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1	SPECIFICATIONS SECTION
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GENERAL SAFETY INFORMATION

⚠WARNING

Do not operate or perform any maintenance on this machine until all instructions found in the OPERATOR'S MANUAL and this MANUAL have been thoroughly read and understood.
Improper operation or maintenance of this machine may cause accidents and could result in serious injury or death.
Always keep the manual in storage.
If it is missing or damaged, place an order with an authorized our Distributor for a replacement.
If you have any questions, please consult an authorized our Distributor.

(1) Most accidents, which occur during operation, are due to neglect of precautionary measures and safety rules. Sufficient care should be taken to avoid these accidents. Erroneous operation, lubrication or maintenance services are very dangerous and may cause injury or death of personnel. Therefore all precautionary measures, NOTES, DANGERS, WARNINGS and CAUTIONS contained in the manual and on the machine should be read and understood by all personnel before starting any work with or on the machine.

(2) Operation, inspection, and maintenance should be carefully carried out, and safety must be given the first priority. Messages of safety are indicated with marks. The safety information contained in the manual is intended only to supplement safety codes, insurance requirements, local laws, rules and regulations.

(3) Messages of safety appear in the manual and on the machine : All messages of safety are identified by either word of "DANGER", "WARNING" and "CAUTION".

1) **DANGER-** Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury and is represented as follows:

⚠DANGER

2) **WARNING-** Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury and is represented as follows:

⚠WARNING

3) **CAUTION-** Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against possible damage to the machine and its components and is represented as follows:

⚠CAUTION

(4) It is very difficult to forecast every danger that may occur during operation. However, safety can be ensured by fully understanding proper operating procedures for this machine according to methods recommended by Manufacturer.

(5) While operating the machine, be sure to perform work with great care, so as not to damage the machine, or allow accidents to occur.

(6) Continue studying the manual until all Safety, Operation and Maintenance procedures are completely understood by all persons working with the machine.

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2.3 SPECIFICATIONS AND PERFORMANCE

(1) SPEED AND GRADEABILITY

Item	Rubber crawler beit		Iron crawler shos	
Slewing Speed	8.6 min^{-1} (8.6 rpm)			
Travel Speed	Low (1st)	High (2nd)	Low (1st)	High (2nd)
	2.0 km/h	4.0 km/h	1.8 km/h	3.6 km/h
Gradeability	58% (30°)			

(2) ENGINE

Model (MITSUBISHI)	L3E-W431KBS
Type	Water-cooled, 4-cycle type Swirl chamber type diesel engine
Number of cylinders-Bore × Stroke	3 - 76 mm × 70 mm (3 - 2.99" × 2.76")
Total Displacement	952 ml (58.1 cu-in)
Output Rating	11.3 kW / 2,200 min^{-1} (15.4 PS / 2,200 rpm)
Maximum Torque	53.5 N-m / 1,800 min^{-1} (39.4 lbf-ft / 1,800 rpm)
Starting Motor	12 V × 1.7 kW
Generator	12 V × 40 A

(3) HYDRAULIC COMPONENTS

Hydraulic Pump	Tandem variable displacement piston pumps
Hydraulic Motor	Axial piston
Hydraulic Motor w/Reducer (Travel)	Variable displacement axial piston, 2-Speed motor
Control Valve	11-spool valve
Cylinder (Boom, Arm, Swing, Bucket, Dozer, Crawler)	Double action cylinder
Return Filter	Safety valve containing / Filter Type (ß10≥8μ)

(4) SIDE DIGGING & DOZER

Type		Boom swing by hydraulic cylinder
Boom Swing Angle	Right	55°
	Left	65°
Dozer blade travel (up / down)		280 mm / 270 mm (11.0 in / 10.6 in)

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12.1 STANDARD WORKING TIME TABLE FOR THE MAINTENANCE OF EXCAVATOR

(1) Standard maintenance time table

1. Units of working time : 6 minutes = 0.1 hour
2. Calculating method of standard maintenance time :
   Maintenance time = Working time × Number of workers
   (Working time = Maintenance time / Number of workers)
3. When more than one work are done,
   a. Add each standard maintenance time
   b. A net time (readily starting) is given except covers easily removed by hand.
   c. Assy works include the following works marked with black dot.
4. O / H : The removing and installing time are not included.
5. Abbreviations in the table.

ASSY	; Assembly	SOL	; Solenoid	Rem.	; Removal
ATT	; Attachment	SW	; Switch	Inst.	; Installation
BRG	; Bearing	V	; Valve	O/H	; Overhaul
C/V	; Control valve	F hose	; Flexible hose		
Cyl	; Cylinder	E/G	; Engine		

(2) Classification of work code

No.	GROUP	REMARKS
01 02 03 04	Attachment Canopy and Guard Upper Structure Under carriage	To indicate removing, installing, replacement and overhaul.

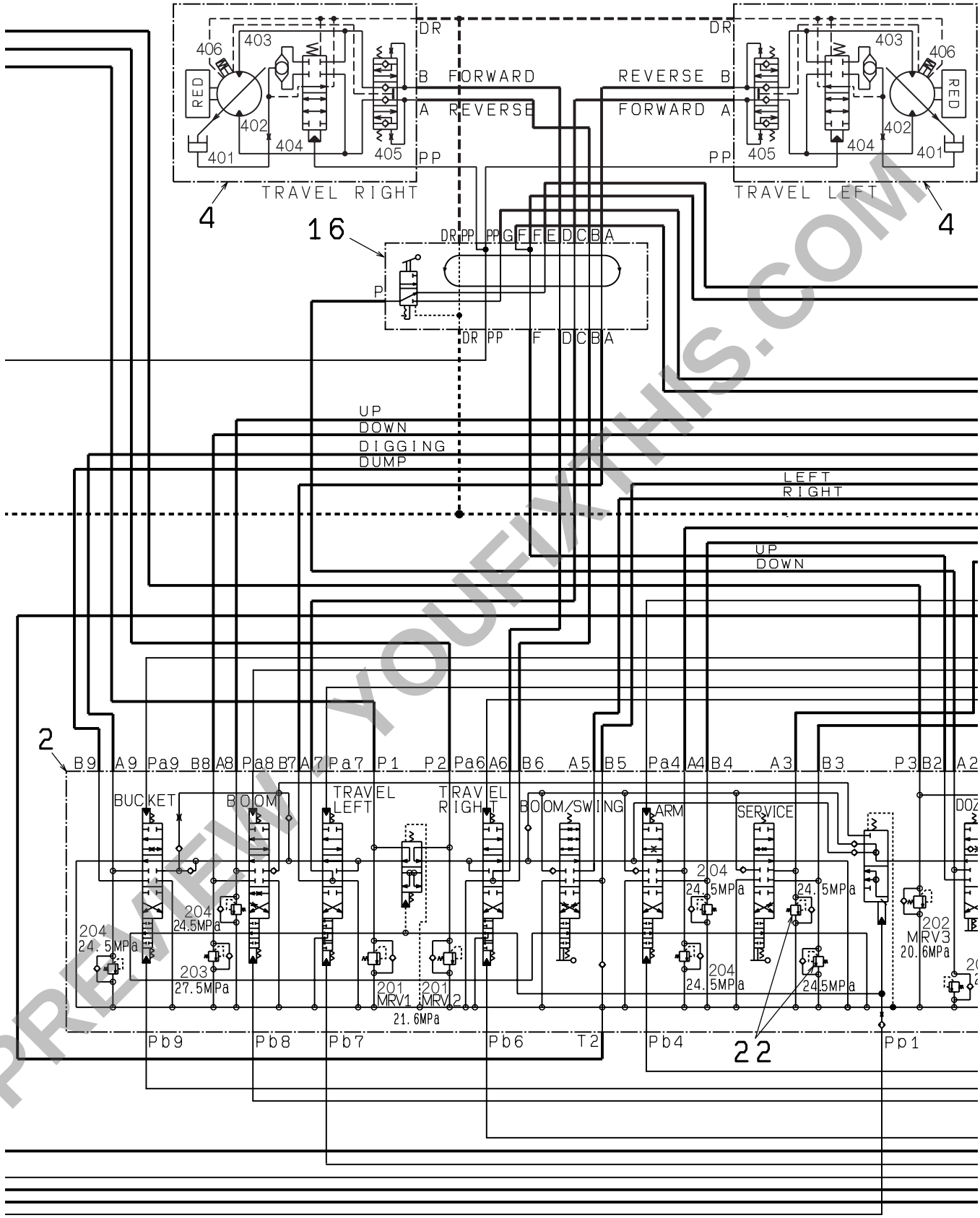
01 Attachment (1/2)

