

DAIHATSU
F70, F75, F77

**Service
manual**

COOLING SYSTEM

DAIHATSU MOTOR CO., LTD.

NO.9703-FE

DAIHATSU

F70, F75, F77

COOLING SYSTEM

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WRE911C0001

COOLING SYSTEM

TROUBLE SHOOTING

Problem	Possible cause	Remedies
Engine overheats	Poor quality coolant	Replenish coolant.
	Water pump drive belt loose or missing	Adjust or replace belt.
	Dirt, leaves or insects on radiator	Clean radiator.
	Leaky hoses, water pump, thermostat housing, radiator, heater, core plugs or head gasket	Repair as necessary.
	Thermostat faulty	Check thermostat.
	Ignition timing retarded	Set timing.
	Radiator hose plugged or deteriorated	Replace hose.
	Water pump faulty	Replace water pump.
	Radiator plugged or cap faulty	Check radiator.
Cylinder head or block cracked or plugged	Repair as necessary.	

PRECAUTIONS

As regards water to be used as cooling water, use soft water which does not contain salts of minerals, calcium, magnesium and so forth.

If the coolant gets to the vehicle body, immediately flush away the coolant using water.

Never open the radiator cap when the cooling water is hot.

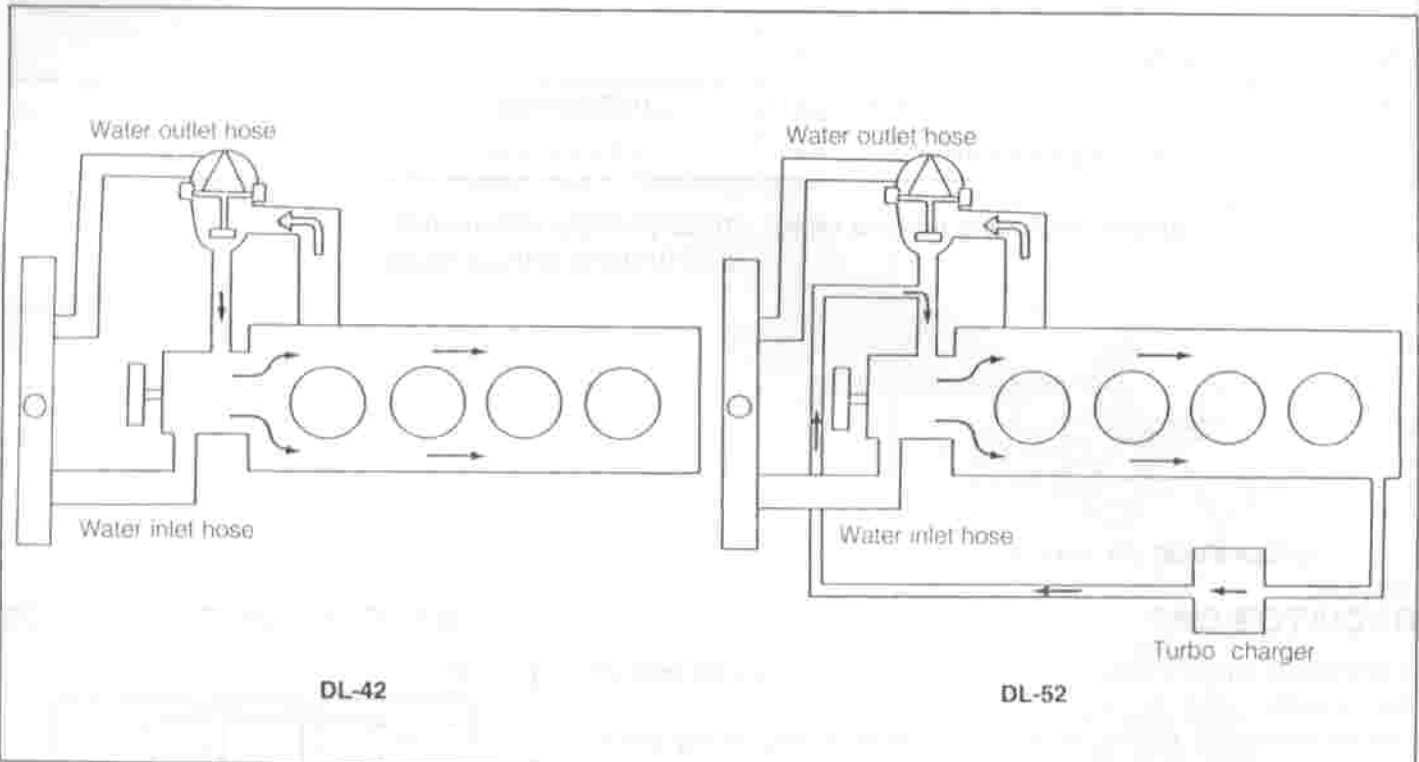
WARNING:

- The inside of the radiator is under a pressurized condition when the cooling water is hot. Therefore, if the radiator cap should be removed, the cooling water will blow off, possibly causing injuries such as scald.

WRE91-CO002

COOLING SYSTEM OUTLINE

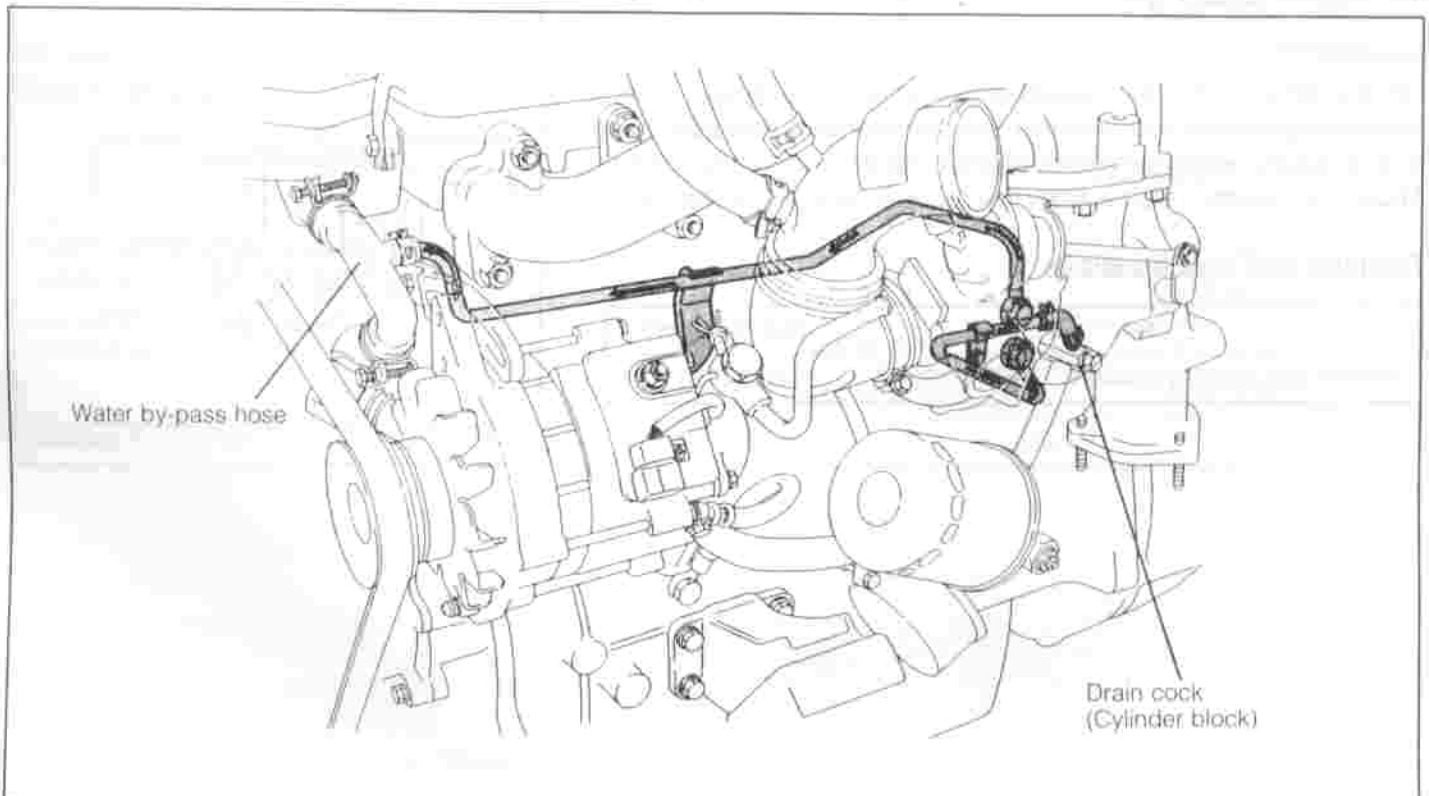
The cooling system is a water-cooled, forced-circulation type. The cooling system employs a bottom by-pass type in which the thermostat is equipped with a by-pass valve. The total capacity of the cooling water is approximately 10ℓ.



