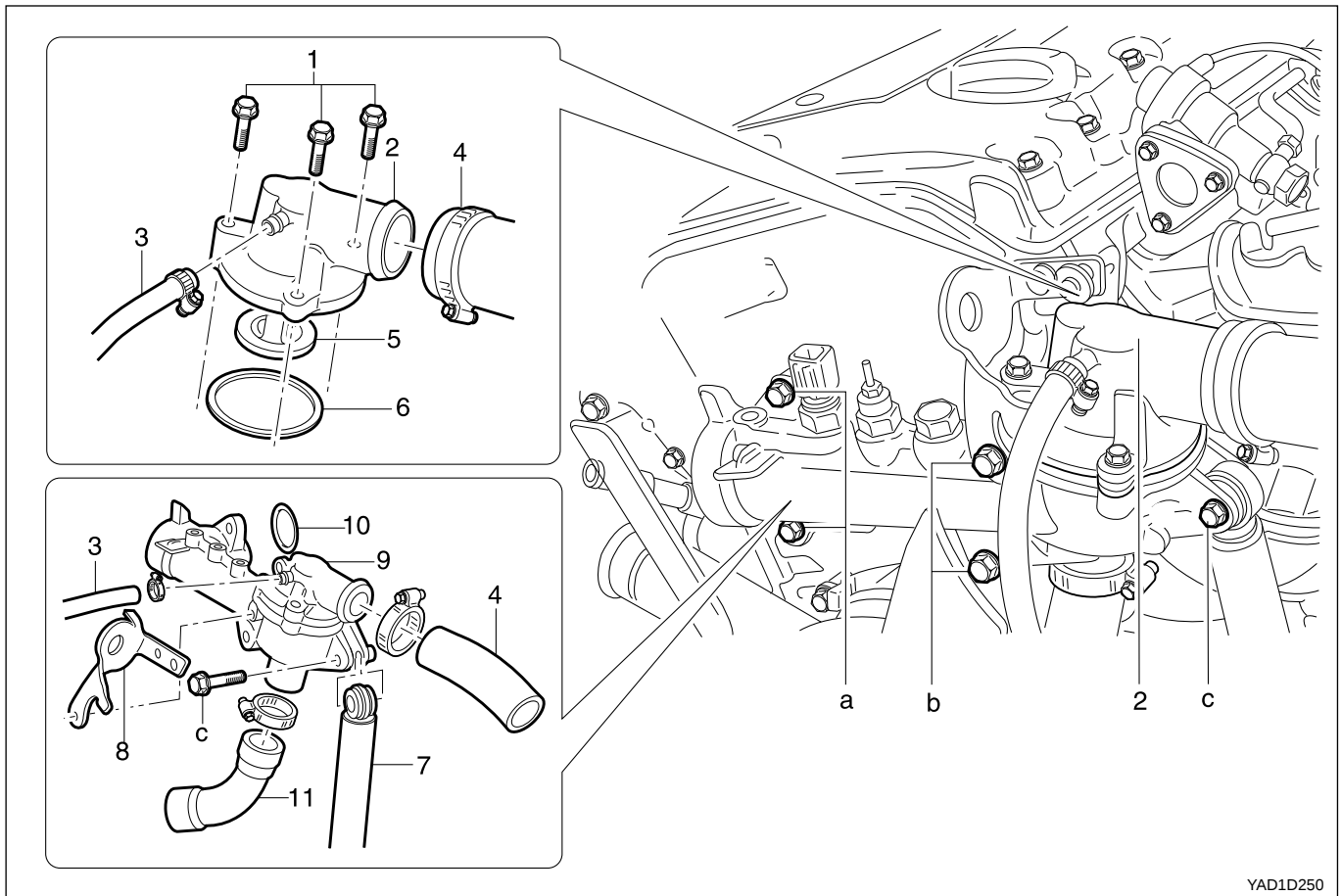
Tightening Torque	9 - 11 N•m (80 - 97 lb-in)
-------------------	-------------------------------

Do not separate the thermostat cover and thermostat.

4. Replace the O-ring if necessary.
5. Check the leakage in the cooling system.

THERMOSTAT AND THERMOSTAT HOUSING ASSEMBLY (M161 ENGINE)

Preceding Work : Removal of viscous clutch



YAD1D250

- | | |
|--|---|
| 1 Bolt (M6 X 25, 3 pieces)
..... 9 - 11 N•m (80-97 lb-in) | 10 O-ring |
| 2 Thermostat Cover | 11 Coolant Bypass Hose |
| 3 De-aeration Hose | a Bolt (M6 X 95, 2 pieces)
..... 9 - 11 N•m (80 - 97 lb-in) |
| 4 Coolant Outlet Hose | b Bolt (M8 X 75, 2 pieces)
..... 22.5 - 27.5 N•m (16.6 - 20.3 lb-ft) |
| 5 Thermostat | c Bolt (M8 X 35, 1 piece)
..... 22.5 - 27.5 N•m (16.6 - 20.3 lb-ft) |
| 6 O-ring | |
| 7 Tensioning Device Shock Absorber | |
| 8 Engine Hanger Bracket | |
| 9 Thermostat Housing Assembly | |

Removal & Installation Procedure

1. Drain the coolant.
2. Remove the de-aeration hose (3), coolant outlet hose (4) and coolant bypass hose (11).
3. Disconnect the engine coolant temperature sensor connector and coolant temperature gauge connector.
4. Unscrew the three bolts (1) and remove the thermostat cover assembly from thermostat housing.

Installation Notice

Tightening Torque	9 - 11 N•m (80 - 97 lb-in)
-------------------	-------------------------------

Do not separate the thermostat cover and thermostat.

5. Replace the O-ring if necessary.
6. Unscrew the bolt (c) and pry off the tensioning device shock absorber (7).

Installation Notice

Tightening Torque	22.5 - 27.5 N•m (16.6 - 20.3 lb-ft)
-------------------	--

7. Unscrew the bolts (a, b) and remove the engine hanger bracket and thermostat housing.

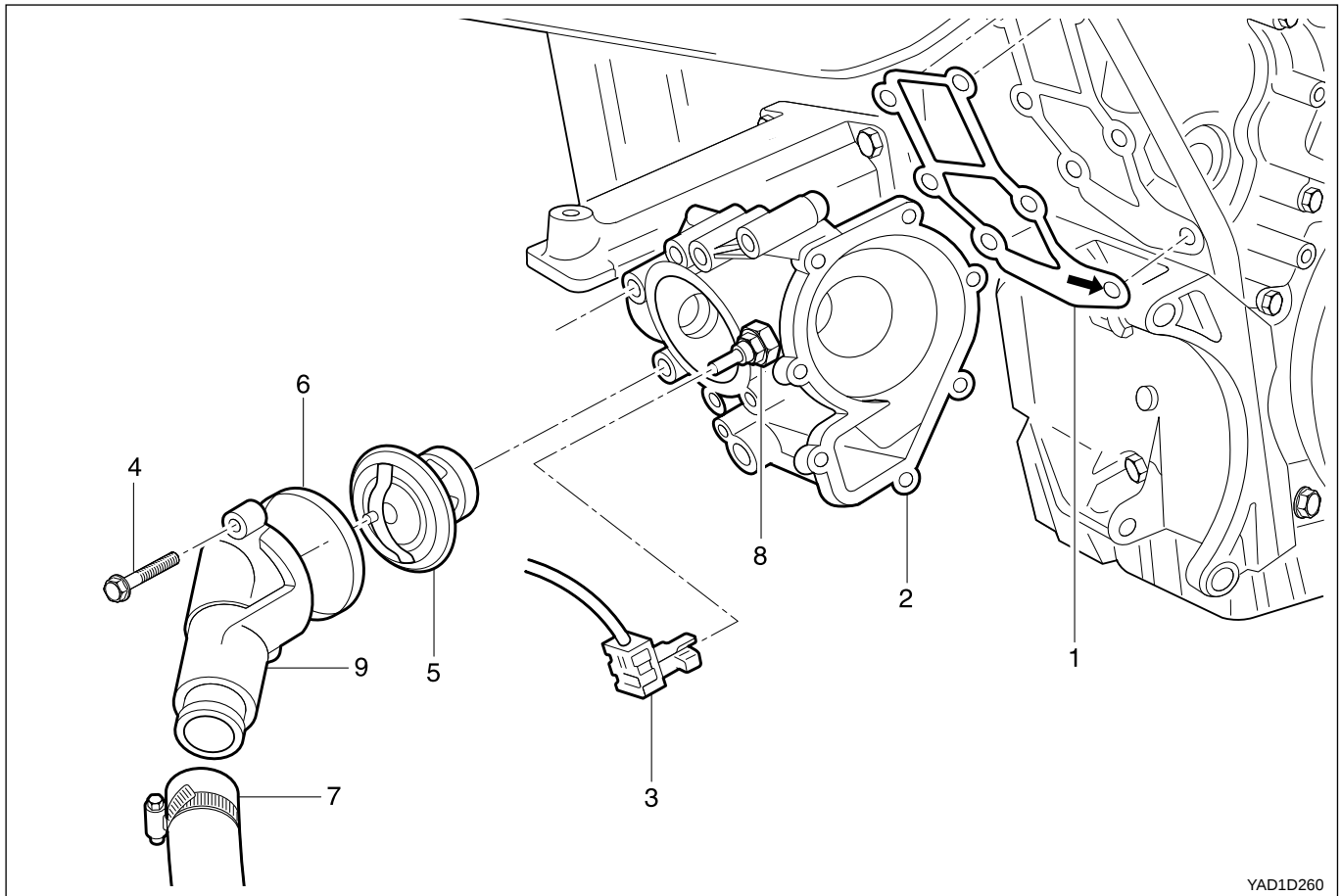
Installation Notice

Tightening Torque	(a)	9 - 11 N•m (80 - 97 lb-in)
	(b)	22.5 - 27.5 N•m (16.6 - 20.3 lb-ft)

