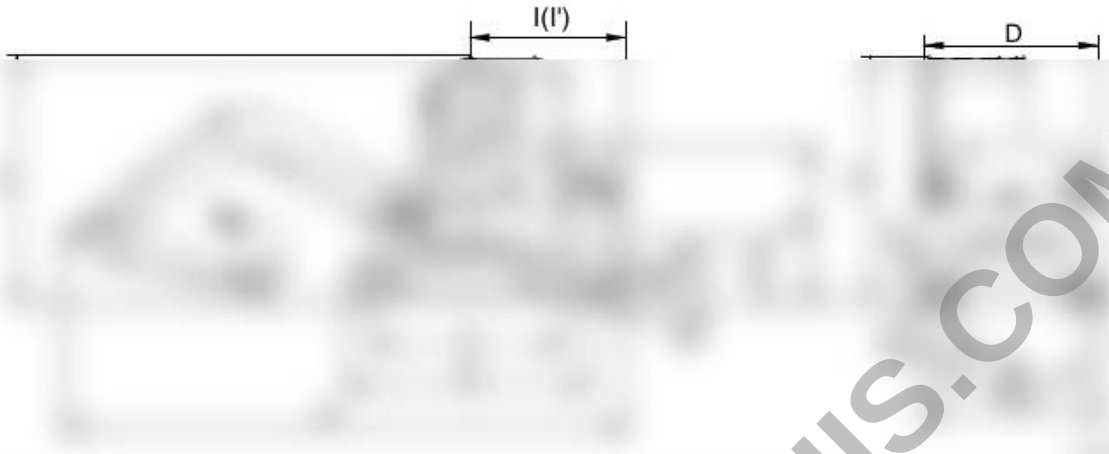
2. SPECIFICATIONS

1) 3.0m(9'10") MONO BOOM, 1.6m(5' 3") ARM, WITH BOOM SWING POST



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3. HYDRAULIC CIRCUIT



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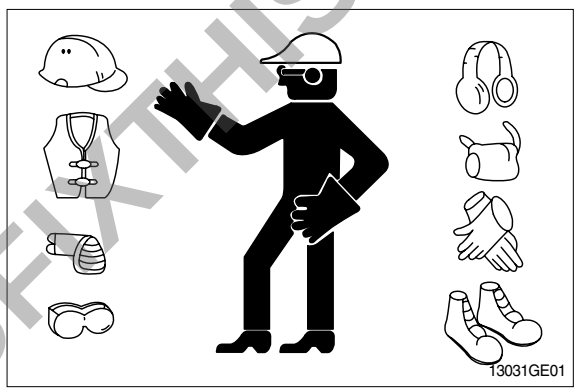
GROUP 1 SAFETY

FOLLOW SAFE PROCEDURE

Unsafe work practices are dangerous. Understand service procedure before doing work; Do not attempt shortcuts.

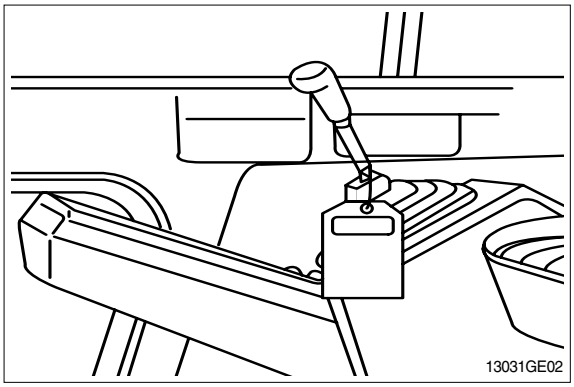
WEAR PROTECTIVE CLOTHING

Wear close fitting clothing and safety equipment appropriate to the job.



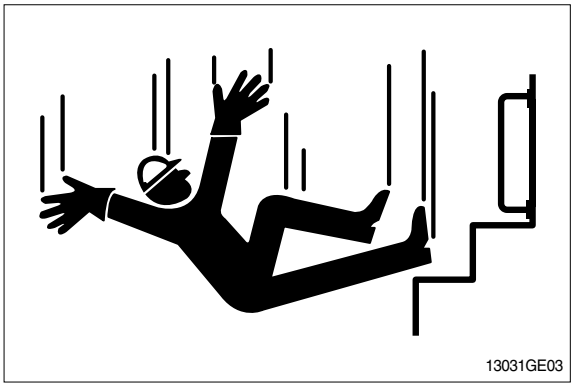
WARN OTHERS OF SERVICE WORK

Unexpected machine movement can cause serious injury.
Before performing any work on the excavator, attach a 「**Do Not Operate**」 tag on the right side control lever.



USE HANDHOLDS AND STEPS

Falling is one of the major causes of personal injury.
When you get on and off the machine, always maintain a three point contact with the steps and handrails and face the machine. Do not use any controls as handholds.
Never jump on or off the machine. Never mount or dismount a moving machine.
Be careful of slippery conditions on platforms, steps, and handrails when leaving the machine.



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Millimeters to inches

1mm = 0.03937in

	0	1	2	3	4	5	6	7	8	9
0		0.039	0.079	0.118	0.157	0.197	0.236	0.276	0.315	0.354
10	0.394	0.433	0.472	0.512	0.551	0.591	0.630	0.669	0.709	0.748
20	0.787	0.827	0.866	0.906	0.945	0.984	1.024	1.063	1.102	1.142
30	1.181	1.220	1.260	1.299	1.339	1.378	1.417	1.457	1.496	1.536
40	1.575	1.614	1.654	1.693	1.732	1.772	1.811	1.850	1.890	1.929
50	1.969	2.008	2.047	2.087	2.126	2.165	2.205	2.244	2.283	2.323
60	2.362	2.402	2.441	2.480	2.520	2.559	2.598	2.638	2.677	2.717
70	2.756	2.795	2.835	2.874	2.913	2.953	2.992	3.032	3.071	3.110
80	3.150	3.189	3.228	3.268	3.307	3.346	3.386	3.425	3.465	3.504
90	3.543	3.583	3.622	3.661	3.701	3.740	3.780	3.819	3.858	3.898

