



NEW HOLLAND

CRAWLER EXCAVATOR

E215B TIER III

REPAIR MANUAL

87612178 NA

Issued 01-2007

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TROUBLESHOOTING SECTION

46-TROUBLESHOOTING (BY ERROR CODES)

46.1 EVALUATION OF ACTUAL PROBLEM AT THE SITE46-3
46.2 CLASSIFICATION OF FAILURE AND TROUBLESHOOTING.....46-4
46.3 MECHATRO CONTROLLER BLOWN FUSE46-4
46.4 TROUBLESHOOTING BY ERROR CODE.....46-4

47-TROUBLESHOOTING (BY SYMPTOM)

47.1 HYDRAULIC SYSTEM.....47-3
47.2 ELECTRIC SYSTEMS47-27
 47.2.1 WIRING CHECKING PROCEDURE.....47-27
 47.2.2 TROUBLE47-30
47.3 ENGINE RELATED TROUBLESHOOTING.....47-33

48-TROUBLESHOOTING (BY DIAGNOSIS MODE)

48.1 TROUBLE DIAGNOSIS MODE48-3

ENGINE SECTION

51-ENGINE

SECTION 1 - DIAGNOSTICS EW - 1-1
SECTION 2 - 6.7 L T/A ENGINE OVERHAULEW - 1-2
SECTION 3 - RECHARGING AND START-UPEW - 1-3

1. OUTLINE

- (3) Inspecting parts
 - 1) Check the disassembled parts for damage or heavy wear.
 - 2) Measure the wear of parts and clearance, and record the measured values.
 - 3) If a part has damage or heavy wear, replace the part.
- (4) Reassembling hydraulic equipment
 - 1) During the parts cleaning, ventilate the room.
 - 2) Before assembly, thoroughly clean all parts.
 - 3) Apply clean hydraulic oil or gear oil prior to assembly.
 - 4) Replace the removed O-ring, back-up rings and oil seal with new ones, and apply grease or oil on them before assembling.
 - 5) Fully clean the surface on which liquid sealants are applied.
 - 6) Before assembling, remove rust preventives on new parts.
 - 7) Use special tools to fit bearings, bushing and oil seals.
 - 8) Assemble parts using the alignment marks made during disassembly.
- (5) Installing hydraulic equipment
 - 1) Confirm hydraulic oil and lubrication oil.
 - 2) Air release is required in the following cases ;
 1. Change of hydraulic oil
 2. Replacement of parts on suction pipe side
 3. Removing and attaching hydraulic pump
 4. Removing and attaching swing motor
 5. Removing and attaching travel motor
 6. Removing and attaching hydraulic cylinder



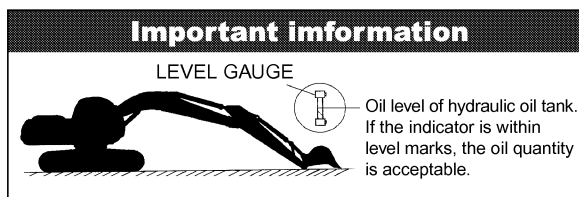
If hydraulic oil and lubricating oil are not filled and also air bleed is not performed, the hydraulic equipment may be damaged.

- 3) For air removal in the hydraulic the pump and swing motor, loosen but do not remove the drain plug on the upper housing, start engine and run in low idle until hydraulic fluid flows from the port. Tighten the plug securely.
- 4) For air removal from the travel motor and hydraulic cylinder, start engine and operate for 10 minutes or more at no-load and low idle.

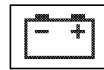


For cylinder, don't move it to the stroke end at beginning.

- 5) Air in pilot circuits can only be removed by operating digging, swing and traveling motions thoroughly.
- 6) Check hydraulic oil level.
Move attachments to hydraulic oil check position, and check hydraulic oil level of tank. Add oil if the oil level is lower than the specified level.
How to check oil level of hydraulic oil tank



1.1.4 ELECTRICAL EQUIPMENT



- (1) Handle equipment with care so as not to drop or bump it.
- (2) Connectors should be removed by unlocking while holding the connector.
Never stress the sealed end of a connector by pulling on the wire.
- (3) Check that connector is completely connected and securely locked.
- (4) Turn the engine key OFF before disconnecting and connecting connectors.
- (5) Turn the engine key OFF before touching terminals of starter and alternator.
- (6) Remove battery grounding terminal before beginning work close to battery and battery relay with tools.
- (7) Wash machine with care so as not to splash water on electrical equipment and connectors.
- (8) Before connecting a waterproofed connector, check the connector ends for moisture. If moisture is present, dry it completely before connecting.

2. SPECIFICATIONS

Item	Model	Unit ; kg (lb)
		E215B
4. Lubricant and water (Assembly of following :)		550 (1,210)
4.1 Hydraulic oil		200 (440)
4.2 Engine oil		20 (44)
4.3 Fuel		310 (680)
4.4 Water		20 (44)

Note

Marks * show dry weight.

3. ATTACHMENT DIMENSIONS

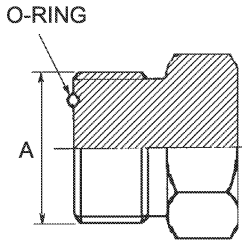
Issue	Date of Issue	Applicable Machines	Remarks
First edition	January, 2007	E215B : YQ11-06001~	5-4600

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11. TOOLS

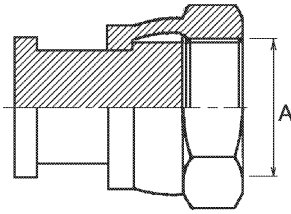
(4) Plug for ORS joints

Male



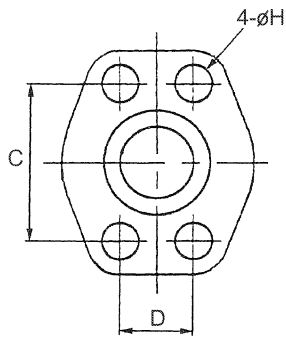
Screw size A	Applicable hose O.D	Plug parts No.	Opposing flats (HEX)	O-ring parts No.	Nominal O-ring
1-14UNS	ø21.7	YN01H01001P1	27	ZD12A01600	1B A16
1 3/16-12UN	ø27.2	YN01H01002P1	36	ZD12A01800	1B A18
1 7/16-12UN	ø34.0	YN01H01003P1	41	ZD12A02100	1B A21

Female



Screw size A	Applicable tube O.D	Plug parts No.	Opposing flats (HEX)
1-14UNS	ø21.7	YN01H01004P1	32
1 3/16-12UN	ø27.2	YN01H01005P1	36
1 7/16-12UN	ø34.0	YN01H01006P1	41

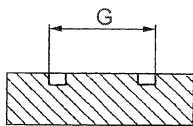
(5) Plug for half clamp



For standard pressure : 20.6 MPa (2990 psi)

Size	Plug part No.	C mm	D mm	G mm	H mm	O-ring part No.
1/2	ZE12Q08000	38.10	17.48	25.53~ 25.40	9	45Z91D2
3/4	ZE12Q12000	47.63	22.23	31.88~ 31.75	11	ZD12P02600
1	ZE12Q16000	52.37	26.19	39.75~ 39.62	11	ZD12P03400
1 1/4	ZE12Q20000	58.72	30.18	44.58~ 44.45	11	ZD12P03800

For high pressure : 41.2 MPa (5970 psi)



Size	Plug part No.	C mm	D mm	G mm	H mm	O-ring part No.
1/2	ZE13Q08000	40.49	18.24	25.53~ 25.40	9	2445Z831D1
3/4	ZE13Q12000	50.80	23.80	31.88~ 31.75	11	ZD12P02600
1	ZE13Q16000	57.15	27.76	39.75~ 39.62	13	ZD12P03400
1 1/4	ZE13Q20000	66.68	31.75	44.58~ 44.45	15	ZD12P03800

[MEMO]

12. STANDARD MAINTENANCE TIME TABLE

Group	Location	Work to be done	Unit	Remarks	Unit: Hour	
03 Swing frame		Detach/attach	1 set	Removing and installing pump	3.2	
		Detach/attach	1 set	Removing and installing air cleaner	0.4	
		Detach/attach	1 set	Removing and installing muffler	0.4	
		Detach/attach	1 set	Removing and installing radiator	4.0	
	150	Upper frame		See 33.1.21		
	151	Upper frame ASSY	Detach/attach	1 pc.	After removing swivel joint	1.3
	152	• Mounting bolt	Detach/attach	1 set		0.4
	153	• Upper frame slinging	Detach/attach	1 pc.		0.4
	154	• Cleaning	Cleaning	1 pc.		0.3
	155	• Sealant	Apply	1 pc.		0.2
		Other necessary works	Detach/attach	1 set	Cab	1.4
			Detach/attach	1 set	Guard	0.4
			Detach/attach	1 set	Counterweight	0.6
			Detach/attach	1 set	Boom	1.4
	04 Travel system	00	Travel relation		See 34.1.2	
01		Track link ASSY	Detach/attach	One side	Include adjustment of tension	1.5
02		• Track link attaching and detaching position	Preparation	One side		0.1
03		• Master pin	Detach/attach	One side		0.5
04		• Track link extending and winding	Detach/attach	One side		0.5
05		Shoe plate	Replace	1 pc.		0.4
10		Upper roller relation			See 34.1.3	
11		Upper roller ASSY	Detach/attach	1	After removing track link	0.2
12		Upper roller	O/H	1		1.0
20		Lower roller relation			See 34.1.4	
21		Lower roller ASSY	Detach/attach	1		0.2
22		Lower roller	O/H	1		1.5
30		Front idler relation			See 34.1.5	
31		Front idler ASSY	Detach/attach	One side	After removing track link	0.6
32		Front idler ASSY slinging	Detach/attach	One side		0.3
33		Front idler ASSY	Detaching	One side		0.3
34		Idler ASSY	O/H	One side		1.0
35		Idler adjuster ASSY	O/H	One side	Replace spring	2.4
36		• Grease cylinder	O/H	One side		0.6
40	Sprocket			See 34.1.6		
41	Sprocket	Replace	One side	After removing track link	0.6	
50	Travel motor relation			See 34.1.7		

13.2 PERFORMANCE INSPECTION STANDARD TABLE

Note

The mode is already "H" mode when power is thrown.
 Unless otherwise specified, measure it on "H" mode.

Table13-1

Inspection Item		Measuring Position			Standard value	Tolerance		Unit	Adjusting Point	Measuring condition	
		Position	Size	Port		Hi	Lo				
Standard Measuring condition	Cleanliness of hydraulic oil	Hydraulic oil in tank			NAS 9 or less	—	—	Class	—	Sampling	
	Hydraulic oil temperature	Tank surface			50 (122)	+ 5 (41)	- 5 (23)	°C	—	Atmospheric temp	
	Water temperature	Radiator surface			75 (167)	+ 15 (59)	- 15 (5)	(°F)	—	50°C~-10°C (122°F~14°F)	
	Engine speed	H mode Lo idle	Measure the engine speed at multi display on the gauge cluster, or measure with diesel speed meter.			1000	+ 50	- 50	min ⁻¹	Adjustment not required	LOW throttle
		H mode Hi idle				2000	+ 50	- 50			Full throttle (HI idle)
		B mode Hi idle				2000	+ 50	- 50			Perform all measurement with the air-conditioner "OFF".
		A mode Hi idle				2000	+ 50	- 50			
Decel		1050				+ 50	- 50				
S mode Hi idle	1800	+ 50	- 50								
Pilot primary pressure circuit		G pump			a4	5.0 (725)	+ 0.5 (+73)	0	PR1	HI idle	
High pressure circuit	Main relief valve pressure	ATT	P1	Main pump	PF1/4	a1	34.3 (4970)	+ 0.7 (+100)	- 0.5 (-73)	MR1	Boom up
			P2			a2					
		Boost	P1			a1	37.8 (5480)	+ 1.0 (+145)	- 0.5 (-73)	MR1	
			P2			a2					
	Over load relief valve pressure	Boom	R			a1	37.8 (5480)	0	- 4.0 (-580)	OR4	Boom down
			H			a1				39.7 (5760)	0
		Arm	R			a2	37.8 (5480)	0	- 4.0 (-580)		
			H			a1				37.8 (5480)	0
		Bucket	R			a1	39.7 (5760)	0	- 5.9 (-855)		
			H			a1				29.0 (4205)	+ 6.0 (+870)
	Swing	RH	a2			29.0 (4205)	+ 6.0 (+870)	0	OR6		
		LH	a2						29.0 (4205)	+ 6.0 (+870)	0
	Travel	RH	FW			a1	34.3 (4970)	+ 0.7 (+100)			
			RV			a1					
		LH	FW			a2	34.3 (4970)	+ 0.7 (+100)	- 0.5 (-73)	—	
RV			a2								

13. MAINTENANCE STANDARD AND TEST PROCEDURE

13.5.4 DRAIN RATE OF TRAVEL MOTOR

(1) Purpose

To measure the drain rate of the travel motor and to confirm the performances of the travel motor.

(2) Conditions

Hydraulic oil temperature ;
45~55°C (113~131°F)
Engine revolution; Hi idle

(3) Preparation

- 1) Place a stopper under the RH and LH travel sprockets.
- 2) Stop the engine and release pressure from the hydraulic circuit.
- 3) Connect a hose with the drain port of the travel motor and take drain in a container.

(4) Measurement ; at Travel Lock



Make sure rotary direction is as indicated in Fig. 13-18. If reversed, Stopper "B" may contact rib "A" causing it to brake.

- 1) Start the engine and relieve pressure at the full stroke of the travel lever.
- 2) Measure the drain rate for 30 seconds of relieving.

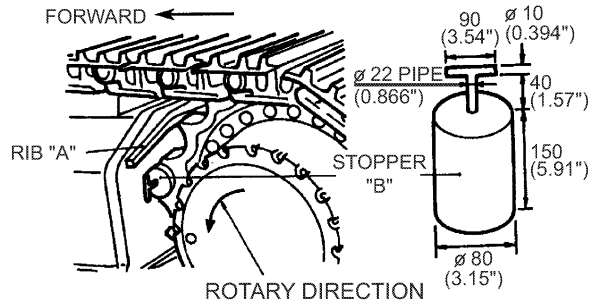


Fig. 13-18 Location of stopper applied to travel sprocket

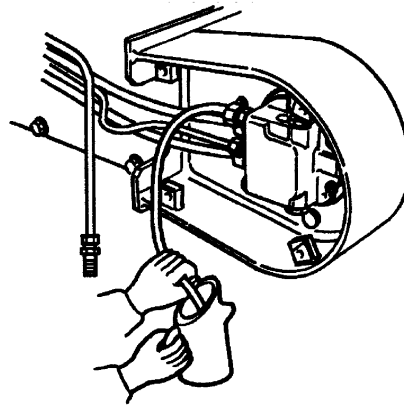


Fig. 13-19 Method of measuring the drain rate of travel motor

Travel deviation		Unit : L(gal)/30sec	
Measuring position	Standard value	Reference value for remedy	Service limit
Drain rate	9 (2.4)	16 (4.2)	23 (6.1)

13. MAINTENANCE STANDARD AND TEST PROCEDURE

13.9.3 ADJUSTMENT OF MECHATRO CONTROLLER OUTPUT (A-B-C ADJUSTMENT)

13.9.3.1 PURPOSE OF THE ADJUSTMENT

There are 3 kinds of adjustment of the mechatro controller as shown below. Every adjustment is essential to maintain the performance of machine.

(1) Adjustment of engine ("A" adjustment)

This adjustment is performed to set the relation between the stepping command voltage output from mechatro controller to governor motor and the engine speed.

(2) Adjustment of pump ("B" adjustment)

This adjustment is performed to correct the output variation by coordinating the output hydraulic pressure with engine rated output.

(3) Adjustment of unloading valve ("C" adjustment)

This adjustment is performed to correct the open variation of unloading valve to improve the operability further.

13.9.3.2 IN CASES WHERE THE ADJUSTMENT OF MECHATRO CONTROLLER IS REQUIRED;

When the following parts are replaced or repaired, carry out the adjustment without fail.

(1) Mechatro controller

(2) Engine

(3) Hydraulic pump or hydraulic pump proportional valve

(4) Unloading proportional valve, spool of unloading valve

13.9.3.3 PREPARATION

((1) Warm the oil temperature to about 50°C (122°F) to warm up the engine.

(2) Turn the HVAC OFF.

(3) Turn the starter key switch OFF to stop the engine.

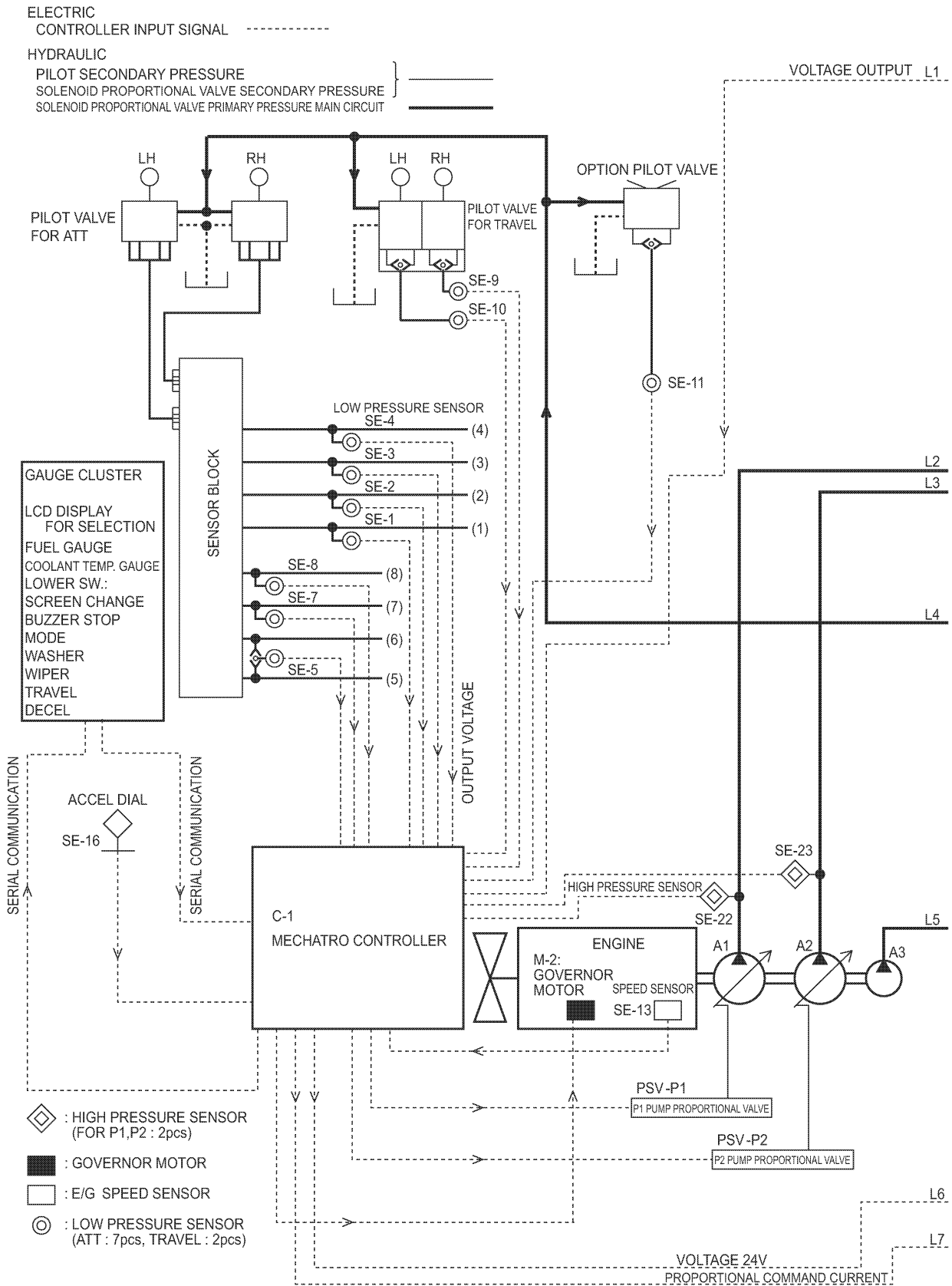
When the mechatro controller was replaced, the following error codes are displayed because the adjustment data is not entered.

A215, A225, A015, A025, A035

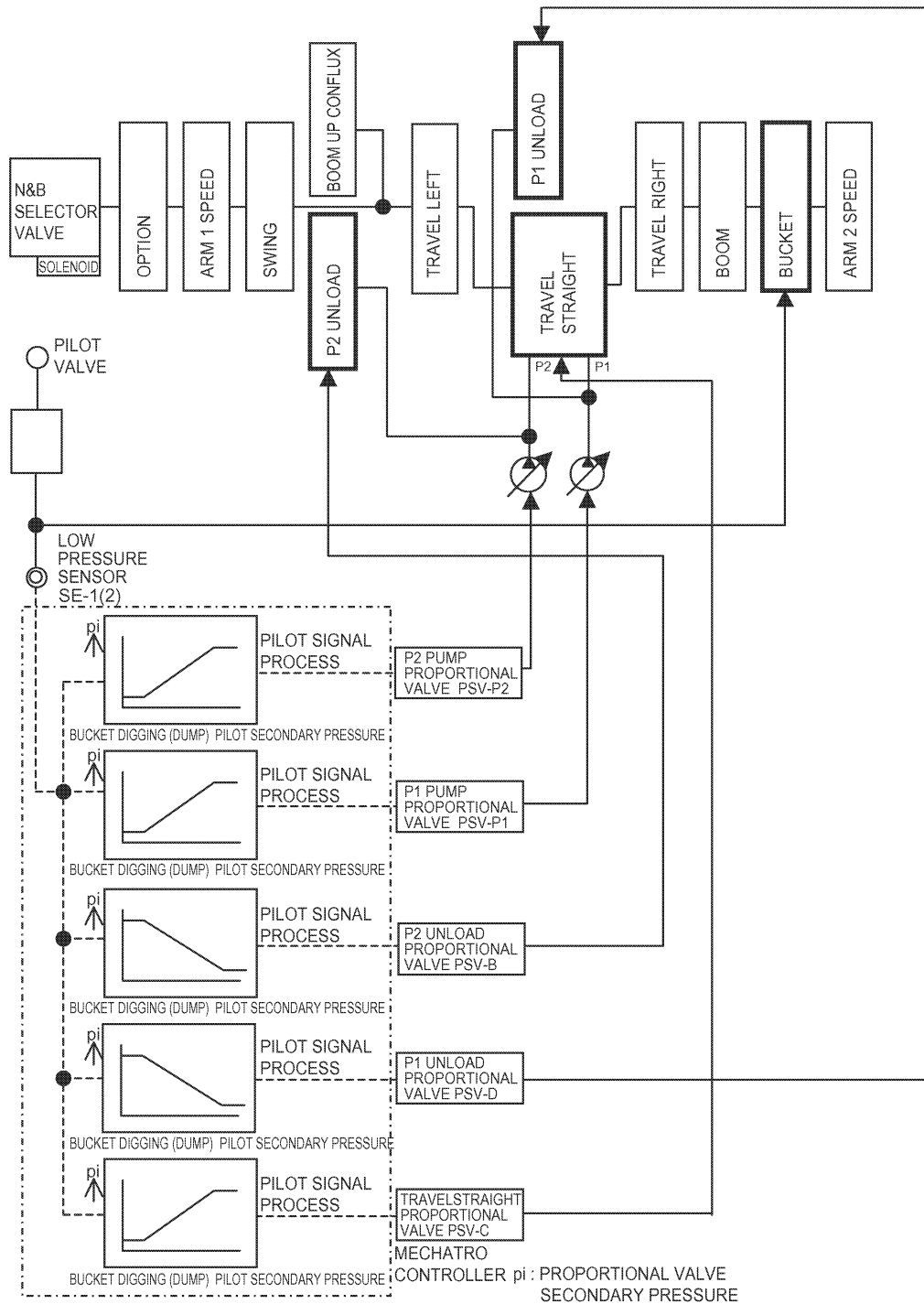
Any error codes other than those shown above may suggest machine faults. Repair the machine according to Error Code List.

21.1 SUMMARY OF MECHATRO CONTROL SYSTEM

21.1.1 MECHATRO CONTROL SYSTEM IN GENERAL

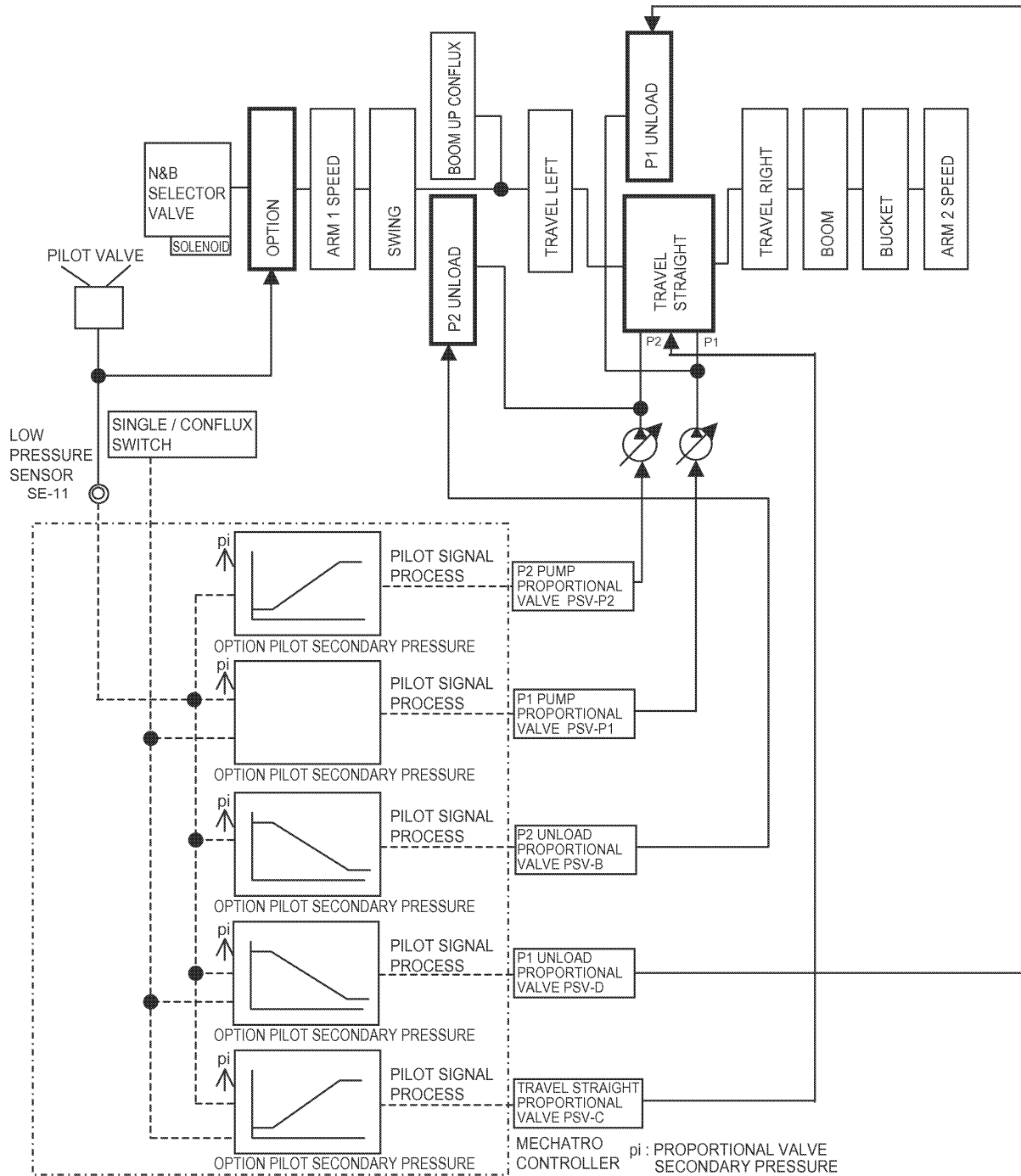


21.1.8 BUCKET DIGGING (DUMP) CONFLUX CONTROL



- (1) On starting bucket digging (dump) operation, bucket digging (dump) operating pilot pressure switches bucket spool and is input to low pressure sensor.
- (2) The output voltage of low pressure sensor is input to mechatro controller and the mechatro controller processes pilot signal and outputs command according to the input voltage to P1 and P2 pump proportional valves, P1 and P2 unload proportional valves and travel straight proportional valve.
- (3) Each proportional valve outputs pilot proportional valve secondary pressure according to the command output by mechatro controller and changes P1 and P2 pump delivery rate and switches P1 and P2 unload valves and travel straight valve of the control valve.
- (4) The tandem passage is connected to P2 port because of the travel straight valve switched and P1 pump delivery oil conflues P2 pump delivery oil because of P2 unload valve switched.

21.1.15 OPTION CONFLUX CONTROL (OPTION)



- (1) Select the Conflux using the Conflux/Single switch.
- (2) When starting option operation, option operating pilot pressure switches the option spool and is input to the low pressure sensor.
- (3) The output voltage of low pressure sensor is input to the mechatro controller. The mechatro controller processes the pilot signal and outputs a command according to the input voltage to the P1 and P2 pump proportional valves, P1 and P2 unload pressure proportional valves and the ltravel straight proportional valve.
- (4) Each proportional valve outputs pilot proportional valve secondary pressure according to the command output by the mechatro controller and changes the P1 and P2 pump delivery rate and switches the P1 and P2 unload valves and travel straight valve in the control valve.
- (5) The parallel passage on the P2 side is connected to the P1 port because the travel straight valve is switched and the P1 pump delivery oil confluges the P2 pump delivery oil when the P2 unload valve is switched.