8. Replace the O-ring with new one.
9. Installation should follow the removal procedure in the reverse order.
10. Check for leaks in cooling system.

THERMOSTAT AND WATER PUMP HOUSING (DIESEL ENGINE)

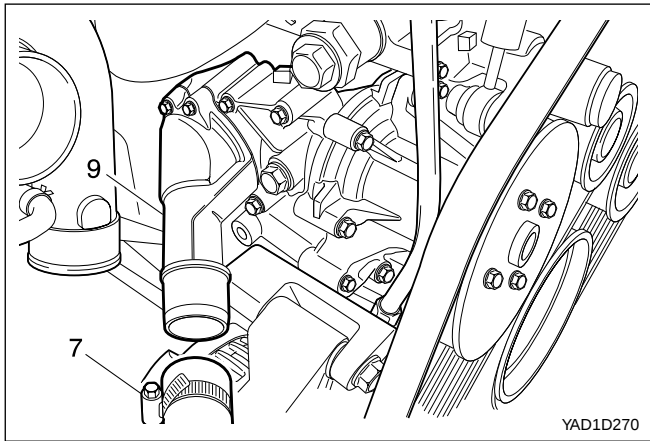
Preceding Work : Removal of coolant pump
Removal of thermostat
Removal of alternator



YAD1D260

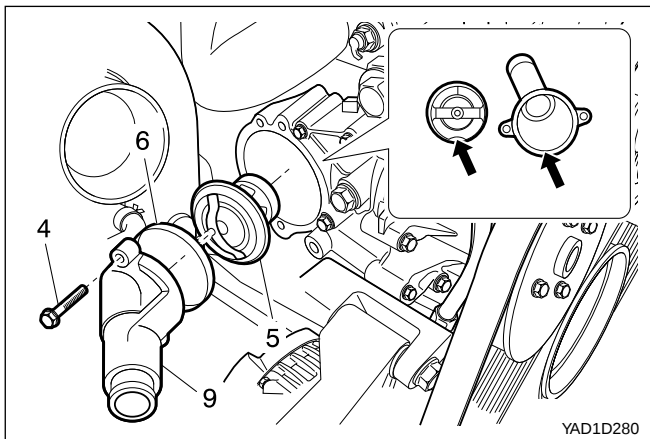
- | | | | |
|----------------------|----------------------------|-----------------------------|---------|
| 1 Gasket | Replace | 6 Seal | Replace |
| 2 Water Pump Housing | | 7 Coolant Hose | |
| 3 Connector | | 8 Coolant Temperature Guage | |
| 4 Bolt..... | 9 - 11 N•m (80 - 97 lb-in) | 9 Thermostat Housing Cover | |
| 5 Thermostat | | | |

Notice: The bolt on the arrow should be installed last.



Removal & Installation Procedure

1. Drain the coolant completely.
2. Disconnect the coolant hose (7) from the thermostat housing cover (9).



3. Remove the bolts (4) and then remove the thermostat (5) and housing cover (9).

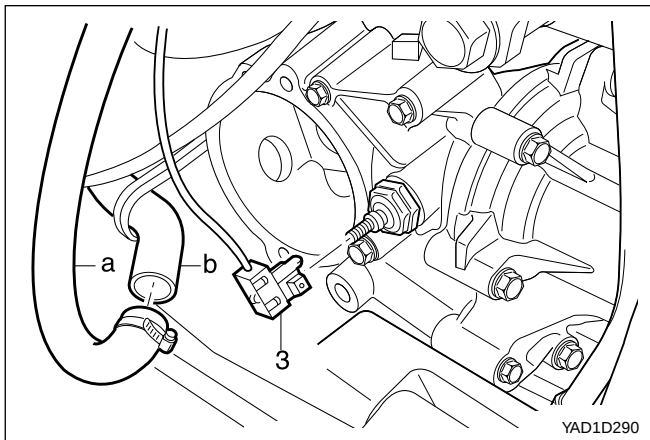
Installation Notice

Align the groove on thermostat and the housing cover rib (arrow).

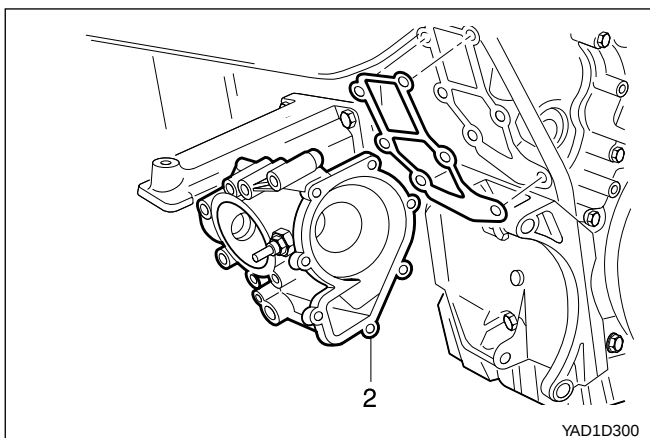
Tightening Torque

9 - 11 N•m
(80 - 97 lb-in)

Replace the seal (6).



4. Disconnect the coolant temperature gauge connector (3).
5. Separate the coolant hose (a) and return pipe (b).



6. Remove the water pump housing bolts.

Installation Notice

Tightening Torque

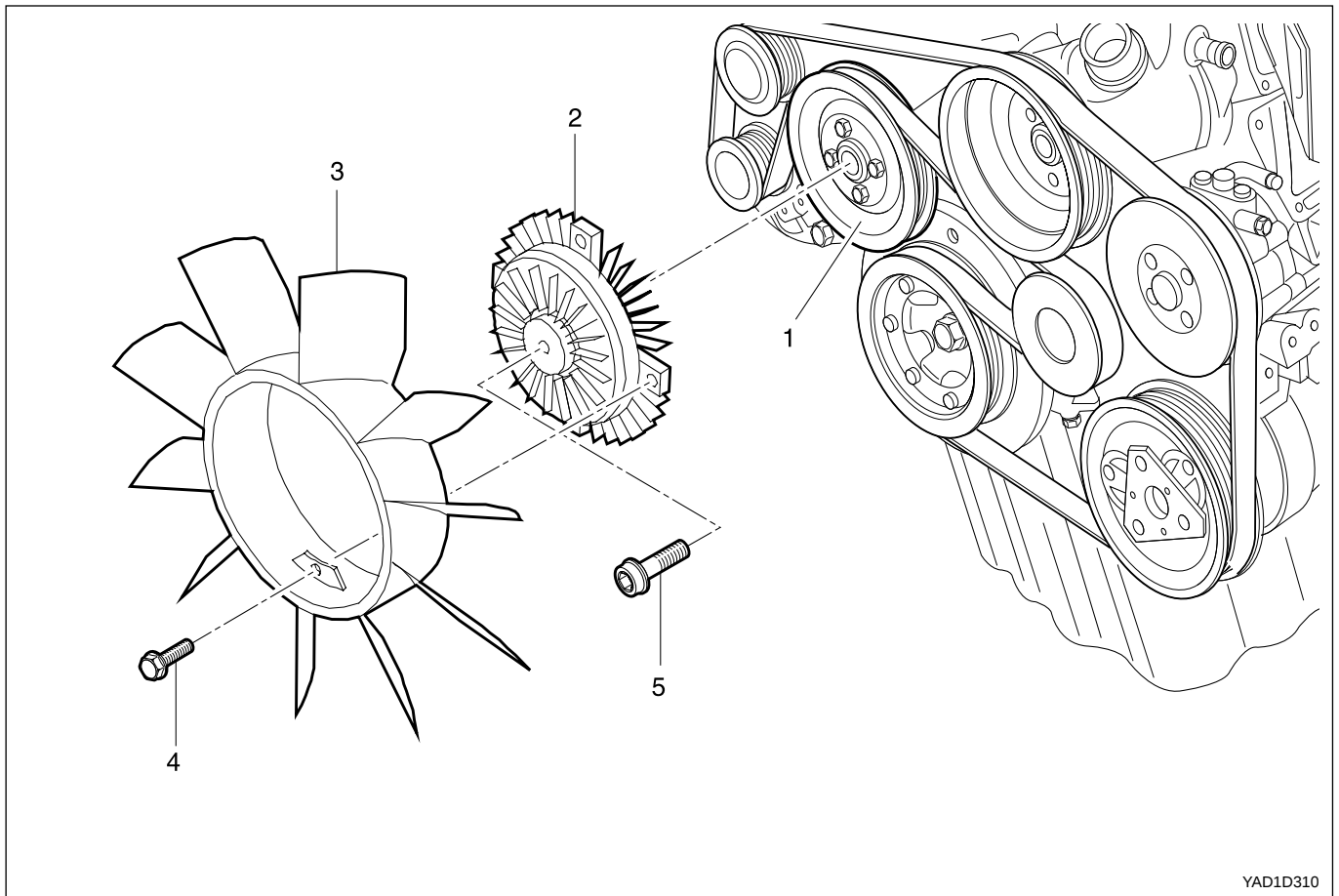
9 - 11 N•m
(80 - 97 lb-in)