Kilogram to Pound

1kg = 2.2046lb

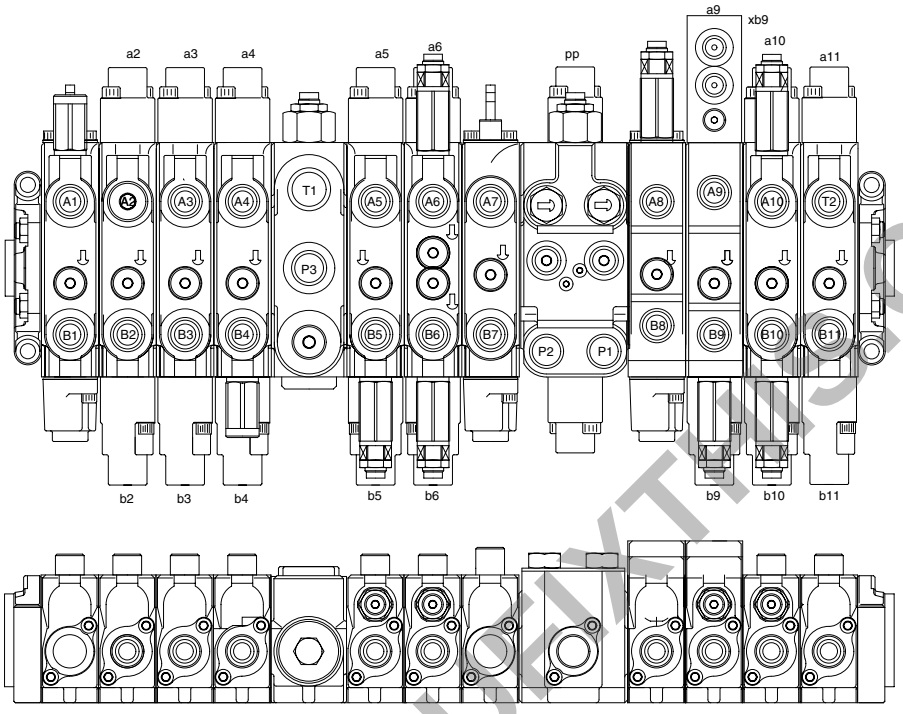
	0	1	2	3	4	5	6	7	8	9
0		2.20	4.41	6.61	8.82	11.02	13.23	15.43	17.64	19.84
10	22.05	24.25	26.46	28.66	30.86	33.07	35.27	37.48	39.68	41.89
20	44.09	46.30	48.50	50.71	51.91	55.12	57.32	59.5.	61.73	63.93
30	66.14	68.34	70.55	72.75	74.96	77.16	79.37	81.57	83.78	85.98
40	88.18	90.39	92.59	94.80	97.00	99.21	101.41	103.62	105.82	108.03
50	110.23	112.44	114.64	116.85	119.05	121.25	123.46	125.66	127.87	130.07
60	132.28	134.48	136.69	138.89	141.10	143.30	145.51	147.71	149.91	152.12
70	154.32	156.53	158.73	160.94	163.14	165.35	167.55	169.76	171.96	174.17
80	176.37	178.57	180.78	182.98	185.19	187.39	189.60	191.80	194.01	196.21
90	198.42	200.62	202.83	205.03	207.24	209.44	211.64	213.85	216.05	218.26

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GROUP 2 MAIN CONTROL VALVE

1. OUTLINE



R5572SF20

Mark	Port name	Port size	Tightening torque
P1	P1 pump port	PF 1/2	6.0~7.0 kgf · m
P2	P2 pump port		
P3	P3 pump port		
A1	Option port		
B1	Option port		
A2	Boom swing(RH) port		
B2	Boom swing(LH) port		
A3	Swing (LH) port		
B3	Swing (RH) port		
A4	Dozer down port		
B4	Dozer up port		
A5	Boom 2 port		
B5	Breaker port		
A6	Arm out port		
B6	Arm in port		
A7	Travel [LH/FW] port		
B7	Travel [LH/RR] port		
A8	Travel [RH/FW] port		
B8	Travel [RH/RR] port		
A9	Boom up port		
B9	Boom down port		

Mark	Port name	Port size	Tightening torque
A10	Bucket out port	PF 1/2	6.0~7.0 kgf · m
B10	Bucket in port		
B11	Arm 2 port		
T2	Tank return port		
T1	Tank return port	PF1	10~12 kgf · m
a2	Boom swing (RH) pilot port	PF 1/4	2.5~3.0 kgf · m
b2	Boom swing (LH) pilot port		
a3	Swing (RH) pilot port		
b3	Swing (RH) pilot port		
a4	Dozer down pilot port		
b4	Dozer up pilot port		
a5	Boom 2 pilot port		
b5	Breaker pilot port		
a6	Arm out pilot port		
b6	Arm in pilot port		
a9	Boom up pilot port		
b9	Boom down pilot port		
a10	Bucket out pilot port		
b10	Bucket in pilot port		
a11	Arm 2 pilot port		
b11	Arm 2 pilot port		

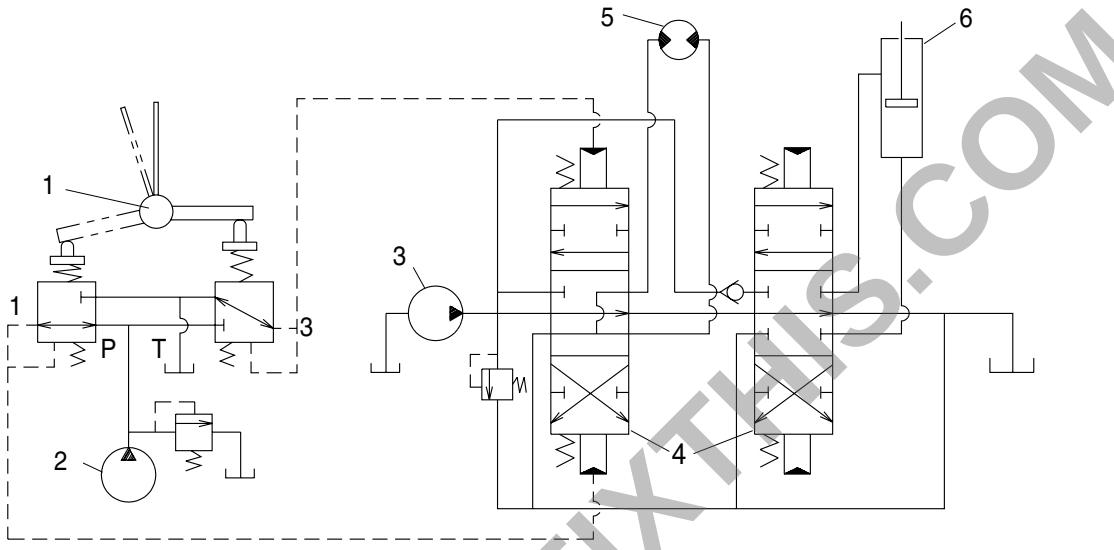
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3) OPERATION

The operation of the pilot valve will be described on the basis of the hydraulic circuit diagram shown below and the attached operation explanation drawing.

The diagram shown below is the typical application example of the pilot valve.



2-70 (140-7TIER)