21. MECHATRO CONTROL SYSTEM

No	Displays	Contents
23	NO.23 DIGITAL OUTPUT DO15 COMP. OFF MEAS. OFF DO16 COMP. OFF MEAS. OFF DO17 COMP. OFF MEAS. OFF DO18 COMP. OFF MEAS. OFF DO19 COMP. OFF MEAS. OFF DO20 COMP. OFF MEAS. OFF DO21 COMP. OFF MEAS. OFF	Set value in computer Measured value Set value in computer Measured value Set value in computer Measured value Set value in computer Measured value Set value in computer Measured value Set value in computer Measured value
24	NO.24 DIGITAL OUTPUT DO22 COMP. OFF MEAS. OFF DO23 COMP. OFF MEAS. OFF DO24 COMP. OFF MEAS. OFF DO25 COMP. OFF MEAS. OFF DO26 COMP. OFF MEAS. OFF DO27 COMP. OFF MEAS. OFF DO28 COMP. OFF MEAS. OFF	Set value in computer Measured value Set value in computer Measured value Set value in computer Measured value Set value in computer Measured value Set value in computer Measured value Set value in computer Measured value
25	NO.25 WIPER SYSTEM WIPER SW OFF RISEUP SW OFF REVERSE SW OFF PREVENT ARC OFF CW MOTOR RLY OFF CCW MOTOR RLY OFF WASHER SW OFF MOTOR RELAY OFF	Wiper switch Wiper rise-up switch Wiper reverse rotation switch Wiper motor ark prevention relay Wiper normal rotation relay Wiper reverse rotation relay Washer switch Washer motor relay

2) Service diagnosis mode No.2

No	Displays	Contents	No	Displays	Contents
1	NO.1 MAIN CONT. P/N YN22E00001F1 PROGRAM VERSION 1-VER 11.11 2-VER 00.00 SERVICE DIAG 2	P/No. indication Program version indication MERIT controller program version Service diagnosis mode	33	NO.33 BUCKET C-1 P1-PRES 13.9M C-2 P2-PRES 13.9M E-1 P1-PSV 600mA E-2 P2-PSV 600mA D-1 P1-UL(BPC) 600mA D-2 P2-UL(BPC) 600mA D-3 S-TRAVEL 600mA B-5 BUCKET DIG 1.9M B-6 BUCKET DUMP 1.9M G-3 ENG SPEED 2205 POWER SHIFT 100mA	Pump pressure sensor Pump pressure sensor Command current Command current Command current Command current Command current Bucket digging pressure sensor Bucket dump pressure sensor Engine actual speed Power shift current
31	NO.31 BOOM C-1 P1-PRES 13.9M C-2 P2-PRES 13.9M E-1 P1-PSV 600mA E-2 P2-PSV 600mA D-1 P1-UL(BPC) 600mA D-2 P2-UL(BPC) 600mA B-1 BOOM RAISE 1.9M B-2 BOOM LOWER 1.9M G-3 ENG SPEED 2205 POWER SHIFT 100mA	Pump pressure sensor Pump pressure sensor Command current Command current Command current Command current Boom up pressure sensor Boom down pressure sensor Engine actual speed Power shift current	34	NO.34 TRAVEL C-1 P1-PRES 13.9M C-2 P2-PRES 13.9M E-1 P1-PSV 600mA E-2 P2-PSV 600mA D-1 P1-UL(BPC) 600mA D-2 P2-UL(BPC) 600mA D-3 S-TRAVEL 600mA B-9 TRAVEL(R) 13.9M B-10 TRAVEL(L) 13.9M Pi-P1 13.9M Pi-P2 13.9M G-3 ENG SPEED 2205 POWER SHIFT 100mA	Pump pressure sensor Pump pressure sensor Command current Command current Command current Command current Command current Travel right pressure sensor Travel left pressure sensor Pilot pressure at travel straight (P1 side) Pilot pressure at travel straight (P2 side) Engine actual rpm Power shift current
32	NO.32 ARM SWING C-1 P1-PRES 13.9M C-2 P2-PRES 13.9M E-1 P1-PSV 600mA E-2 P2-PSV 600mA D-1 P1-UL(BPC) 600mA D-2 P2-UL(BPC) 600mA D-3 S-TRAVEL 600mA D-6 ARM-IN-2 600mA B-3 ARM OUT 13.9M B-4 ARM IN 13.9M B-1 BOOM RAISE 13.9M B-7 SWING 13.9M G-3 ENG SPEED 2205 POWER SHIFT 100mA	Pump pressure sensor Pump pressure sensor Command current Command current Command current Command current Command current Arm out pressure sensor Arm in pressure sensor Boom up pressure sensor Swing pressure sensor Engine actual speed Power shift current	35	NO.35 OPT C-1 P1-PRES 13.9M C-2 P2-PRES 13.9M E-1 P1-PSV 600mA E-2 P2-PSV 600mA D-1 P1-UL(BPC) 600mA D-2 P2-UL(BPC) 600mA D-3 S-TRAVEL 600mA E-3 OPT RELIEF 600mA B-16 P1 OPT 1.9M B-17 P2 OPT 1.9M F-4 OPT SELECT NIB DOUBLE FLOW SW NIB G-3 ENG SPEED 2205 POWER SHIFT 100mA	Pump pressure sensor Pump pressure sensor Command current Command current Command current Command current Command current Command current P1 side option pressure sensor P2 side option pressure sensor Optional selector SOL (Nibbler line) Conflux/ Single selector switch Engine actual rpm Power shift current

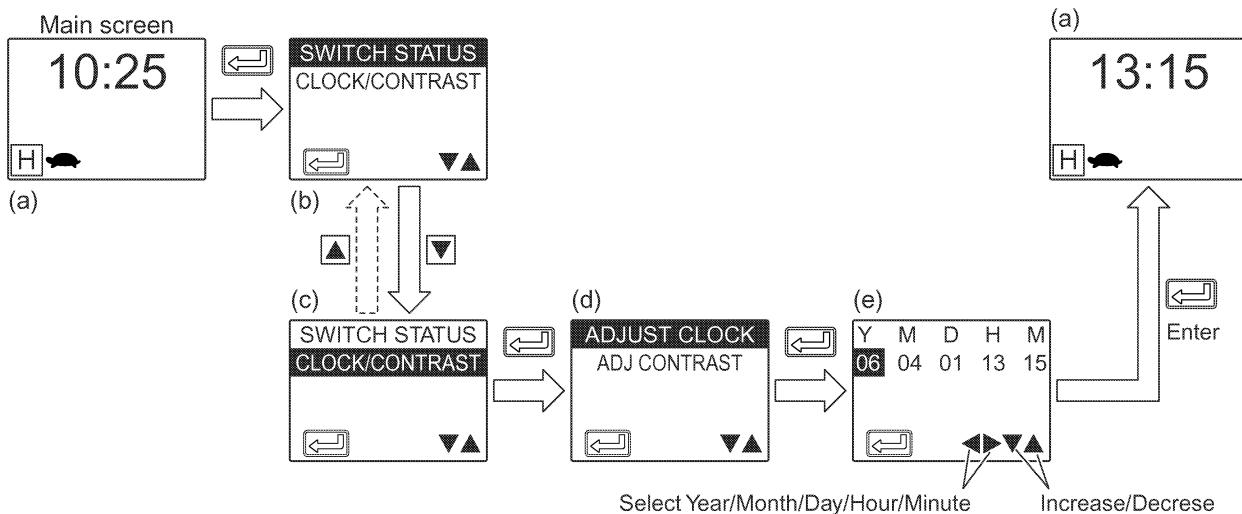
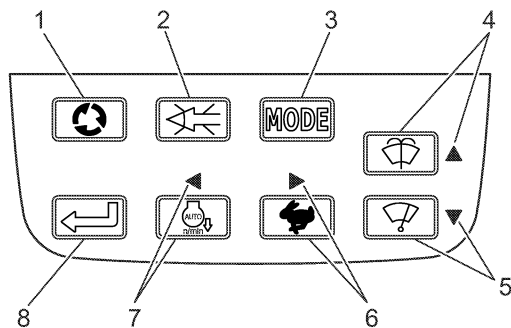
21. MECHATRO CONTROL SYSTEM

21.2.7 ADJUSTING PROCEDURE OF DISPLAY

(1) For operator

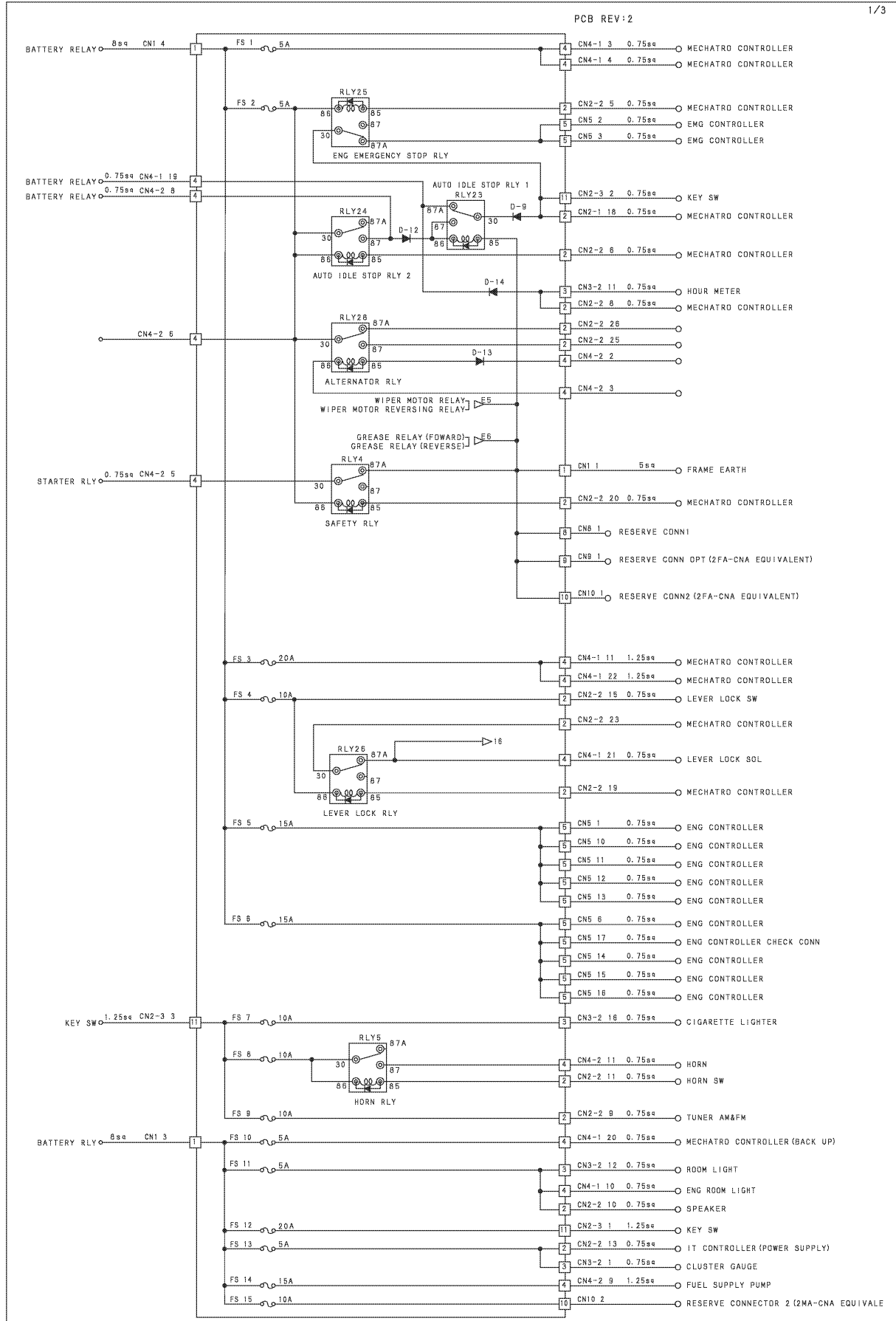
1) Clock Adjustment Switches

No.	Switches
1	Screen Change Switch
2	Buzzer Stop Switch
3	KPSS Work Mode Select Switch
4	Washer Switch
5	Wiper Switch
6	Travel Speed Select Switch
7	Auto Accel Switch
8	Select Switch

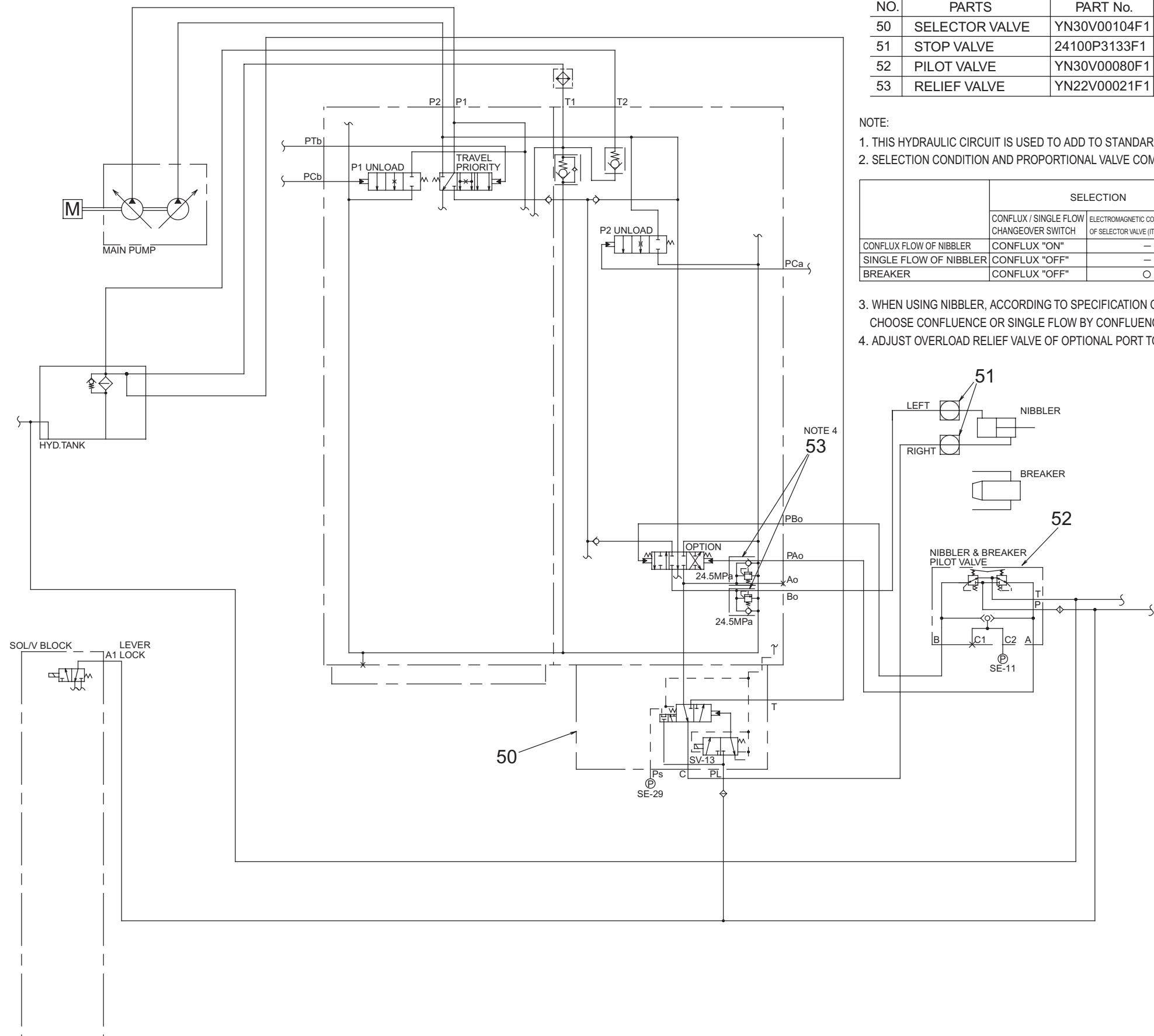


1. Turn starter key switch on and display main screen (a) for operator, and then press select switch (8) and display "SWITCH STATUS CLOCK/CONTRAST" select screen (b).
2. In operations of FEED ▲ (4) and FEED ▼ (5), move cursor to "CLOCK/CONTRAST" screen (c) and then press select switch (8) and the "ADJUST CLOCK ADJ CONTRAST" screen (d) is displayed.
3. In operations of FEED ▲ (4) and FEED ▼ (5), move cursor to "ADJUST CLOCK" and then press select switch (8) and the "ADJUST CLOCK" screen (e) is displayed.
4. Select any of "Y•M•D•H•M" in operation of FEED ▲ (4) and FEED ▼ (5) and vary the values in operations of FEED ▲ (4) and FEED ▼ (5).
5. After adjustment, press select switch (8) and the adjusted values are stored as memory and time setting is completed, and then the screen returns to main screen (a).

2) Circuit diagram



22.2.2 N&B SPECIFICATION (OPTION)



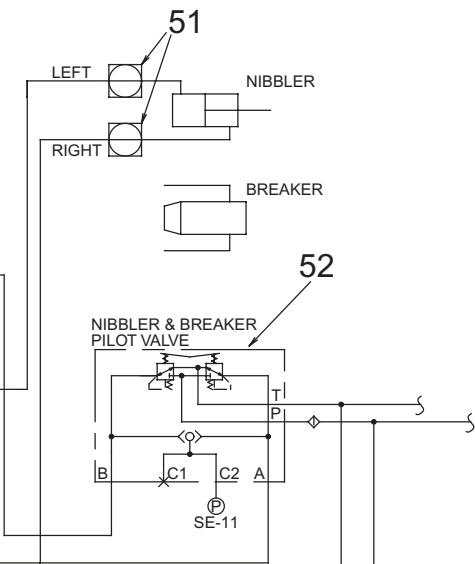
N&B specification		YN01Z00162P1	
NO.	PARTS	PART No.	MODEL No.
50	SELECTOR VALVE	YN30V00104F1	VBY-174B
51	STOP VALVE	24100P3133F1	
52	PILOT VALVE	YN30V00080F1	16030-00000
53	RELIEF VALVE	YN22V00021F1	KRX16EK22

NOTE:

1. THIS HYDRAULIC CIRCUIT IS USED TO ADD TO STANDARD CIRCUIT.
2. SELECTION CONDITION AND PROPORTIONAL VALVE COMMAND WHEN ANY OF NIBBLER SINGLE & CONFLUX FLOW OR BREAKER IN SERVICE.

	SELECTION		COMMAND SIGNAL OF SOLENOID PROPORTIONAL VALVE (W:O, W/O: -)				
	CONFLUX / SINGLE FLOW CHANGEOVER SWITCH	ELECTROMAGNETIC COMMAND SIGNAL OF SELECTOR VALVE (ITEM 50)(W/O,W/O:-)	P1 PUMP	P2 PUMP	TRAVEL STRAIGHT	P1 UNLOAD	P2 UNLOAD
CONFLUX FLOW OF NIBBLER	CONFLUX "ON"	-	○	○	○	○	○
SINGLE FLOW OF NIBBLER	CONFLUX "OFF"	-	-	○	-	-	○
BREAKER	CONFLUX "OFF"	○	-	○	-	-	○

3. WHEN USING NIBBLER, ACCORDING TO SPECIFICATION OF NIBBLER INSTALLED, CHOOSE CONFLUENCE OR SINGLE FLOW BY CONFLUENCE FLOW CHANGEOVER SWITCH.
4. ADJUST OVERLOAD RELIEF VALVE OF OPTIONAL PORT TO CUSTOMIZE SPECIFICATION ORDINARY SET PRESSURE.



This section describes boom lower operation.

- (1) Boom down pilot circuit
- (2) Prevention of natural fall by lock valve and actuation at lowering
- (3) Constant recirculation function of boom down main circuit

22.7.3 BOOM DOWN PILOT CIRCUIT

- (1) Operation :
 - 1) If the boom down operation is performed, the secondary pilot proportional pressure comes out of port C of the right pilot valve (9) and acts upon the low pressure sensor (SE-4). At the same time, the pressure acts upon the PBb port of C/V (2).
 - 2) The voltage output of the low pressure sensor (SE-4) enters the mechatro controller and processed in it.
 - 3) Then, the proportional secondary pressure fed into C/V (2) PBb port and branches off in two lines and switches boom spool and releases boom lock valve.

22.7.4 PREVENTION OF NATURAL FALL BY LOCK VALVE AND ACTUATION AT LOWERING

- (1) Purpose :
Prevention of natural fall when the lever is neutral
- (2) Principle :
The oil is prevented from returning to the boom spool by the poppet seat of the boom lock valve.
- (3) Operation :
In the boom down action, the selector valve is changed over by the secondary proportional pressure of PBb port. Then the poppet spring chamber of the lock valve CRb gets through the drain line (Dr) and makes the lock valve poppet open.
When the boom lever is at neutral, the drain line on the lock valve CRb poppet spring chamber is closed which causes the poppet closed.
The result is that the oil returning from the boom cylinder head (H) to the boom spool is held and makes the leak from the boom spool zero.
Thus the boom cylinder is prevented from making a natural fall.

22.7.5 CONSTANT RECIRCULATION FUNCTION OF BOOM DOWN MAIN CIRCUIT

- (1) Purpose :
Prevention of cavitation during boom lowering motion.
- (2) Principle :
The oil returning from the boom cylinder head (H) is recirculated to the rod (R).
- (3) Operation :
When the oil is supplied to the boom cylinder rod (R) side during boom down operation, the boom moves faster than it should do in some cases by the self weight of the attachment.
On that occasion, the circuit pressure on the rod (R) side is on the negative side.
The oil supplied to the boom cylinder rod (R) flows into the A1 port of the P1 pump and the P1 port of C/V. The oil then passes through the boom spool and goes out of the Bb port.
On that occasion, the oil returning from the head (H) goes through the recirculation path in the boom spool, pushes the check valve in the spool open, is recirculated to the Bb port and is supplied to the rod (R). When the (R) pressure is larger than the head (H) pressure, the check valve in spool closes. Thereupon, the recirculation is stopped.

22.10 COMBINED CIRCUIT

This section describes only the difference in combined operation.

- (1) Boom up / travel, pilot circuit
- (2) Boom up / travel, main circuit

22.10.1 BOOM UP / TRAVEL, PILOT CIRCUIT

(1) Operation :

<Operation: Different point of pilot circuit from independent operation >

- 1) The mechatro controller outputs command current to travel straight solenoid proportional valve after signal processing, and the solenoid valve outputs secondary pressure and acts on PTb port of C/V (2).
- 2) Then the pressure of PTb port switches the travel straight valve one step.

22.10.2 BOOM UP / TRAVEL, MAIN CIRCUIT

(1) Purpose :

To insure straight travel movement during travel operation even if the attachment is operated.

(2) Principle :

The travel action and the attachment action are actuated by separate pumps.

(3) Operation :

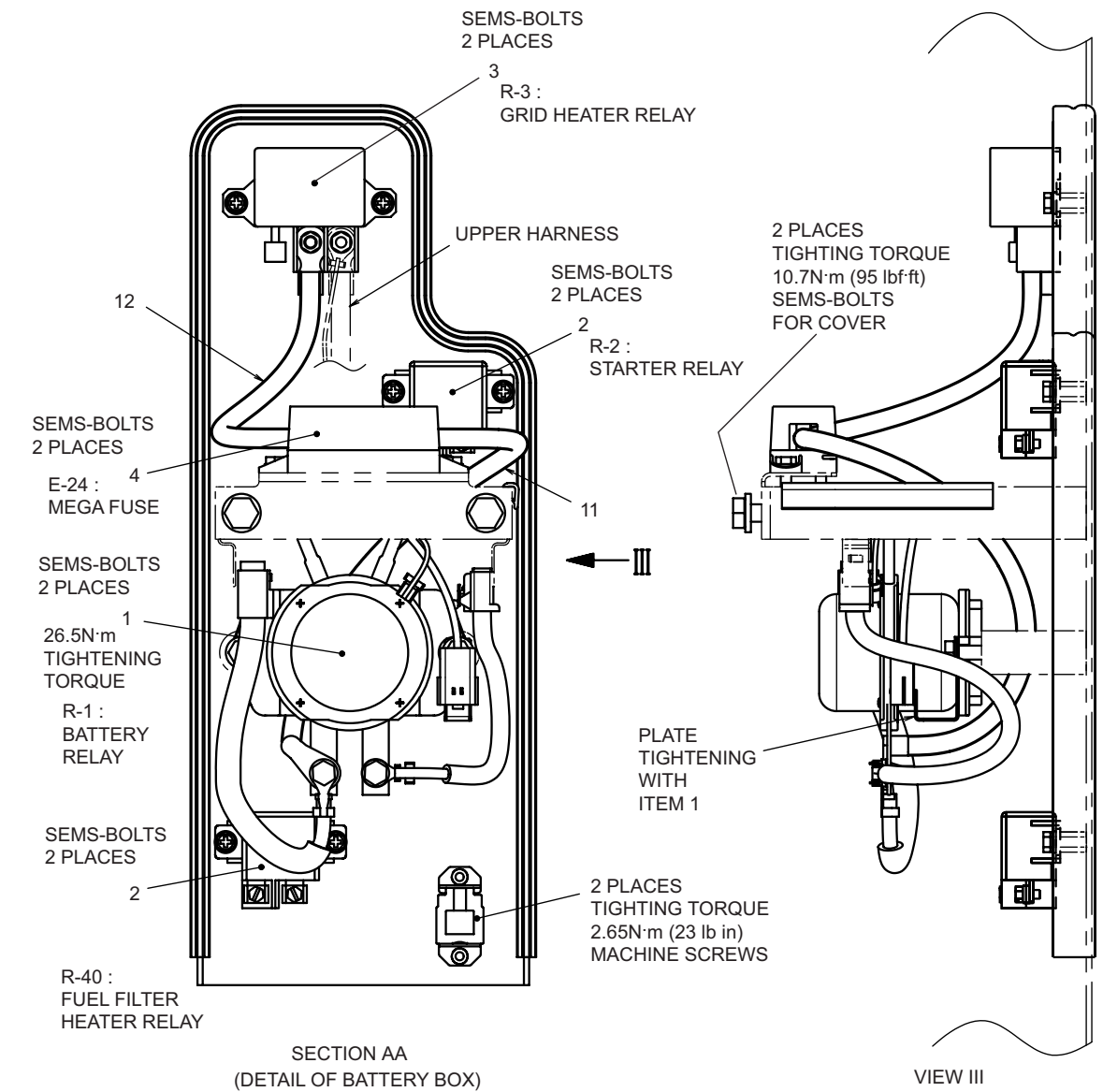
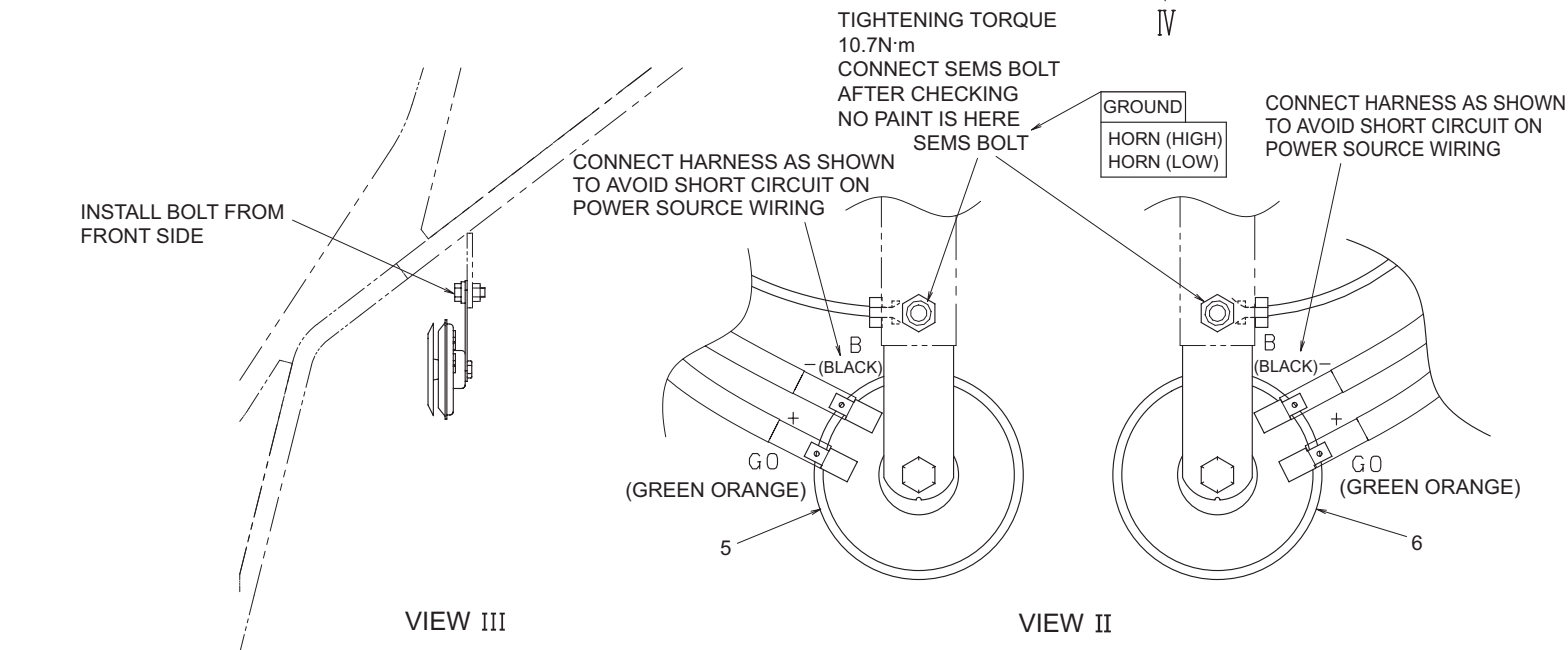
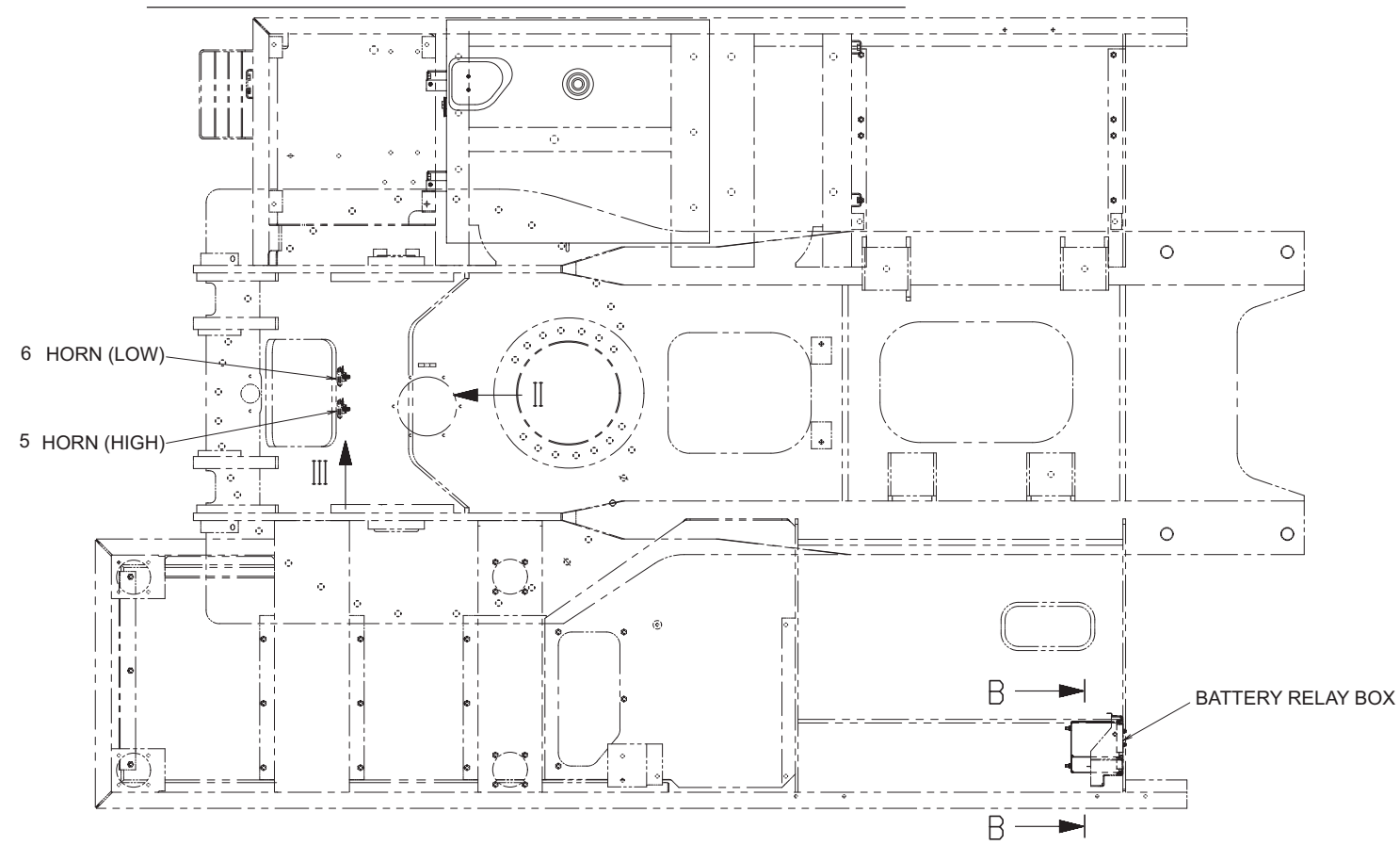
- 1) P1 pump delivery oil flows through P1 port of C/V(2) and branches off in P1 parallel circuit and travel straight spool. P2 pump delivery oil flows through P2 port of C/V(2) and branches off in P2 tandem circuit and travel straight spool.
- 2) The delivery oil flowed into P1 parallel circuit of P1 pump opens check valve CT1 and LCb and flows in boom spool, which exerts on boom up operation. The delivery oil flowed into travel straight spool of P1 pump opens check valve CT2 because the travel straight spool is shifted, and flows in boom conflux spool and exerts on boom up operation with the internal oil conflux. (In travel straight operation, P1 pump delivery oil exerts on swing operation of attachment.)
- 3) The delivery oil flowed into P2 tandem circuit of P2 pump flows in left travel spool to travel leftward. The delivery oil flowed into travel straight spool of P2 pump flows in right travel spool because the travel straight spool is shifted and exerts on the right travel operation. (In travel straight operation, P2 pump delivery oil exerts on travel operation.)
- 4) However, a portion of the flow is led to the travel straight spool notch restriction. The speed of attachments like travel, boom, etc. is adjusted by the circuit of restriction.