Clean gasket residues on the sealing surface of water pump and replace the gasket.

7. Remove the water pump housing (2).
8. Installation should follow the removal procedure in the reverse order.

COOLING FAN AND VISCOUS CLUTCH (M162 ENGINE)

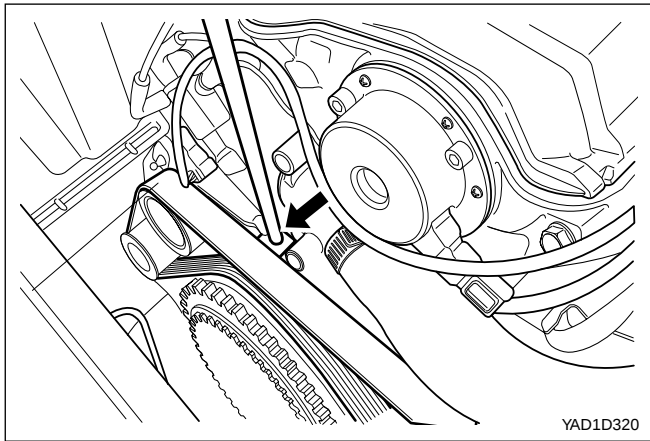
Preceding Work : Removal of cooling fan shroud



YAD1D310

- 1 Cooling Fan Pulley
- 2 Viscous Clutch
- 3 Cooling Fan

- 4 Bolt (M6 X 12, 4 pieces)
..... 9 - 11 N•m (80 - 97 lb-in)
- 5 Bolt (M10 X 45, 1 piece)
..... 40.5 - 49.5 N•m (29.8 - 36.5 lb-ft)



Tools Required

603 589 00 40 00 Fan Clutch Holder

Removal & Installation Procedure

1. Remove the engine hanger bracket bolts.

Installation Notice

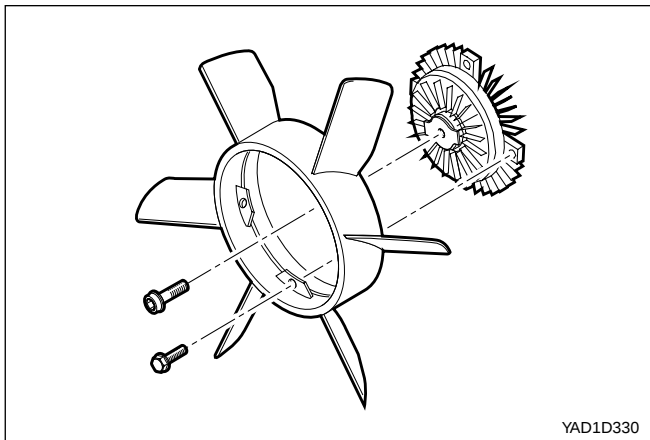
Tightening Torque	22.5 - 27.5 N•m (16.6 - 20.3 lb-ft)
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2. Remove the engine hanger bracket.
3. Remove the cooling fan bolts.

Installation Notice

Tightening Torque	9 - 11 N•m (80 - 97 lb-in)
-------------------	-------------------------------

4. Hold the cooling fan pulley using the fan clutch holder 603 589 00 40 00.



5. Remove the viscous clutch mounting bolts and viscous clutch.

Installation Notice

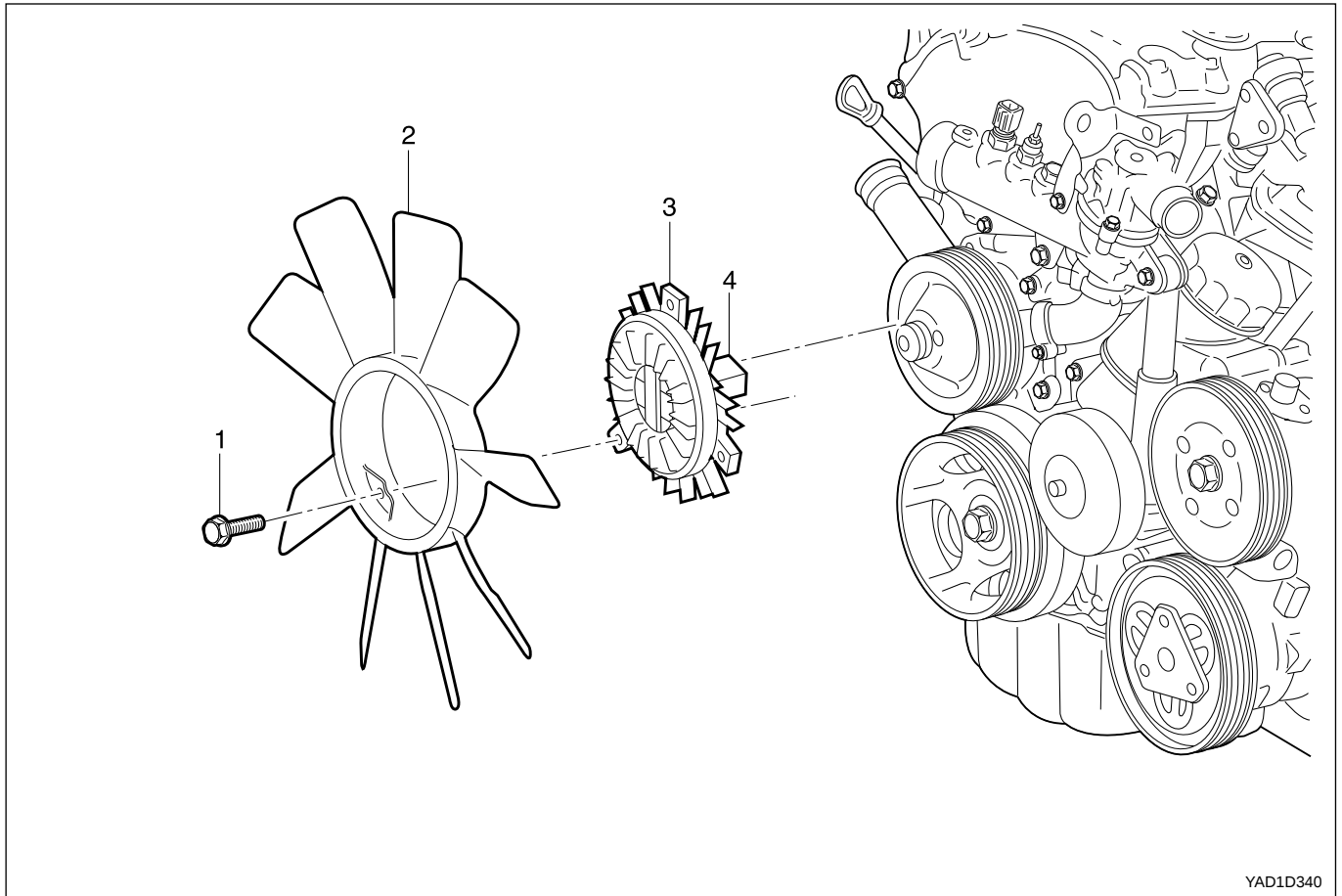
Tightening Torque	40.5 - 49.5 N•m (29.8 - 36.5 lb-ft)
-------------------	--

Important: There are two chambers in the viscous clutch. Be sure to make the viscous clutch stand on the ground not to flow silicone oil into another chamber in the viscous clutch. Do not lay down the clutch.