WRE91-00003

TURBO CHARGER COOLING WATER ROUTE

The turbo charger is cooled by the cooling water which flows in the following route: cylinder block - turbo charger - turbo charger water by-pass - water pump.



WRE91-00004

COOLING SYSTEM

RADIATOR

Radiator specification

Item		Specification	
		DL-42	DL-52
Radiator water capacity	dm ³	2.6	2.2
Heat radiating rate	KJ/h (kcal/h)	186279 (44500)	182093 (43500)
Core dimensions (width × height × thickness)	mm	526 × 400 × 32	526.4 × 400 × 27

Coolant Capacity (excluding reserve tank): 10.5ℓ (Vehicle with heater)
9.8ℓ (Vehicle without heater)

WRE91-C0006

RADIATOR CAP

A pressure type radiator cap is installed at the upper part of the radiator.

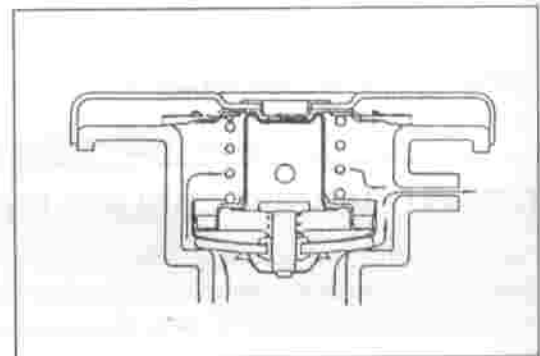
The radiator cap has two valves: a pressure regulating valve and a negative pressure valve.

When the pressure of the cooling system exceeds a specified limit, the rising pressure opens the pressure regulating valve of the radiator cap. As a result, the coolant in the radiator flows to the reserve tank.

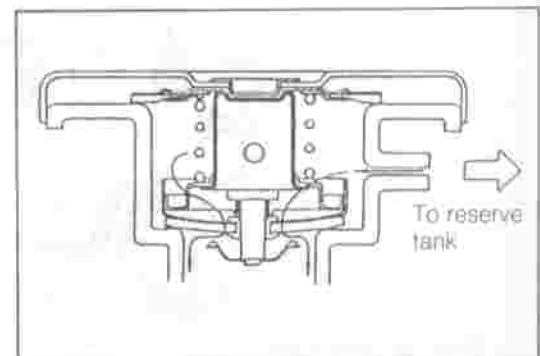
On the other hand, the negative pressure valve opens when the inner pressure drops below the atmospheric pressure due to a dropped water temperature after the engine has stopped. Thus, the coolant returns from the reserve tank to the radiator.

Radiator cap specifications

Item		Specifications
Radiator cap opening pressure	kPa (kgf/cm ²)	88.3 (0.9)



WRE91-C0006



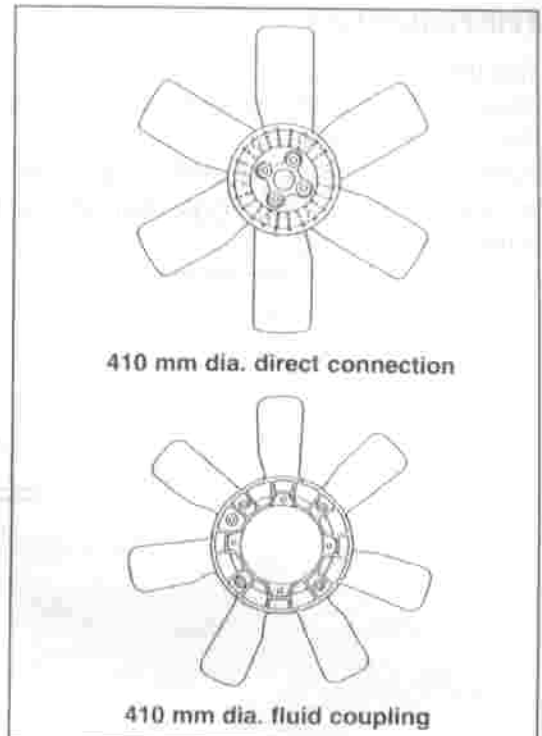
WRE91-C0007

COOLING FAN

The fan comes in two specifications. One is a type where the fan is directly connected to the water pump pulley. The other is a type where the fan is connected to the pulley through a fluid coupling.

The fan-equipped fluid coupling with a temperature control device is employed in order that the noise level may be reduced.

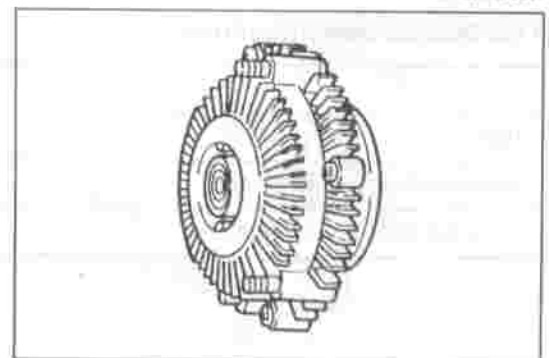
Furthermore, the drop in engine output due to the installation of the cooling fan has been kept to a minimum level.



WRE91-C0008

FLUID COUPLING WITH FAN

The fluid coupling employs a three-stage temperature control type.



WRE91-C0009

Specifications

Item		Specifications	
		DL-42	DL-52
Fluid coupling outer diameter	mm	136	136
Fan revolution speed (when engine revolution speed is 4000 rpm)	rpm	600 at 60°C	650 at 65°C
		1600 at 75°C	1750 at 80°C
		3200 at 85°C	3500 at 90°C
Cooling fan outer diameter × Number of blades	mm	410 × 7	

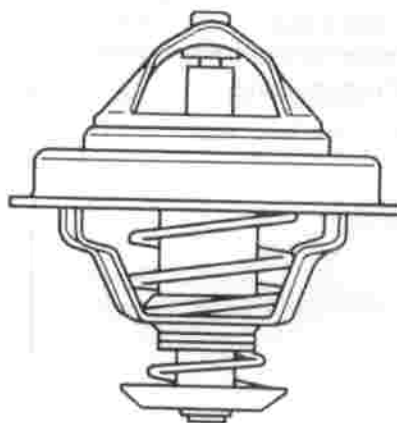
WRE91-C0010

COOLING SYSTEM

THERMOSTAT

The thermostat is a wax type with a bypass valve. The thermostat helps the engine to warm up quickly by allowing the cooling water to be recirculated through the cylinder block and cylinder head without passing through the radiator.

Furthermore, the thermostat is equipped with a jiggle pin which performs the air bleeding while the engine is stopped. Also, the jiggle pin allows the temperature of the cooling water to rise quickly during the warming-up period.



WRE91-CO011

Thermostat specifications

Item		Standard specifications	Cold area specifications
Type		Wax type	
Valve opening temperature	°C	82 ± 2	88 ± 2
Valve full opening temperature	°C	95	100

WRE91-CO012

CHECK & CHANGE OF ENGINE COOLANT

1. Check of coolant level

Check to see if the coolant level is between the LOW and FULL lines of the reserve tank.

If the coolant level is near the low level or below the low level, add the coolant up to the full level.