No.	EQUIPMENT PORTION	WORK TO BE DONE	UNIT	REMARKS	UNIT : HOUR
00	Bucket portion			Refer to 32.1.2	
01	Bucket ASSY	Rem./Inst.	1 pc.	Include adjustment	0.4
02	-Bucket removing / installing position	Preparation	1 pc.		0.1
03	-Bucket installing pin	Rem./Inst.	1 pc.	Include stopper pin.	0.1
04	-Bucket drive pin	- ditto -	1 pc.		0.1
05	-Bucket sling and transfer	Preparation	1 pc.		0.1
06	Bucket (Single)	O / H	1 pc.	Not include removal / inst.	0.6
07	-Bushing	Replace	1 pc.		0.5
10	Arm portion			Refer to 32.1.3	
11	Arm ASSY	Rem./Inst.	1 pc.		0.8
12	-Bucket cylinder removing / installing position and piping	Preparation	1 pc.		0.2
13	-Bucket cylinder rod pin	Rem./Inst.	1 pc.	Include stopper pin.	0.1
14	-Bucket cylinder head pin	- ditto -	1 pc.	Include stopper pin.	0.1
15	-Bucket cylinder assy	- ditto -	1 pc.		0.1
16	-Arm cylinder rod pin	- ditto -	1 pc.	Include stopper pin.	0.1
17	-Boom top pin	- ditto -	1 pc.		0.1
18	-Arm sling and transfer	- ditto -	1 pc.		0.1

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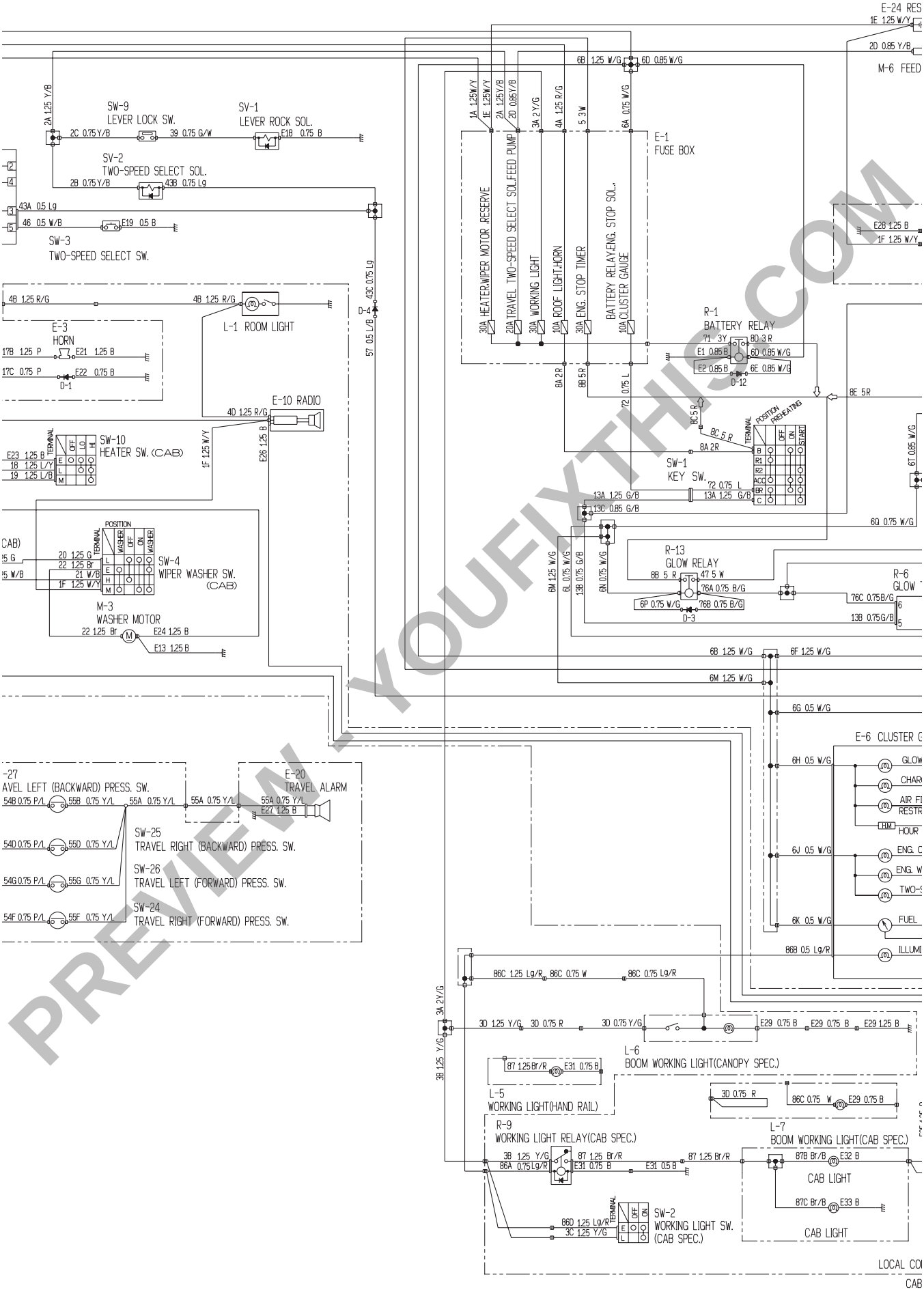
22.2.1 STANDARD SPECIFICATION



No.	NAME	PRESSURE:MPa {psi}	No.	
201	MAIN RELIEF VALVE P1,P2	21.6 {3130}	204 22	OVER LOA
202	MAIN RELIEF VALVE P3	20.6 {2990}	304	SLEW REL
203	OVER LOAD RELIEF VALVE	27.5 {3990}	13-1	PILOT REL