6. Installation should follow the removal procedure in the reverse order.

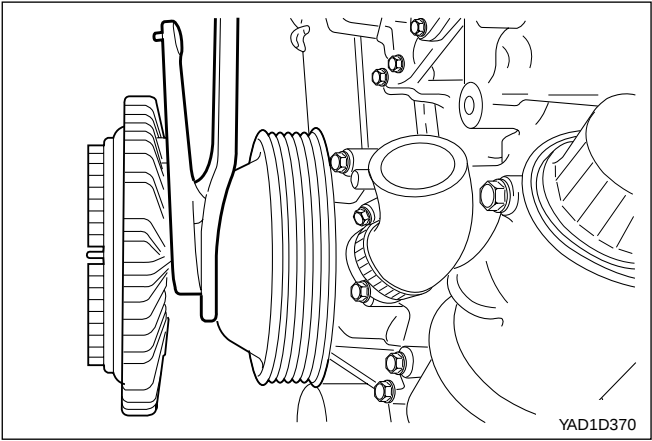
COOLING FAN AND VISCOUS CLUTCH (M161 ENGINE)

Preceding Work : Removal of cooling fan shroud



YAD1D340

- | | |
|----------------------------------|---|
| 1 Bolt (M6 X 14, 3 piece) | 3 Viscous Clutch |
| 9 - 11 N•m (80 - 97 lb-in) | 4 Union Nut (Left Threaded Screw) |
| 2 Cooling Fan | 40.5 - 49.5 N•m (29.8 - 36.5 lb-ft) |



Tools Required

- 111 589 02 01 00 Open End Wrench
- 111 589 00 40 00 Holder

Removal & Installation Procedure

1. Install the holder 111 589 00 40 00 to the bolt at the pulley as shown in the right figure to hold the pulley.
2. Remove the viscous clutch using an open end wrench 111 589 02 01 00.

Installation Notice

Tightening Torque	40.5 - 49.5 N•m (29.8 - 36.5 lb-ft)
-------------------	--

The union nut is left threaded screw.

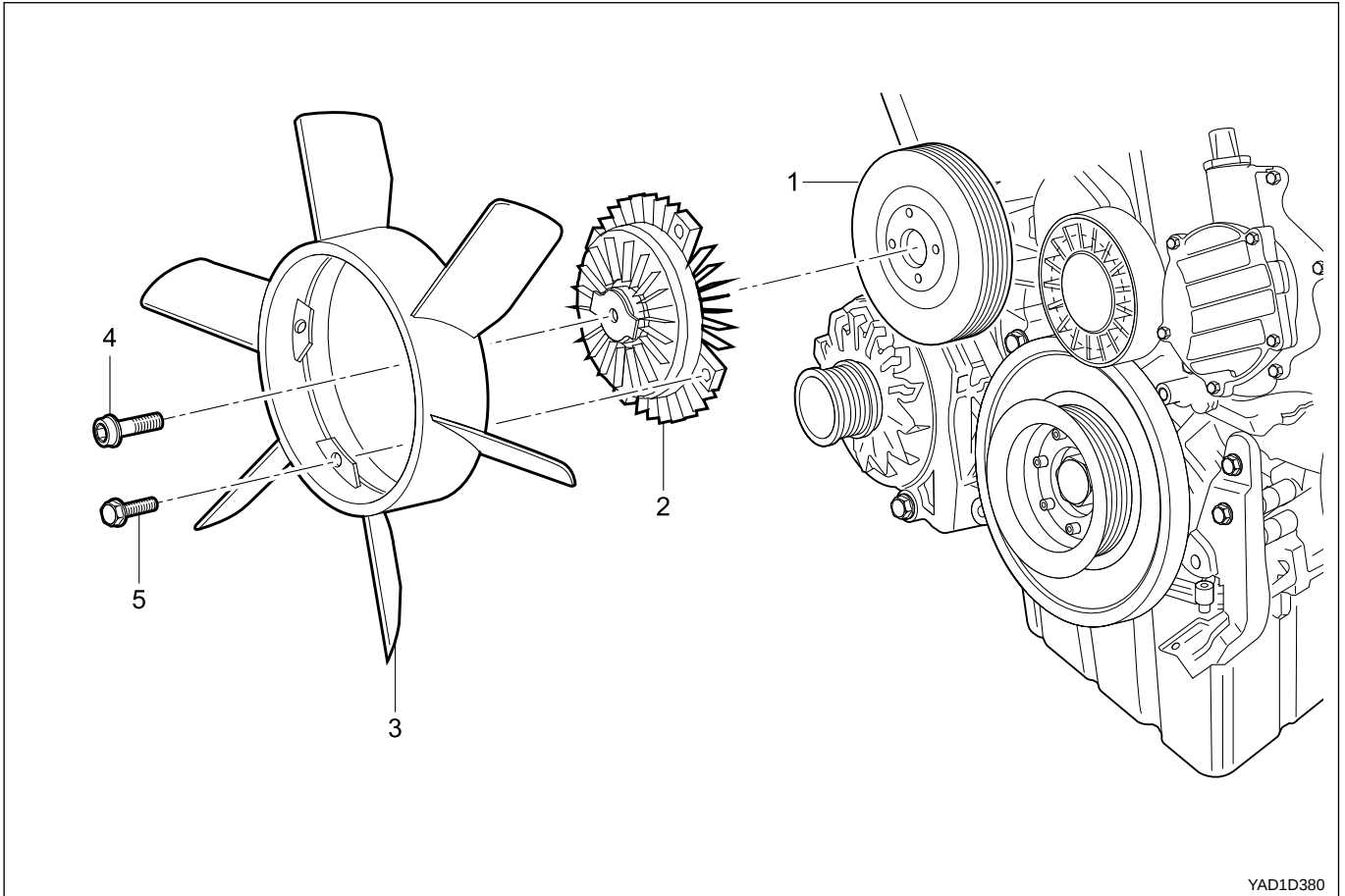
3. Remove the 3 bolts (1) from the viscous clutch and remove the cooling fan and the viscous clutch.

Installation Notice

Tightening Torque	9 - 11 N•m (80 - 97 lb-in)
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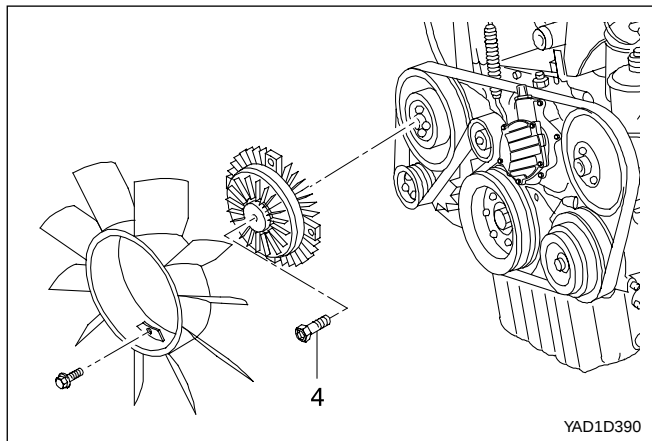
You may change the procedure (2) and (3) if necessary.

4. Installation should follow the removal procedure in the reverse order.

COOLING FAN AND VISCOUS CLUTCH (DIESEL ENGINE)

- 1 Cooling Fan Pulley
- 2 Viscous Clutch
- 3 Cooling Fan

- 4 Bolt..... 40.5 - 49.5 N•m (29.8 - 36.5 lb-ft)
- 5 Bolt..... 9 - 11 N•m (80 - 97 lb-in)