WRE91-CO013

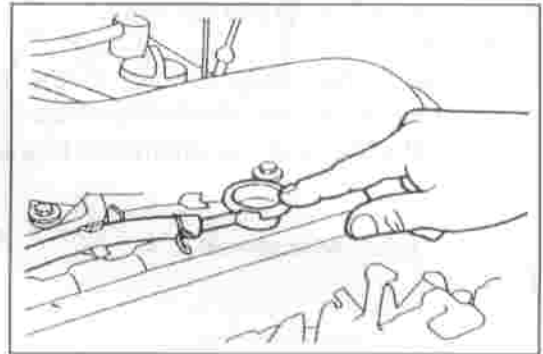
2. Check of coolant quality

There should not be any excessive deposits of rust or water scales around the radiator cap or the radiator filler hole. Also, the coolant should be free of oil.

Change the coolant if it is excessively dirty or the time due to change the coolant has already arrived.

WARNING:

- Never open the radiator cap when the engine is hot.



WRE91-CO014

3. Change of engine coolant

(1) Remove the radiator cap.

WARNING:

- Never open the radiator cap and/or the drain plug when the engine is still hot. Care must be exercised to avoid getting scalded.

(2) Place an adequate container below the radiator drain plug. Drain the coolant by removing the drain plug.

(3) Close the drain plug.

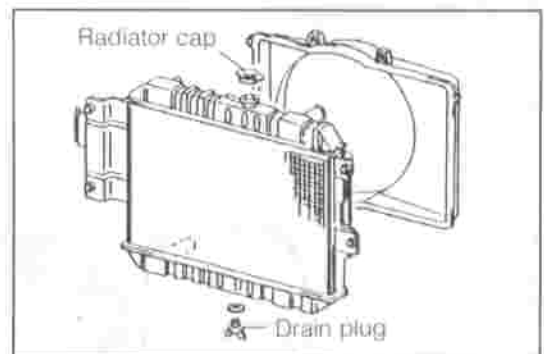
(4) Fill the system with water.

(5) Start the engine, and stop it.

(6) Repeat the steps (1) through (5) two to three times.

NOTE:

- Replace the drain plug gasket with a new one.



WRE91-CO015

(7) Fill the radiator and reserve tank with antifreeze solution in accordance with the instructions of the manufacturer of the antifreeze solution.

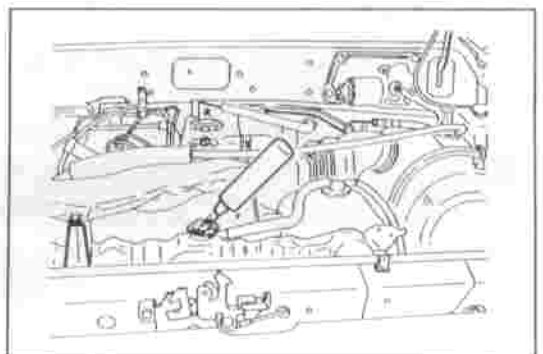
CAUTION:

- Use a Good brand of ethylene-glycol base antifreeze solution.

Coolant Capacity (excluding reserve tank):

10.5ℓ (Vehicle with heater)

9.8ℓ (Vehicle without heater)



WRE91-CO016

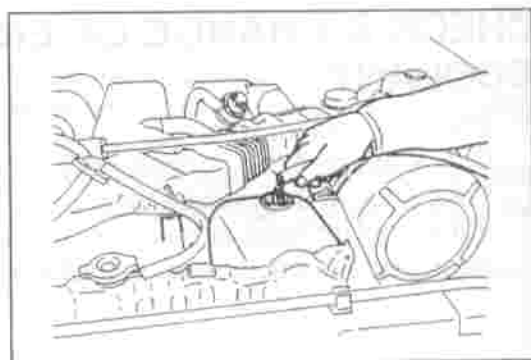
COOLING SYSTEM

- (8) Fill the system with water.
- (9) Start the engine. Check the coolant level. Add water, as required.
- (10) Tighten the radiator cap.
- (11) Warm the engine. Afterwards, allow the coolant to cool down to the atmospheric temperature. Recheck the coolant level at the reserve tank. Add coolant to the full level, as required.

If no coolant remains at all in the reserve tank, recheck the coolant level in the radiator. Replenish the radiator with water, as required. Replenish the reserve tank with coolant up to the full level.

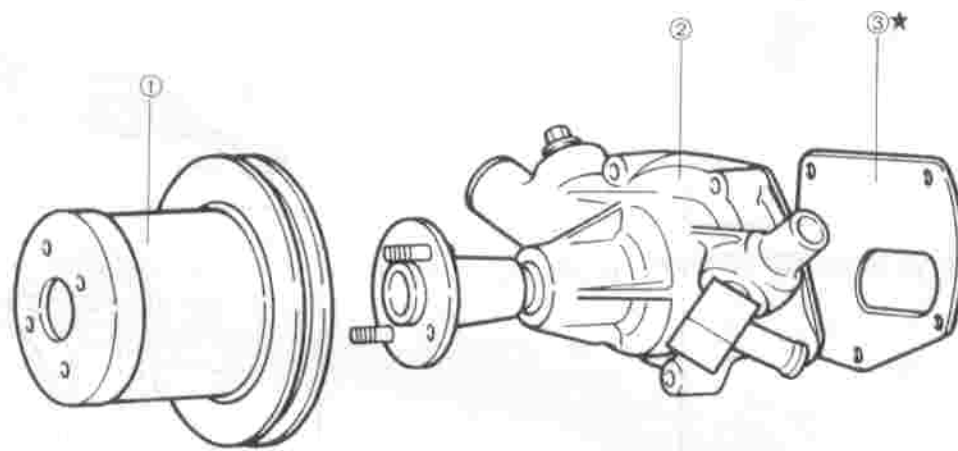
NOTE:

- Here, the coolant refers to the mixture of water and antifreeze that has been mixed in accordance with the instructions of the antifreeze manufacturer.



WRE31-CO017

WATER PUMP

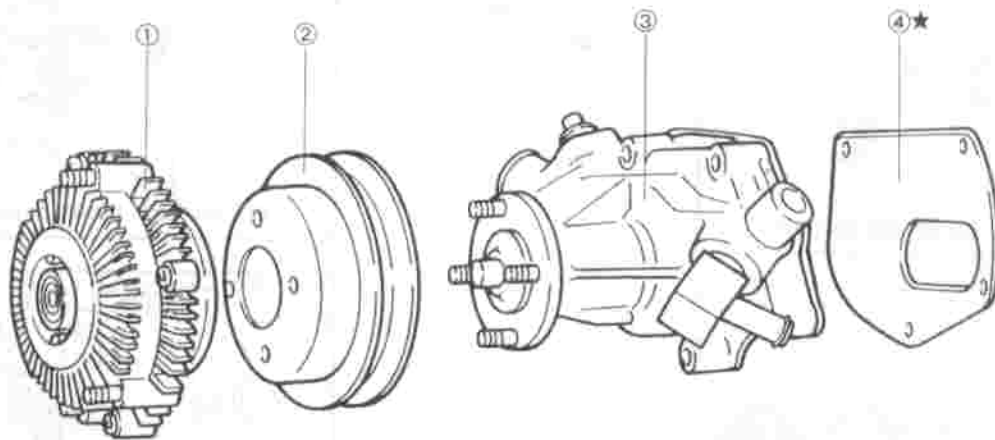


- ① Pulley
- ② Water pump
- ③ Gasket

410 mm dia. direct connection type

★ : Non-reusable parts

WRE91-CO018



- ① Fluid coupling
- ② Pulley
- ③ Water pump
- ④ Gasket

410 mm dia. fluid coupling type

★ : Non-reusable parts

WRE91-CO019

REMOVAL OF WATER PUMP

1. Disconnect the battery ground cable from the negative (-) terminal of the battery.
2. Drain the coolant. (See page CO-7.)
Open the radiator cap and drain plug, and allow the coolant to drain into a clean container.

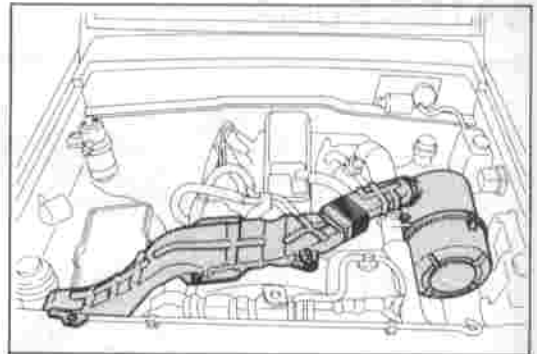
WARNING:

- Never open the radiator cap and/or drain plug while the engine is hot.