1	Pilot valve	3	Main pump	5	Hydraulic motor
2	Pilot pump	4	Main control valve	6	Hydraulic cylinder

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GROUP 2 MONITORING SYSTEM

1. OUTLINE

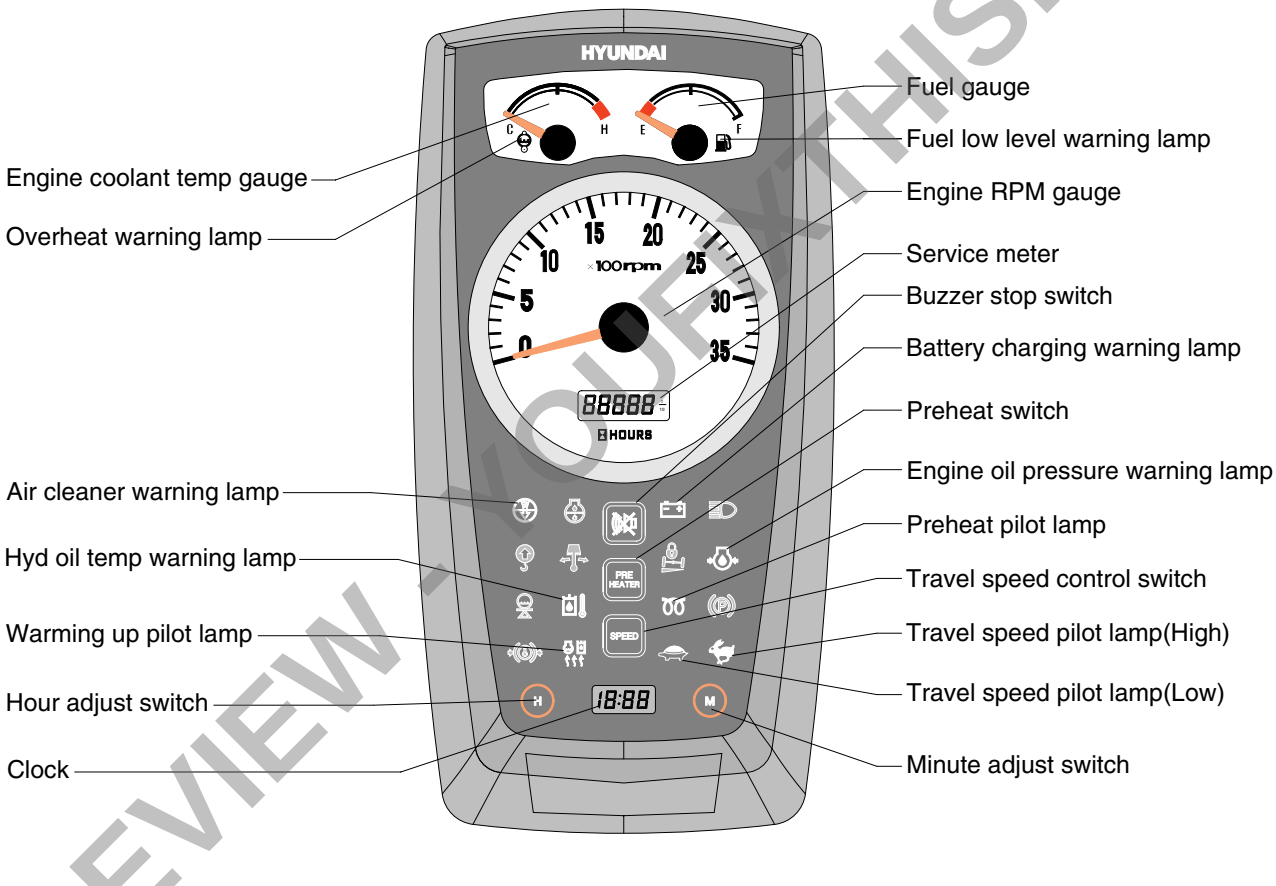
Monitoring system consists of the monitor part and switch part.

The monitor part gives warnings when any abnormality occurs in the machine and informs the condition of the machine.

Various select switches are built into the monitor panel, which act as the control portion of the machine control system.

2. CLUSTER

1) MONITOR PANEL

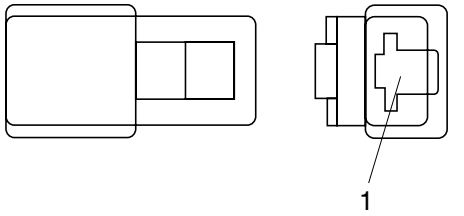
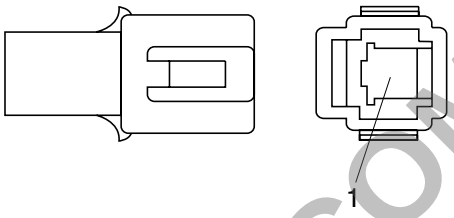
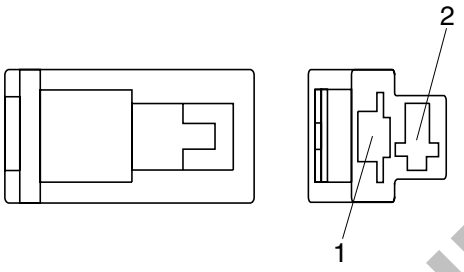
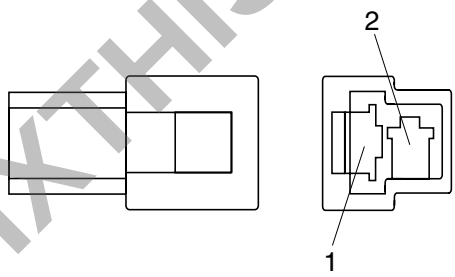
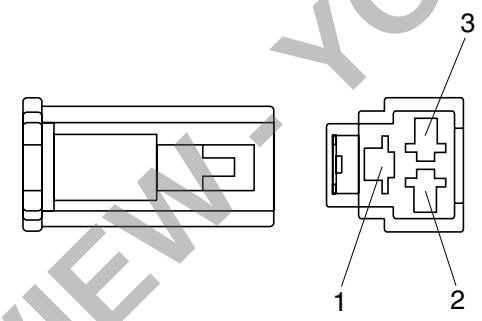
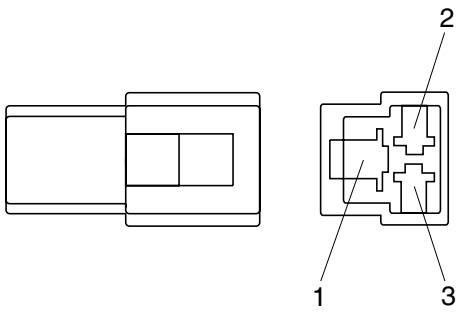
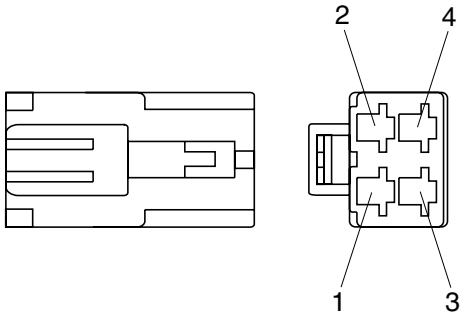
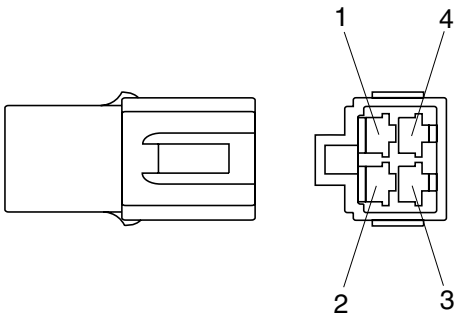