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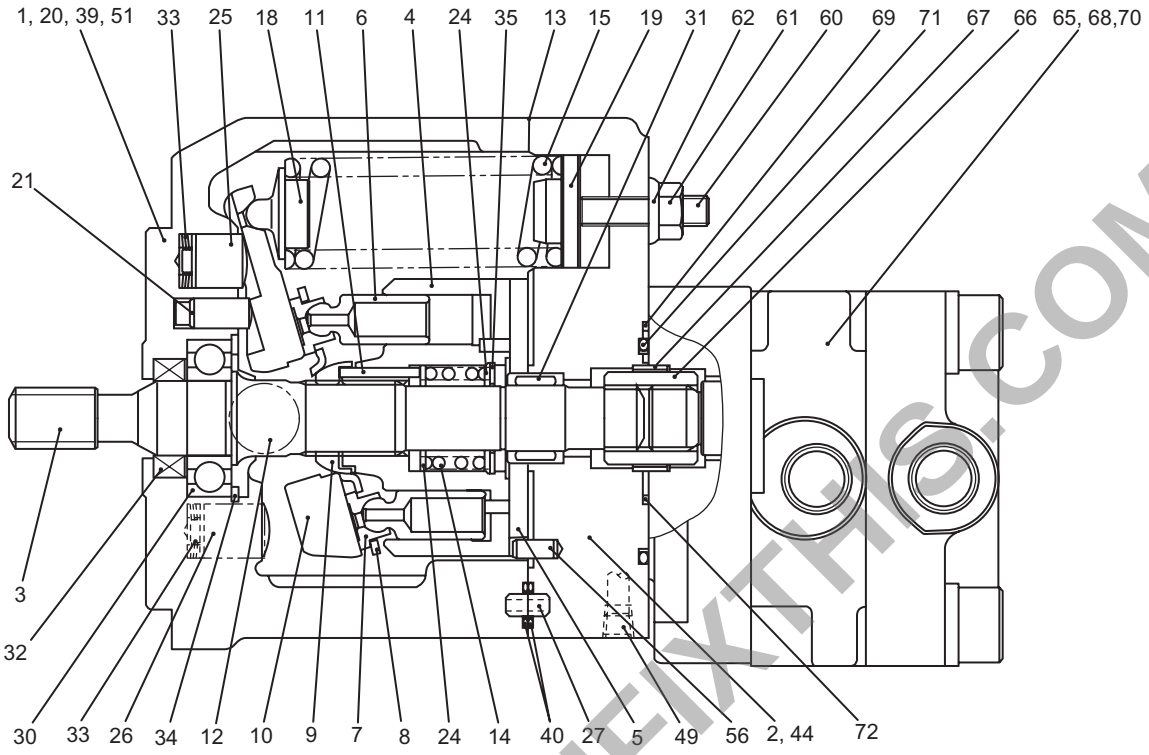
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24.1.1.2 CONSTRUCTION



Hydraulic pump-Sectional view

No	Name	Qty	No	Name	Qty	No	Name	Qty
1	Body S	1	19	Spring guide	1	49	Plug	4
2	Body H	1	20	Pin	1	51	Plug	1
3	Shaft	1	21	Rod G	1	56	Spring pin	1
4	Cylinder barrel	1	24	Retainer	2	60	Screw	1
5	Valve plate	1	25	Stopper pin A	1	61	Hexagon nut	1
6	Piston	10	26	Stopper pin B	1	62	Seal washer	1
7	Shoe	10	27	Pin	1	65	Gear pump	1
8	Shoe holder	1	30	Ball bearing	1	66	Coupling	1
9	Barrel holder	1	31	Needle bearing	1	67	Collar	1
10	Swash plate	1	32	Oil seal	1	68	Screw	2
11	Needle	3	33	Dish washer	8	69	O-ring	1
12	Ball	2	34	Snap ring	1	70	Washer	2
13	Packing	1	35	Snap ring	1	71	O-ring	1
14	Sprimg C	1	39	O-ring	1	72	O-ring	1
15	Spring T	1	40	O-ring	2			
18	Spring holder	1	44	Screw	4			

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42.2 TROUBLE DIAGNOSIS : HYDRAULIC

Classification	Reference No.		Causes / Phenomenon	Pump: Main pump	Pump: Trochoid pump	Pump: Gear pump	Valve: Travel & ATT main R/V	Valve: Main gear pump R/V	Valve: Each overload R/V	Valve: Travel straight valve	Valve: Travel spool	Valve: Attachment spool	Valve: Check valve	Valve: Shuttle valve	Actuator: Slewing motor unit	Actuator: Travel motor unit	Actuator: Hydraulic cylinder
Attachment	1	(1)	Attachment operational failure Encluding swing,dozer and crawler width	○							○	○					
		(2)	Travel speed is slow.	○								○					○
		(3)	Attachment operating power is low.				○		○								○
		(4)	Malfunction of attachment							○		○					○
Travel operation	2	(1)	Travel operational failure	○							○					○	
		(2)	Travel speed is slow.	○							○					○	
		(3)	Travel operating power is low.				○									○	
		(4)	It deviates in travel independent operation.	○						○	○					○	
Slewing operation	3	(1)	Slewing operational failure									○			○		
		(2)	Slewing speed is slow.			○											
		(3)	Slewing operating power is low.					○	○						○		
		(4)	Malfunction of slewing operation									○		○	○		
Pump	4	(1)	Engine speed is reduced due to pump load.	○													
		(2)	Malfunction of pump	○	○	○											

Abbreviation

E/G : Engine
SOL : Solenoid
SW : Switch
ATT : Attachment
C/V : Control valve
R/V : Relief valve
V : Valve

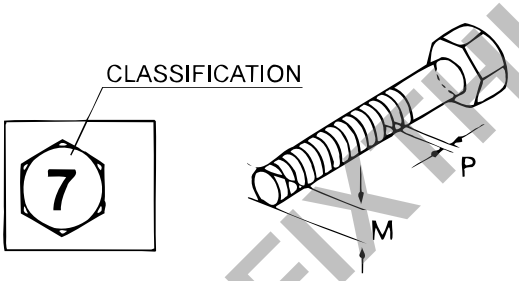
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11.1 TORQUE SPECIFICATIONS FOR CAPSCREWS & NUTS

The following Torque Specifications are provided for use when actual torque value of a fastener is not known. Check the capscrews and nuts for their looseness and dropping off before the start of daily work and at the periodical maintenance. Retighten the loosened ones, and install new ones for the dropped off. For the new machine, the check and retightening of them must be carried out at first 50 hours operation. For the replacement of them, make sure to use the same size of manufacturer's genuine parts.
Refer to the table below for the tightening and retightening of capscrews.

- The table below is not applicable for the capscrews to fix the cover, etc., made of plastic. For the tightening torque for such capscrews, consult with an authorized our distributor. Over-tightening may cause damages on the parts to be fixed.
- In case that the tightening torque is specified in the manual, use such torque values regardless to the table below.
- Numerical indication on the capscrew head shows the classification for strength (e.g., 7 = 7 T). No indication is provided for smaller size of capscrews, M 5 or less.



11.1.1 Metric Coarse Thread Standard Tightening Torque Values. Make Certain to tighten all Capscrews & Nuts to proper torque values.