WRE91-CO020

COOLING SYSTEM

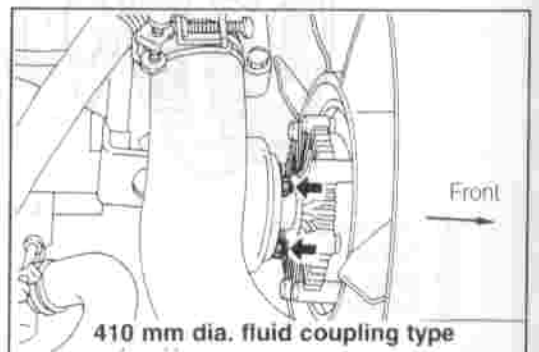
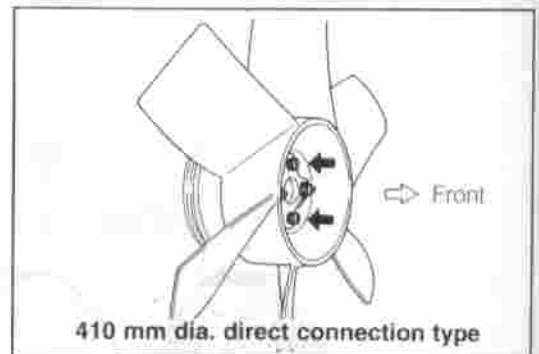
3. Remove the cool air intake duct.



4. Remove the reserve tank. (DL-52 only)

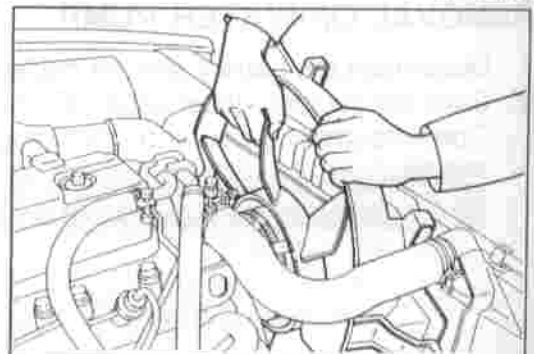


5. Removal of fan and fan shroud
(1) Remove the four nuts retaining the fan.

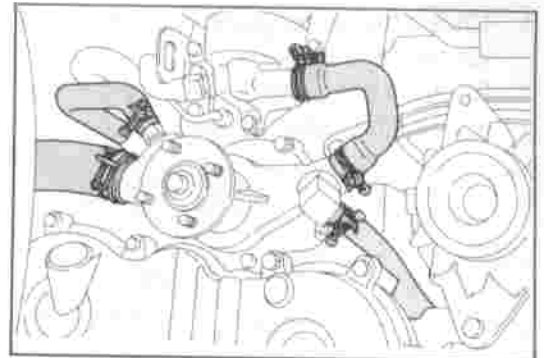


(2) Remove the two bolts retaining the fan shroud and radiator.

(3) Remove the fan shroud together with the fan.

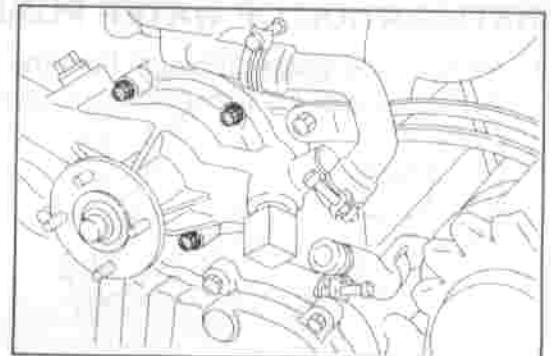


4. Disconnect the hoses connected to the water pump.



WRE91-C0025

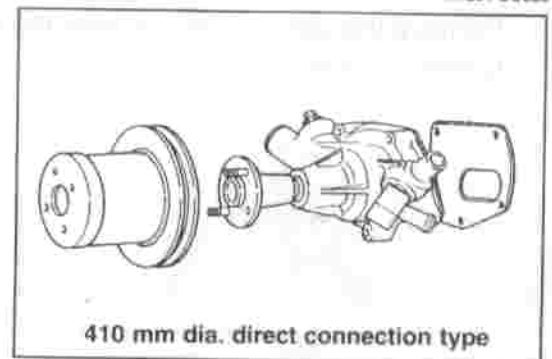
5. Remove the water pump by removing the attaching bolts of the water pump.



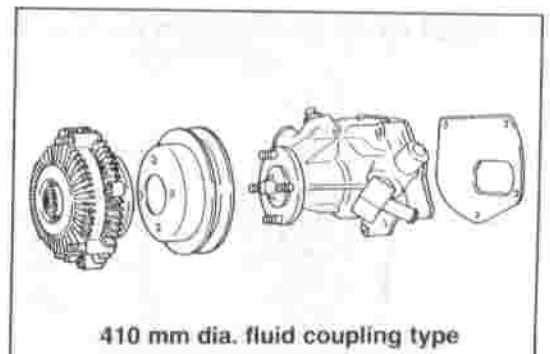
WRE91-C0026

INSPECTION OF WATER PUMP-RELATED PARTS

1. Check the water pump pulley for damage or deformation. Replace the water pump pulley if it exhibits damage or deformation.



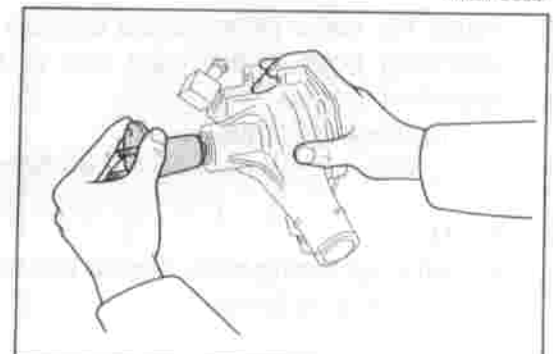
410 mm dia. direct connection type



410 mm dia. fluid coupling type

WRE91-C0027

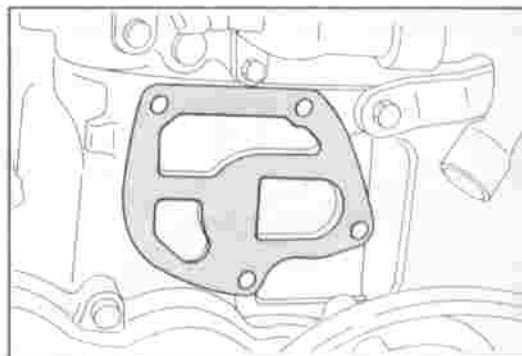
2. Ensure that the water pump rotates smoothly by hand. Replace the water pump if it will not rotate smoothly.



WRE91-C0028

COOLING SYSTEM

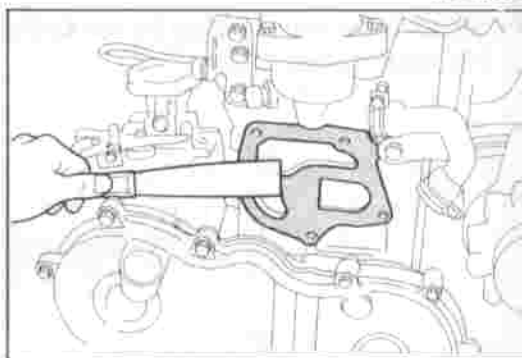
3. Check the water pump cover section of the cylinder block for damage or wear.
Replace the cylinder block if the water pump cover section exhibits damage or wear.



