

ISUZU
Bellett

**COOLING
SYSTEM**

ENGINE SERIES

PART 7

INTRODUCTION

ISUZU MOTORS LIMITED

TOKYO, JAPAN

PART 7 COOLING SYSTEM

7-1 INTRODUCTION

1) Component part of the cooling system

The cooling system comprises radiator, water pump, cooling fan, fanbelt, thermostat, by-pass pipe, rubber joint and the like.

2) Cooling water circulation

The forced water circulating method has been employed in the Bellett engine. As the thermostat valve is held closed, the cooling water is not forced to circulate irrespective of water pump operation until the cooling water reaches as high as 76.5°C.

Thus, the cooling water temperature raise quickly thereby bringing the engine into optimum operating temperature after a short period of driving.

As the cooling water reaches the thermostat valve opening temperature, the valve is forced to open and the cooling water is taken into the water jacket from the lower tank in the radiator. The water is then, forced to return to the radiator through the upper hose and cooled by the cooling fan.

7-2 SPECIFICATIONS OF THE COOLING SYSTEM

	Model G150	Model G130	Model C180
Cooling method	Pressurized circulation system	Same as left	Same as left
Cooling system capacity (ltr)	6	"	"
Water pump type	Impeller type	"	"
Maximum delivery(ltr/min) at 3,000 rpm total lift 2.5m or above	Above 50	"	Above 55
Type of thermostat	Wax pellet type with by-pass	"	Same as left
Thermostat valve opening temperature	7.65 [±] 1.5	"	"

COOLING SYSTEM

Thermostat valve fully opening temperature	90	"	"
Valve opening stroke (mm) at water temperature 90°C	8.5	"	"
Radiator type	Pressurized colling	"	"
Type of water tube and fin	Corrugated fin with flat tube	"	"
Number of piping arrangement	2	"	"
Number and diameter of the cooling fan	4 x 350	"	4 x 370
Fan belt	Model A	"	Same as left

7-3 TROUBLE-SHOOTING

Cause	Correction
1. Over-heating	
(1) Insufficient cooling water	Water replenished and cooling system checked for leakage
(2) Loosened or worn fan belt	Fanbelt tension adjusted or replace the fan belt
(3) Oil or grease on the fan belt	Replace the fan belt
(4) Thermostat failure	Replace thermostat as necessary
(5) Water pump operating failure	Rectify or replace
(6) Clogged water transfer port	Clean the radiator and water passage preferably with radiator chemicals
(7) Improper ignition timing	Readjust ignition timing

(8) Contaminated or clogged radiator core	Clean external part of the radiator
(9) Mixture leaks into the water jacket due to worn cylinder head gasket	Replace cylinder head gasket
2. Over-cooling	
(1) Thermostat operating failure	Replace thermostat
(2) Extremely low ambient temperature	Reduce cooling area by covering the radiator
3. Reduction of cooling water	
(1) Leakage in the radiator	Rectify or replace the radiator
(2) Loosened or damaged rubber joint	Retighten the clamping or replace the hose
(3) Water pump leaking	Rectify or replace the parts
(4) Loosened or damaged heater hose connection	Tighten or replace the hose
(5) Water leaking from the cylinder head gasket	Retighten cylinder head clamping bolts or replace the gasket
(6) Cracked cylinder block or cylinder head	Rectify or replace the parts
4. Noise arises from the cooling system	
(1) Worn water pump bearing	Replace water pump
(2) Loosely mounted blade or bent fan blade	Retighten or replace the fan blades
(3) Worn fan belt	Replace the fan belt

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7-4 WATER PUMP

7-4-1 Specifications

	Model G150	Model G130	Model C180
Type	Impeller type with 6 blades	Same as left	Same as left
Amount of delivery ltr/min (at 3,000 rpm, total lift 2.5m or above)	Above 50	"	55
Diameter of the pulley	132 ϕ	"	120 ϕ
Gear ratio to the crankshaft	1.04	"	1.14
Water sealant	Mechanical sealing	Same as left	Same as left
Bearing type	Ball bearing	"	"
Pump impeller and pump			
Clearance between the body (mm)	1	"	1.2 - 1.3