Torque value Unit : N•m (lbf•ft)

Classification		4.8T		7T		10.9T	
Nominal size		No lubrication	Oil lubrication	No lubrication	Oil lubrication	No lubrication	Oil lubrication
M6	P=1	4.4±0.5 (3.2±0.4)	3.7±0.4 (2.7±0.3)	9.6±1.0 (7.1±0.7)	8.1±0.8 (6.0±0.6)	17.4±1.8 (12.8±1.3)	14.7±1.5 (10.8±1.1)
M8	P=1.25	10.7±1.1 (7.9±0.8)	9.0±0.9 (6.6±0.7)	23.5±2.0 (17.3±1.5)	19.6±2.0 (14.5±1.5)	42.2±3.9 (31.1±2.9)	35.3±3.9 (26.0±2.9)
M10	P=1.5	21.6±2.0 (15.9±1.4)	17.9±1.8 (13.2±1.3)	46.1±4.9 (34.0±3.6)	39.2±3.9 (28.9±2.9)	83.4±8.8 (61.5±6.5)	70.6±6.9 (52.1±5.1)
M12	P=1.75	36.3±3.9 (26.8±2.9)	31.4±2.9 (23.2±2.1)	79.4±7.8 (58.6±5.8)	66.7±6.9 (49.2±5.1)	143±15 (105±11)	121±12 (89.2±8.9)
M14	P=2	57.9±5.9 (42.7±4.4)	49.0±4.9 (36.1±3.6)	126±13 (92.9±9.6)	106±10 (78.2±7.4)	226±20 (167±15)	191±19 (141±14)
M16	P=2	88.3±8.8 (65.1±6.5)	74.5±6.9 (55.0±5.1)	191±20 (141±15)	161±16 (119±12)	343±39 (253±29)	284±29 (209±21)
M18	P=2.5	122±12 (90.0±8.9)	103±10 (75.8±7.2)	265±29 (195±21)	226±20 (167±15)	481±49 (355±36)	402±39 (297±29)
M20	P=2.5	172±17 (127±13)	144±14 (106±10)	373±39 (275±29)	314±29 (232±21)	667±69 (492±51)	559±59 (412±44)

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22.3.6 BOOM OPERATING CIRCUIT

Pilot oil hydraulic system with operating lever

22.3.6.1 Boom Up Operating Circuit

(1) Pilot Circuit

1. Boom Spool Shifting
   When the operating lever is put at boom up position, the pilot secondary pressure oil is generated from pilot valve (11). The pressurized oil entered into Pa8 port on control valve (2) shifts the boom valve spool.

(2) Main Circuit

1. Supply Circuit for Cylinder (5)
   The oil delivered from P1 port on variable pump of pump assy (1) enters into P1 port on control valve (2). The oil supplied from A8 port through boom valve is entered into the head side of boom cylinder (5) to up the boom.

22.3.6.2 Boom Down Operating Circuit

(1) Pilot Circuit

1. Boom Spool Shifting
   When the operating lever is put at boom down position, the pilot secondary pressure oil is generated from pilot valve (11), and enters into Pb8 port on control valve (2) to shift the boom valve spool.

(2) Main Circuit

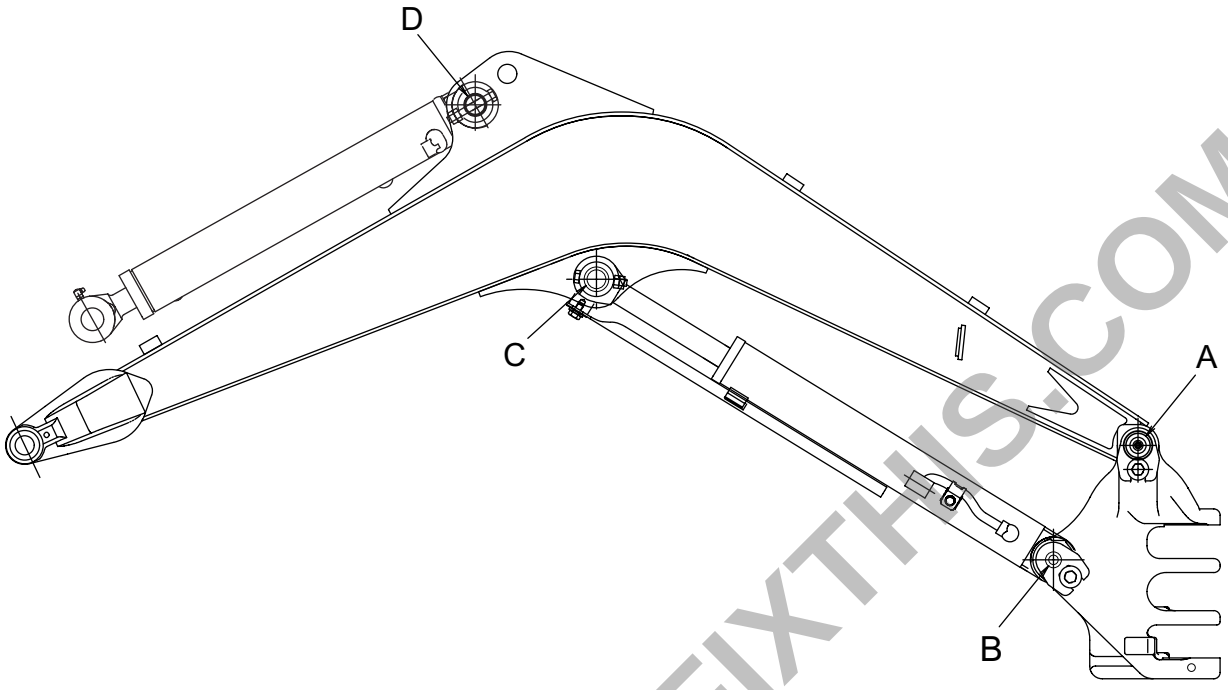
1. Supply Circuit for Cylinder (5) and Return Oil Circuit
   The pressurized oil delivered from P1 port on variable pump is led to boom valve provided on control valve (2), and supplied to the rod side of boom cylinder (5) to down the boom.
   The oil returned from the head side of cylinder (5) enters into A8 port on control valve (2), and returns to the tank through the boom valve.
   Its flow rate is restricted by the throttle effect in boom valve, accordingly the boom is lowered at a stable speed.

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3.1.2 BOOM MAINTENANCE STANDARDS

(1) Clearance of pin and bushing on boom section



Clearance of pin and bushing on boom section

Unit : mm (in)

Pos.	Item	Pin part No.	Standard dimensions			Clearance			Remedy
			Pin dia.	Tolerance on pin dia.	Tolerance on bushing bore dia.	Standard value	Standard value for repair	Service-ability limit	
A	Boom foot	PU02B01212P1	ø35 (1.3780)	–0.02 –0.05 (-0.0008) (-0.0020)	+0.05 0 (+0.0020) (0)	0.02~ 0.10 (0.0008~ 0.0039)	0.7 (0.028)	1.0 (0.039)	Replace bushing or pin
B	Boom cylin-der (Head side)	PU02B01168P1		–0.02 –0.08 (-0.0008) (-0.0031)	+0.18 +0.05 (+0.0071) (+0.0020)	0.07~ 0.26 (0.0028~ 0.0102)			
C	Boom cylin-der (Rod side)	PU02B01170P1		–0.02 –0.05 (-0.0008) (-0.0020)	+0.18 +0.05 (+0.0071) (+0.0020)	0.07~ 0.23 (0.0028~ 0.0091)			
D	Arm cylin-der (Head side)	PF02B01022P1		–0.03 –0.08 (-0.0012) (-0.0031)	+0.18 +0.05 (+0.0071) (+0.0020)	0.08~ 0.26 (0.0031~ 0.0102)			

Note

-The tolerance for bushing inside diameter means the dimension after fitting of it into place.
-The part number for pins may be changed owing to improvement, use them only for reference.