Tools Required

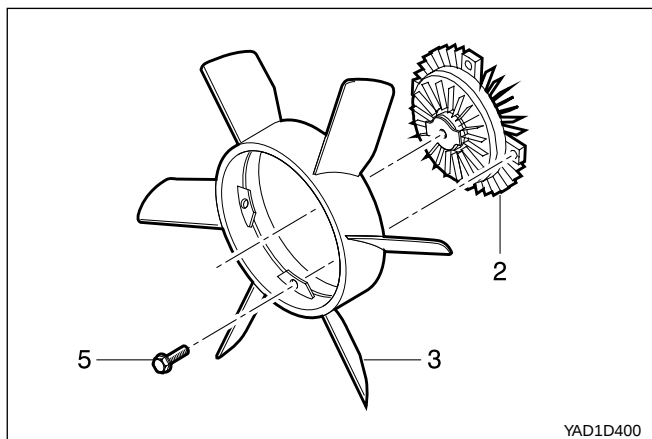
603 589 00 40 00 Fan Clutch Holder

Removal & Installation Procedure

1. Hold the cooling fan pulley with fan clutch holder 603 589 00 40 00 and remove the bolt (4).

Installation Notice

Tightening Torque	40.5 - 49.5 N•m (29.8 - 36.5 lb-ft)
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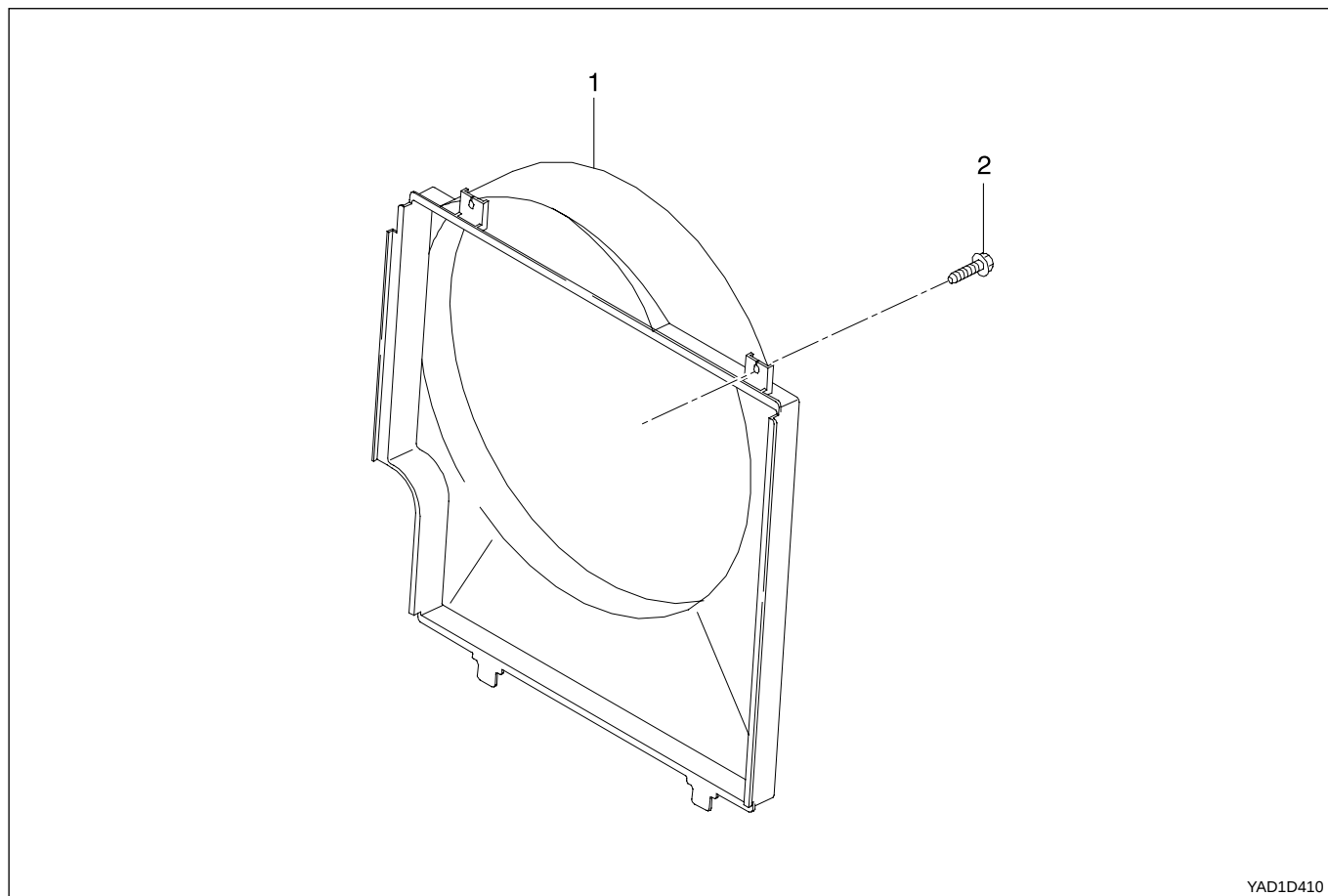
2. Remove the socket bolt (5) and then remove the cooling fan (3) and viscous clutch (2).

Installation Notice

Tightening Torque	9 - 11 N•m (80 - 97 lb-in)
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Keep the viscous clutch vertically.

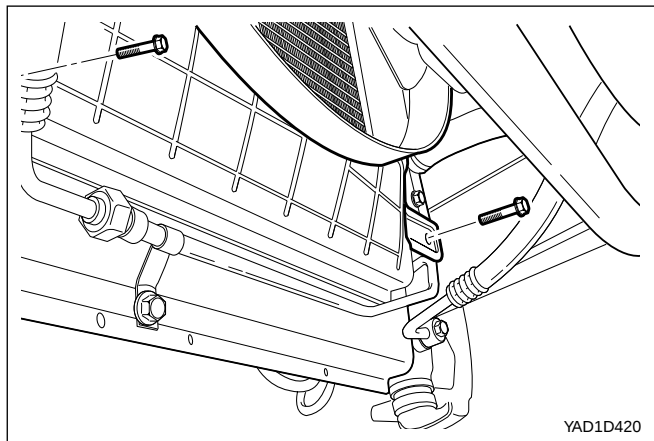
3. Installation should follow the removal procedure in the reverse order.

COOLING FAN SHROUD (GASOLINE ENGINE)

YAD1D410

1 Fan Shroud Assembly

2 Bolt..... 3 - 7 N•m (27 - 62 lb-in)



Removal & Installation Procedure

1. Pull out the 2 clips (1) from the fan shroud assembly.
2. Remove the lower fan shroud (2).

Notice: For installation, exactly align the lower fan shroud pin into the hole of the fan shroud assembly (4) and insert the clips.

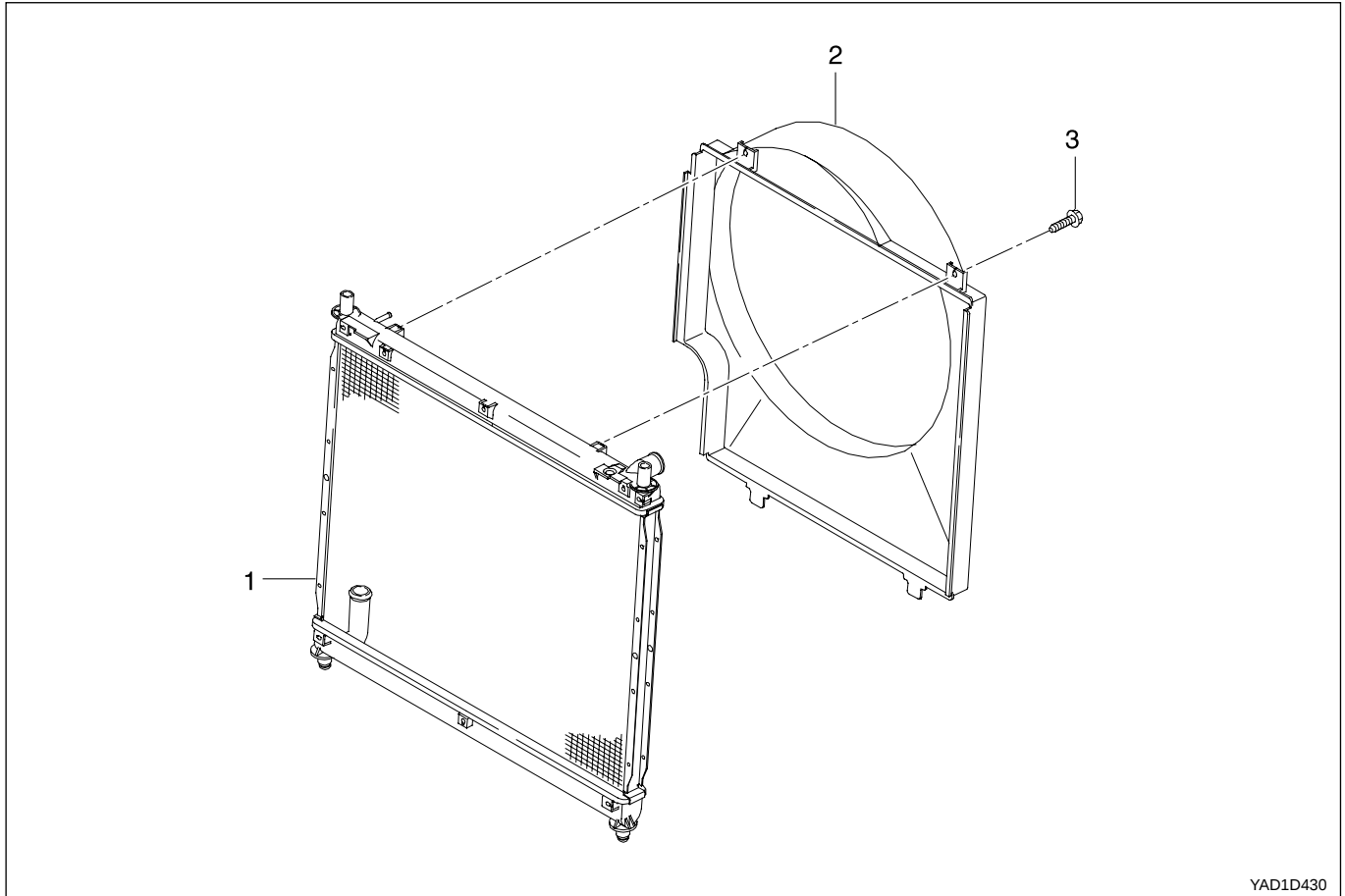
3. Remove the bolts (3) and then remove the cooling fan shroud assembly (4).