7-4-2 Construction and the component parts of the water pump

Construction of the water pump

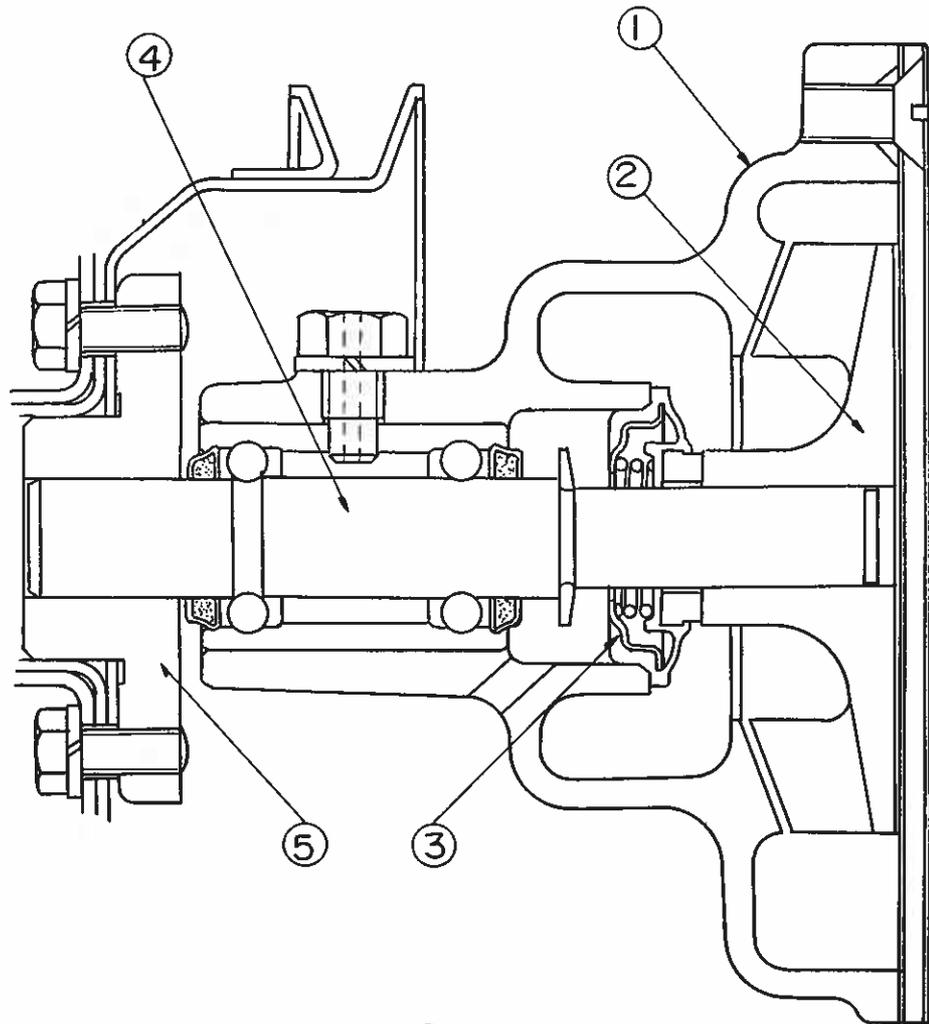
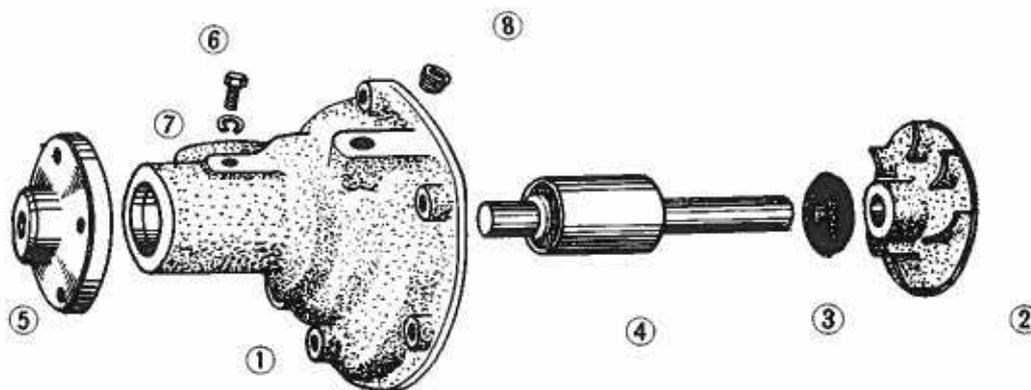


Fig. 7-1

Component parts of the water pump



- | | |
|---------------------|-------------------|
| (1) Water pump body | (5) Fan center |
| (2) Impeller | (6) Setting screw |
| (3) Sealing unit | (7) Spring washer |
| (4) Bearing unit | (8) Heater plug |

Fig. 7-2

7-4-3 Removing

The parts should be removed in the following order.

