HYDRAULIC EXCAVATOR

SHOP MANUAL model SK115SR SK115SR L SK135SR (LC) SK135SR L

INDEX

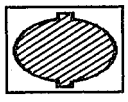
KOBELCO

Book code No. S5YY0002E②

(9) When water has entered in the waterproofed connector, the removing of water is not easy. So check the removed waterproofed connector with care to protect it from entry of water. If moisture adheres on it, dry it completely before connecting.

⚠ Battery electrolyte is dangerous.
The battery electrolyte is dilute sulfuric acid, and causes scald and loss of eyesight by adhering on eyes, skin and clothes. When the electrolyte has adhered on them, take an emergency measure immediately and see a doctor for medical advice.

- o When it has adhered on skin ;
  Wash with soap and water.
- o When it has got in eyes ;
  Wash in water for 10 minutes or more immediately.
- o When it has spilled out in large quantity ;
  Use sodium bicarbonate to neutralize, or wash away with water.
- o When it was swallowed ;
  Drink milk or water.
- o When it has adhered on clothes ;
  Wash it immediately.



1.5 HYDRAULIC PARTS

1) O ring
   - Check that O ring is free from flaw and has elasticity before fitting.
   - Even if the size of O ring is equal, the usage differs, for example in dynamic and static sections, the rubber hardness also differs according to the pressure force, and also the quality differs depending on the materials to be seated. So, choose proper O ring.
   - Fit O ring so as to be free from distortion and bend.
   - Floating seal should be put in pairs.
2) Flexible hose (F hose)
   - Even if the connector and length of hose are the same, the parts differ according to the withstanding pressure. Use proper parts.
   - Tighten it to the specified torque, and check that it is free from distortion, over tension, interference, and oil leakage.

1.6 WELD REPAIR

(1) The weld repair should be carried out by authorized personnel in the specified procedure after disconnecting the grounding cable of battery. If the grounding cable is not disconnected, the electrical equipment may be damaged.
(2) Remove parts which may cause flame due to the entry of spark beforehand.
(3) Repair attachments which are damaged, giving particular attention to the plated section of piston rod to protect it from sparks, and don't fail to cover the section with fire clothes.

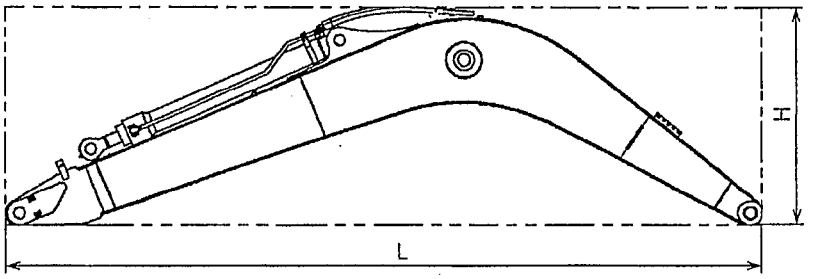
1.7 ENVIRONMENTAL ISSUES

(1) Engine should be started and operated in the place where air can be sufficiently ventilated.
(2) Industrial waste disposal
The following parts follows the regulation.
Waste oil, waste container
Battery
(3) Asbestos parts
Breathing dust that may be generated when handling components containing asbestos fibers raises danger of getting lung cancer.
Don't raise dust by compressed air and breath it.
Parts to be handled with care :
Brake parts, gasket, etc.
(4) Precautions for handling hydraulic oil
Hydraulic oil may cause inflammation of eyes.
Wear goggles to protect eyes on handling it.
- o When it has got in eyes ;
  Wash eyes with water until the stimulus is gone.
- o When breathed dust ;
  Immediately see a doctor for medical advice.
- o When it has adhered on skin ;
  Wash with soap and water.

(5) Others
For spare parts, grease and oil, use KOBELCO genuine ones.

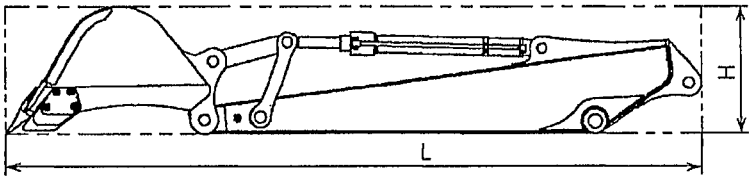
● OVERALL DIMENSIONS OF BOOM

Item \ Type		4.6m (15ft-1in) Boom
Length×Height×Width L×H×W	m(ft-in)	4.76×1.39×0.57 (15′ 7″×4′ 7″×1′ 10″)
Weight	kg (lbs)	940 (2,080)



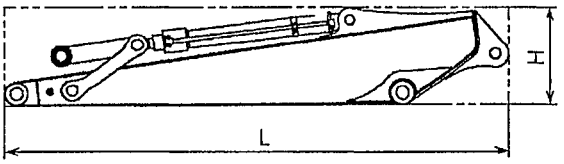
● OVERALL DIMENSIONS OF ARM+BUCKET

Item \ Type		2.45m (8ft) Arm+0.5m³ (0.65cu·yd) Bucket
Length×Height×Width L×H×W	m(ft-in)	4.36×0.81×1.00 (14′ 4″×2′ 8″×3′ 3″)
Weight	kg (lbs)	950(2,100)



● OVERALL DIMENSIONS OF ARM

Item \ Type		2.45m (8ft) Arm
Length×Height×Width L×H×W	m(ft-in)	3.20×0.61×0.37 (10′ 10″×2′ ×1′ 3″)
Weight	kg (lbs)	580(1,280)

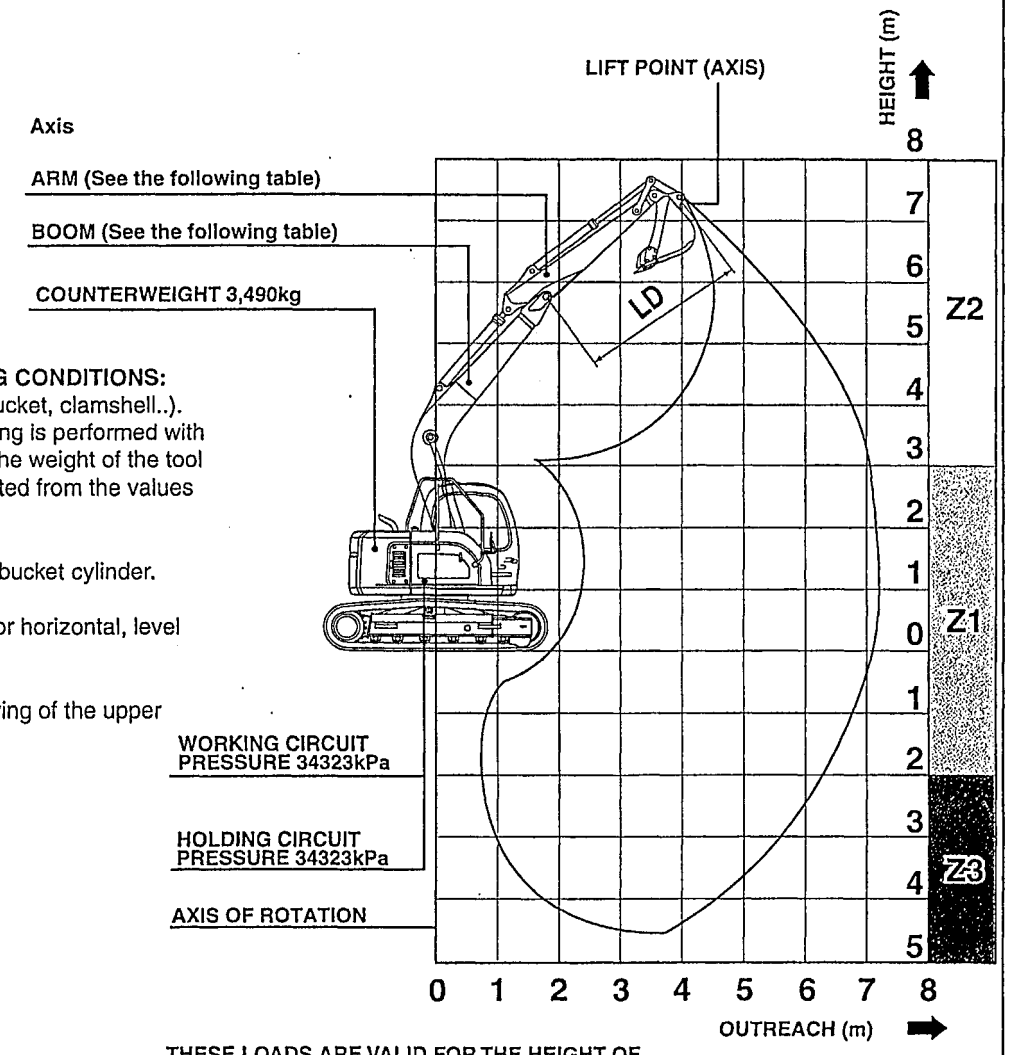


SK135SRLC

RATED OBJECT HANDLING CAPACITIES TABLE

SK135SRLC

SHOE WIDTH 600mm



WORKING CONDITIONS:

- with no tool (bucket, clamshell..). If object handling is performed with tool installed, the weight of the tool shall be deducted from the values of this table.
- with extended bucket cylinder.
- on a compact or horizontal, level ground.
- in complete swing of the upper structure

THESE LOADS ARE VALID FOR THE HEIGHT OF THE CONSIDERED ZONE (Z.) FOR THE INTENDED OUTREACH

BOOM LENGTH 4.60m

ARM LENGTH (m)	OUTREACH IN METERS LOADS IN KG (BOOM FOOT HEIGHT)						
	OUTREACH (m)		3	4.5	6	7.5	MAX REACH
2.45	LD= 2.70	Z2	5300	2500	1900	–	–
		Z1	4800		1600	–	1300 (7.19 m)
		Z3	4900		–	–	–
2.95	LD= 3.19	Z2	–	2500	1700	–	–
		Z1	4700		1600	1100	1100 (7.52 m)
		Z3	4800		1600	–	–

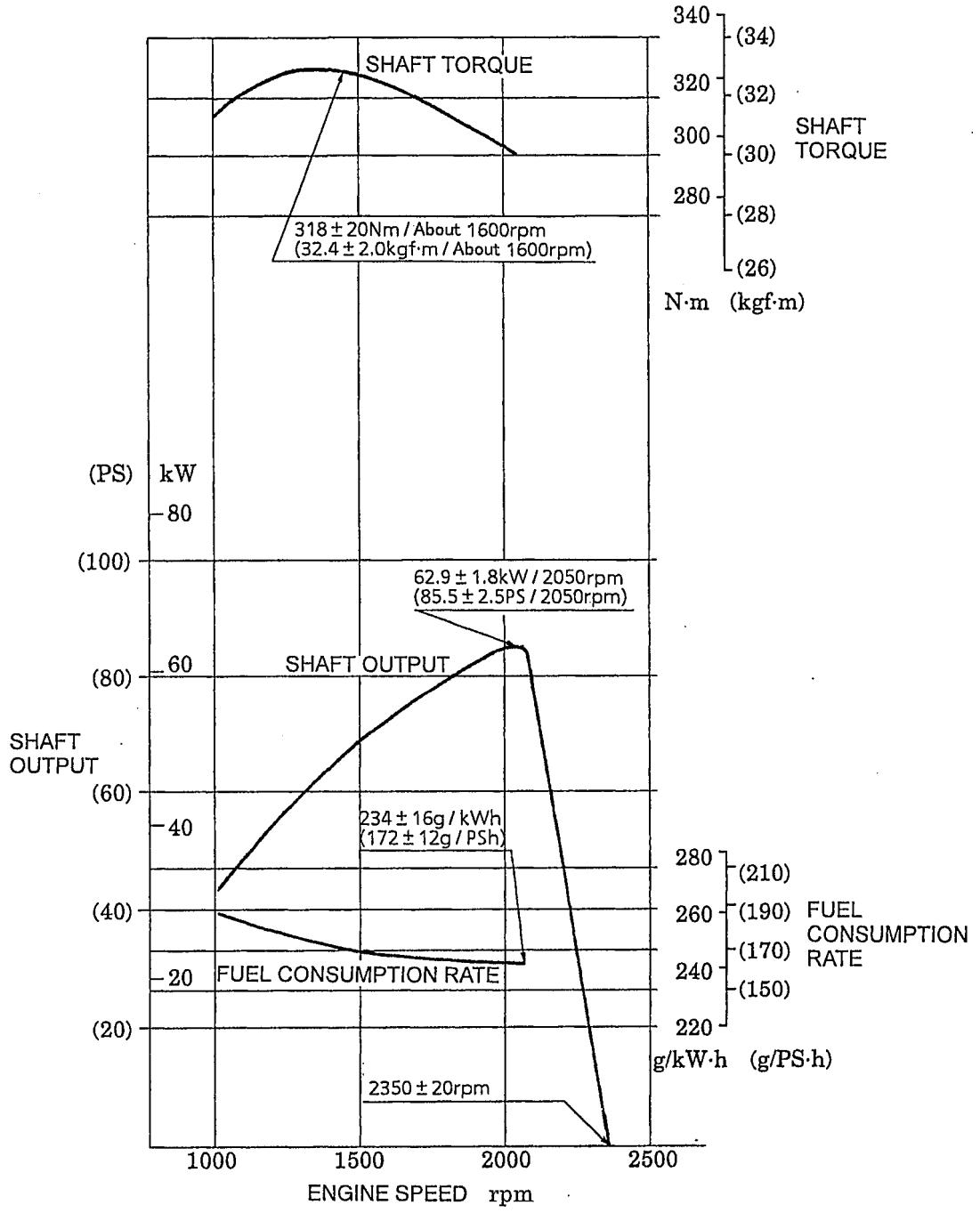
LD: BOOM POINT TO HOOK POINT DISTANCE

YY20T01013P1

SK135SR | SK135SRL

12.2 ENGINE CHARACTERISTIC CURVE (ISUZU 4BG1T)

Condition to be measured : With fan and generator
Without muffler and air cleaner



$$\text{Fuel consumption volume} = \frac{\text{Fuel consumption rate}}{0.835\times1000}\times PS\times \text{Load factor}\ (\alpha)$$

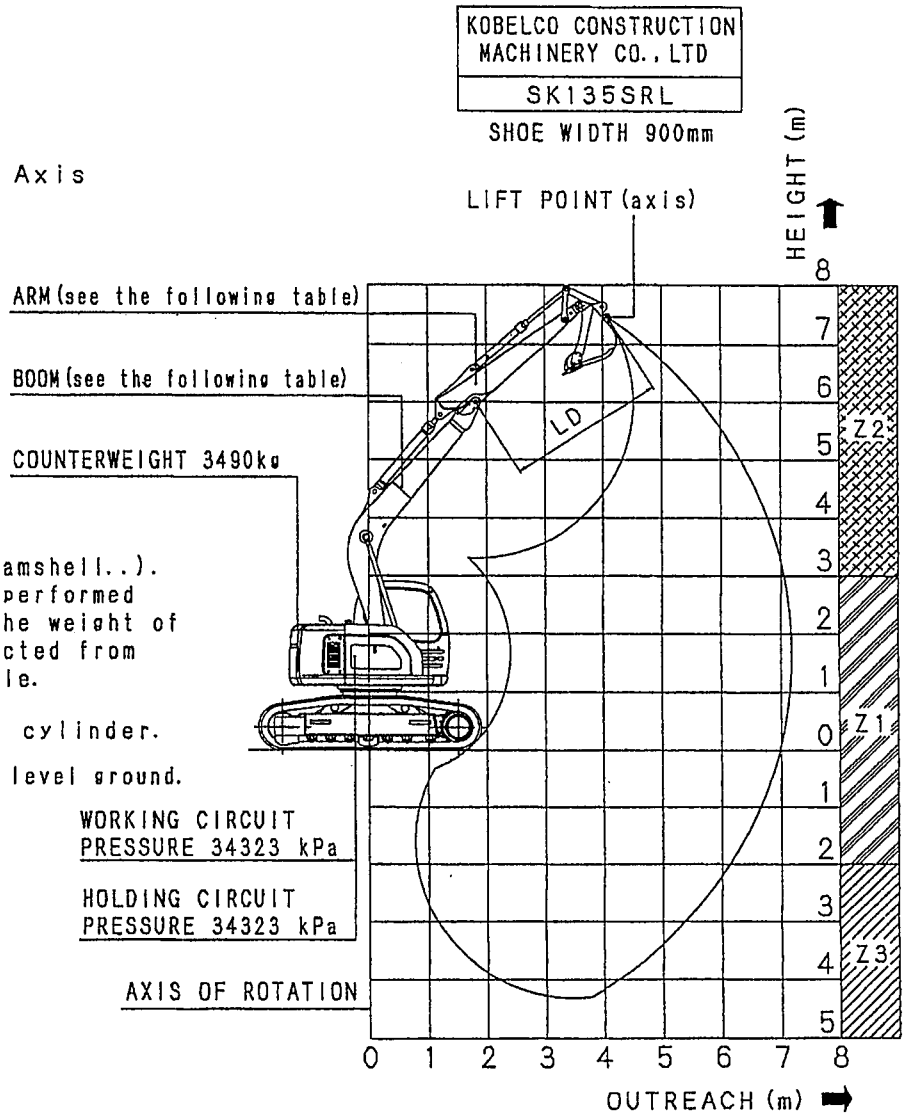
$$= \frac{172\text{g/PS·h}}{0.835\times1000}\times 85.5PS\times\alpha$$

α : Standard load factor (0.70~0.80)

$$=17.6\,\alpha\ \cdot \ell/h$$

Fuel consumption in regular operation
(load factor : 0.70~0.80)
12.3~14.1 ℓ/h

SK135SRL



WORKING CONDITIONS:

-with no tool (bucket, clamshell..). If object handling is performed with tool installed the weight of the tool shall be deducted from the values of this table.

-with extended bucket cylinder.

-on a compact horizontal level ground.

-In complete swing of the upperstructure.

THESE LOADS ARE VALID FOR THE HEIGHT OF THE CONSIDERED ZONE (Z.) FOR THE INTENDED OUTREACH

BOOM length 4.60m

ARM LENGTH (m)	OUTREACH IN m- LOADS IN kg		3	4.5	6	7.5	(BOOM FOOT HEIGHT) MAX REACH
2.45	LD= 2.70	Z2	4800	2170	1640	-	-
		Z1	6160		2130	-	1660 (7.19m)
		Z3	5040		-	-	-
2.95	LD= 3.19	Z2	4700	2980	1930	-	-
		Z1	5610		2110	1550	1540 (7.62m)
		Z3	5010		-	-	-

LD: BOOM POINT TO HOOK POINT DISTANCE

YY20T01044P1

3. BUCKET

3.1 HOE BUCKET

(1) Hoe bucket dimensional drawing

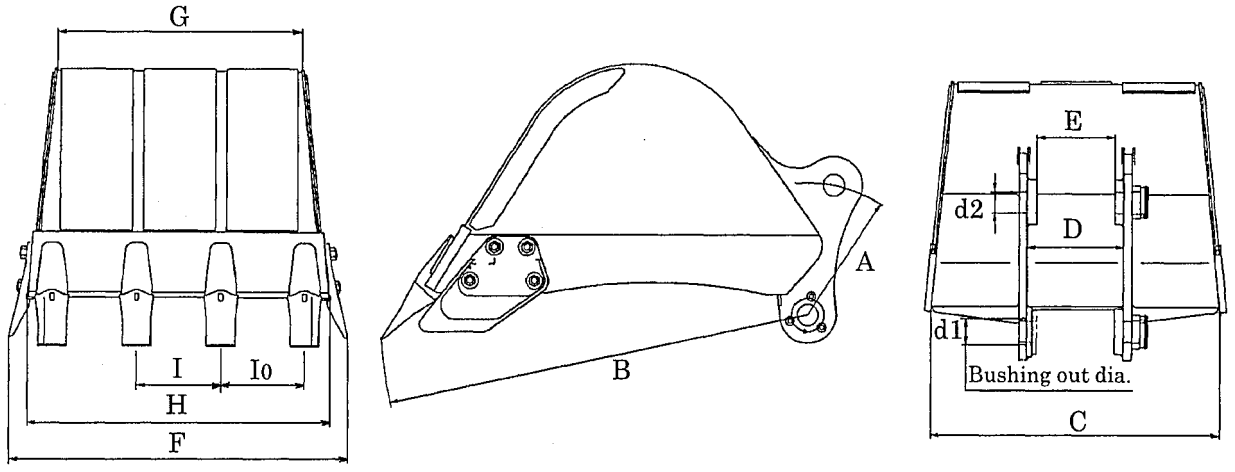


Fig. 3-1 Hoe bucket dimensional drawing

Table 3-1

No.	NAME	No.	NAME
A	Distance between pin and bracket	G	Outer width of bucket bottom
B	Distance between bucket pin and tooth end	H	Bucket outer width of front side
C	Inner width of bucket top end	I	Pitch between teeth
D	Inner width of lug	I0	Pitch between teeth
E	Inner width of bracket	d1	Outer width of bushing
F	Outer width of side cutter	d2	Pin dia.

(2) Hoe bucket dimensional table

1) SK115SRDZ , SK135SR(LC) Table 3-2 (1/2) Unit : mm (ft-in)

Type	Hoe bucket						
Capacity	〔STD〕 0.50m³ (0.65cu·yd)	0.24m³ (0.31cu·yd)	0.31m³ (0.41cu·yd)	0.38m³ (0.50cu·yd)	0.45m³ (0.59cu·yd)	0.57m³ (0.75cu·yd)	0.70m³ (0.92cu·yd)
Part No.	LP61B00030F1	LP61B00041F1	LP61B00038F1	LP61B00037F1	LP61B00040F1	LP61B00036F1	LP61B00039F1
A	370 (14.6″)	←	←	←	←	←	←
B	R1,225 (4′)	←	←	←	←	←	←
C	862 (33.9″)	462 (18.2″)	562 (22.1″)	662 (26.1″)	772 (30.4″)	962 (37.9″)	1,112 (3′8″)
D	324 (12.8″)	←	←	←	←	←	←
E	252 (9.92″)	←	←	←	←	←	←
F	1,000 (3′3″)	593 (23.3″)	700 (27.6″)	800 (31.5″)	910 (35.8″)	1,100 (3′7″)	—
G	739 (29.1″)	383 (15.1″)	439 (17.3″)	539 (21.2″)	649 (25.6″)	839 (33.0″)	989 (38.9″)
H	900 (35.4″)	500 (19.7″)	600 (23.6″)	700 (27.6″)	772 (30.4″)	1,000 (3′3″)	1,150 (3′9″)
I	193.5 (7.62″)	187 (7.36″)	237 (9.33″)	191 (7.52″)	228 (8.98″)	218.5 (8.60″)	256 (10.1″)
I0	193.5 (7.62″)	187 (7.36″)	237 (9.33″)	191 (7.52″)	228 (8.98″)	218.5 (8.60″)	256 (10.1″)
d1	∅80 (3.15″)	←	←	←	←	←	←
d2	∅65 (2.56″)	←	←	←	←	←	←

KOBELCO

Book code No. S5YY1102E

SK115SR
SHOP MANUAL SK135SR(LC)

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TOOLS

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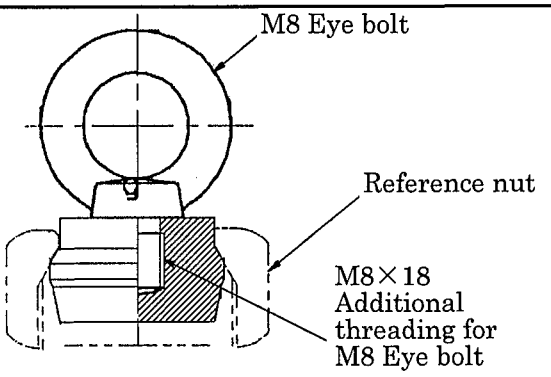
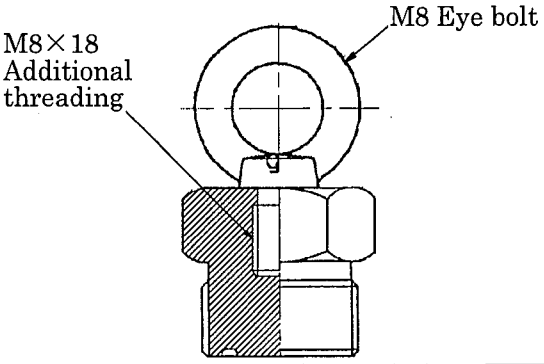
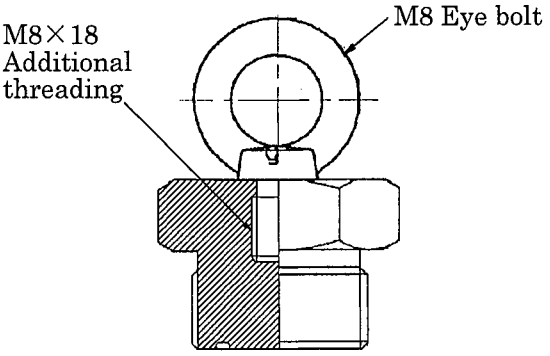
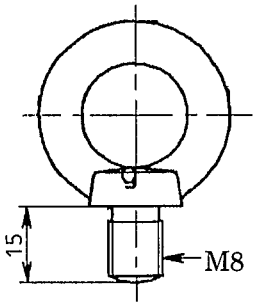
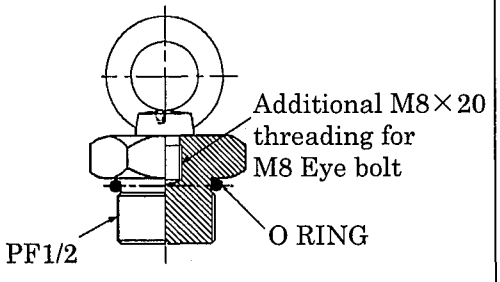
KOBE STEEL, LTD.

Table 6-2

No.	Tools name	Tools No.	Sketch	Applicable
6	Plug (Nominal tube dia. 22) Reference Eye bolt Nut	ZF83P22000 ZS91C00800 ZF93N22000		Flare hose
7	Plug Nominal 1-14UNS Eye bolt	YN01H01001P1 ZS91C00800		Flare hose
8	Plug Nominal 1 3/16-12UN Eye bolt	YN01H01002P1 ZS91C00800		Flare hose
9	Eye bolt M8×15	ZS91C00800 or commercial equivalent		For slinging the swing motor & Flare hose
10	Plug PF1/2	ZE72X08000		For slinging the swivel joint

1. STANDARD MAINTENANCE TIME SCHEDULE FOR EXCAVATOR

(1) Standard maintenance time schedule

1) Units of working time : 6 minutes=0.1 hour

2) Calculating method of standard maintenance time :

Maintenance time=working time×
the number of workers

(working time=Maintenance time÷
the number of workers)

3) When more than one operation is going on :
Add each standard service time.
A pure time (readily started) is given except covers easily removed by hand. Assy works include the following works marked with black dot •.

4)O/H : Basically the installing and removing operations are included.

5) Abbreviations in the table.

A/C ; Air conditioner
ASSY ; Assembly
ATT ; Attachment
BRG ; Bearing
C/V ; Control valve
Cyl ; Cylinder
E/G ; Engine
F hose ; Flexible hose
O/H ; Over haul
SOL; Solenoid
SW ; Switch
V ; Valve

(2) Classification of working code

No.	Group	Remarks
01 02 03 04	Attachment Cab & Guard Swing frame Travel system	Indicates installing, removing, replacement and overhaul.
06	Electric equipments	Indicates the installing, removing and replacement of single items.
09	E/G relation	Indicates overhaul of the single engine. (Materials prepared by manufacturer)

(3) Conditions for standard service time of the engine

1) Tools designated by E/G maker are used
2) Genuine parts are changed
3) Correct working procedures are observed.
- The time required for works specified in this Chapter shows the total time for maintenance.

Unit : Hour

Group		Location	Work to be done	Unit	Remark	SK115SRα SK135SRLC	SK115SR SK135SRLC
01 Attachment	00	Bucket relation			2. Reference for bucket		
	01	Bucket ASSY	Detach/attach	1 pc.	Include adjustment.	0.5	←
	02	• Bucket attaching and detaching position	Preparation	1 pc.		0.1	←
	03	• Bucket attaching pin	Detach/attach	1	Include omission of pin.	0.1	←
	04	• Bucket drive pin	Detach/attach	1		0.1	←
	05	• Bucket sling and movement	Preparation	1 pc.		0.1	←
	06	Bucket (single)	O/H	1 pc.	Not include attaching and detaching.	2.0	←
	07	• Tooth	Replace	1 pc.		0.5	←
	08	• Side cutter	Replace	1 pc.		1.0	←
	09	• Bushing	Replace	1 pc.		0.5	←
	10	Arm relation			3. Reference for arm		
	11	Arm ASSY	Detach/attach	1 pc.		1.0	←
	12	• Bucket cylinder attaching and detaching position and piping	Preparation	1 pc.		0.3	←
	13	• Bucket cylinder rod pin	Detach/attach	1 pc.	Include omission of pin.	0.1	←
	14	• Bucket cylinder head pin	Detach/attach	1 pc.	Include omission of pin.	0.1	←
	15	• Bucket cylinder assy	Detach/attach	1 pc.		0.1	←
	16	• Arm cylinder rod pin	Detach/attach	1 pc.	Include omission of pin.	0.1	←
	17	• Boom top pin	Detach/attach	1 pc.	Include detent of pin.	0.1	←
	18	• Arm sling and movement	Detach/attach	1 pc.		0.1	←
	30	Boom relation			4. Reference for boom		
	31	Boom ASSY	Detach/attach	1 pc.		1.0	←
	32	• Boom attaching and detaching position	Preparation	1 pc.		0.1	←
	33	• Boom cylinder temporary slinging	Preparation	2 pcs.		0.2	←
	34	• Boom cylinder rod pin	Detach/attach	1	Include omission of two pins.	0.2	←

KOBELCO

Book code No. S5YY13 02E②

SHOP MANUAL

SK115SR
SK115SR L
SK135SR (LC)
SK135SR L

MAINTENANCE STANDARD AND TEST PROCEDURE

YY13

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KOBELCO CONSTRUCTION MACHINERY CO., LTD.

(2) Dozer control valve

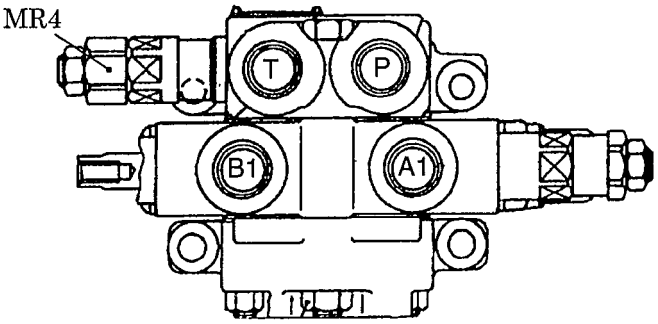


Fig. 7 Dozer control valve

(3) Pilot relief valve
Pilot relief valve PR1 is built in main pump.

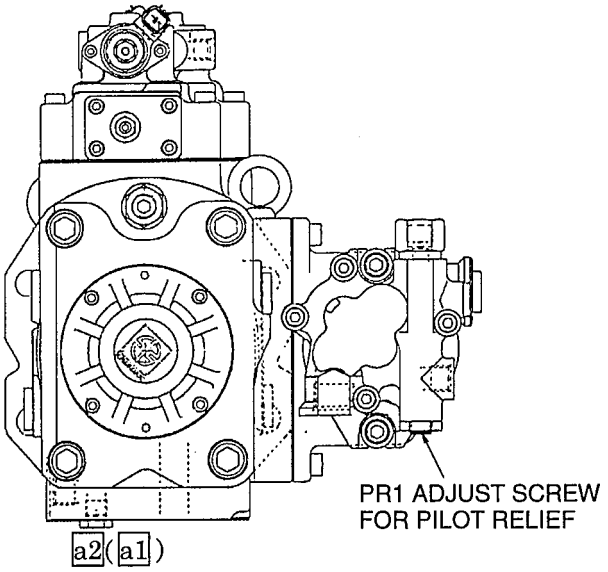


Fig. 8 Pilot relif valve position

(4) Swing port relief
The swing motor is equipped with plugs for pressure measurement, but the measurement is carried out using gauge ports a1 and a2 . (See Fig. 5,8.)

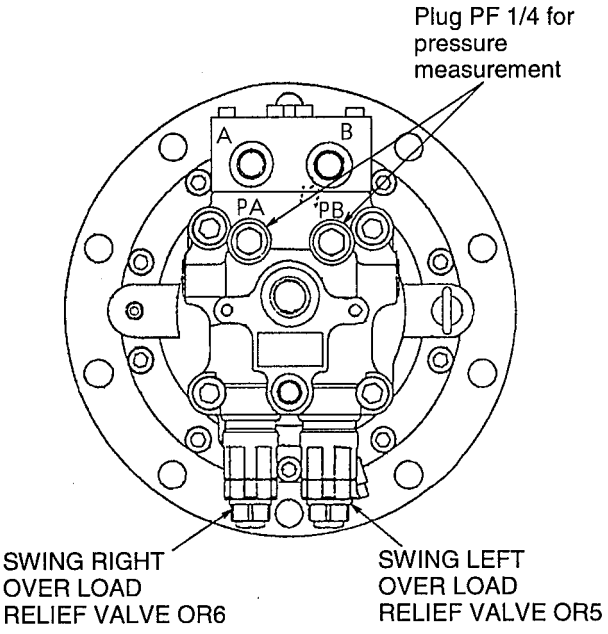
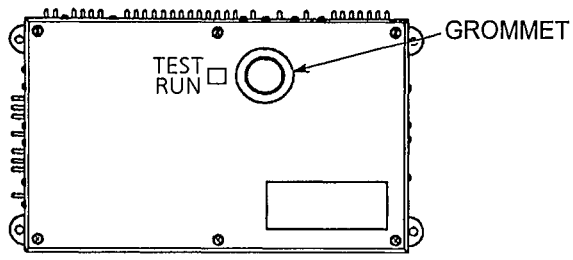


Fig. 9 Swing port relief position

9.6 "A" ADJUTMENT OF MECHATRO CONTROL

(1) When adjustment of mechatro control is required;

Case	"A" adjustment
Replace mechatronic controller.	○
Replace governor motor.	○
CPU ROM DATA FAILURE on display.	○
CPU ROM DATA FAILURE and CPU MECHATRO SET ERROR are shown by turns.	○



C—1 MECHATRO CONTROLLER

Fig. 43

(2) Preparation

1) Warm up engine.
2) Turn A/C switch OFF.
3) Turn starter switch OFF to stop engine.
4) Pull up the safety lock lever and pull up the left control box upwards.
5) Pull operator seat forward fully and incline seat back forward.
6) Pull operator seat forward fully and incline seat back forward.
7) Remove resin cover on the rear side, then mechatro controller appears. (Remove 5 attaching bolts from resin cover with driver ⊕).

Note : Check to be sure that the engine emergency stop lever knob is fully pressed down. If mechatro controller is adjusted in the condition where the knob is pulled out, the engine speed can not be set properly.