23. ELECTRIC SYSTEM

Issue	Date of Issue	Applicable Machines	Remarks
First edition	January, 2007	E215B : YQ11-06001~	5-4660

23.3.5 UPPER ELECTRIC ASSY

UPPER ELECTRIC ASSY		YN03E00017F1	(02)	
ITEM	PART NAME	PART No.	QTY	REMARKS
1	BATTERY RELAY	YN24S00008F1	1	
2	RELAY	YN24S00009P1	2	STARTER & FUEL FILTER
3	RELAY	YN24S00004P1	1	GRID HEATER
4	FUSE ASSY	YN73E00009F1	1	MEGA FUSE
5	HORN	LC53S00001D1	1	HORN
6	HORN	LC53S00001D2	1	HORN
11	CABLE	YN03E01057P1	1	MEGA FUSE - BATTERY RELAY
12	CABLE	YN03E01058P1	1	MEGA FUSE - GRID HEATER RELAY



23. ELECTRIC SYSTEM

23.3.6-1 UPPER HARNESS (4/4) : YN13E01461P2

CONNECTORS SELECTION TABLE

CONNECTOR NAME (PIN NUM.)	MANUFAC.	(PART NUMBER)						
		HOUSING	TERMINAL	HARNESS SEAL	RETAINER LOCK PLATE	SEALING PLUG	WIRE COVER	BAR
2FA-JME+	AMP	174352-2	171682-1 171682-5		1-174353-1			
2MA-JME+	AMP	174354-2				172748-2		
3FA-JME+	AMP	174357-2	171682-1 171682-5 1-174358-1		1-174359-1	172748-2		
4FA-JME+	AMP	174257-2	171682-1	900324-4	1-174258-1			
4MA-JME+	AMP	174258-2		(P1. 4-1. 8)		172748-2		
6FA-JME+	AMP	174262-2	171682-1 171682-5	1-900325-9 (P2. 0-2. 3)	1-174263-1	172748-2		
8NA-JME+	AMP	174284-2				172748-2		
10FA-JME+	AMP	174855-2	171682-1		1-174856-1			CTB-5
10MA-JME+	AMP	174857-2				172748-2		
12FA-JME+	AMP	174861-2	171682-1		1-174862-1	172748-2		CTB-6
12MA-JME+	AMP	174863-2				172748-2		
1FA-CNA	AMP	172128-1	170032-2					
1MA-CNA	AMP	172127-1	170340-1					
2FA-CNA	AMP	172130-1	170032-2					
3FA-CNA	AMP	172132-1	170032-2					
1FA-SS	AMP	282079-1	282110-1	281934-2				
2FA-SS	AMP	282080-1	282110-1	281934-2				
1FA-PDL	AMP	171809-2	170233-1					
2FA-PDL	AMP	171810-2	170233-1					
2FA-JPT	AMP							
3FA-JPT	AMP							
CA104	AMP	170887-1	170002-5					
CB104	AMP	170889-1	170003-5					
1FA-HSG	AMP	1-480418-0	170213-2					
4FA-WCP	AMP	939822-1	1-987588-1					
3FA-HGS	AMP	2-887842-1	985908-5	987987-1				
10FA-0401PM	AMP	318013-8	175288-2					
20FA-0401PM	AMP	318018-8	175288-2					
31FA-0408BD	AMP	353031-1	318017-10. Hsd					
24FA-0408BD	AMP	353029-1	318017-10. Hsd					
17FA-0408BD	AMP	353027-1	318017-10. Hsd					
12FA-070WLI	AMP	173851-1	173851-1					
12MA-070WLI	AMP	174933-1	173845-1					
12FA-070WLI	AMP	178118-8	173831-1					
20FA-070WLI	AMP	178119-8	173831-1					
22FA-HB	AMP	917989-8	175285-1	918-3-8. Hsd 175289-1 918-8-1-1. Hsd				
12FA-HB	AMP	917978-8	175289-1					
1FY-301	YAZAKI	7123-3010	239912-0					
1MY-58Y	YAZAKI	7222-4210-30	7114-3250	7157-3881-80				
2MY-58Y	YAZAKI	7222-4220-30	7114-3250	7157-3881-80	7157-8000-80			
2FY-080A	YAZAKI	7123-7228-40	7118-1181P					
2FS-080	SUMITOMO	8189-0084	1500-0110	7180-8234 (AEXO. 75sq) 7185-0078 (AVSSO. 75sq)				
3FS-08080	SUMITOMO	8400-0018	8240-4422	8409-0075				
3FB-BOSCH	BOSCH	1828403888	1828498080	828804-2				
2FD-DEL	FIAT-GPPT	12330587	12330144	12330587				
5FF-GHW	Grote&H	18241.000000	28206.201184	18895.827842	14898.825888			
	AMP		282081-1					

WIRE NO	WIRE COLOR	WIRE SIZE	FROM	CONNECTION	TO
1A	RY	AVSSO. 75sq	CN-105F	—————	CN4-1
1B	RY	AVSSO. 75sq	CN-105F	—————	CN4-1
2A	WY	AVSSO. 75sq	CN4-2	—————	CN-30F
2C	WY	AVSSO. 75sq	CN-42F	—————	CN-30F
2E	WY	AVSSO. 75sq	CN-43F	—————	CN-30F
2F	WY	AVSSO. 75sq	CN-164F	DOUBLE SPLICE	CN-30F
2G	WY	AVSSO. 75sq	CN-164F	—————	CN-176F
3A	L	AVSS1. 25sq	CN-105F	—————	CN4-1
3B	L	AVSS1. 25sq	CN-106F	—————	CN4-1
10	YG	AVSSO. 75sq	CN-105F	—————	CN4-1
11A	YB	AVSSO. 75sq	CN-30F	—————	CN4-1
11B	YB	AVSSO. 75sq	CN-30F	—————	CN-205F
11C	YB	AVSSO. 75sq	CN-30F	—————	CN-205F
29	Gr	AVSS1. 25sq	CN4-1	—————	CN-74F
32	LR	AVSS1. 25sq	CN-50F	—————	CN4-2
33	W	AEX5sq	CN-182F	—————	P-8
34	W	AEX30sq	P-3	—————	P-6
35	W	AEX20sq	P-1	—————	T-1
40	R	AEX20sq	T-2	—————	P-28
41	Y	AV8sq	T-4	—————	P-29
51	W	AVS8sq	CN-257M	—————	CN1
52	R	AVS8sq	CN-258M	—————	CN1
53	Y	AVS8sq	CN-257M	—————	CN1
59	W	AVSSO. 75sq	CN-256F	—————	CN4-1
60	WL	AVSSO. 75sq	CN-185F	—————	CN-186M
62A	W	AVSS1. 25sq	CN-30F	—————	CN5
62B	W	AEX1. 25sq	CN-30F	—————	CN-201F
62C	W	AVSSO. 75sq	CN-30F	—————	CN-44F
63A	WY	AVSSO. 75sq	CN-216F	DOUBLE SPLICE	CN-186M
63B	WY	AVSSO. 75sq	CN-216F	—————	CN-41F
64A	LW	AVSSO. 75sq	CN-216F	DOUBLE SPLICE	CN4-2
64B	LW	AVSSO. 75sq	CN-216F	—————	CN-41F
68	YR	AEX0. 75sq	CN-205F	—————	CN4-2
69A	L	AV5sq	P-25	—————	P-27
69B	L	AV8sq	P-26	—————	T-3
70A	W	AVS2sq	CN-161F	DOUBLE SPLICE	P-4
70B	W	AVS2sq	CN-162F	—————	P-4
70C	W	AVSS1. 25sq	CN-173F	—————	P-5
71A	GrG	AVSSO. 75sq	CN-163F	DOUBLE SPLICE	CN-164F
71B	GrG	AVSSO. 75sq	CN-30F	—————	CN-164F
71C	GrG	AVSSO. 75sq	CN-30F	—————	CN-40F
71D	GrG	AVSSO. 75sq	CN-30F	—————	CN-42F
83A	GO	AVSS1. 25sq	CN-155F	DOUBLE SPLICE	CN4-2
83B	GO	AVSS1. 25sq	CN-155F	—————	CN-153F
85A	WB	AVSS1. 25sq	CN-110F	DOUBLE SPLICE	CN4-2
85B	WB	AVSSO. 75sq	CN-110F	—————	CN-128F
86	OW	AVSSO. 75sq	CN-116F	—————	CN4-1
88	PG	AVSSO. 75sq	CN-138F	—————	CN4-1
150	BP	AVSSO. 75sq	CN-133F	—————	CN4-1
155	BR	AEX0. 75sq	CN-133F	—————	F-22
216	O	AVSSO. 75sq	CN-35F	—————	CN4-2
218	P	AVSSO. 75sq	CN-35F	—————	CN4-1
225	G	AVSSO. 75sq	CN4-1	—————	CN-35F
227	PL	AVSSO. 75sq	CN4-2	—————	CN-35F

WIRE NO	WIRE COLOR	WIRE SIZE	FROM	CONNECTION	TO
401A	GR	AVSSO. 75sq	CN-157F	—————	CN-33F
401B	GR	AVSSO. 75sq	CN-145F	—————	CN-33F
401C	GR	AVSSO. 75sq	CN-74F	—————	CN-33F
402A	YG	AVSSO. 75sq	CN-157F	—————	CN-33F
402B	YG	AVSSO. 75sq	CN-145F	—————	CN-33F
402C	YG	AVSSO. 75sq	CN-74F	—————	CN-33F
403A	Br	AVSSO. 75sq	CN-157F	—————	CN-33F
403B	Br	AVSSO. 75sq	CN-145F	—————	CN-33F
403C	Br	AVSSO. 75sq	CN-74F	—————	CN-33F
507	VG	AVSSO. 75sq	CN-169F	—————	CN-103F
510	LoY	AVSSO. 75sq	CN-704F	—————	CN-104F
515	V	AEX0. 75sq	CN-139F	—————	CN-103F
516	L	AEX0. 75sq	CN-140F	—————	CN-103F
520	L	AVSSO. 75sq	CN-181F	—————	CN-104F
544	GB	AVSSO. 75sq	CN-134F	—————	CN-104F
548	GY	AVSSO. 75sq	CN-23F	—————	CN-107F
549	Lo	AVSSO. 75sq	CN-190F	—————	CN-107F
550	BL	AEX0. 75sq	CN-106F	—————	CN-175F
551	GL	AVSSO. 75sq	CN-132F	—————	CN-107F
554	L	AVSSO. 75sq	CN-175F	—————	CN-106F
562	LO	AEX0. 75sq	CN-208F	—————	CN-107F
564	LY	AVSSO. 75sq	P-7	—————	CN-107F
570	YB	AVSSO. 75sq	CN4-2	—————	CN-572M
571	YB	AVSSO. 75sq	CN-571F	—————	CN-107F
580	W	PEXBS0. 5sq	CN-136F	—————	CN-106F
581	B	2	CN-136F	—————	CN-106F
581	Gr	2	CN-136F	—————	CN-106F
596	GB	AEX0. 75sq	CN-204F	—————	CN-107F
600	YR	AEX0. 75sq	CN-204F	—————	CN-104F
601	BrR	AVSSO. 75sq	CN-152F	—————	CN-104F
620	YB	AVSSO. 75sq	CN-165F	—————	CN-186M
621	Sb	AVSSO. 75sq	CN-40F	—————	CN-107F
700	WG	AVSSO. 75sq	CN-256F	—————	CN4-2
701	V	AVSSO. 75sq	CN-105F	—————	CN-186M
702	LoB	AVSSO. 75sq	CN-122F	—————	CN-105F
703	P	AVSSO. 75sq	CN-117F	—————	CN-105F
705	RL	AVSSO. 75sq	CN-251F	—————	CN-105F
713	BrY	AVSSO. 75sq	CN-74F	—————	CN-513M
715	GW	AVSSO. 75sq	CN-74F	—————	CN-186M
716	WV	AVSSO. 75sq	CN-74F	—————	CN-186M
720	PB	AVSSO. 75sq	CN-123F	—————	CN-186M
740	BO	AVSSO. 75sq	CN-118F	—————	CN-105F
741	GrR	AVSSO. 75sq	CN-118F	—————	CN-105F
742	VR	AVSSO. 75sq	CN-119F	—————	CN-105F
743	GrB	AVSSO. 75sq	CN-119F	—————	CN-105F
744	BP	AVSSO. 75sq	CN-120F	—————	CN-105F
745	PW	AVSSO. 75sq	CN-120F	—————	CN-105F
746	BrG	AVSSO. 75sq	CN-121F	—————	CN-105F
747	YV	AVSSO. 75sq	CN-121F	—————	CN-105F
748	V	AEX0. 75sq	CN-141F	—————	CN-105F
749	Lo	AEX0. 75sq	CN-141F	—————	CN-105F
750	W	AEX0. 75sq	CN-142F	—————	CN-105F

WIRE NO	WIRE COLOR	WIRE SIZE	FROM	CONNECTION	TO
751	Sb	AEX0. 75sq	CN-142F	DOUBLE SPLICE	CN-105F
754	G	AVSSO. 75sq	CN-105F	—————	CN-148F
755	Sb	AVSSO. 75sq	CN-105F	—————	CN-148F
760	R	AVSSO. 75sq	CN-183F	—————	CN-106F
761	Gr	AVSSO. 75sq	CN-183F	—————	CN-106F
771	G	MVVS0. 75sq	CN-135F	—————	CN-106F
772	B	4	CN-135F	—————	CN-106F
773	R	4	CN-135F	—————	CN-106F
774	W	4	CN-135F	—————	

23. ELECTRIC SYSTEM

23.3.8-1 CAB HARNESS (2/2) : YN14E01100P3

WIRE NO	WIRE COLOR	WIRE SIZE	FROM	CONNECTION	TO
7	YL	AVSS0.75sq	F-61	—————	CN-72F
11	YB	AVSS0.75sq	CN-54F	—————	CN-72F
13	YB	AVS0.5sq	CN-600F	—————	CN-72F
18	RG	AVSS0.75sq	CN-500F	—————	CN-72F
19	W	AVS0.5sq	CN-600F	—————	CN-72F
25	WG	AVSS1.25sq	CN-500F	—————	CN-72F
26	RL	AVSS0.75sq	CN-500F	—————	CN-71F
65	WR	AVSS0.75sq	CN-607F	—————	CN-72F
80	GrR	AVSS0.75sq	CN-604F	—————	CN-72F
81	GrB	AVSS0.75sq	CN-604F	—————	CN-72F
85	WB	AVSS0.75sq	CN-500F	—————	CN-72F
89	BrL	AVSS0.75sq	CN-501F	—————	CN-71F
90A	RY	AVSS1.25sq	F-1	DOUBLE SPLICE	CN-72F
90B	RY	AVSS1.25sq	F-1	DOUBLE SPLICE	F-3
90C	RY	AVSS0.75sq	F-4	—————	F-3
92	RW	AVSS1.25sq	F-2	—————	CN-72F
96	WG	AVSS0.75sq	CN-62F	—————	CN-71F
98	LW	AVSS0.75sq	CN-25F	—————	CN-71F
99	Br	AVSS0.75sq	CN-25F	—————	CN-71F
100	LR	AVSS0.75sq	CN-24F	—————	CN-71F
101	OB	AVSS0.75sq	CN-24F	—————	CN-71F
150	BP	AVSS0.75sq	CN-500F	—————	CN-72F
557	L	AVSS0.75sq	CN-604F	—————	CN-71F
558	G	AVSS0.75sq	CN-604F	—————	CN-71F
559	PB	AVSS0.75sq	CN-60F	—————	CN-71F
564	LY	AVSS0.75sq	CN-504F	—————	CN-71F
713A	BrY	AVSS0.75sq	CN-510F	DOUBLE SPLICE	CN-72F
713B	BrY	AVSS0.75sq	CN-510F	—————	CN-71F
582	W	MVVS0.5sq	CN-600F	—————	CN-71F
770	R		CN-600F	—————	CN-71F
980	B		CN-600F	—————	CN-71F
SH	Gr		UN-CONNECTED	✗	CN-71F

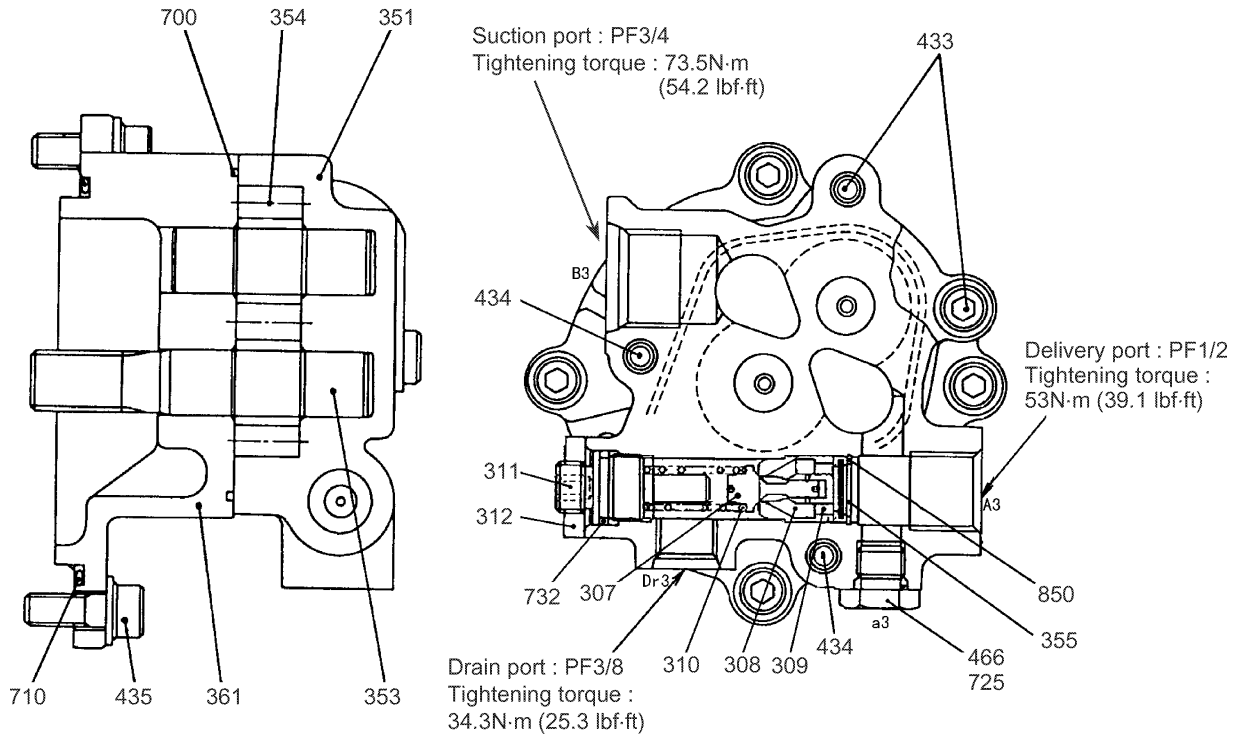
WIRE NO	WIRE COLOR	WIRE SIZE	FROM	CONNECTION	TO
E1	B	AVS0.5sq	CN-600F	—————	CN-605F
E2	B	AVSS0.75sq	CN-501F	—————	CN-605F
E3	B	AVSS0.75sq	CN-504F	—————	CN-605F
E4	B	AVSS1.25sq	CN-500F	—————	CN-605F
E6	B	AVS5sq	P-2	DOUBLE SPLICE	CN-515M
E5	B	AVSS1.25sq	P-2	—————	CN-605F
E14	B	AVSS1.25sq	M-1	DOUBLE SPLICE	CN-605F
E15	B	AVSS0.75sq	M-1	—————	M-2
E7	B	AVSS0.75sq	CN-510F	—————	CN-605F
E20	B	AVSS1.25sq	M-3	DOUBLE SPLICE	CN-605F
E21	B	AVSS0.75sq	M-3	—————	M-4
E8	B	AVSS1.25sq	CN-605F	—————	CN-605F
E9	B	AVSS0.75sq	CN-605F	—————	CN-60F
E10	B	AVSS0.75sq	CN-605F	—————	CN-608F
E11	B	AVSS0.75sq	CN-605F	—————	CN-604F
E12	B	AVSS0.75sq	CN-605F	—————	CN-606F
E13	B	AVSS0.75sq	CN-605F	—————	CN-61F

CONNECTORS SELECTION TABLE

CONNECTOR NAME (PIN NUM.)	MANUFUC.	(PART. NUMBER)					
		HOUSING	TERMINAL	HARNESS SEAL	RETAINER LOCK PLATE	SEALING PLUG	CLIP
1FA-CNA	AMP	172128-1	170032-2				
2FA-CNA	AMP	172130-1	170032-2				
3FA-CNA	AMP	172132-1	170032-2				
6FA-CNA	AMP	171898-1	170032-2				
8FA-040MLI	AMP	174044-2	173681-2				
20FS-HM090S (Gr)	SUMITOMO	6400-0081 6409-0255	8240-4422				
CA104	AMP	170887-1	170002-5				
CB104	AMP	170889-1	170003-5				
1FA-POL	AMP	171809-2	170233-1				
6FY-58M	YAZAKI	7123-6060	7116-2871				
1FA-205	AMP	4-170823-1	170179-1				
1FA-HSG	AMP	1-480416-0	170213-2				
1MY-301	YAZAKI	7122-3010	7114-3030				
14FA-070MLI	AMP	173852-1	173631-1 173631-2				
20FA-070MLI	AMP	174952-1	173631-1 173631-2				
3FA-CNA (G)	AMP	172132-4	170032-2				
3FA-CNA (L)	AMP	172132-5	170032-2				

24. COMPONENTS SYSTEM

(2) Gear pump (For pilot)



No.	Parts	Q'ty	No.	Parts	Q'ty
307	Poppet	1	361	Front case	1
308	Seat	1	433	Flange socket; M8× 40	2
309	Ring	1	434	Flange socket; M8× 55	2
310	Spring	1	435	Flange socket; M8× 20	4
311	Adjust screw	1	466	VP plug ; PF1/4	1
312	Lock nut ; M14× 1.5	1	700	Ring	1
351	Gear case	1	710	O-ring ; 1B G95	1
353	Drive gear	1	725	O-ring ; 1B P11	1
354	Driven gear	1	732	O-ring ; 1B P16	1
355	Filter	1	850	Locking ring	1

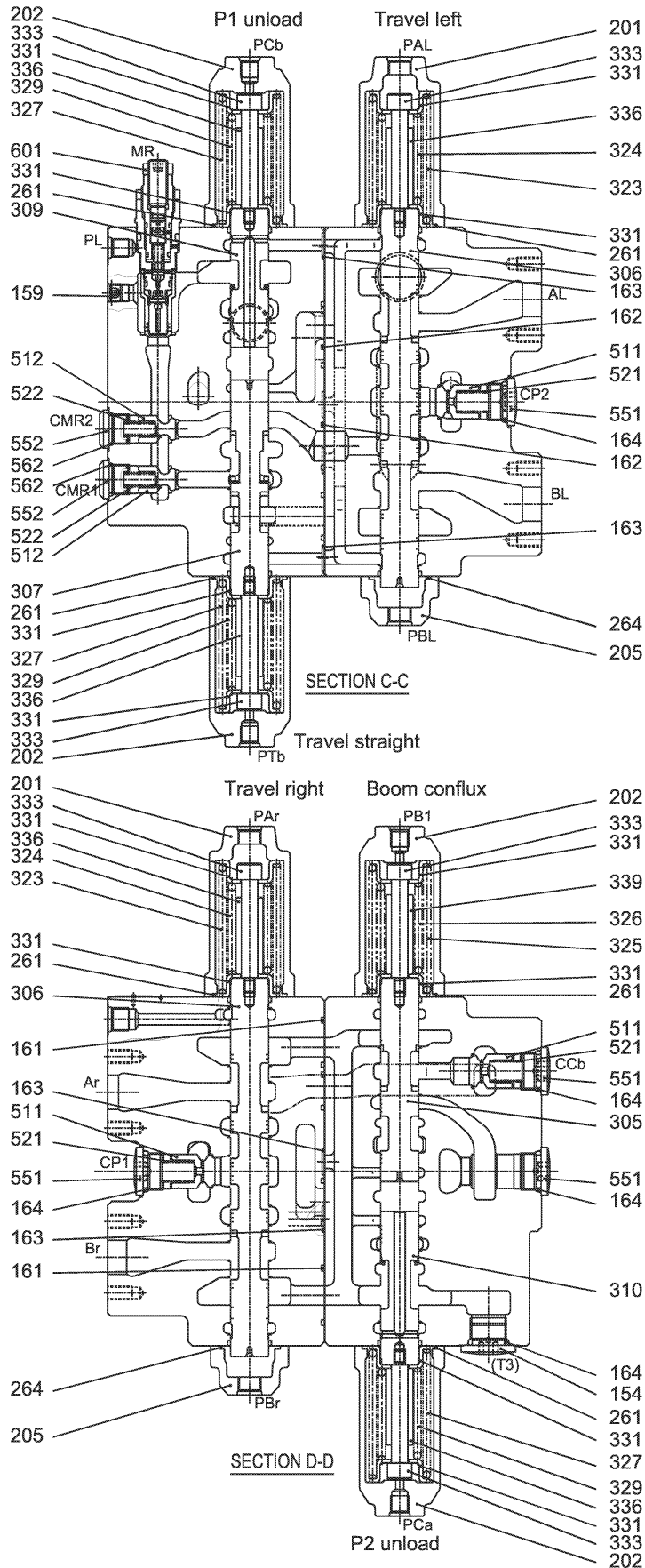


Fig. 24-25 Section (3/6)

24. COMPONENTS SYSTEM

(8) Swing shuttle valve cover (204)

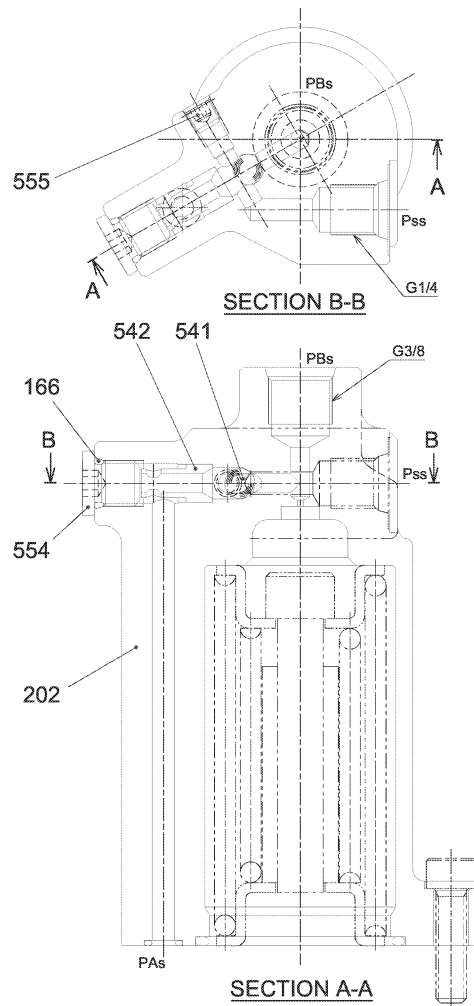


Fig. 24-35 Swing shuttle valve cover

Tightening torque N•m (lbf•ft)	No.	Parts	Q'ty	Tightening torque N•m (lbf•ft)	No.	Parts	Q'ty
	166	O-ring	1		542	Seat	1
	202	Cover	1	25~29 (18~21)	554	Plug	1
	541	Steel ball	1	7.9~9.8 (5.9~7.2)	555	Plug	1

3) In boom down operation:

When starting boom down operation, the pilot pressure enters port PBb and boom spool (301) moves to the left against the force of springs (321) (322). The secondary pressure of solenoid proportional valve [X1] acts on PCb and switches unloading spool (309). Simultaneously the spool of lock valve selector (211) is switched, and poppet (514) is released because the spring chamber of lock valve poppet CRb (514) is connected to the drain circuit.

The oil delivered by hydraulic pump P1 flows into parallel passage (53), and opens load check valve LCb (511). It then flows between the perimeter of boom spool (301) and casing through the U-shaped passage. It is then supplied to boom cylinder rod side (R) through port (Bb).

In the meantime, the return oil from boom cylinder head side (H) enters the control valve through port (Ab). Because the retention of lock valve poppet CRb (514) (which is located on this side of boom spool (301)) is released, the lock valve poppet (514) opens. The return oil enters BH chamber and passes between the perimeter of boom spool (301) and the casing. It then flows through low pressure circuit (D) and boost check valve (517), and returns to the hydraulic tank through tank port T1. A part of the return oil flows into the inside of boom spool (301) through circular notch of boom spool (301). Since the return oil contains sufficient pressure with the self weight of boom, arm, etc. the return oil passes through the inside passage of boom spool (301) and opens poppet (317) to the left as shown in the figure. It then flows through the circular notch, and supplies boom cylinder rod (R) side through port Bb. (Boom recirculation function)

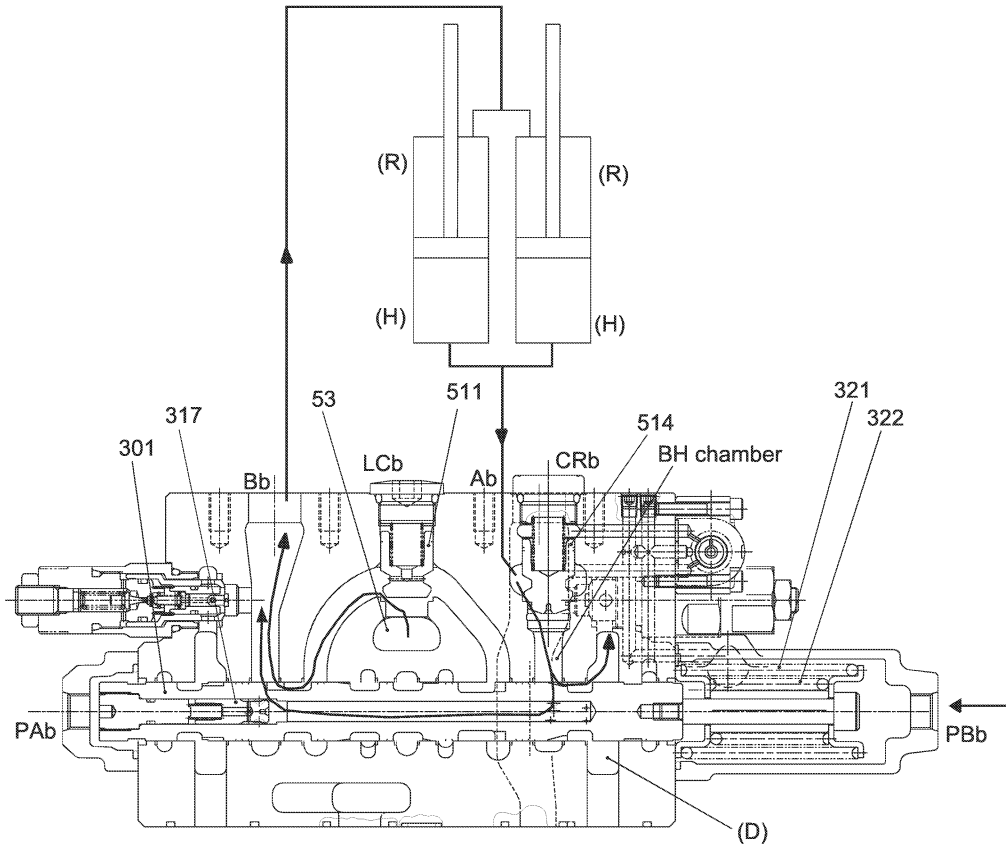


Fig. 24-45 In boom down operation

24. COMPONENTS SYSTEM

(10) Boost check valve, By-pass check valve

1) Boost check valve

The boost check valve is located between low pressure passage (D) and tank port T1 and generates boost pressure necessary for the low pressure passage.

a. In normal operation:

The hydraulic oil from low pressure passage (D) moves the boost check valve (517) upward against the force of spring (527), and returns to the hydraulic tank through tank port T1. At this time, the pressure generated by spring (527) is used as the boost pressure for the low pressure passage.

The return oil used for the arm out and bucket dumping operation does not pass through boost check valve (517), but returns from low pressure passage (D') to hydraulic tank through tank port T1.

b. In make up operation:

When supplying oil to make up the flow rate through low pressure passage (D), after the swing operation is suspended, the deficient hydraulic oil is made up from the hydraulic tank into low pressure passage (D). When the deficient hydraulic oil in low pressure passage (D) is not sufficient, the pressure in the low pressure passage (D) is lowered. If the pressure in the low pressure passage (D) is lowered to the pressure at tank port T1, poppet (102), housed in boost check valve (517), receives the pressure at tank port T1 into the receiving section in ring type, which is made up of guide diameter and seat diameter of poppet (102), is pushed upward and opens. The hydraulic oil flows from the hydraulic tank to low pressure passage (D) to make up the deficient flow rate.