Installation Notice

Tightening Torque	3 - 7 N•m (27 - 62 lb-in)
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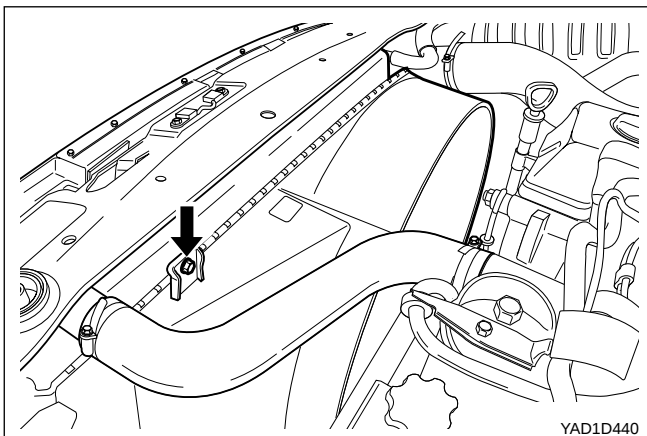
4. Installation should follow the removal procedure in the reverse order.

COOLING FAN SHROUD (DIESEL ENGINE)



- 1 Radiator
2 Cooling Fan Shroud

3 Bolt 3 - 7 N•m (27 - 62 lb-in)



Removal & Installation Procedure

Cooling Fan Shroud

1. Remove the radiator deaeration hose and tube.
2. Remove the bolt (3) and then remove the cooling fan shroud (2).

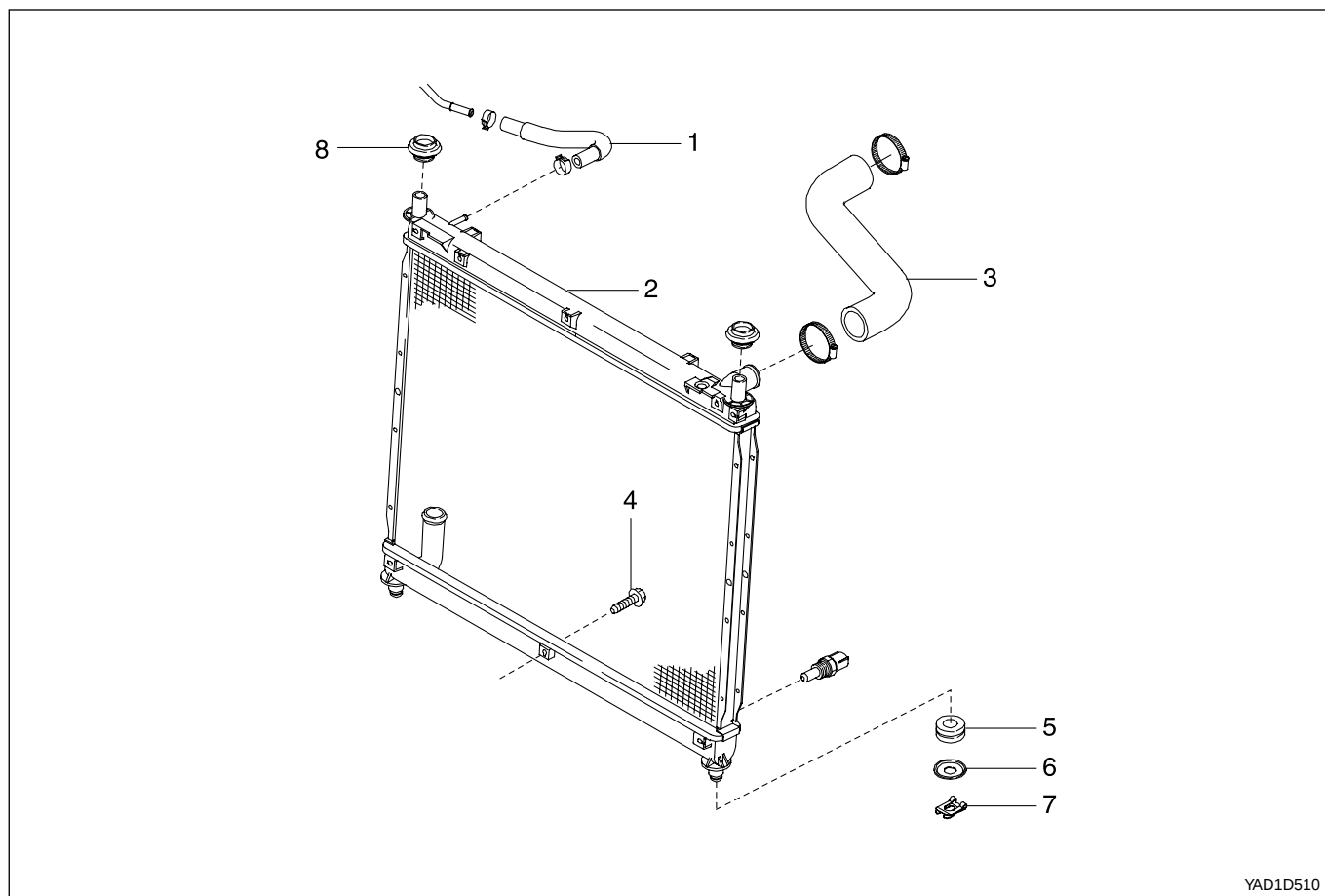
Installation Notice

Tightening Torque	3 - 7 N•m (27 - 62 lb-in)
-------------------	------------------------------

3. Installation should follow the removal procedure in the reverse order.

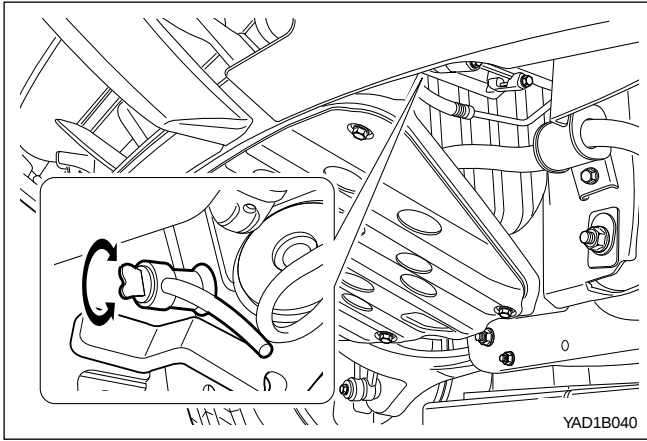
RADIATOR (GASOLINE ENGINE)

Preceding Work : Removal of cooling fan shroud



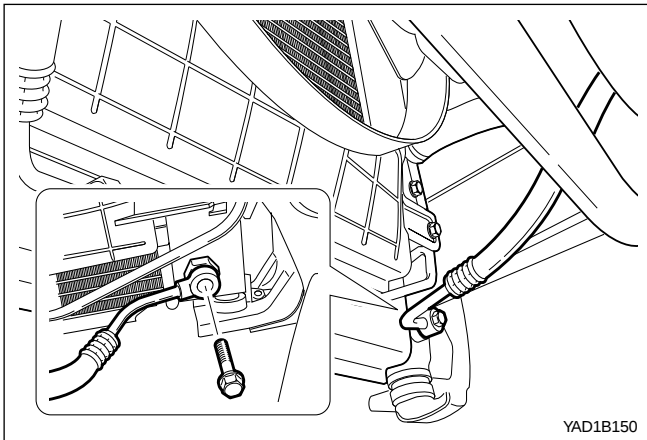
- 1 Deaeration Hose
- 2 Radiator
- 3 Inlet Hose
- 4 Bolt