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13.2 PERFORMANCE INSPECTION STANDARD TABLE

13.2.1 STANDARD VALUE TABLE

[TEMPORARY]

Div.	Item			Unit	Standard value	Repairable value
Measuring condition	Hyd. oil cleanliness			Class	8±1	—
	Hyd. oil temperature (Tank surface)			℃ (°F)	50~60 (122~140)	—
	Coolant temperature (Radiator surface)				60~90 (140~194)	—
Engine speed	Low idle			min^{-1} (rpm)	1350±50	—
	High idle				2350±50	—
Main relief valve pressure	Boom • Bucket • Travel (LH)		P1	MPa (psi)	$21.6^{+0.5}_{0}$ (3130^{+73}_{0})	—
	Arm • Swing • Travel (RH) • Service		P2		$21.6^{+0.5}_{0}$ (3130^{+73}_{0})	—
	Dozer • *1 Slew		P3		$20.6^{+0.5}_{0}$ (2990^{+73}_{0})	—
Pilot relief valve pressure		Pilot Line	—		3.5±0.4 (508±58)	—
*2 Port (Over load) relief valve pressure	Boom		Head	Mpa (psi)	$24.5^{0}_{-3.0}$ (3550^{0}_{-440})	—
			Rod		$27.5^{0}_{-5.0}$ (3990^{0}_{-730})	—
	Arm		Head, Rod		$24.5^{0}_{-3.0}$ (3550^{0}_{-440})	—
	Bucket		Head		$24.5^{0}_{-3.0}$ (3550^{0}_{-440})	—
	Dozer		Head		$27.5^{0}_{-5.0}$ (3990^{0}_{-730})	—
	*1 Slew		LH/RH		$14.5^{+1.0}_{0}$ (2100^{+145}_{0})	—
Travel	Crawler Speed (5 rev.)	Rubber crawler	Low	sec.	31.0±1.6	40
			high		15.7±0.8	20
		Iron crawler	Low		31.9±1.6	42
			High		16.1±0.8	21
	Travel Speed 10 m (32.8 ft)	Rubber crawler	Low	sec.	18.4±0.9	24
			High		9.3±0.5	12
		Iron crawler	Low		19.7±1.0	26
			High		9.9±0.5	13
	Travel deviation			mm (in)	150^{0}_{-150}	300
	Drift due to gravity		w / o P.B. (5 min)		80^{0}_{-80} ($3.1^{0}_{-3.1}$)	160 (6.3)

*1. The pressure for slew is controlled by the relief valve attached to the slew motor.

*2. Reference value for checking of pressure
(tighten up the adjusting nut of main relief valve. Refer to item 13.4.2.1)

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11. TOOLS

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22.3 HYDRAULIC CIRCUIT OPERATION

22.3.1 COLOR CODING STANDARD FOR HYDRAULIC

Blue : Feed, drain circuit, less than 0.34 MPa (50 psi)
Green : Return, make-up circuit, 0.34~ 0.59 MPa (50~86 psi)
Purple : Secondary pilot pressure, 0.59~3.5 MPa(85~508 psi)
Red : Primary pilot pressure, 3.5~3.9 MPa (508~ 566 psi)
Orange : Main pump drive pressure, 4.9~23 MPa (711~3340 psi)
Blue tone : At valve selection
Red valve : When proportional valve (reducing) is operating
Red solenoid : In active and exciting
Displaying the flow circuit and standby circuit when operating.
Regarding the electrical symbols in this manual, refer to the electric circuit diagram.

22.3.2 NEUTRAL CIRCUIT

(1) Pilot Circuit

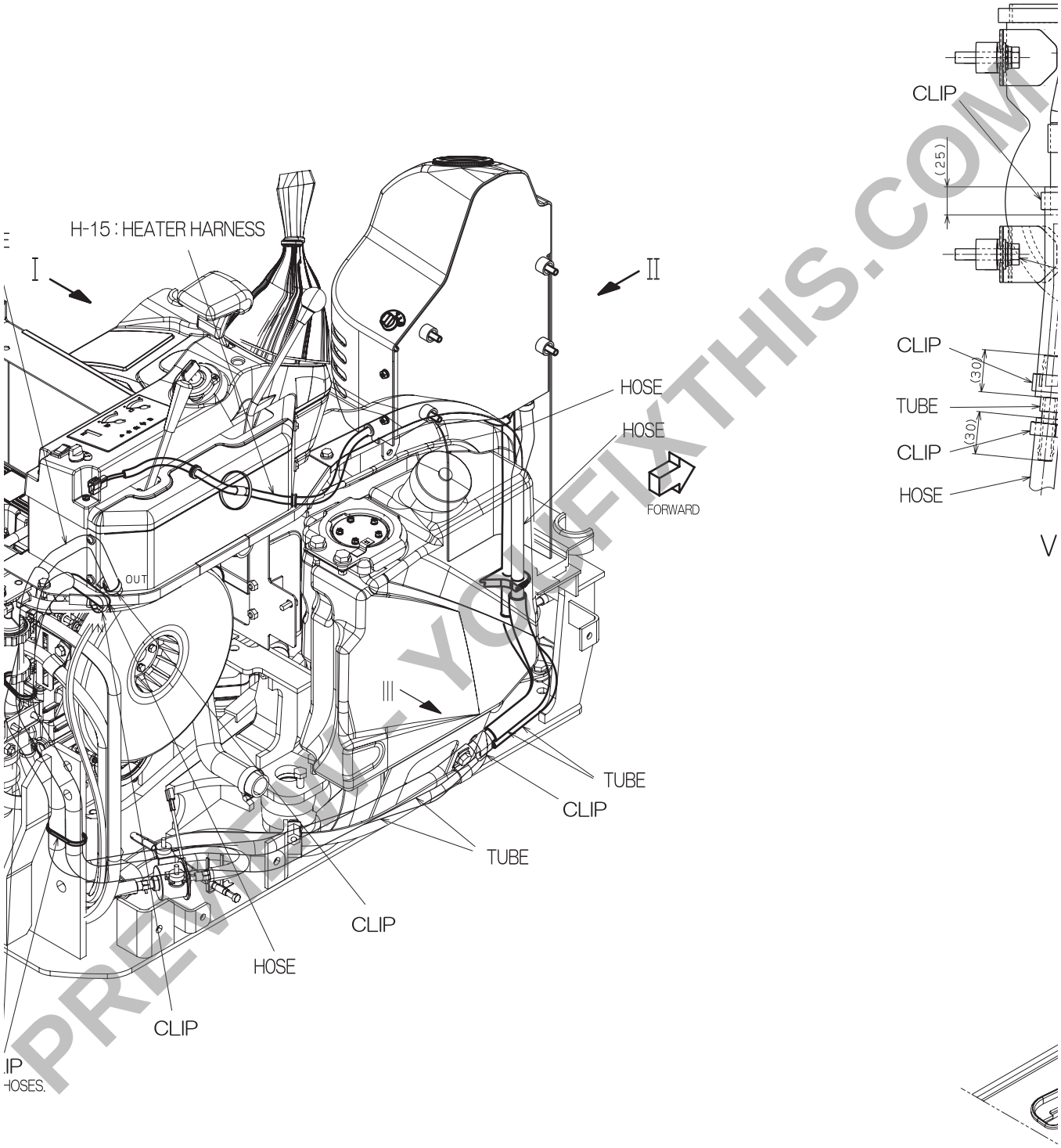
1. Pilot Primary Pressure Circuit
   The oil delivered from the P4 port on pump assy (1) enters into the solenoid valve (13) through the line filter (19).
   The pressurized oil from the port A1 of the solenoid valve (13) with the safety lock lever released (in the operating condition) is supplied to the P ports of the pilot valves for attachment (11) and, travel (12).
   Since the operating circuit is fully closed in the neutral position, the oil delivered by the pump other than the oil supplied to the Pp1 port of the control valve loses its flowing passage, and returns to the hydraulic tank (21) through the relief valve (set pressure : 3.5MPa [508 psi]) built in the solenoid valve (13).
   The oil supplied to the Pp1 port is led to the tank passage through the pilot passages provided to the right and left travel spools.
2. Pilot Secondary Pressure Circuit
   While the pilot valves (11) and (12) are being in neutral, the pilot secondary pressure is not generated.
   By means of operating the operating lever, the secondary pressure is generated in accordance with its motion and led to the control valve (2) from the pilot valve to shift each spool of shifting valve.