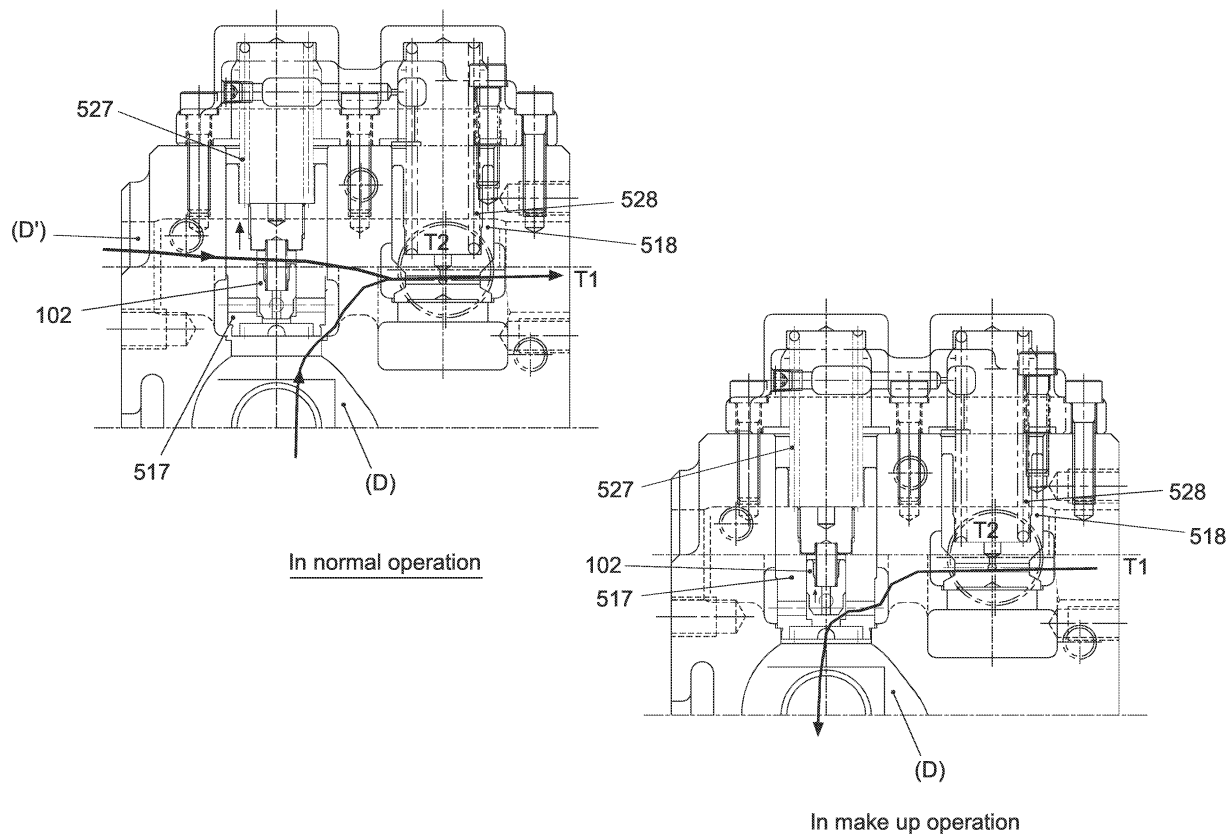


Fig. 24-55 Boost check valve operation

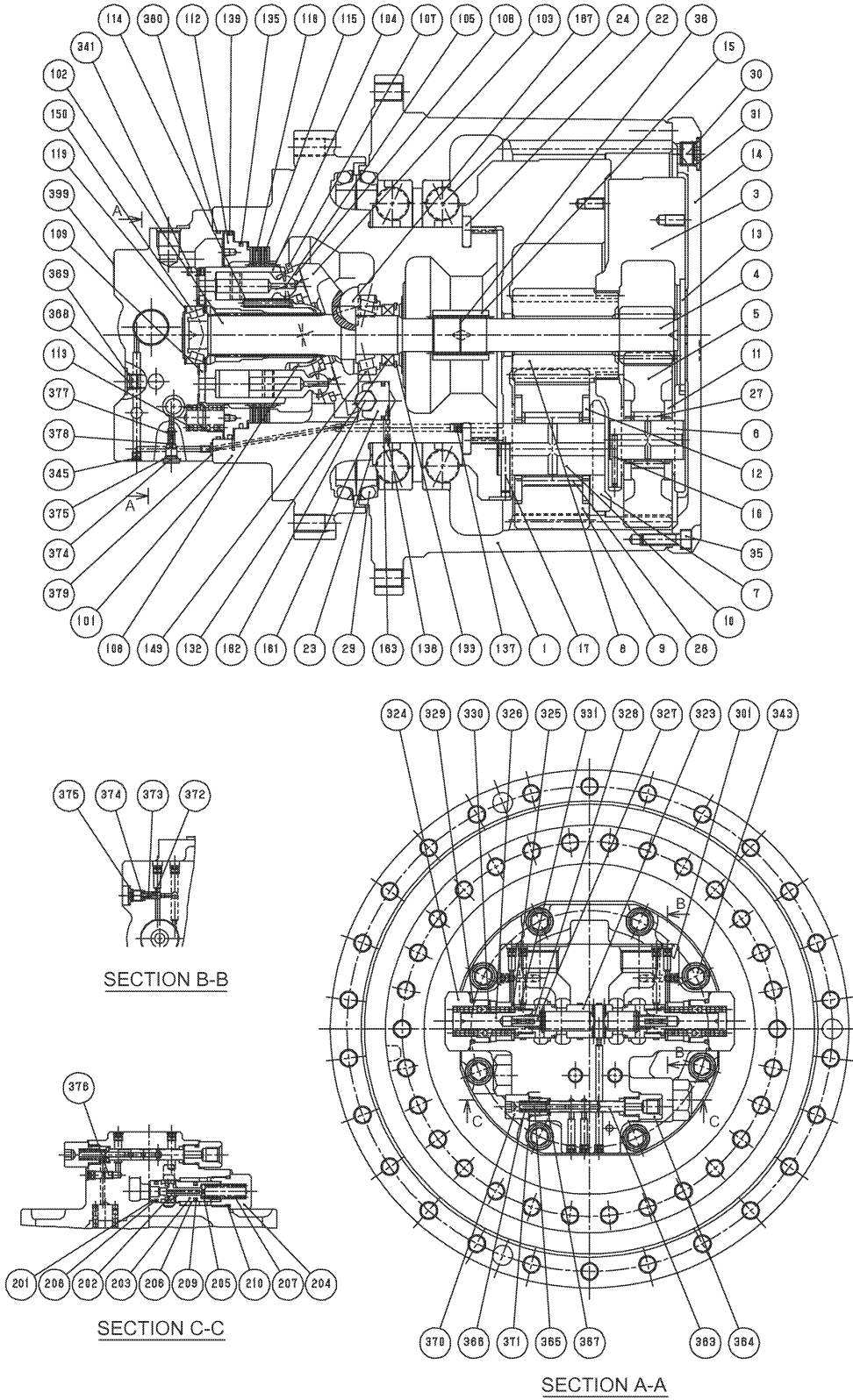
24. COMPONENTS SYSTEM

(2) Specifications

Swing motor unit part No.		YN15V00036F1	
Hydraulic motor	Type	M5X130CHB-10A-41C/295	
	Part No.	YN15V00035F1	
	Displacement	cm ³ (in ³)	129.2 (7.88)
	Working pressure	MPa (psi)	32.4 (4700)
	Max. flow	L/min (gal/min)	220 (58)
	Braking torque	N•m (lbf•ft)	655 (483)
	Release pressure	MPa (psi)	2.5~5.0 (362~725)
	Relief set pressure	MPa (psi)	29 (4205)
	Weight	kg (lbs)	49 (108)
Anti-reaction valve block	Type	2KAR6P72/240-712	
	Weight	kg (lbs)	2.5 (5.5)
Hydraulic motor assy weight		kg (lbs)	51.5 (114)
Reduction unit	Part No.	YN32W00019F1	
	Speed reduction type	Planetary 2-stage	
	Reduction ratio	15.38	
	Lubricate oil	Gear oil SAE90 (API class GL-4 grade)	
	Lubricate oil volume	L (gal)	3 (0.8)
	Grease	Extreme pressure lithum base #2 grease	
	Grease volume	kg (lbs)	Approx. 1 (2.2)
	Weight	kg (lbs)	145 (320)
Total weight		kg (lbs)	Approx. 197 (434)

24. COMPONENTS SYSTEM

24.1.6.2 CONSTRUCTION

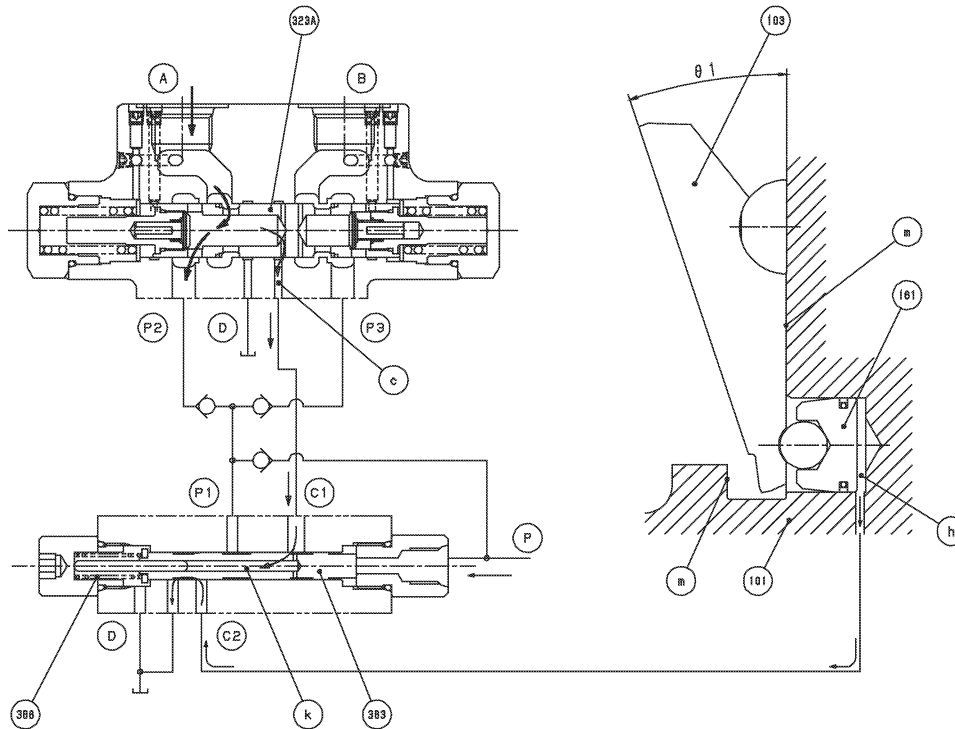


24. COMPONENTS SYSTEM

c. Auto high to low speed change.

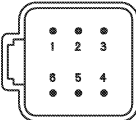
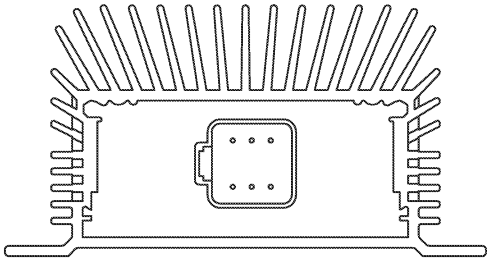
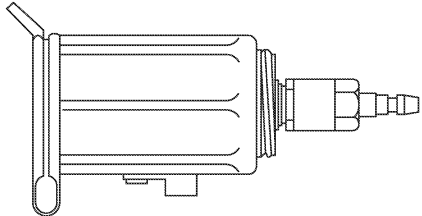
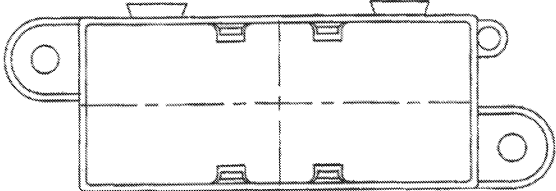
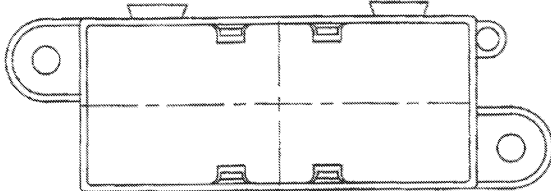
As the load increases during high speed operation, the hydraulic pressure at port A (or port B) increases. The spool slides right when the pressure in combination of the force of spring (366) and the pressure in chamber (k) inside of spool (363) overcomes the pressure at port P. Hydraulic oil in chamber (h) which has pushed the swash plate to face m is fed into drain port D through spool (363). At this time the swash plate strikes spindle face n and turns it to the maximum tilt angle θ_1 . The speed changes to low speed operation.

When the load lessens and the hydraulic pressure at port A (or port B) lowers, cylinder capacity turns to the minimum and the high speed operation is resumed as described in item "b. In high speed operation".

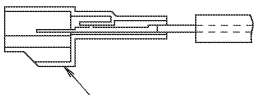
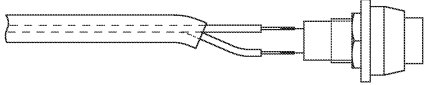

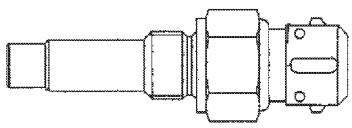
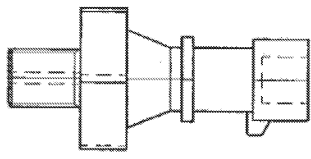
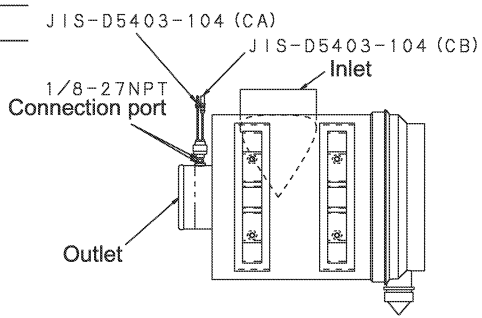


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24. COMPONENTS SYSTEM

File No. Name of part Part No. Use Applicable Machine	Specification	Description																				
E - 21 Heater Grid heater YQ11 - 06001 ~	ART NOT AVAILABLE																					
E - 22 Converter YN77S00017P1 DC24V to DC12V LC10 - 07001 ~ YC10 - 03501 ~	<table border="1" style="margin-bottom: 10px;"> <tr> <td>Input voltage</td> <td>DC 17~35V</td> </tr> <tr> <td>Output voltage</td> <td>DC 13.7V</td> </tr> <tr> <td>Output current</td> <td>8.4A</td> </tr> </table> <table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <th>PIN</th> <th>CONNECT</th> </tr> <tr> <td>1</td> <td>+24V INPUT VOLTAGE</td> </tr> <tr> <td>2</td> <td>IGNITION</td> </tr> <tr> <td>3</td> <td>GROUND</td> </tr> <tr> <td>4</td> <td>+12V MEMORY</td> </tr> <tr> <td>5</td> <td>+12V</td> </tr> <tr> <td>6</td> <td>GROUND</td> </tr> </table>  	Input voltage	DC 17~35V	Output voltage	DC 13.7V	Output current	8.4A	PIN	CONNECT	1	+24V INPUT VOLTAGE	2	IGNITION	3	GROUND	4	+12V MEMORY	5	+12V	6	GROUND	
Input voltage	DC 17~35V																					
Output voltage	DC 13.7V																					
Output current	8.4A																					
PIN	CONNECT																					
1	+24V INPUT VOLTAGE																					
2	IGNITION																					
3	GROUND																					
4	+12V MEMORY																					
5	+12V																					
6	GROUND																					
E - 23 Socket YN81S01002P1 Power scoker LC10 - 07001 ~ YC10 - 03501 ~	<table border="1" style="margin-bottom: 10px;"> <tr> <td>Power supply</td> <td>For 12V</td> </tr> <tr> <td>Maker</td> <td>TOKAI RICA CO., LTD</td> </tr> <tr> <td>Marker P. No.</td> <td>347-0385-00010</td> </tr> </table> 	Power supply	For 12V	Maker	TOKAI RICA CO., LTD	Marker P. No.	347-0385-00010															
Power supply	For 12V																					
Maker	TOKAI RICA CO., LTD																					
Marker P. No.	347-0385-00010																					
E - 24 Fuse assy YN73E00009F1 Mega fuse YQ11 - 06001 ~	FUSE CAPACITY: 150 AMP																					
E - 25 Fuse assy YN73E00021F1 Fuse Ink box YQ11 - 06001 ~	FUSE CAPACITY: 40 AMP																					

24. COMPONENTS SYSTEM

File No. Name of part Part No. Use Applicable Machine	Specification	Description										
SW - 5, 10, 20, 21 Switch YN03M01861F1 (Right grip) YN03M01862F1 (Left grip) Horn, ATT Power boost YN11 - 45001 ~ YQ11 - 06001 ~ LC10 - 07001 ~ YC10 - 03501 ~	<table border="1"> <tr> <td>Type</td> <td>Buried in left grip</td> </tr> <tr> <td>Switch assy</td> <td>YN50E00017P1</td> </tr> <tr> <td>Rating</td> <td>125V 3AAC</td> </tr> <tr> <td>Insuration resistance</td> <td>More than 100MΩ / DC500V megger</td> </tr> </table>   <p>Sumitomo wiring systems HOUSING : 6090-1031 (2P male) Sumitomo wiring systems TERMINAL : 8230-4282 Lead wire (Sumitomo wiring systems Robo top DP3)</p>	Type	Buried in left grip	Switch assy	YN50E00017P1	Rating	125V 3AAC	Insuration resistance	More than 100MΩ / DC500V megger	SW-10 : Buried in left grip Right and left switches are same.		
Type	Buried in left grip											
Switch assy	YN50E00017P1											
Rating	125V 3AAC											
Insuration resistance	More than 100MΩ / DC500V megger											
SW - 6 Switch PN E/G water temp. switch YQ11 - 06001 ~	<table border="1"> <thead> <tr> <th colspan="2">NTC CHARACTERISTIC</th> </tr> <tr> <th>TEMP. °C</th> <th>RESISTANCE (ohm)</th> </tr> </thead> <tbody> <tr> <td>25</td> <td>2252 +/- 10x</td> </tr> <tr> <td>60</td> <td>536 +/- 10x</td> </tr> <tr> <td>90</td> <td>195 +/- 10x</td> </tr> </tbody> </table>  	NTC CHARACTERISTIC		TEMP. °C	RESISTANCE (ohm)	25	2252 +/- 10x	60	536 +/- 10x	90	195 +/- 10x	
NTC CHARACTERISTIC												
TEMP. °C	RESISTANCE (ohm)											
25	2252 +/- 10x											
60	536 +/- 10x											
90	195 +/- 10x											
SW - 7 Switch E/G oil pressure switch YQ11 - 06001 ~	<table border="1"> <tr> <td>Type</td> <td>Normal close</td> </tr> <tr> <td>Working pressure</td> <td>75~105kPa (11~15psi)</td> </tr> <tr> <td>Rating</td> <td>DC 24V/12W</td> </tr> </table> 	Type	Normal close	Working pressure	75~105kPa (11~15psi)	Rating	DC 24V/12W					
Type	Normal close											
Working pressure	75~105kPa (11~15psi)											
Rating	DC 24V/12W											
SW - 8 Switch YR11P00008S005 Air cleaner Clogging switch YT02 - 04001 ~ YT03 - 05293 ~ YT04 - 07001 ~ YN11 - 45001 ~ YQ11 - 06001 ~ LC10 - 07001 ~ YC10 - 03501 ~	<table border="1"> <tr> <td>Maker's P/No.</td> <td>REX018171</td> </tr> <tr> <td>Air cleaner</td> <td>LC11P00018F1</td> </tr> </table>  <p>JIS-D5403-104 (CA) JIS-D5403-104 (CB) 1/8-27NPT Connection port Inlet Outlet</p>	Maker's P/No.	REX018171	Air cleaner	LC11P00018F1							
Maker's P/No.	REX018171											
Air cleaner	LC11P00018F1											

25. AIR-CONDITIONER SYSTEM

25.2.2 CONSTRUCTION

(1) Air conditioner unit

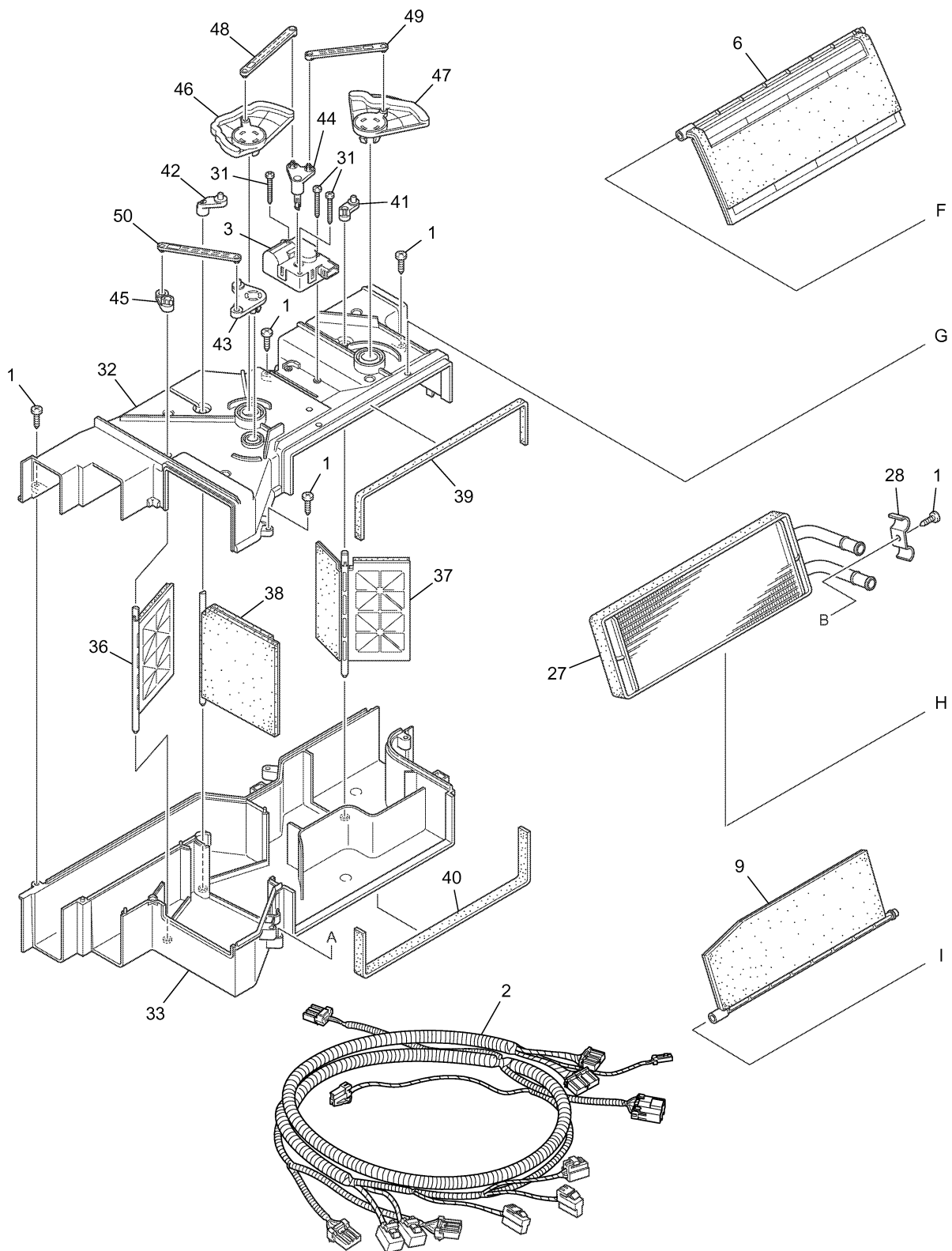


Fig. 25-2 Air conditioner unit (1/2)

25. AIR-CONDITIONER SYSTEM

Fig. 25-10 shows how the block type expansion valve is constructed. The temperature sensing is provided in the shaft of the expansion valve to directly detect the refrigerant temperature at the outlet of the evaporator.

The diaphragm contains R134a in a wet state. The pressure in the diaphragm changes according to the temperature detected by the sensor. The change in the pressure causes the force acting upon the diaphragm to vary accordingly.

The high-pressure high-temperature liquid refrigerant that is fed from the receiver side reduces the pressure abruptly as it passes through the valve (throttling action). When this happens, part of the refrigerant evaporates by the very heat of the refrigerant and cools off. The result is that low-pressure low-temperature damp refrigerant vapor is fed to the evaporator. The opening of the valve is determined by the equilibrium between the pressure (low) of the evaporator side, the action of the adjust spring and the pressing force of the diaphragm (the temperature of the refrigerant at the outlet of the evaporator to be sensed by the thermowell). The feed rate is controlled automatically so that under the pressure in the evaporator, the refrigerant is properly overheated (3~8 degrees C) and goes out of the evaporator. This action is carried out by sensing the refrigerant temperature at the outlet of the evaporator as compared to the inlet pressure of the evaporator and thusly controlling the feed rate of the refrigerant.

This means that if the refrigerant pressure drop in the evaporator is excessive, it would be difficult to control the overheating or the feed rate of the refrigerant. For this reason, it is best to have a small pressure drop in the evaporator. The expansion valve senses the pressure and the temperature at the outlet of the evaporator and controls the overheating of the refrigerant and the refrigerant supply to the evaporator. The air conditioner in this system uses a block type expansion valve.

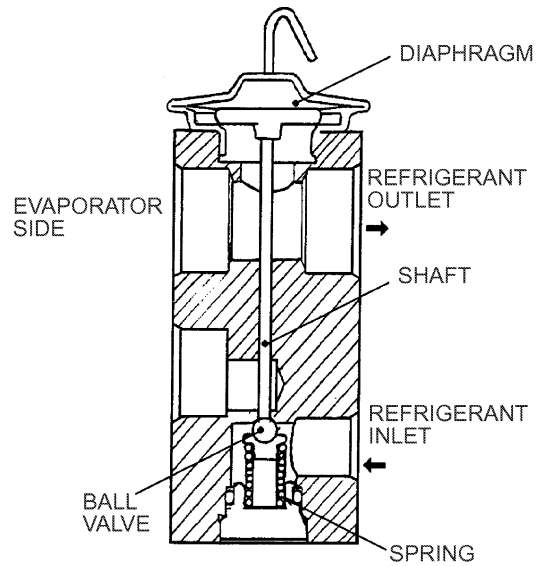


Fig. 25-10 Block type expansion valve

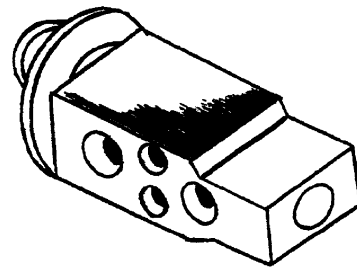


Fig. 25-11 Expansion valve outside view

25. AIR-CONDITIONER SYSTEM

25.6.3 CHARGING PROCEDURE

25.6.3.1 VACUUM MAKING OPERATION

(1) Connecting gauge manifold (See Fig. 25-25)

- 1) Close the high pressure valve (HI) and the low pressure valve (LO) of the gauge manifold.
- 2) Connect the charging hoses (red and blue) with the service valves of the compressor.

Red hose :

High pressure side (HI) of the gauge manifold—high pressure side (DIS) of compressor

Blue hose :

Low pressure side (LO) of gauge manifold—low pressure side (SUC) of compressor

CAUTION

- Do not mistake the high pressure hose for the low pressure hose in any circumstances when connecting them. Put the hose in firmly till a clicking sound is heard.

- 3) Connect the center valve of the gauge manifold with the charging hose of the vacuum pump.

CAUTION

Some kinds of gauge manifolds are not equipped with an open/close valve in the center.

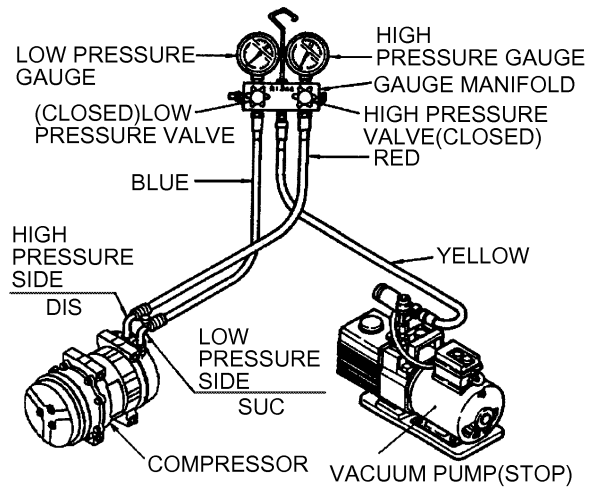


Fig. 25-25

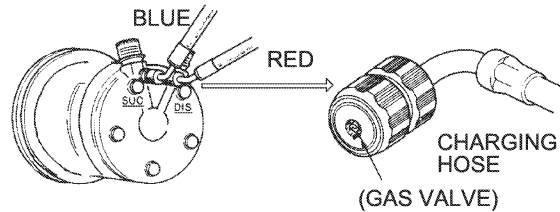


Fig. 25-26 Connecting gauge manifold

25. AIR-CONDITIONER SYSTEM

(5) Inner and outer air flow actuator.

The actuator for inner and outer air flow selection is installed on the blower intake unit. It opens and closes the inner and outer air damper through the link.

The actuator for the inner and outer air flow selection contains a position detection switch which is switched with the movement of shaft of the actuator.

When the inner and outer damper position is set by the inner and outer switch on the control panel, the control unit reads the signal of the position detection switch in the actuator and determines the rotation direction of the motor. Then as the motor rotates, the position detection switch also rotates and stops the motor at the control switch set position for the inner and outer air damper.

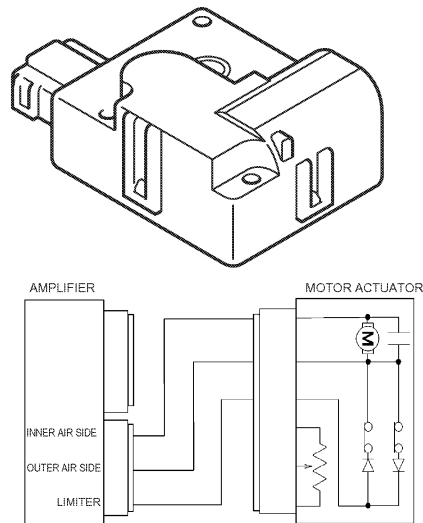


Fig. 25-38

(6) Evaporator sensor

This sensor is used to control the evaporator outlet temperature with the compressor ON-OFF to protect the evaporator from freezing, and this evaporator sensor functions as a sensor of this control.

- Evaporator sensor inspecting items
(Specification)
Terminal resistance :
at 0 degree C : 7.2 k Ω
at 25 degree C : 2.2k Ω

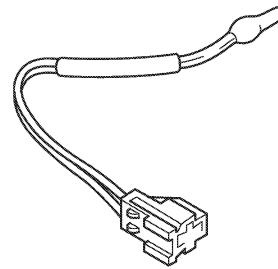


Fig. 25-39

(7) Dual pressure switch.

This dual pressure switch is attached to the L-hose and is used to turn OFF the compressor. It uses dual type control (for high and low pressure control) to protect the cooling cycle from possible failure at a time when abnormal pressure is generated on the high pressure side.

SPECIFICATION OF DUAL PRESSURE SWITCH

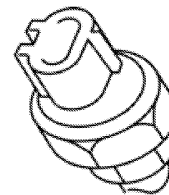
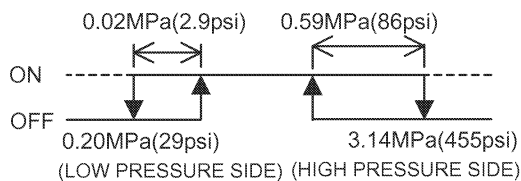


Fig. 25-40

(8) Solar radiation sensor.

The solar radiation sensor is used to input the solar radiation information to the auto air conditioner control unit. It detects the strength and solar orientation of sunshine transforming it into current by means of a photo diode.

Inspection : Check for the continuity between terminals.



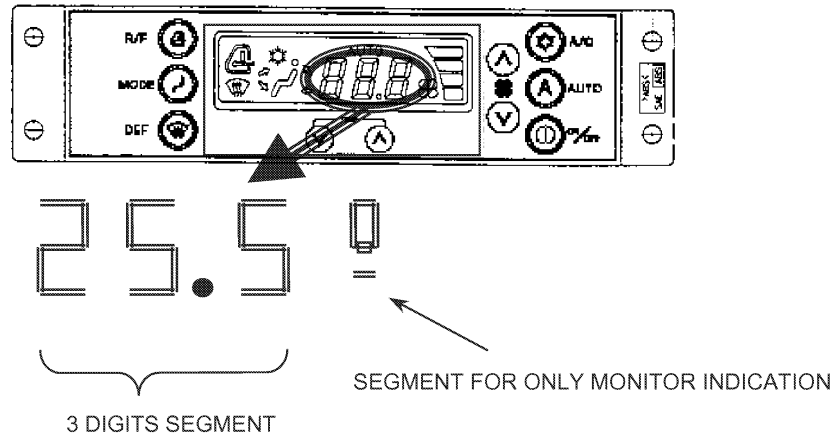
Fig. 25-41

25. AIR-CONDITIONER SYSTEM

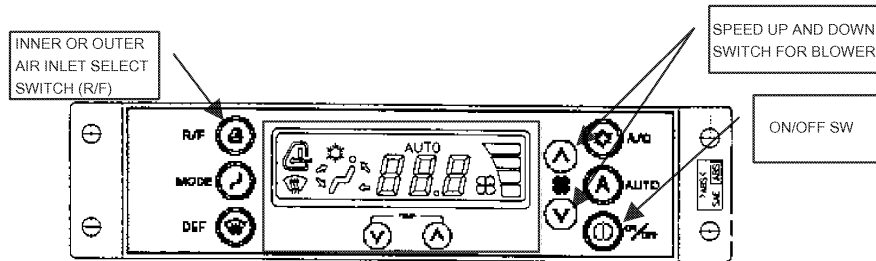
25.9.3 EXPLANATION OF MONITOR MODE

When error of 25.9.2 (2) sensors is displayed, the monitor mode is available to identify the sensor condition (disconnection, short circuit).

(1) Position of monitor mode indication



(2) Operation of monitor mode



- 1) Press inner and outer air flow select switch and ON/OFF switch simultaneously for 1 second.
- 2) Press AUTO switch.
(After all segments are lit on for 1 second, the mode is switched into monitor mode.)
- 3) Numbers from 0 to 9 or any letter of the alphabet from A to F are displayed on the 3rd and 2nd digit of the three digit segment. The 1st digit is indicated by "H".
- 4) Any digit indicated by one of figures 0 to 2 for the exclusive segment in three digits is selected by pressing UP or DOWN of blower switch, and the required sensor is selected from the list below.

SEGMENT ASSIGNMENT LIST	
0	INNER AIR SENSOR
1	EVAPORATOR SENSOR
2	SOLAR RADIATION SENSOR

(Excluding above mentioned indications, for example "from 3 to 9 and from B to F" are not used at service work.)

- 5) The monitor display is terminated by pressing the inner and outer air flow select switch (R/F) and ON/OFF switch for 1 second again, or turning off the main switch of excavator.

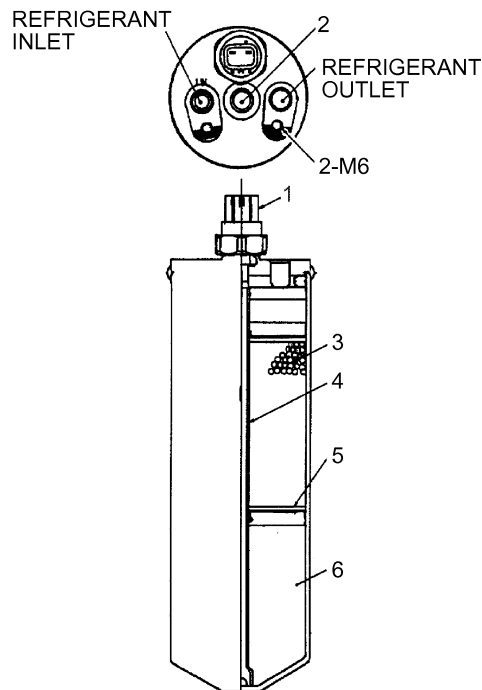
Notes)

1. The air conditioner is turned off while the monitor mode is in operation, and all switches are not available for operation and setting until the monitor mode is cancelled.
2. Even if each sensor is corrected while the monitor mode is in operation, the error display is memorized. Therefore turn on ON/OFF switch again, and the error display is disappeared.