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4) CN TYPE CONNECTOR

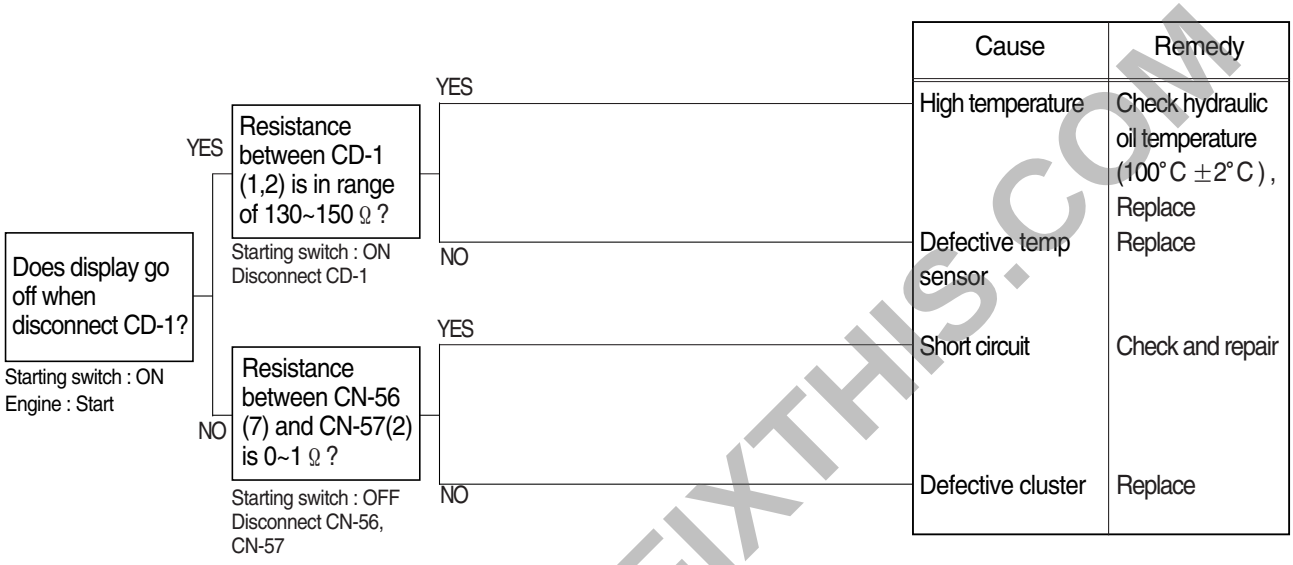
No. of pin	Receptacle connector(Female)	Plug connector(Male)
1	 S810-001202	 S810-101202
2	 S810-002202	 S810-102202
3	 S810-003202	 S810-103202
4	 S810-004202	 S810-104202

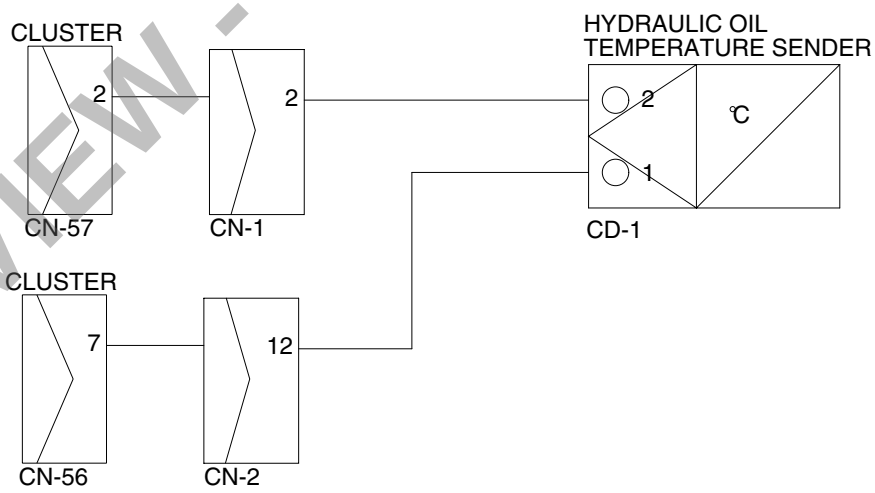
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6. WHEN HYDRAULIC OIL TEMPERATURE WARNING LAMP LIGHTS UP(Engine is started)

- Before disconnecting the connector, always turn the starting switch OFF.
- Before carrying out below procedure, check all the related connectors are properly inserted.
- After checking, insert the disconnected connectors again immediately unless otherwise specified.





R5575TS15

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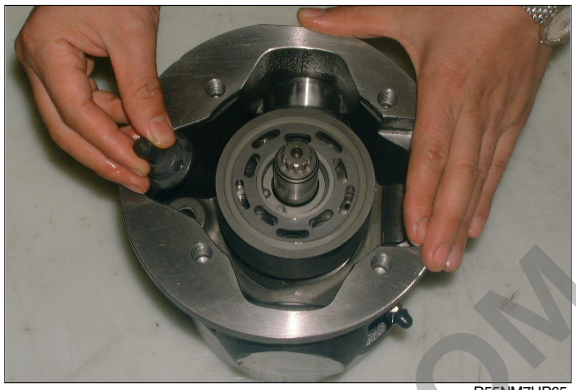
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Item No.	Part name	Situation	Standard dimension	Maximum allowable value(Criteria)
108 109	Thrust ball Timing plate	· The spherical sliding section that contacts the retainer plate(107) is nonuniformly worn out. · The sliding surface has the traces of seizure or nonuniformly wear.	-	-
115 116	Friction plate Mating plate	· Both edges are nonuniformly worn out. · The required torque cannot be achieved. · The traces of seizure are present.	Braking torque 40.6kgf · m or more	Braking torque 40.6kgf · m or less
118	Valve seat	· The seat surface is damaged.	-	-
119	Valve	· The outer surface is damaged. · The seat surface is damaged.	-	-
Body kit 136 137	Body Spool	· The sliding section that contacts the spool(137) is damaged. · The clearance against the spool(137) is too large. · The outer surface is damaged. · The outer surface is nonuniformly worn out.	Linear clearance : 7 to 15 μ	Linear clearance : 20 μ
149 150	Roller bearing Ball bearing	· Dents are present. · Flaking develops. · Nonuniform wear is observed.	-	-
163	Valve	· The outer surface is damaged. · The seat surface is damaged.	-	-
164	Stopper	· The seat surface is damaged.	-	-
142	Valve	· The outer surface is damaged. · The seat surface is damaged.	-	-
172	Valve seat	· The seat surface is damaged.	-	-

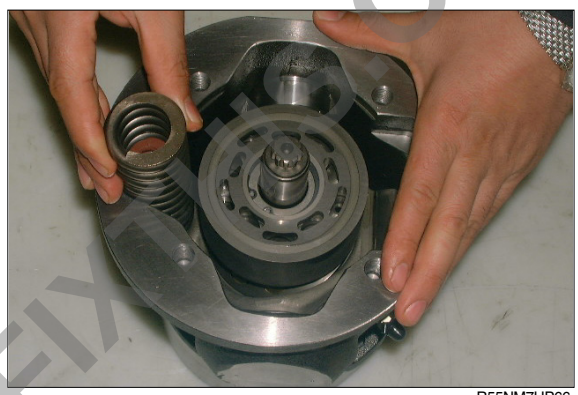
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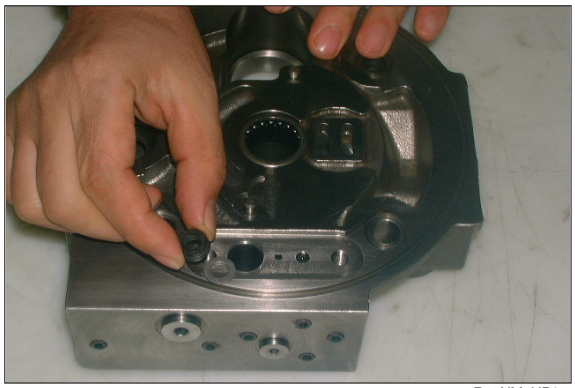
(15) Assembling the control spring.
Apply grease to the spherical portion of the spring seat before assembling.


R55NM7HP65

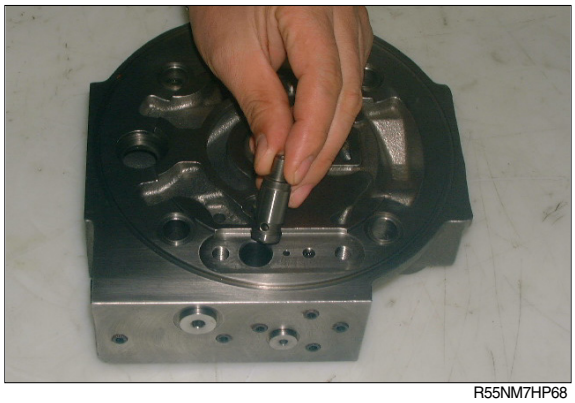
(16) Assemble 2 springs (Inner and outer).