(2) Main Circuit

1. Variable Pump Circuit
   The delivered oil from P1 and P2 ports on variable pump enters into P1 and P2 ports on control valve (2) respectively.
   All the discharged oil from these two ports finally returns to the hydraulic oil tank (21), through each valve of travel left, boom and bucket for the P1 oil, and through each valve of travel right, swing, arm and service for the P2 oil.
2. Third Pump Circuit
   The oil delivered from P3 port on 3rd pump enters into P3 port on control valve (2).
   The whole amount of oil discharged through the port P3 flows through the selector valves for the slewingr and the dozer and through the independent travel and flow conflux valves into the P2 line and returns to the hydraulic oil tank (21).

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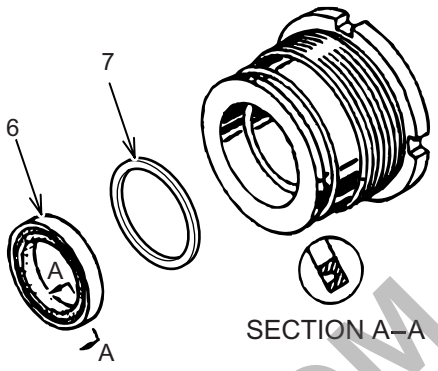
Body 1 sub assy group

No.	NAME	Q'TY	No.	NAME	Q'TY
301	BODY 1	1	312	PLUG	2
302	SPOOL	1	313	CHOKE	5
303	CHECK VALVE	2	314	RING	2
304	SPRING GUIDE	2	315	PLUG	8
305	SPOOL	1	316	PLUG	2
306	SHUTTLE SPOOL	1	317	O-RING	2
307	SPRING V1	2	318	O-RING	2
308	SPRING V2	2	319	O-RING	2
309	SPRING V3	1	320	CHOKE	2
310	PLUG	2	321	PIN	2
311	PLUG	2	322	PLUG	6

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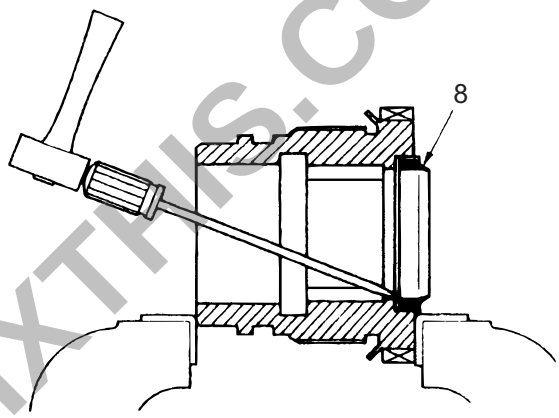
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2. Removal of U-ring
   Remove the U-ring (6) and back-up ring (7).



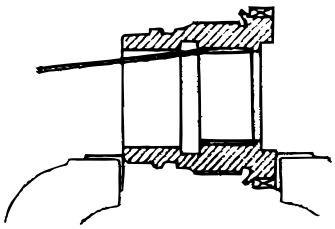
Disassembling cylinder head

3. Remove the wiper ring (8).
   - Alternately tap inside of the metal ring of wiper ring at several positions, as shown in the figure, to push it out step by step from the groove.



Removing wiper ring

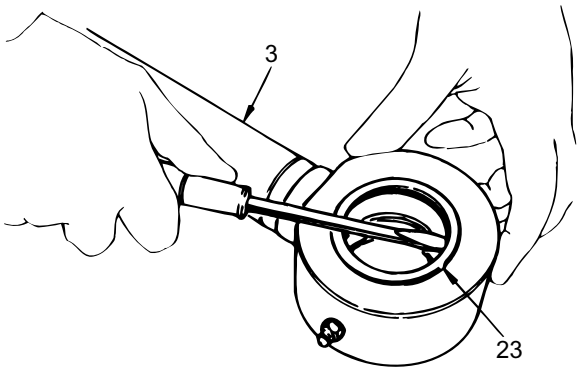
4. Remove the bushing (5) using a removal jig.



Removing bushing

(5) Disassembly of clevis portion:

1. Remove the dust seals (23) from the clevis portion of tube (1) and piston rod (3).



Removing dust seal

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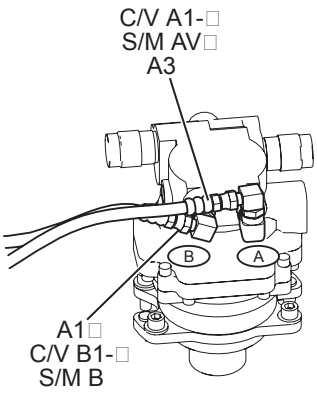
33.1.20 SLEWING MOTOR

33.1.20.1 REMOVAL PREPARATION

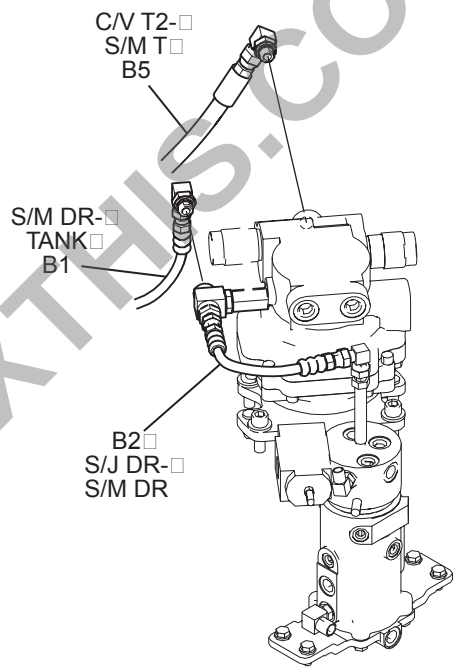
(1) Remove the floor mat, the floor plate and the cover (See Section 33.1.5.1).
(2) Release the residual pressure in the circuit and the pressure in the hydraulic tank.