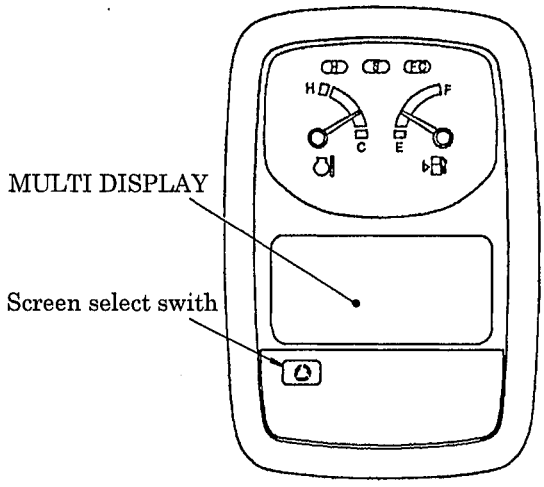
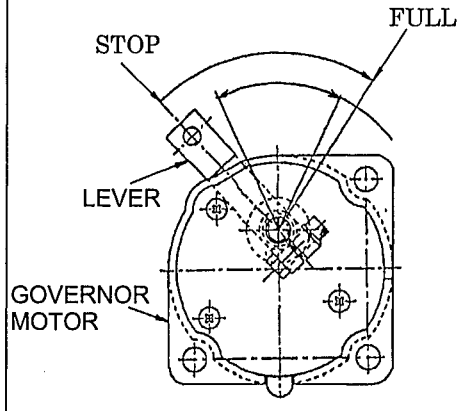
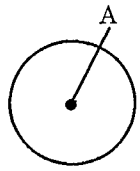


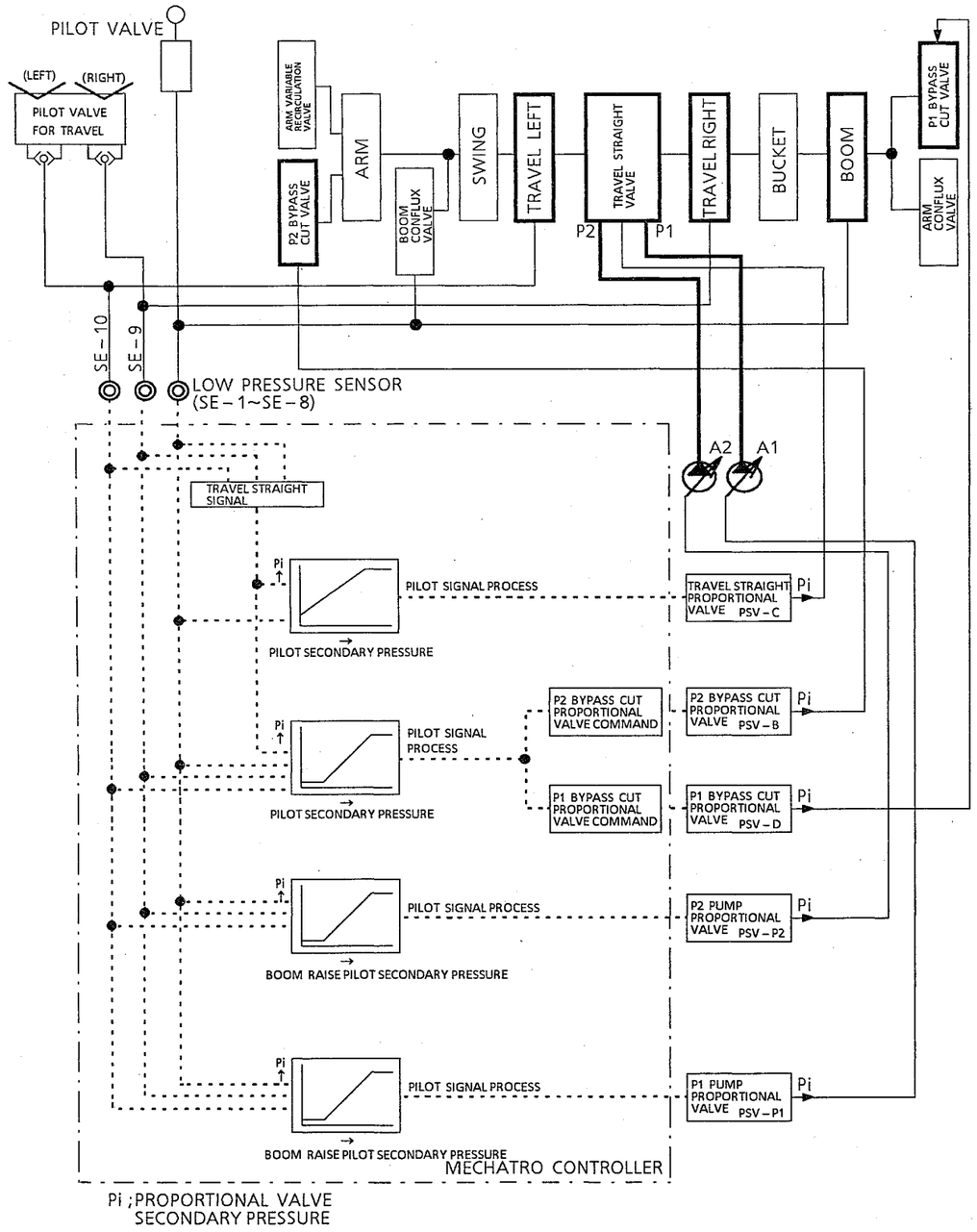
Fig. 44

(3) Adjustment

Table 18 (1/2)

Procedure	Multi display	Movement of governor motor
① Remove grommet on upper surface of mechatro controller, and switch internal adjustment JP switch from RUN to TEST. RUN — In normal position TEST — During adjustment		
② Turn starter switch ON Turn the accel dial to a certain position.	MONITOR SYSTEM OK	 Stop at the position set by accel dial.

1.7 TRAVEL STRAIGHT



TRAVEL STRAIGHT

1) Start ATTs work operations (boom, arm, bucket, swing) in travel operation (right and left), and the pilot pressure switches respective spools, and is input into respective low pressure sensors.

Note: Boom raise operation is explained here.

2) If mechatro controller receives the input satisfying the following combination shown in Table, the controller determines it as travel straight, and the travel straight signal turns on.
3) After the travel straight signal has turned on, the signal is input to respective proportional valve corresponding to the following commands.

Travel straight proportional valve command

Outputs switching command corresponding to boom raise pilot pressure (ATT pilot pressure in high priority in operation)

P1 bypass cut valve command

The P1 bypass cut valve does not operate if the boom raise operation is performed. During the arm and swing operation, the higher of the remote control pressures is selected to put out a select pressure.

P2 bypass cut valve command

Outputs switching command corresponding to boom raise pilot pressure (Selection of the higher ATT pilot pressures from C/V on P1 side during operation) and the pressure selected by travel right pilot pressure as high priority.

(Reference) Operating condition where travel straight signal turns on

	Boom	Bucket	Arm	Swing
In travel right operation(P1)	○	○	—	—
In travel left operation(P2)	—	—	○	○

2.3 SERVICE DIAGNOSIS

The result of the service diagnosis at the present time is displayed in 30 categories depending on the data output by the mechatro controller.

How to display

1) Turn the starter key switch on, keeping the buzzer stop switch depressed, and place the attachment to the travel position while operating in the low idling condition after the engine starts.
2) The mechatro controller P/NO and the program version in the 1st item are displayed.

SK115SRDZ,
SK135SRLC (KAI SPEC.)

No.1
MAIN CONTROLLER P/No.
YV22E00005F1
PROGRAM VERSION
VER 1.00

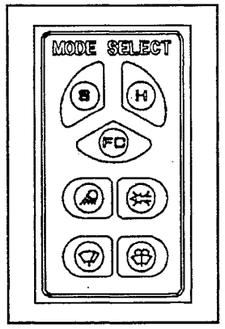
SK135SR(LC) (EU SPEC.)

No.1
MAIN CONTROLLER P/No.
YY22E00006F1
PROGRAM VERSION
VER 1.00

SK135SR (Oceania SPEC.)

No.1
MAIN CONTROLLER P/No.
YY22E00001F8
PROGRAM VERSION
VER 1.00

SWITCH ASSY



3) By pressing "H" mode of the work mode switch, goes to No.2,No.3··· in order.
4) By pressing the buzzer stop switch, returns from No.13, No.12··· in order.
5) Turn the starter switch off, and the display also goes off.

No.	DISPLAY	REMARKS	No.	DISPLAY	REMARKS
1	No.1 MAIN CONT.P/No. YV22E00001F8 YY22E00006F1 YY22E00005F1 PROGRAM VER VER 1.00	 SK115SR or SK135SR P/No. indication Version indication	6	No.6 SOL. VALVE F—3 1/2-TRAVEL COMP. OFF MEAS. OFF SWITCH OFF	 ON/OFF indication ON/OFF indication ON/OFF indication
2	No.2 E/G SET 2310 MEAS 2310 E/G PRS. LIVE KPSS SW H	 No load set rpm Actual rpm LIVE/DEAD indication H / S / FC indication	8	No.8 RELAY I—2 BAT. RELAY COMP. OFF MEAS. OFF KEY SWITCH OFF	 ON/OFF indication ON/OFF indication ON/OFF indication
3	No.3 H—1 ACCEL VOLT. 4.2V POS. 100% MOTOR STEP 256 POS. 100%	 Potentio voltage Voltage position No of motor steps Step position	9	No.9 PRESS. SENSOR B—1 BOOM RAISE 3.5V 35k B—2 BOOM LOWER 3.5V 35k	 Sensor voltage / Pressure converted value Sensor voltage / Pressure converted value
4	No.4 GOVERNOR MOTOR G—1 COIL A 0.9A G—1 COIL B 1.0A G—2 LIMIT OFF	 A phase current B phase current ON/OFF indication	10	No.10 PRESS. SENSOR B—3 ARM OUT 3.5V 36k B—4 ARM IN 3.5V 36k	 Sensor voltage / Pressure converted value Sensor voltage / Pressure converted value
5	No.5 SOL. VALVE F—2 SWING-BRAKE COMP. OFF MEAS. OFF RELEASE SW OFF	 ON/OFF indication ON/OFF indication ON/OFF indication	11	No.11 PRESS. SENSOR B—5 BUCKET DIG 3.5V 37k B—6 BUCKET DUNP 3.5V 37k	 Sensor voltage / Pressure converted value Sensor voltage / Pressure converted value

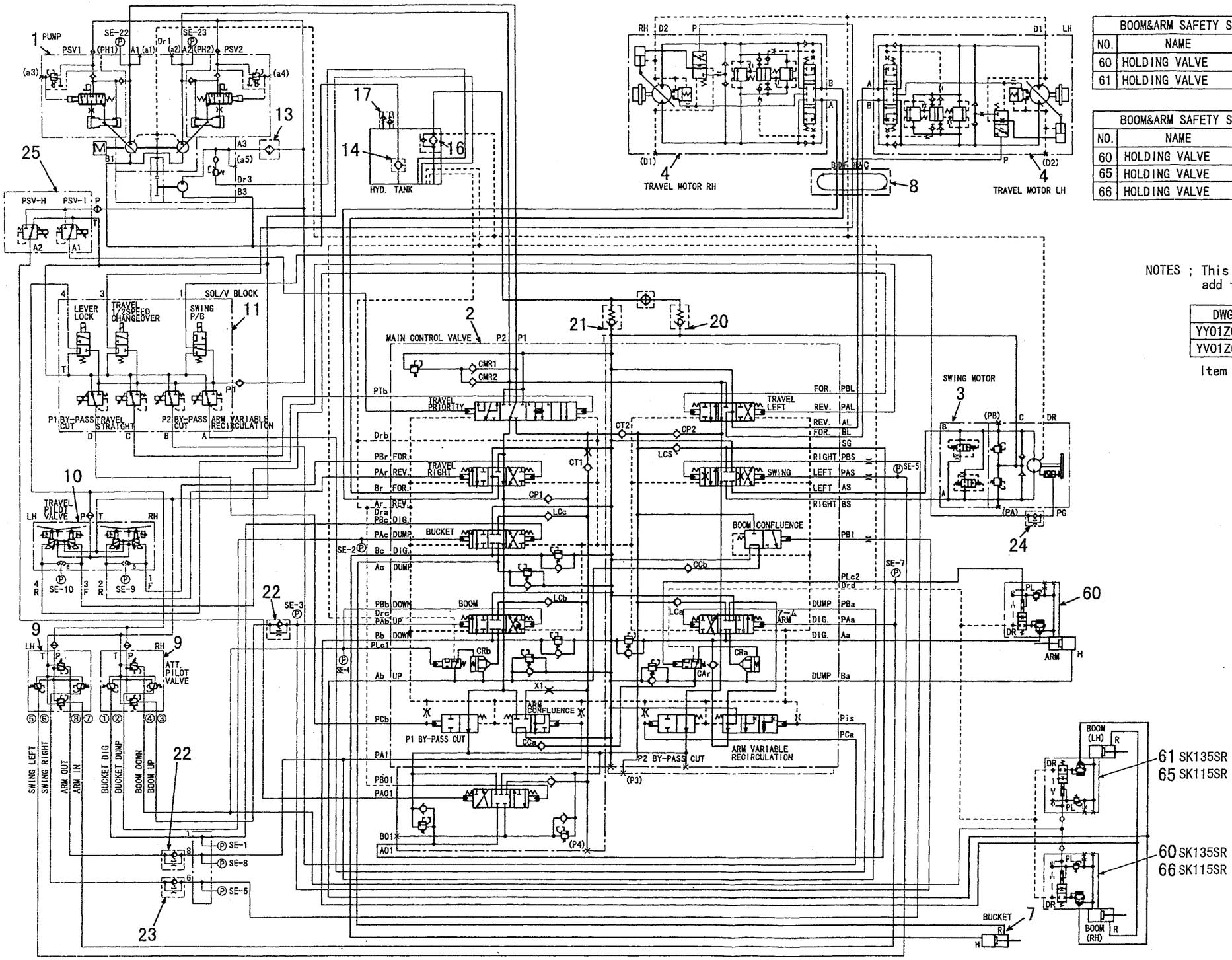
No.	DISPLAY	REMARKS	No.	DISPLAY	REMARKS
12	No.12 PRESS. SENSOR B—7 SWING (R) 3.5V 38k B—8 SWING (L) 3.5V 38k	 Sensor voltage / Pressure converted value Sensor voltage / Pressure converted value	23	No.23 PROPO-VALVE D—6 A-RECIRCULAT COMP. 600mA 45k MEAS. 600mA 45k	 Command current / Pressure converted value Feedback current / Pressure converted value
13	No.13 PRESS. SENSOR B—9 TRAVEL (R) 3.5V 39k B—10 TRAVEL (L) 3.5V 39k	 Sensor voltage / Pressure converted value Sensor voltage / Pressure converted value	24	No.24 PROPO-VALVE E—1 P1 PUMP COMP. 600mA 45k MEAS. 600mA 45k POWER SHIFT 100mA	 Command current / Pressure converted value Feedback current / Pressure converted value
14	No.14 PRESS. SENSOR C—1 PUMP P1 3.5V 42k C—2 PUMP P2 3.5V 42k	 Sensor voltage / Pressure converted value Sensor voltage / Pressure converted value	25	No.25 PROPO-VALVE E—2 P2 PUMP COMP. 600mA 45k MEAS. 600mA 45k POWER SHIFT 100mA	 Command current / Pressure converted value Feedback current / Pressure converted value
15	No.15 PRESS. SENSOR B—16 P1 OPT. 3.5V 36k B—17 P2 OPT. 3.5V 36k	 Sensor voltage / Pressure converted value Sensor voltage / Pressure converted value	29	※1 No.29 PROPO-VALVE D—8 ARM IN COMP. 600mA 45k MEAS. 600mA 45k	 Command current / Pressure converted value Feedback current
20	No.20 PROPO-VALVE D—1 P1 BYPASS COMP. 600mA 45k MEAS. 600mA 45k	 Command current / Pressure converted value Feedback current / Pressure converted value	31	※2 No.31 PROPO-VALVE D—10 OFFSET LEFT COMP. 600mA 45k MEAS. 600mA 45k	 Command current / Pressure converted value Feedback current
21	No.21 PROPO-VALVE D—2 P2 BYPASS COMP. 600mA 45k MEAS. 600mA 45k	 Command current / Pressure converted value Feedback current / Pressure converted value	39	No.39 MECHATRO ADJT. CONT. SW TEST CONT. VOL 100% PROG. SW OFF	 RUN/TEST indication Inner trimmer ON/OFF indication
22	No.22 PROPO-VALVE D—3 S-TRAVEL COMP. 600mA 45k MEAS. 600mA 45k	 Command current / Pressure converted value Feedback current / Pressure converted value	40	No.40 RELEASE SW KPSS TEST SWING BRAKE OFF	 ON/OFF indication ON/OFF indication

Note : ※1. The PROPO—VALVE D—8 ARM IN is displayed on the screen No. 29 of multidisplay, but in fact it indicates the swing priority proportional valve.

※2. The PROPO—VALVE D—10 OFFSET(L) is displayed on the screen No. 31 of multidisplay, but in fact it indicates the drain pressure proportional valve.

2.3 BOOM & ARM SAFETY SPEC.

Applicable machines YV01-00101～
YY01-00101～
YH01-00101～



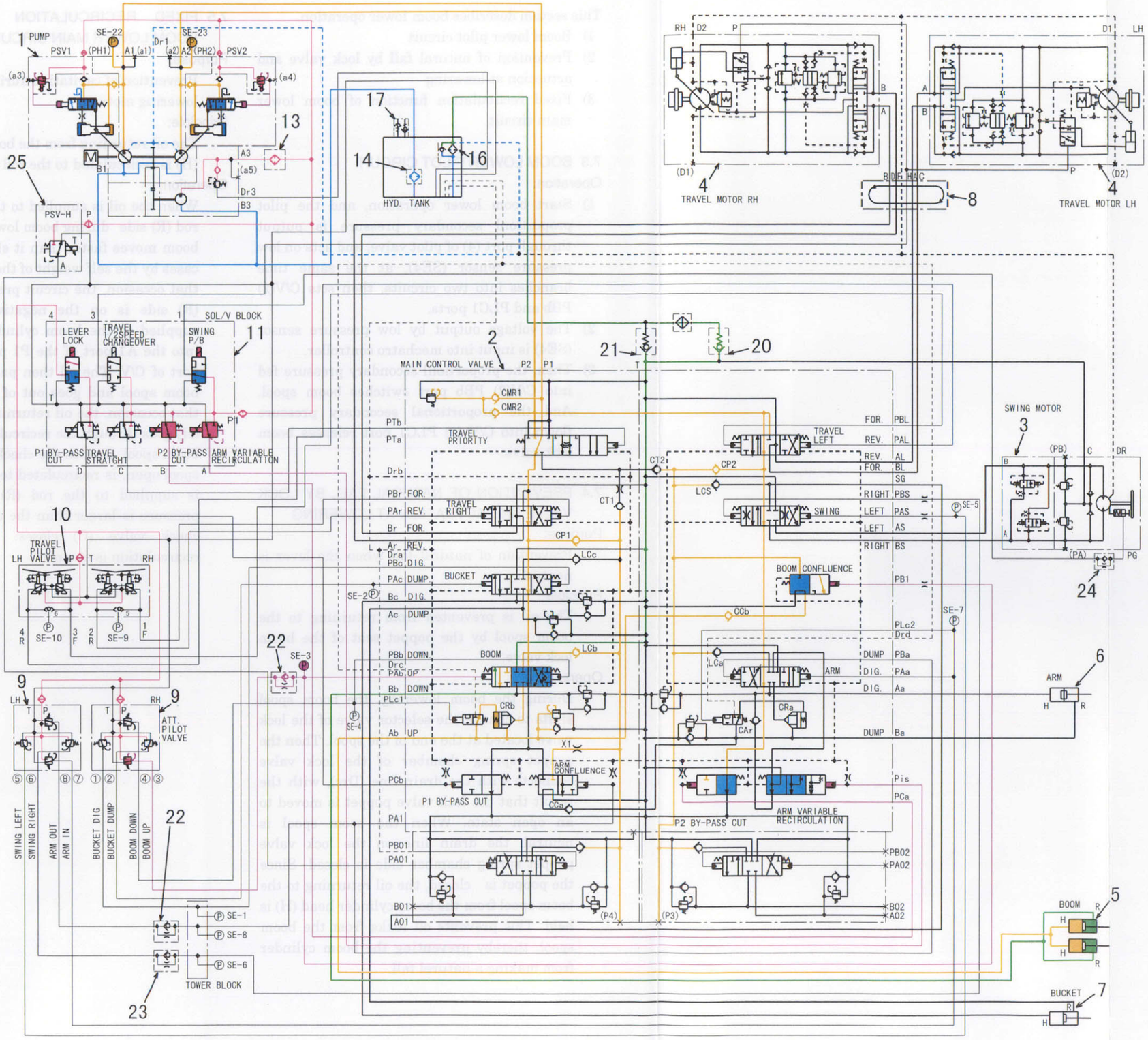
BOOM&ARM SAFETY SPEC.		YY01Z00009P1	SK135SR(LC)
NO.	NAME	PART NO.	MODEL NO.
60	HOLDING VALVE	YM28V00001F2	KHCV20P010
61	HOLDING VALVE	YM28V00002F2	KHCV20P010

BOOM&ARM SAFETY SPEC.		YY01Z00009P1	SK115SR
NO.	NAME	PART NO.	MODEL NO.
60	HOLDING VALVE	YM28V00001F2	KHCV20P010
65	HOLDING VALVE	YV28V00002F1	KHCV20P02
66	HOLDING VALVE	YV28V00001F1	KHCV20P01

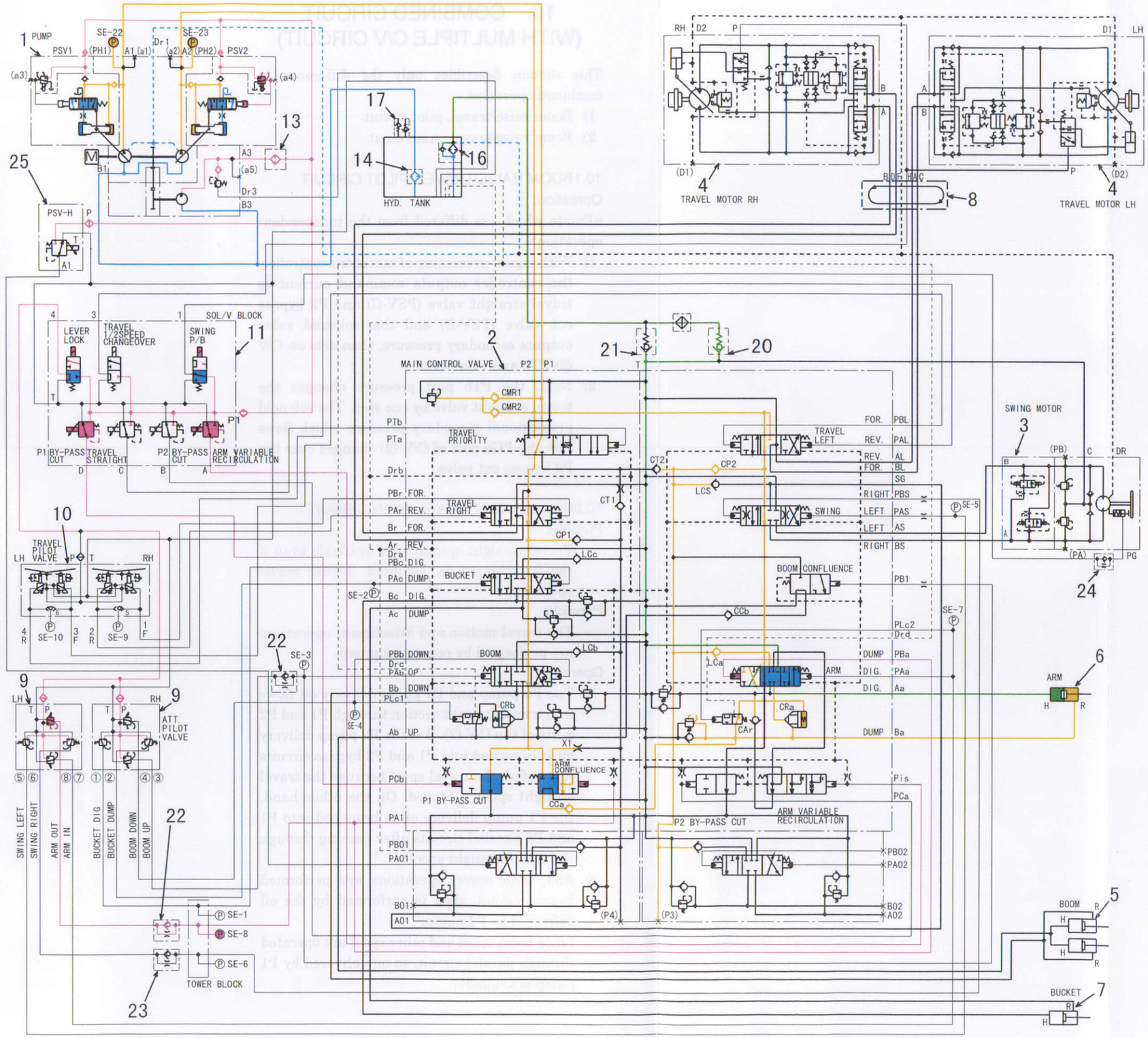
NOTES ; This hydraulic circuit is used to add to following circuit.

DWG. No.	REMARKS
YY01Z00012P1	EU SK135SR(LC)
YV01Z00021P1	EU SK115SR

Item 60, 61 are different from STD.



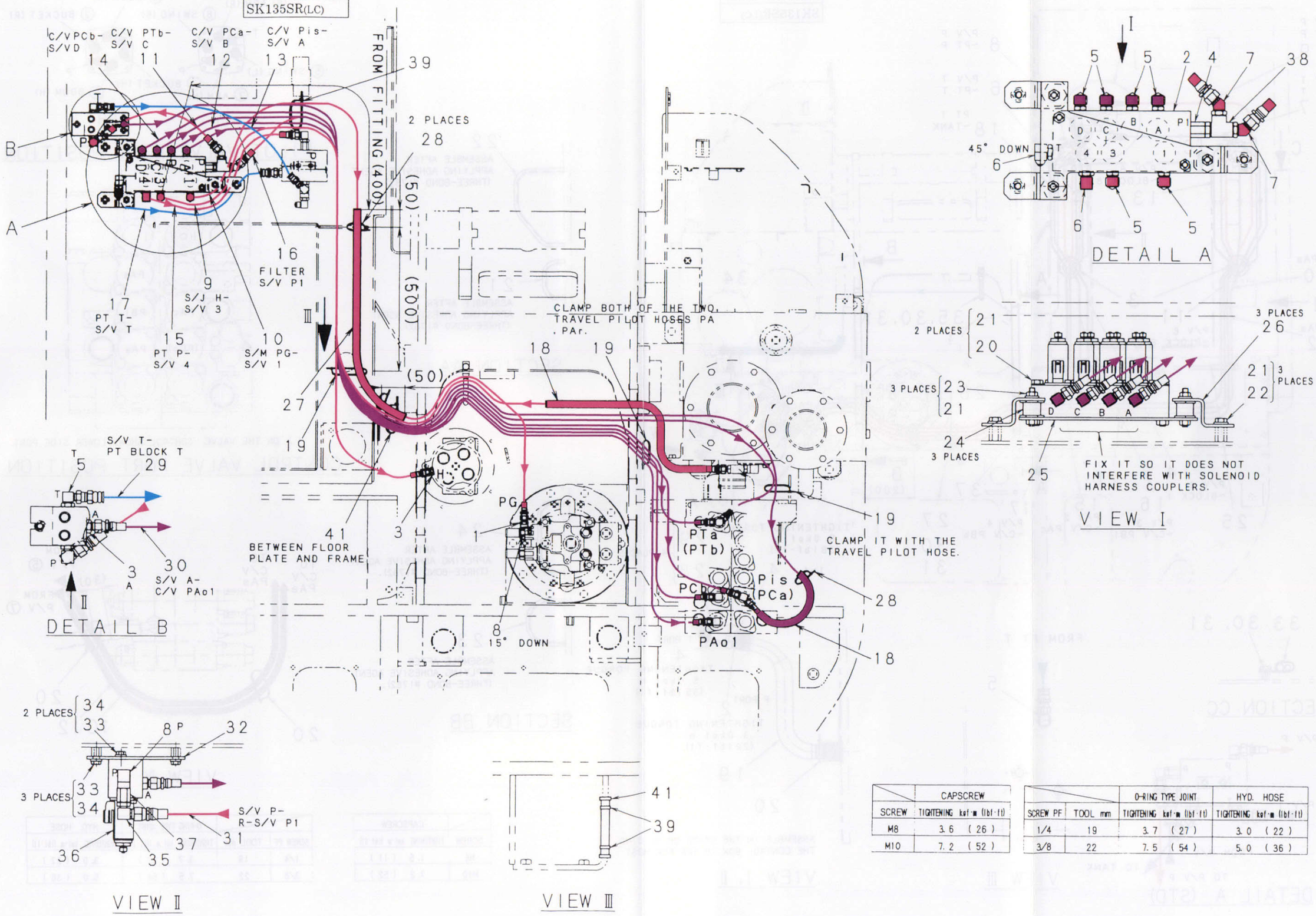
EU Spec. BOOM CIRCUIT: BOOM UP OPERATION, CONFLUX FUNCTION



EU Spec. ARM CIRCUIT : ARM OUT (EXTEND) OPERATION, CONFLUX FUNCTION

(2) SOL. valve control lines ; YY64H00005F1

SK115SR
SK115SR Dozer
SK135SR(LC)

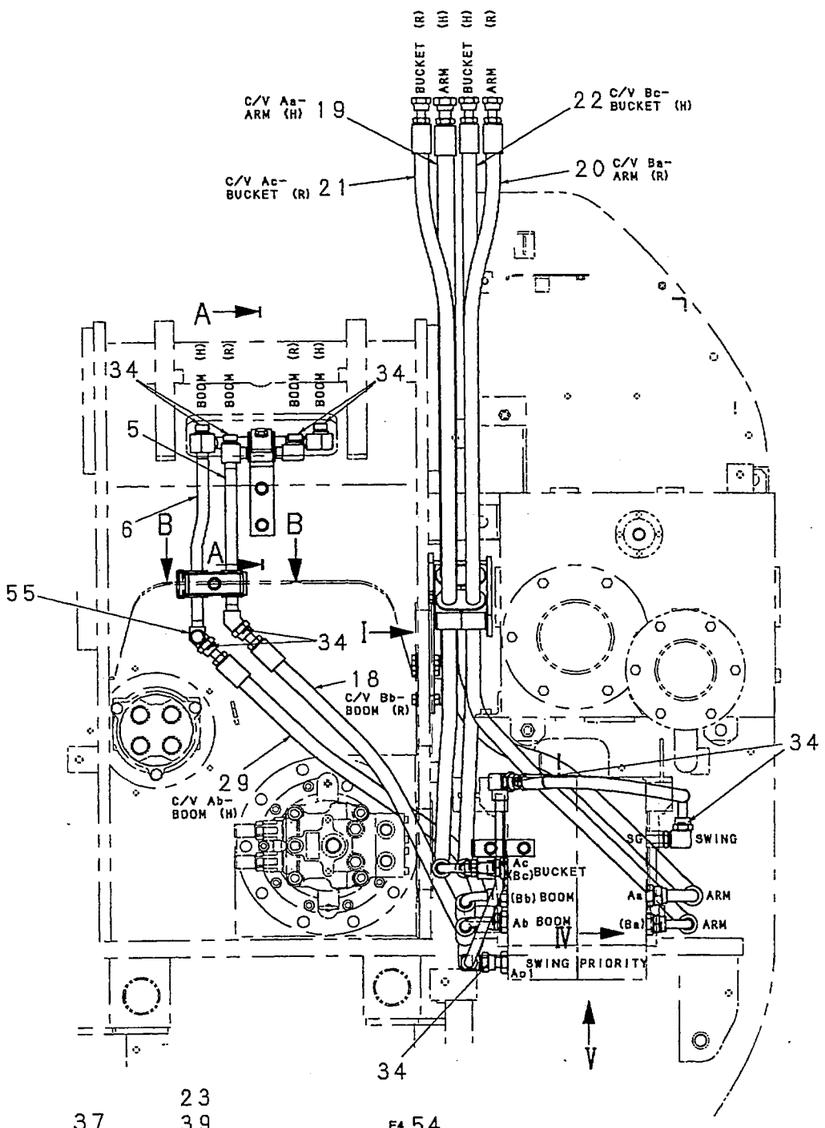


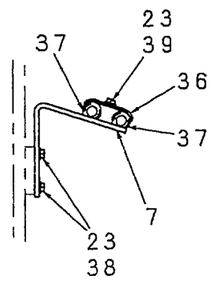
	CAPSCREW
SCREW	TIGHTENING kgf·m (lbf·ft)
M8	3.6 (26)
M10	7.2 (52)

		O-RING TYPE JOINT	HYD. HOSE
SCREW PF	TOOL mm	TIGHTENING kgf·m (lbf·ft)	TIGHTENING kgf·m (lbf·ft)
1/4	19	3.7 (27)	3.0 (22)
3/8	22	7.5 (54)	5.0 (36)

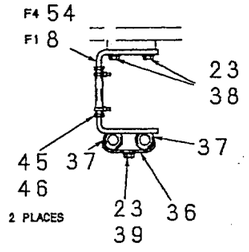
(2) Main C/V hydraulic 1/2 :

YY03H00010F1	SK135SR(LC)	STD
YY03H00010F4	SK135SR(LC)	Boom / Arm safety
YV03H00012F1	SK115SR	STD
YV03H00012F4	SK115SR	Boom / Arm safety

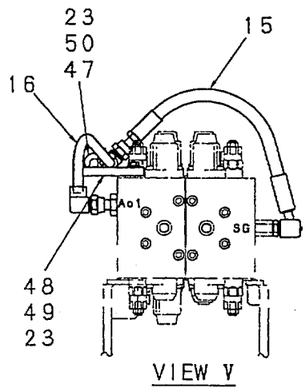




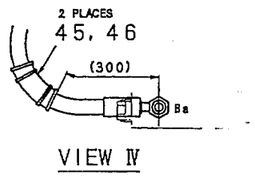
SECTION AA



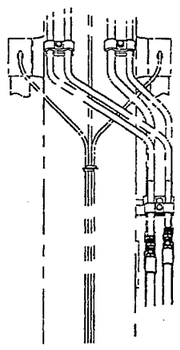
SECTION BB



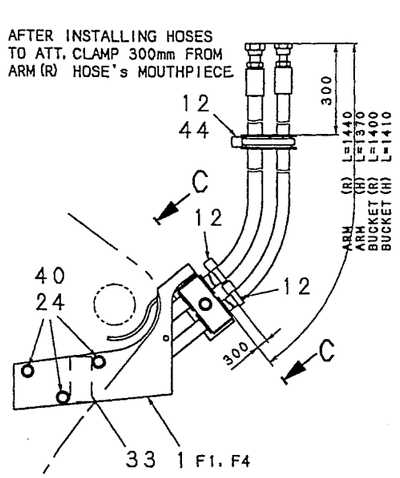
VIEW V



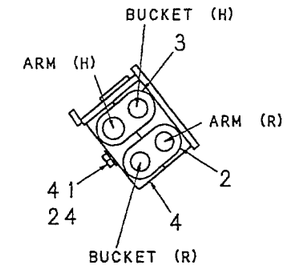
VIEW Ⅳ



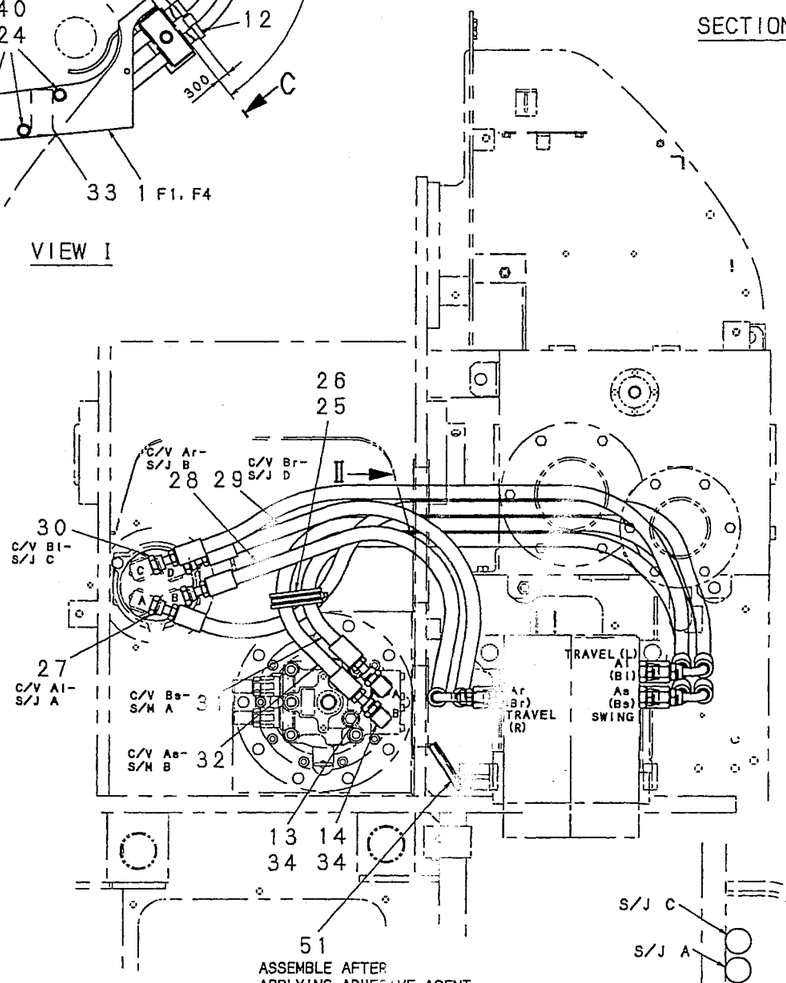
CONNECTION PROCEDURE TO ATT

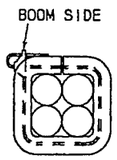


VIEW I

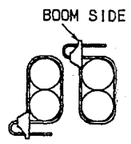


SECTION CC

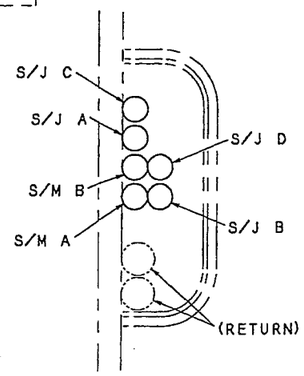




DETAIL CLAMPING METHOD



DETAIL CLAMPING METHOD



VIEW Ⅱ

KOBELCO

Book code No. S5YY2302E①

SK115SR
SHOP MANUAL SK135SR(LC)

ELECTRIC SYSTEM

YY23

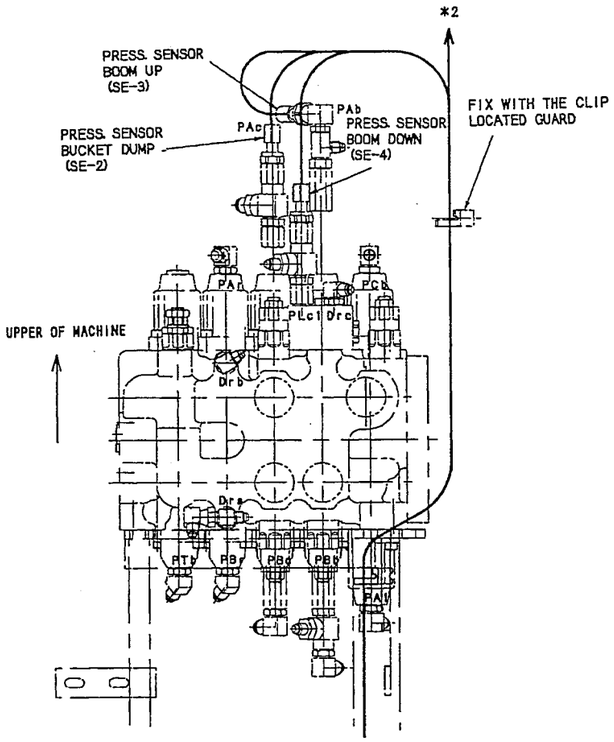
TABLE OF CONTENTS

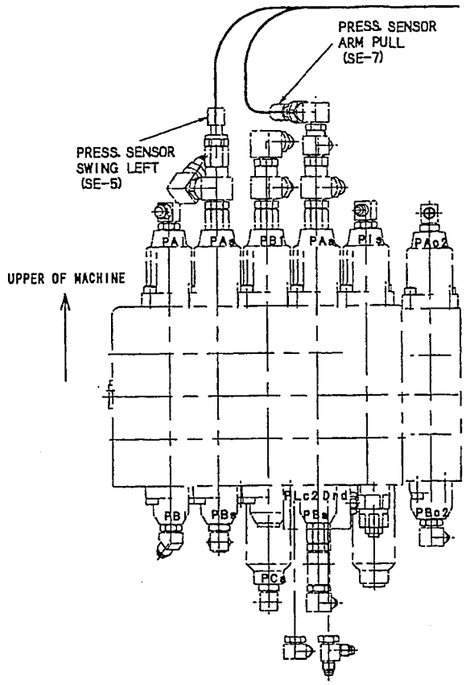
KOBE STEEL, LTD.