WRE91-C0030

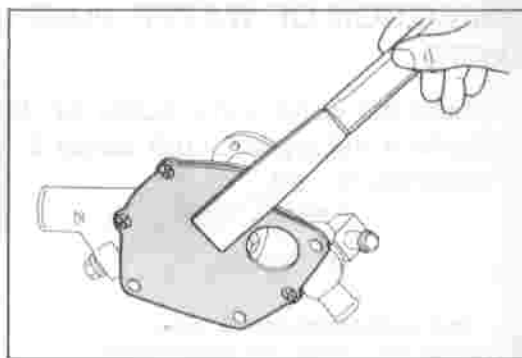
INSTALLATION OF WATER PUMP

1. Remove the gasket material from the water pump installation surface of the cylinder block, using a gasket scraper.



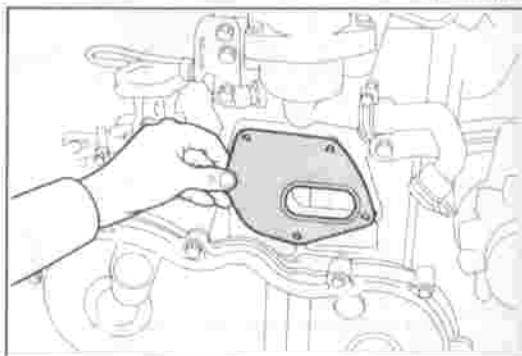
WRE91-C0030

2. Remove the gasket material from the water pump, using a gasket scraper.



WRE91-C0031

3. Install a new gasket to the cylinder block.



WRE91-C0032

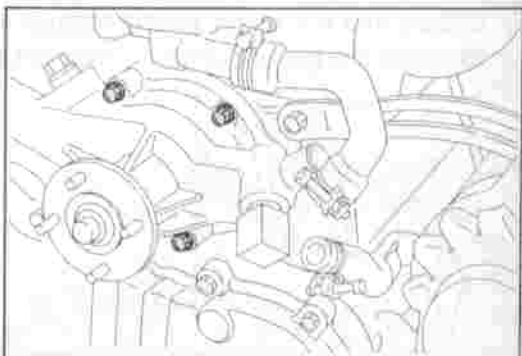
4. Install the water pump to the cylinder block. Tighten the attaching bolts evenly over two or three stages to the specified torque.

Tightening Torque:

18.2 ± 2.4 N·m (1.85 ± 0.35 kgf·m, 13.3 ± 2.5 ft·lb)

NOTE:

- After tightening bolts, ensure that the water pump rotates smoothly by hand.



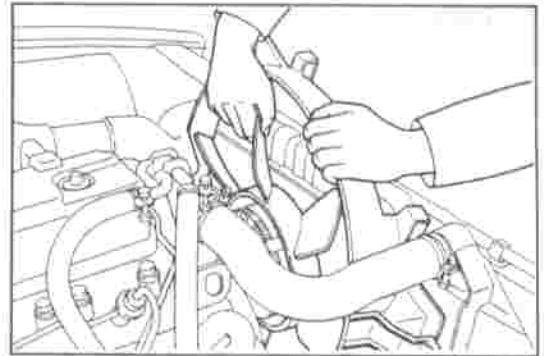
WRE91-C0033

5. Installation of fan and fan shroud
 (1) Install the fan together with the fan shroud.

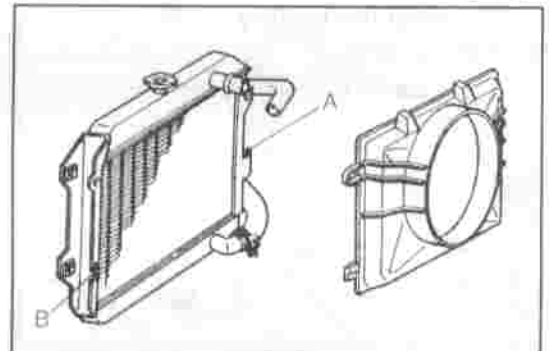
NOTE:

Insert the pawl at the right side of the fan shroud into the pawl A of the radiator. With the pawl at the right side put in, insert the pawl at the left side of the fan shroud into the pawl B of the radiator.

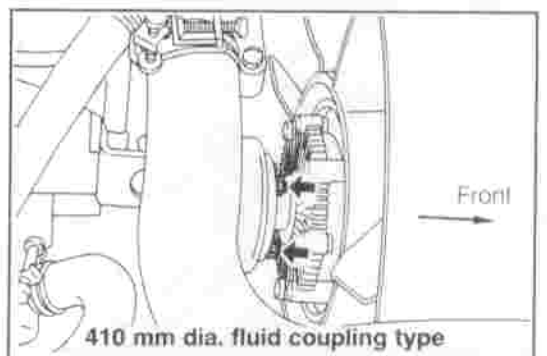
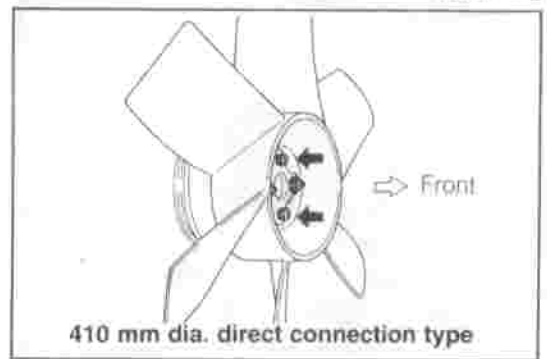
- (2) Install the fan with the four nuts.



WRE91-C0034



WRE91-C0035



WRE91-C0036

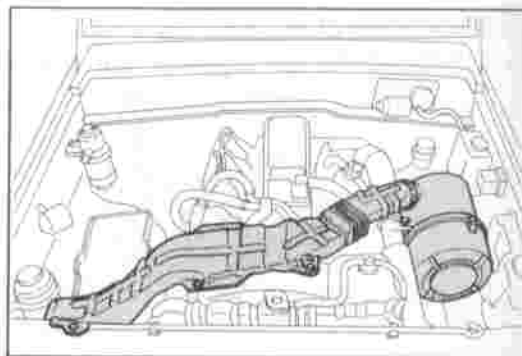
6. Install the reserve tank.
 (DL-Turbo only)



WRE91-C0037

COOLING SYSTEM

7. Install the cool air intake duct.



WRE91-00038

8. Connect the battery.
9. Fill coolant.
(See page CO-7.)

After the engine is started, check the coolant level in the reservoir. If the level is low, add coolant. Do not overfill. The coolant level should be maintained between the "Full" and "Low" marks.

WRE91-00039

THERMOSTAT

REMOVAL OF THERMOSTAT

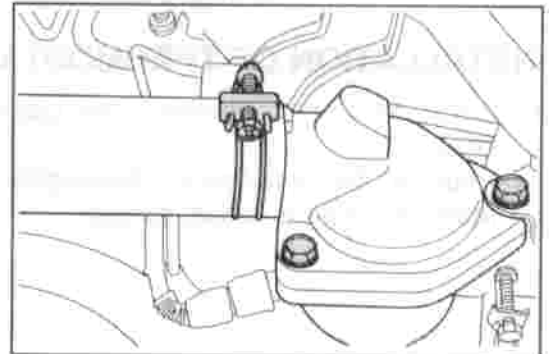
1. Disconnect the battery ground cable from the negative (-) terminal of the battery.
2. Drain the coolant. (See page CO-7.)

WARNING:

- Never open the radiator cap and/or drain plug while the coolant is hot.

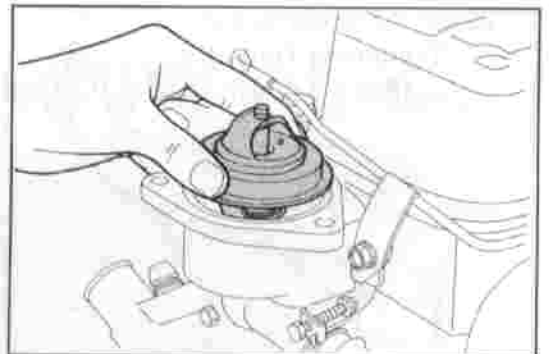
WRE91-CO040

3. Remove the radiator inlet hose and attaching bolts.



WRE91-CO041

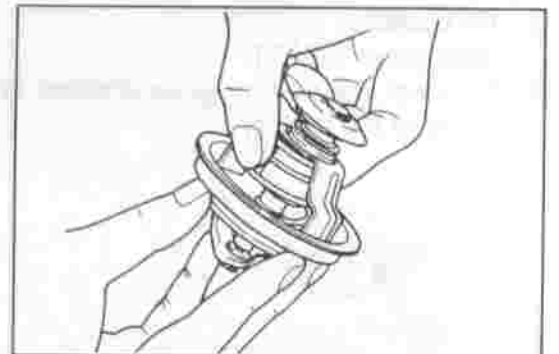
4. Remove the thermostat by removing the water outlet.