25. AIR-CONDITIONER SYSTEM

No.	Parts	Q'ty	No.	Parts	Q'ty	No.	Parts	Q'ty
1	Screw M5× 16	23	19	Relay	2	40	KK-box lower packing	1
2	Main harness	1	20	Evaporator	1	41	Vent lever	1
3	MA air mix	3	21	Expansion valve	1	42	Face lever	1
4	Blower controller	1	22	O-ring	1	43	Foot joint lever	1
5	Upper casing	1	23	O-ring	1	44	MA mode lever	1
6	Air mix door	1	24	Screw M5×40	2	45	Foot lever	1
7	Air mix lever	1	25	Thermistor	1	46	Face lever cam	1
8	Lower casing	1	26	Thermistor holder	1	47	Vent lever cam	1
9	Air mix door sub	1	27	Heater core	1	48	Face rod	1
10	Air mix lever sub	1	28	Pipe holder	1	49	Vent rod	1
11	Blower	1	29	Thermistor	1	50	Foot rod	1
12	Lever MA air mix	1	31	Screw M4×30	9	52	Inner air filter	1
13	Intake door	1	32	Upper casing	1	55	Screw M6×25	10
14	MA intake lever	1	33	Lower casing	1	56	Screw M8×25	10
15	Intake lever	1	36	Foot door	1	59	Evaporator packing	1
16	Intake rod	1	37	Vent door	1	60	Casing packing A	1
17	Air mix rod	1	38	Face door	1	61	Casing packing B	1
18	Air mix rod sub	1	39	KK box upper packing	1			

(2) Receiver dryer



No	NAME	Q'TY
1	PRESSURE SWITCH	1
2	SIGHT GLASS	1
3	DESICCANT	1
4	SUCTION PIPE	1
5	FILTER	1
6	RECEIVER TANK	1

Fig. 25-4 Receiver dryer

25. AIR-CONDITIONER SYSTEM

(5) Receiver dryer (See Fig. 25-14.)

1) Receiver Tank

During operation, the revolution of the compressor varies greatly which causes the flow of refrigerant in the cooling circuit to vary. It is the receiver tank that accepts the variations. When the cooling circuit does not need much refrigerant, the receiver tank stores extra refrigerant temporarily and supplies it when the cooling circuit needs more refrigerant. The receiver tank also stores an extra amount of refrigerant to be used for filling balance and supplement small amounts of leakage of refrigerant through penetration of rubber hoses.

2) Dryer

If water is present in the cooling circuit, it deteriorates the compressor valves and oil, corrodes the metallic parts of the circuit or clogs the circuit as the water freezes in the expansion valve. It is desirable that the amount of water in the refrigerant should be held below a concentration of 30ppm. The air conditioner uses a molecular sieve as a desiccant in order to absorb water content that intrudes into the circuit when the dryer is installed or when refrigerant is charged.

3) Sight Glass

This is a inspection window with which the refrigerant level in the circuit is checked. It is the only means of confirming the inside of the circuit visually.

4) Filter

5) Pressure Switch

The system employs pressure switches of high/ low pressure type.

The pressure switch protects the circuit by cutting off the power supply to the compressor when high pressure increases to more than 3.14MPa (460psi).

The pressure switch also detects refrigerant leakage by cutting the power supply to the compressor when the pressure in the circuit falls below 0.2MPa (28psi).

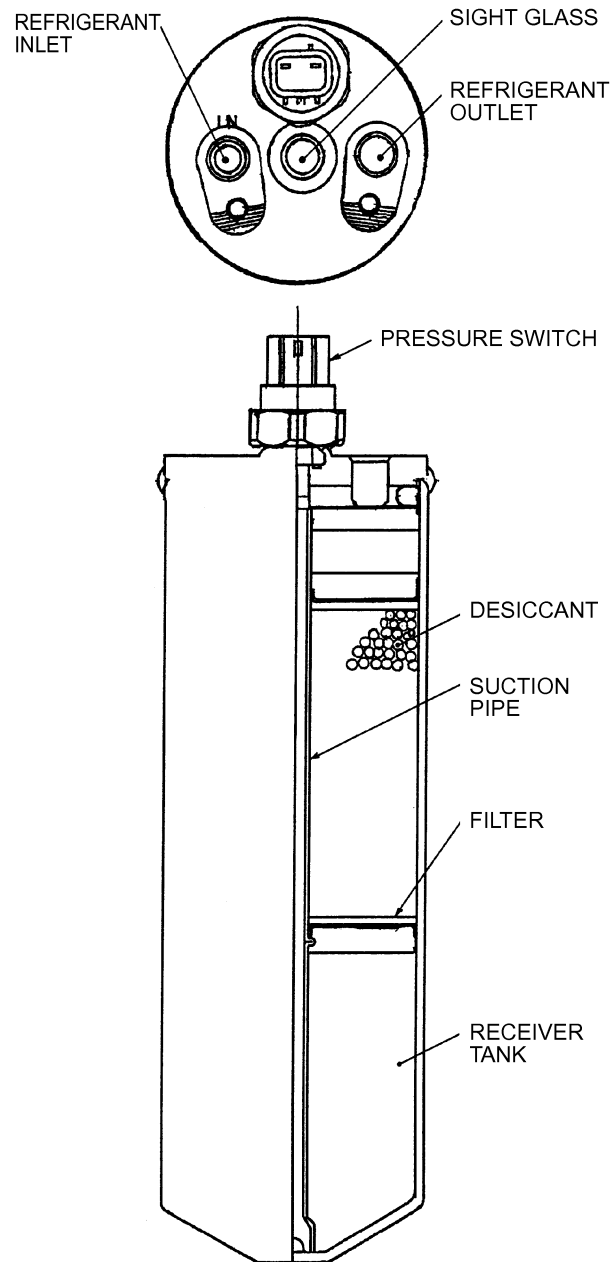


Fig. 25-14

25. AIR-CONDITIONER SYSTEM

25.6.3.2 GAS CHARGING OPERATION

(1) Charging from high pressure side (See Fig. 25-28.)

1) After following the vacuum operation, change the charging hose (yellow) on the gauge manifold from the vacuum pump to the refrigerant can.

2) Air purge

Open the refrigerant can valve. (Be sure the high and low pressure valves of the gauge manifold are closed.) Using a screw driver, push the gas valve on the side service port on the low pressure side of the manifold to release the air in the charging hose with the pressure of the refrigerant. (See Fig. 25-28.) (Stop releasing when a hissing sound is heard.)

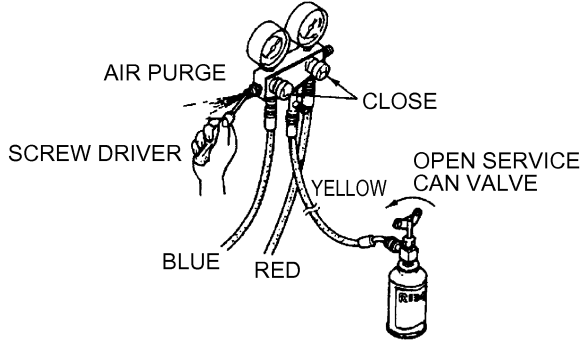


Fig. 25-28 Gas charging operation

3) Open the high pressure valve of the gauge manifold and charge in refrigerant. [Charge in gaseous refrigerant to a gauge pressure of 0.1MPa (14psi).]

After charging, close the high pressure valve of the gauge manifold and the service and valve. (See Fig. 25-29.)

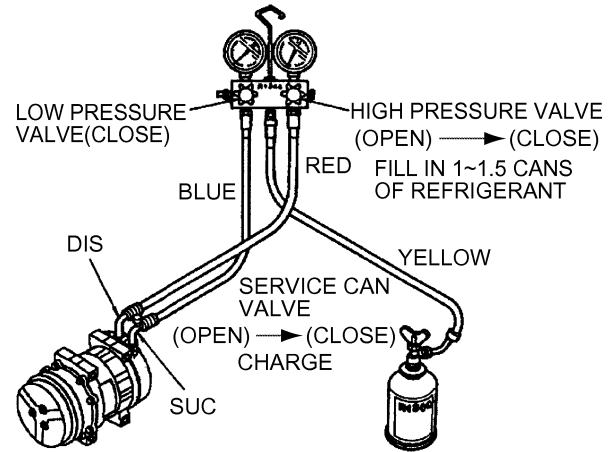


Fig. 25-29 Gas charging operation (High pressure side)

WARNING

- Do not run the compressor during this process, (Otherwise the refrigerant flow in reverse direction which causes the service can and the hoses to rupture. This is very dangerous.)

(2) Checking for gas leak.

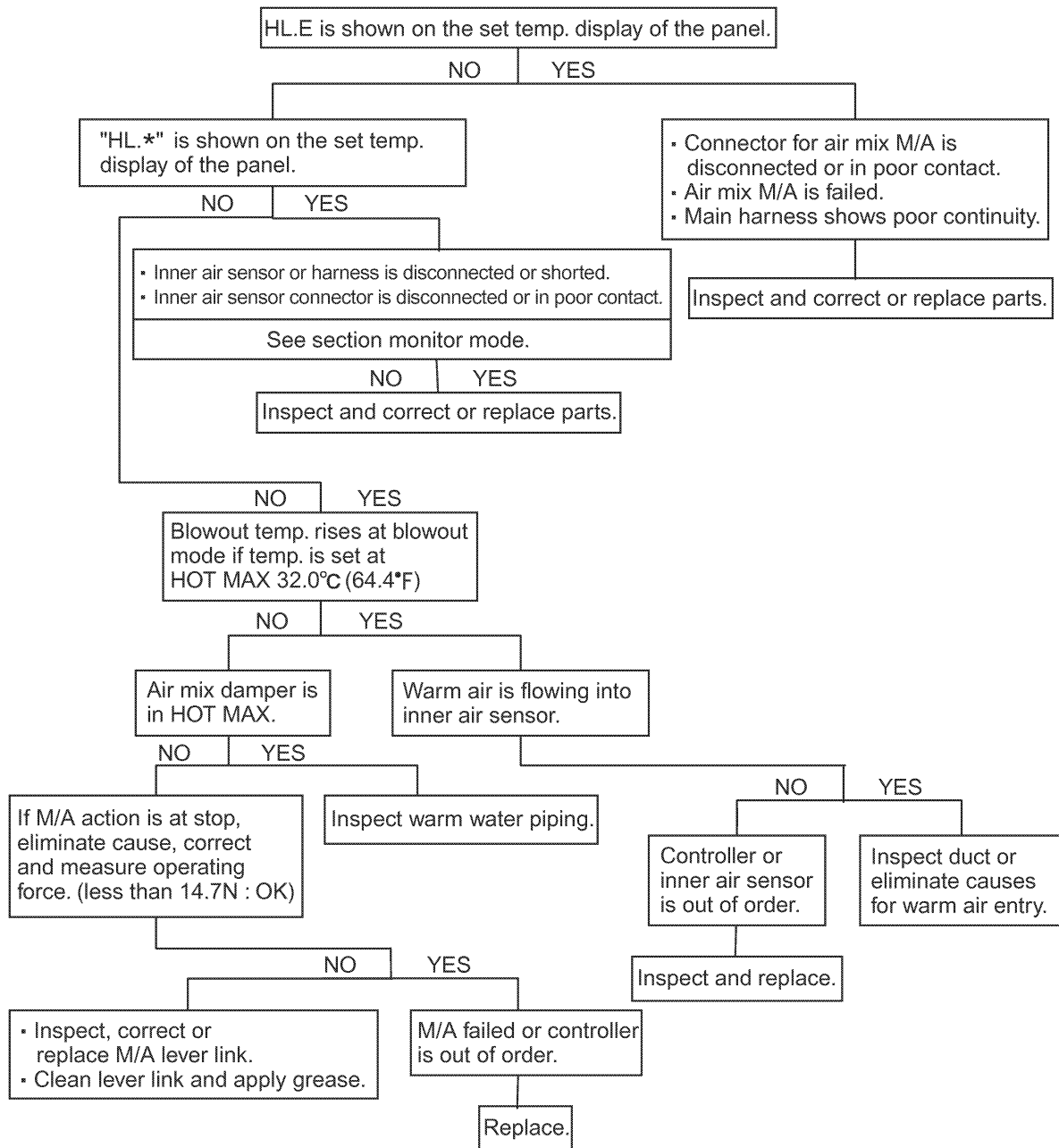
Check for any gas leaks in the system using a gas leak detector (electric type). Tighten and correct any leaking points.

CAUTION

- Always use the leak tester for R134a. (Do not use one for flon gas service as it provides poor sensitivity.)

Air temperature does not rise.

Note : * is any of the numbers 0 ~ 9.



[MEMO]

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32. ATTACHMENT

Issue	Date of Issue	Applicable Machines	Remarks
First edition	January, 2007	E215B : YQ11-06001~	5-4700

PREFACE


- (1) This section describes the procedures for removal to installation, arranged by component.
- (2) This section consists of 2 parts. "Removing and Installing", and "Disassembling and Assembling".
- (3) The removing and installing can be performed in the procedure specified in Table of Contents, but in view of actual repairing or time saving some process can be ignored.
- (4) The removing and installing procedure does not completely cover all possible situations because of differences of field condition and faulty component.
- (5) Be aware that the procedure to be followed must be determined according to the above conditions.
When disassembly and assembly are required, select the required part of the section, read the instructions, then begin working.

32. ATTACHMENT


(11) Removing and installing boom cylinder

- 1) Release pressure from boom circuit and bleed air in hydraulic tank.
- 2) Sling boom cylinder (2) using nylon sling temporarily not to act the weight of cylinder upon the cylinder head.
- 3) Disconnect each two hoses (C2) and (C3). And plug their both ends.

Plug : TOOLS 11.5.2-(4) Plugs for ORS fitting

 : 27,32,36,41mm

- 2) Removing boom cylinder foot pin (B)
(See Fig. 32-23, Fig. 32-24)
Loosen nut (5), remove capscrews M16× 150 (3) and pull out pin (B).

 : 24mm

- 3) Boom cylinder (2) removal.
Use appropriate lifting equipment and remove the boom cylinder.
Weight of boom cylinder : 170 kg (375 lbs)
- 4) Remove another boom cylinder the same way.

32.1.4.3 ATTACHING BOOM

- (1) Attaching boom foot pin (A).
Insert boom foot pin (A) and install the boom assembly.
Attach it in the reverse procedure of removing, paying attention to the following:
 - 1) When aligning the pin holes, do not put your finger in the pin holes, align them visually.
 - 2) Check that the dust seals are not damaged.
Replace as necessary.
 - 3) When inserting the pin, apply grease to the shaft.
 - 4) Refer to paragraph 32.1.3.2 (page 32-8) about installing the jam nut.
 - 5) When installing boom and cylinder, check the clearance of mounting section in thrust direction, and decide the thickness of shim according to the maintenance standard.
Install plastic shim first, and insert iron shim into remaining gap.
Regarding the position of shim, refer to Fig. 32-20.

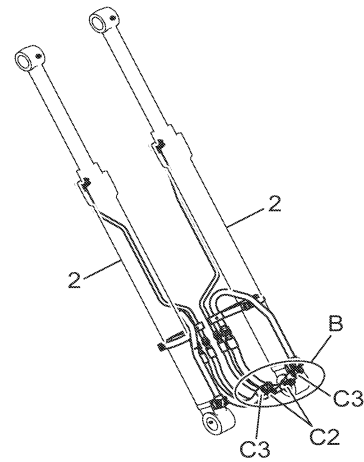


Fig. 32-22 Removing and installing boom cylinder

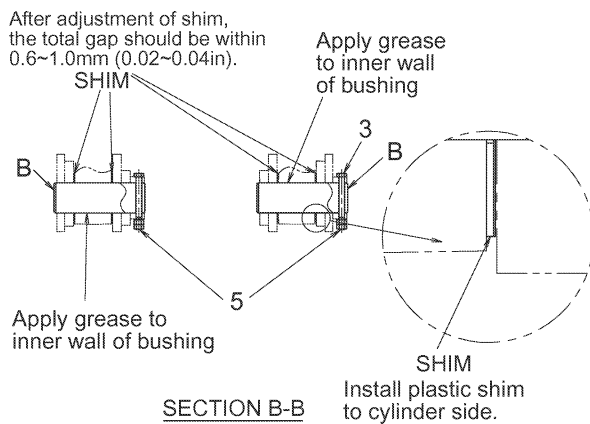


Fig. 32-23 Removing and installing boom cylinder head pin (B)

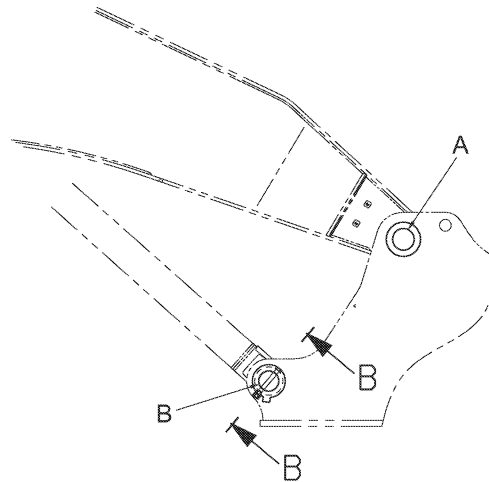


Fig. 32-24 Boom foot pin (A)

32. ATTACHMENT

32.2.1.5.2 ASSEMBLING OF PISTON ASSY

(1) The installation of the seal ring (16) requires a special tool as shown in Fig. 32-46. Seal ring (16) is pushed in with a press with the pushing in tool as shown. (The O-ring of seal ring (16) and back-up ring (17) on one side should be installed beforehand.)

CAUTION

Heat the rings to make them pliable. Never heat the rings over 100°C (212.0°F) or more.

(2) Install the back-up ring (17) on the remaining side. After installing, compress it immediately to prevent expansion of the seal ring (16) with correcting jig (H) as shown in Fig. 32-47.

CAUTION

- When installing the piston, stop installation (for 3 to 5 seconds), and then push it in fully.
- After fitting, wind tape around seal ring (16) 2 or 3 times, and remove it immediately before piston (15) is inserted in cylinder tube (1).
- Install slide rings (18) (19) at the same time when piston (15) is inserted in cylinder tube (1).

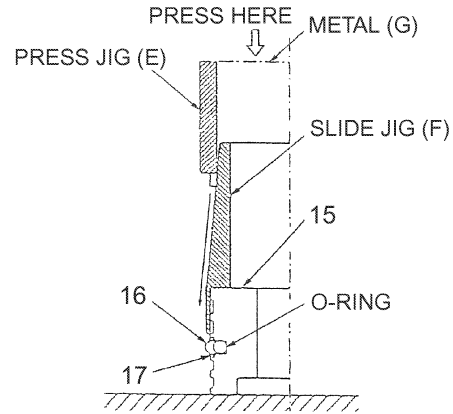


Fig. 32-46 How to fit seal ring (16)

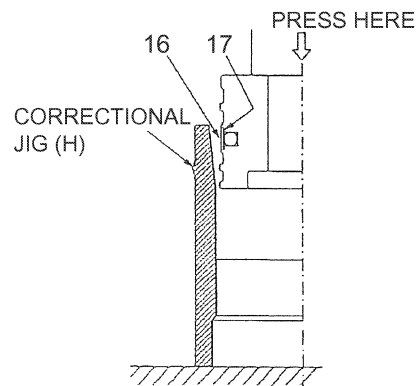


Fig. 32-47 Installing seal ring (16)

32.2.1.5.3 ASSEMBLING ROD COVER ASSY

(1) Press fit bushing (4) in rod cover (3) with bushing press-fitting jig (A). Install the snap ring (5) in the groove. Apply hydraulic oil on internal surface of rod cover (3).

CAUTION

The snap ring (5) can not be fitted when the bushing (4) is not press-fitted fully to the stop end.

(2) Apply grease to wiper ring (9), and install the wiper ring (9), with the lip side toward the groove of the retainer tool (D). Set the retainer tool (D) on rod cover (3) and install wiper ring (9) with press.

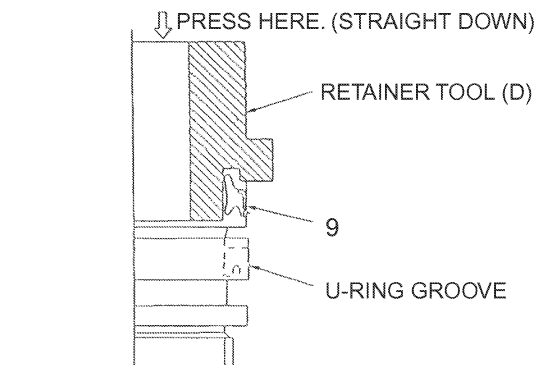
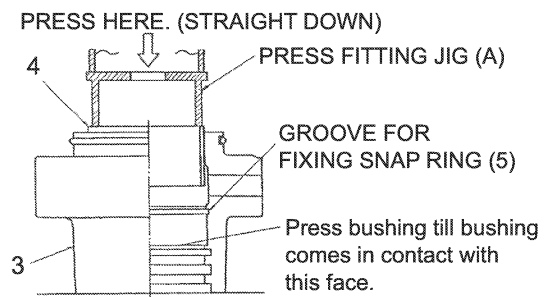


Fig. 32-48 Press fitting of bushing (4)

32. ATTACHMENT

Special Jig No. List

- (1) For jigs for rod cover, select jig corresponding to respective rod diameter.
- (2) For jigs for piston, select jig corresponding to the cylinder bore.

Table32-6

Jig for rod cover removing & installing	Application rod diameter (mm)	Kit No. of maker
	65	3006J-56001
	70	3007J-06001
	75	3007J-56001
	80	3008J-06001
	85	3008J-56001
	90	3009J-06001
	95	3009J-56001
	100	3010J-06001
	105	3010J-56001
	110	3011J-06001
	115	3011J-56001
120	3012J-06001	
Jig for seal ring inserting & correcting	Application cylinder bore (mm)	Kit No. of maker
	95	3009J-51001
	100	3010J-01001
	105	3010J-51001
	110	3011J-01001
	115	3011J-51001
	120	3012J-01001
	125	3012J-51001
	130	3013J-01001
	135	3013J-51001
	140	3014J-01001
	145	3014J-51001
	150	3015J-01001
160	3016J-01001	
170	3017J-01001	

[MEMO]

33. UPPER STRUCTURE

(11) Remove beam (4)

- 1) Loosen 6 sems bolts (41) M12×25.
- 2) Remove beam (4).



: 19 mm
Weight : 8kg (18 lbs)

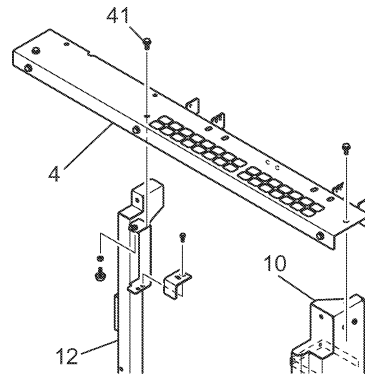


Fig. 33-21 Removing and installing of beam (4)

(12) Remove pillar (10), (12)

Remove battery relay box in advance and remove pillar (10). (See Chapter 23)

- 1) Loosen 2 sems bolts (42) M12×30.
- 2) Loosen 2 sems bolts (43) M12×40.
- 3) Loosen a sems bolt (51) M12×35.



- 4) Remove pillar (10), (12).
- Weight : Pillar (10) : 12kg (26 lbs)

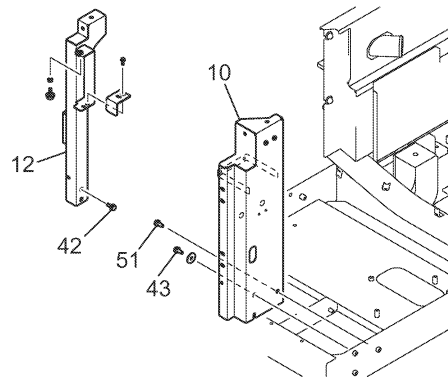


Fig. 33-22 Removing and installing of pillar (10),(12)

(13) Remove guard assy (18) and (13)

- 1) Loosen 4 capscrews (33) M12×20, and remove guard assy (18).
- 2) Loosen 2 sems bolts (42) M12×20, and remove guard assy (13).



: 19 mm
Weight : 12kg (26 lbs)

(14) Remove guard (19)

Loosen 6 sems bolts (41) M12×25, and remove guard (19).

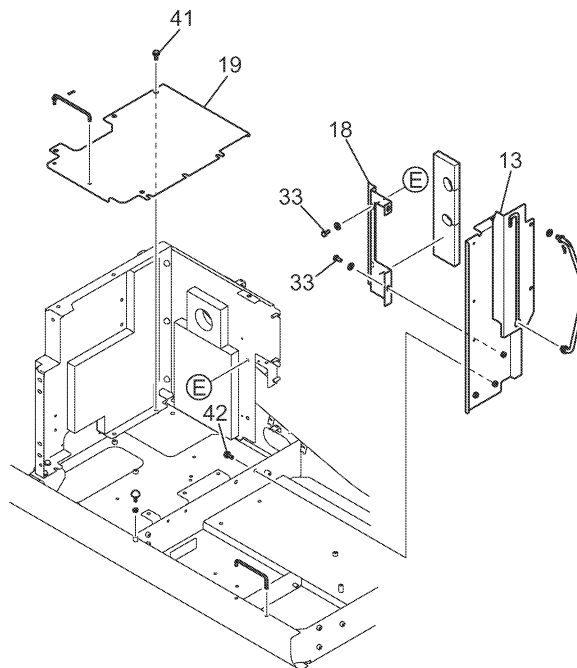



Fig. 33-23 Removing and installing of guard assy and guard

33. UPPER STRUCTURE

33.1.8 HYDRAULIC PUMP

33.1.8.1 PREPARATION FOR REMOVAL

- (1) Release pressure in hydraulic oil tank.
(See 33.1.7HYDRAULIC TANK)
- (2) Remove six capscrews (C5) M10×25.
- (3) Remove cover (C2)
 : 17 mm
- (4) Take out suction strainer.
- (5) Install suction stopper.
For suction stopper, see chapter 11. Tools.

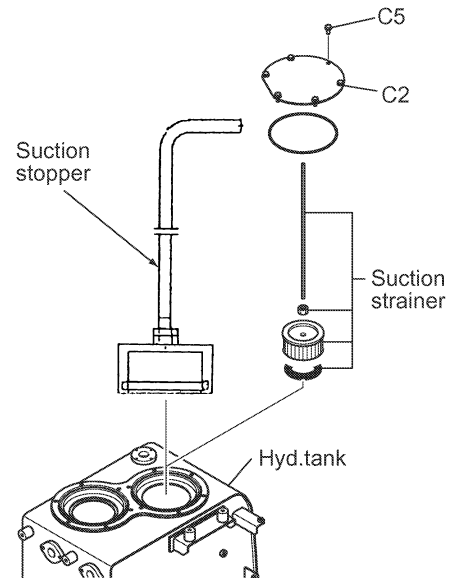


Fig. 33-39 Suction stopper installing

- (6) Remove guards
 - 1) Remove bonnet assy (1).
 - 2) Remove guard (5), (14), (15), (17) and guard assy (16).
 - 3) Remove those parts that are required to remove the hydraulic pump such as the fuel filter assy.
 - 4) Remove drain hose at the bottom of the muffler.

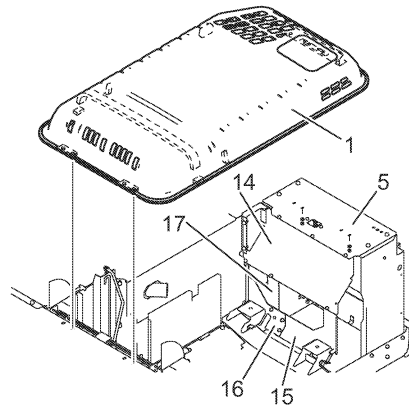



Fig. 33-40 Removing guards

33. UPPER STRUCTURE

33.1.12.2 REMOVAL

(1) Remove radiator stay (A1).

- 1) Remove a sems bolt (A2) M12× 35 and 3 sems bolts (A3) M12× 30.

 : 19 mm

- 2) Remove 2 stays (A1).

(2) Remove water hose (2),(3)

- 1) Loosen the hose bands for water hose (2).

 : Flat-blade screwdriver

- 2) Remove hose (2).

- 3) Loosen hose bands on water hose (3).

 : Flat-blade screwdriver

- 4) Remove hose (3).

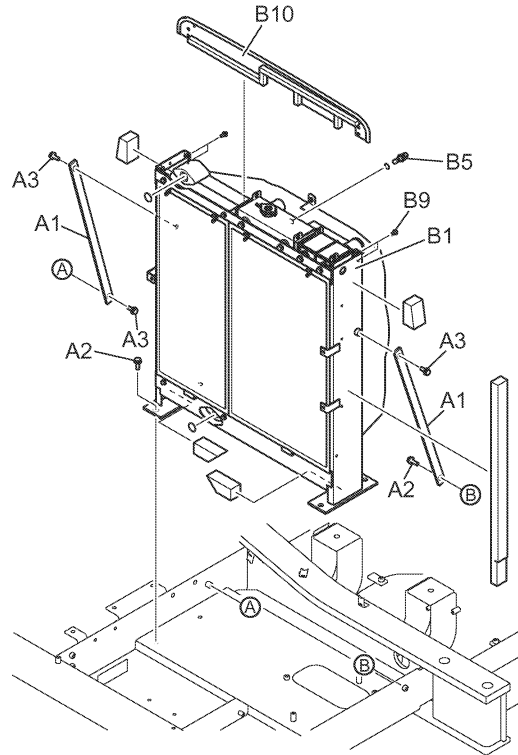




Fig. 33-57 Removing radiator assy

(3) Remove hoses (4)(5) for inter-cooler

- 1) Remove two retaining U-bolts from tubes (4 and 5).

 : 13 mm

- 2) Loosen sems bolt (21) M10× 20 from retaining plate.

 : 17 mm

- 3) Loosen hose bands and remove hoses (4 and 5).

 : Flat-blade screwdriver

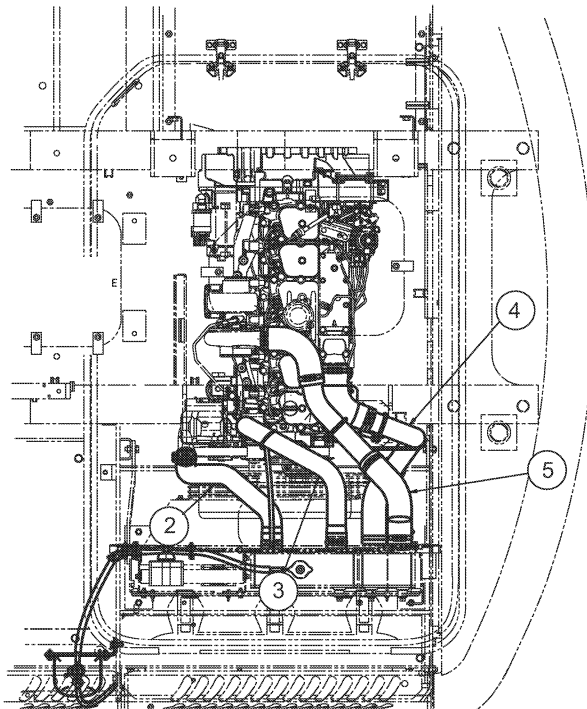



Fig. 33-58 Removing hose for radiator/inter-cooler

(4) Remove guard (12), (13) (See Fig. 33-55)

- 1) Remove 4 sems bolts M8× 20.

- 2) Remove guard (12), (13).