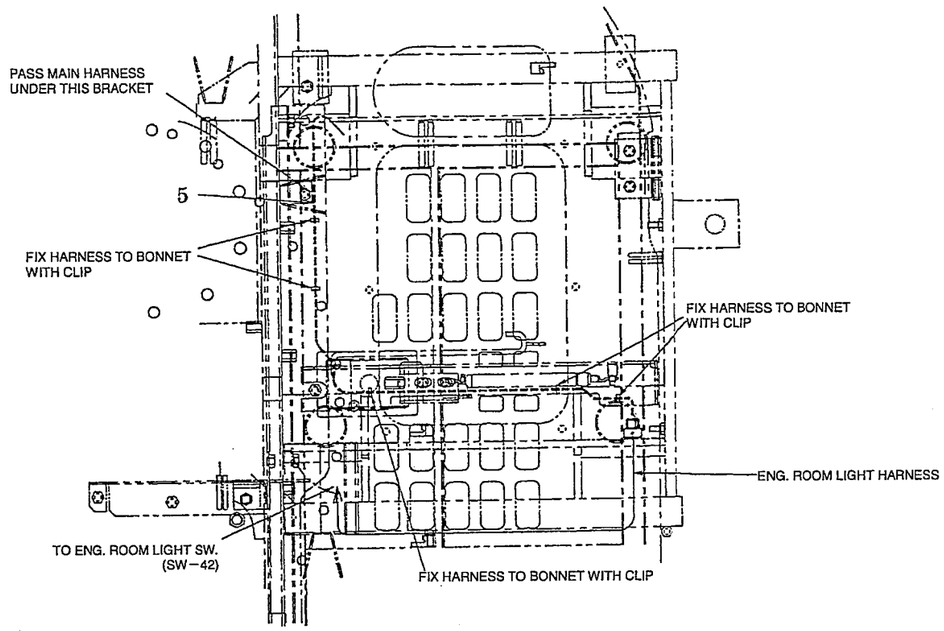
WIRE NO	WIRE COLOR	WIRE SIZE	FROM	CONNECTION	TO	FUNCTION
1A	RY	AVSS0.75sq	CN-15F		CN-2F	MECHATRO CONTROLLER → FUSE BOX
1B	RY	AVSS0.75sq	CN-15F	DOUBLE SPLICE	CN-42F	MECHATRO CONTROLLER → RESISTOR
1C	RY	AVSS0.75sq	CN-2F		CN-42F	FUSE BOX → RESISTOR
2A	WY	AVSS0.75sq	CN-36F		CN-2F	15PAF-J/B → FUSE BOX
2B	WY	AVSS0.75sq	CN-37F		CN-26F	15PAF-J/B ← WIPER MOTOR RELAY
2C	WY	AVSS0.75sq	CN-38F		CN-25F	15PAF-J/B ← WASHER MOTOR RELAY
3	RL	AVSS0.75sq	CN-76M		CN-1M	CIGARETTE LIGHTER → FUSE BOX
4A	OL	AVSS0.75sq	CN-72F		CN-1M	J/C-GRAY ← FUSE BOX
4B	OL	AVSS0.75sq	CN-72F		CN-3M	J/C-GRAY → TUNER
4C	OL	AVSS0.75sq	CN-72F		CN-76M	J/C-GRAY → CONVERTER
5A	WG	AVSS0.75sq	CN-36F		CN-1M	15PAF-J/B → FUSE BOX
5B	WG	AVSS0.75sq	CN-37F		CN-23F	15PAF-J/B ← HORN RELAY
5C	WG	AVSS0.75sq	CN-38F		CN-23F	15PAF-J/B ← HORN RELAY
7	YG	AVSS0.75sq	CN-15F		CN-1M	MECHATRO CONTROLLER → FUSE BOX
8	WR	AVSS1.25sq	CN-10F		CN-1M	FUEL SUPPLY PUMP → FUSE BOX
9A	YB	AVSS0.75sq	CN-36F		CN-1M	15PAF-J/B → FUSE BOX
9B	YB	AVSS0.75sq	CN-37F		CN-3M	15PAF-J/B → TUNER
9C	YB	AVSS0.75sq	CN-38F		CN-77F	15PAF-J/B → ROOM LIGHT
9D	YB	AVSS0.75sq	CN-39F		CN-76M	15PAF-J/B → CONVERTER
9E	YB	AVSS0.75sq	CN-40F		CN-10F	15PAF-J/B → ENG. ROOM LIGHT SW.
10	WV	AVSS1.25sq	CN-4M		CN-1M	KEY SW. → FUSE BOX
11A	R	AVSS0.75sq	CN-22F	DOUBLE SPLICE	CN-1M	CAB WORK LIGHT RELAY → FUSE BOX
11B	R	AVSS1.25sq	CN-22F	DOUBLE SPLICE	CN-22F	CAB WORK LIGHT RELAY → CAB WORK LIGHT RELAY
11C	R	AVSS0.75sq	CN-10F		CN-22F	FUEL PUMP ← CAB WORK LIGHT RELAY
12	RG	AVSS0.75sq	CN-74F		CN-1M	WIPER RELAY ASSY → FUSE BOX
13A	W	AVSS0.75sq	CN-36F		CN-1M	15PAF-J/B → FUSE BOX
13C	W	AVSS0.75sq	CN-38F		CN-76M	15PAF-J/B → CLUSTER GAUGE
14A	RB	AVSS1.25sq	CN-72F		CN-1M	J/C-GRAY → FUSE BOX
14B	RB	AVSS0.75sq	CN-72F		CN-26F	J/C-GRAY → WIPER MOTOR REALY
14F	RB	AVSS0.75sq	CN-72F		CN-21F	J/C-GRAY → ROOF WIPER SW
14G	RB	AVSS0.75sq	CN-72F		CN-25F	J/C-GRAY → WASHER MOTOR RELAY
15	WB	AVSS0.75sq	CN-3M		CN-1M	LEVER LOCK SW. → FUSE BOX
16A	RW	AVSS1.25sq	CN-36F		CN-1M	15PAF-J/B → FUSE BOX
16B	RW	AVSS1.25sq	CN-37F		CN-24F	15PAF-J/B ← WORK LIGHT RELAY
16C	RW	AVSS0.75sq	CN-38F		CN-24F	15PAF-J/B ← WORK LIGHT RELAY
17	WL	AVSS0.75sq	CN-34F		CN-1M	RESISTOR → FUSE BOX
18	WG	AVSS1.25sq	CN-3M		CN-1M	AIR CONDITIONER AMP. → FUSE BOX
19	RL	AVSS0.75sq	CN-3M		CN-1M	AIR CONDITIONER AMP. → FUSE BOX
20	WR	AVSS1.25sq	CN-29F		CN-1M	POWER RESERVE → FUSE BOX
50	L	AVSS1.25sq	CN-4M		CN-2F	KEY SW. → FUSE BOX
51	W	AVS2sq	CN-10F		CN-2F	BATTERY RELAY → FUSE BOX
52	R	AVS5sq	CN-70M		CN-2F	BATTERY RELAY → FUSE BOX
53	Y	AVS5sq	CN-70M		CN-2F	BATTERY RELAY → FUSE BOX
60A	GrL	AVSS0.75sq	CN-36F		CN-12F	15PAF-J/B → MECHATRO CONTROLLER
60B	GrL	AVSS0.75sq	CN-37F		CN-32F	15PAF-J/B → DIODE
60C	GrL	AVSS0.75sq	CN-38F		CN-4M	15PAF-J/B → KEY SW.
60D	GrL	AVSS0.75sq	CN-39F		CN-33F	15PAF-J/B → DIODE
61A	BrY	AVSS0.75sq	CN-36F		CN-12F	15PAF-J/B → MECHATRO CONTROLLER
61B	BrY	AVSS0.75sq	CN-37F		CN-32F	15PAF-J/B → DIODE
61C	BrY	AVSS0.75sq	CN-38F		CN-32F	15PAF-J/B → DIODE
61D	BrY	AVSS0.75sq	CN-39F		CN-4M	15PAF-J/B → KEY SW.
62A	GrB	AVSS0.75sq	CN-36F		CN-4M	15PAF-J/B → KEY SW.
62B	GrB	AVSS0.75sq	CN-37F		CN-32F	15PAF-J/B → DIODE
62C	GrB	AVSS0.75sq	CN-38F		CN-10F	15PAF-J/B → GLOW RELAY
62D	GrB	AVSS0.75sq	CN-39F		CN-57F	15PAF-J/B → DIODE
63	WY	AVSS0.75sq	CN-4M		CN-10F	KEY SW. → SAFETY RELAY
64A	GW	AVSS0.75sq	CN-36F		CN-33F	15PAF-J/B → DIODE
64B	GW	AVSS0.75sq	CN-37F		CN-10F	15PAF-J/B → BATTERY RELAY
64C	GW	AVSS0.75sq	CN-38F		CN-33F	15PAF-J/B → DIODE

WIRE NO	WIRE COLOR	WIRE SIZE	FROM	CONNECTION	TO	FUNCTION
80	LY	AVSS0.75sq	CN-21F		CN-26F	WIPER MOTOR → WIPER MOTOR RELAY
81	BrB	AVSS0.75sq	CN-21F		CN-26F	WIPER MOTOR → WIPER MOTOR RELAY
82	GO	AVSS0.75sq	CN-25F		CN-10F	WASHER MOTOR → WINDOW WASHER MOTOR RELAY
83A	WL	AVSS0.75sq	CN-23F		CN-36F	HORN RELAY → 15PAF-J/B
83B	WL	AVSS0.75sq	CN-10F		CN-37F	HORN → 15PAF-J/B
83C	WL	AVSS0.75sq	CN-10F		CN-38F	HORN → 15PAF-J/B
84A	WB	AVSS0.75sq	CN-3M		CN-36F	HORN SW. → 15PAF-J/B
84B	WB	AVSS0.75sq	CN-23F		CN-37F	CONTROL CUT LIMIT SW. → 15PAF-J/B
84C	WB	AVSS0.75sq	CN-4M		CN-38F	HORN SW. → 15PAF-J/B
85A	WB	AVSS1.25sq	CN-36F		CN-24F	15PAF-J/B → WORK LIGHT RELAY
85B	WB	AVSS0.75sq	CN-37F		CN-10F	15PAF-J/B → BOOM WORKING LIGHT LEFT
85C	WB	AVSS0.75sq	CN-38F		CN-10F	15PAF-J/B → WORINGK LIGHT RIGHT
85D	WB	AVSS0.75sq	CN-39F		CN-3M	15PAF-J/B → AIR CONDITIONER AMP.
85E	WB	AVSS0.75sq	CN-40F		CN-4M	15PAF-J/B → SWITCH ASSY
86	OW	AVSS0.75sq	CN-500F		CN-251M	TIMER RELAY → OPERATING LEVER LOCK SOL.
87A	WL	AVSS0.75sq	CN-500F	DOUBLE SPLICE	CN-17F	TIMER RELAY → MECHATRO CONTROLLER
87B	WL	AVSS0.75sq	CN-500F		CN-3M	TIMER RELAY → LEVER LOCK SW.
88	LR	AVSS0.75sq	CN-19F		CN-3M	SPEAKER RIGHT → TUNER
89	OB	AVSS0.75sq	CN-19F		CN-3M	SPEAKER RIGHT → TUNER
90	LW	AVSS0.75sq	CN-28F		CN-3M	SPEAKER LEFT → TUNER
91	Br	AVSS0.75sq	CN-28F		CN-3M	SPEAKER LEFT → TUNER
92	BP	AVSS0.75sq	CN-3M		CN-10F	A/C RELAY → RECEIVER DRIER
179	L	AVSS1.25sq	F-4		CN-22F	CAB WORKING LIGHT (OPT) → CAB WORK LIGHT RELAY
180	OL	AVSS0.75sq	CN-26F		CN-43M	WIPER MOTOR RELAY → WIPER MOTOR INTER LOCK SW
181	R	MVVS0.75sq	CN-3M		CN-3M	AIR CONDITIONER AMP. → AIR CONDITIONER SW.
184	B	4 CORES SHIELD	CN-3M		CN-3M	AIR CONDITIONER AMP. → AIR CONDITIONER SW.
608	G		CN-3M		CN-3M	AIR CONDITIONER AMP. → AIR CONDITIONER SW.
609	W		CN-3M		CN-3M	AIR CONDITIONER AMP. → AIR CONDITIONER SW.
SH2	Gr		CN-3M		CN-3M	SHIELD
185	LY	AVSS0.75sq	CN-22F		CN-269F	CAB WORK LIGHT RELAY → WORK LIGHT SW
207	PB	AVSS0.75sq	CN-76M		CN-3M	CONVERTER → SOCKET
208	PW	AVSS0.75sq	CN-76M		CN-3M	CONVERTER → SOCKET
209	LY	AVSS0.75sq	CN-74F		CN-10F	WIPER RELAY ASSY → SWING FLASHER RIGHT
210	Lg	AVSS0.75sq	CN-74F		CN-10F	WIPER RELAY ASSY → SWING FLASHER LEFT
500	LgR	AVSS0.75sq	CN-11F		CN-10F	MECHATRO CONTROLLER ← PRESS. SENSOR (LOW) : BUCKET DIGGING
501	LgW	AVSS0.75sq	CN-11F		CN-10F	MECHATRO CONTROLLER ← PRESS. SENSOR (LOW) : BUCKET DUMP
502	LgY	AVSS0.75sq	CN-11F		CN-10F	MECHATRO CONTROLLER ← PRESS. SENSOR (LOW) : BOOM RAISING
503	LO	AVSS0.75sq	CN-11F		CN-10F	MECHATRO CONTROLLER ← PRESS. SENSOR (LOW) : BOOM LOWERING
504	PW	AVSS0.75sq	CN-11F		CN-10F	MECHATRO CONTROLLER ← PRESS. SENSOR (LOW) : ARM IN
505	PL	AVSS0.75sq	CN-11F		CN-10F	MECHATRO CONTROLLER ← PRESS. SENSOR (LOW) : ARM OUT
506	V	AVSS0.75sq	CN-11F		CN-10F	MECHATRO CONTROLLER ← PRESS. SENSOR (LOW) : SWING RIGHT
507	VW	AVSS0.75sq	CN-11F		CN-10F	MECHATRO CONTROLLER ← PRESS. SENSOR (LOW) : SWING LEFT
508	VY	AVSS0.75sq	CN-11F		CN-251M	MECHATRO CONTROLLER ← PRESS. SENSOR (LOW) : TRAVEL RIGHT
509	Sb	AVSS0.75sq	CN-11F		CN-251M	MECHATRO CONTROLLER ← PRESS. SENSOR (LOW) : TRAVEL LEFT
510	GO	AVSS0.75sq	CN-13F		CN-251M	MECHATRO CONTROLLER ← PRESS. SENSOR (LOW) : OPT. 1-1
511	LgY	AVSS0.75sq	CN-13F		CN-251M	MECHATRO CONTROLLER ← PRESS. SENSOR (LOW) : OPT. 1-2
512	LgR	AVSS0.75sq	CN-12F		CN-251M	MECHATRO CONTROLLER ← PRESS. SENSOR (LOW) : OPT. 2-1
513	VG	AVSS0.75sq	CN-12F		CN-251M	MECHATRO CONTROLLER ← PRESS. SENSOR (LOW) : OPT. 2-2
514	VY	AVSS0.75sq	CN-12F		CN-10F	MECHATRO CONTROLLER ← PRESS. SENSOR (HIGH) : PUMP P1
515	Sb	AVSS0.75sq	CN-12F		CN-10F	MECHATRO CONTROLLER ← PRESS. SENSOR (HIGH) : PUMP P2
530	P	AVSS0.75sq	CN-11F		CN-4M	MECHATRO CONTROLLER ← ACCEL POTENTIO
534	R	MVVS0.75sq	CN-12F		CN-10F	MECHATRO CONTROLLER → ENG. REVOLUTION SENSOR
535	W	2 CORES SHIELD	CN-12F		CN-10F	MECHATRO CONTROLLER → ENG. REVOLUTION SENSOR
SH3	Gr		CN-12F		CN-10F	SHIELD
536	BrR	AVSS0.75sq	CN-76M		CN-10F	CLUSTER GAUGE → FUEL SENSOR
537	YR	AVSS0.75sq	CN-76M		CN-10F	CLUSTER GAUGE → COOLANT THERMO SENSOR

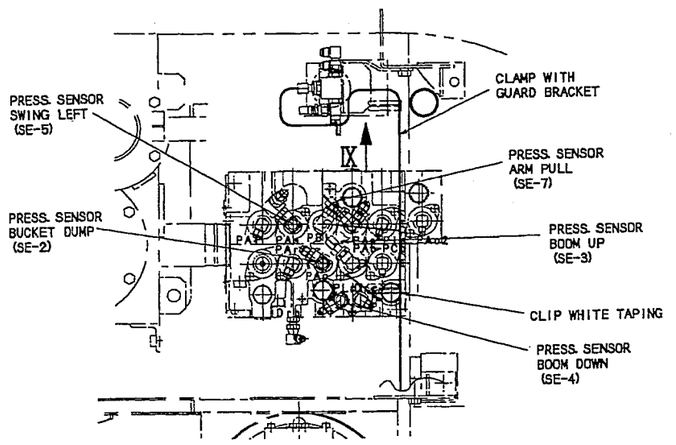
WIRE NO	WIRE COLOR	WIRE SIZE	FROM	CONNECTION	TO	FUNCTION
550	O	AVSS0.75sq	CN-14F		CN-10F	MECHATRO CONTROLLER → ENG. OIL PRESS SW.
551	BrL	AVSS0.75sq	CN-14F		CN-10F	MECHATRO CONTROLLER → AIR FILTER RESTRICTION SW
552	GB	AVSS0.75sq	CN-14F		CN-10F	MECHATRO CONTROLLER → ENG. WATER TEMP SW.
553A	BrB	AVSS0.75sq	CN-14F	DOUBLE SPLICE	CN-42F	MECHATRO CONTROLLER → RESISTOR
553B	BrB	AVSS0.75sq	CN-10F		CN-42F	FUEL SENSOR → RESISTOR
555	LB	AVSS0.75sq	CN-17F		CN-3M	MECHATRO CONTROLLER → DISPRESS SW.
556	LO	AVSS0.75sq	CN-12F		CN-71M	MECHATRO CONTROLLER → MAINTENANCE CONNECTOR
557	Gr	AVSS0.75sq	CN-17F		CN-3M	MECHATRO CONTROLLER → SWING FLASHER SELECT SW.
558	YV	AVSS0.75sq	CN-14F		CN-35F	MECHATRO CONTROLLER → FLOW CONTROLLER
559	PL	AVSS0.75sq	CN-12F		CN-251M	MECHATRO CONTROLLER → TWO-SPEED SELECT SW.
560	V	AVSS0.75sq	CN-11F		CN-10F	MECHATRO CONTROLLER → STEPPING MOTOR
561	Lg	AVSS0.75sq	CN-12F		CN-27F	MECHATRO CONTROLLER → SWING PARKING RELEASE SW.
563	PL	AVSS0.75sq	CN-14F		CN-3M	MECHATRO CONTROLLER → DOUBLE SINGLE SELECT SE.
583	VW	AVSS0.75sq	CN-14F		CN-10F	MECHATRO CONTROLLER → OVER LOAD SW.
600	R	MVVS0.5sq	CN-14F		CN-76M	MECHATRO CONTROLLER → CLUSTER GAUGE
601	W	3 CORES SHIELD	CN-14F		CN-76M	MECHATRO CONTROLLER → CLUSTER GAUGE
602	B		CN-14F		CN-76M	MECHATRO CONTROLLER → CLUSTER GAUGE
SH4	Gr		CN-14F		CN-76M	SHIELD
603	LgR	AVSS0.75sq	CN-14F		CN-4M	MECHATRO CONTROLLER → SWITCH ASSY
604	LG	AVSS0.75sq	CN-14F		CN-4M	MECHATRO CONTROLLER → SWITCH ASSY
605	VG	AVSS0.75sq	CN-14F		CN-4M	MECHATRO CONTROLLER → SWITCH ASSY
606	BrW	AVSS0.75sq	CN-14F		CN-4M	MECHATRO CONTROLLER → SWITCH ASSY
607	GW	AVSS0.75sq	CN-14F		CN-4M	MECHATRO CONTROLLER → SWITCH ASSY





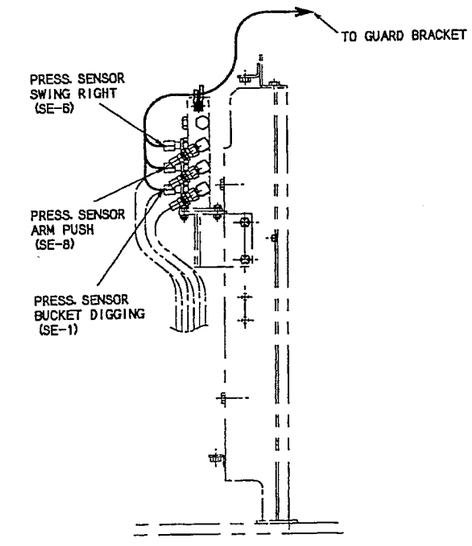


VIEW VI DETAIL OF CONTROL VALVE

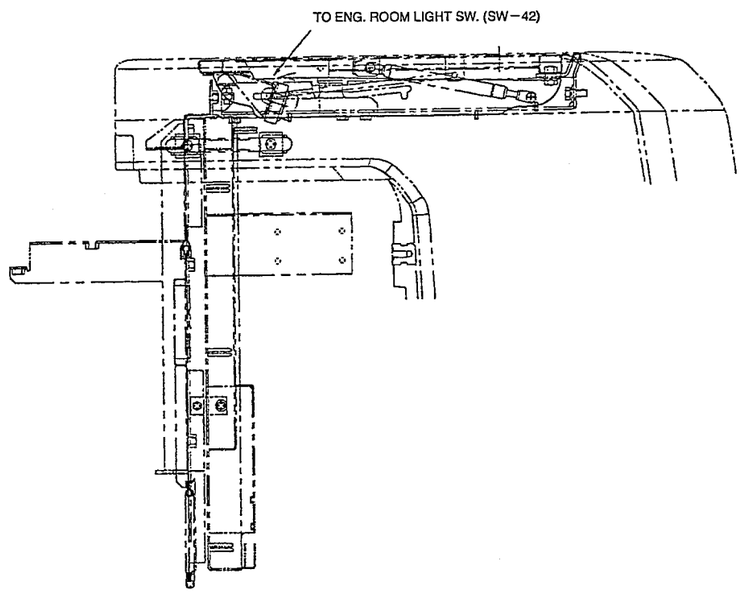


DETAIL OF PRESS. SENSOR

SECTION AA DETAIL OF CONTROL VALVE



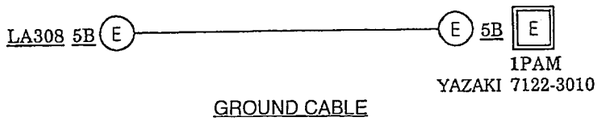
VIEW IX



DETAIL OF BONNET

Fig. 8 (3/3) Upper harness assy

3.8.3 GROUND CABLE : LE13E01005P1



GROUND CABLE

3.8.8 UNDER FLOOR HARNESS : YY13E01011P3

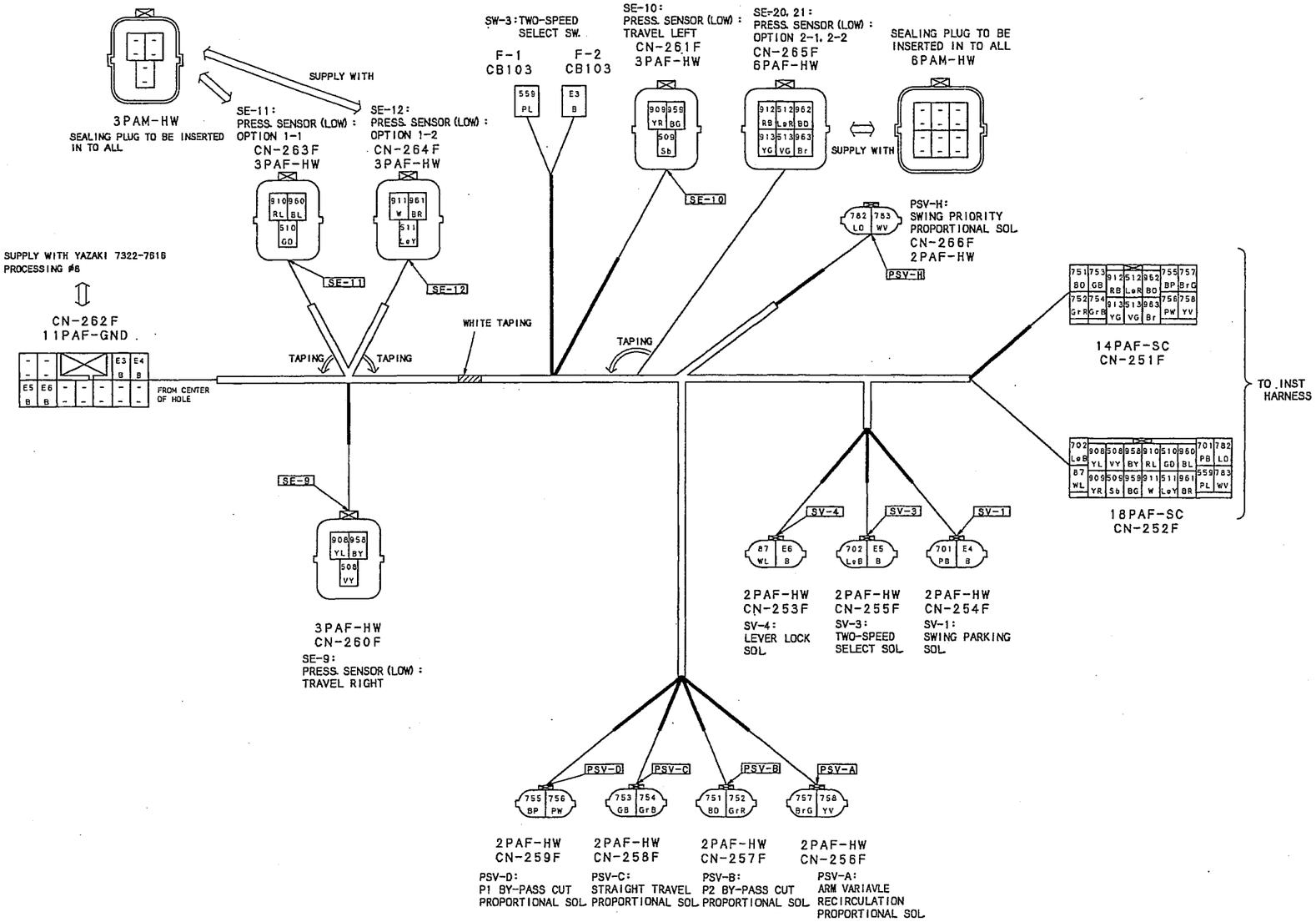


Fig. 19 Under floor harness

CONNECTORS SELECTION TABLE

CONNECTOR NAME (PIN NUM.)	MANUFUC.	PART. NUMBER	
		HOUSING	TERMINAL
2PAF-HW	SUMITOMO	6189-0129	1500-0106
3PAF-HW	SUMITOMO	6189-0131	1500-0133
3PAM-HW	SUMITOMO	6181-0072	
11PAF-GND	YAZAKI	7283-1110 7322-7616	7116-4021
14PAF-SC	AMP	178689-2	175266-2 (040 GOLD PLATING) 175269-1 (070M PLATING)
18PAF-SC	AMP	178690-1	175266-2 (040 GOLD PLATING) 175269-1 (070M PLATING)
6PAF-HW	SUMITOMO	6189-0133	1500-0133
6PAM-HW	SUMITOMO	6181-0074	
CB103	TOYO	7120-1010	300402-1

WIRE NO	WIRE COLOR	WIRE SIZE	FROM	CONNECTION	TO	FUNCTION
87	WL	AVSSO. 75sq	CN-253F	——	CN-252F	LEVER LOCK SOL. → MECHATRO CONTROLLER
508	VY	AVSSO. 75sq	CN-260F	——	CN-252F	PRESS. SENSOR (LOW) : TRAVEL RIGHT → MECHATRO CONTROLLER
509	Sb	AVSSO. 75sq	CN-261F	——	CN-252F	PRESS. SENSOR (LOW) : TRAVEL LEFT → MECHATRO CONTROLLER
510	GO	AVSSO. 75sq	CN-263F	——	CN-252F	PRESS. SENSOR (LOW) : OPT. 1-1 → MECHATRO CONTROLLER
511	LgY	AVSSO. 75sq	CN-264F	——	CN-252F	PRESS. SENSOR (LOW) : OPT. 1-2 → MECHATRO CONTROLLER
512	LgR	AVSSO. 75sq	CN-265F	——	CN-251F	PRESS. SENSOR (LOW) : OPT. 2-1 ← MECHATRO CONTROLLER
513	VG	AVSSO. 75sq	CN-265F	——	CN-251F	PRESS. SENSOR (LOW) : OPT. 2-2 ← MECHATRO CONTROLLER
559	PL	AVSSO. 75sq	F-1	——	CN-252F	TWO-SPEED SELECT SW. ← MECHATRO CONTROLLER
701	PB	AVSSO. 75sq	CN-254F	——	CN-252F	SWING PARKING SOL. ← MECHATRO CONTROLLER
702	LgB	AVSSO. 75sq	CN-255F	——	CN-252F	TWO-SPEED SELECT SOL. → MECHATRO CONTROLLER
751	BO	AVSSO. 75sq	CN-257F	——	CN-251F	P2 BY-PASS CUT PROPORTIONAL SOL. ← MECHATRO CONTROLLER
752	GrR	AVSSO. 75sq	CN-257F	——	CN-251F	P2 BY-PASS CUT PROPORTIONAL SOL. → MECHATRO CONTROLLER
753	GB	AVSSO. 75sq	CN-258F	——	CN-251F	STRAIGHT TRAVEL PROPORTIONAL SOL. ← MECHATRO CONTROLLER
754	GrB	AVSSO. 75sq	CN-258F	——	CN-251F	STRAIGHT TRAVEL PROPORTIONAL SOL. → MECHATRO CONTROLLER
755	BP	AVSSO. 75sq	CN-259F	——	CN-251F	P1 BY-PASS CUT PROPORTIONAL SOL. ← MECHATRO CONTROLLER
756	PW	AVSSO. 75sq	CN-259F	——	CN-251F	P1 BY-PASS CUT PROPORTIONAL SOL. → MECHATRO CONTROLLER
757	BrG	AVSSO. 75sq	CN-256F	——	CN-251F	ARM VARIAVLE RECIRCULATION PROPORTIONAL SOL. ← MECHATRO CONTROLLER
758	YV	AVSSO. 75sq	CN-256F	——	CN-251F	ARM VARIAVLE RECIRCULATION PROPORTIONAL SOL. → MECHATRO CONTROLLER
782	LO	AVSSO. 75sq	CN-266F	——	CN-252F	SWING PRIORITY PROPORTIONAL SOL. → MECHATRO CONTROLLER
783	WV	AVSSO. 75sq	CN-266F	——	CN-252F	SWING PRIORITY PROPORTIONAL SOL. → MECHATRO CONTROLLER
908	YL	AVSSO. 75sq	CN-260F	——	CN-252F	PRESS. SENSOR (LOW) : TRAVEL RIGHT → MECHATRO CONTROLLER
909	YR	AVSSO. 75sq	CN-261F	——	CN-252F	PRESS. SENSOR (LOW) : TRAVEL LEFT ← MECHATRO CONTROLLER
910	RL	AVSSO. 75sq	CN-263F	——	CN-252F	PRESS. SENSOR (LOW) : OPT. 1-1 ← MECHATRO CONTROLLER
911	W	AVSSO. 75sq	CN-264F	——	CN-252F	PRESS. SENSOR (LOW) : OPT. 1-2 ← MECHATRO CONTROLLER
912	RB	AVSSO. 75sq	CN-265F	——	CN-251F	PRESS. SENSOR (LOW) : OPT. 2-1 → MECHATRO CONTROLLER
913	YG	AVSSO. 75sq	CN-265F	——	CN-251F	PRESS. SENSOR (LOW) : OPT. 2-2 → MECHATRO CONTROLLER
958	BY	AVSSO. 75sq	CN-260F	——	CN-252F	PRESS. SENSOR (LOW) : TRAVEL RIGHT ← MECHATRO CONTROLLER
959	BG	AVSSO. 75sq	CN-261F	——	CN-252F	PRESS. SENSOR (LOW) : TRAVEL LEFT ← MECHATRO CONTROLLER
960	BL	AVSSO. 75sq	CN-263F	——	CN-252F	PRESS. SENSOR (LOW) : OPT. 1-1 → MECHATRO CONTROLLER
961	BR	AVSSO. 75sq	CN-264F	——	CN-252F	PRESS. SENSOR (LOW) : OPT. 1-2 → MECHATRO CONTROLLER
962	BO	AVSSO. 75sq	CN-265F	——	CN-251F	PRESS. SENSOR (LOW) : OPT. 2-1 → MECHATRO CONTROLLER
963	Br	AVSSO. 75sq	CN-265F	——	CN-251F	PRESS. SENSOR (LOW) : OPT. 2-2 → MECHATRO CONTROLLER
E3	B	AVSSO. 75sq	F-2	——	CN-262F	TWO-SPEED SELECT SW. → EARTH
E4	B	AVSSO. 75sq	CN-254F	——	CN-262F	SWING PARKING SOL. → EARTH
E5	B	AVSSO. 75sq	CN-255F	——	CN-262F	TWO-SPEED SELECT SOL. → EARTH
E6	B	AVSSO. 75sq	CN-253F	——	CN-262F	LEVER LOCK SOL. → EARTH