- (1) Drain the cooling water
- (2) Disconnect the intake hose and outlet hose
- (3) Remove the fan belt
- (4) Remove the pump from the cylinder body

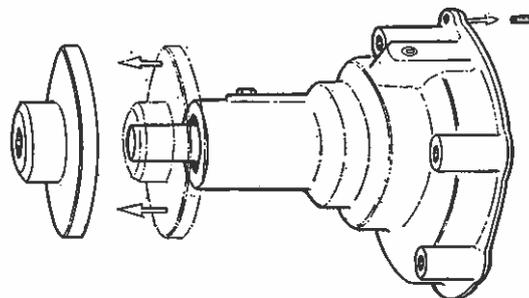


Fig. 7-3

7-4-4 Dismantling

The parts should be dismantled in the following order.

- (1) Remove the water pump cover.
- (2) Remove the fan center with the aid of puller. (See Fig. 7-3)

- (3) Loosen the setting screws on the bearing unit and then pull out the shaft with the impeller. (See Fig. 7-4)

Note: The shaft should be pulled out with the aid of press machine.

- (4) Remove the impeller from the shaft. (See Fig. 7-5)
- (5) Remove the seal unit and thrower from the shaft.
- (6) The bearing unit is provided with sealed-in grease and integrally connected with the shaft and hence it can not be dismantled.

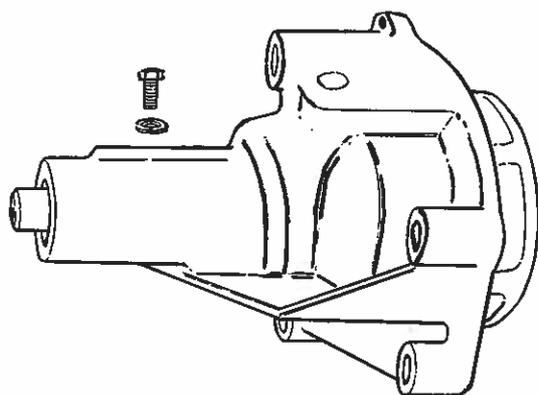


Fig. 7-4

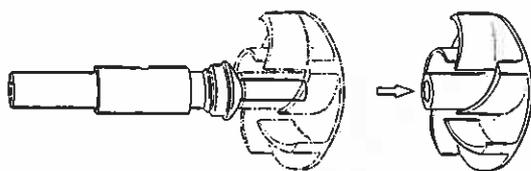


Fig. 7-5

7-4-5 Inspecting and adjusting

The parts should be cleaned before they are inspected.

(1) Bearing unit

- 1) Check the bearing unit to see if they are damaged or bent.
- 2) Replace the bearing unit if it is provided with above 0.2mm of excessive play in the direction across to the shaft.

(2) Water pump body

- 1) Check the drain hole on the pump body for clogging.
- 2) Check the pump body for cracking or damage.
- 3) Check the contacting face of the seal unit for wear.

(3) Impeller

- 1) Replace the impeller if it is corroded or damaged.
- 2) Check the contacting face of the sealing unit for wear, irregular contact and damage and replace the parts as necessary.

(4) Seal unit

- 1) Replace the parts if the carbon bakelite seal is excessively worn or damaged and no longer gives proper contact.
- 2) Check the rubber boot and replace the seal unit if damage is serious.

7-4-6 Reassembling

The water pump should be reassembled in the following order.

- 1) With the setting hole of the bearing unit agreed with the setting screw on the pump body, the bearing unit should be inserted into the pump body.
- 2) The bearing unit should be mounted in the pump body with the setting screw.
- 3) Refit the impeller to the bearing unit with the aid of press machine. Check the clearance between the cylinder body and the impeller by holding a straight edge right against the mounting face of the body and inserting a feeler gage into the clearance between the straight edge and the impeller. To avoid the impeller from coming into contact with the body, adequate clearance should be given therbetween. The clearance is standard at 0.3 ± 0.1 mm.
- 4) Refit the fan center into position with the aid of the press machine.

Measuring the clearance in the back of the Impeller

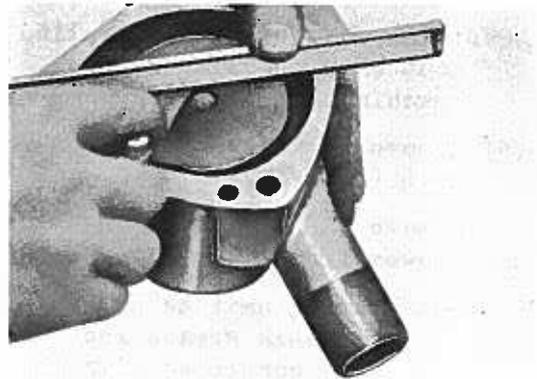


Fig. 7-6

7-5 FAN AND FAN BELT

7-5-1 Specifications

	Model G150	Model G130	Model C180
Type of the fan	Axial flow air-intake	Same as left	Same as left
Number and diameter of the fan blade mm	4 x 350	"	4 x 370
Diameter of the pulley	132 ϕ	"	120 ϕ
Gear ratio to the crankshaft	1.04	"	1.14
Type of the fan belt	A-type	Same as left	Same as left

7-5-2 Removing the fan belt

- 1) Remove the four (4) clamping bolts fastening the fan blades and then, remove the fan, fan pulley and spacer.
- 2) Slacken the clamping bolts fastening the adjust plate and generator bracket and the pivot the generator all the way to the engine for removing the fan belt.