 : 13 mm

33. UPPER STRUCTURE

Functions	Ports	Ports on upper sides	Ports	Functions
		LEFT ← → RIGHT		
P2 bypass cut	PBp2		PBp1	P1 bypass cut
Option	PAo		PBa2	Arm 2 in
Arm (R) relief valve	-		Mu	Make-up line
Arm 1 out	PBa1		-	Bucket (R) relief valve
Swing (LH)	PBs		PBb	Boom down
Boom conflux	PB1		-	Boom (H) relief valve
Travel left forward	PAL		PAr	Travel right forward
Tank return	T2		-	Main relief valve
			PCb	P1 unload
		Ports on rear sides (on machine)		
		LEFT ← → RIGHT		
			P 1	P1 pump
			P 2	P2 pump
		Ports on right sides (on machine)		
		UPPER SIDE ← → LOWER SIDE		
Bucket dump	BC		AC	Bucket digging
Bucket dump	PBc		Bb	Boom down
Bucket (H) stroke limit	PCc		BR	Travel right reverse
Boom up	Ab			
Drain	Dr			
Travel right forward	AR			
ATT power boost	PL			

Fig. 33-72 Control valve ports (1/2)

33. UPPER STRUCTURE

33.1.20 UPPER FRAME

33.1.20.1 PREPARATION FOR REMOVAL

- (1) Remove attachment
(See chapter 32)
- (2) Remove cab (See 33.1.2 CAB)
- (3) Remove guard (See 33.1.4 GUARD)
- (4) Remove counterweight
(See 33.1.11 COUNTERWEIGHT)
- (5) Remove swivel joint
(See 33.1.20 SWIVEL JOINT)

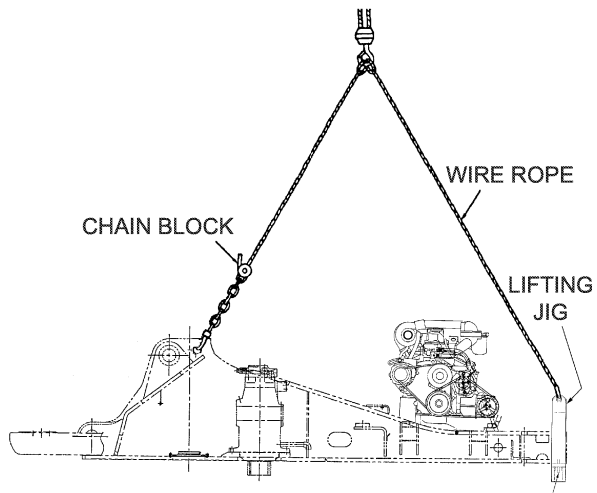


Fig. 33-87 Temporarily lift upper frame

33.1.20.2 REMOVAL


- (1) Lifting up upper frame temporarily
Insert two upper swing body lifting jigs and 2 counterweight fastening cap screws (A1) M27× 335 into the counterweight mounting holes from above. Attach 2 chain blocks to the boom foot side and lift the upper frame at four points.

Wire rope ;

ø16 (0.630")× 2.5m(8ft-2in), 2pcs.

ø16 (0.630")× 1.5m(4ft-11in), 2pcs

Chain block ; For 2,000kg (4,410 lbs) 2pcs.

- (2) Making match marks on swing bearing
Put match marks on the upper frame and swing bearing.
- (3) Removing upper frame attaching bolts
Remove 32 capscrews M20× 100 and a reamer bolt (11) used to install swing bearing and upper frame.
 : 30 mm
- (4) Slings upper frame
Sling according to Fig. 33-87, and remove upper frame and put it on a stand.
Weight : Approx. 5ton (11,000lbs)

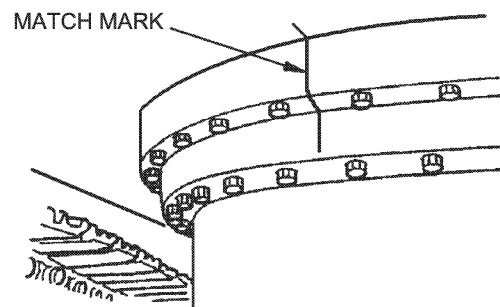


Fig. 33-88 Matching mark on swing bearing and upper frame

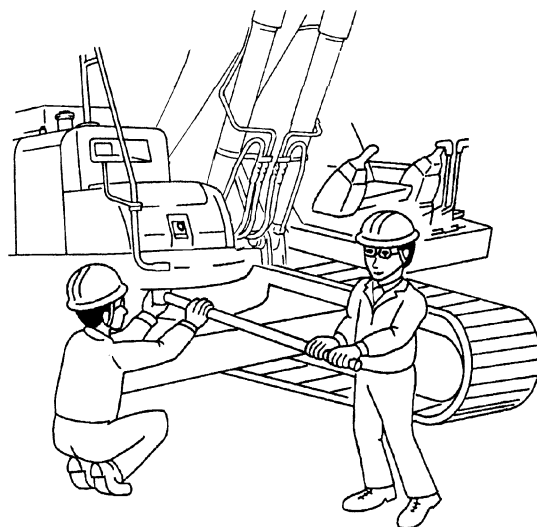


Fig. 33-89 Removing upper frame attaching bolts

33. UPPER STRUCTURE

(3) Installing procedure

- 1) Precautions need to be exercised during installation. Assembly is a reverse order of disassembly, but observe the following:
 1. Repair scored parts at disassembly. Get replacements ready beforehand.
 2. Wash parts sufficiently in a cleaning solvent and dry them with compressed air.
 3. Do not forget to coat the sliding areas and bearings with clean hydraulic oil.
 4. In principle, replace sealing parts such as O-rings and oil seals.
 5. Tighten socket bolts and plugs to specified torques in this manual, using a torque wrench.
 6. Do not mix up front pump parts with rear pump parts.

2) Installing swash plate support

Attach swash plate support (251) to pump casing (271) by tapping the swash plate support lightly with a soft hammer.

- When the servo piston, the tilting pin, the stopper (L) and the stopper (S) have been removed, install them to the pump casing beforehand.
- When tightening servo piston and tilting pin, use a jig so as not to damage the head of the tilting pin and feedback pin.
Coat the screwed part with Loctite #262.

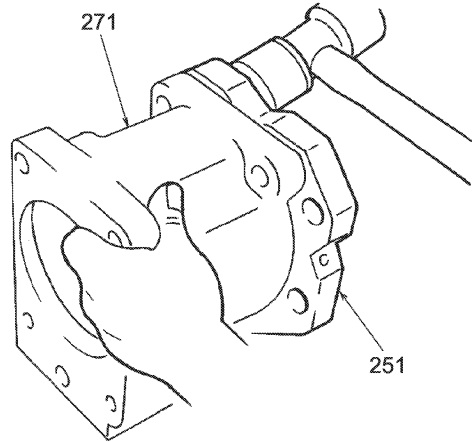


Fig. 33-103 Installing swash plate support (251)

3) Installing swash plate

Set the pump casing, with its mounting surface of the regulator facing down. Properly insert the tilting bushing of the swash plate into tilting pin (531), and fit swash plate (212) to swash plate support (251).

- Confirm by the fingers of your both hands that swash plate moves smoothly.
- The shaft be installed easily if grease is applied to the sliding parts of swash plate and swash plate support.
- Do not damage the sliding surface of shoe plate.

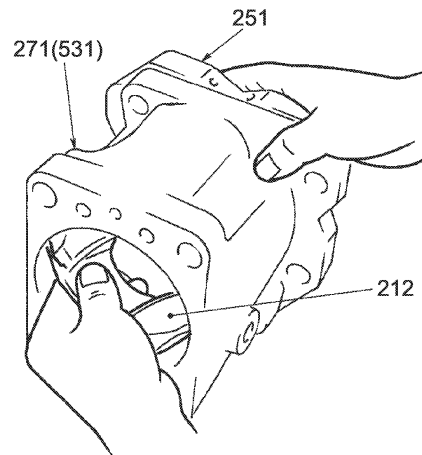


Fig. 33-104 Installing swash plate (212)

33. UPPER STRUCTURE

6) Remove compensating parts

(See Fig. 33-111 (D) section, See Fig. 33-113, Fig. 33-114)

After removing the cover (C) (629) sub assy, take out outer spring (625), inner spring (626) and spring seat (624) from the compensating part. Then take out adjust stem (645), pilot spring (646) and spring seat (644) from the pilot part.

- Adjustment stem (645) comes out easily with the use of a M4 bolt.

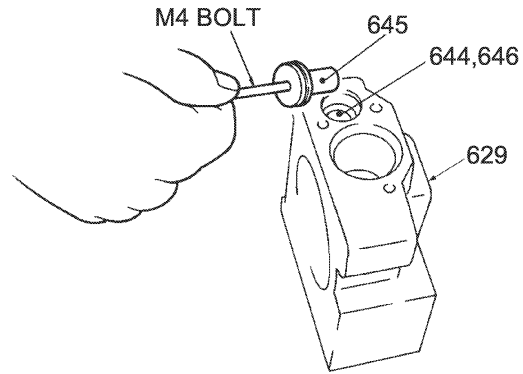


Fig. 33-114 Removing compensating parts

7) Remove pilot cover and the set spring

Remove socket bolt (439) and pilot cover (641). Once the pilot cover comes off, separate set spring (655) from the pilot section. (Fig. 33-111 (A) and (B) section)

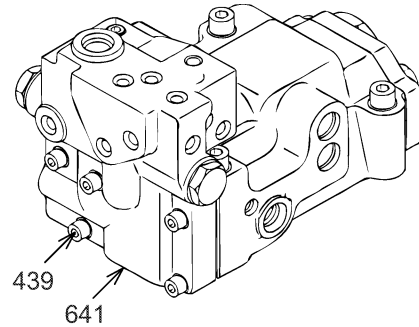
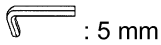


Fig. 33-115 Removing pilot cover (641) and set spring (655)

8) Remove spring seat, return spring and sleeve (Fig. 33-111 (A) section)

Remove snap ring (814). Then remove spring seat (653), return spring (654) and sleeve (651).

- Sleeve (651) is equipped with snap ring (836).
- When removing snap ring (814), return spring (654) comes out : Use care so as not to lose it.

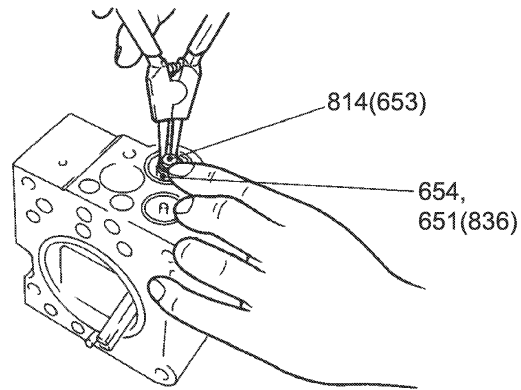


Fig. 33-116 Removing spring seat (653), return spring (654) and sleeve (651)

9) Remove adjust plug (Fig. 33-111 (F),(G) section) remove snap ring (858) and take out fulcrum plug (614) and adjust plug (615).

- Fulcrum plug (614) and adjust plug (615) come off easily if a M6 bolt is used.

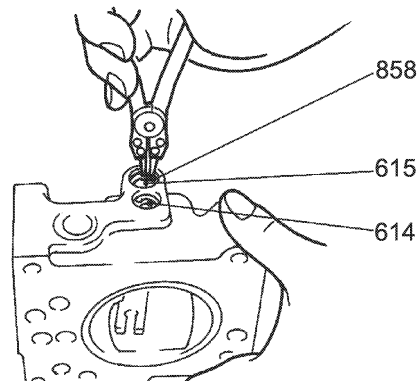


Fig. 33-117 Removing adjust plug (615)

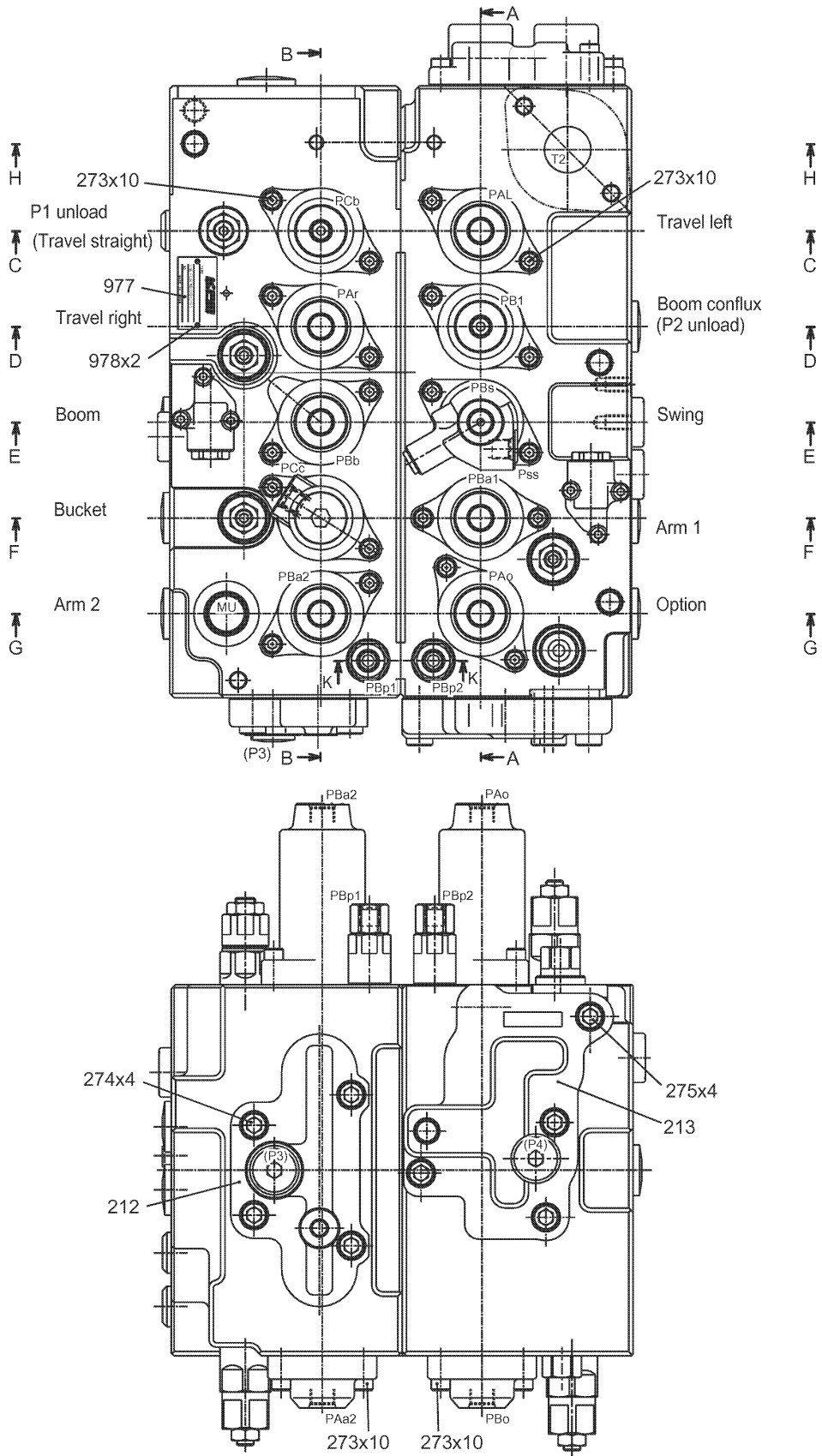


Fig. 33-140 Section (2/6)

33. UPPER STRUCTURE

- (3) Secure the boom spool assy with a vise via a protective plate (aluminum plate, etc.) and remove bolt (333). Separate spring seat (331), springs (321), (322) and stopper (336) from boom spool (301). Do not disassemble boom spool (301) further unless there is a special reason.

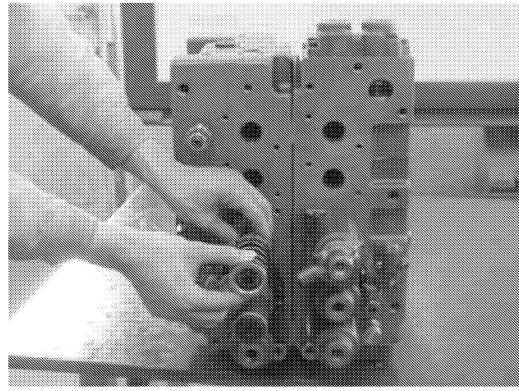


Fig. 33-156 Removing boom spool (301) assy

33.2.2.3.5 Disassembling the swing spool

- (1) Loosen the socket bolts (273) and remove the spring cover sub (204) and the O-ring (261), (266) for swing. Do not disassemble spring cover sub (204) further unless there is special reason.
- (2) Remove the swing spool (303), spring seat (331), springs (321), (322), stopper (336) and bolt (333) assembly from casing A (101).



When removing the spool assy, use care so as not to score casing A (101).

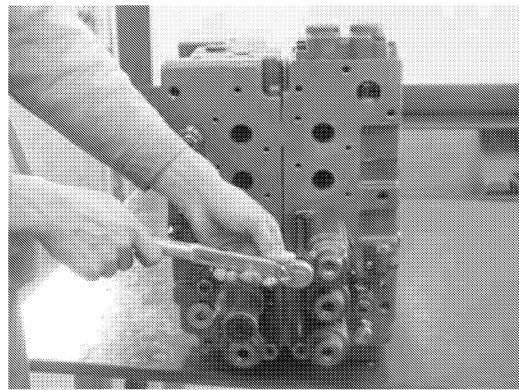


Fig. 33-157 Removing spring cover sub (204)

- (3) Secure the swing spool assy with vise via a protective plate (aluminum plate, etc.) and remove bolt (333). Then separate spring seat (331), springs (321), (322) and stopper (336) from swing spool (303).

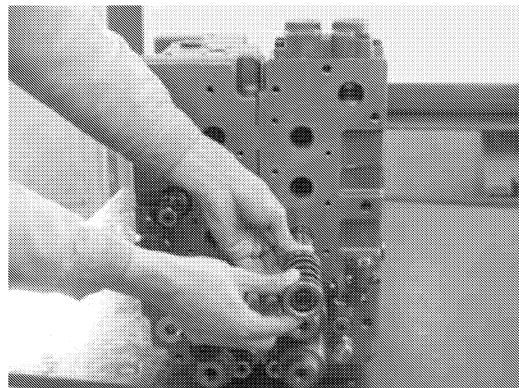


Fig. 33-158 Removing swing spool (303) assy

33. UPPER STRUCTURE

33.2.2.4.1 Installing check valve

- (1) Load check valve, conflux check valve, etc.:
Install poppet (511) and spring (521), place O-ring (164) on plug (551) and tighten them to the specified torque.
(9 places)
- (2) Load check valve of swing section:
Install poppet (511) and spring (523), place O-ring (164) on plug (556) and tighten them to the specified torque.
(1 place)
- (3) Load check valve of arm 2 section:
Install poppet (515) and spring (521), place O-ring (164) on plug (551) and tighten them to the specified torque.
(1 place)
- (4) Lock valve section:
Install poppet (514) and spring (524), place O-ring (164) on plug (556) and tighten them to the specified torque.
(2 places)
- (5) Main relief valve section:
Install poppet (512) and spring (522), place O-ring (562) on plug (552) and tighten them to the specified torque.
(2 places)



Take care to prevent misassembly of parts and installation position because the parts in (1) to (5) are similar in shape.

33.2.2.4.2 Assembling plate

- (1) Place O-rings (162), (163) in casing.
- (2) Attach plates (212), (213) and tighten socket bolts (274), (275) to the specified torque.

Replace control valve so that this plate face directs downward.

33.2.2.4.3 Assembling back pressure check valve

- (1) Attach boost check valve poppet sub (517), by-pass check valve poppet (518) and springs (527), (528).
- (2) Attach O-rings (264), (266) in back pressure check valve cover, attach it to casing A (101) and tighten socket bolt (278) to the specified torque.

33.2.2.4.4 Assembling lock valve selector sub

- (1) Attach lock valve selector sub (211) to the casing and tighten socket bolt (211-171) to the specified torque.

33.2.2.4.5 Assembling by-pass cut valve

- (1) Attach by-pass cut valve (606) to casing and tighten it to the specified torque.



Do not drop poppet (606-201) and spring (606-202) when attaching by-pass cut valve.

33. UPPER STRUCTURE

33.2.3 PILOT VALVE (ATT)

33.2.3.1 CROSS-SECTIONAL VIEW

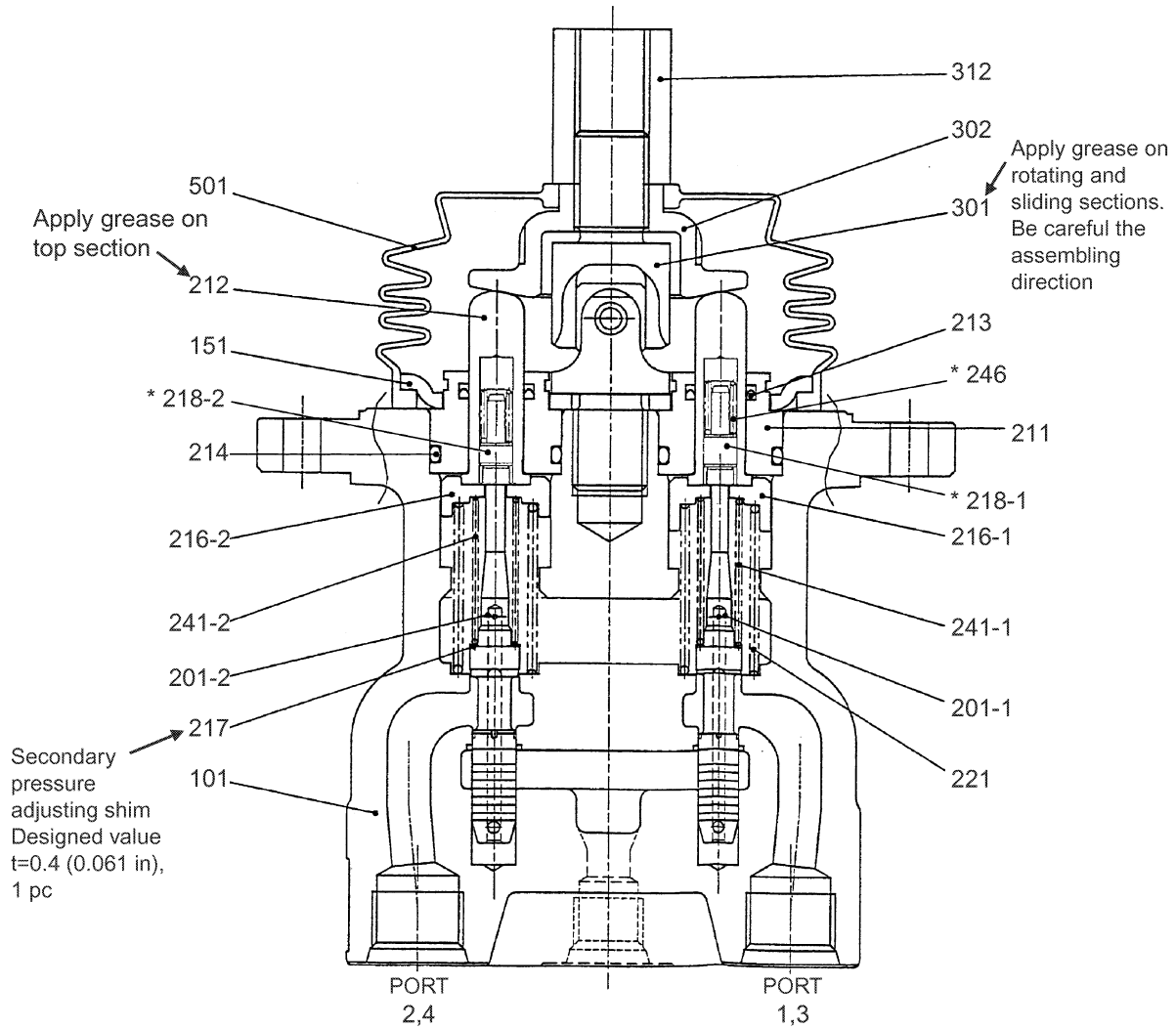


Fig. 33-182 Pilot valve (For ATT)

Apply loctite #277 to areas marked ☆

Tightening torque N•m (lbf•ft)	No.	Parts	Q'ty	Tightening torque N•m (lbf•ft)	No.	Parts	Q'ty
	101	Casing	1		*218-1	Seat	2
	151	Plate	1		*218-2	Seat	2
	201-1	Spool	2		221	Spring	4
	201-2	Spool	2		241-1	Spring	2
	211	Plug	4		241-2	Spring	2
	212	Push rod	4		*246	Spring	4
	213	Seal	4	47.1 (35)	301	Joint : M14	1
	214	O-ring ; 1B P20	4		302	Circular plate	1
	216-1	Spring seat	2	68.6 (51) ☆	312	Adjust nut : M14	1
	216-2	Spring seat	2		501	Boots	1
	217	Washer 2 (Shim)	4				

Note) The parts marked * might not be equipped depending on valve type.

33. UPPER STRUCTURE

33.2.4 PILOT VALVE (FOR TRAVEL)

33.2.4.1 CONSTRUCTION

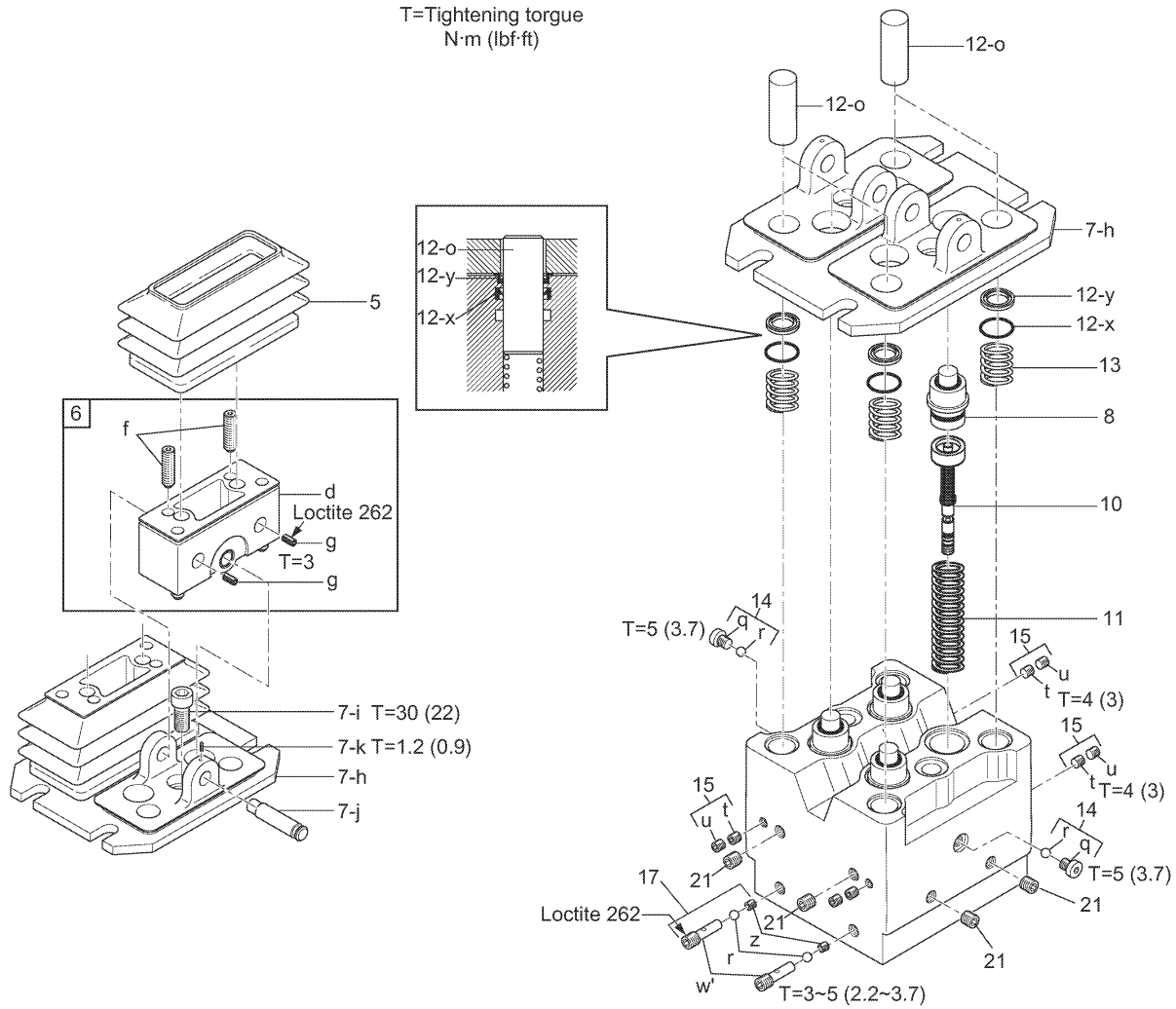


Fig. 33-207 Exploded view of pilot valve

No.	Parts	Q'ty	No.	Parts	Q'ty
5	Rubber boots	2	12-x	Seal $\phi 14 \times 20 \times 3$	6
6	Foot pedal (Switch plate)	(2)	12-y	Wiper ring	6
6-d	Switch plate	2	13	Damper spring	4
6-f	Regulation screw M8 \times 28	4	14	Check valve kit	(2)
6-g	Set screw M5 \times 8	4	14-q	Plug M8	2
7	Retaining plate kit	(1)	14-r	Ball M6, 35	2
7-h	Plate	1	15	Orifice	(4)
7-i	Capscrew M10 \times 20	2	15-u	Plug M6	4
7-j	Shaft	2	15-t	Orifice M6, $\phi 0.6$	4
7-k	Set screw M4 \times 10	2	17	Shuttle valve kit	(2)
8	Flange kit	4	17-w'	Shuttle valve & orifice	2
10	Control spool	4	17-r	Ball M6, 35	2
11	Return spring	4	17-z	Orifice M5, $\phi 0.8$	2
12	Damper flange kit	(4)	21	Plug	4
12-o	Damper plunger $\phi 14$	4			

33. UPPER STRUCTURE

Tightening torque N•m (lbf•ft)	No.	Parts	Q'ty	Tightening torque N•m (lbf•ft)	No.	Parts	Q'ty
177 (130)	051	Relief valve ; M33-P1.5	2	69 (51)	400	Anti-reaction valve ; M22-P1.5	2
	051-1	O-ring ; 1B G30	2		400-1	O-ring ; 1B P20	2
	052	Anti-reaction valve sub	1	400-2	Backup ring	2	
	100	Casing for anti-reaction valve	1	431 (320)	401	Socket bolt ; M20×45	4
	101	Drive shaft	1		443	Roller bearing	1
	111	Cylinder	1	334 (250)	444	Roller bearing	1
	114	Spring plate	1		451	Pin	2
	121	Piston	9		469	ROMH plug ; M30-P1.5	2
	122	Shoe	9		472	O-ring	1
	123	Set plate	1		488	O-ring ; 1B P28	2
36 (27)	124	Shoe plate	1		491	Oil seal	1
	131	Valve plate	1		702	Brake piston	1
	151	Plug ; PF1/4	2		706	O-ring	1
	161	O-ring ; 1B P11	2		707	O-ring	1
	162	O-ring ; 1B P12	2		712	Brake spring	16
29 (22)	163	O-ring ; 1B P6	2	0.9 (0.65)	742	Friction plate	3
	171	Socket bolt ; M8×55	4		743	Separator plate	4
	301	Casing	1		980	Plug ; PF1/4	1
	303	Valve casing	1		984	Plug ; PF3/8	1
	351	Plunger	2		985	Plug ; PF3/4	3
	355	Spring	2	65 (48)	993	Plug ; PT1/2	1
	390	Name plate	1	98 (72)	994	Plug ; PT3/4	1
	391	Rivet	2				

33. UPPER STRUCTURE

Code	Tool name	Remarks
i	Snap ring plier	For shaft
j	Torque wrench	140 N•m (100 lbf•ft) class
k	Plastic hammer (Wooden mallet)	
m	Press	30 ton (66150 lb) class
n	Flat-bladed screw driver	
p	General tools	Allen wrench, Steel bar
q	Thread sealant	Three Bond #1360K
	Sealant	Loctite #515

33.2.5.3.2 Disassembly

The numbers in parentheses correspond to the ones in construction drawings Fig. 33-230.

(1) Preparation

- 1) Before disassembly, clean the outside of the reduction unit thoroughly and check for no damage and scoring.
- 2) Drain gear oil from the reduction unit.
- 3) Disconnect the drain tube.
- 4) Matching Mark
To facilitate the reassembly of the unit, put matching mark on the joining parts of the housing before disassembly.

(2) Disassembling swing motor from reduction unit

1) Preparation for disassembly

Place the reduction unit assy on a stable work bench as shown in Fig. 33-244, remove plug (27), drain out oil and put a matching mark on the matching surface of the figure on the right.

2) Removing swing motor assy

Loosen all socket bolt (23) (M14). Attach eye bolts (M10) in the lifting bolt holes in the top surface of the swing motor and lift the assy by crane.

Insert a flat-blade screwdriver in the groove of the flange to assist in separating the swing motor from the reduction unit..

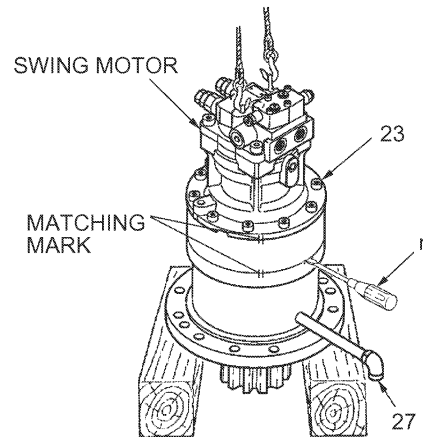
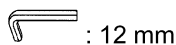


Fig. 33-244 Removing swing motor assy

(3) Disassembling reduction unit

1) Remove #1 sun gear (2).

2) Removing #1 spider assy (7).

The spider assy (7) [consisting of thrust washer (15), #1 pinion (3), needle bearing (16) and snap ring (28)] can be removed from the spline easily if it is lifted up in that condition.

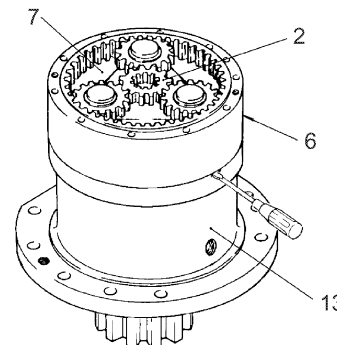


Fig. 33-245 Removing #1 sun gear and #1 spider assy

33. UPPER STRUCTURE

(2) Standard for correcting sliding surfaces

If the surface roughness of the sliding surface of parts exceeds the following standard, correct it or replace the parts.