3.15 FUEL PUMP ASSY

FUEL PUMP ASSY	SK115SR	YY22P00001F1
	SK135SR	↑

ITEM	PART NAME	PART No.	Q'TY		REMARKS
3	FUEL PUMP	YY22P00002F1	1	←	

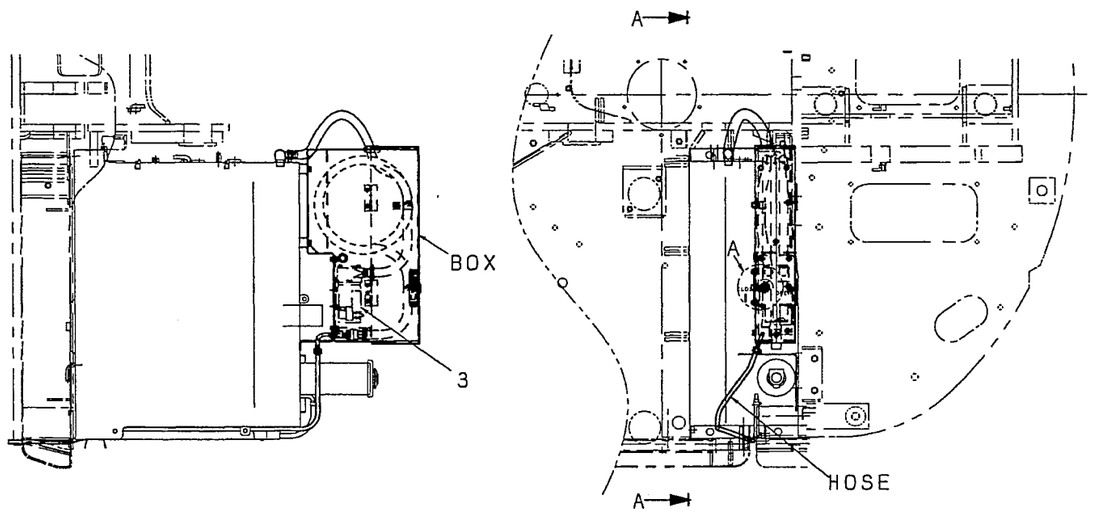


Fig. 39 Fuel pump assy

3.15.3 FUEL PUMP

FUEL PUMP	SK115SR	YY22P00002F1
	SK135SR	↑

ITEM	PART NAME	PART No.	Q'TY		REMARKS
1	FUEL PUMP ASSY	YT22P00001F3	1	←	
1-10	ELECTRIC MOTOR	YT22P00001S010	1	←	
1-18	CHECK VALVE	YT22P00001S018	1	←	
1-22	FUSE	YT22P00001S022	1	←	

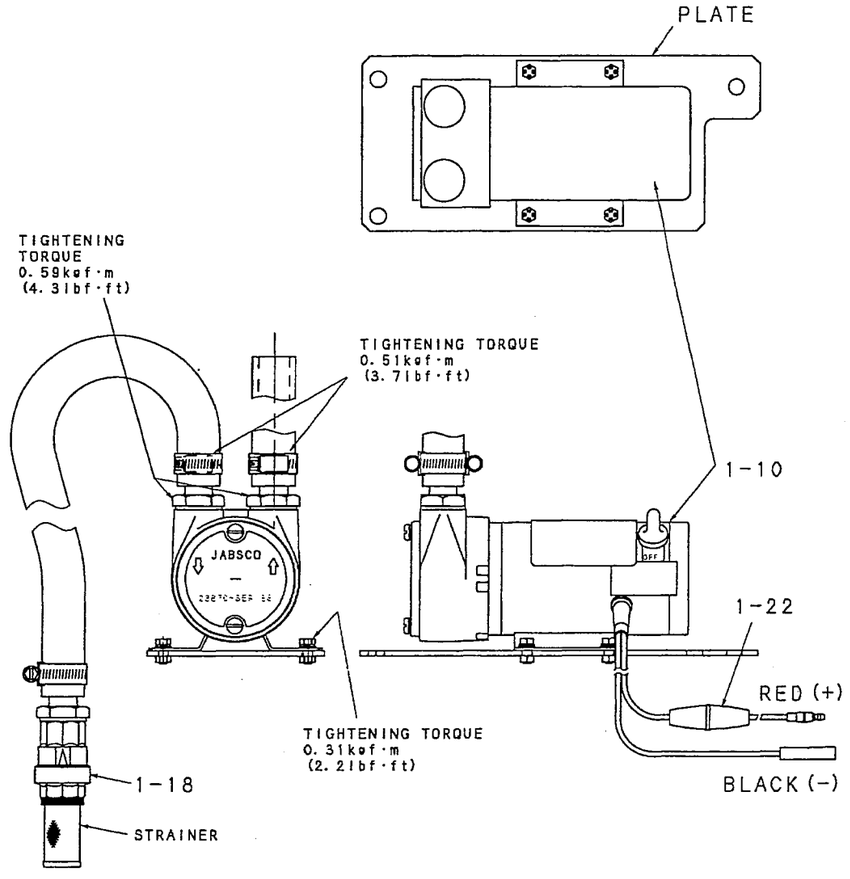


Fig. 40 Fuel pump

(4) Gear pump for dozer (for SK115SRDZ)

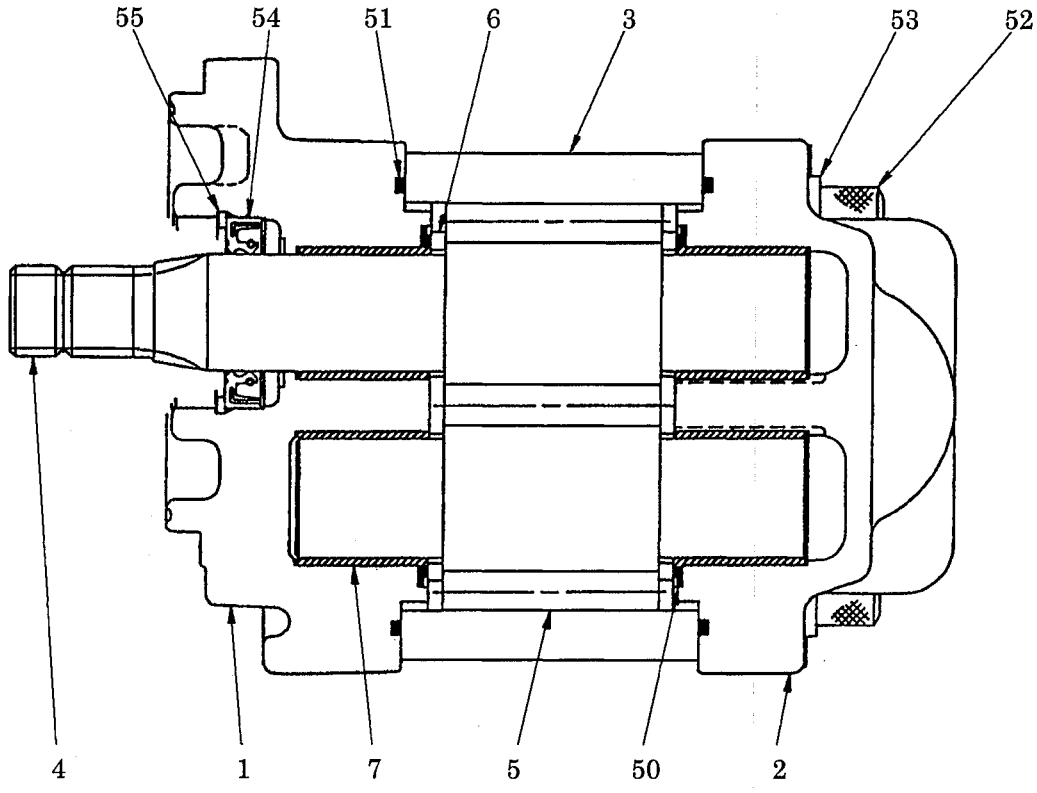


Fig. 1-5 Construction of gear pump(for dozer)

Item \ Specification		Gear pump for dozer
Parts No.		YX10V00002F1
Model		SGP1−25
Displacement capacity	cm^3/rev	24.9
Working pressure	kgf/cm^2(psi)	210(2,990)
Max. flow	ℓ /min(gal/min)	51(13)
Relief set pressure	kgf/cm^2(psi)	210(2,990)

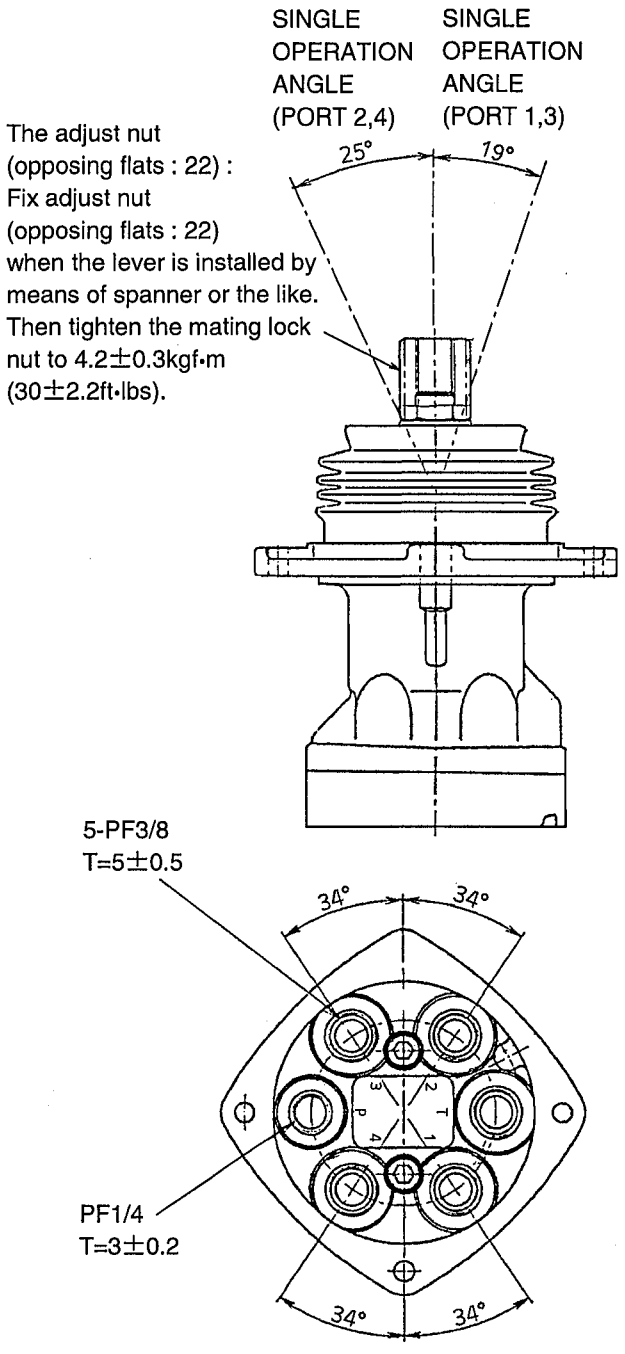
Table 1-6

No.	NAME	Q'TY	No.	NAME	Q'TY
1	FRONT COVER	1	50	GASKET(SHAPED LIKE LETTER 3)	2
2	REAR COVER	1	51	GASKET	2
3	BODY	1	52	SOCKET BOLT	4
4	DRIVE GEAR	1	53	WASHER	4
5	DRIVEN GEAR	1	54	OIL SEAL	1
6	SIDE PLATE	2	55	SNAP RING	1
7	BUSHING	4			

2. PILOT VALVE (ATT)

2.1 OUTLINE

(1) Outside view



(2) Specification

Table 2-1

Item	Specification
Part No.	YT30V00008F2
Model	PV48K1008
Operating torque	Refer to the table below
Max. primary pressure	50kgf/cm² (710psi)
Primary pressure	50kgf/cm² (710psi)
Rated flow	20 ℓ /min (5.3gal/min)
Weight	Approx. 2kg (4 lbs)

(3) Performance characteristics

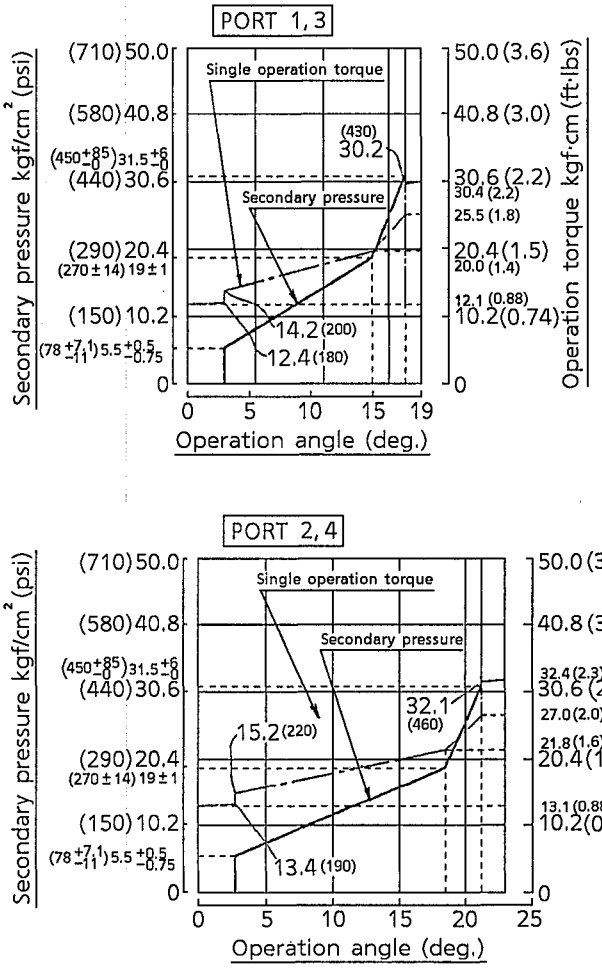


Fig. 2-1

3) Shuttle section

- If pressure is built up at port 1 or 3, the ball is pressed against the seat by the pressure. The pressure goes through from port 1 to port 5(or from port 3 to port 6).
  Only a little leakage occurs from port 2 or 4 as the ball is sealed metallically by the seat.
  If pressure occurs at port 2 or 4, the ball is pressed against the body by the pressure. The result is that the pressure connects with port 5 from port 2(with port 6 from port 4).
  Only a little leakage occurs at port 1 or 3 as the ball is sealed metallically against the body.

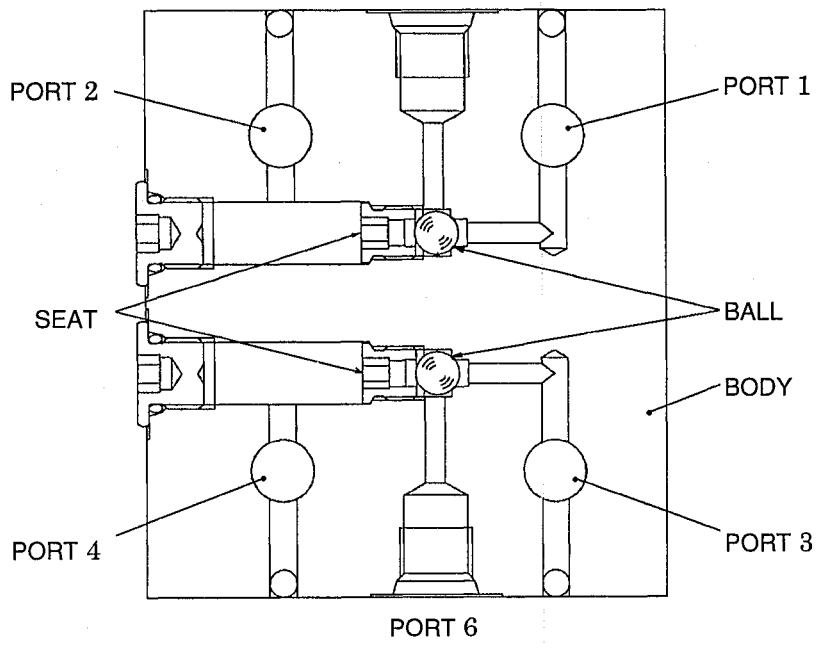


Fig. 3-5 Shuttle section

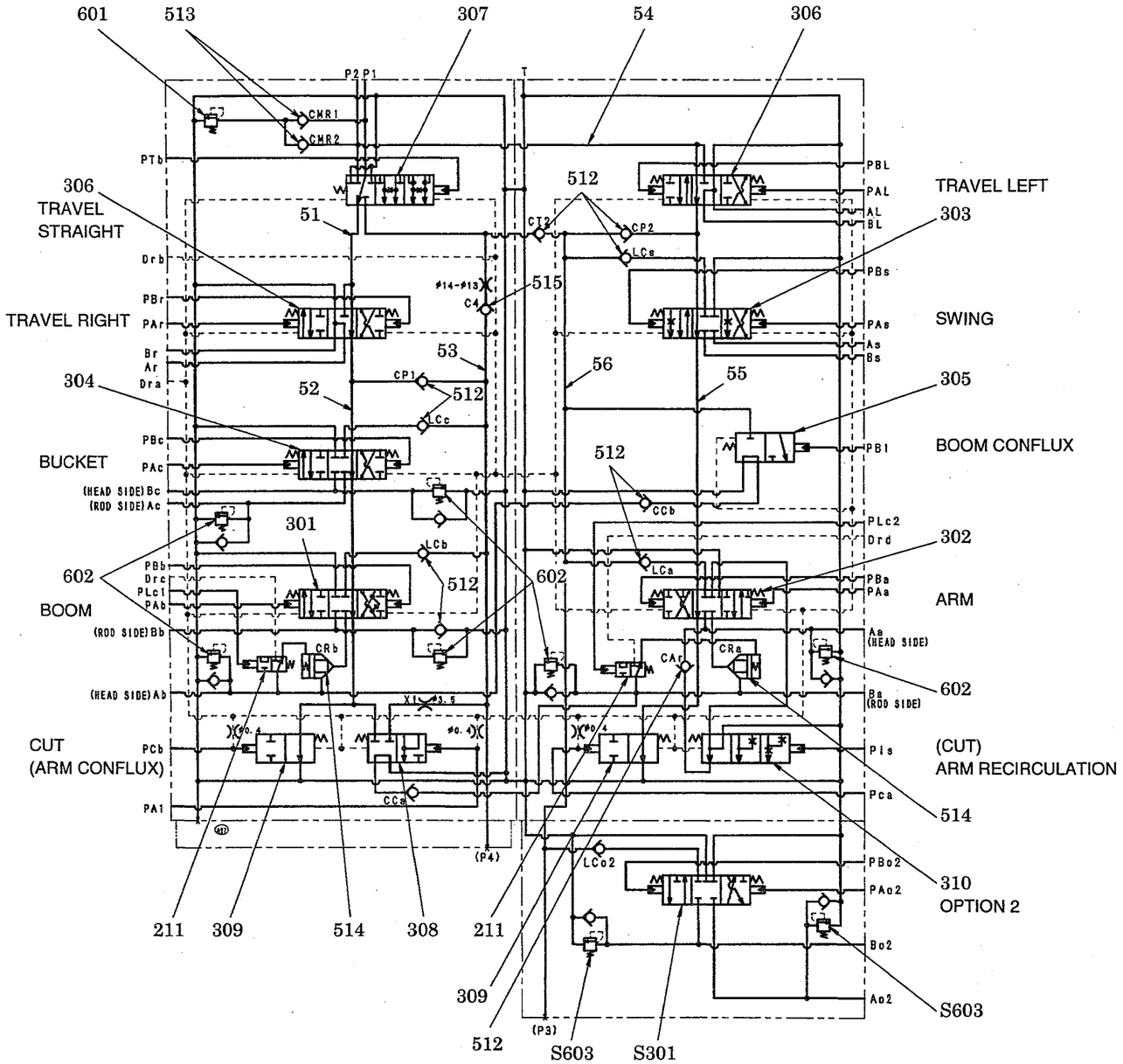


Fig. 4-9 Hydraulic circuit diagram

Table 4-4

No.	NAME
51	Main passage (P1 side)
52	Bypass circuit (P1 side)
53	Parallel circuit (P1 side)
54	Main passage (P2 side)
55	Bypass circuit (P2 side)
56	Parallel circuit (P2 side)
211	Lock valve selector A sub
212	Lock valve selector B sub
301	Boom spool
302	Arm spool
303	Swing spool
304	Bucket spool
305	Boom conflux spool
306	Travel spool
307	Travel straight spool
308	Arm conflux spool
309	P1,P2 bypass cut valve
310	Arm recirculation spool
512	Poppet D=20
513	Poppet
514	Lock valve poppet
515	Poppet (with restrictor)
601	Main relief valve
602	Port relief valve
S301	Spool for option valve
S603	Port relief valve for option valve

(5) Arm

1) Arm out operation

If arm out operation is performed, the secondary pilot pressure from port (8) of the pilot valve acts upon ports PBa and PA1 of the control valve. (refer to next page)

The pressure oil which enters port PBa shifts the arm spool (302) leftwards. The pressure oil which enters port PA1 changes over the arm conflux valve.

The secondary pressure of the electromagnetic proportional valve [D] acts upon port PCb of the control valve and changes over the P1 bypass cut valve (309).

The pressure oil delivered by pump P2 flows into the bypass circuit (55) by way of the main passage (54), but since it is blocked by the arm spool (302), it pushes the check valve open, flows into the parallel circuit (56), pushes the load check valve (512) open, goes between the outer circumference of the arm spool and the casing by way of the U-shaped passage, runs into chamber AR, pushes the lock valve poppet (514) open and is supplied to the arm cylinder rod side via port (Ba).

In the meantime, the oil which returns from the arm cylinder bottom side passes between the outer circumference of the arm spool (302) and the casing by way of the port (Aa), flows into the tank port (T) from the low pressure circuit (D) and returns to the hydraulic oil tank.

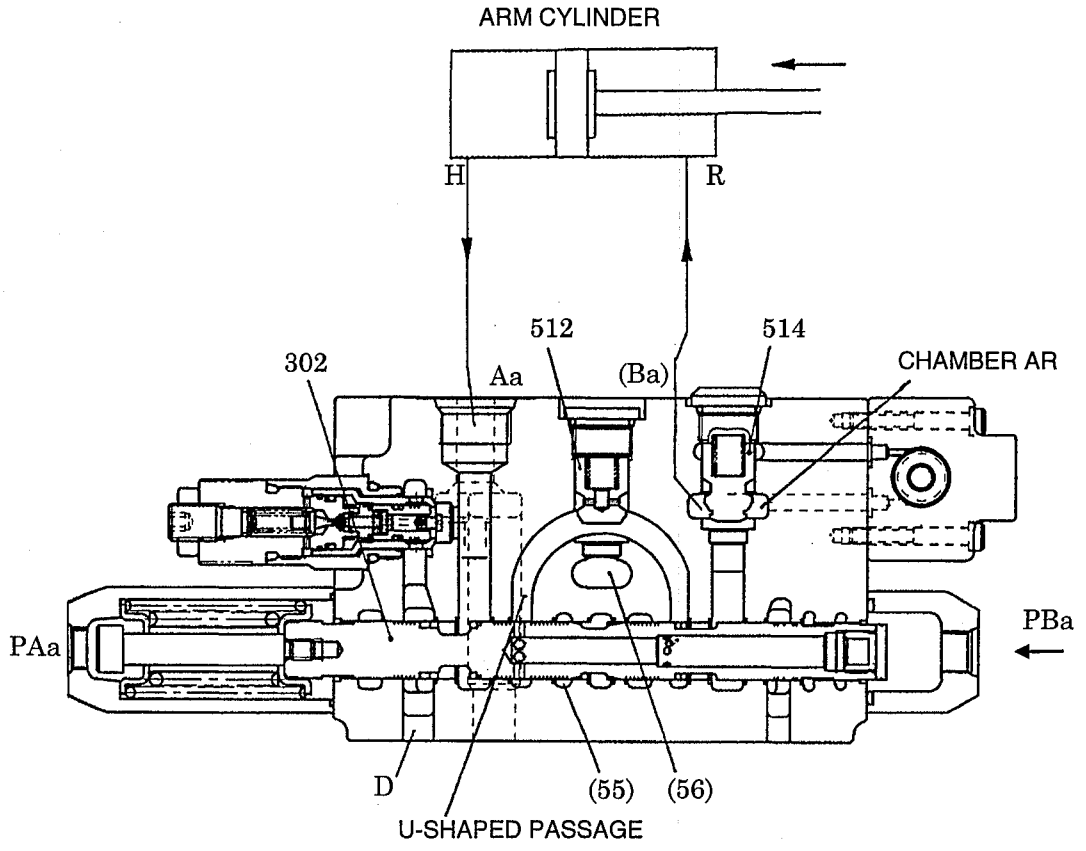


Fig. 4-19 At arm out operation (Arm spool)

(10) Operation of port relief valve

The port relief valve is located between the cylinder port and the low pressure passage, functions as both a relief valve and an anti cavitation check valve, as mentioned below :

1) Operation as a relief valve

1. The pressurized oil enters the hole A through the clearance between piston (301) and plunger (511) and fills up chamber B. Thus plunger (511) is seated tightly against seat (541).

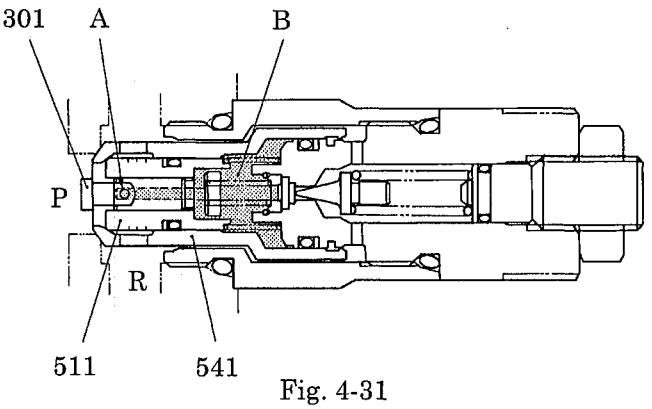


Fig. 4-31

2. When the hydraulic pressure of the port (P) arrives at a set pressure of the spring (621), it pushes the poppet (611) open, flows on the circumference of the poppet (611) and passes through the hole (C) to (R).

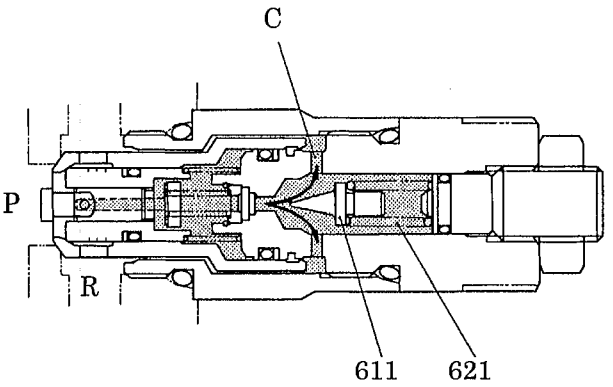


Fig. 4-32

3. When the poppet (611) opens, the hydraulic pressure in chamber B falls which causes the plunger (511) to open and allows the hydraulic pressure of port (P) to flow directly to (R).

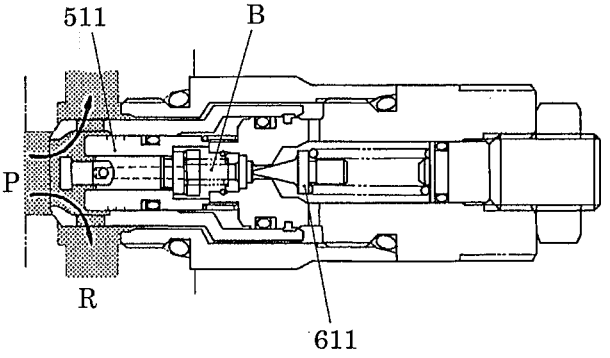


Fig. 4-33

2. Operation of anti cavitation check valve

The check valve supplies oil from port (R) when a negative pressure is built up at port (P). When the pressure at (R) gets higher than that of port (P), the push-up force of circuit (R) gets stronger than the pressing force of chamber B.

This causes seat (541) to move to the right. Then the oil passes through the clearance of seat (541) and enters port (P) in sufficient quantity to fill up the vacancy.

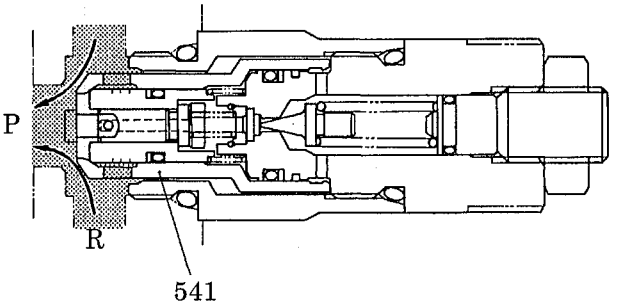


Fig. 4-34

- The numbers of the parts of the main relief valve in this section correspond to those in Fig.4-5.

5.3.3 OPERATION OF BRAKE SECTION

The cylinder (111) is jointed by drive shaft (101) and a spline. Separator plate (743) is fixed in its circumferential direction by circular grooves provided in casing (301).

Now, if the friction plate (742) splined to the outer circumference of the cylinder is pressed against casing (301) via separat or plate (743) and brake piston (702) by the action of brake spring (712), frictional force is created between friction plate (742) and casing (301) and between separator plate (743) and brake piston (702). The frictional force bounds the drive shaft to brake the motor. In the meantime, when brake release pressure applied to the oil chamber formed between brake piston (702) and casing (301) overcomes the spring force, the brake is released as brake piston (702) moves till friction plate (742) is detached from casing (301).

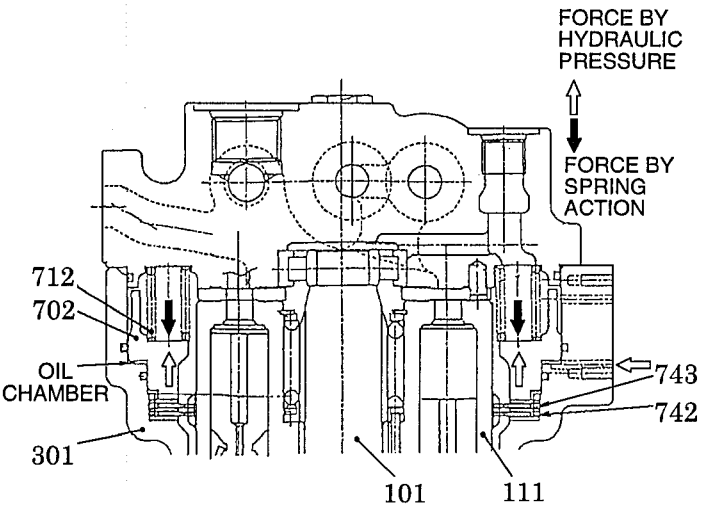


Fig. 5-9 Operation of swing brake

5.3.4 SWING REDUCTION UNIT

The power of the swing motor drive shaft is transmitted to sun gear No.2 (204) on the 2nd stage through sun gear No.1 (211) on the 1st stage and carrier No.1 (231).

Similarly, the power is transmitted to drive shaft (201) through sun gear No.2 (204) on the 2nd stage and carrier No.2 (230). The pinion shaft is supported by two shaft bearing (401),(402) in casing (102).

In addition, oil seal (801) is installed at the center of casing (102) to protect the bearing on the drive shaft side of which the load condition is difficult from the gear frictional abrasion powder, and the A chamber side is lubricated by oil in the ring gear (202) and the B chamber is lubricated by the grease sealed inside.

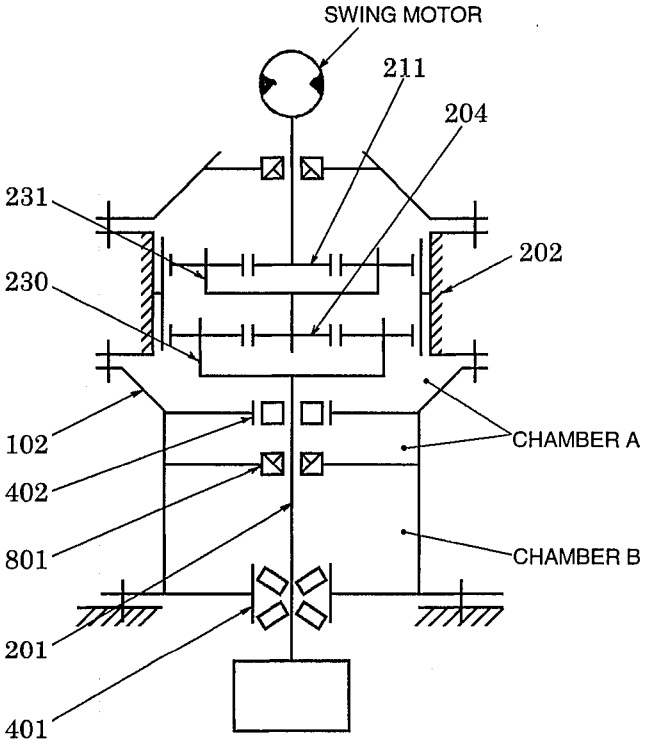


Fig. 5-10 Operation of reducting unit

2) braking

a) Operation (Brake released)

The pressure oil is led to through port (A), opens valve (127), and led to port (C) on the section side of hydraulic motor to rotate hydraulic motor.