WRE91-CO042

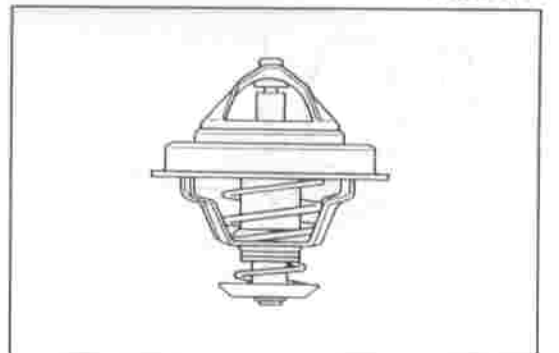
INSPECTION OF THERMOSTAT

1. Ensure that the thermostat valve is closed completely at room temperature 20°C and the spring has no play. Replace the thermostat if the valve is open or the spring has a play.



WRE91-CO043

2. Check the rubber grommet of the thermostat for damage or crack. Replace the thermostat if the rubber grommet exhibits damage or crack.



WRE91-CO044

COOLING SYSTEM

3. Immerse the thermostat in water, and check the valve opening temperature by heating the water gradually.

Specifications	Valve opening temperature °C	Valve lift
Standard specifications	80 - 84	10 mm or more at 95°C
Cold area specifications	86 - 90	10 mm or more at 100°C

Replace the thermostat if the valve operation fails to conform to the specifications.

INSTALLATION OF THERMOSTAT

1. Install the thermostat and a new gasket in this sequence.

NOTE:

Prior to the installation, thoroughly remove the gasket material, using a gasket scraper.

2. Install the water outlet.

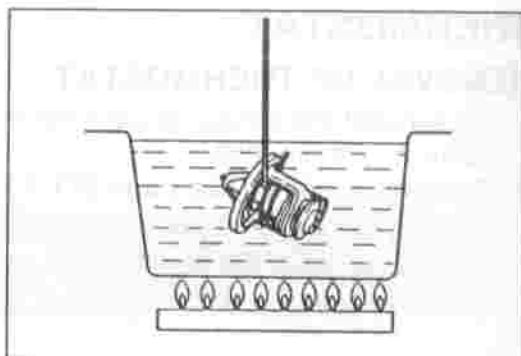
Tightening Torque:

18.2 ± 3.4 N·m (1.85 ± 0.35 kgf·m, 13.4 ± 2.6 ft·lb)

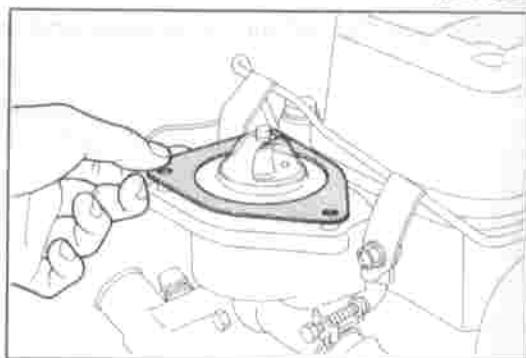
3. Fill coolant.

(See page CO-7.)

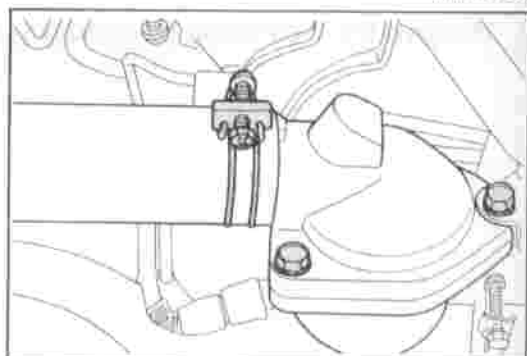
4. Connect the battery ground cable to the negative (-) terminal of the battery.



WRE91-C0045



WRE91-C0046



WRE91-C0047

WRE91-C0048

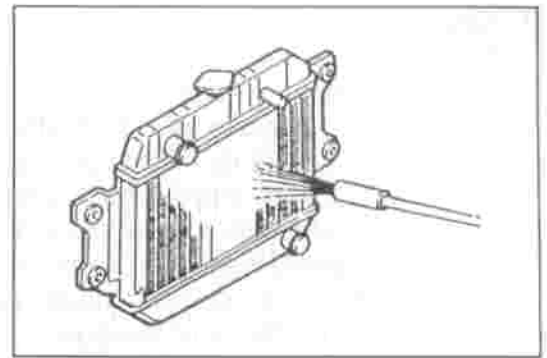
RADIATOR

CLEANING OF RADIATOR

Using water or steam cleaner, remove mud and dirt from the radiator core.

CAUTION:

- When using a high pressure type cleaner, be careful not to deform radiator core fins.
- Keep a distance of more than 40 - 50 cm between the radiator core and cleaner nozzle when the cleaner nozzle pressure is 2942 - 3433 kPa (30 - 35 kgf/cm²). Also, the injection angle of pressurized water should be right angles to the radiator.



WRE91-C0049

INSPECTION OF RADIATOR

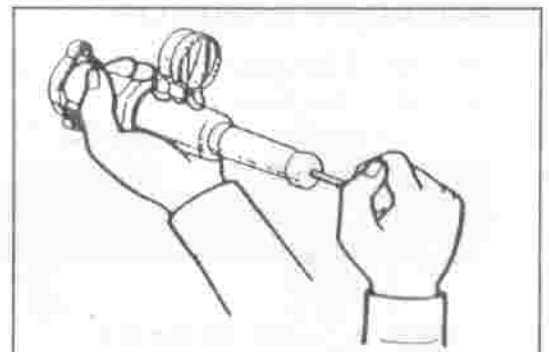
1. Check of radiator cap

- (1) Check the radiator cap by means of a radiator cap tester to see if the relief valve opens at a pressure of 73.6 - 103.0 kPa (0.75 - 1.05 kgf/cm²).

If the radiator cap does not conform to the specification, replace the radiator cap.

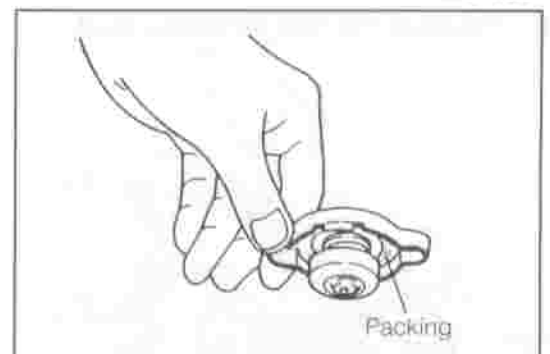
WARNING:

- Never open the radiator cap when the engine is hot.



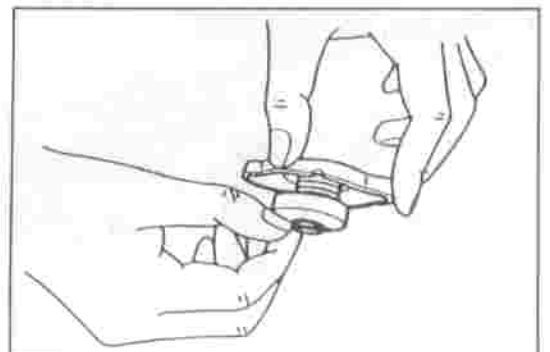
WRE91-C0050

- (2) Check the seal packing of the radiator cap for damage. Replace the radiator cap with a new one, if any damage exists.



WRE91-C0051

- (3) Lift the valve at the vacuum side with your fingers. Ensure that the valve is functioning properly. Replace the radiator cap with a new one, if the valve fails to function.



WRE91-C0052

COOLING SYSTEM

2. Check of cooling system for leakage

- (1) Fill the radiator with coolant. Attach a radiator cap tester.
- (2) Warm up the engine.
- (3) Apply a pressure of 117.7 kPa (1.2 kgf/cm²) to the cooling system by means of a radiator tester.