33.1.20.2 REMOVAL

(1) Disconnect six hoses (A1), (A3), (B1), (B2) and (B5) connected to the slewing motor.
Tools: Spanner: 17, 19 and 22 mm

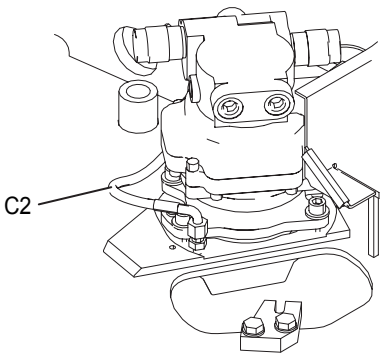


Main hose disconnection



Main hose disconnection

(2) Remove grees hose (C-2) connected to the slewing motor.
Tools: Spanner: 19 and 22 mm

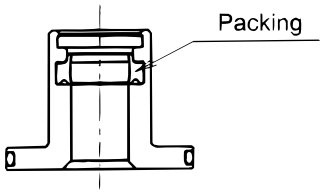


Pilot hose removal

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(6) Place O-rings (211, 213) in casing (101).
(7) Fix upper casing (102) with vise and place the steel ball in it.
(8) Place spring seat (218) in casing (102) with tweezers.
(9) Place damping spring (336) in casing (102).
(10)Install piston (224).
(11)Place O-ring (212) in plug (202).
(12)Place packing (210) in plug (202).
-Pay attention to the direction when placing the packing in.
-Apply grease slightly before placing packing in.



(13)Place grease cup (203) in plug (202).
(14)Install push rod (214) on plug (202).
(15)Place the push rod subassembly which is assembled by the procedures in par. 11) to 14) in casing (102).
(16)Put cover (201) on the flat work bench, press bushing (414) with special jig 1, and press fit the bushing striking lightly.
(17)Fix the lower cover assembly which is assembled by the procedures in paragraph 2) to 6) with vise, and install the upper cover assembly which is assembled by the procedures in paragraph 7 to 15) on it.
(18)Install cover (201) on casing (102).
(19)Tighten socket bolt (271) to the specified torque.
(20)Install cam (420) on cover (201).
(21)Insert cam shaft (413) from the outside pressing cam (420).
(22)Apply Loctite #241 or equivalent to the thread of socket bolt.
(23)Tighten socket set bolt (472) to the specified torque.
(24)Incline cam (420), apply grease to the top end of push rod (214), and fill grease cup (203) of plug (202) with grease.
(25)After fitting the top end of bellows (501) in cam (402), fit the lower side in the groove of cover (201).

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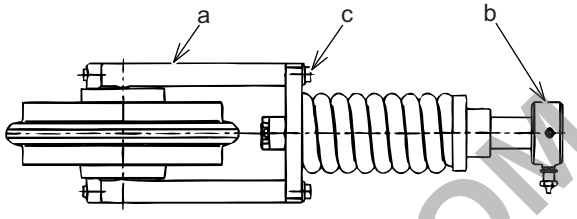
34.1.6 IDLER ADJUSTER

34.1.6.1 REMOVAL AND INSTALLATION PROCEDURES

34.1.6.1.1 Removing

(1) Idler adjuster assembly assembled with idler assembly (a) is removed from the lower frame.
Do this work by referring to 34.1.5.1.1 Removing front idler.

(2) Loosen capscrews (c) and separate idler assembly (a) from idler adjuster assembly (b).
Tools: Spanner: 13mm
Weight of idler assembly : 14 kg (31 lbs)
Weight of idler adjuster assembly : 8 kg (18 lbs)



Disassembling idler assembly

WARNING

The separated idler assy is easy to fall down. Lay it down so it does not fall down on your feet, utilizing square lumber.

34.1.6.1.2 Installing

(1) Installation is done in the reverse order of removal :
First of all, assemble idler assembly (a) to idler adjuster assembly (b), and tighten them together with capscrews (c).
In that case, coat the threaded part of capscrews (c) with Loctite #262 beforehand.
Tools: Spanner: 13mm T: 46.1N-m (34 lbf-ft)

(2) Before installing the idler adjuster to the crawler frame, assemble it with the idler assembly. For the procedure, refer to 34.1.5.1.2 Installing front idler.

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43. TROUBLESHOOTING (ELECTRICAL SYSTEM)

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43.2.3 TRAVEL OPERATION 43-9

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2. Tightening torque table

2.1 Tightening torque list

2.1.1 Engine main parts

Table 2-8 Tightening torque list - Engine main parts

Item		Threads Dia × Pitch (mm)	Torque			Remark
			N·m	kgf·m	lbf·ft	
Cylinder head bolt	Main	M10 × 1.25	73.5 to 83.4	7.5 to 8.5	54.2 to 61.5	
	Sub	M8 × 1.25	19.6 to 29.4	2.0 to 3.0	14.5 to 21.7	
Rocker cover nut		M6 × 1.0	4.9 to 6.9	0.5 to 0.7	3.6 to 5.1	
Rocker stay bolt		M8 × 1.25	14.7 to 21.6	1.5 to 2.2	10.8 to 15.9	
Main bearing cap bolt		M10 × 1.25	49.0 to 53.9	5.0 to 5.5	36.2 to 39.8	
Connecting rod cap nut		M8 × 1.0	31.4 to 34.3	3.2 to 3.5	23.1 to 25.3	
Flywheel bolt		M10 × 1.25	83.4 to 93.2	8.5 to 9.5	61.5 to 68.7	
Crankshaft pulley nut		M16 × 1.5	98.1 to 117.7	10 to 12	72.3 to 86.8	

2.1.2 Fuel system

Table 2-9 Tightening torque list - Fuel system

Item	Threads Dia × Pitch (mm)	Torque			Remark
		N·m	kgf·m	lbf·ft	
Hollow screw (fuel injection pump)	M10 × 1.0	9.8 to 14.7	1.0 to 1.5	7.2 to 10.8	
Delivery valve holder (fuel injection pump)		34.3 to 38.2	3.5 to 3.9	25.3 to 28.2	
Air-bleeding plug (fuel injection pump)		4.9 to 6.9	0.5 to 0.7	3.6 to 5.1	
Lock plate (fuel injection pump)		3.2 to 4.0	0.3 to 0.4	2.2 to 2.9	
Stop wire bracket (fuel injection pump)		3.2 to 4.0	0.3 to 0.4	2.2 to 2.9	
Fuel injection nozzle retaining nut	M16 × 0.75	34.3 to 39.2	3.5 to 4.0	25.3 to 28.9	
Fuel injection nozzle holder	M20 × 1.5	49.0 to 68.6	5.0 to 7.0	36.2 to 50.6	
Fuel injection pipe nuts	M12 × 1.5	24.5 to 29.4	2.5 to 3.0	18.1 to 21.7	
Fuel return pipe nut	M12 × 1.5	20.6 to 24.5	2.1 to 2.5	15.2 to 18.1	
Nut for setting torque spring	M12 × 1.0	14.7 to 24.5	1.5 to 2.5	10.8 to 18.1	
Adjusting screw nut for setting torque spring	M8 × 1	7.8 to 11.8	0.8 to 1.2	5.8 to 8.7	