Standard for correcting sliding surfaces

Name of parts	Standard surface roughness	Surface roughness requiring correction
Shoe	0.8—Z (Ra=0.2) (lapping)	3—Z (Ra=0.8)
Shoe plate	0.4—Z (Ra=0.1) (lapping)	3—Z (Ra=0.8)
Cylinder	1.6—Z (Ra=0.4) (lapping)	12.5—Z (Ra=3.2)
Valve plate	0.8—Z (Ra=0.2) (lapping)	6.3—Z (Ra=1.6)

- Lap each sliding surface to a standard roughness level or finer.
- If the spherical sliding surface of the spring (114) and cylinder (111) are roughened, replace parts in pairs.

33. UPPER STRUCTURE

(2) Assembling stem

Lightly coat the outer circumference of stem (2) and the inner surface of body (1) with grease or vaseline and slowly insert stem (2) into body (1).

CAUTION

- If stem (2) is pressed in too fast, the seal may be damaged. Do it slowly.
- The clearance between body (1) and stem (2) is about 0.1mm (0.004in). Push stem straight along the shaft center.

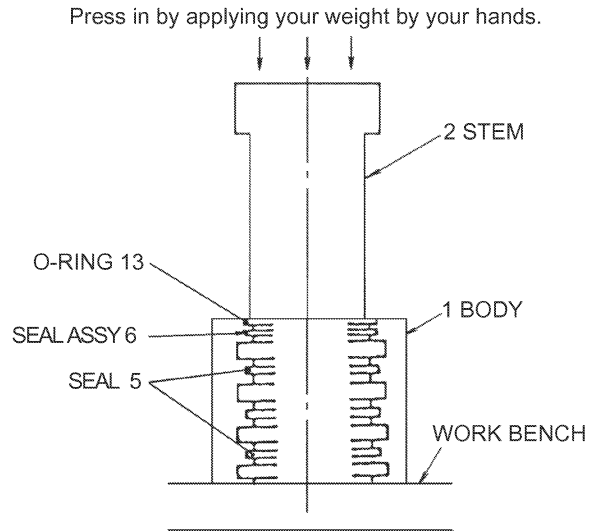


Fig. 33-278 Inserting stem (2)

(3) Assembling thrust plate

- 1) While holding stem (2) and body (1), align the hole in thrust plate (3) and the stem (2) hole.
- 2) After removing any oil from the thread of socket bolt (8), apply Loctite #242 and tighten to stem (2).



: 6 mm,

Tightening torque : 30.4 N•m (22 lbf•ft)

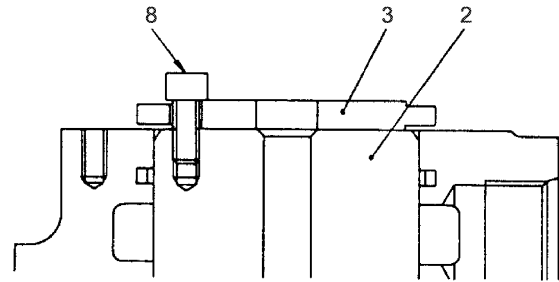


Fig. 33-279 Tightening socket bolt (8)

(4) Assembling cover

Install O-ring (7) to cover (4) and align the matching marks of the cover (4) and body (1). Apply Loctite #242 to socket bolt (9) and tighten.



: 6 mm,

Tightening torque : 30.4 N•m (22 lbf•ft)

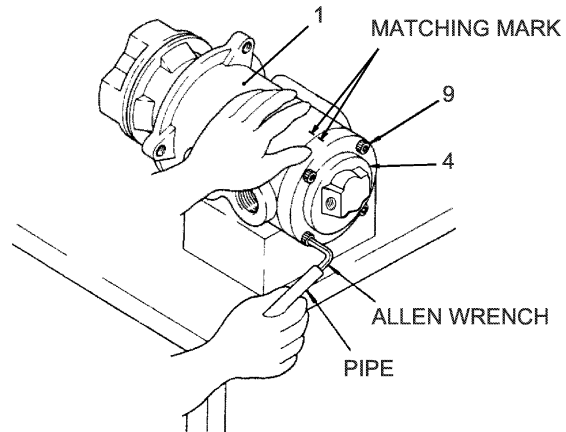


Fig. 33-280 Tightening socket bolt (9)

34. TRAVEL SYSTEM

34.1.2.4 MAINTENANCE STANDARD

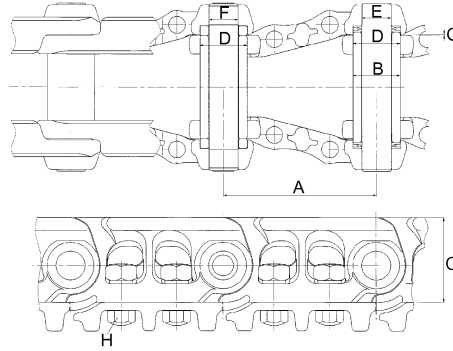


Fig. 34-10


Unit : mm (in)

No.	ITEM	STANDARD VALUE		REPAIRABLE LEVEL	SERVICE LIMIT	REMEDY	
A	Link pitch	190 ± 0.1 (7.4803 ± 0.0039)		194 (7.64)	198 (7.80)	Replace the link assy if the service limit is exceeded	
B	O.D. of bushing	ø 58.78 ^{+0.11} _{-0.05} (2.3142 ^{+0.0043} _{-0.0020})		ø 55 (2.17)	ø 54 (2.13)		
C	Height of link	106 ± 0.3 (4.1732 ± 0.0118)		100 (3.94)	98 (3.86)		
D	Interference between bushing and link	Basic dimension	Tolerance		Fit	Fit	Replace
		ø 58.78 (2.3142)	Shaft	+ 0.11 (+0.0043) - 0.05 (-0.0020)	Interference 0.05 (0.0020)	Interference 0	
E	Interference between track pin and link	ø 36.63 (1.4421)	Shaft	+ 0.1 (+0.0039) - 0.05 (-0.0020)	Interference 0.05 (0.0020)	Interference 0	
F	Interference between master pin and link	ø 36.50 (1.43701)	Shaft	- 0.03 (-0.00118) - 0.088 (-0.00315)	Interference 0.05 (0.0020)	Interference 0	Replace Link
G	Clearance between links	1.5 (0.06) (both side)		8 (0.32) (both side)	10 (0.39) (both side)	Replace	
H	Tightening torque of shoe bolt	853 N•m (629 lbf•ft)				Reassembly	


34.1.2.5 TOOLS AND JIGS

(1) Tightening tools

Unit : mm (in)

NAME	OPPOSING FLATS
 Socket	30 (1.2)

(2) Jig

NAME	SHAPE
Master pin fixing jig for iron crawler	

34. TRAVEL SYSTEM

5) Removing collar (2) and O-ring (7).

Remove the O-ring (7) from shaft (3) that was previously removed.

6) Removing floating seal (6).

Remove floating seal (6) from collar (2).

7) Removing floating seal (6).

Remove the remaining floating seal (6) from the roller (1).

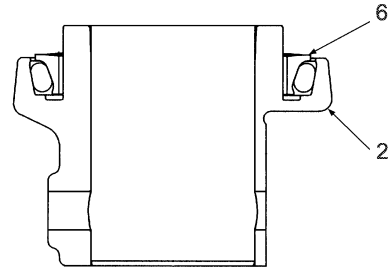


Fig. 34-30 Removing floating seal (6)

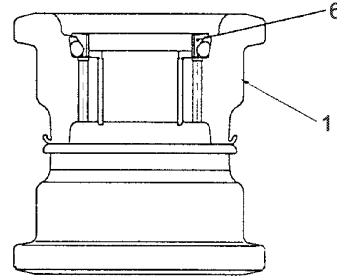


Fig. 34-31 Removing floating seal (6)

8) Removing bushing (4)

Because the thickness of bushing (4) is 2.0mm (0.079in), removal is not possible without destroying the bushing. Use a lathe or split the bushing. Use care not damage inner bore of roller. Place the upper roller (1) on jig (M) and apply the end of push-out jig (N) on the end of the and push it out by tapping with a mallet.

CAUTION

Hammer the inside surface of roller lightly so as not to damage the surface. Put the extrusion jig (N) uniformly over the circumference of bushing (4) and remove it a little at a time.

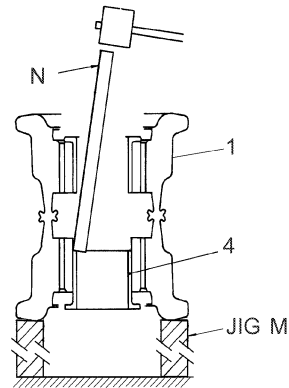


Fig. 34-32 Extruding bushing (4)

34. TRAVEL SYSTEM

34.1.5.3.4 TOOLS AND JIGS

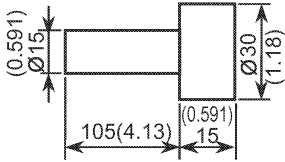
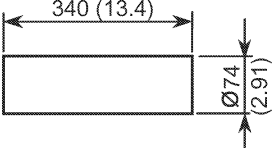
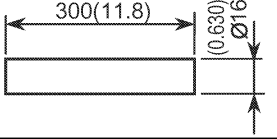
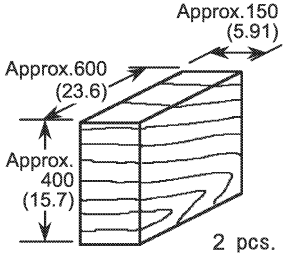
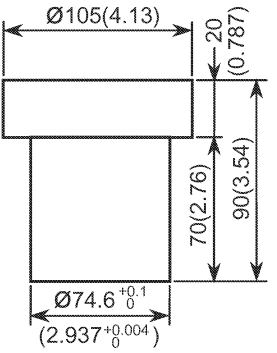
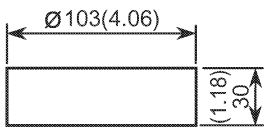
(1) Tightening tools

Unit : mm

NAME	OPPOSING FLATS
 Socket	24
 Allen wrench	5

(2) Jigs

Unit : mm (in)

No.	NAME	SHAPE
R	Pin striking jig	
S	Shaft push out jig	
T	Bushing drawing rod	
U	Stand	
V	Bushing press fitting jig	
W	Collar press fitting jig	

34. TRAVEL SYSTEM

34.1.7.3 INSTALLING

Installation of the travel motor piping is performed in the reverse order of removal.

- 1) Cleaning
Check that the contact surface of travel motor and crawler frame is free from burrs and foreign matter.
- 2) Tightening torque
Tighten capscrew and hydraulic pipes to the torque specified in "Tightening Torque".
- 3) Add hydraulic oil through motor drain port to casing before installing piping for drain. When first starting, operate motor at low idle and at low speed for several minutes. Check for oil leaks and noise.

NAME	SIZE	TOOLS HEX	NO.	TIGHTENING TORQUE N·m(lbf·ft)	REMARKS
SEMS BOLT	M12	19	6	83.4 (61)	APPLY LOCTITE #262
CAPSCREW	M16	24	3	279 (206)	
FLARELESS NUT FOR PIPES, SLEEVE	φ10X1.5	19	—	49(36)	
	φ18X2.5	32	—	147(110)	
	φ28	41	—	275(200)	
HOSE CAP	PF1/4	19	—	29.4(21.7)	
	PF1/2	27	—	78.5(57.9)	
CONNECTOR	PF1/4	19	—	36.3(27)	
	PF1/2	27	—	108(80)	
	PF1	41	—	255(190)	

34.1.8 SWING BEARING

34.1.8.1 SWING BEARING ASSY

SWING BEARING ASSY			YN40F00027F1
No.	NAME	Q'TY	REMARKS
1	SWING BEARING	1	YN40F00026F1
2	CAPSCREW	36	M20XP1.5X65

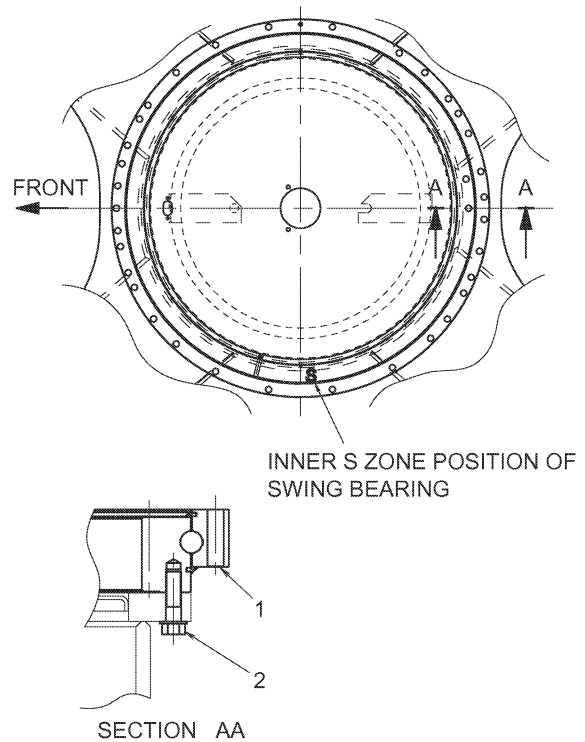


Fig. 34-77 Swing bearing assy

34. TRAVEL SYSTEM

34.2.1.3 DISASSEMBLY

34.2.1.3.1 Preparation

The following preparations must be made before disassembly.

(1) Preparing working bench

- Prepare work bench for travel motor.
- Use a work bench which is sturdy enough for disassembly and assembly of the travel motor and has enough space to put the parts.
- Cover the work bench with rubber sheet or vinyl sheet.

(2) Preparing tools and materials.

Prepare the tools and materials which are specified in paragraph 34.2.1.2.1.

34.2.1.3.2 General cautions required to perform the work



The internal parts may be slippery because they are coated by gear oil and hydraulic oil. Be careful when handling parts so they do not fall and injure or be damaged.



Do not use diesel fuel or kerosene to wash the disassembled parts. Always use cleaning solvent.

- (1) Identify the items to be checked and any failures detected before disassembly. Carry out the disassembly according to the specified procedure.
- (2) Handle parts taking care not to damage machined parts.
- (3) Do not strike or pry parts. Assembly might be difficult due to burrs and damage and may cause the deterioration of performance.
- (4) If the parts removed or under disassembly are left out, rusting of parts due to moisture can occur. If it is necessary to stop disassembly, work, protect the parts from rust.
- (5) Mark the mating face of each part at the time of disassembly.
- (6) Put the removed parts in order so as not to lose parts during disassembly.
- (7) The removed seal and o-rings must be replaced with new ones even if no damage is found. Get new parts before disassembling.

34. TRAVEL SYSTEM

34.2.1.5 ASSEMBLY

Assembly is the reverse procedure of disassembly.

34.2.1.5.1 Preparation

Prepare work bench, tools and materials similar to the disassembly specified in paragraph 34.2.1.3.

34.2.1.5.2 General caution necessary to perform the work

- (1) Pay attention to the same general caution as for disassembly explained in paragraph 34.2.1.3.
- (2) On assembly, remove metal chips and foreign matters from all parts and make sure that parts are free from burrs, dents. If a burr or dent are found, remove using an oil stone.
- (3) Replace all O-rings, oil seals and floating seals with new ones.
- (4) Remove adhesive left on the threaded bore in hub (1) by running a tap M10×P1.5 through the bore. Then clean and degrease the threaded bore. Dry using compressed air.
Replace socket bolt (7) with a new one.
- (5) Use care when installing O-rings, oil seals and floating seal so as not to damage. (Apply grease in small amounts to help with installation.)
- (6) Be sure to apply clean hydraulic oil (NAS grade 9 or more) to the moving parts on the hydraulic motor and valve before assembling.
- (7) Do not use cloth gloves during assembling work. (To prevent lint or fiber contamination)
- (8) Tighten bolts and plugs to the torque values specified in paragraph 34.2.1.2.2 "Table of Torque".
- (9) When the assembly is completed, plug all ports to prevent dust from entering.
- (10) The pictures and figures shown in this document are taken as typical models. Even if a part of the picture and figure differs from those of products being serviced, it has not an effect on the assembling procedure.

34.2.1.5.3 Assembling procedure

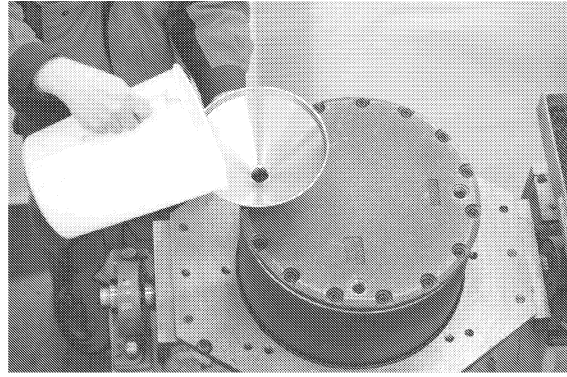
Note

- Remove adhesive from threaded hole M10 of hub (1) using a tap.
 - Remove sealant adhered on mating surface of hub (1) and cover (14) with scraper.
 - Sufficiently clean all parts in cleaning solvent before assembling.
-

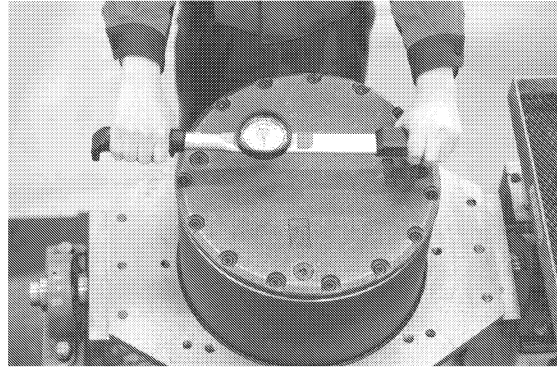
34. TRAVEL SYSTEM

(13) Lubricating

1) Add lubrication oil through filling port.



2) Tighten the plug (30) to the specified torque.



46. TROUBLE SHOOTING (BY ERROR CODES)

Table46-7

Error code	A245	
Trouble	The data of ROM hourmeter is written incorrectly.	
Judging condition	Check hourmeter memory, and judge the data is incorrect.	
Symptom	The hour meter data which was judged as error is taken as 0 Hr. No problem in normal operation	
Control in the event of failure	Normal control is available.	
Returned in normal condition	It does not regain. Replace controller.	
Service diagnosis checking screen	Screen No.	
	Screen No.	
	Screen No.	
Checking object		Checking contents and remedy
1	Mechatro controller	Check that the error is corrected after replacement of controller.
2		
3		

Table46-8

Error code	A255	
Trouble	The data of proportional valve adjustment is written incorrectly.	
Judging condition	Check proportional valve adjustment data, and judge the data is incorrect.	
Symptom	It is not normal output, but no problem in normal operation	
Control in the event of failure	Using fixed value of proportional valve correction data, usual control is done.	
Returned in normal condition	It does not regain. Replace controller.	
Service diagnosis checking screen	Screen No.	
	Screen No.	
	Screen No.	
Checking object		Checking contents and remedy
1	Mechatro controller	Check that the error is corrected after replacement of controller.
2		
3		

46. TROUBLE SHOOTING (BY ERROR CODES)

Table46-27

Error code	B072		
Trouble	Swing pressure sensor outputs error		
Judging condition	After starter switch ON and engine does not start yet. And the input voltage from the swing pressure sensor after starter switch ON is in the range of 1.4V or more to less than 4.7V.		
Symptom	The swing operability becomes poor.		
Control in the event of failure	Normal control		
Returned in normal condition	Not returned automatically under normal condition. Switch the power OFF once and turns on it again.		
Service diagnosis checking screen	Screen No.	6	B-7 SWING
	Screen No.		
	Screen No.		
Checking object		Checking contents and remedy	
1	• Swing pressure sensor SE-5	When B072 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.	
2	• Wiring between swing pressure sensor and controller CN-169F CN-103F	When B072 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.	
3	• Mechatro controller	Check that the error is corrected after replacement of controller.	

Table46-28

Error code	B073		
Trouble	Swing pressure sensor's wiring is disconnected.		
Judging condition	The input voltage from swing pressure sensor is 0.1V or less.		
Symptom	The swing operability becomes poor.		
Control in the event of failure	Set proportional valve output rate of P1 and P2 pumps to 0mA. (Hydraulic pump emergency mode) Set output of P2 unload proportional valve to 0mA. (Valve emergency mode)		
Returned in normal condition	It returns automatically in normal condition.		
Service diagnosis checking screen	Screen No.	6	B-7 SWING
	Screen No.		
	Screen No.		
Checking object		Checking contents and remedy	
1	• Swing pressure sensor SE-5	When B073 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.	
2	• Wiring between swing pressure sensor and controller CN-169F CN-103F	When B073 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.	
3	• Mechatro controller	Check that the error is corrected after replacement of controller.	

46. TROUBLE SHOOTING (BY ERROR CODES)

Table46-47

Error code	C022		
Trouble	P2 pump pressure sensor outputs error.		
Judging condition	After starter switch ON and engine does not start yet. And the input voltage from the P2 pump pressure sensor after starter switch ON is in the range of 1.4V or more to less than 4.7V.		
Symptom	The P2 pump operability becomes poor.		
Control in the event of failure	Normal control		
Returned in normal condition	Not returned automatically under normal condition. Switch the power OFF once and turns on it again.		
Service diagnosis checking screen	Screen No.	7	C-2 PUMP P2
	Screen No.		
	Screen No.		
Checking object		Checking contents and remedy	
1	• P2 pump pressure sensor SE-23	When C022 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.	
2	• Wiring between P2 pump pressure sensor and controller CN-140F CN-103F	When C022 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.	
3	• Mechatro controller	Check that the error is corrected after replacement of controller.	

Table46-48

Error code	C023		
Trouble	P2 pump pressure sensor's wiring is disconnected.		
Judging condition	The input voltage from P2 pump pressure sensor is 0.1V or less.		
Symptom	The delicate operability of P2 pump related attachment becomes poor.		
Control in the event of failure	Set proportional valve output rate of P1 and P2 pumps to 0mA. (Hydraulic pump emergency mode)		
Returned in normal condition	It returns automatically in normal condition.		
Service diagnosis checking screen	Screen No.	7	C-2 PUMP P2
	Screen No.		
	Screen No.		
Checking object		Checking contents and remedy	
1	• P2 pump pressure sensor SE-23	When C023 is cancelled and other error occurs by turning starter switch on after exchanging the connector with other sensor. Check sensor unit for possible failure. If failure found, replace it.	
2	• Wiring between P2 pump pressure sensor and controller CN-140F CN-103F	When C023 is displayed after turning the starter switch on after the connector is exchanged with other sensor. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.	
3	• Mechatro controller	Check that the error is corrected after replacement of controller.	

46. TROUBLE SHOOTING (BY ERROR CODES)

Table46-69


Error code	F023		
Trouble	Swing parking solenoid valve and output transistor ON are failure, and disconnection.		
Judging condition	The feed-back signal is 24V level while exciting command is not output.		
Symptom	Swing parking is not available or is leaving available.		
Control in the event of failure	Normal control		
Returned in normal condition	The feed-back signal is grounding level while exciting command is output.		
Service diagnosis checking screen	Screen No.	3	F-1 POWER BOOST
	Screen No.		
	Screen No.		
Checking object		Checking contents and remedy	
1	• Swing parking solenoid valve SV-1	When F023 is cancelled and other error occurs by exchanging the connector for other solenoid valve. Check solenoid valve unit for possible failure. If failure found, replace it.	
2	• Wiring between swing parking solenoid valve and controller CN-123F CN-105F	When F023 is displayed after the connector is exchanged with other solenoid valve. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.	
3	• Mechatro controller	Check that the error is corrected after replacement of controller.	

Table46-70

Error code	F031		
Trouble	Travel 1, 2 speed solenoid valve and output transistor OFF are failure, and grounding is short-circuit.		
Judging condition	The feed-back signal is grounding level while exciting command is output.		
Symptom	Travel 2 speed is not obtainable.		
Control in the event of failure	Normal control		
Returned in normal condition	The feed-back signal is 24V level while exciting command is output.		
Service diagnosis checking screen	Screen No.	3	F-3 1/2-TRAVEL
	Screen No.		
	Screen No.		
Checking object		Checking contents and remedy	
1	• Travel 1, 2speed solenoid valve SV-3	When F031 is cancelled and other error occurs by exchanging the connector for other solenoid valve. Check solenoid valve unit for possible failure. If failure found, replace it.	
2	• Wiring between travel 1, 2speed solenoid valve and controller CN-122F CN-105F	When F031 is displayed after the connector is exchanged with other solenoid valve. Check wiring for possible failure according to the wiring checking procedure and repair it if necessary.	
3	• Mechatro controller	Check that the error is corrected after replacement of controller.	

46. TROUBLE SHOOTING (BY ERROR CODES)

Table46-91

Error code	R024		
Trouble	Wiper motor forward rotation relay error		
Judging condition	The mechatro controller output line to wiper motor forward rotation relay is short-circuited with the power source.		
Symptom	Wiper does not move.		
Control in the event of failure	Relay output is stopped.		
Returned in normal condition	When the power is OFF		
Service diagnosis checking screen	Screen No.	25	CW MOTOR RLY
	Screen No.		
	Screen No.		
Checking object		Checking contents and remedy	
1	<ul style="list-style-type: none"> Wiper motor forward rotation relay R-29 	<p>When error is cancelled after removing wiper motor forward rotation relay, check relay unit for failure, replace it with new one if failed.</p> <p>When resistance between relays (1) and (2) is $0\ \Omega$, it is in abnormal condition.</p> 	
2	<ul style="list-style-type: none"> Wiring between wiper motor forward rotation relay and controller CN-109F, CN2-1 Fuse & relay box E-1 	<p>When R024 is left displayed with the relay removed</p> <p>Check that no power 24V is produced on relay (-) line according to the wiring checking procedure and replace it if necessary.</p> <p>When no failure found after checking on wiring and R024 is left displayed</p> <p>Replace fuse/relay box.</p>	
3	<ul style="list-style-type: none"> Mechatronics controller 	<p>Check that the error is corrected after replacement of controller.</p>	

47. TROUBLESHOOTING (BY SYMPTOM)

Issue	Date of Issue	Applicable Machines	Remarks
First edition	January, 2007	E215B : YQ11-06001~	5-4740

47. TROUBLESHOOTING (BY SYMPTOM)

No.	Sections	Contents/normal value		Corrective action, others
5	Secondary pressure of P1, P2 unload proportional valve	Measure the proportional valve secondary pressure directly at the ports A7 and A5 of 8 sections solenoid block	Check that P1/P2 unload secondary pressures are within the range of 0.5 to 1.2MPa in arm out full lever and high idling operation	Replace proportional valve
6	Measurement of current value of P1/P2 pump proportional valve	Carry out service diagnosis	<ul style="list-style-type: none"> •No.9 E-1 P1 pump E-2 P2 pump •See Service Diagnosis Data List Operation No.9 Arm out full lever & in operation 	In case where the reading is largely differed from the actually measured value, check proportional valve and controller for possible failure.
7	Secondary pressure of P1, P2 pump proportional valve	Measure the pump proportional valve secondary pressure directly (Ports a3, a4)	Check that P1/P2 pump proportional valve pressures are within the range of 1.5 to 2.7MPa in arm out full lever and high idling operation (Secondary pressure is affected by oil temperature and attachment weight)	Replace proportional valve
8	Measurement of current value of travel straight proportional valve	Carry out service diagnosis	<ul style="list-style-type: none"> •Check that the value is not change regardless of operation •See Service Diagnosis Data List Operation No. 1 Operation is nil Operation No.18 Travel right full lever & idling Operation No.19 Travel left full lever & idling 	<ul style="list-style-type: none"> •Check pressure sensor of travel •In case where the reading is largely differed from the actually measured value, check proportional valve and controller for possible failure.
9	Secondary pressure of travel straight proportional valve	Measure directly the proportional valve secondary pressure at the ports A6 (travel straight) of 8 sections solenoid block	0.8MPa or less in high idling operation regardless of neutral/operation	Replace proportional valve
10	Remote control valve	Check targeted remote control valve	Check that spool is free from abnormal damage and spring is free from breakage	Replace
11	Main relief valve <Trouble> Relief pressure is low.	Check set pressure	•See Service Diagnosis Data List Operation No.3 boom up full lever and relief	Reset or replace
12	Over load relief valve <Trouble> P1, P2 pressure is low.	Visual check (Rod side)	<ul style="list-style-type: none"> •Pressure is 32MPa or more in arm out and relief. •Free from dust entered in over load relief valve. Seat is free from abnormality 	When only relief pressure of arm out is low, replace valve
13	Arm 1 spool <Trouble> P2 pressure is high.	Visual check	<ul style="list-style-type: none"> •When removing, free from abnormal resistance against sliding •Free from abnormal damage, etc on outside surface •Spring is free from breakage. 	Replace (Check on the casing side for damage)
14	Arm 2 spool <Trouble> P1 pressure is high.	Visual check	<ul style="list-style-type: none"> •When removing, free from abnormal resistance against sliding •Free from abnormal damage, etc on outside surface •Spring is free from breakage. 	Replace (Check on the casing side for damage)

47. TROUBLESHOOTING (BY SYMPTOM)

No.	Sections	Contents/normal value		Corrective action, others
14	Travel motor	Visual check	Inner parts (piston, cylinder block, valve plate, brake valve spool) are to be free from abnormal resistance against sliding. Free from abnormal damage, etc on outside surface (brake plate etc)	Replace
15	Travel reduction gear oil	Take sample oil from travel reduction gear drain	Sampling oil does not include a lot of metal powder.	Disassemble and inspect reduction gear
16	Travel reduction	Visual check	Tooth surface is not worn abnormally and is not chipped.	Replace
17	Pump regulator	Visual check	When removing, free from abnormal resistance against sliding Free from abnormal damage, etc on outside surface Spring free from breakage, damage, etc.	Replace
18	Pump	Visual check	When removing, inside parts (cylinder block, piston, valve plate, shaft, etc.) are free from abnormal resistance against sliding, abnormal damage, etc.	Replace

(17) Travel 1/2 speed cannot be switched

(In the case of traveling under heavy loading (for example traveling on a slope or traveling on a soft ground), the speed sometimes does not change from 1st to 2nd even though the machine has the function of automatic speed change.)