- 5 Lower Radiator Insulator
- 6 Plate
- 7 Clip
- 8 Upper Radiator Insulator



Removal & Installation Procedure

1. Drain coolant from the radiator.
2. Remove the each coolant hoses.



3. Remove the upper and lower automatic transmission oil cooling pipes from radiator.

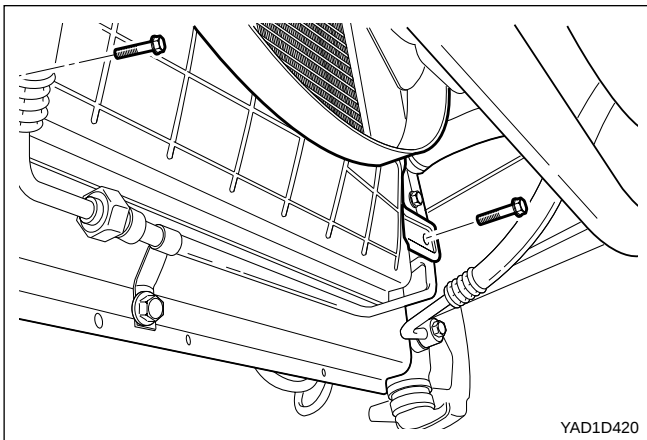
Installation Notice

Tightening Torque	25 - 35 N•m (18 - 26 lb-ft)
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4. Remove the mounting bolt (9) from the automatic transmission oil cooler pipe (5) and then disconnect the cooler pipe (5).

Installation Notice

Tightening Torque	3 - 7 N•m (27 - 62 lb-in)
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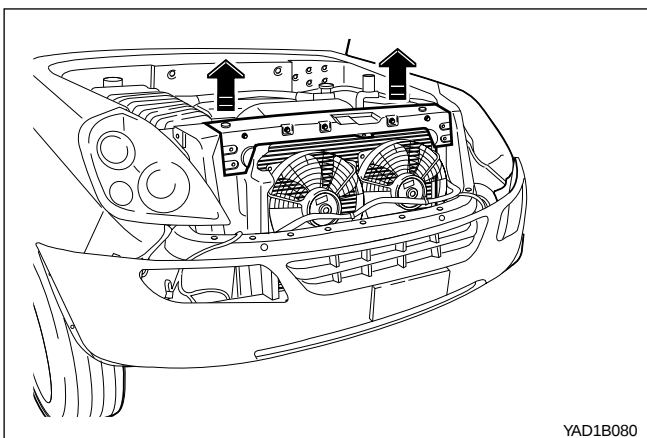


5. Remove the cooling fan shroud bolts and cooling fan shroud.

Installation Notice

Tightening Torque	3 - 7 N•m (27 - 62 lb-in)
-------------------	------------------------------

6. Remove the radiator grille mounting screw and radiator grille.



7. Remove the front and upper member mounting bolts and front end upper member.

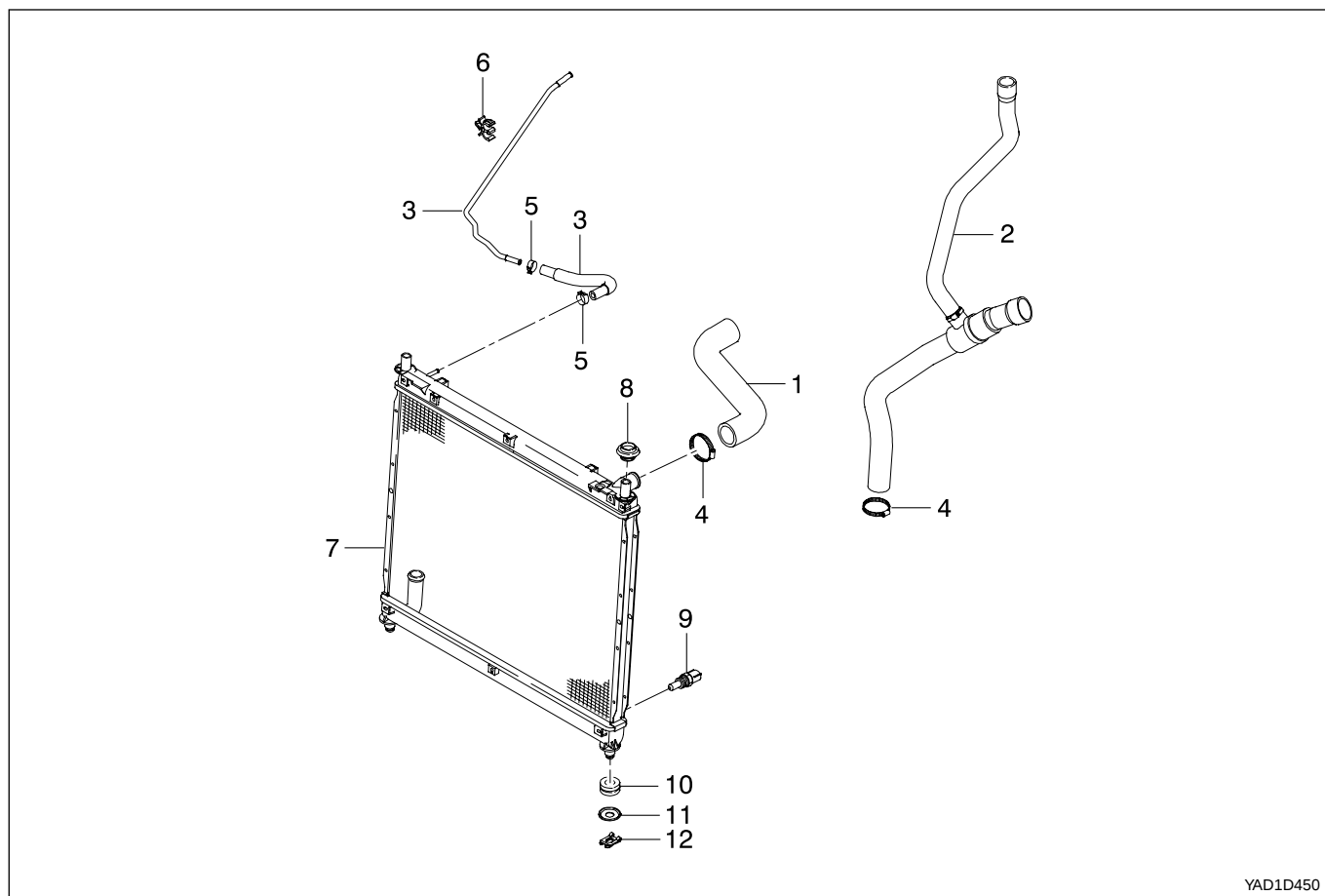
Installation Notice

Tightening Torque	30 - 40 N•m (22 - 30 lb-ft)
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8. Remove the radiator
9. Check the radiator pin for crack, damage, leakage and bending and replace it if necessary.
10. Installation should follow the removal procedure in the reverse order.
11. Check for leakage in the cooling system.

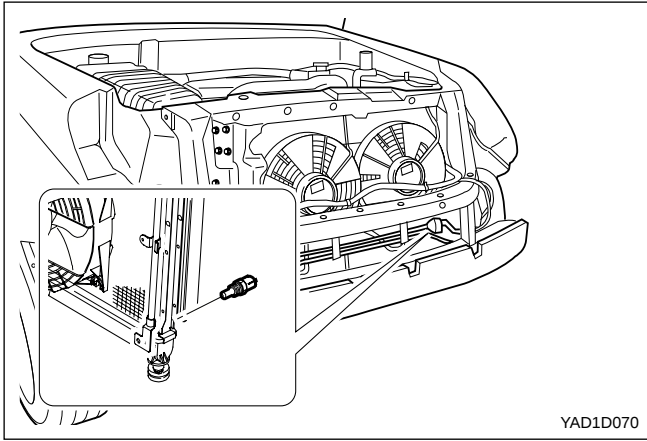
RADIATOR (DIESEL ENGINE)