At the same time, the pressure oil enters chamber (b) through passage (a) from the small hole of spool (123), and exerts on the end of spool to generate the force.

Then the force of spring (128) slides the spool placed on the neutral position leftward.

The sliding of spool forms the space (passage) between spool and rear flange with spool groove. This passage is connected to port (D) and port (B) of the return circuit of the hydraulic motor, and the return oil returns to tank side, enabling hydraulic motor to rotate.

Then, the sliding of spool (123) leads pressure oil to port (P) and port (S). The pressure oil led to port (P) moves piston (112) of parking brake, and releases parking braking force. (For details, refer to item "Parking brake".)

If pressurized oil is supplied from port (B) the movements of spool (123) and valve (127) are reversed so that the hydraulic motor is rotated reversely.

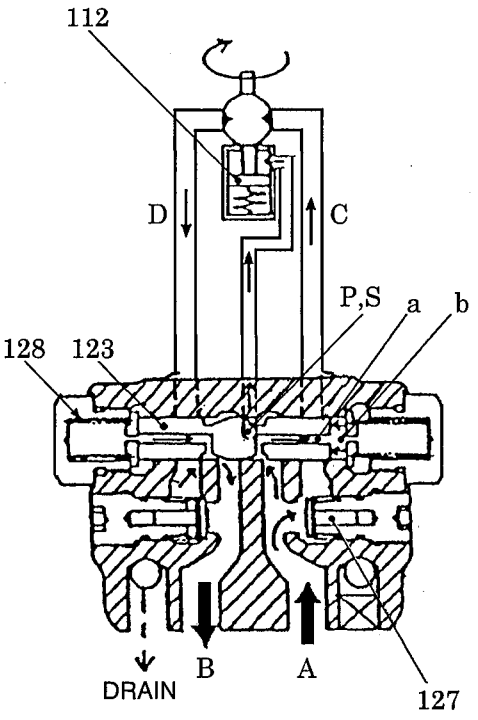


Fig. 6-12

b) Self-traveling

While machine is being operated, as the travel speed is increased due to steep slope, the oil flow rate of the hydraulic motor is higher than the supply flow rate of the hydraulic oil pump. The rotation of the hydraulic motor in this case is called a self-traveling (Overrun).

While self-traveling, the oil pressure is lowered similar to the stopping condition. Then brake valve is moved similar to the stopping condition, throttles passage in the return side of hydraulic motor, and generate back pressure.

In addition, the force of inertia decreases the revolution of hydraulic motor to revolution having a balance with the supply flow rate of pump.

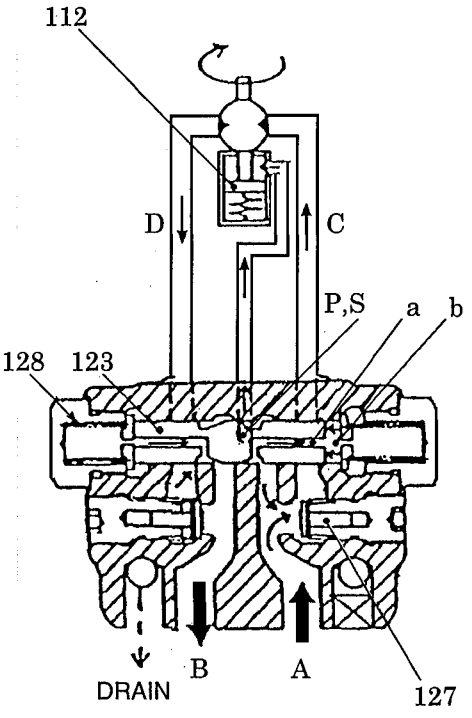


Fig. 6-13

(137) from being moved by the hydraulic pressure so that motor port (C) will not be connected when the motor is in motion. When hydraulic pressure is supplied from the suction side of the motor and port (B) on the return side, the motions of spool (123) and valve (127) are reversed with regard to the right and left direction to reverse the rotation of the motor.

c) At stop and stall (when the brake operates)

If hydraulic pressure from port (A) is shut off, the spool (123) which has moved to the left attempts to return to the right via stopper (125) by the action of spring (128). On that occasion, the oil in chamber (b) tends to go out of port (A) past path (a) in spool (123), but the speed of spool (123) returning to the right is controlled by the effect of the restrictor in path (a).

Then, the motor attempts to rotate by its inertia even after pressure is shut off. Accordingly, the return oil tends to go back to port (B) side through port (D) and past a path which is formed in the clearance between the groove of spool (123) and rear flange (101). When spool (123) returns to neutral completely, the path formed in the clearance is closed completely to stop the motor. Thus the motor is braked smoothly to a stop as the oil returning from the motor is gradually controlled by the return speed of spool (123) and the spool function.

However, the motor changes its motor action to pumping action by inertia moment and tries to suck oil.But oil can not be fed to the motor as pressurized oil supply is shut off , with the result that the motor develops cavitation that has adverse effect on it. Concurrently, since the path is closed by spool (123), the return oil from the motor is confined on port (D) side which results in a rise in the pressure. This pressure moves spool (137) leftwards till port (D) and port (C) are shortcircuited. These are a surge cut valve function and an anti－cavitation valve function that prevent pressure rise and cavitation.

In this way the valve (127) is actuated by a minimal negative pressure which opens the oil passage form port (A) to the suction port (C) of the motor, thereby preventing cavitation of the motor.

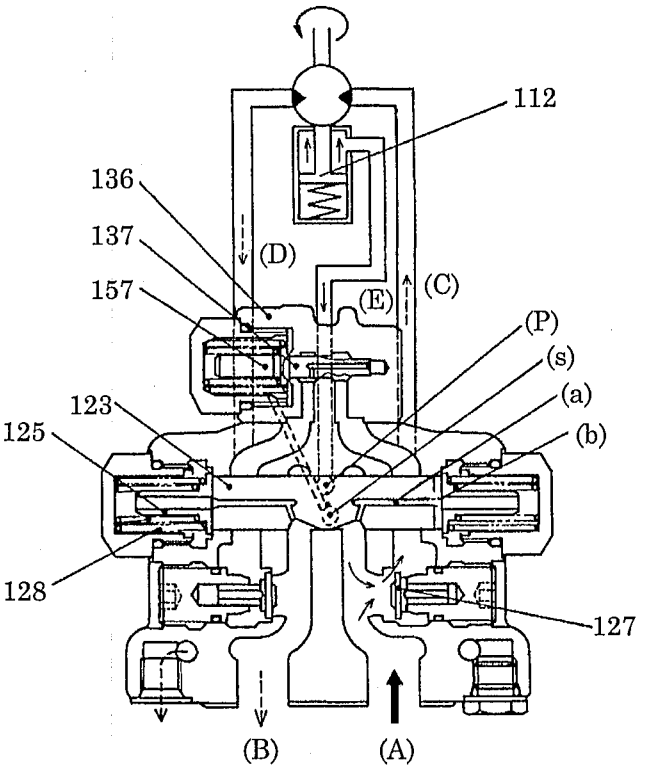


Fig. 10

(2) Arm cylinder

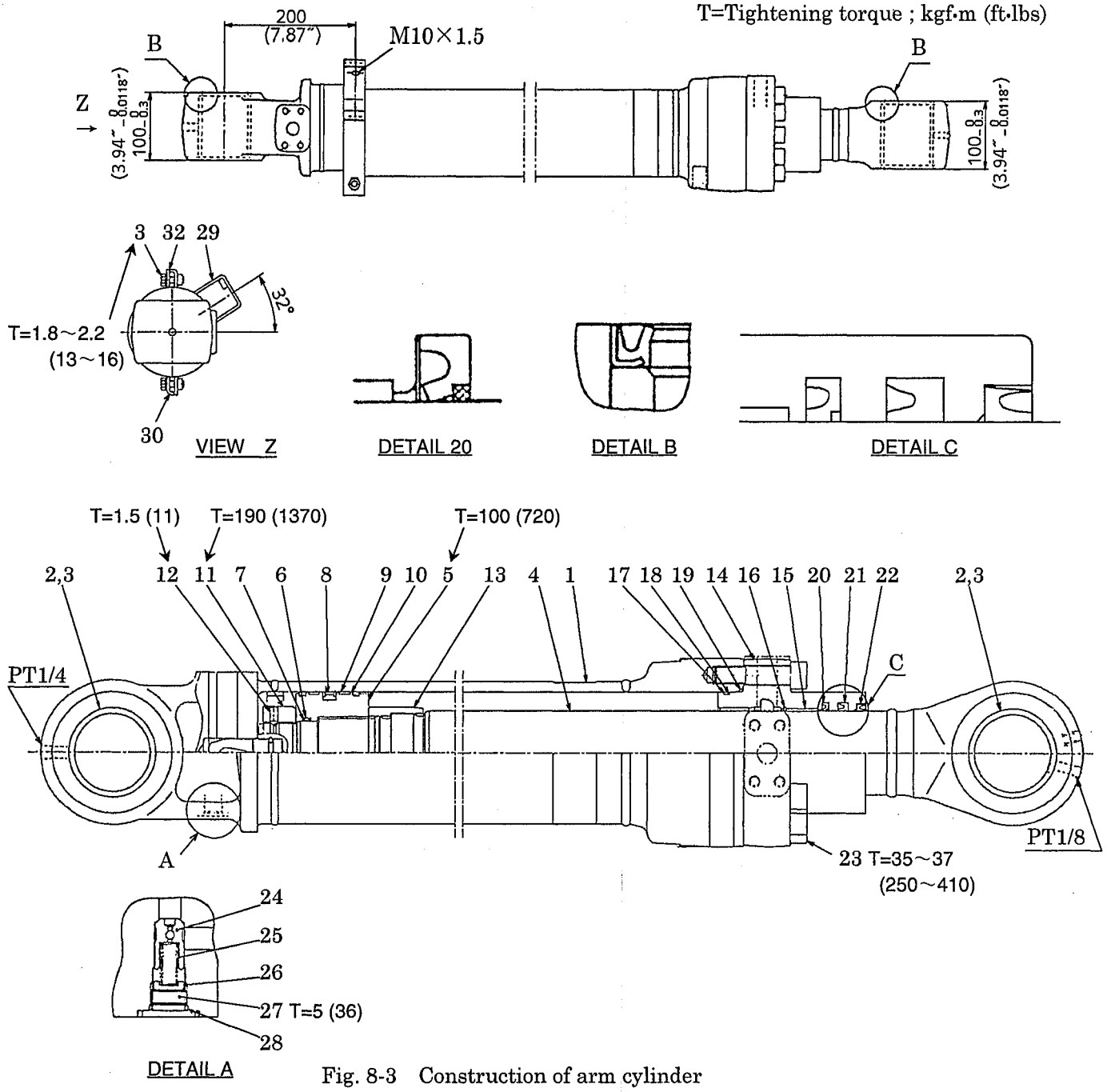
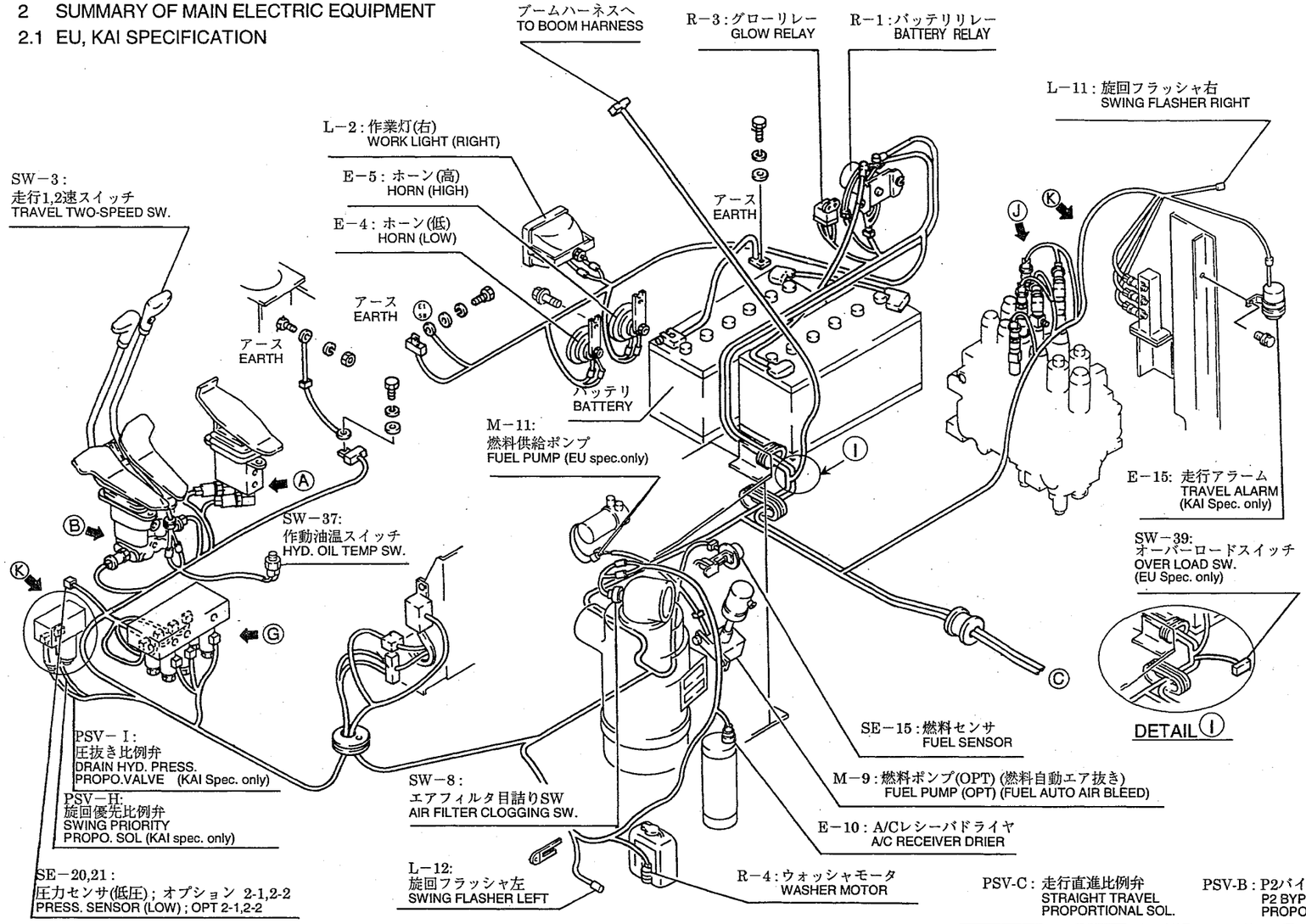


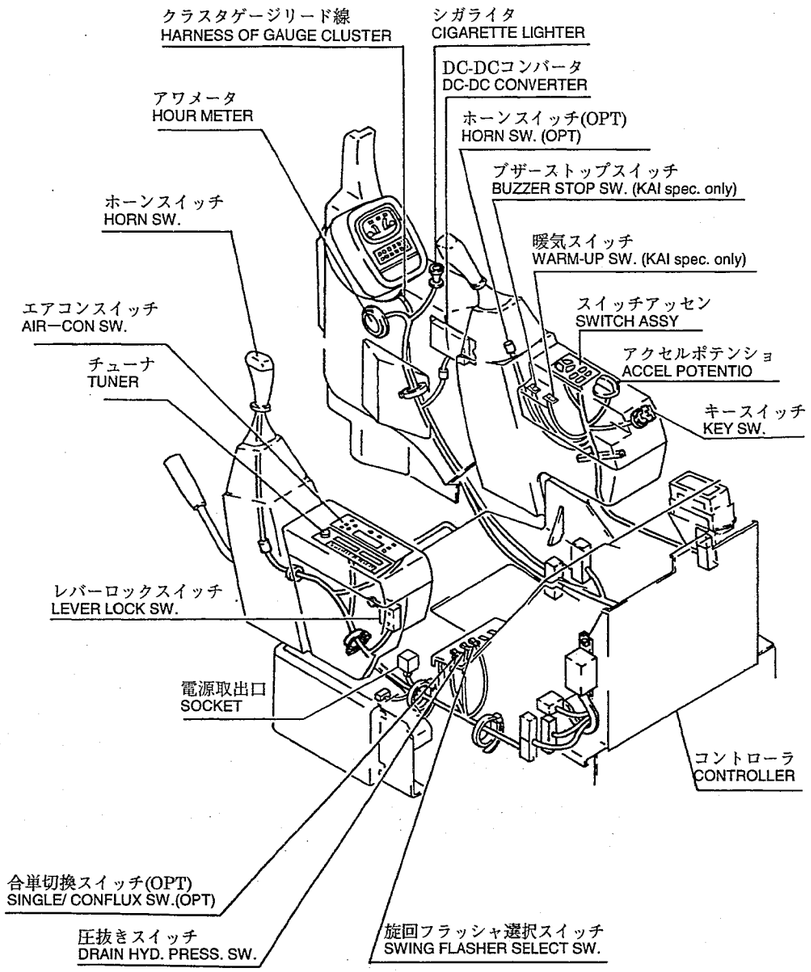
Fig. 8-3 Construction of arm cylinder

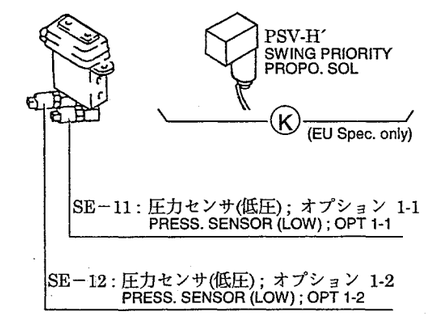
No.	NAME	Q'TY	No.	NAME	Q'TY	No.	NAME	Q'TY
1	CYLINDER TUBE	1	12	SET SCREW ; M8	1	23	SOCKET BOLT ; M16×70	10
2	BUSHING	4	13	CUSHION RING	1	24	RESTRICTOR	1
3	DUST SEAL	4	14	ROD COVER	1	25	SPRING	1
4	PISTON ROD	1	15	BUSHING	1	26	SPRING SEAT	1
5	PISTON	1	16	SURCLIP	1	27	PLUG ; PF3/8	1
6	O RING	1	17	O RING ; 1B G110	1	28	O RING ; 1B P14	1
7	BACKUP RING	2	18	BACKUP RING	1	29	BAND	1
8	PISTON SEAL	1	19	O RING ; 1B G115	1	30	BAND	1
9	WEAR RING	2	20	BUFFER SEAL	1	31	CAPSCREW ; M10×30	2
10	DUST RING	2	21	ROD PACKING	1	32	LOCK WASHER	2
11	PISTON NUT	1	22	DUST SEAL	1			

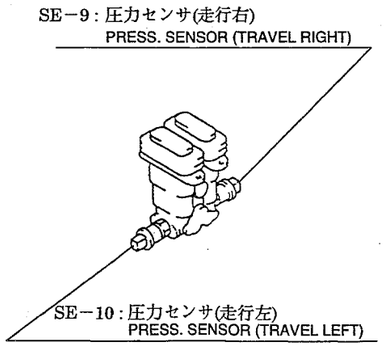
2 SUMMARY OF MAIN ELECTRIC EQUIPMENT

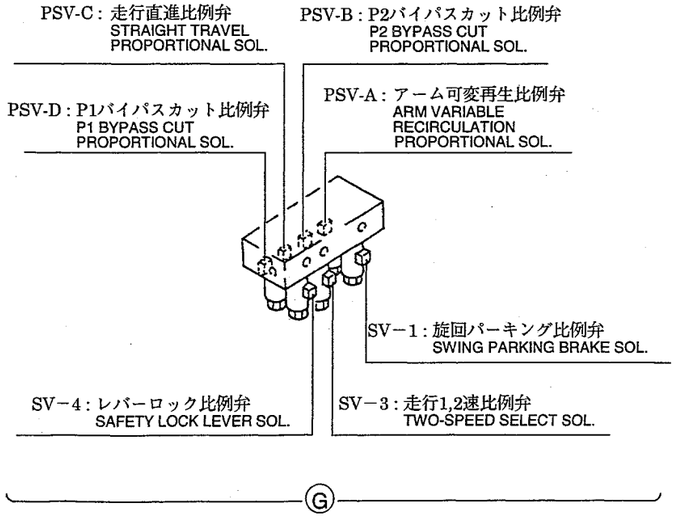
2.1 EU, KAI SPECIFICATION

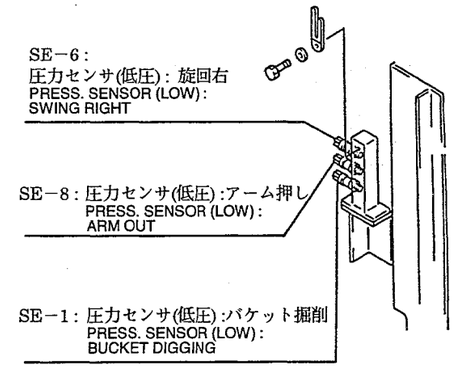


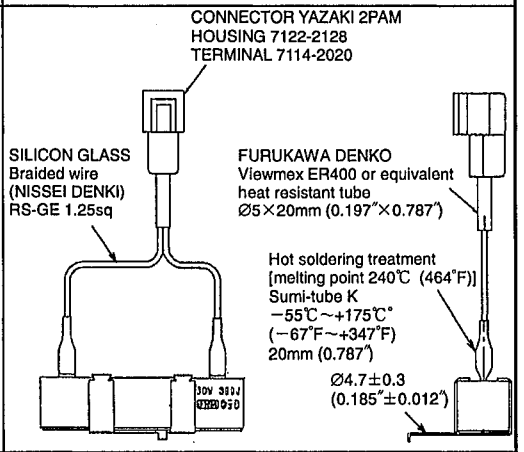
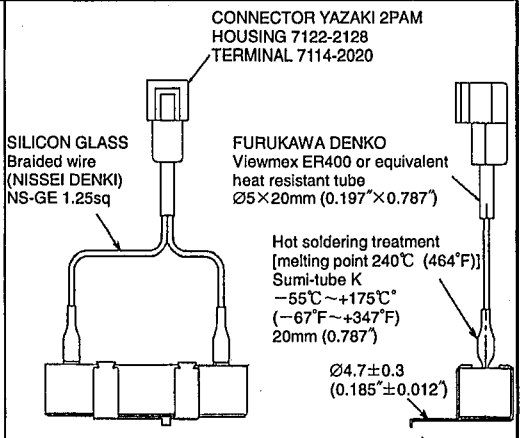
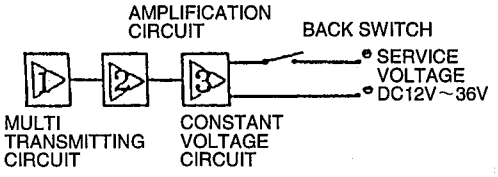
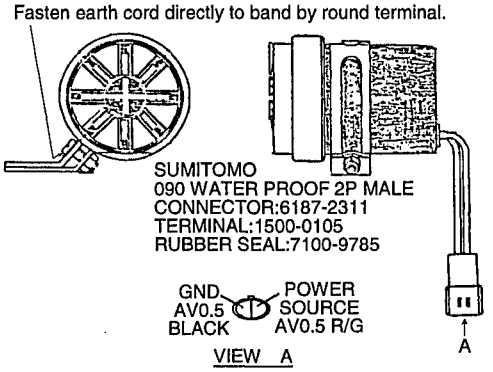
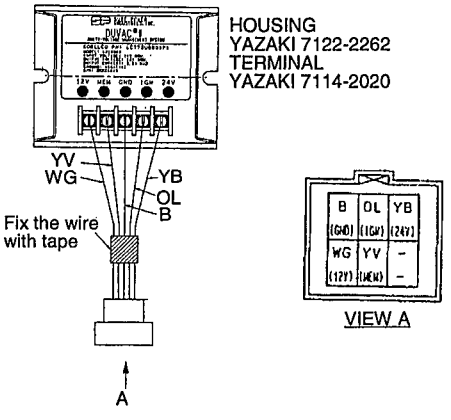


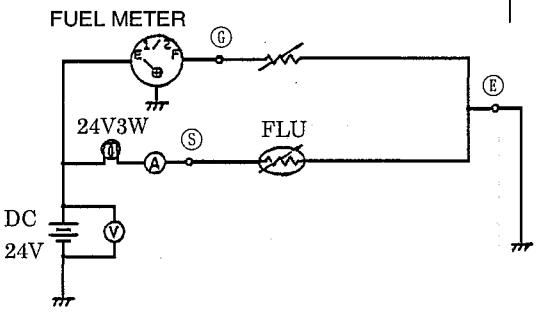
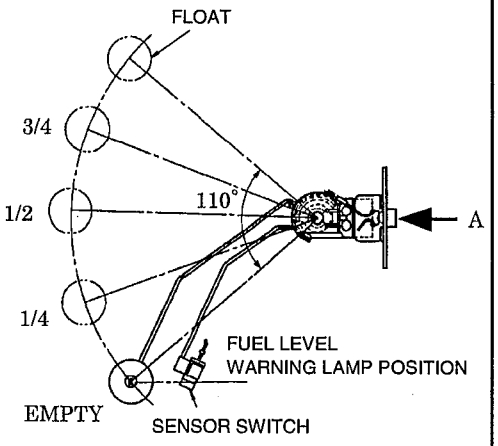
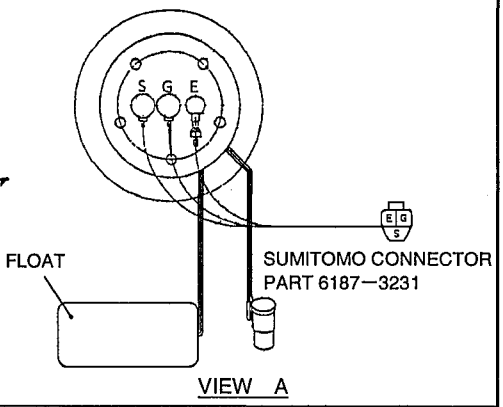
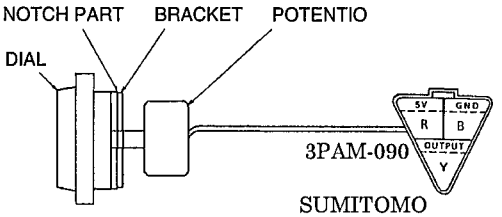
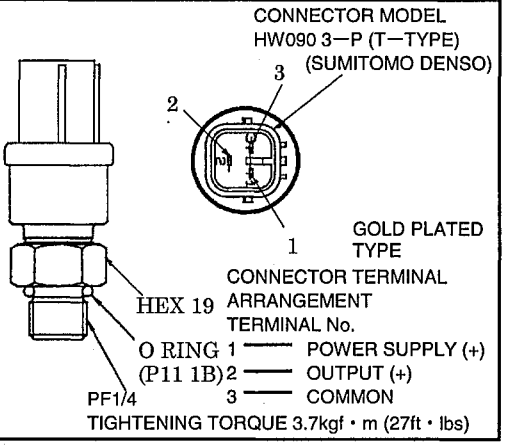








File No. Name of part Part No. Use Applicable Machine	Specification	Description
E−13 Resistor YR26E01001P1 (Oceania Spec.) P2 bypass cut proportional valve YR04001~ YX01001~ YV00101~ YY00101~	Rated power consumption: 30W Resistance value: 39ΩJ Insulation resistance: DC500V / More than 20MΩ	
E−14 Resistor LC22E01001D1 P1,P2 pump proportional valve YX01001~ YV00101~ YY00101~ YH00101~	Rated power consumption: 40W Resistance value: 16Ω Insulation resistance: DC500V / More than 20MΩ	
E−15 Alarm 2479U1710 (KAI, EU Spec.) Travel YY00101~ YH00101~	Rated voltage: DC12V~36V Rated current: 0.2A at 24V  BLOCK CIRCUIT DIAGRAM	
E−16 Converter YT77S00001P1 (KAI, EU Spec.) DC-DC converter YY00101~ YH00101~	Input voltage: 24V NOM. Output voltage: 12V NOM. Output current: 2.5A MAX.	

File No. Name of part Part No. Use Applicable Machine	Specification	Description
SE－15 Fuel sensor 2489U267F1 Fuel sending YW06501～ LP11001～,YP02301～ YN18001～,YQ02301～ LQ03301～,LL02301～ YT00101～,YR04001～ YX01001～, YV00101～ YY00101～,YH00101～	<table><tr><th>Float level</th><th>Resistance value Ω</th></tr><tr><td>FULL</td><td>$10^{+0.1}_{-0.5}$</td></tr><tr><td>3/4</td><td>(19)</td></tr><tr><td>1/2</td><td>32±3</td></tr><tr><td>1/4</td><td>(49.5)</td></tr><tr><td>EMPTY</td><td>80^{+12}_{+2}</td></tr></table> 	  VIEW A
SE－16 Potentio meter YN52S00009P1 Accel dial YT00101～ YR04001～ YX01001～ YV00101～ YY00101～ YH00101～	<table><tr><td>Total resistance value</td><td>2KΩ</td></tr><tr><td>Effective electric angle</td><td>90°</td></tr><tr><td>Number of notches</td><td>10</td></tr><tr><td>Source voltage</td><td>5V</td></tr></table>	 SUMITOMO 6187-3231 TERMINAL 1500-0105
SE－20,21 Pressure sensor (low pressure) LC52S00001P2 Option 2-1, 2-2 YT00101～ YR04001～ YX01001～ YV00101～ YY00101～ YH00101～	<table><tr><td>Pressure range</td><td>0～30kgf/cm² (0～430psi)</td></tr><tr><td>Max. allowable press.</td><td>250kgf/cm²(3560psi)</td></tr><tr><td>Operating source voltage</td><td>5±0.5V DC</td></tr><tr><td>Load resistance</td><td>10KΩ MIN</td></tr><tr><td>Insulation resistance</td><td>More than 100MΩ</td></tr></table>	

KOBELCO

Book code No. S5YY2502E

SK115SR
SHOP MANUAL SK135SR(LC)

AIR-CONDITIONER SYSTEM

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YY25

KOBE STEEL, LTD.

Consequently, the cooling circuit is so constructed that the evaporator can cool down an object (air in this case) sufficiently (i.e. so as to decrease the pressure in the evaporator) and that an adequate amount of refrigerant can be fed to the evaporator.
The feed rate of the refrigerant is controlled by the expansion valve, but the pressure in the evaporator is held low by the throttling action of the expansion valve and the suction action of the compressor. The compressor acts as a pump that allows the refrigerant to circulate. The compressive action of the compressor and the heat exchange (heat radiation) action of the condenser transform the refrigerant in a dry vapor state back to a liquid state.

3.3 COMPONENT PARTS

(1) Evaporator (See Fig.8.)
The evaporator is an important heat exchanger that absorbs the heat of the compartment air (object) by the utilization of the latent vaporization heat of the low-temperature, low-pressure liquid-state refrigerant. Therefore, it is necessary that satisfactory heat transfer between the object and the refrigerant take place in the evaporator.
To that end, the evaporator is equipped with fins on the air side in order to increase the heat transfer area of the air side and thereby perform excellent thermal transfer between the refrigerant and the air.
The humidity in the air condenses as the air cools down and adheres to the outside of the evaporator as water drops. The cooling effect deteriorates if the water drops freeze. Therefore, how to discharge water is an important point.
The amount of refrigerant supplied to the evaporator is controlled by the expansion valve which is described in the following. In order to attain proper control, it is necessary to reduce the pressure drop of the refrigerant of the evaporator. Accordingly, reducing the pressure drop is one element that makes the evaporator attain its full performances.

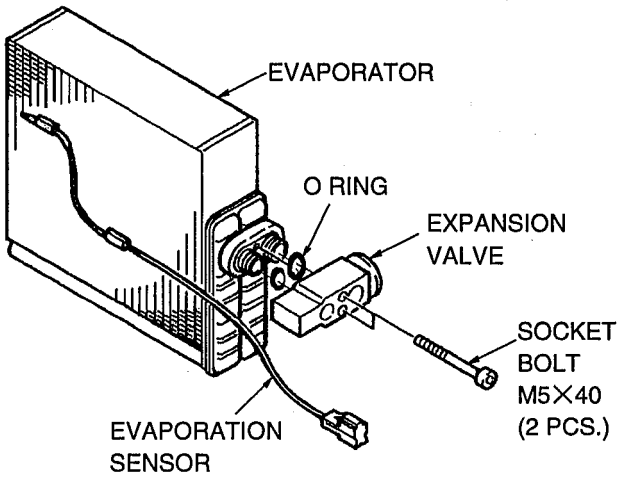


Fig. 8 Evaporator

(2) Expansion Valve
In order for the evaporator to fulfill its performances, a proper amount of low-pressure low-temperature liquid refrigerant must be fed to the evaporator.
If the feed rate is too low, the refrigerant completes vaporization early in the evaporator which results in deterioration of the cooling effect. If the feed rate is too high, unvaporized liquid refrigerant returns to the compressor (liquid back). This not only deteriorates the cooling effect, but also damages the compressor valves.

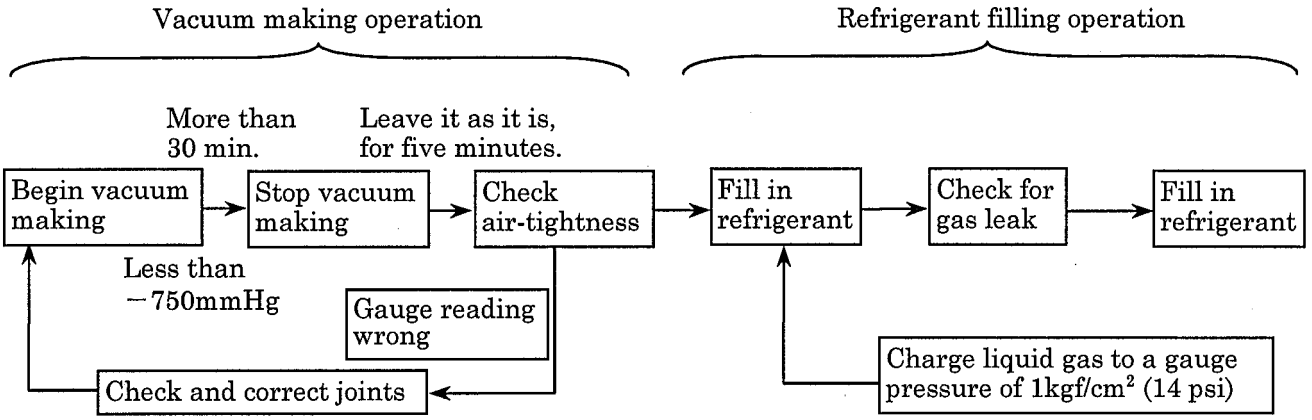
5.2 OPERATING PROCEDURE

(1) Refrigerant charge into the air-conditioner consists mainly of "vacuum making operation", and "gas charge operation".

1) The "vacuum making operation" consists of removing water in the air-conditioner circuit. If only a little water remains in the circuit, the small holes of the expansion valve are frozen during operation. This causes the circuit to clog up or rust, resulting in a variety of malfunctions. Therefore, before filling refrigerant in the circuit, make vacuum and allow the water in the circuit to boil and vaporize. Water in the circuit is thus eliminated.

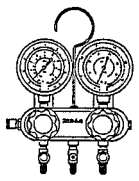
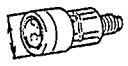
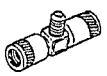
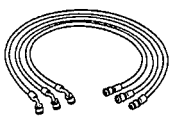
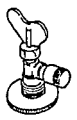
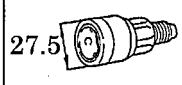
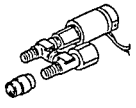
2) The "gas charging operation" consists of filling refrigerant in the circuit after forming vacuum. Filling gas not only depends upon the cooling performances of the air-conditioner, but also affects the service life of the component parts of the circuit. Extreme overcharge will make the circuit pressure extremely high and causes the cooling performance to deteriorate. On the contrary, undercharge causes poor circulation of the lubricating oil of the compressor and causes seizure of the moving parts of the compressor. The gas filling operation involves handling of high pressure gas; filling gas according to incorrect operation procedure is dangerous. Fill refrigerant correctly following the operation procedures and cautions stated in this manual.