7-5-3 Refitting and adjusting the fan belt

After the fan belt is refitted into the pulleys, pivot the generator about the clamping bolts on the generator bracket for adjusting the tension of the fan belt. Tighten the clamping bolts on the adjusting plate and generator bracket after the fan belt is properly tensioned.

7-5-4 Inspecting

- 1) Check the fan blades for crack or bending and replace as necessary.
- 2) Check the fan belt for wear, separation or cracking and replace as necessary.

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7-6 THERMOSTAT

7-6-1 Specifications

	Model G150	Model G130	Model C180
Type	Wax pellet type with by-pass	Same as left	Same as left
Valve opening temperature	$76.5^{\circ} \pm 1.5^{\circ}$	"	"
Temperature for fully opening the valve °C	90	"	"
Valve lifting stroke (mm) at 90°C	8.5	"	"

7-6-2 Construction

Construction and function of the wax pellet type thermostat

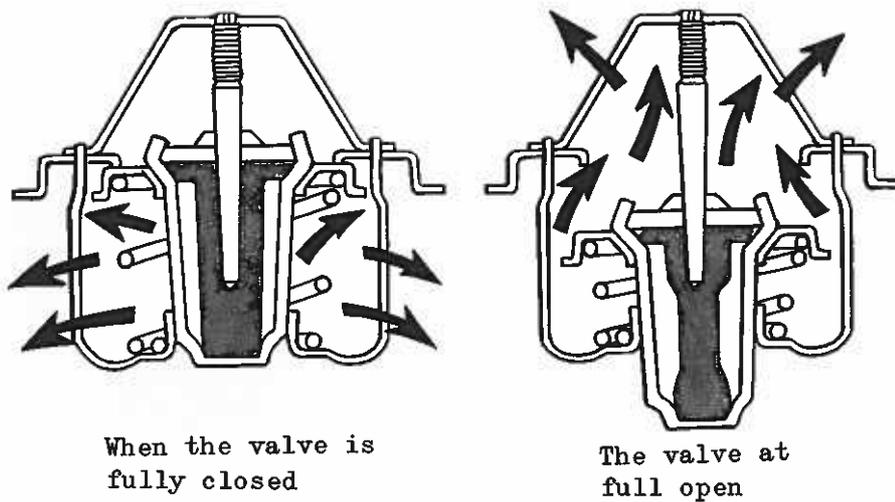


Fig. 7-7

The wax pellet type thermostat relies upon the expansion of the element for the valve operation.

- 2) Check the valve operating temperature in the following manner.

With the thermostat held in water, gradually raise the water temperature and measure the temperature at which the valve of the thermostat started opening and held fully open.

- 3) The maximum valve opening stroke is standard at 8.5mm.
- 4) Replace the thermostat as necessary.

7-6-3 Removing

Drain the cooling system entirely and disconnect the water outlet pipe and then take out the thermostat.

7-6-4 Inspecting

- 1) Replace the thermostat if it fails to close when disposed in a water at normal temperature.

7-7 RADIATOR

7-1 Specifications

	Model G150	Model G130	Model C180
Type	Pressurized cooling system	Same as left	Same as left
Type of cooling pipes and fins	Flat cooling pipes with corrugated fins	"	"
Number of cooling pipes	2	"	3
Pressure valve operating pressure	0.04 - 0.50	"	Same as left
Valve opening pressure kg/cm ²		"	
Operating of vacuum pressure valve	0.04 - 0.50	"	"
Valve opening pressure kg/cm ²			

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7-7-2 Removing

- 1) Drain the cooling system.
- 2) Disconnect upper and lower water hoses.
- 3) Remove four (4) radiator clamping bolts and then dismantle the radiator.

7-7-3 Inspecting and repairing

- 1) Check the radiator and core for water leakage in the upper and lower water reservoir and repair the water leakage as necessary.
- 2) Check the radiator core for clogging and if clogged area is in excess of 80 percent of the entire area of the core, replace the radiator assembly.
- 3) Check the pressure valve on the radiator cap for weakened spring and faulty packing and replace the cap if necessary.

7-7-4 Refitting

Reverse the procedure for removing. After it is refitted to position, fill the coolant with water and operate the engine and check to see if water is allowed to leak from hose connections.