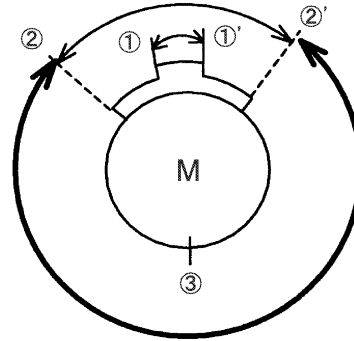
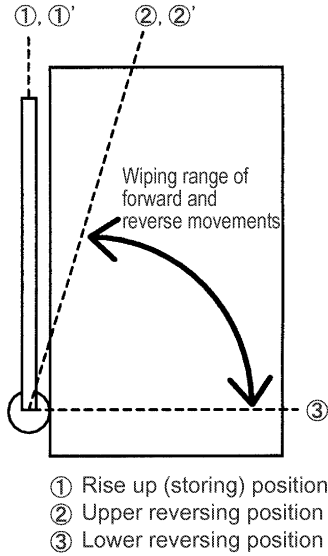
No.	Sections	Contents/normal value		Corrective action, others
1	Travel 1/2 speed switching solenoid	Carry out service diagnosis	Switch travel 1/2 speed to 2nd speed No.3 F-3 1/2-TRAVEL Lever neutral COMP OFF, MEAS OFF Travel operation COMP ON, MEAS ON	Check pressure sensor Check harness Check travel 1/2 speed switch on gauge cluster
2	Travel 1/2 speed switching solenoid	Measure A3 port pressure on solenoid valve	Lever neutral: 0MPa In operation: 4MPa or more	Replace solenoid valve
3	1/2 speed switching spool in travel motor	Visual check	Check that spool is free from abnormal damage and spring is free from breakage	Replace (Check on the casing side for damage)
4	1/2 speed switching orifice in travel motor	Visual check	Free from entry of dust	Remove dust or replace
5	Tilting piston in travel motor	Visual check	Free from abnormal wear on piston and seal	Replace (Check on the casing side for damage)

(18) Machine does not stay on a slope in traveling

No.	Sections	Contents/normal value		Corrective action, others
1	Pilot pressure sensor	Carry out service diagnosis	•Engine stop & starter key switch is ON Targeted pilot low pressure sensor is in range of 0 to 0.1MPa	Check pressure sensor and replace as necessary Check remote control valve
2	Remote control valve	Check targeted remote control valve	Check that spool is free from abnormal damage and spring is free from breakage	Replace

47. TROUBLESHOOTING (BY SYMPTOM)

(5) Wiper does not function

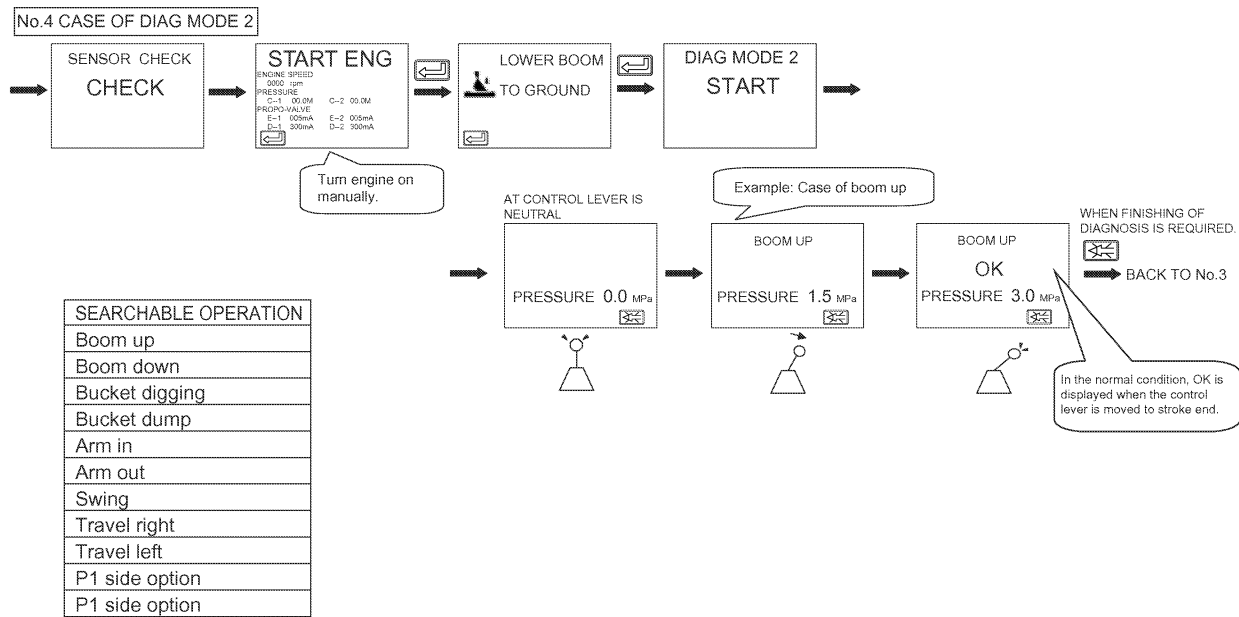


Wiper motor

①~①' Rise up limit switch's ON range
②~②' Reverse limit switch's ON range

No.	Sections	Contents/normal value	Corrective action, others																																																
1	Fuse	Check fuse No.20	Replace fuse																																																
2	SW-19: Wiper interlock switch	Service diagnosis No.19 D125 Wiper switch display (D125) is OFF with front window closed.	Check wiper interlock switch and repair it if necessary Check according to "WIRING CHECKING PROCEDURE" and repair it if necessary																																																
3	Rise up limit switch built-in wiper motor Reverse limit switch	Service diagnosis No.25 Wiper system Switch action in operation <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>Normal condition</td> <td>①~①'</td> <td>①~②,①'~②'</td> <td>②~③~②'</td> </tr> <tr> <td>Rise up limit switch</td> <td>ON</td> <td>OFF</td> <td>OFF</td> </tr> <tr> <td>Reverse limit switch</td> <td>ON</td> <td>ON</td> <td>OFF</td> </tr> </table>	Normal condition	①~①'	①~②,①'~②'	②~③~②'	Rise up limit switch	ON	OFF	OFF	Reverse limit switch	ON	ON	OFF	Check according to "WIRING CHECKING PROCEDURE"																																				
Normal condition	①~①'	①~②,①'~②'	②~③~②'																																																
Rise up limit switch	ON	OFF	OFF																																																
Reverse limit switch	ON	ON	OFF																																																
4	R-31: Arc prevention relay R-29: Forward rotation relay R-30: Reverse rotation relay	Service diagnosis No.25 Wiper system <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>When started by forward rotation:</td> <td>STOP</td> <td>START①</td> <td>①~②</td> <td>②~③</td> <td>③~②'</td> <td>②' (STOP)</td> <td>②'(REVERSE)</td> <td>②'~③</td> <td>③~②</td> <td>② (STOP)</td> <td>②(FORWARD)</td> </tr> <tr> <td>Arc prevention relay</td> <td>OFF</td> <td>ON</td> <td>ON</td> <td>ON</td> <td>ON</td> <td>OFF</td> <td>ON</td> <td>ON</td> <td>ON</td> <td>OFF</td> <td>ON</td> </tr> <tr> <td>Forward rotation relay</td> <td>OFF</td> <td>ON</td> <td>ON</td> <td>ON</td> <td>ON</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> <td>ON</td> </tr> <tr> <td>Reverse rotation relay</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> <td>ON</td> <td>ON</td> <td>ON</td> <td>OFF</td> <td>OFF</td> </tr> </table> Check that the relay is worked as shown in the table. * When the limit switch does not change in OFF after 4 seconds from the wiper startup, turn OFF all relay's outputs.	When started by forward rotation:	STOP	START①	①~②	②~③	③~②'	②' (STOP)	②'(REVERSE)	②'~③	③~②	② (STOP)	②(FORWARD)	Arc prevention relay	OFF	ON	ON	ON	ON	OFF	ON	ON	ON	OFF	ON	Forward rotation relay	OFF	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	ON	Reverse rotation relay	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	OFF	OFF	Check that the relay is excited. Check relay & fuse box and replace it if necessary.
When started by forward rotation:	STOP	START①	①~②	②~③	③~②'	②' (STOP)	②'(REVERSE)	②'~③	③~②	② (STOP)	②(FORWARD)																																								
Arc prevention relay	OFF	ON	ON	ON	ON	OFF	ON	ON	ON	OFF	ON																																								
Forward rotation relay	OFF	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	ON																																								
Reverse rotation relay	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	OFF	OFF																																								

48. TROUBLESHOOTING (TROUBLE DIAGNOSIS MODE)



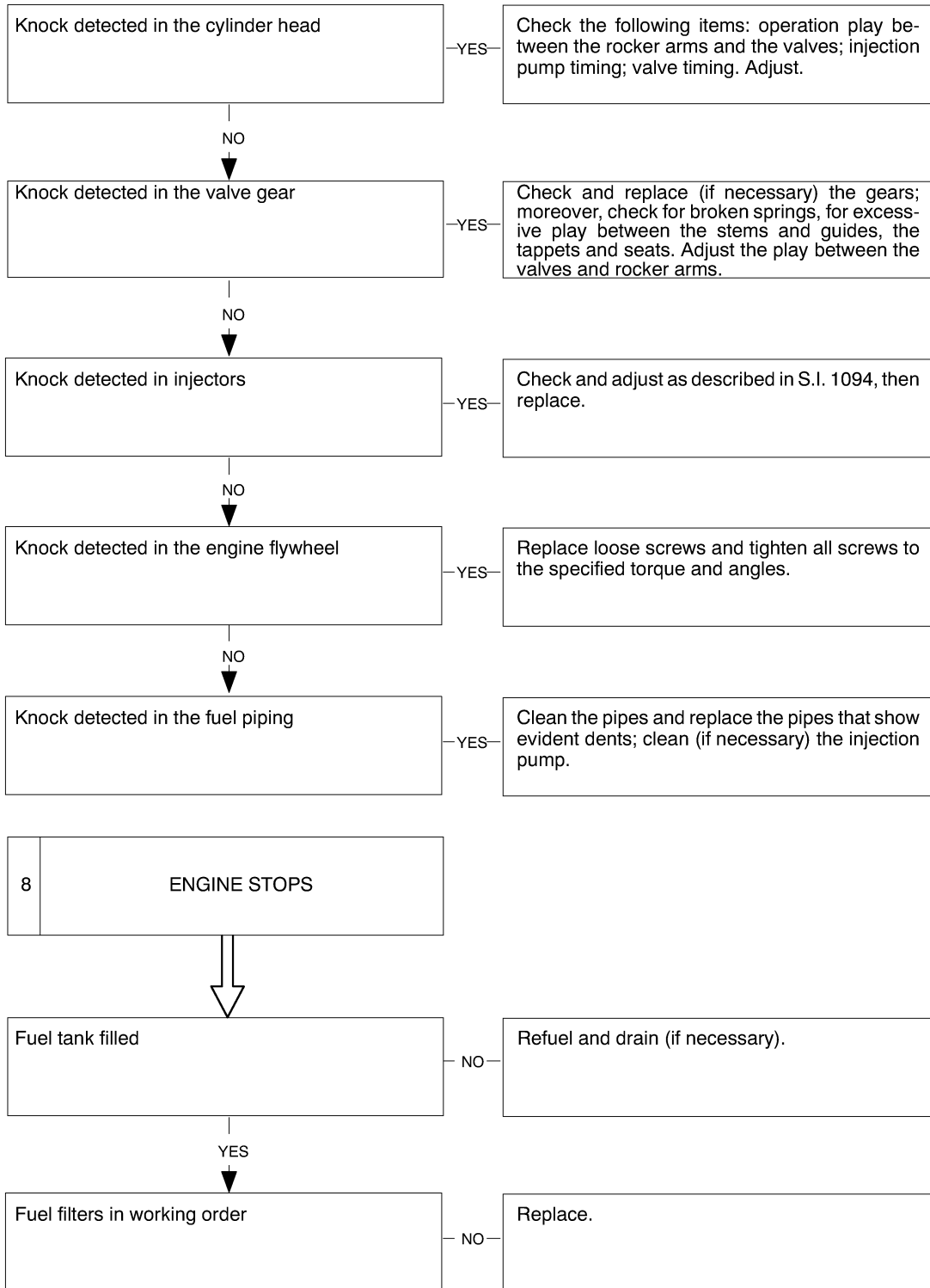
Notes:

- When the trouble diagnosis mode is operating, lower the attachment and put the bucket on the ground. If the machine failed; the unexpected touch to the lever may move the attachment and it causes injury or death. Because the bucket-grounded/bucket-not-grounded can not be automatically identified, do not fail to start operating the trouble diagnosis mode after making sure of the bucket-grounded condition. Place the bucket on the ground between both crawlers.
- In the case of "DIAG MODE2", pump pressure is unloaded with unload valve in order not to actuate attachment. When trouble diagnosis is performed, if the pump pressure is generated, the engine stops and "UN-LOAD PSV NG" is displayed. Check the troubled section according to indication.
- When the trouble diagnosis mode is executing, the error display with self-diagnosis and warning does not appear. If necessary, examine the presence or absence of trouble referring to the trouble history.

Table48-1 Failure diagnosis Mode-1/Diagnosis item

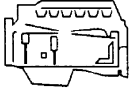

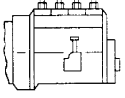



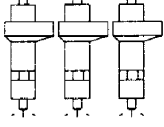
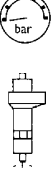
No.	Display	Contents of diagnosis
1	1 P1 UNLOAD	Is normal pressure generated in the condition that the flow rate at P1 side is minimum and the unloading valve is in the emergency position?
2	2 P1 UNLOAD	Is normal pressure generated in the condition that the minimum flow rate is relieved at P1 side?
3	3 P1 UNLOAD	Is normal pressure generated in the condition that the unload valve is fully opened, and P1 side flow rate is minimum?
4	1 P2 UNLOAD	Is normal pressure generated in the condition that the unload valve is in emergency position, and P2 side flow rate is minimum?
5	2 P2 UNLOAD	Is normal pressure generated in the condition that the minimum flow rate is relieved at P2 side?
6	3 P2 UNLOAD	Is normal pressure generated in the condition that the unload valve is fully opened, and P2 side flow rate is minimum?
7	1 P1 PUMP	Is normal pressure generated in the condition that the flow rate at P1 side is emergency and the unloading valve is in the emergency position?
8	2 P1 PUMP	Is normal pressure generated in the condition that the unload valve is emergency, and P1 side flow rate is minimum?
9	3 P1 PUMP	Is normal pressure generated in the condition that the unload valve is in emergency position, and P1 side flow rate is maximum?
10	1 P2 PUMP	Is normal pressure generated in the condition that the flow rate at P2 side is emergency and the unloading valve is in the emergency position?
11	2 P2 PUMP	Is normal pressure generated in the condition that the unload valve is emergency, and P2 side flow rate is minimum?
12	3 P2 PUMP	Is normal pressure generated in the condition that the unload valve is in emergency position, and P2 side flow rate is maximum?

DIAGNOSTICS



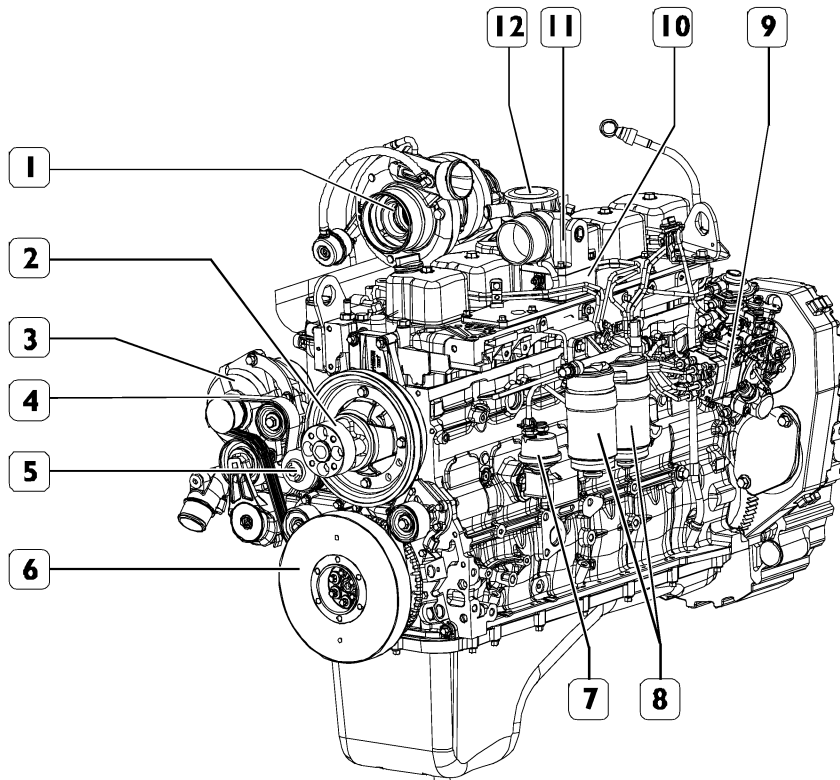
(to be continued)

6.7 L T/A ENGINE OVERHAUL

	Type	667TA
		MEB
COOLING		By fluid
Water pump drive:		By means of belt
Thermostat:		
Start of opening: °C		81 ± 2
 Ambra Master gold HSP 15W40	REFUELLING - engine sump + filter - engine sump	litres 18.3 litres 15.5
	FEEDING Bosch-type injection	VE6 / 12 F 1000 LV
	Pump setting	0° ± 0°.5
	Start of delivery	mm 1
	Type of nozzle	DSLA 145 P
	Injection sequence	1 - 5 - 3 - 6 - 2 - 4
	Injection pressure (bar)	-

667TA ENGINES

Figure 1



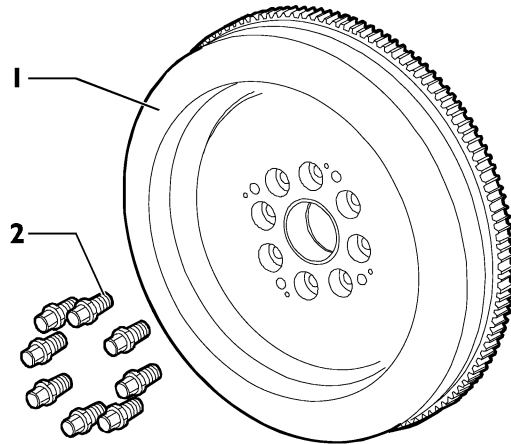
1. Turbocharger - 2. Fan coupling - 3. Alternator - 4. Poly V drive belt - 5. Water pump -
6. Damper flywheel - 7. Fuel supply pump - 8. Fuel filters - 9. Rotary injection pump -
10. Air heater for cold starting - 11. Intake manifold - 12. Blow-by

Engine flywheel

The flywheel (1) does not need being positioned in a fixed manner on the drive shaft, since it does not bear any stamping, notch or reference hole for sen-

sors or timing. The equidistance of fastening screw holes (2) allows it to be mounted in any position.

Figure 13



View of engine flywheel

6.7 L T/A ENGINE OVERHAUL

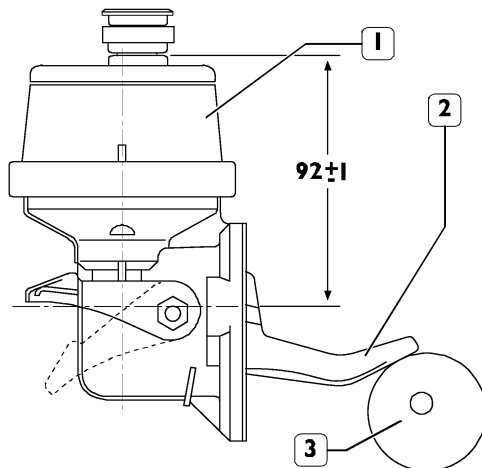
Mechanical fuel pump

Volumetric pump, assembled on the left side of the engine, supplies the injection pump. It is controlled by the camshaft.

Characteristics

Priming at 60 rpm :	max 28 cycles
Unitary displacement 60 rpm:	~10 cm ³
Static pressure at 1800 rpm:	0.47±0.61 bar
Minimum capacity at 600 rpm:	111.3 L/h
Minimum capacity at rpm:	127.3 L/h

Figure 30

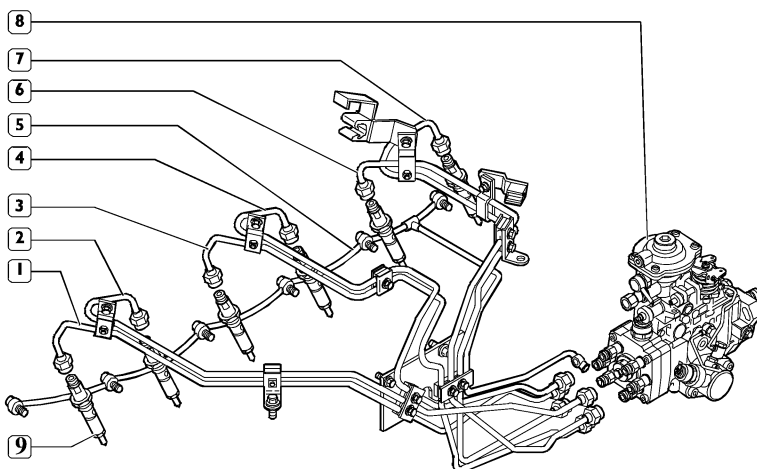


116725

1. Pump - 2. Control lever - 3. Distributing shaft

Injection assembly

Figure 31

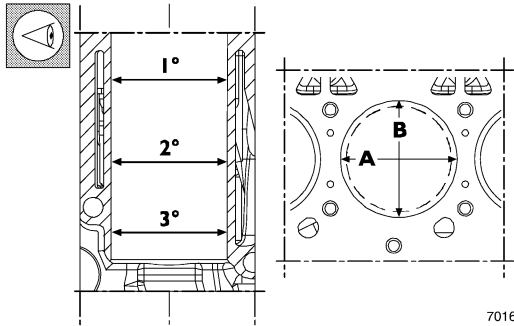


86495

1. Injector fuel pipe 1 - 2. Injector fuel pipe 2 - 3. Injector fuel pipe 3 -
4. Injector fuel pipe 4 - 5. Fuel discharge pipe from injectors - 6. Injector fuel pipe 5 -
7. Injector fuel pipe 6 - 8. Injection pump - 9. Injector

6.7 L T/A ENGINE OVERHAUL

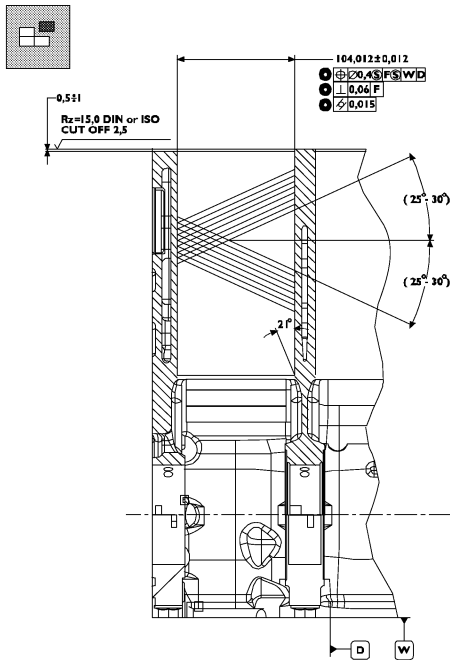
Figure 70



70167

Measurements must be taken for each single cylinder, at three different heights of the liner and on two planes perpendicular to each other: one parallel to the engine longitudinal axis (A), the other perpendicular (B); the greatest amount of wear is usually found on the latter plane and during the first measurement. When detecting out-of-roundness, taper or wear, the cylinder liners must be bored and refaced. Cylinder liner reconditioning must be performed with regard to the spare piston diameter increased by 0.5 mm of the rated value, and to the prescribed assembling play.

Figure 71



116734

IMPORTANT - In case of reconditioning, all the liners must be machined to the same increase (0.5 mm).

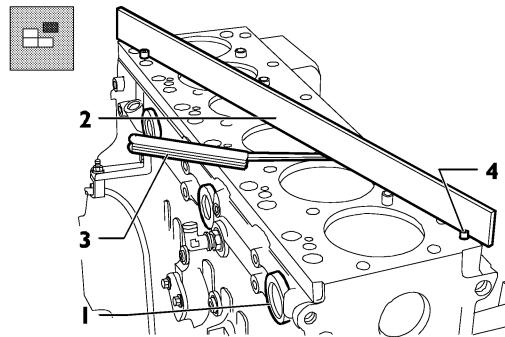
Check the main bearing seats as follows:

- mount the bed caps on the supports without bearings;
- tighten the fastening screws to the specified torque;
- check, by means of an adequate internal comparator, that the seat diameter is the same as the specified value.

If a greater value is found, replace the crankcase.

Checking the surface supporting the head on the cylinder cluster

Figure 72



84088

Verify that the head supporting plane on the cylinder cluster does not show deformations.

This check can be carried out by taking off dowels (4) by means of a gauged rule (2) and thickness gauge (3).

After detecting the deformed areas, flatten the supporting surface by means of a grinder.

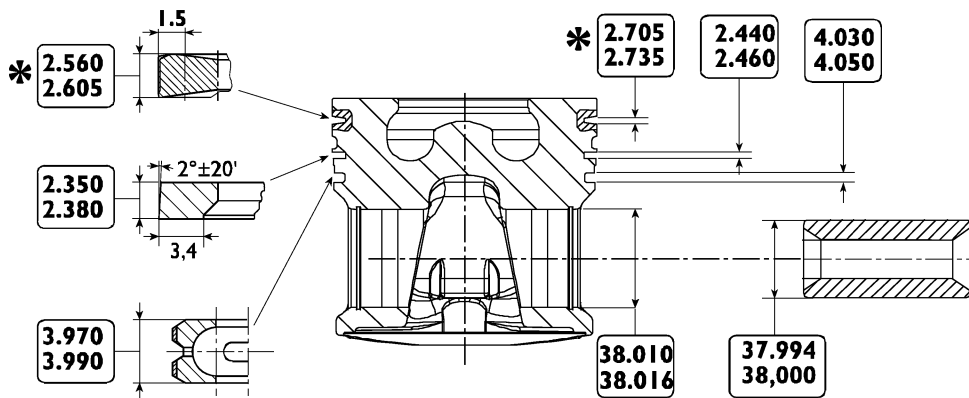
The flatness error must not be greater than 0.075 mm.

NOTE - Crankcase flattening may be carried out only after making sure, when the repair work has been completed, that the protrusion of the piston from the cylinder liner is not greater than the specified value.

Check the condition of cylinder cluster working caps (1); they must be replaced if they are rusty or their sealing properties are in doubt.

After flattening, restore the cylinder liner countersink, as shown in Figure 71.

Figure 99



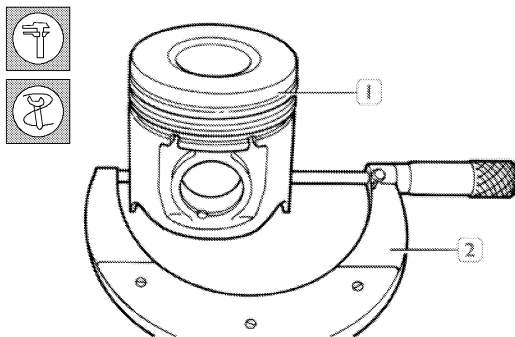
* Measured at Ø 101 mm

116198

MAIN DATA OF PISTON

Measuring the piston diameter

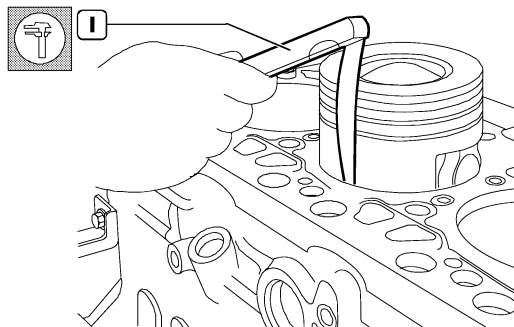
Figure 100



84096

Measuring the piston diameter (1) by means of a micrometer (2) to determine the assembling play.

Figure 101



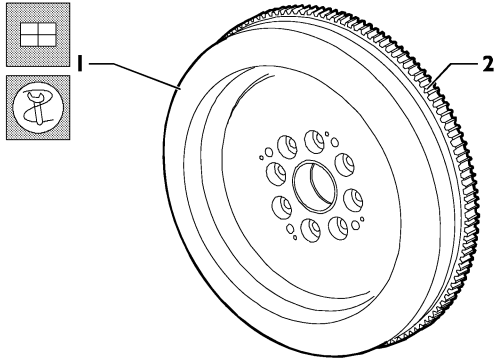
70192

The play between the piston and the cylinder liner can also be measured by means of a thickness gauge (1) as shown in the figure.

NOTE - The diameter must be measured 61 mm far from the piston skirt base.

Engine flywheel

Figure 137

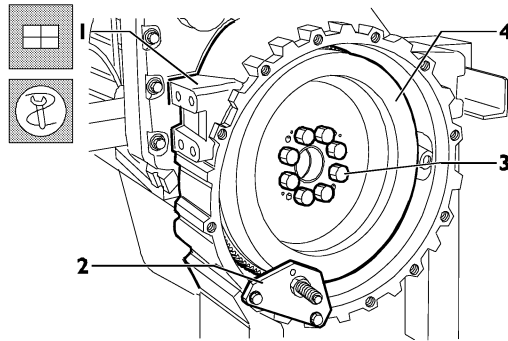


84111

Replacing the engine flywheel ring gear

Check the condition of ring gear (2) teeth. If breaks or excessive tooth wear is found, remove the ring gear from the engine flywheel (1) by using a normal beater, then mount the new gear ring after previously heating it to 150 °C for 15' to 20'; the countersink made on the gear ring inner diameter must face the engine flywheel.

Figure 139

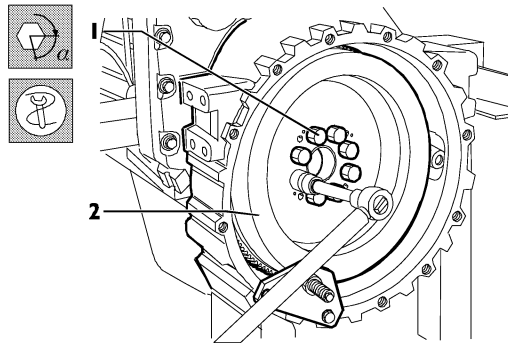


84075

Apply tool (2) to the flywheel cover case (1) to stop engine flywheel (3) rotation.

Tighten screws (4) fastening engine flywheel (3) to the drive shaft.

Figure 140



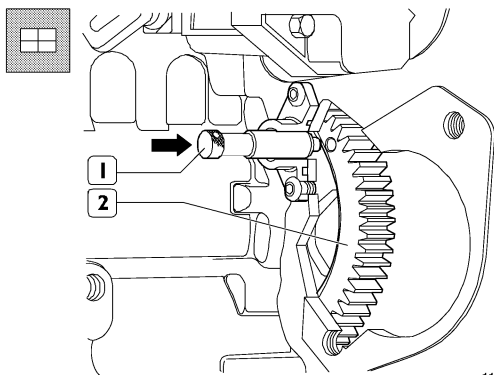
84114

Tighten engine flywheel (2) fastening screws (1) in two separate phases:

- 1st phase: tighten to a torque of 30 ± 5 Nm by means of a torque wrench;
- 2nd phase: angle-tighten to $60^\circ \pm 5^\circ$.

IMPORTANT - Angle tightening is carried out by means of tool 380001001.

Figure 138



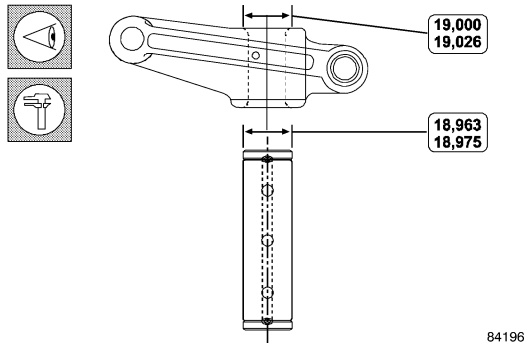
116733

Screw down two pins (2) of adequate length into the shaft holes (3), then remove the engine flywheel (1) by means of suitable harnesses and a hoist.

Remove the engine flywheel lock.

6.7 L T/A ENGINE OVERHAUL

Figure 180

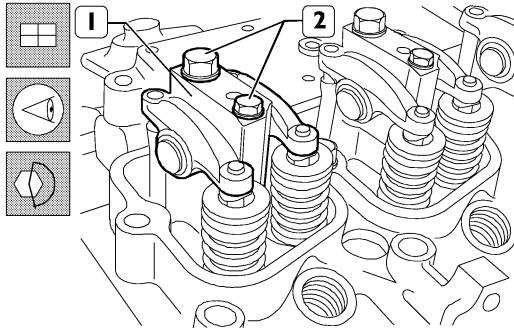


84196

MAIN DATA OF ARBOUR-ROCKER ARM

Verify that the arbour/rocker arm matching surfaces do not show excessive wear or damages.

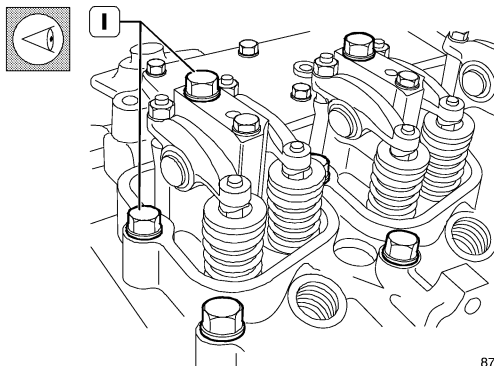
Figure 181



84197

Verify that the tappet adjusters are unscrewed to prevent the latter from crawling on the rods when the rocker arm assembly (1) is mounted. Mount the rocker arm assembly made up of the arbours and rocker arm support, then secure them to the head without torque-tightening screws (2).

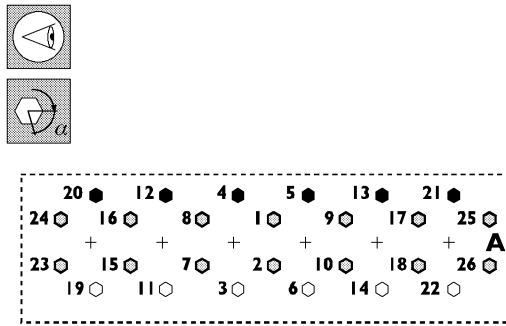
Figure 182



87036

Fasten the head screws (1) according to the instructions given Figure 183.

Figure 183

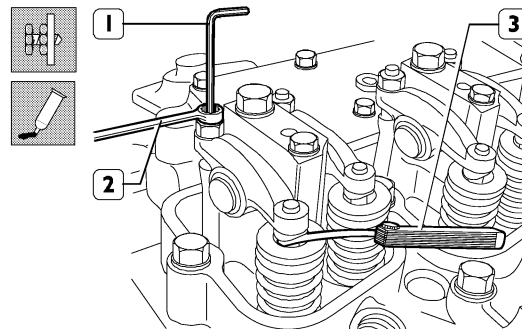


84199

Scheme of cylinder head fastening screw tightening sequence:

- 1st phase: pre-fastening by means of a torque wrench:
screw M12 x 1.75 x 70 [] 50 Nm ± 5 Nm;
screw M12 x 1.75 x 140 [] 40 Nm ± 5 Nm;
screw M12 x 1.75 x 180 [] 70 Nm ± 5 Nm;
- 2nd phase: angle tightening: 90°
- 3rd phase: angle tightening only for screws 140 and 180 mm long: 90°.

Figure 184



87037

Adjust the play between the rocker arms and the valves by means of an Allen wrench (2), box wrench (3) and thickness gauge (1).

- The operation play is:
- intake valves: 0,25 ± 0,05 mm
 - exhaust valves: 0,50 ± 0,05 mm.

Take the cylinder where clearance must be adjusted to the bursting phase; its valves are closed while balancing the symmetric cylinder valves.

Symmetric cylinders are 1-6, 2-5 and 3-4.

FIRING ORDER 1-5-3-6-2-4

Adjusting cylinder valve no.	1	5	3	6	2	4
Adjusting clearance of cylinder valve no.	6	2	4	1	5	3

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