(2) Operation Chart



(3) Tools

Table 5 unit : mm

No.	Name of Part	Q'TY	Sketch	Service	No.	Name of Part	Q'TY	Sketch	Service
1	Gauge manifold	1			4	Quick joint	1	 23.5	Low pressure side
					5	T joint	1		For service can valve
2	Charging hose	3		Red : high pressure side Blue : low pressure side Yellow : vacuum pump side	6	Service can valve	2		For service can
3	Quick joint	1	 27.5	High pressure side	7	Vacuum pump adapter	1		For vacuum pump

7. TROUBLESHOOTING

【Temperature does not fall.】

Note) M/A : Motor actuator

If A/C switch is pushed, "HL.E" is indicated on the set temp. display of the panel.

NO

"HL.※" is shown on the set temp. display of the panel.

NO

※※E on display.

A snow mark on the panel is flashing.

NO

Blowout temp. falls if temp. is set at 18.0 (64.4°F) (COOLMAX) and the blowout mode is changed to vent mode.

NO

※1 Air mix damper is in COOLMAX.

NO

If M/A is at stop halfway, eliminate cause, correct and measure operating force.(less than 1.5kgf : OK)

NO

- Inspect, correct or replace M/A lever link.
- After cleaning lever link, apply grease.

YES

M/A failed or controller is out of order.

Replace.

YES

Turn compressor clutch on and off. Inspect and correct electric circuits.

Refer to Troubleshooting for refrigeration cycle.

YES

Chilly air flowing into inner air sensor

NO

Controller is faulty or inner air sensor is faulty.

Inspect and replace.

YES

Inspect duct or eliminate cause for chilly air intrusion.

YES

A snow mark on panel is flashing.

Note) ※ is any of the numbers 0 ~ 9.

NO

- Inner air sensor or harness is disconnected or shorted.
- Inner air sensor connector is disconnected or in poor contact.

Inspect and correct or replace parts.

YES

- Both inner air sensor and evaporation sensor are disconnected or shorted.
- Controller failed.

YES

- Connector for air mix M/A is disconnected or in poor contact.
- M/A is broken.
- Main harness shows poor conductance.

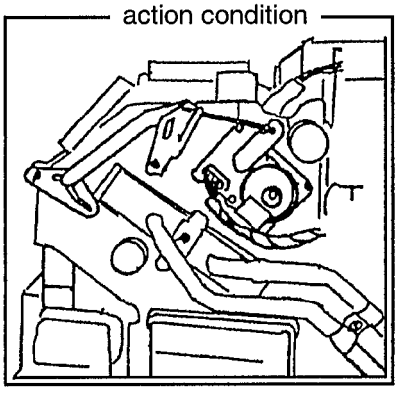
Inspect and correct or replace parts.

YES

- Evaporation sensor connector is disconnected or in poor contact.
- Evaporation sensor is disconnected or shorted.

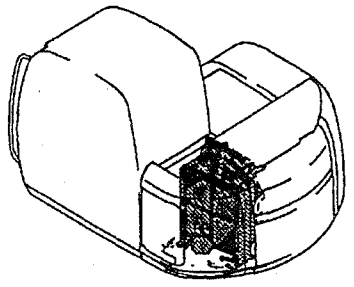
Inspect and correct or replace parts.

※1 COOL-MAX action condition



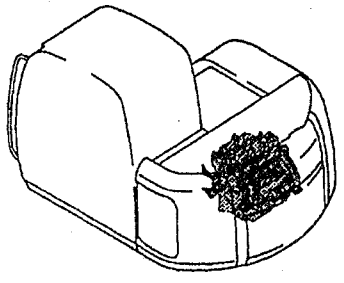
(13) Radiator & Oil cooler YY33— I —21

Radiator install ····· FIG 033-28
Radiator assy ····· FIG 038-01



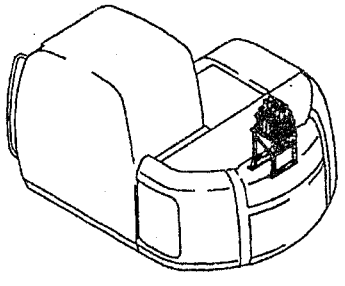
(14) Engine YY33— I —25

Engine assy ····· FIG 024-50
Engine install ····· FIG 029-01



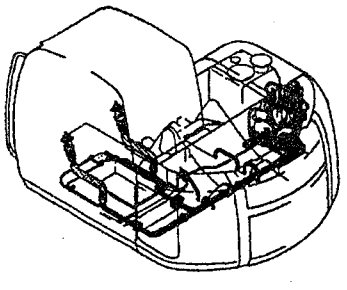
(15) Control valve YY33— I —32

Valve install ····· FIG 079-01



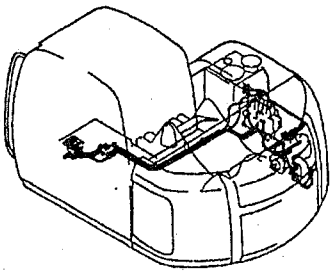
(16) Pilot valve (ATT) YY33— I —36

Control lines, remote ····· FIG 114-50



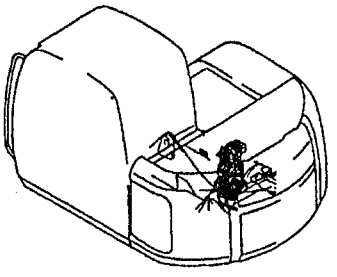
(17) Pilot valve (TRAVEL) YY33— I —37

Control lines, remote ····· FIG 126-01



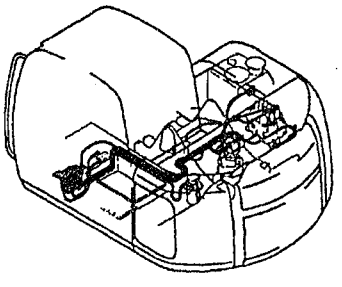
(18) Swing unit YY33— I —38

Motor install, swing ····· FIG 070-01



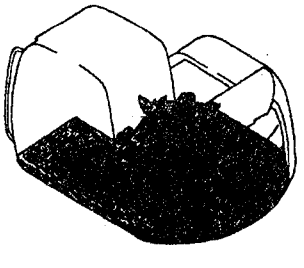
(19) Swivel joint YY33— I —40

Control lines, remote ····· FIG 120-01



(20) Upper frame YY33— I —43

Frame assy, upper ····· FIG 010-01



4. BOOM

4.1 PREPARATION FOR REMOVING AND ATTACHING BOOM

When removing and attaching boom in the position shown in Fig.4-1, to remove and attach boom foot pin (A), removing and attaching of cab and guard are required.

4.2 REMOVING BOOM

(1) Put the machine in position to remove boom.
Place top end of boom down on block, etc. giving attention for arm cylinder rod not to be extended.

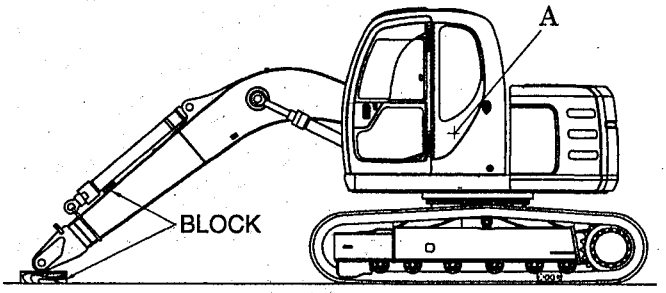


Fig. 4-1 Position to remove boom

(2) Lifting up boom cylinder temporarily
Remove the right and left boom cylinders one side by one side according to the following procedure:
Lift up boom cylinder temporarily to prevent it from dropping.

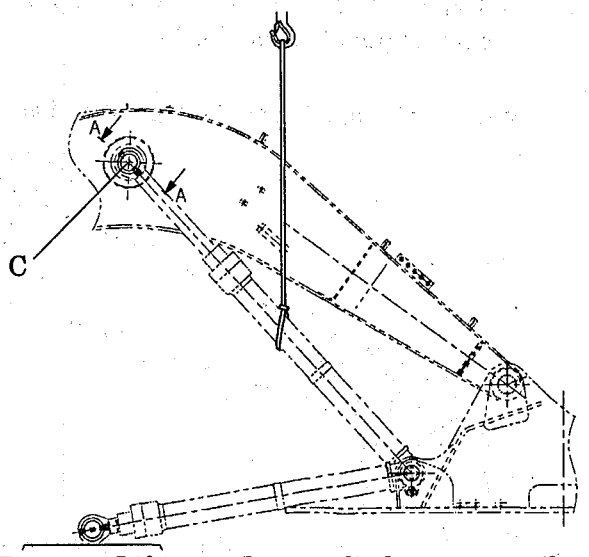
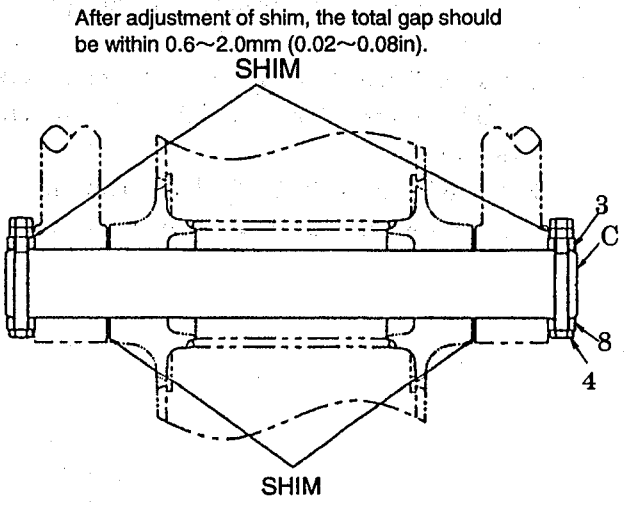


Fig. 4-2 Lifting up boom cylinder temporarily

(3) Removing boom cylinder rod pin (C)
Loosen nut (8), remove capscrew (4), collar (3) and push out pin (C).



SECTION AA

Fig. 4-3 Detail of boom cylinder rod pin (C)

(4) Preparing for disconnecting cylinder pipes
Retract boom cylinder rod, and place one side of cylinder on block. (See Fig.4-2.)

- At this time, the weight of piston rod (4) is loaded on rod cover (16). Therefore, lift the top end of the piston rod with a crane or something to the extent that only the rod weight may be held.

5) Draw out the piston rod assy from cylinder tube (1).

Since the piston rod assy is heavy in this case, lift the tip of the piston rod (4) with a crane or some means and draw it out. However, when piston rod (4) has been drawing out to approximately two thirds of its length, lift it in its center to draw it completely. However, since the plated surface of piston rod (4) is lifted, do not use a wire rope or something which may score the surface, but use a strong cloth, a belt or a rope.

6) Place the removed piston rod assy on a wooden V-block that is set level.

- Cover a V-block with rag.

7) Remove wear ring (11) and dust ring (12) from piston (7).

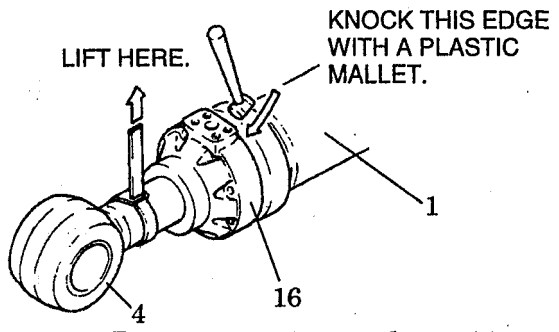


Fig. 1-6 Drawing out piston rod assy (4).

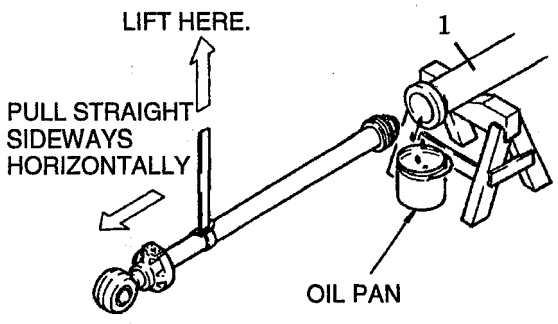


Fig. 1-7 Method of drawing out the piston rod assy

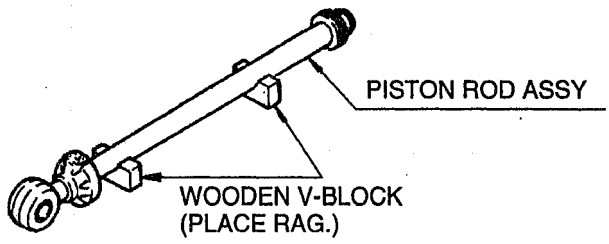


Fig. 1-8 Method of placing the piston rod

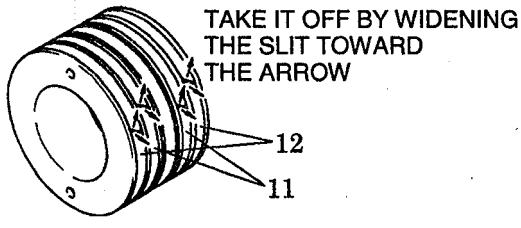


Fig. 1-9 Remove wear ring (11) and dust ring (12)

1.7 MAINTENANCE STANDARDS

1.7.1 INSPECTION AFTER DISASSEMBLY

Visually inspect all parts after cleaning to see that excessive wear, crack and other faults that are detrimental to use are not present.

(1) Inspection Item

Table 1-2

Part Name	Inspecting Section	Inspection Item	Remedy
Piston rod	1. Neck of rod pin	Presence of crack	Replace.
	2. Weld on rod hub	Presence of crack	Replace.
	3. Stepped part to which piston is attached	Presence of crack	Replace.
	4. Threads	Presence of seizure	Recondition or replace
	5. Bend	Measure degree of bend (See Fig. 1-39.)	Refer to Table 1-2.
	6. Plated surface	Check that: 1) Plating is not worn off to base metal 2) Rust is not present on plating. 3) Scratches are not present.	 1) Replace or replate 2) Replace or replate 3) Recondition, replate or replace.
	7. Rod	Wear of O. D.	Recondition, replate or replace.
	8. Bushing at mounting part	Wear of I. D.	Replace.
Cylinder tube	1. Weld on bottom	Presence of crack	Replace.
	2. Weld on head	Presence of crack	Replace.
	3. Weld on hub	Presence of crack	Replace.
	4. Tube interior	Presence of faults	Replace if oil leak is seen.
	5. Bushing at mounting part	Wear on inner surface	Replace.
Rod cover	1. Bushing	1) Wear on inner surface 2) Flaw on inner surface	1) See para. 1.7.2. 2) Replace if flaw is deeper than coating.

(2) Repair method

Check all seals and parts to see that they do not show excessive damage and wear. For correction of faults on the piston rod, observe the following procedure:

1) Correct very fine longitudinal scratches with an oilstone. Replace the piston rod if the scratch is so deep as may be caught by your nail.
2) In case of a smooth indention, recondition by removing the sharp area around the indention with an oilstone. If the flaw or the indention is excessive, replace or replate the faulty part.

⚠
- Always regrind after replating. The thickness of the plating must be maximum 0.1mm (0.004in).
- In case plating is removed to the base metal during reconditioning with an oilstone, do not fail to replate the surface.

1. SPECIFICATION

1.1 REMOVAL

(1) Remove floor mat

(2) Remove the following parts for air-con cover.
1) 5 bolts (1-9) for catch (24)
2) Cover (1)
3) Grille under front seat
4) Duct from duct (14) to under right duct on cab inside.

: Cross recessed screw driver
: 13mm

(3) Remove the following parts for harness and connector.
1) Antenna cable from back side of tuner
2) Harness for room lamp
3) Harness on cab front right side
4) Harness for gauge cluster

(4) Remove window washer tube

(5) Remove the following parts for cab mounting bolt
1) 5 capscrews (A1)M10
2) 4 nuts M16
3) Sems bolt (B2) M10, 2 pcs, on lower section of hand rail

: 17mm, 24mm

(6) Slinging cab
1) Remove 2 plastic plugs on front side of cab ceiling, and attach eye bolts M10, and hook wire 3 places, 2 bolts and lifting eye, on rear left side.
2) Then lift up slowly avoiding interference with surroundings.
Wire with hook ;
Length 1.5m (4ft 11in) × Dia. 8mm (0.315 in) × 3pcs.
Weight of cab ; Approx. 200kg (440 lbs)

1.2 INSTALLATION

Mount it in reverse procedure of Dismounting according to the Tightening Torque Table.

Tightening position	Tool	Tightening torque kgf·m (ft·lbs)
Lower section of hand rail Sems bolt (B2)	17	4.7 (34)
Nut M16	24	19.5 (140)
Capscrew (A1)	17	4.7 (34)

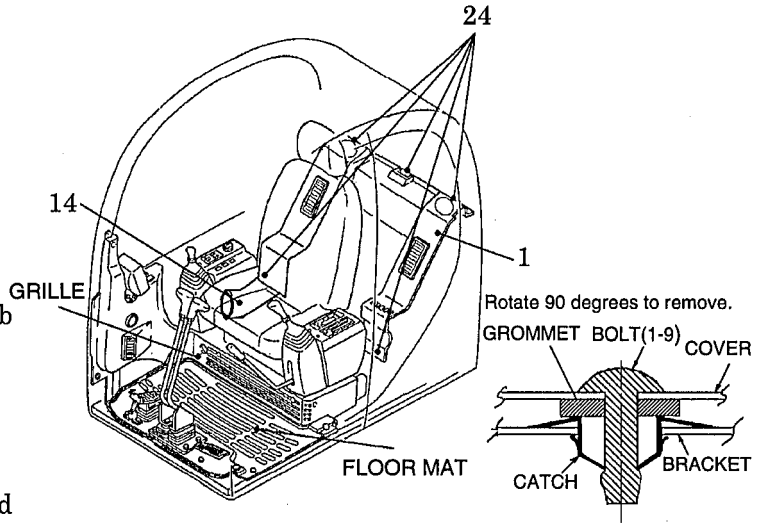


Fig. 1-1 Detaching and attaching air conditioner cover

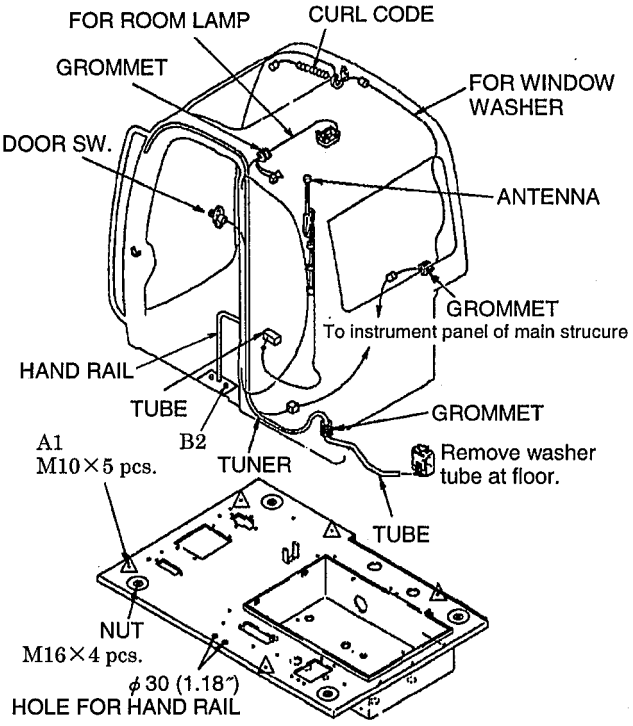


Fig. 1-2 Removing and attaching harness connector and cab mounting bolts

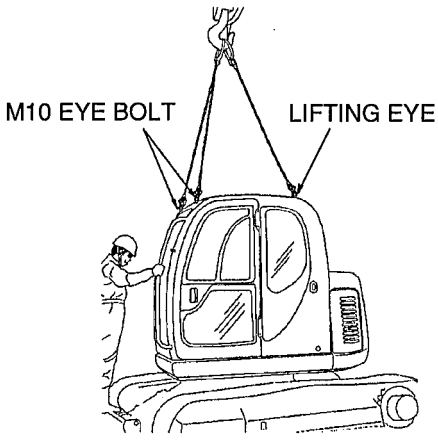


Fig. 1-3 Slinging cab

8. AIR CLEANER

8.1 PREPARATION FOR REMOVAL

(1) Opening bonnet assy (5)
1) Unlock it with starter key.
2) Open bonnet (5) and support it with stay (36).

(2) Opening cover assy (4)
(3) Unplug terminals on indicator lines (1-5) (See Fig.8-3.)

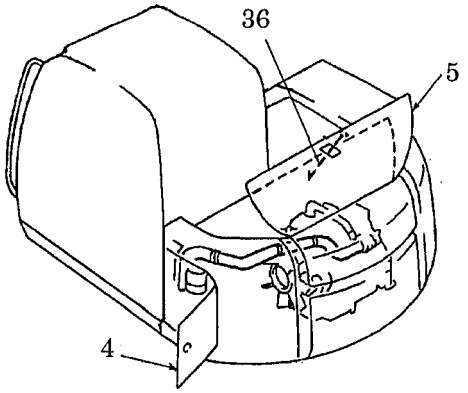


Fig. 8-1 Preparation for removal

8.2 REMOVAL

(1) Pulling out hose (3) (See Fig.8-3.).
1) Loosen clips (8), (9) on both sides of hose (3).
2) Pulling out hose (3)
: Flat-blade screw driver

(2) Pulling out hose (2) (See Fig.8-2.).
1) Loosen clips (7), (8) on both sides of hose (2).
2) Pulling out hose (2)
: Flat-blade screw driver

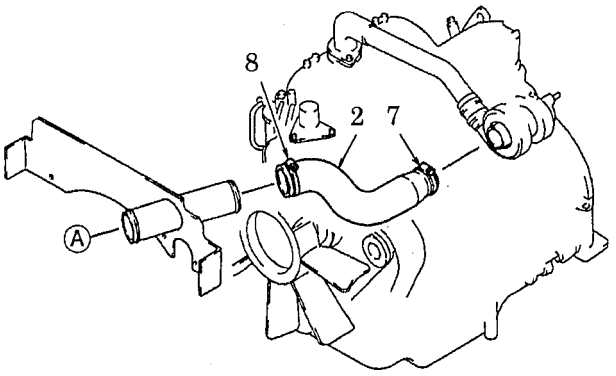


Fig. 8-2 Pulling out air hose (2)

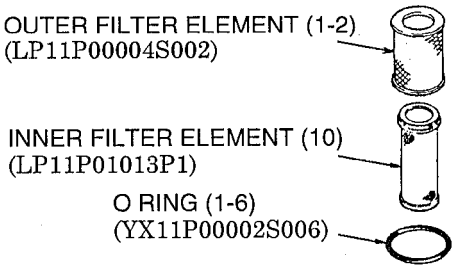
(3) Remove air cleaner assy (1)
1) Remove 4 capscrews (5) M8×14
2) Remove air cleaner assy (1) from guard bracket.
: 13mm

8.3 INSTALLATION

(1) Installing is the reverse order of removing with attention paid to the following items:
1) Attach grommet (4) to the guard, before installing the air cleaner.
2) Provide an insertion allowance of 40mm (1.6in) on both ends of air hoses (2),(3).
3) Tightening torque

No.	NAME	Tightening Torque kgf·m (ft·lbs)
1-5	INDICATOR	0.4 (2.9)
5	CAPSCREW	2.0 (14)

(2) Spare parts for deteriorated elements



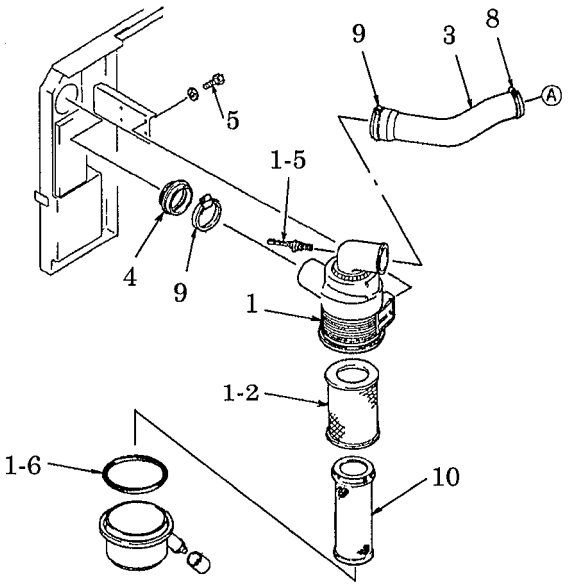


Fig. 8-3 Removing air cleaner

13. RADIATOR & OIL COOLER

13.1 PREPARATION FOR REMOVAL

T=Tigtening torque

⚠ Connection of hoses for air-con should not be loosened and removed. Refrigerant may be leaked.

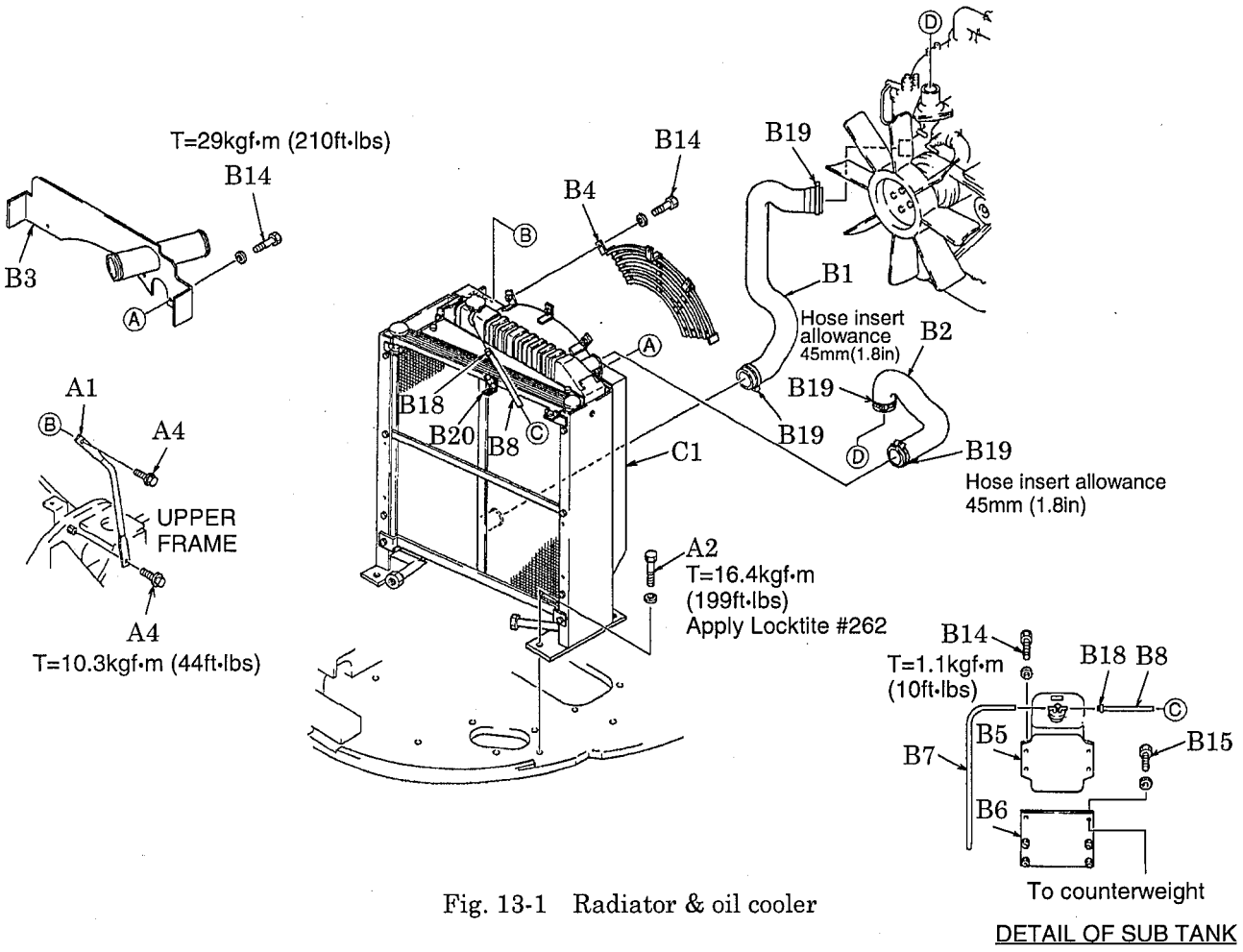


Fig. 13-1 Radiator & oil cooler

(1) Remove counter weight

(2) Bleeding internal air of hydraulic oil tank

(3) Remove cover of suction strainer, and adjust oil quantity so that oil level becomes lower than the return tube level.

(4) Remove air cleaner hose
1) Loosen clips (7), (8), (9). ┐
2) Pulling out hose (2). ├ Refer to air cleaner on page I -10
3) Pulling out hose (3). ┘

: Flat-blade screwdriver

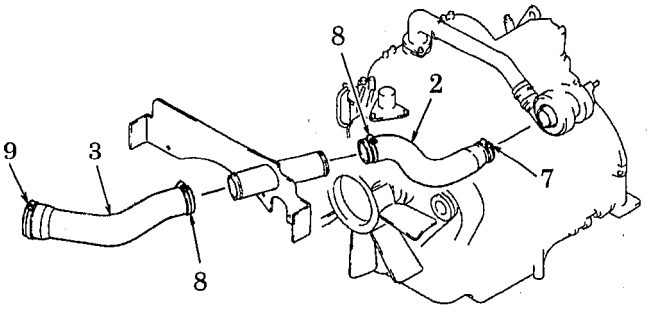
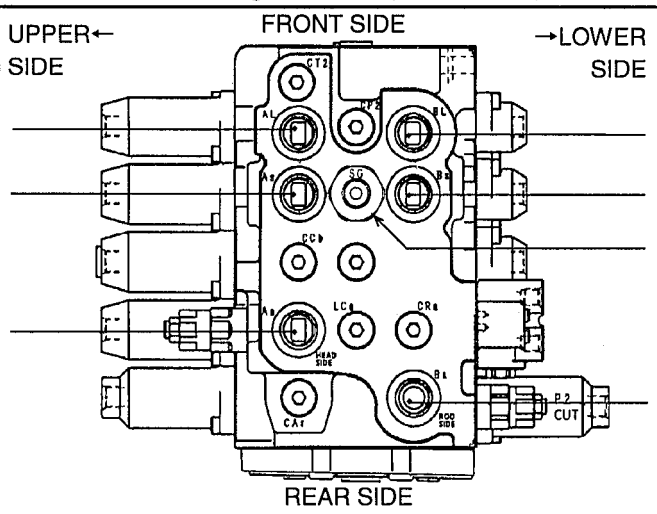
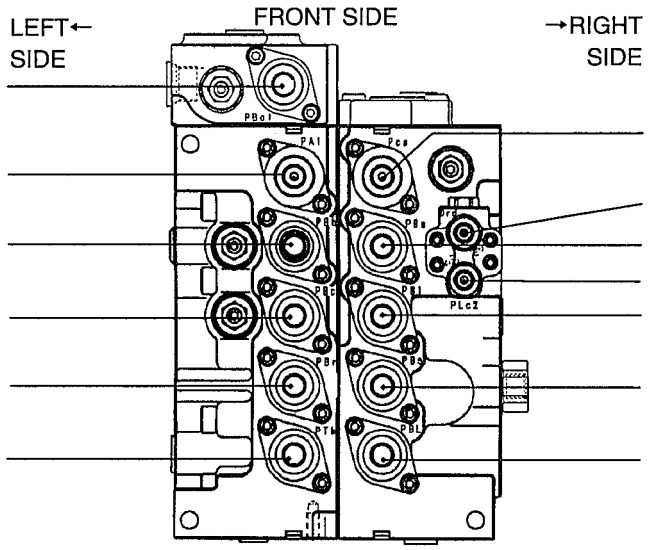


Fig. 13-2 Removing air cleaner hose

Ports	Functions	Ports on right sides (on machine)	Ports	Functions
AL	Travel left forward		BL	Travel left reverse
As	Swing (right)		Bs	Swing (left)
			B1	Arm conflux
Aa	Arm in			
			Ba	Arm out

Ports	Functions	Ports on bottom sides (on machine)	Ports	Functions
PB01	Drain		PCa	P2 bypass cut
PA1	Arm conflux		Drd	Drain
PBb	Boom down		PBa	Arm out
			PLC2	Arm lock valve reliese
PBc	Bucket digging		PB1	Boom conflux
PBr	Travel right reverse		PBs	Swing (left)
PTb	Travel straight		PBL	Travel left reverse

(2) Remove control valve

1) Remove two capscrews (2) M12×30 and two capscrews (7) M12×45 from upper frame.
2) Remove bracket (1) together with control valve.
3) Remove two capscrews (3) M12×60 and a capscrew (8) M12×70 from bracket.
   : 19mm
4) Weight : 120kg (260 lbs)

16.3 INSTALLATION

(1) Installing is done in the reverse order of remove.
   : 19mm,
   Tightening torque : 12.3kgf·m(89ft·lbs)
(2) Make certain that attachment moves normally in operation.
(3) Check oil level and that it is free from oil leakage.

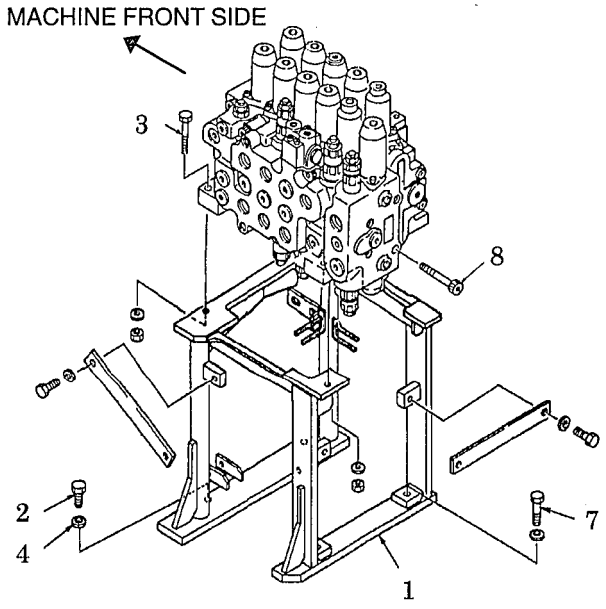


Fig. 16-1 Removing main control valve

(2) Disconnecting the hoses on the top part of swivel joint
[Refer to Swivel Joint under, Hydraulic system (4), (5).]

1) Remove drain hose. (E port : PF1/2)
: 27mm
Tightening torque : 8.0kgf·m (58ft·lbs)

2) Remove hoses (A27), (A30).
(A, C port : 1-14UNS)
: 32mm
Tightening torque :
14.0kgf·m (100ft·lbs)

3) Remove hoses (A28), (A29).
(B, D port : 1-14UNS)
: 32mm
Tightening torque :
14.0kgf·m (100ft·lbs)

4) Remove hose (20).
(2-speed change over port : PF1/4)
: 19mm
Tightening torque : 3.0kgf·m (22ft·lbs)

5) Remove dozer hoses (A24), (A25). (Only on machine with dozer) (F, G port : 1-14UNS)
: 32mm
Tightening torque :
14.0kgf·m (100ft·lbs)

(3) Remove whirl-stop of swivel joint.

1) Loosen the nut (C5) M16.