Preceding : Removal of cooling fan shroud



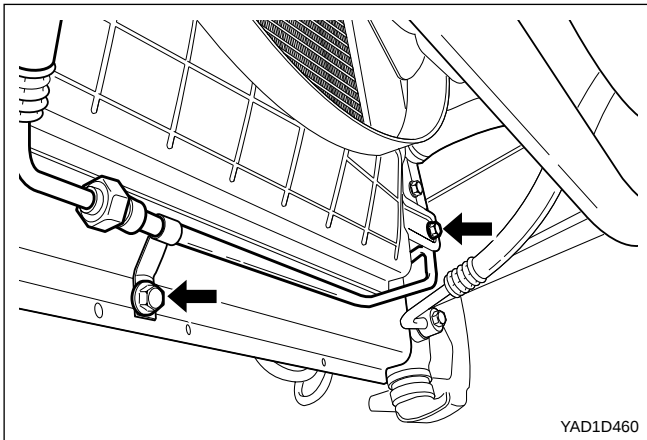
YAD1D450

- | | |
|-----------------------------------|----------------------------------|
| 1 Radiator Inlet Hose | 7 Radiator |
| 2 Radiator Outlet Hose | 8 Upper Insulator |
| 3 Radiator Deaeration Tube & Hose | 9 Coolant Thermo Switch |
| 4 Clamp | 10 Lower Insulator |
| 5 Spring Clamp | 11 Lower Radiator Mounting Plate |
| 6 Clip | 12 Clip |



Removal & Installation Procedure

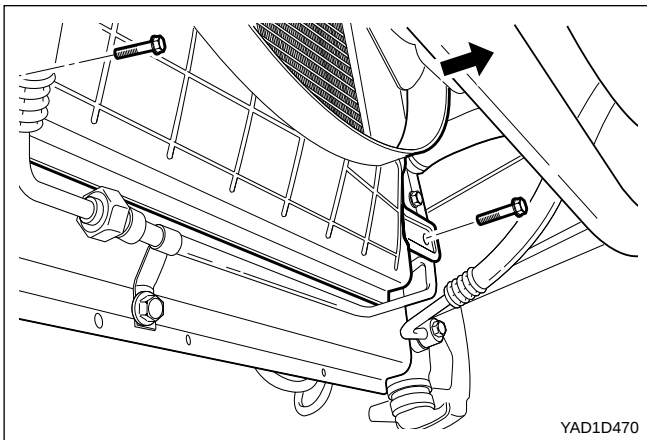
1. Drain coolant from the radiator.
2. Remove the coolant thermoswitch connector from radiator.
3. Remove the each coolant hose.



4. Remove the automatic transmission oil cooler hose and cooling line.

Installation Notice

Tightening Torque	25 - 35 N•m (18 - 26 lb-ft)
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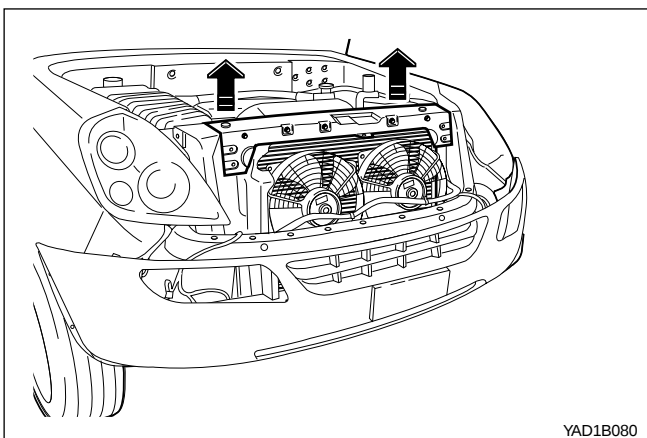


5. Remove the cooling fan shroud bolts and cooling fan shroud.

Installation Notice

Tightening Torque	3 - 7 N•m (27 - 62 lb-in)
-------------------	------------------------------

6. Remove the radiator grille mounting screw and radiator grille.



7. Remove the front and upper member mounting bolts and front end upper member.

Installation Notice

Tightening Torque	30 - 40 N•m (22 - 30 lb-ft)
-------------------	--------------------------------

8. Remove the radiator.
9. Check the radiator pin for crack, damage, leakage and bending and replace it if necessary.
10. Installation should follow the removal procedure in the reverse order.
11. Check for leakage in the cooling system.

SPECIFICATION

GENERAL SPECIFICATIONS

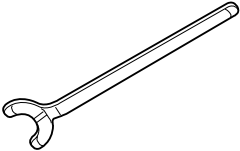
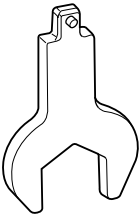
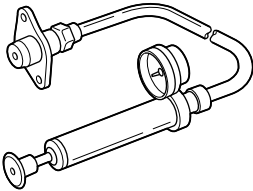
Application		Unit	Gasoline Engine	Diesel Engine
Cooling System	Type	-	Water Cooling Forced Circulation	←
Coolant	Capacity	L	11.3	11.0
Thermostat	Type	-	Wax Pellet Type	←
	Initial Opening Temp.	°C (°F)	82 (180)	←
	Fully Opening Temp.	°C (°F)	95 (203)	←
	Fully Closing Temp.	°C (°F)	80 (176)	←
	Stroke	mm	7	←
Cooling Fan	Type	-	Electric Cooling Fan	←
	Blades	-	5	←
	Diameter	mm	320	←
	Low Speed ON Temp.	°C (°F)	95 (203)	88 (190)
	Low Speed OFF Temp.	°C (°F)	90 (194)	85 (185)
	High Speed ON Temp.	°C (°F)	105 (221)	92 (198)
	High Speed OFF Temp.	°C (°F)	100 (212)	89 (192)
	High Speed ON Temp. (By A/C Pres- sure)	kPa (psi)	269.8 (1860)	←
Coolant Reservoir	Pressure Valve Opening Pressure	kPa (psi)	118 - 147 (17.1 - 21.3)	←
	Pressure Valve Opening Pressure	kPa (psi)	9.8 (1.4)	←
Water Pump	Vacuum Valve Opening Pressure	-	Turbo Centrifugal	←
	Type	mm	65	←
	Impeller Diameter	-	8	←
Radiator	Impeller Blades	-	Cross-flow	Down-flow
	Type	mm	701	←
	Core Width	mm	372	←
	Core Height	mm	18	←
	Core Thickness	Kcal/h	45,000	←
Coolant Temperature Gauge	Minimum Radiation Capability	Ω	185.2	←
	Resistance (at 50 °C (122° F))	Ω	47.4	←
	Resistance (at 80 °C (176° F))	Ω	28.2	←
Engine Coolant Temperature Sensor	Resistance (at 105 °C (221° F))	K Ω	3.33 - 37.8	←
	Resistance (at 20 °C (68° F))	K Ω	0.32 - 0.35	←
	Resistance (at 80 °C (176° F))			
Anti-Freeze Agent	Type	-	ALUTEC-P78	←
	Mixture of Water and Good Quality Ethylene Glycol-Base Anti-Freeze	-	50 : 50	←

FASTENER TIGHTENING SPECIFICATIONS

Application		N•m	Lb-Ft	Lb-In
Automatic Transmission Oil Cooler Pipe		20	15	-
Automatic Transmission Oil Cooler Pipe Mounting Bolt		3 - 7	-	27 - 62
Coolant Drain Plug		30	22	-
Cooling Fan Bolt		9 - 11	-	80 - 97
Cooling Fan Shroud Bolt		3 - 7	-	27 - 62
Engine Hanger Bracket and Coolant Outlet Port Bolt (M162 Engine)		22.5 - 27.5	16.6 - 20.3	-
Oil Cooler Pipe Line Bolt (M161 Engine)		9 - 11	-	80 - 97
Radiator Mounting Bracket Bolt		3 - 7	-	27 - 62
Tensioning Device Shock Absorber Bolt (M161 Engine)		22.5 - 27.5	16.6 - 20.3	-
Thermostat Cover Bolt (Diesel Engine)		9 - 11	-	80 - 97
Thermostat Cover Bolt (M161 Engine)		9 - 11	-	80 - 97
Thermostat Cover Bracket Bolt (M162 Engine)		9 - 11	-	80 - 97
Thermostat Housing Bolt (M161 Engine)	M6	9 - 11	-	80 - 97
	M8	22.5 - 27.5	16.6 - 20.3	-
Viscous Clutch Mounting Bolt		40.5 - 49.5	29.8 - 36.5	-
Water Pump Housing Bolt (Diesel Engine)		9 - 11	-	80 - 97
Water Pump Housing Bolt (M161 Engine)	M6	9 - 11	-	80 - 97
	M8	22.5 - 27.5	16.6 - 20.3	-
Water Pump Mounting Bolt (Diesel Engine)		9 - 11	-	80 - 97
Water Pump Mounting Bolt (M162 Engine)		22.5 - 27.5	16.6 - 20.3	-
Water Pump Pulley Bolt (Diesel Engine)		9 - 11	-	80 - 97
Water Pump Pulley Bolt (M161 Engine)		9 - 11	-	80 - 97

SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS TABLE

 YAD1D350	111 589 00 40 00 Holder	 YAD1D360	111 589 02 01 00 Open End Wrench
 YAD1D020	124 589 15 21 00 Leakage Tester	 KAA1C2D0	603 589 00 40 00 Fan Clutch Holder