R55NM7HP66

(17) Assembling the cover.
Assemble the spring seats and coned disk springs (3 pieces).


R55NM7HP67

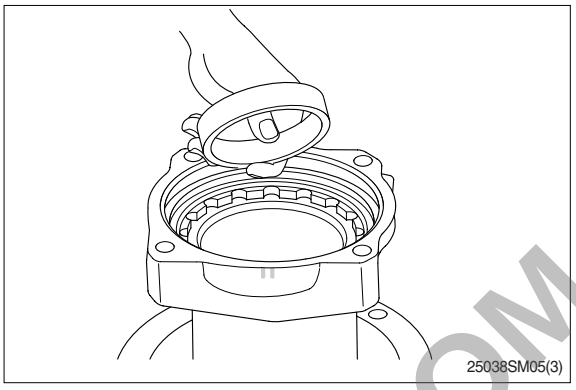
(18) Assembling the control piston.


R55NM7HP68

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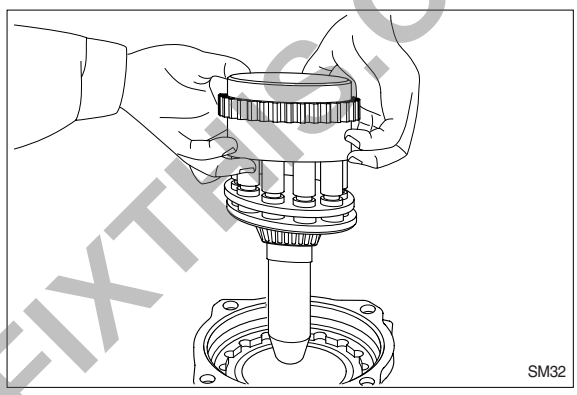
(4) Assemble outer race of taper roller bearing(5) to motor housing(1).



(5) Cylinder assembly

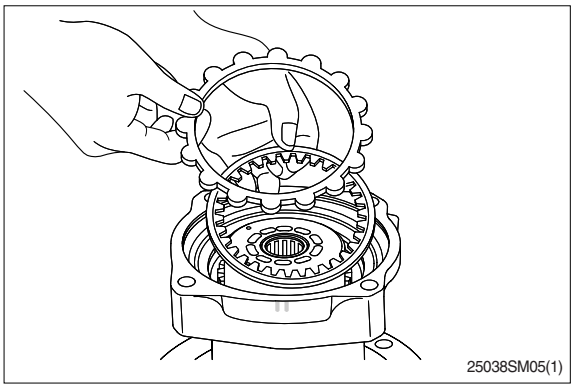
Hold end of cylinder assembly(3) with hands and assemble cylinder assembly to housing(1). Be careful to prevent damage of seal by spline of shaft.

※ When assemble cylinder assembly, spline shaft of cylinder is protruded from end of housing, therefore put pads with length 30~50㎜ under bottom of housing.



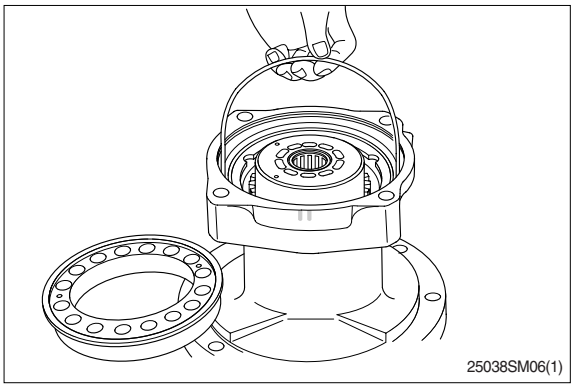
(6) Assemble friction plate(26) and lining plate(27).

※ Lubricate specified hydraulic oil on each side.



(7) Insert O-rings(14,29) into housing(1) and piston(28).

※ Lubricate O-ring with grease.

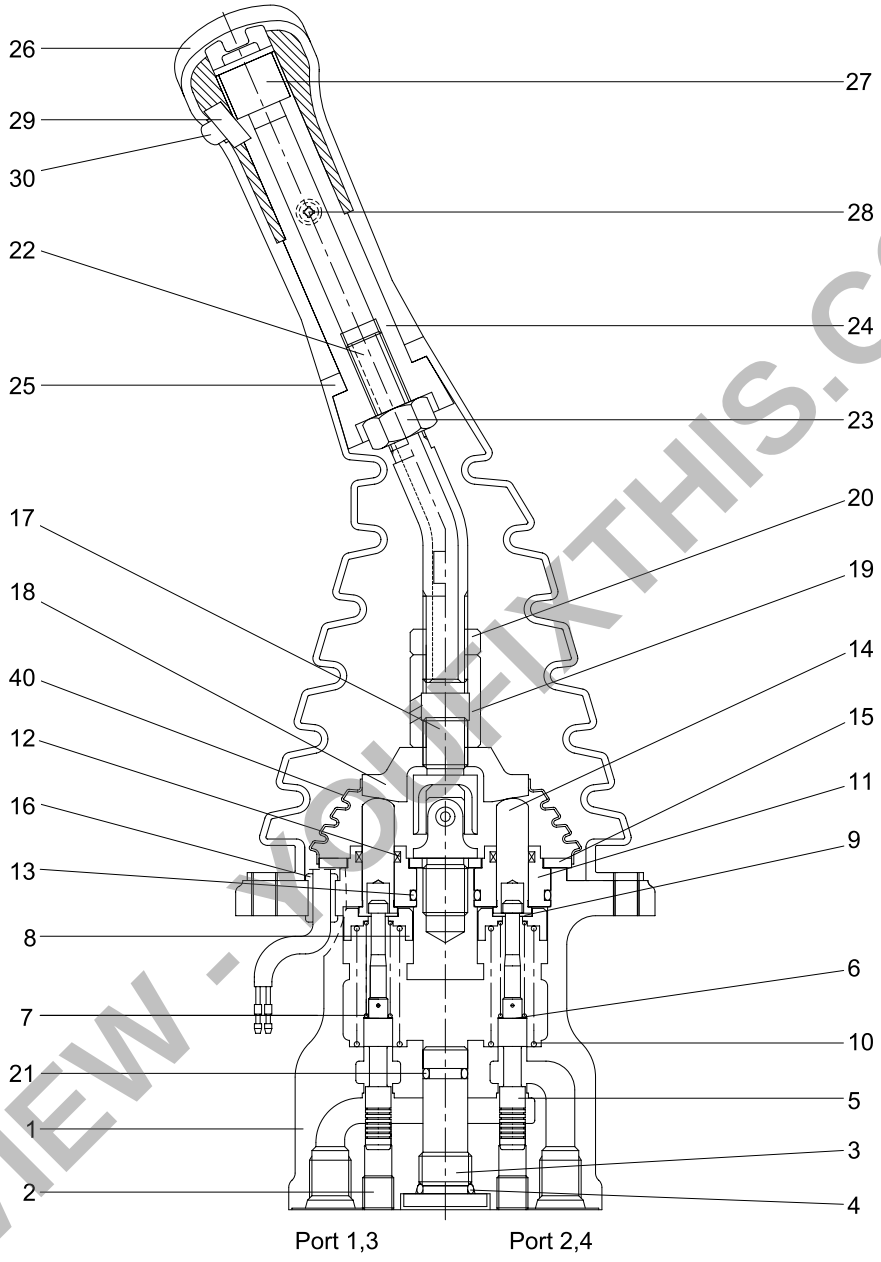


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2. DISASSEMBLY AND ASSEMBLY

1) STRUCTURE



1	Case	12	Rod seal	22	Handle connector
2	Plug	13	O-ring	23	Nut
3	Plug	14	Push rod	24	Insert
4	O-ring	15	Plate	25	Boot
5	Spool	16	Bushing	26	Handle
6	Shim	17	Joint assembly	27	Switch assembly
7	Spring	18	Swash plate	28	Screw
8	Spring seat	19	Adjusting nut	29	Switch assembly
9	Stopper	20	Lock nut	30	Switch cover
10	Spring	21	O-ring	40	Boot
11	Plug				