2) Remove a capscrew (C3)M16×110.
: 24mm

(4) Remove joint for piping (Refer to Fig.20-2)

1) Remove two elbows (B5). (F, G port)

2) Remove connector (35) for travel 2-speed change over (1). (PF1/4)
: 19mm
Tightening torque : 3.7kgf·m (27ft·lbs)

(5) Remove dust cover (B1)

1) Remove five capscrews (B9) M10×25.
: 17mm

2) Remove clip (B7).

3) Remove dust cover (B1).

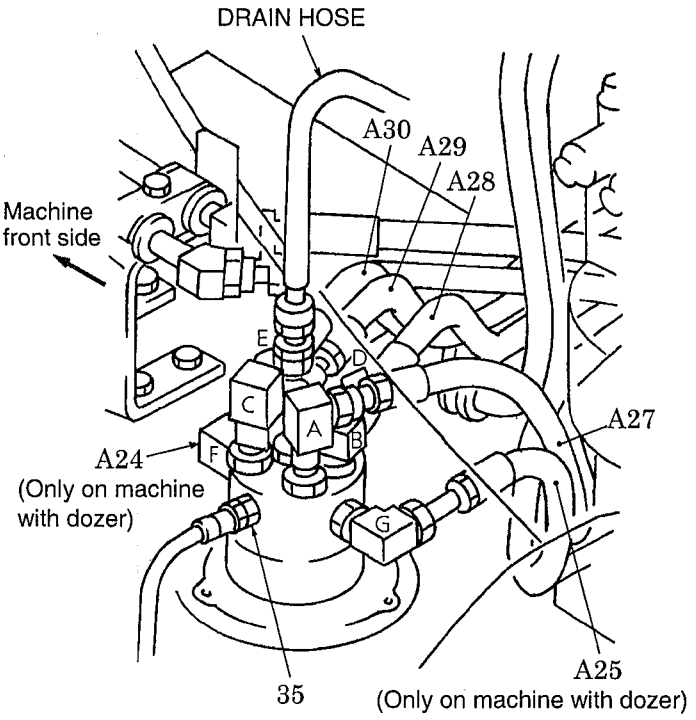


Fig. 20-2

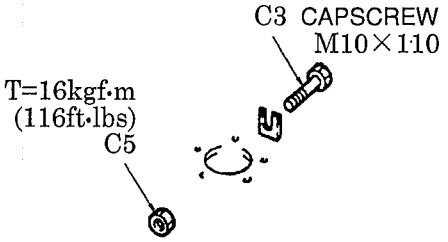


Fig. 20-3 Removing whirl-stop nut & the capscrew

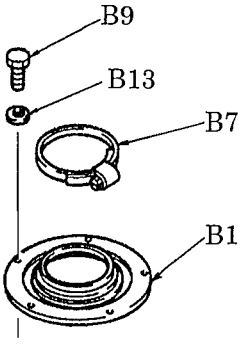


Fig. 20-4 Removing dust cover (B1)

13) Remove valve plate
Remove valve plate (313, 314) from valve block (312).

- The valve plate may come off during the operation under 6).

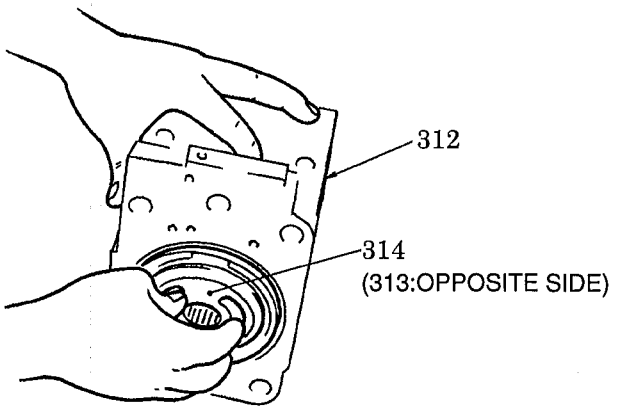


Fig. 1-10 Removing valve plates (313), (314)

14) Remove other parts
If necessary, remove stopper (L) (534), stopper (S) (535), servo piston (532) and tilting pin (531) from pump casing (271), and remove needle bearing (124) from valve block (312).

- When removing the tilting pin, use care so as not to score the head of the tilting pin, using a jig.
- It is hard to separate the tilting pin from the servo piston in some cases as Locktite is coated on the mating part between them. Use care so as not to score the servo piston by applying unreasonable force.
- Do not draw out needle bearings except when their service life has ended.
- Do not loosen hex nuts (808) of valve block (312) and swash plate support (251). A set flow rate changes.

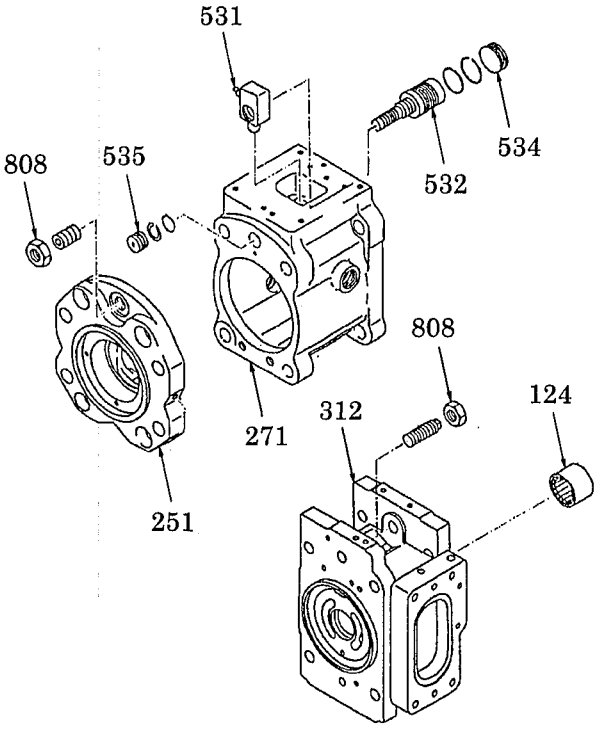


Fig. 1-11 Removing other parts

1.2.2 DISASSEMBLY AND ASSEMBLY

(1) Tools

The right list shows the tools required for remove and install.

Table 1-5

Tool name	Dimension
Allen wrench	Opposing flats 4,5,6,8mm
Eye wrench Socket wrench Wrench with double heads (single head)	Opposing flats 19mm
Adjust wrench	Medium size 1pc.
Screw driver	Flat-bladed screw driver 1pc.
Socket bolt	Plunger (627), for drawing out (M4)
Torque wrench	One that may be fastened to specified torque

(2) Disassembling procedure

1) Selecting a place for disassembly.

- Choose a clean place.
- Spread rubber sheet or cloth on work bench to protect parts from damaging.

2) Cleaning

Remove dust and rust, etc. on regulator surface with wash oil.

3) Remove regulator

Remove socket bolts (415) and separate the regulator from the pump body.

: 6mm

- Exercise care so as not to lose O rings and check valve sub (541), (543), and (545).

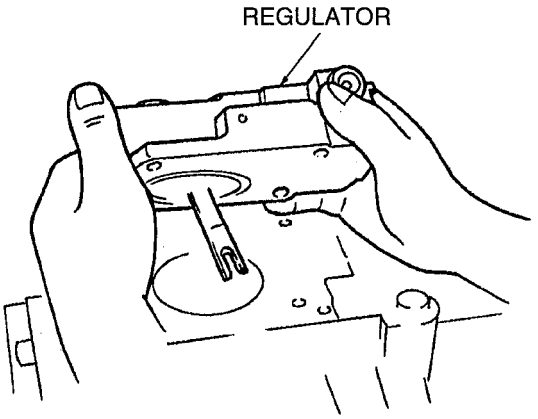


Fig. 1-21 Removing regulator

4) Remove valve casing

Remove socket bolts (407) and remove valve casing (325) with solenoid proportional reducing valve (079).

: 5mm

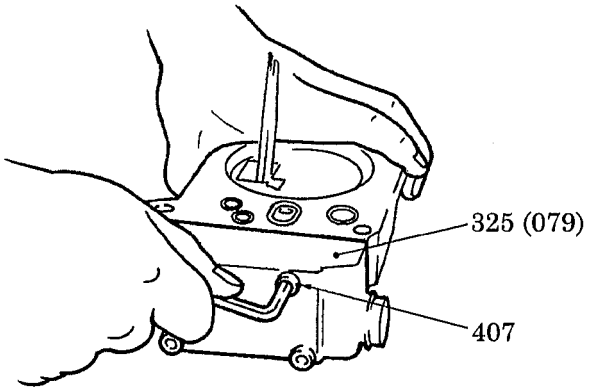


Fig. 1-22 Removing valve casing (325)

3) Fix the arm recirculation spool assy with vise via a protective plate (aluminum plate, etc.) and remove bolt (333). Then separate spring seat (332), springs (325), (326) and stopper (337) from arm recirculation spool (310).

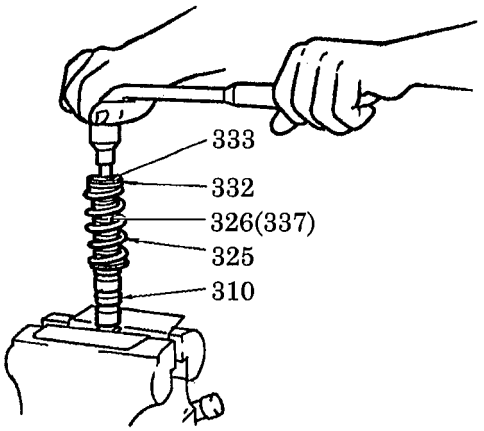


Fig. 2-7 Disassembling arm recirculation spool assy

(4) Disassembling cut spool (Section G-G)

1) Loosen socket bolt (273) and separate spring cover (204) and O ring (262) from the cut spool.

: 6mm

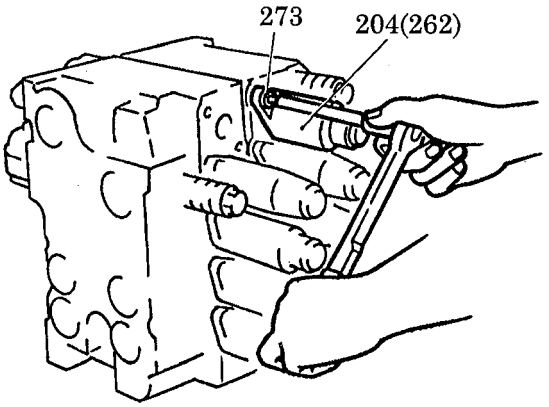


Fig. 2-8 Removing cut spool spring cover (204)

2) Draw out the assy of cut spool (309), spring seat (332), springs (325), (326), stopper (337) and bolt (333) from casing A (101) or casing B (102).

⚠ When drawing out the spool assy, take care so as not to score casing A (101) or casing B (102).

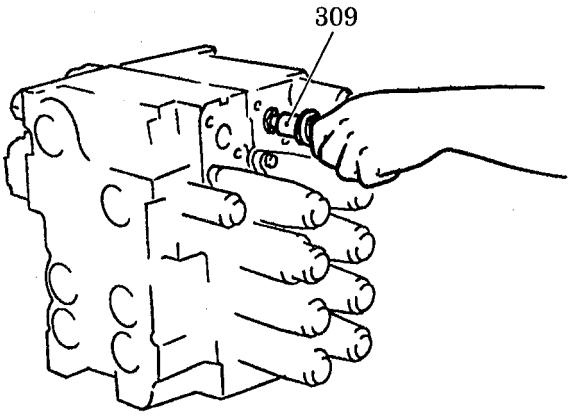


Fig. 2-9 Drawing out cut spool assy

3) Fix the cut spool assy with vise via a protective plate (aluminum plate, etc.) and remove bolt (333). Then separate spring seat (332), springs (325), (326) and stopper (337) from cut spool (309).

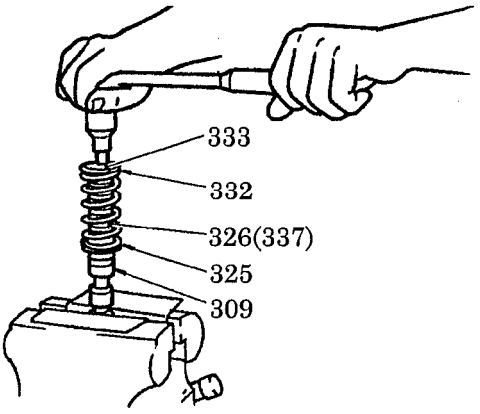


Fig. 2-10 Disassembling cut spool assy

(18) Disassembling main relief valve (See Fig.4-3.)

1) Remove plug (103) and seat (541) by pulling them by hand as snap ring (121) is fixed.
2) Draw out spring (521) and plunger (512) from inside seat (541).
3) Remove locknut (671) and adjust screw (651). Remove spring plate (612), spring (621) and poppet (611).
4) Separate snap ring (121), spacer (122), O ring (561) and backup ring (562) from plug (103).

⚠ Filter (125) and filter stopper (124) are assembled with plug (103) by means of snap ring (123).
Therefore, it can not be disassembled any further.

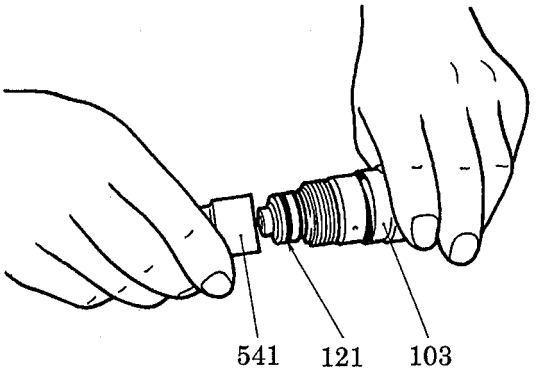


Fig. 2-47 Disassembling main relief valve

(19) Disassembling port relief valve (See Fig.4-5.)

1) Loosen plug (102), remove springs (521), (522) and seat (541) out of body (101) and draw out piston (301) and plunger (511) out of seat (541).
: 30mm

2) Separate locknut (671) and adjust screw (651) from plug (102) and remove spring seat (612), spring (621) and poppet (611).

⚠ Filter (125) and filter stopper (124) are assembled with plug (103) by means of snap ring (123).
Therefore, it can not be disassembled any further.

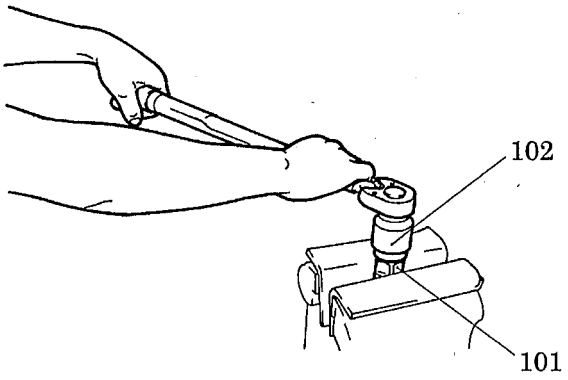


Fig. 2-48 Disassembling port relief valve

Trouble	Cause	Remedy
6. Swing priority function does not operate.	1) Operating fault of arm recirculation spool [the same way as 5-1) below].	1) The same way as 5-1).
7. Boom or arm conflux does not operate.	1) Malfunctioning conflux valve. Refer to item 5.1) above.	1) Measure pilot pressure. Refer to item 5.1) above.

(2) Relief valve

Trouble	Cause	Remedy
1. No pressure rise.	Main or pilot poppet of relief valve is sticking and valve is open, or there is foreign matter on valve seat.	● Check for foreign matter on each poppet. ● Confirm that each component slides smoothly. ● Clean all components thoroughly.
2. Unstable relief pressure.	Damaged pilot poppet seat of relief valve. Pilot piston sticks against main poppet.	● Replace damaged component. ● Clean all components thoroughly. ● Smooth surface damage.
3. Irregular relief pressure.	1) Wear due to foreign matter. 2) Loosened lock nut or adjusting screw.	1) Disassemble and clean. 2) Adjust pressure.
4. Oil leak.	1) Damaged seat. Worn out O ring. 2) Sticking component due to foreign matter.	1) Replace damaged or worn component. Confirm that each component operates smoothly before reassembling. 2) Confirm that there are no scratches, scores, or foreign matter present before reassembling.

3.5 MAINTENANCE STANDARDS

Check items	Standard	Remarks
Leakage	When leakage quantity reaches to 1000cc/min. or more where handle is set in neutral position, or to 2000cc/min. or more in operation, replace spool with new one. If leaked, even if the spool is replaced, replace pilot valve assy with new one.	Conditions Primary pressure 3.0kgf/cm^2 (43psi) Hydraulic oil viscosity 2.3 cSt
Spool	When the wear of sliding section is 10 μ m more than the that of non sliding section, replace it with new one.	This condition may be the same as the above.
Push rod	When the wear of top is 1mm (0.04in) or more, replace it with new one.	
Looseness of control section	When looseness of 2mm (0.08in) or more on circle plate (302) on control section and joint section (301) due to wear is produced, replace them with new ones.	In case of the looseness due to the loosening on tightening section, adjust it.
Stability of operation	When trouble such as noise, hunting, drop of primary pressure,etc. has occurred in operation, and it does not restore after taking corrective action according to below Troubleshooting, replace pilot valve assy with new one.	

Note 1) O ring, etc. should be replaced with every disassembling.
Note 2) When socket bolt (125) has been loosened, don't fail to replace seal washer (121).

3.6 TROUBLESHOOTING

It is very difficult to find defective section. The following table explains the several estimated causes.For repair, refer to the estimated causes and corrective actions.
The following table explains general phenomenon, estimated causes and corrective actions. However, most machine problems are not caused by the failure of only one part, but involve relations with other parts. Therefore corrective action other than those described in this table is often required. The following table does not cover causes and corrective actions for all the troubles. So it may be necessary to perform further investigation of troubles and causes.

Trouble	Cause	Remedy
Secondary pressure does not rise.	① Primary pressure is insufficient. ② Secondary pressure springs (241) are broken or fatigued. ③ Clearance between spool (201) and casing (101) is abnormally large. ④ Handle has a gap.	① Secure primary pressure. ② Replace with new ones. ③ Replace spool (201). ④ Disassembly and reassembly or replace handle section.
Secondary pressure is unstable.	① Sliding parts are caught. ② Tank line pressure varies. ③ Air has mixed into pipeline.	① Repair the unsmoothed section. ② Bring pressure directly to oil tank. ③ Bleed air by operating it several times.
Secondary pressure is high	① Tank line pressure is high. ② Sliding parts are caught.	① Bring pressure directly to oil tank. ② Correct.

(2) Swing reduction unit

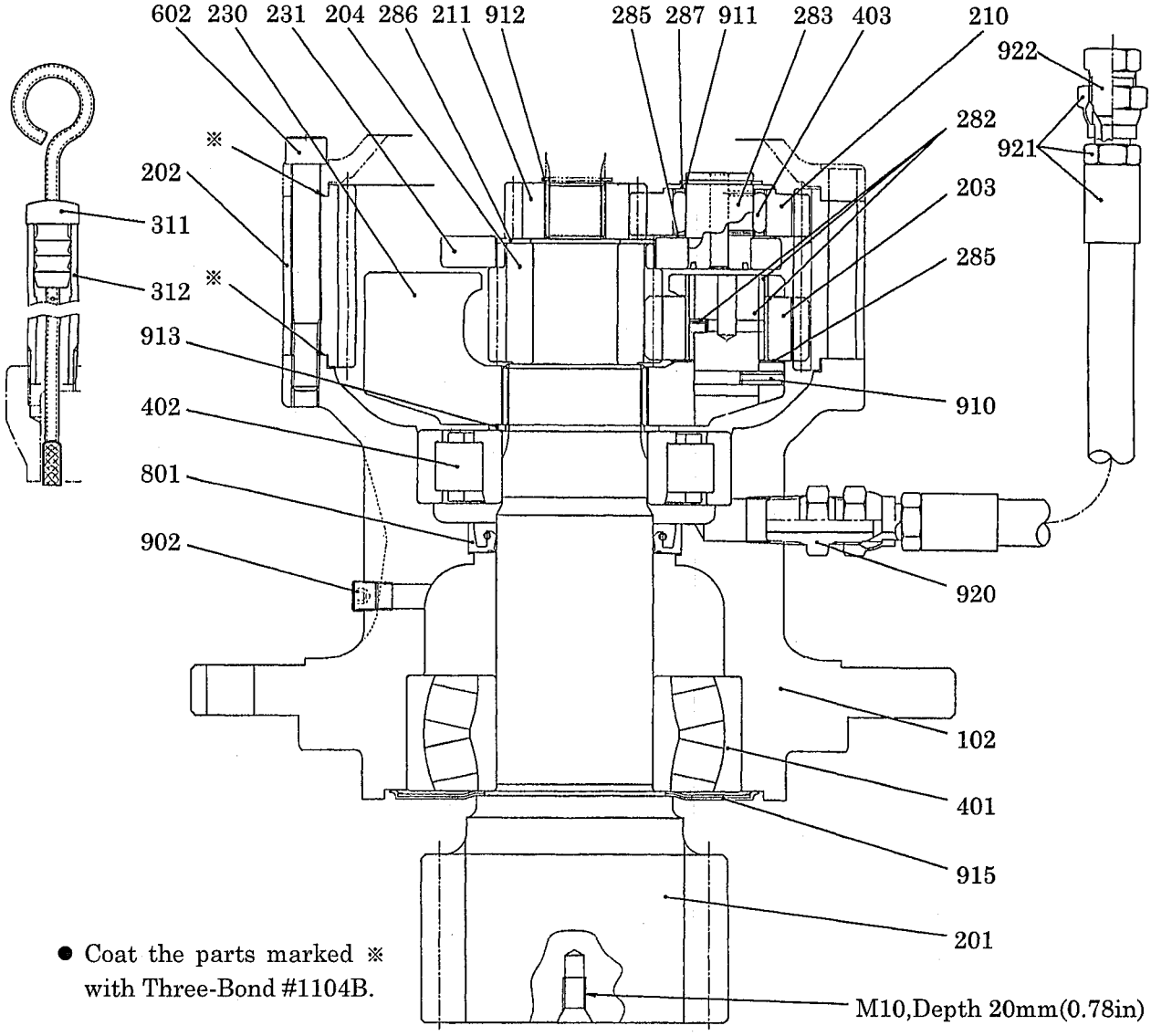


Fig. 5-2 Swing reduction unit

TIGHTENING TORQUE kgf·m (ft·lbs)	No.	NAME	Q'TY	TIGHTENING TORQUE kgf·m (ft·lbs)	No.	NAME	Q'TY
	102	CASING	1		312	PIPE	1
	201	DRIVE SHAFT	1		401	ROLLER BEARING	1
	202	RING GEAR	1		402	ROLLER BEARING	1
	203	No.2 PLANETARY GEAR	4		403	NEEDLE BEARING	3
	204	No.2 SUN GEAR	1	10 (72)	602	SOCKET BOLT ; M12×100	10
	210	No.1 PLANETARY GEAR	3		801	OIL SEAL	1
	211	No.1 SUN GEAR	1	2.2 (16)	902	PLUG ; PT1/4	2
	230	No.2 CARRIER	1		910	SPRING PIN	4
	231	No.1 CARRIER	1		911	SNAP RING	3
	282	No.2 PIN	4		912	SNAP RING	1
	283	No.1 PIN	3		913	SNAP RING	1
	285	SIDE PLATE t=1	7		915	SEAL	1
	286	THRUST WASHER t=2	1	6.6 (48)	920	ADAPTER ; PT1/2	1
	287	SIDE PLATE t=2	3	11 (80)	921	HOSE ; PF1/2	1
	311	LEVEL BAR	1	11 (80)	922	PLUG ; PF1/2	1

18) Insert outer race of roller bearing
Insert the outer race of roller bearing (444) into valve casing (303), knocking it lightly by means of a steel bar.

- Knock on the outer circumference of the outer race evenly around and fix it so it stops at the step of the valve casing.

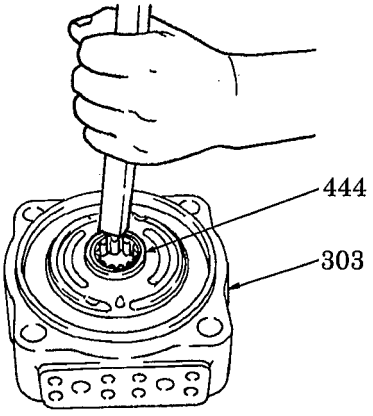


Fig. 5-35 Inserting outer race of roller bearing

19) Installing valve plate
Assemble valve plate (131) into valve casing (303) and then fit O ring (472) in place.

- Coat the contact surface of the valve plate with a thin film of grease. (To prevent it from falling off.)

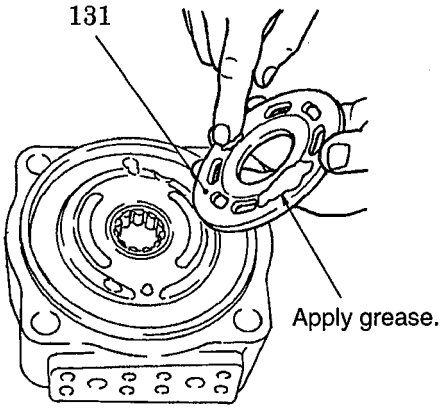


Fig. 5-36 Installing valve plate

20) Installing valve casing
Attach valve casing (303) to casing (301) and fasten it with socket bolt (401).
: 14mm, Tightening torque : 24kgf·m (170ft·lbs)

- Beware of the direction of the valve casing.
- Be careful so the valve plate does not come off.
- Use care so the brake spring does not fall down.
- Fasten the socket bolts evenly all around.

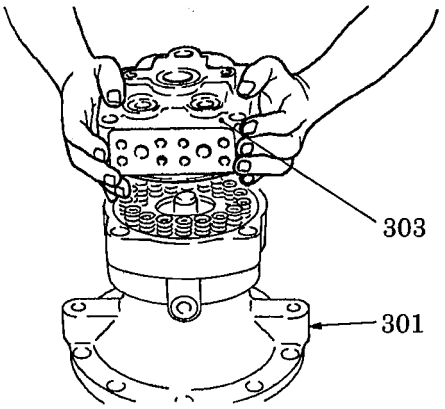


Fig. 5-37 Installing valve casing

21) Fitting plunger
Place plunger (351) and spring (355) into valve casing. Fasten RO plug (469) with O ring (488) into valve casing.
: 10mm, Tightening torque : 11kgf·m (80ft·lbs)

- Make sure that the plunger moves smoothly.

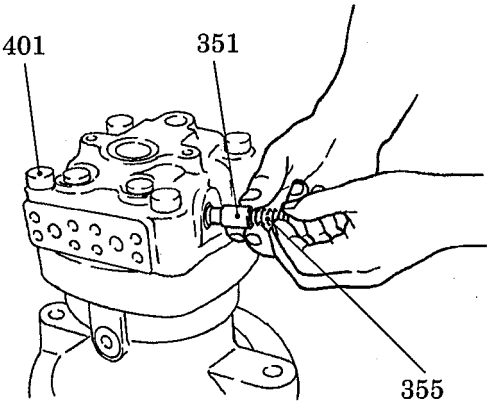


Fig. 5-38 Fitting plunger

5) Installing needle bearing and No.1 planetary gear
Fit needle bearing (403) and No.1 planetary gear (210).

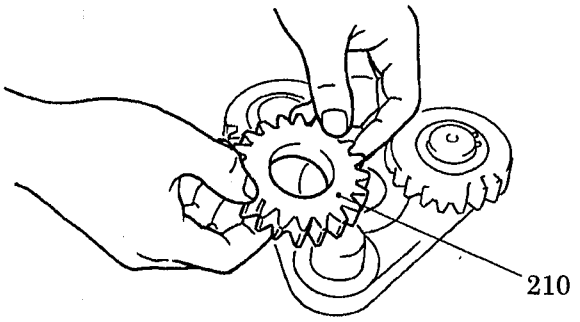


Fig. 5-65 Installing planetary gear

6) Installing side plate
Put side plate (287) in and fit snap ring (911).

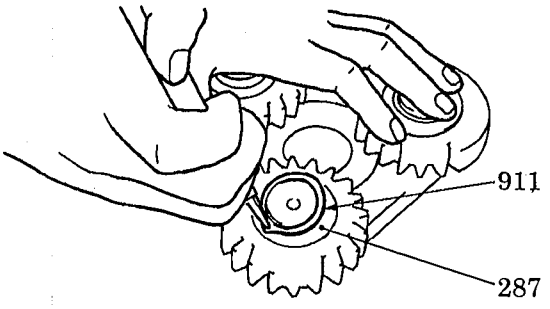


Fig. 5-66 Installing side plate and snap ring

(15) Installing No.1 carrier assy
Assemble the No.1 carrier assy. Make sure that thrust washer (286) in the center sits in the convex part of No.2 sun gear (204).

(16) Installing No.1 sun gear
Assemble No.1 sun gear (211).

(17) Apply liquid packing
Remove the temporarily fastened bolts and coat the mounting surface of the hydraulic motor of ring gear (202) with liquid packing (Three-Bond #1104B).

(18) Installing hydraulic motor
Fit snap ring (912) to the drive shaft of the hydraulic motor, lower it vertically, assemble the hydraulic motor in place, while matching it with the spline position and fasten it with socket bolt (602).
: 10mm, Tightening torque : 10kgf·m (72ft·lbs)

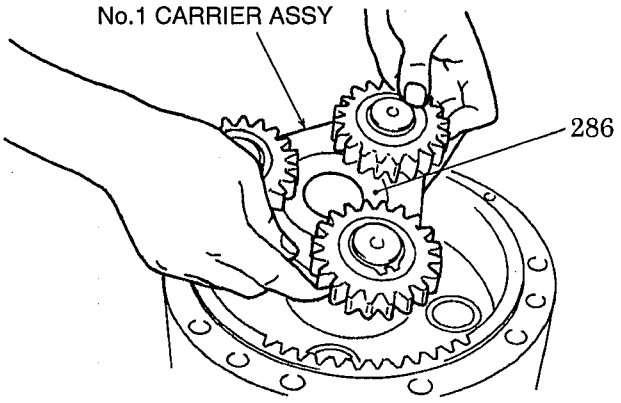


Fig. 5-67 Installing No.1 carrier assy

(19) Wind seal tape around oil drain plug (902) and fit it to the casing.
: 6mm, Tightening torque : 2.2kgf·m (16ft·lbs)

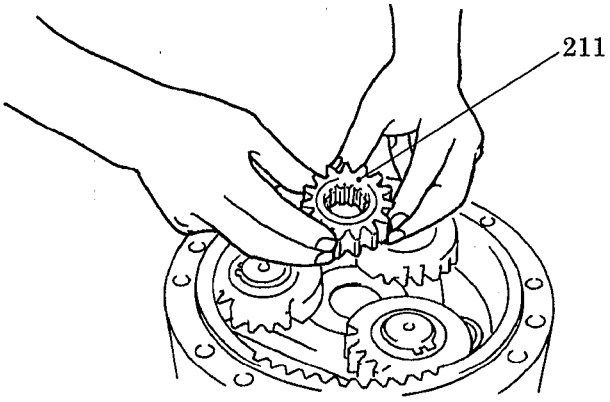


Fig. 5-68 Installing No.1 sun gear

(20) Filling oil
Fill in gear oil through the oil inlet.
Lubricating oil :
SAE#90~#140, API GL class 3~4
(Shell Spirax 90EP filled up at shipping)
Lubricant volume : 1.7ℓ(0.45gal)

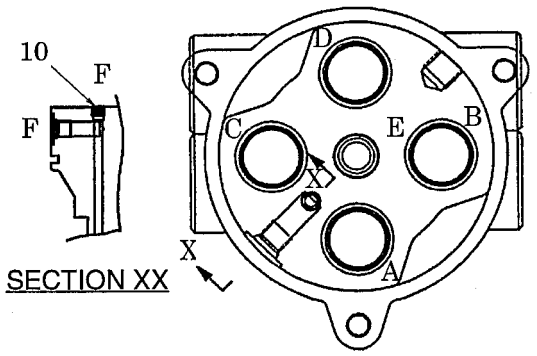
- Temporarily fit the level bar to the pipe and check the level.

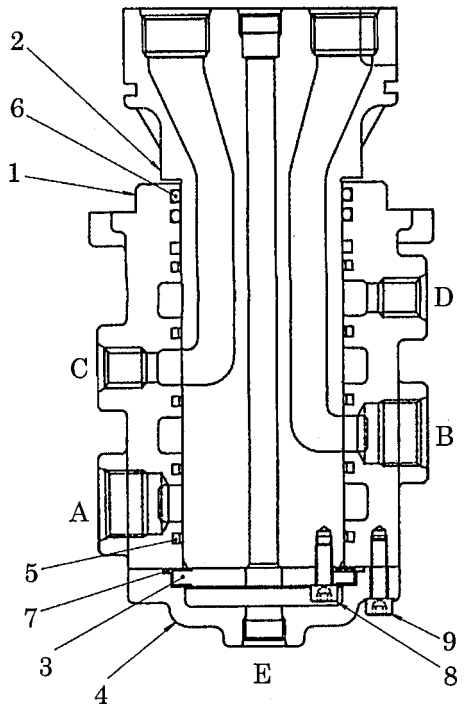
6. SWIVEL JOINT

6.1 CONSTRUCTION VIEW

(1) Specification 1

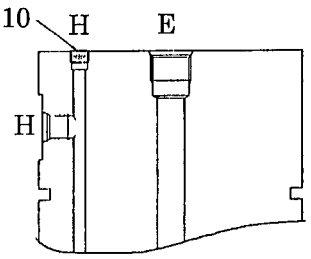
SK135SR & SK135SRLC





(2) Specification 2

SK115SRDZ



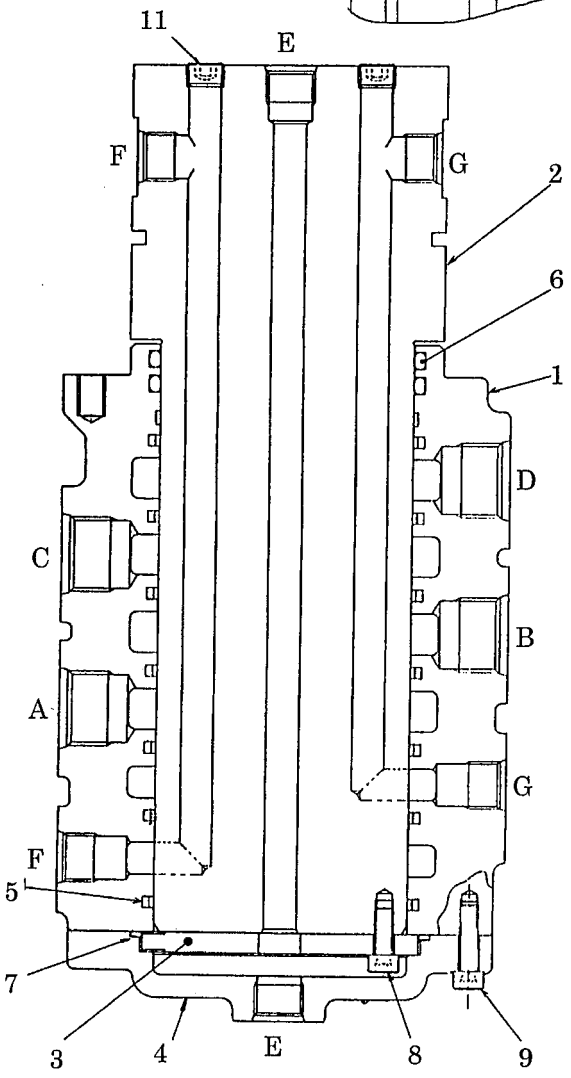


Table 6-1

NO.	NAME	Q' TY		NO.	NAME	Q' TY	
		Spec.1	Spec.2			Spec.1	Spec.2
1	BODY	1	1	7	O RING(1A G95)	1	1
2	STEM	1	1	8	SOCKET BOLT (M8×20)	2	2
3	THRUST PLATE	1	1	9	SOCKET BOLT (M8×30)	4	4
4	COVER	1	1	10	PLUG	1	1
5	SEAL ASSY	5	7	11	PLUG	—	2
6	O RING	2	2				

Fig. 6-1 Construction of swivel joint

Book code No. S5YY3402E②

KOBELCO

SHOP MANUAL

SK115SR(L)
SK115SR DZ
SK135SR(LC)
SK135SR L

TRAVEL SYSTEM

TABLE OF CONTENTS

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KOBELCO CONSTRUCTION MACHINERY CO., LTD.