If the pressure drops, check the hoses, radiator, water pump and heater for evidence of leakage.

If no external leakage is found, check the heater core, cylinder block, cylinder head, oil cooler and throttle body for evidence of leakage.

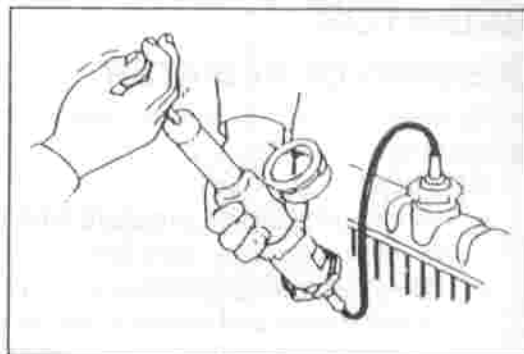
Check the hoses for deterioration, cracks, bulge or damage.

Replace the defective part(s) if necessary.

- (4) Remove the radiator cap tester from the radiator.

WARNING:

- Never remove the radiator cap tester when the coolant temperature is high.



WRE91-C0063

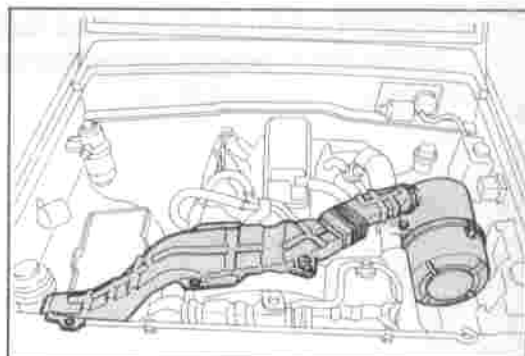
REMOVAL OF RADIATOR

1. Disconnect the ground cable terminal from the negative (-) terminal of the battery.
2. Drain the coolant. (See page CO-7.)

WARNING:

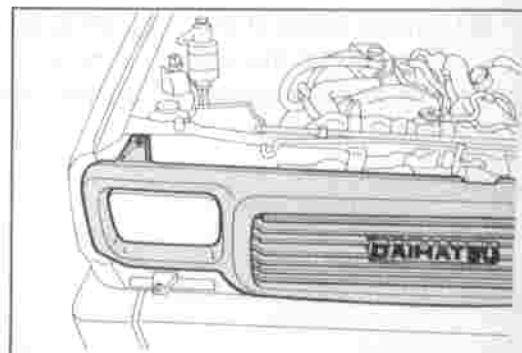
- Never open the radiator cap and/or drain plug while the coolant is hot.

3. Remove the cool air intake duct.



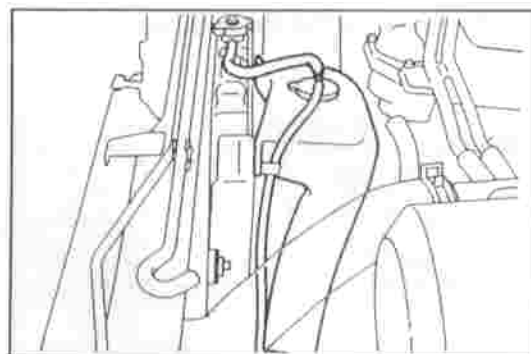
WRE91-C0068

4. Remove the front grille.



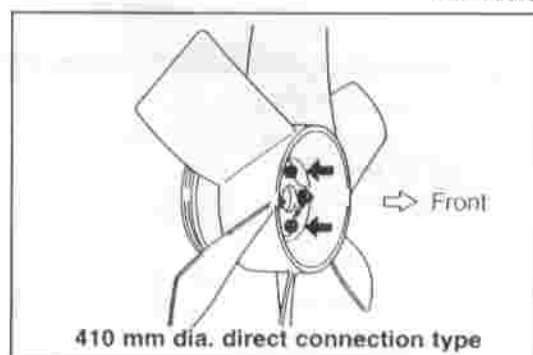
WRE91-C0069

5. Remove the reserve tank. (DL-52 only)

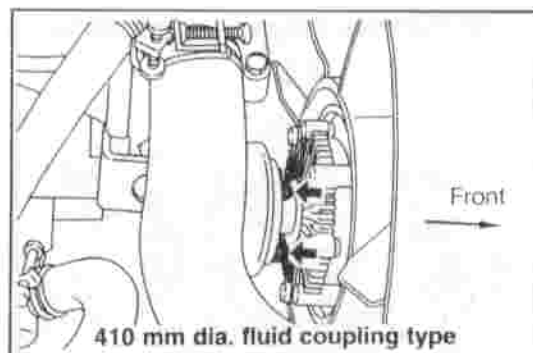


WRE91-C0057

6. Removal of fan and fan shroud
 - (1) Remove the four nuts retaining the fan.



410 mm dia. direct connection type



410 mm dia. fluid coupling type

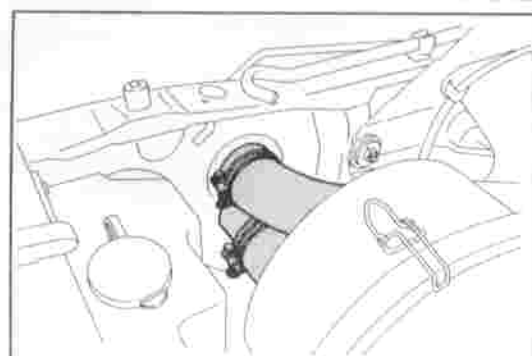
WRE91-C0058

- (2) Remove the two bolts retaining the fan shroud and radiator.
- (3) Remove the fan shroud together with the fan.



WRE91-C0059

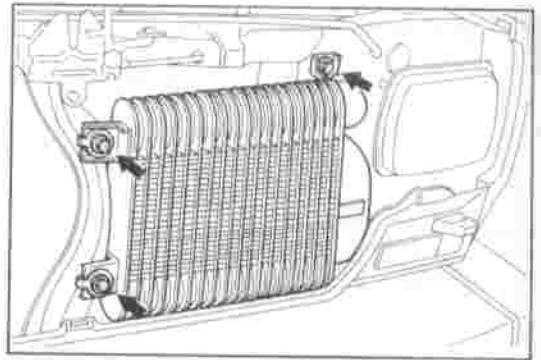
7. Removal of intercooler (DL-52 only)
 - (1) Remove the hose connected to the intercooler.



WRE91-C0060

COOLING SYSTEM

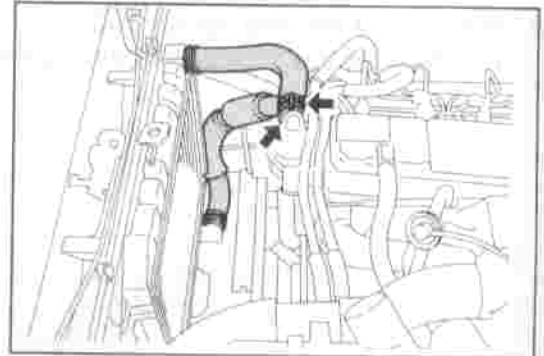
(2) Remove the intercooler.



WRE91-C0061

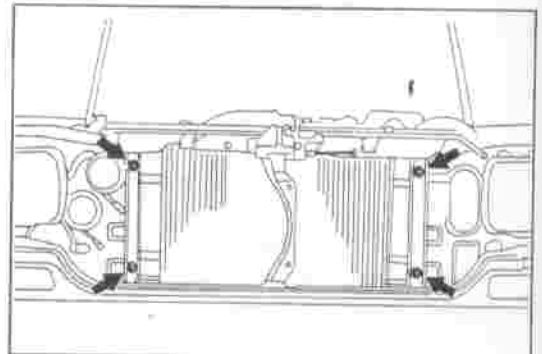
8. Removal of radiator

(1) Disconnect the radiator hoses from the radiator.



WRE91-C0062

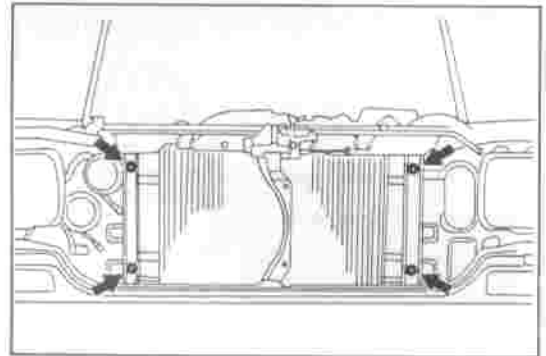
(2) Remove the radiator by removing the four bolts.