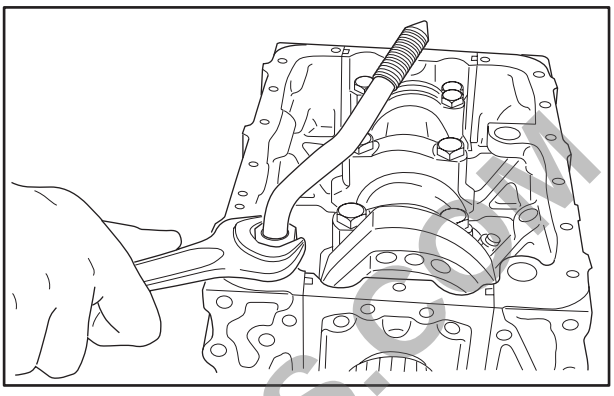
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1.11 Installing oil screen

(1) Turn the engine upside down to face up the oil pan mounting surface.

(2) Install the oil screen so that the tip of the screen does not contact the oil pan.

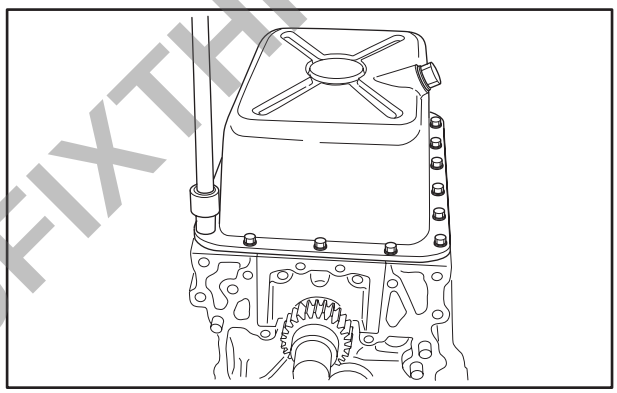


Installing oil screen

1.12 Installing oil pan

(1) Install new oil pan gasket.

(2) Tighten oil pan bolts evenly and diagonally.

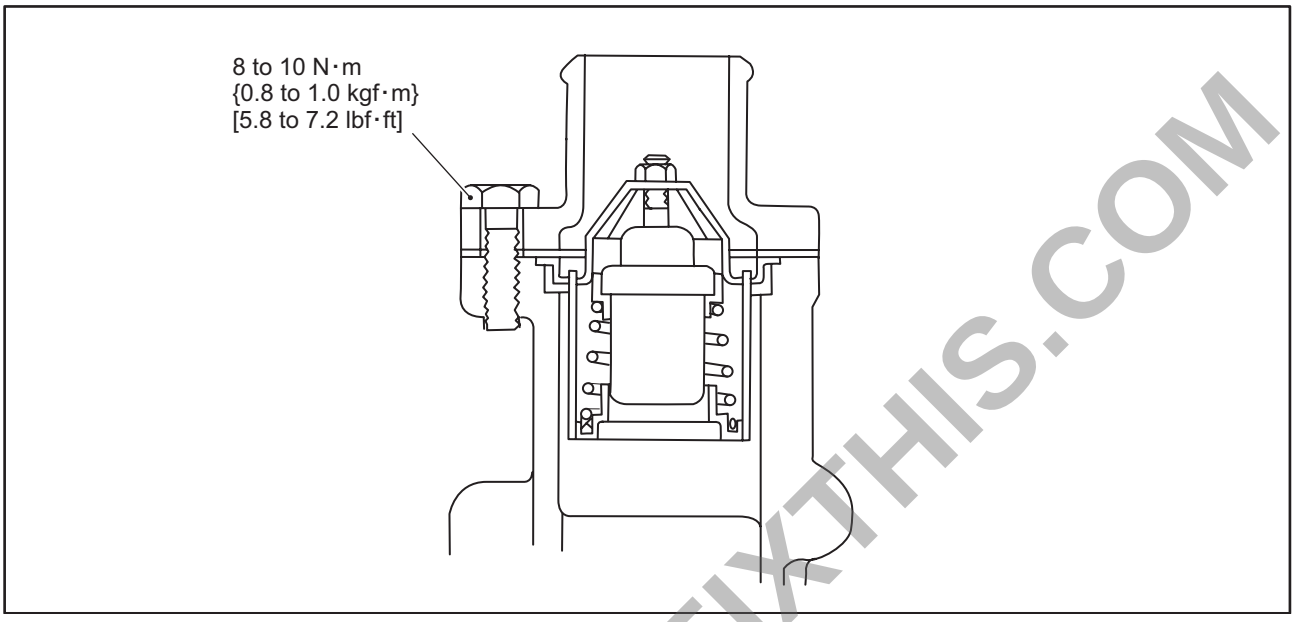


Installing oil pan

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2.3 Reassembling thermostat



Reassembling thermostat

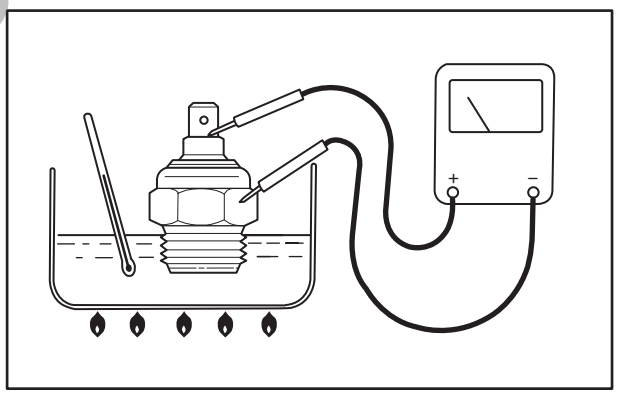
2.4 Inspecting thermoswitch

⚠ CAUTION

Both water and the thermositch become hot. Pay attention to prevent burn and fire.

Immerse the temperature-senser in oil and measure the resistance while raising the oil temperature. If the resistance extremely deviates from the standard, replace the thermoswitch.

Temperature	Standard
120°C [248°F]	30 mΩ

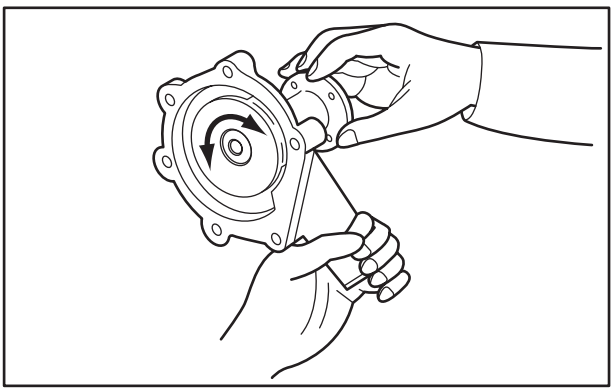


Inspecting thermoswitch

2.5 Inspecting water pump

2.5.1 Checking water pump for smooth rotation

Check to make sure that the impeller and shaft of water pump rotate smoothly without noise and irregularities. If faulty, replace the water pump assembly.



Checking impeller and shaft for smooth rotation

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