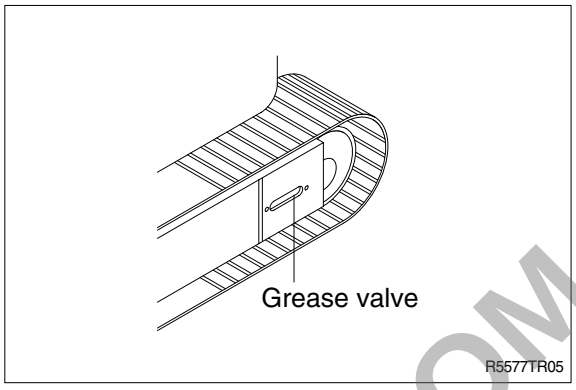
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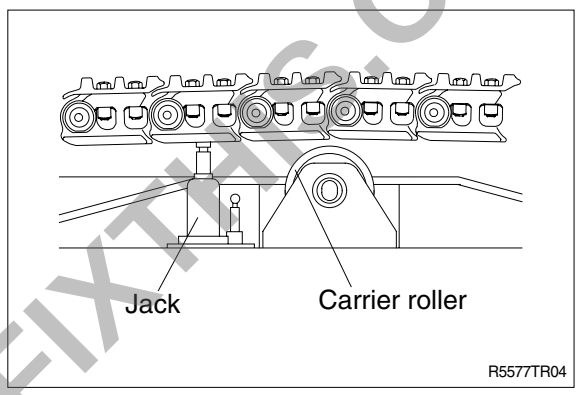
2. CARRIER ROLLER

1) REMOVAL

(1) Loosen tension of the track link.

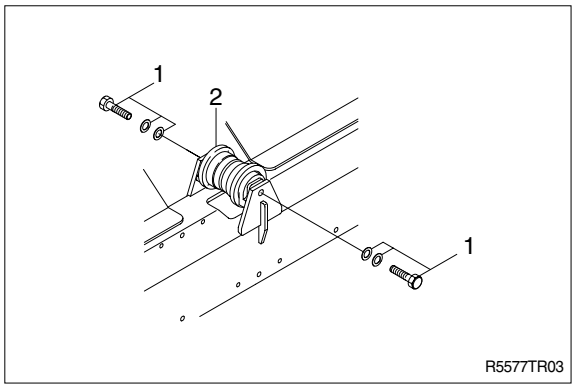


(2) Jack up the track link height enough to permit carrier roller removal.



(3) Remove bolt(1) at both side.

(4) Remove carrier roller(2).
- Weight : 10kg(20lb)



2) INSTALL

(1) Carry out installation in the reverse order to removal.

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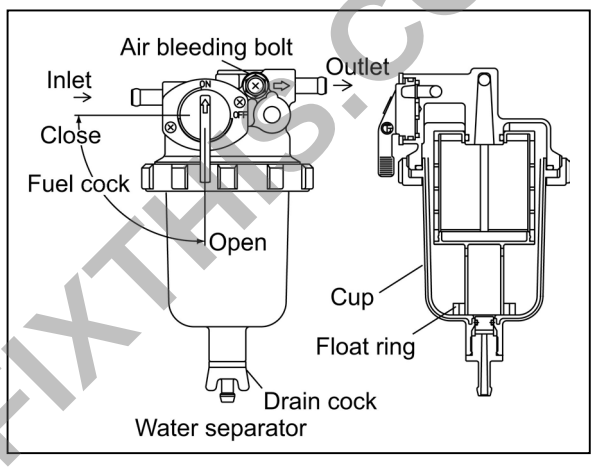
2.2.5 Inspection every 500 hours or 6 months

Be sure to check the following points every 500 hours or 6 months operation, whichever comes first.

No.	Inspection Item
(1)	Water separator cleaning
(2)	Fuel filter element replacement
(3)	Air cleaner cleaning and element replacement

(1) Water separator cleaning

Periodically wash the water separator element and inside cup with clean fuel oil.



1) Prepare a waste oil container.
2) Close the fuel cock.
3) Loosen the drain cock and drain.
   Refer to 2.2.3.(2)
4) Turn the retaining ring counter-clockwise and remove the cup.
   (Disconnect the coupler of the lead wire for drain sensor before removing the cup if it is with drain sensor).
5) Wash the element and inside cup with clean fuel oil. Replace the element with new one if any damaged.

Model	Applicable element Part No.
3TNV82A～ 4TNV106(T)	119802-55710

6) Insert the element to the bracket (O-ring) and after putting the float ring in the cup, install it to the bracket by tightening the retaining ring clockwise.

   Tightening torque: 15～20Nm (1.5～2.0kgf-m)

7) Close the drain cock (connect the coupler if with drain sensor).
8) Bleed the fuel system. Refer to 2.2.3.(3)

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4.2.4 Servicing points

Point1

[Disassemble]

- Loosen the mounting bolt while supporting the alternator.

⚠ CAUTION

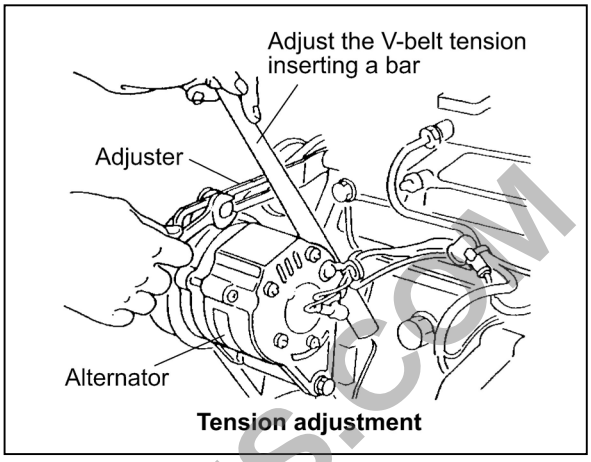
Do not tilt the alternator toward the cylinder block in haste since it may damage the alternator or pinch a finger.