WRE91-C0063

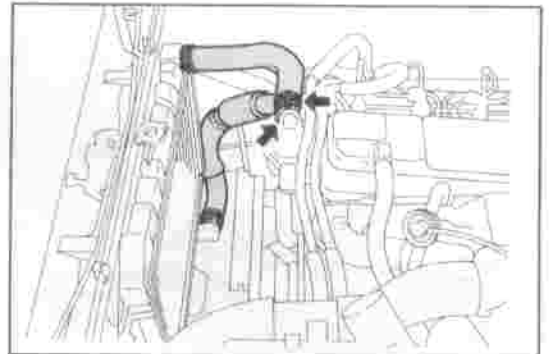
INSTALLATION OF RADIATOR

1. Installation of radiator
 - (1) Install the radiator.



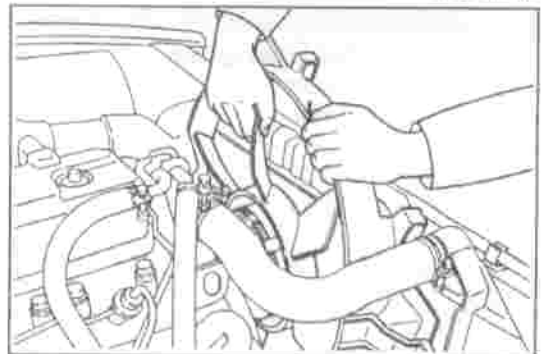
WRE91-CO064

- (2) Connect the radiator hoses and attach new hose bands.



WRE91-CO065

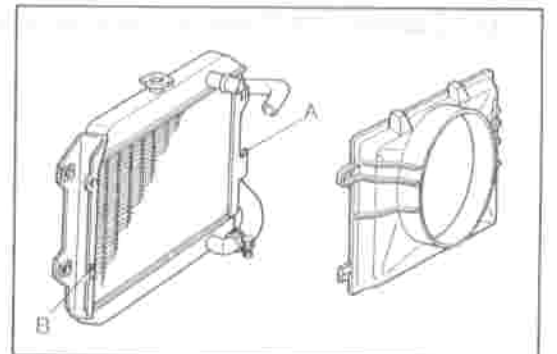
2. Installation of fan and fan shroud
 - (1) Install the fan together with the fan shroud.



WRE91-CO066

NOTE:

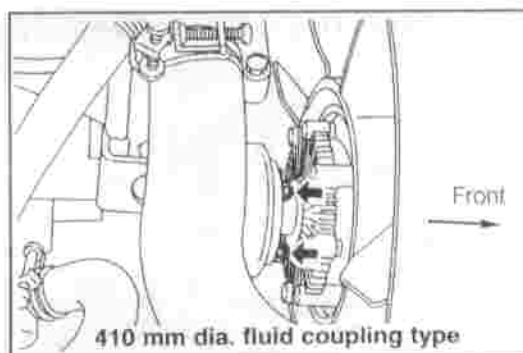
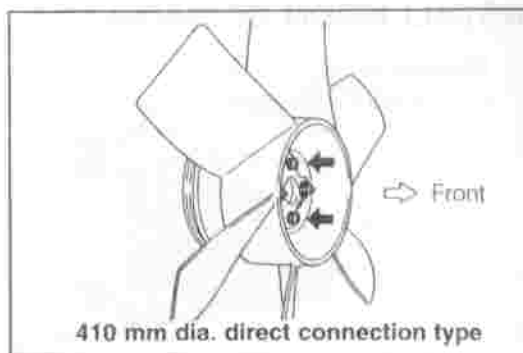
Insert the pawl at the right side of the fan shroud into the pawl A of the radiator. With the pawl at the right side put in, insert the pawl at the left side of the fan shroud into the pawl B of the radiator.



WRE91-CO067

COOLING SYSTEM

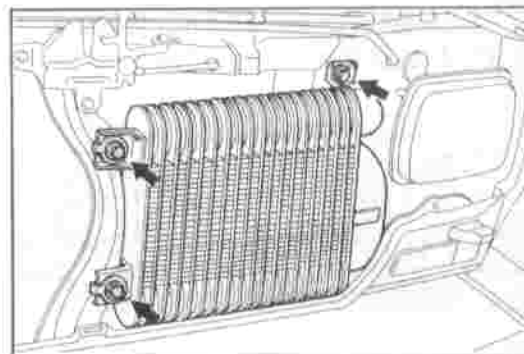
(2) Install the fan with the four nuts.



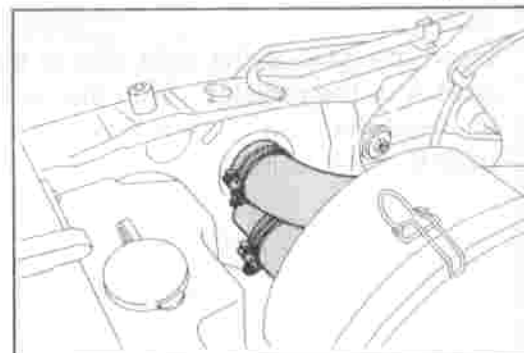
WRE91-C0068

3. Installation of intercooler (DL-Turbo only)

(1) Install the intercooler.



(2) Connect the hoses to the intercooler.

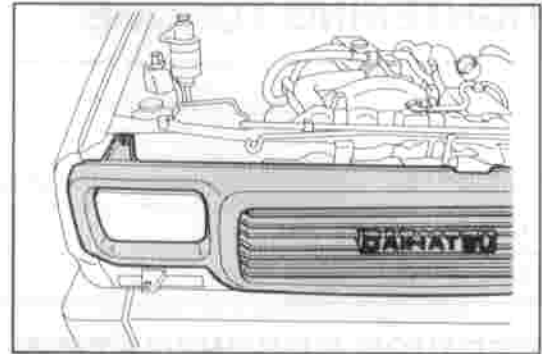


4. Install the reservoir tank.
(DL-Turbo only)



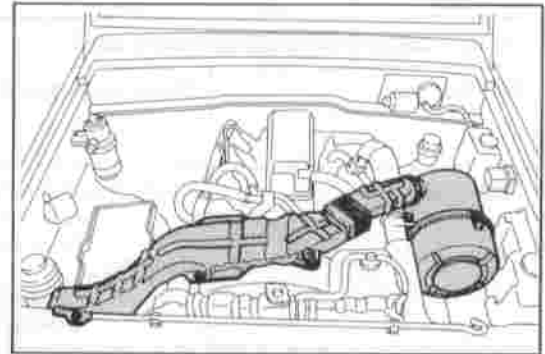
WRE91-C0071

5. Install the front grille.



WRE91-C0072

6. Install the cool air intake duct.



WRE91-C0073

7. Connect the battery.
8. Fill coolant.
(See page CO-7.)

WRE91-C0074

COOLING SYSTEM

TIGHTENING TORQUE

Tightening component	Tightening torque			Remark
	N·m	kgf·m	ft·lb	
Cylinder head × Water temperature sender gauge	22.1 ± 2.5	2.25 ± 0.25	16.3 ± 1.8	Dry
Cylinder block × Water inlet	18.1 ± 3.4	1.85 ± 0.35	13.4 ± 2.5	Dry
Cylinder block × Water pump	18.1 ± 3.4	1.85 ± 0.35	13.4 ± 2.5	Dry

WRE91-C0075

SERVICE SPECIFICATION

Coolant capacity [Excluding reserve tank]	10.5 ℓ (with heater) 9.8 ℓ (without heater)	
Radiator cap	Relief valve opening pressure	73.5 - 103.0 kPa (0.75 - 1.05 kgf/cm ²)
Thermostat	Valve opening temperature: Standard specifications Cold area specifications Valve lift Standard specifications Cold area specifications	82 ± 2 C° 88 ± 2 C° 10 mm or more at 95°C 10 mm or more at 100°C

WRE91-C0076