[Reassemble]

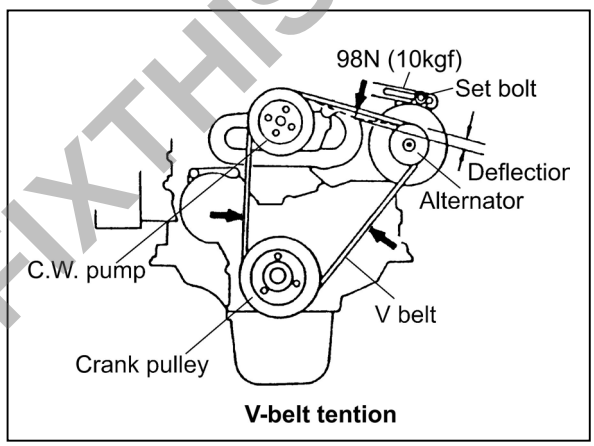
- The belt deflection shall be checked according to 2.2.2. in Chapter2.

[Reassemble]

- Replace the belt with a new one if cracked, worn or damaged.
- Carefully prevent the belt from being smeared with oil or grease.



Tension adjustment



V-belt tention

Point2

[Reassemble]

- Check the thermostat function. (See3.9 in Chapter 3 for the check procedure.)

Pont3

[Reassemble]

- Replace the fuel filter element with a new one.

[Disassemble]

- Cover the fuel pipe opening with tape to prevent intrusion of foreign matters.

Point4

[Reassemble]

- Replace the oil filter with a new one.
- After fully tightening the filter manually, retighten it with a filter wrench (see 11.1-6 in Chapter 11) by 3/4 turn.

Point5

[Disassemble]

- Cover the fuel injection pipe and pump inlets and outlets with tape or the like to prevent intrusion of foreign matters.

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5.5 Parts Inspection and Measurement

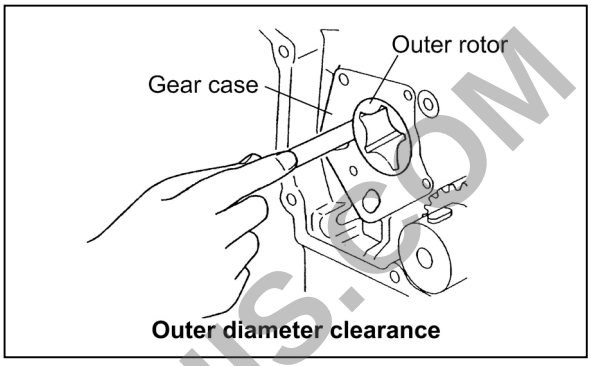
5.5.1 Trochoid pump inspection and measurement

(1) Outside clearance and side clearance of outer rotor

Insert a gap gage between a outer rotor and a pump body, and measure the clearance.

Outside clearance mm

Model	Standard	Limit
3TNV82A～88	0.12～0.21	0.30
4TNV94L/98	0.100～0.155	0.25
4TNV106(T)	0.100～0.165	0.25

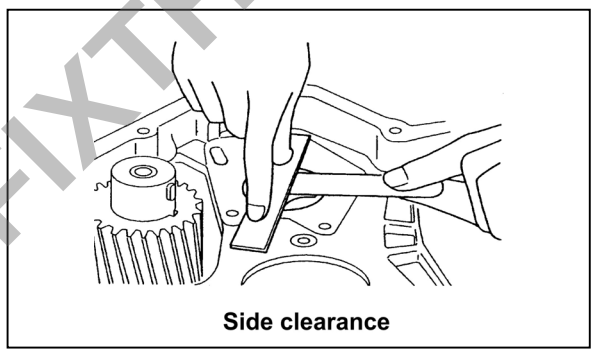


Outer diameter clearance

When measuring a side clearance, put a right-angle gage to the pump body, insert a gap gage and measure the clearance.

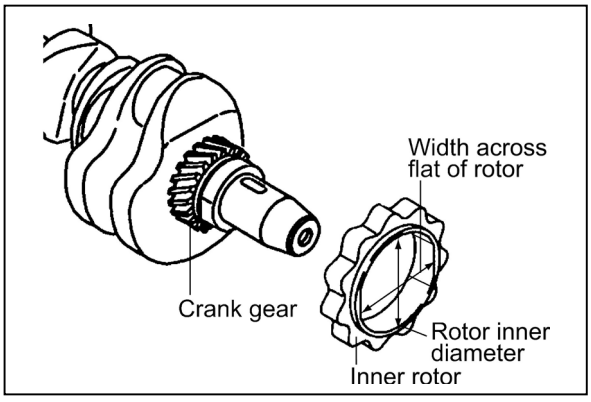
Side clearance mm

Model	Standard	Limit
3TNV82A～88	0.02～0.07	0.12
4TNV94L/98	0.05～0.10	0.15
4TNV106(T)	0.03～0.12	0.17


Side clearance

(2) Inner rotor and gear boss clearance (3TNV82A-4TNV88)

Item	Part	Standard dimension (mm)	Standard clearance (mm)	Standard clearance limit (mm)
Inside clearance of inner rotor	Gear boss diameter	53.05～53.15	0.3～0.5	0.6
	Rotor inner diameter	53.45～53.55		
Width across flat clearance of inner rotor	Width across flat of gear boss	49.45～49.75	0.2～0.6	0.7
	Width across flat of rotor	49.95～50.05		



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(d) Armature and commutator run-out
Use a dial gage and measure the armature core run-out and commutator run-out. Correct or replace if the limit is exceeded.

mm

	Standard	Limit
Armature	0.03	0.2
Commutator	0.03	0.2

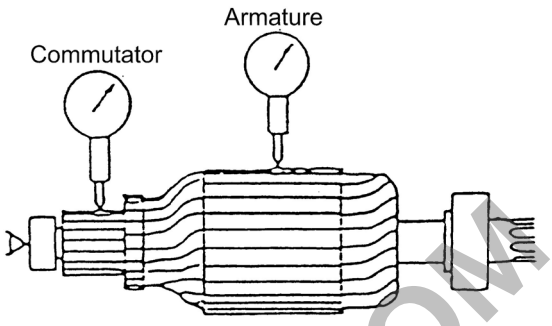
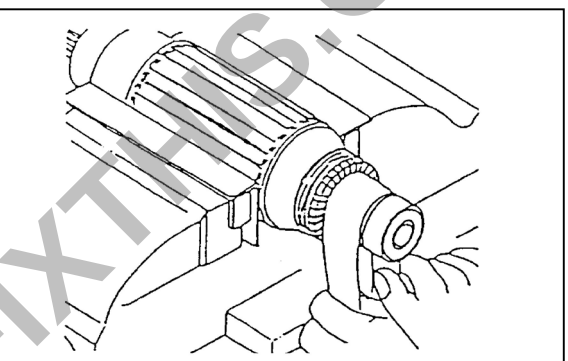


Fig. 13

(e) Commutator surface inspection
If the commutator surface is roughened, grind with #500 to #600 emery cloth.


Fig. 14

(f) Commutator insulation depth
Measure the depth of the insulating material between commutator segments, and correct it if it is less than the limit.

mm

Standard	Limit
0.5∼0.8	0.2

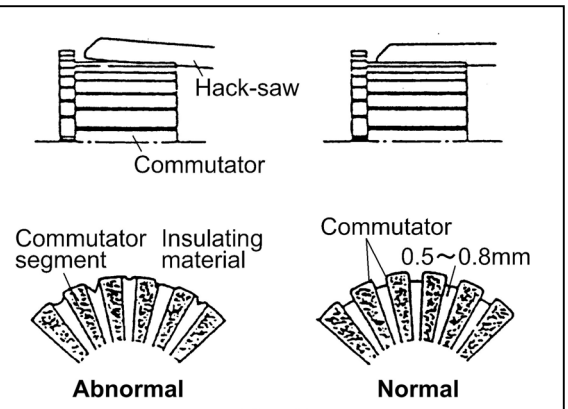


Fig. 15

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12. SERVICE STANDARDS

12.1 Engine Tuning

No.	Inspection item			Standard		Limit	Reference page
1	Gap at intake/exhaust valve heads mm		TNV82A～98	0.15～0.25		-	2.2.6(4)
			4TNV106(T)	0.25～0.35		-	
2	V-belt tension mm at 98N (10kgf)	Between alternator and crank pulley	Used part	10～14		-	2.2.2.(2)
			New part	8～12		-	
		Between alternator and radiator fan	Used part	7～10			
			New part	5～8			
		Between radiator fan and crank pulley	Used part	9～13			
			New part	7～11			
3	Fuel injection pressure MPa (kgf/cm^2)	3TNV82A～TNV88(VM) 4TNV94L～106(T)		21.57～22.55 (220～230)		-	2.2.6.(3)
		3TNV82A～TNV88(CL)		19.6～20.6 (200～210)			
4	Compression pressure (at 250 min^{-1}) MPa (kgf/cm^2)	TNV82A		3.16(31)±0.1(1)		2.45(25)±0.1(1)	3.3
		TNV84		3.24(33)±0.1(1)		2.55(26)±0.1(1)	
		3/4TNV84T		2.94(30)±0.1(1)		2.45(25)±0.1(1)	
		TNV88-106		3.43(35)±0.1(1)		2.75(28)±0.1(1)	
5	Coolant water Capacity (Only engine body) (Liter)	3TNV82A,84		1.8		-	2.2.1.(4)
		3TNV84T,88		2.0		-	
		4TNV84(T),88		2.7		-	
		4TNV94L･98(T)		4.2		-	
		4TNV106(T)		6.0		-	
6	Lubricating oil capacity (oil pan) (Liter)	-		Full	Effective	-	2.2.1.(3)
		3TNV82A		5.5	1.9	-	
		3TNV84(T)/88		6.7	2.8	-	
		4TNV84(T)/88		7.4	3.4	-	
		4TNV94L/98(T)		10.5	4.5	-	
		4TNV106(T) (CL class)		14.0	9.0	-	
		4TNV106(T) (VM class)		14.0	7.5	-	
7	Lubricating oil pressure MPa (kgf/cm^2)	-		at rated speed		at low idle speed	-
		3TNV82A～98		0.29(3.0)～0.39(4.0)		0.06(0.6) or above	-
		4TNV98T 4TNV106(T) (VM, WO balancer)		0.39(4.0)～0.49(5.0)			
		4TNV106(T) (CL, WO balancer)		0.31(3.2)～0.49(5.0)			
		4TNV106(T) (VM, W balancer)		0.34(3.5)～0.44(4.5)			
8	Oil pressure switch operating pressure MPa (kgf/cm^2)			0.05±0.01 (0.5±0.1)		-	-
9	Thermostat			valve opening temperature deg. C		Full opening lift (mm) (temperature)	2.7
		All models		69.5～72.5		8 or above (85 deg.C)	
		All models option		80～84		10 or above (95 deg.C)	
10	Thermo switch actuating temperature (deg.C)			107～113		-	2.4.2

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2.6. Timer Mechanism

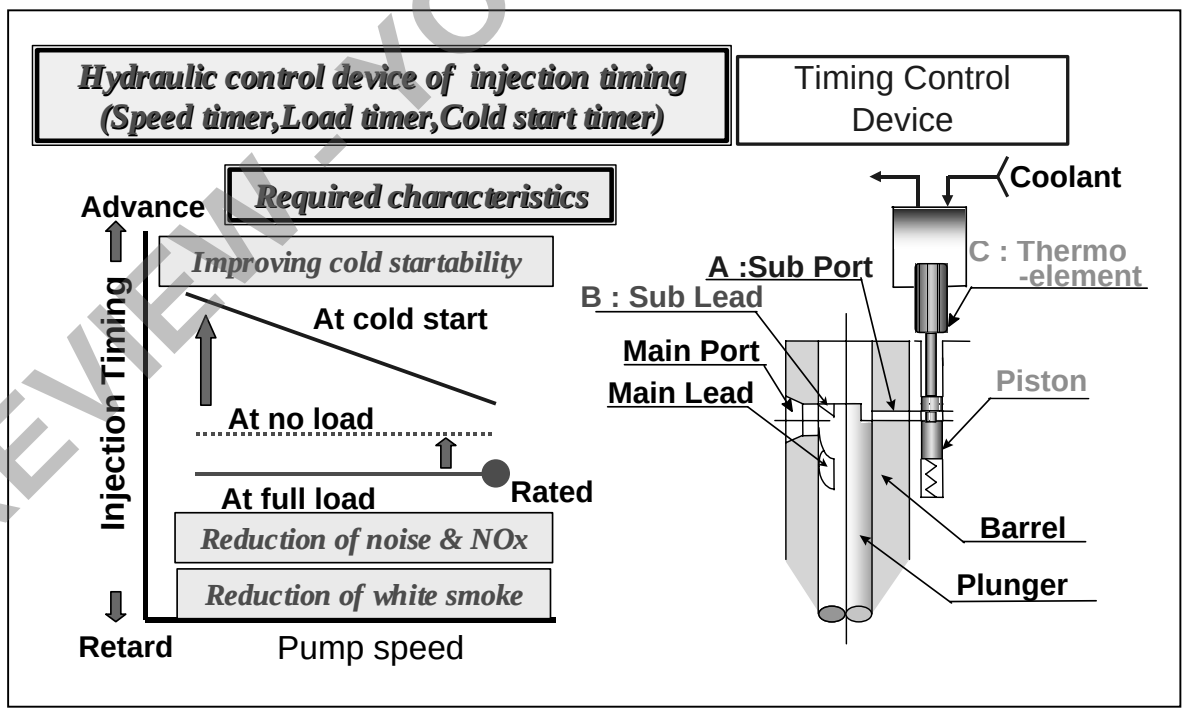
When the engine is used in a wide range from low to high speeds, it is necessary to change the fuel injection timing according to the engine speeds for always keeping the optimum firing timing. It is also necessary to optimize the injection timing for reducing noise and exhaust gas emissions.
This pump has the timer mechanism for revolutions, load and cold starting.

2.6.1. Structure and Functions

The engine speed timer is the mechanical timer which uses the oil leakage from the small diameter sub spill port installed slightly upper side of the main spill port of the jerk pump. When the engine speed is high, pressure rises before oil leaks from the small diameter port and injection is started. But when the engine speed is low, pressure does not rise until the port blocked by the plunger and the injection start is delays. Usually, the lower the engine speed, further the injection timing advances. But this engine speed timer prevents the injection timing from advancing during the low engine speed ranges and thus the noise and Nox. emissions can be controlled.

The fewer the injection amount, the earlier the load timer causes the main port to close by the plunger's upper lead for advancing the injection timing. This feature is instrumental in preventing misfire or emission of bluish white smoke during low load operation.

The cold start timer causes the sub port to be blocked only under cold temperatures for accelerating injection timing and facilitating in cold starting. The timer houses the thermo element and cooling water circulates around the temperature sensing section. The thermo-element senses the coolant temperature for adjusting the control piston. The sub-port is blocked when the temperature is lower than the set temperature and the pressure is raised earlier than in the normal temperature for advancing the injection timing. When the temperature exceeds the set temperature, the sub-port is opened and the regular injection characteristics are recovered.



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