3. UPPER ROLLER

3.1 UPPER ROLLER ASSY

UPPER ROLLER ASSY
- LP64D00003F5
- LC ; LP64D00003F6
- L ; YN64D00007F2

No.	NAME	Q'TY			REMARKS
2	CAPSCREW	2	4	—	M16×90
	CAPSCREW	—	—	4	M20×100
3	NUT	2	4	—	M16
	NUT	—	—	4	M20
5	ROLLER ASSY	2	4	—	LP64D01006F1
	ROLLER ASSY	—	—	4	YN64D01013F1

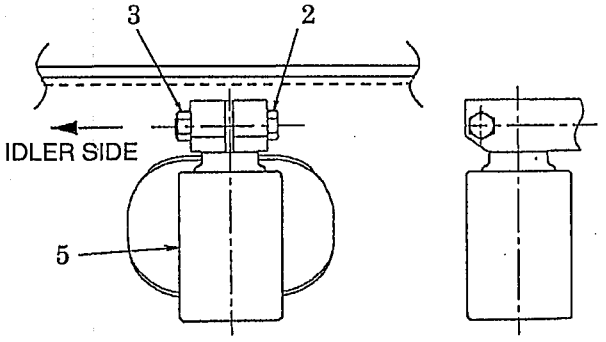


Fig. 3-1 Upper roller assy

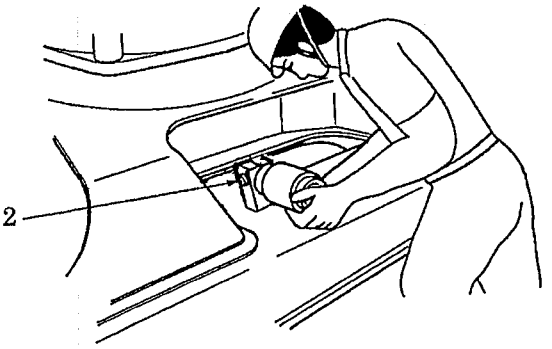


Fig. 3-2 Removing upper roller

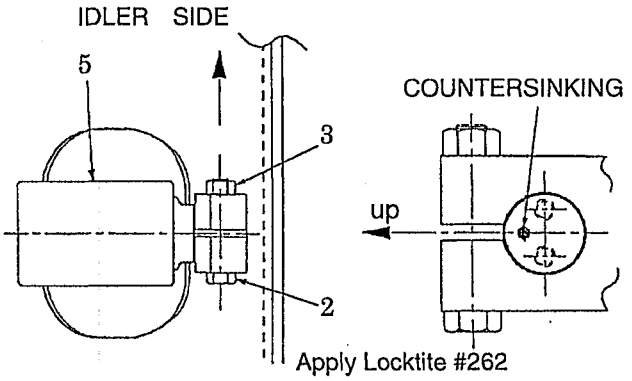


Fig. 3-3 Installing upper roller

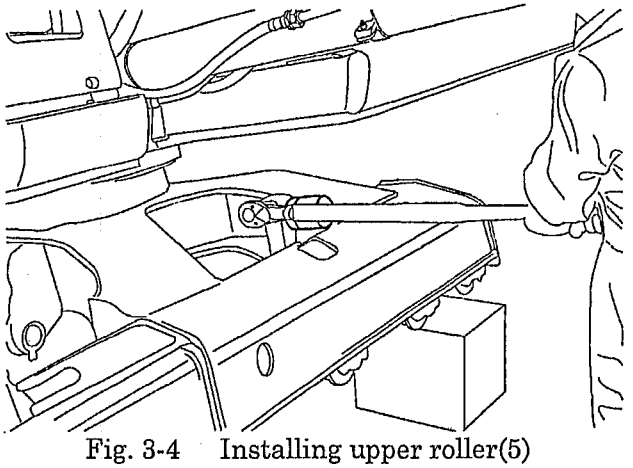


Fig. 3-4 Installing upper roller(5)

3.2 REMOVING

(1) Preparation for removal
Remove crawler (Above mentioned).

(2) Removing upper roller (5)
1) Remove nuts on support tightening section, and also remove capscrew.
: 24mm (M16)
: 30mm (M20)

3.3 INSTALLING

Installing is done in the reverse order of removing.

(1) Inspection
Before reassembling, check it that it rotates smooth manually and for leakage.

(2) Installing upper roller (5)
1) Fit it directing nut toward idler side.

2) Insert it until collar comes in contact with support.

3) Fit it directing the countersinking mark of shaft end upward.

4) Apply Locktite #262 on capscrew and tighten it to the specified torque.

: 24mm (M16),
Tightening torque : 28.5kgf·m (210ft·lbs)

: 30mm (M20),
Tightening torque : 55kgf·m (400ft·lbs)

7) Installing O ring (6)
Install O ring (6) to groove on shaft.

- Replace O ring with new one.
- Grease O ring.

8) Press fitting collar (7)
Press-fit collar (7) to shaft (2).

- Press-fit collar (7) on aligning pin (4) hole.

9) Inserting pin (4)
Press-fit pin (4) in to the pin hole mating pin hole of collar (7) with pin hole on the end side of shaft (2).

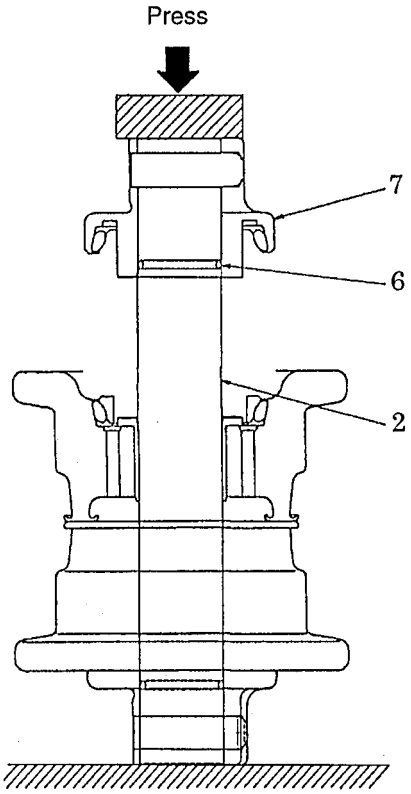


Fig. 4-15 Installing O ring (6), collar (7)

10) Filling oil
Remove plug (8) and fill in 150cc (9.2cu・in) of engine oil API grade CD#30.

11) Check it for leakage
Before tightening plug (8), check it for leakage in the condition of air pressure 2.0kgf/cm^2 (28psi).

12) Installing plug (8)
Apply oil resistant sealant on plug (8), and tighten it in the plug hole on the collar (7) end face.
:6mm,
Tightening torque : 2.4kgf·m (17ft·lbs)

⚠ After assembling the lower roller, confirm that oil is not leaking and that the roller rotates smoothly by hand.

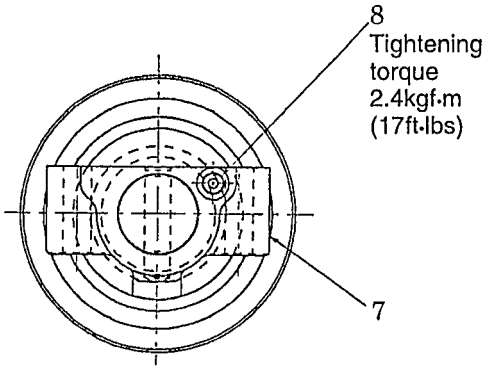


Fig. 4-16 Installing filling oil plug (8)

5.4.2 DISASSEMBLY AND ASSEMBLY

(1) Disassembly

1) Spring set special jig

Before disassembling and assembling the idler adjuster assy, prepare spring setting jig (V).

Capacity of hydraulic jack : more than 20 tons (44000 lbs)

: 46mm

⚠ Large power is needed to set the spring. Prepare a special jig before disassembly and assembly.

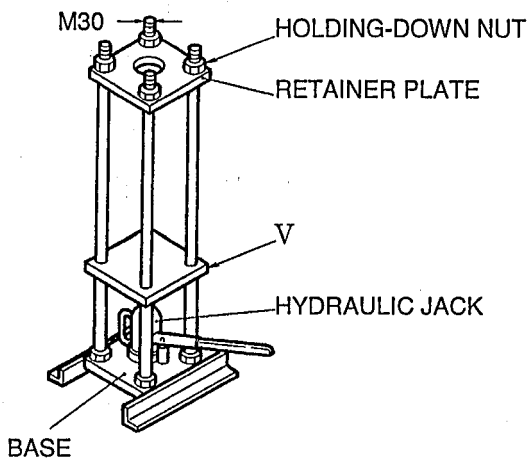


Fig. 5-15 Spring set special jig (V)

2) Preparation for working

Place a hydraulic jack between the jig base and the stand.

Loosen the holding-down nuts of the jig and draw out the retainer plate upward.

: 46mm

3) Draw out grease cylinder (See Fig. 5-14)

Draw out piston (6) from grease cylinder (1) of the idler adjuster assy.

4) Removing oil seal (8), O ring (7) (See Fig. 5-14)

Taken out oil seal (8) and O ring (7) from grease cylinder (1).

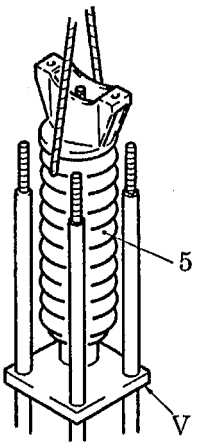


Fig. 5-16 Slinging work idler adjuster

5) Slinging work idler adjuster

Set the idler adjuster assy on the stand of the jig, with its bracket side facing up.

7.2 REMOVING

(1) Preparation for removal
Remove crawler, lift up crawler frame using attachment, and put it on square timbers to float and stabilize.

(2) Removing cover (1),(2)
Remove capscrew (7) M12 × 25 and also remove covers (1),(2).

: 19mm

(3) Preparation of oil pan

(4) Removing hydraulic pipe
Bleed air in hydraulic oil tank, remove all pipes connecting to travel motor. Then plug up all pipes and joint section to protect them from entry of dust.

: 19mm, 27mm, 32mm, 36mm
Refer to tool 4.plug (1).

(5) Removing sprocket
Removing capscrews (2) M16.

: 24mm

(6) Loosening travel motor attaching bolts (2)
Apply match marks on travel motor and crawler frame, and remove capscrews (2) M16.

: 24mm

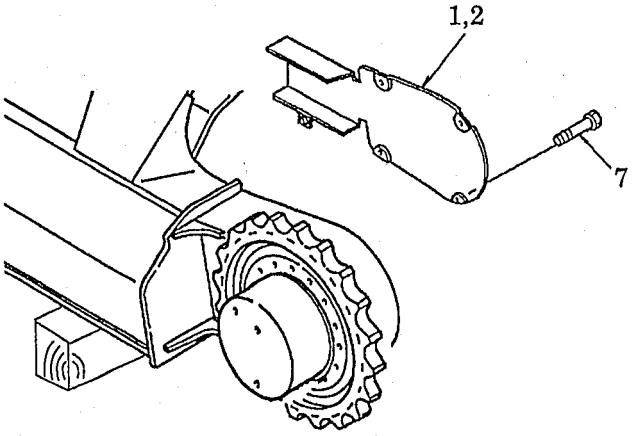


Fig. 7-2 Removing and installing cover (1), (2)

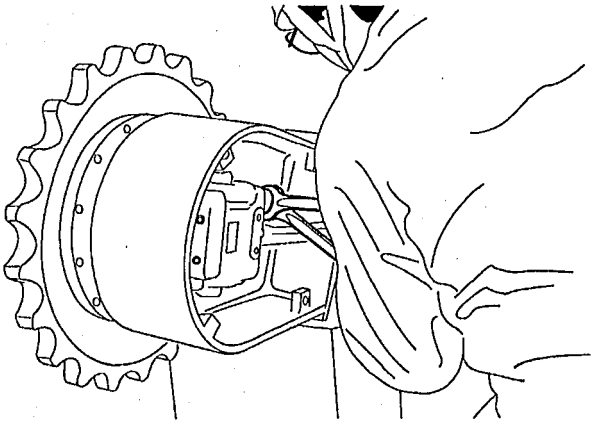


Fig. 7-3 Removing and installing hydraulic pipe

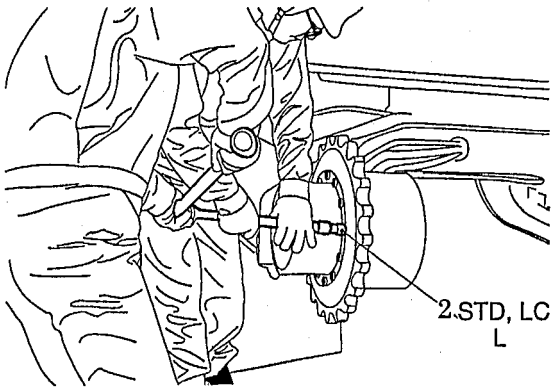


Fig. 7-4 Removing and installing sprocket

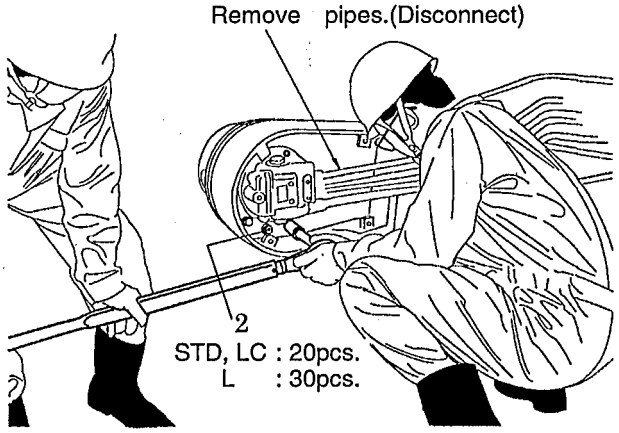


Fig. 7-5 Removing and installing travel motor attaching bolts

(2) Tightening torque

APPLICATION ITEM (No.)	BOLT · NUT		OPPOSING FLATS (mm)	Q'TY	TIGHTENING TORQUE kgf·m (ft·lbs)
	NAME	SIZE			
19	Reamer bolt	M27 (P2.0)	36	3	70 (510)
33	Socket plug	PT1/2	10	2	6 (43)
35	Socket bolt	M12 (P1.75)	10	12	10.4 (75)
121,165	Plug	PF1/2	10	1	10 (72)
124	Plug	M30 (P1.5)	36	2	36 (260)
126	Plug	M24 (P1.5)	10	2	13 (94)
143	Socket bolt	M10 (P1.5)	8	8	5.9 (43)
146	Socket plug	PT1/8	5	1	1.25 (9.0)
154	Socket plug	NPTF1/16	4	8	1 (7.2)
170	Socket bolt	M8 (P1.25)	6	4	3 (22)
192	Socket plug	PF1/4	6	2	3 (22)
202	Sleeve	PF5/8	27	2	13 (94)
204	Plug	M18 (P1.5)	10	2	8 (58)
214	Plug	PF1/2	10	1	10 (72)
215	Plug	PF1/4	6	2	3 (22)
222	Socket plug	NPTF1/16	4	6	11 (80)

(3) Tools

NAME	SIZE	APPLICATION ITEM (No.)
General work bench		Disassembly and assembly
Cleaning bath	For rough cleaning and finish cleaning	Cleaning the parts
Work bench for press	Pressing capacity 200kg (441 lbs) or over	104,149
Heating bath	Heating capacity 100℃ (212° F) or over volume 500×500×500 (20in×20in×20in)	149
Compressed air	Pressure 3~5kgf/cm²(43~71psi)	Drying after cleaning
Lathe		Hold flange machining for bearing (21) pre-load

(4) Measuring instrument

NAME	SIZE	APPLICATION ITEM
Thickness gauge × 2	Measurement 0.04~0.3mm (0.00016~0.0118in)	For snap ring (20) thickness adjustment
Outside micrometer	Measured value:0~25mm (0~0.984in) Minimum graduation: 0.01 (0.00039in)	For snap ring (20) thickness adjustment
Single depth micrometer	Measured value:0~25mm (0~0.984in) Minimum graduation: 0.01 (0.00039in)	For bearing (21) pre-load adjustment

- When it is difficult to remove, attach thread M3 to threaded hole (M3) used to disassemble piston (213) and pull it out.
- Then take care not to damage piston bore.

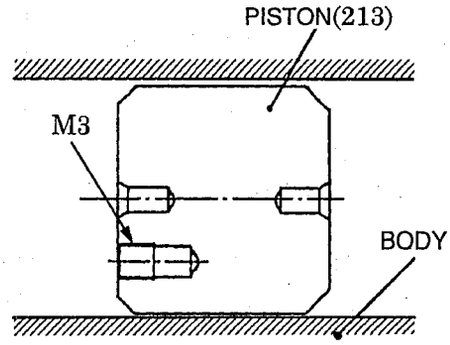


Fig. 1-25 Removing piston (213) [method 2]

4) Remove two plugs (215)
   : 6mm

   - Loosen it with vise for easy working

5) Separate O ring (224) from plug (215)

   - Do not reuse removed O ring (224).

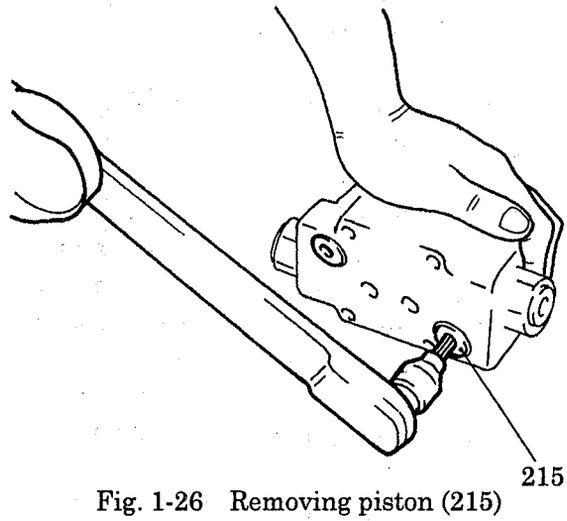


Fig. 1-26 Removing piston (215)

6) Remove out two balls (216) from body (212)

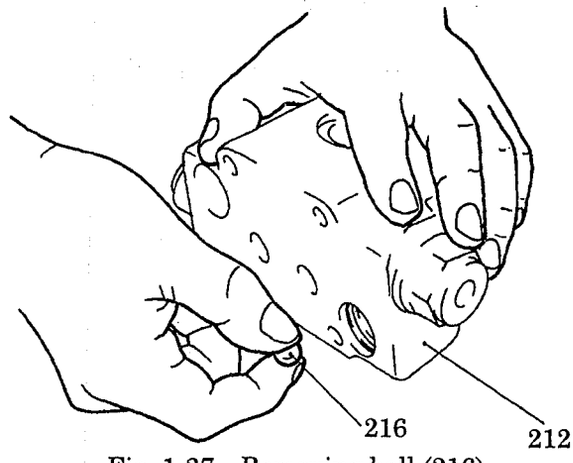


Fig. 1-27 Removing ball (216)

7) Remove sleeve (202) from body.
   : 27mm

   - Before loosing sleeve (202), loosen plug in the condition where rear flange (101) is installed for easy of loosening.

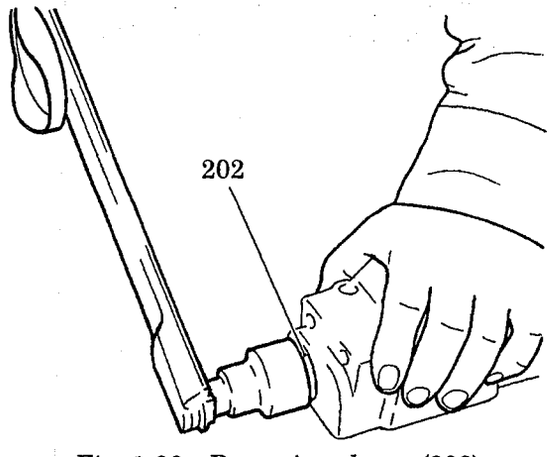


Fig. 1-28 Removing sleeve (202)

1.4 ASSEMBLY

1.4.1 GENERAL PRECAUTIONS FOR ASSEMBLY

(1) Assembly it by reversing the procedure of disassembly.

(2) Assemble it in clean air condition.

(3) Don't use cloth gloves during assembly.

(4) Replace or repair the damaged parts during disassembly according to the instructions in the "Maintenance standard" .
Replace O ring, oil seal, etc. with new one.

(5) Clean every part sufficiently, and blow them with compressed air don't use waste cloth.

(6) Prior to assembling, apply clean hydraulic oil to moving and sliding portions of hydraulic motor valve.

(7) Tighten bolt and plug to the specified torque using torque wrench.

(8) Replace reamer bolt with new ones. If it is unavoidably reused, remove completely the adhesive agent on reamer bolt, repair flaws on bolt seat surface with oilstone, and degrease it.

(9) Prior to assembling, apply grease to lip portions of O ring, oil seal, and floating seal to protect it from being damaged, and to moving section and sliding section.

(10) After assembly, plug every port to protect the entry of dust, etc.

1.4.2 PREPARATORY ARRANGEMENT FOR ASSEMBLY

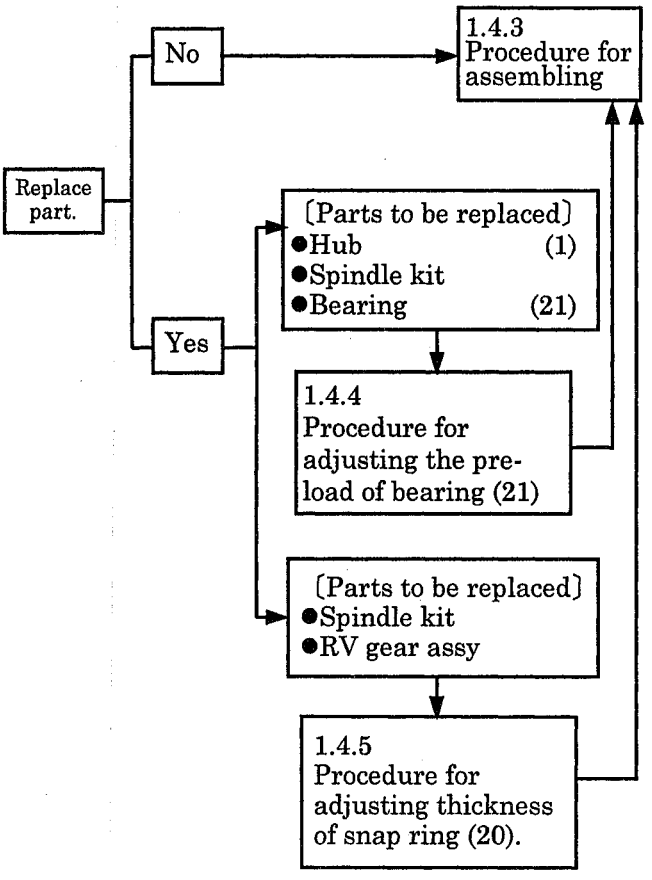
(1) After replacing parts with new ones, adjust the pre-load of bearing and thickness of snap ring without fail.

1) When the following parts are replaced, the pre-load adjustment of bearing is required.

Hub	(1)
Spindle kit	
Bearing	(21)

2) Replacement parts that need adjustment of the axial clearance of bearing (22):
Spindle kit
RV gear assy

(2) The assembling procedure varies according to the procedure of the above described parts.



⚠ Where replacing the above parts, the previously adjusted parts should be used. If unadjusted parts are used, the travel motor moves abnormally, causing early breakage.

3) Assemble plug (165) into rear flange (101) and tighten it up to a specified torque.

Tightning torque :10kgf·m (72ft·lbs)

(14) Installing fittings to rear flange.

1) Place rear flange (101) directing the contact surface with spindle (2) upward.

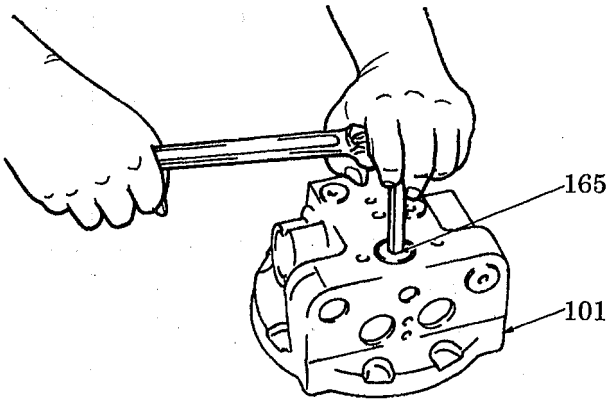


Fig. 1-79 Tightening plug (165)

2) Apply hydraulic oil to bearing (150), and install it in rear flange (101).

3) Drive parallel pin (141) in pin hole of rear flange (101).

4) Apply the surface of timing plate (109) in contact with rear flange (101).

- Fix timing plate (109) till it comes in contact with rear flange (101). Take measures to prevent the timing plate from falling off from the rear flange.

5) Install timing plate (109) on rear flange(101) taking parallel pin (141) as a guide.

- Coat spring (113) with sufficient grease so it does not come off from rear flange (101).

6) Attach 8 springs (113) to rear flange (101) and adhere them with grease.

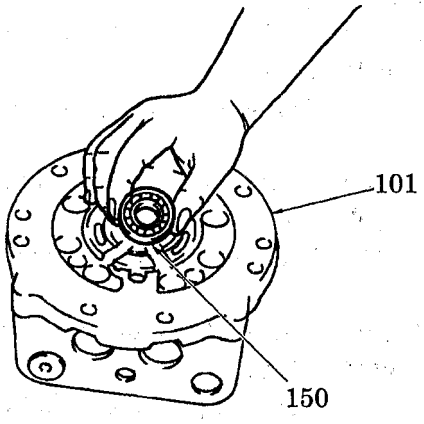


Fig. 1-80 Installing bearing (150)

(15) Connecting rear flange with spindle.

1) Fix O ring (27),(30) into the O ring groove of spindle (2).

- Fix O ring (27), (30) without application of grease. Application of grease may cause taking the seeped grease out of contact face of rear flange and spindle for the leaking oil. So never apply grease on O ring.

1.5 SERVICE STANDARDS

1.5.1 SERVICE STANDARDS FOR PARTS

(1) Replace all seals (O ring, oil seal, floating seal) once used even if no damage is seen.

(2) Wear parts maintenance standard

1) Replace any part that shows damage on appearance.

2) Replace such parts that show the following abnormalities, as well.

Item No.	Parts	Trouble	Reference value	Allowable value
	Spindle kit			
(2)	Spindle	● Severe damage to appearance ● Abnormal wear such as scoring is present.		
(3)	Hold flange			
(19)	Reamer bolt			
	RV gear assy			
(4)	RV gear (A)	● The RV gear tooth surface shows uneven wear. ● Crankshaft−related parts do not move smoothly when crankshaft (9) is turned.		
(5)	RV gear (B)			
(9)	Crankshaft			
(22)	Taper roller bearing			
(23)	Needle roller bearing			
20	Snap ring	● The end face of the circumference is abnormally worn.		
21	Bearing	● Dent is present. ● Flaking is seen. ● Uneven wear is present.		
	Rear flange kit			
(101)	Rear flange	● Part in contact with spool (123) is scratched. ● Clearance with spool is large. ● Surface in contact with valve (127) is scratched. ● Depth to the contact surface with valve (127) is large.	Clearance on diameter 10～20 μ (0.0004～0.0008in)	Clearance on diameter 25 μ (0.001in)
(123)	Spool	● Outer circumference is scored. ● Outer circumference is worn unevenly.		
102	Shaft	● Contact surface with oil seal (132) is worn. ● Spline is worn.		

1A.3 DISASSEMBLY

1A.3.1 GENERAL PRECAUTIONS TO BE EXERCISED

1) Since hydraulic components are precision finished, handle them in a less dusty, clean place. Use clean tolls and cleaning oil. For drying, use compressed air ; avoid using rag and paper for cleaning.
2) After the travel motor is removed from the machine, put a plug in each port and clean the outer surface to be free from dirt, oil and other foreign matter.
3) Before disassembly, leave matching marks on the matching faces of each component and take care so as not to damage or lose parts. Arrange removed parts in order as disassembly goes on.
4) Once seals are removed, replace them with new ones in principle, regardless of whether or not they are damaged. Therefore, get replacement seals ready beforehand.
5) Some parts are not available in loose state and only available in subassemblies. Get them ready beforehand, looking them up in the part manual.
6) Do not reuse seals, such as O rings and backup rings.
7) The numerals in parentheses after part names represent those in the structural drawings (Fig.1).

1A.3.2 DISASSEMBLING THE BRAKE VALVE

(1) Removing brake valve

1) Removing the surge cut valve
   Loosen the four socket head bolts (170) and separate body (136) from rear flange (101).
2) Take off two O rings (140, 156) from the rear flange.

: 6mm

3) Removing rear flange (101)
   Remove nine socket head bolts (143).

: 14mm

Fig. 2 Removing surge cut valve

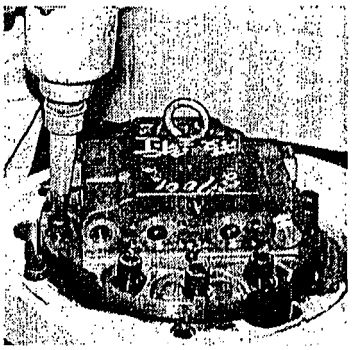


Fig. 3 Removing rear flange mounting bolts

(6) Disassembling coupling gear (8)

1) Separate ring (15) from ring gear (B) (5).

⚠
- Do not reuse ring (15) once removed.
- Tools to be used :
  ○Sharp-point steel rod

2) Separate coupling gear (8) from ring gear (B) (5).

⚠
- Do not disassemble coupling gear (8) and ring gear (B) (5) only where they must be replaced.

(7) Disassembling carrier assembly

Do not disassemble the carrier assembly any more.

In case it needs replacement because of damage to some component part, replace the carrier assembly as a whole.

⚠
- Construction of carrier assembly
  ○Carrier (3)
  ○Cluster gear (6)
  ○Shaft (9)
  ○Thrust collar (14)
  ○Needle roller bearing (25)
  ○Parallel pin (34)

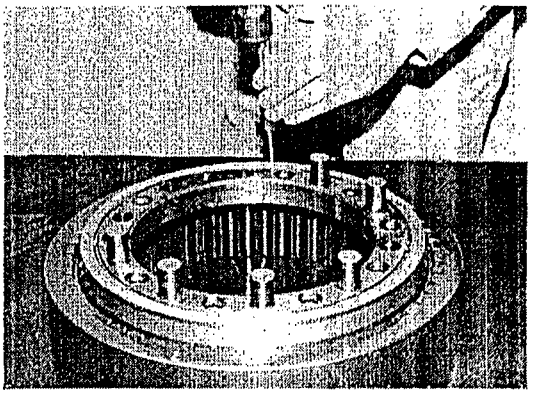


Fig. 36 Removing ring (15)

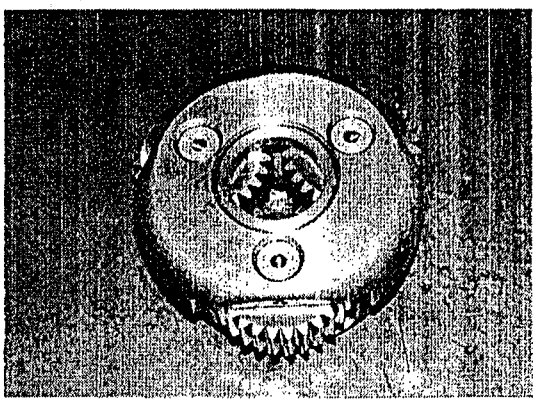


Fig. 37 Carrier assembly

(12) Assembling parking brake

1) Fit separator plate (116) and friction plate (115) alternately in that order into the circumferential groove of cylinder block (104). On that occasion, use care so as not to mistake the order of installation of friction plates (115) (2 pcs) and separator plate (116) (2 pcs).

⚠ • Immerse friction plates (115) in hydraulic oil before installation.

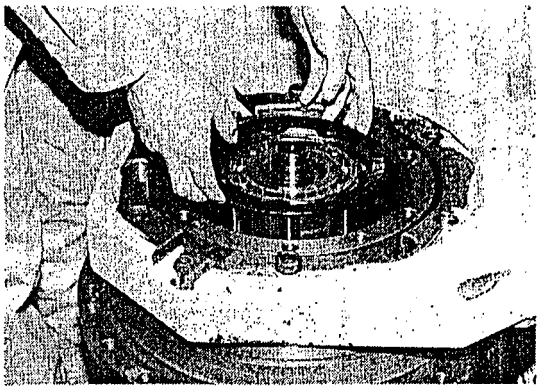


Fig. 63 Fitting friction plates and companion plates

2) Fix O rings (135) (139) and backup rings (147) (148) to piston (112).

⚠ • Coat O rings (135) (139) with a thin film of grease.

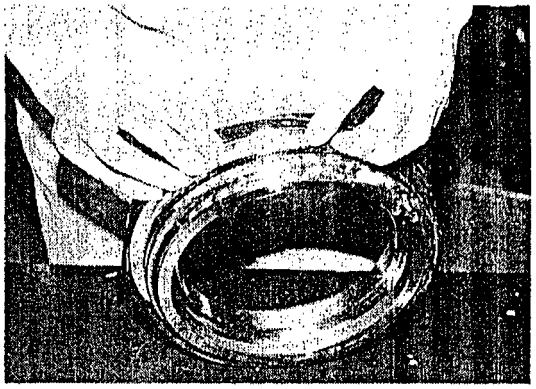


Fig. 64 Placing piston O rings and backup rings

3) Fit piston (112) into spindle (2).

⚠ • In case piston (112) is hard to enter spindle (2) because of the resistance of the O rings, tap the end face of piston (112) lightly and evenly, using a plastic mallet.
In that operation, take care so as not to score the O rings.

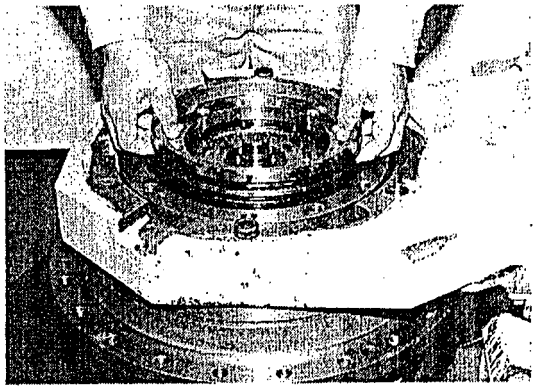


Fig. 65 Placing piston

4) Arrange twelve springs (113) in the spring mounting holes of piston (112).

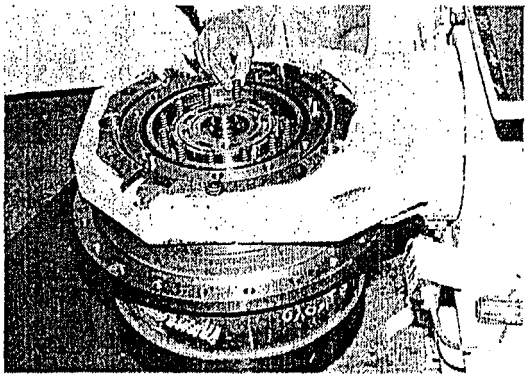


Fig. 66 Attaching springs (113)

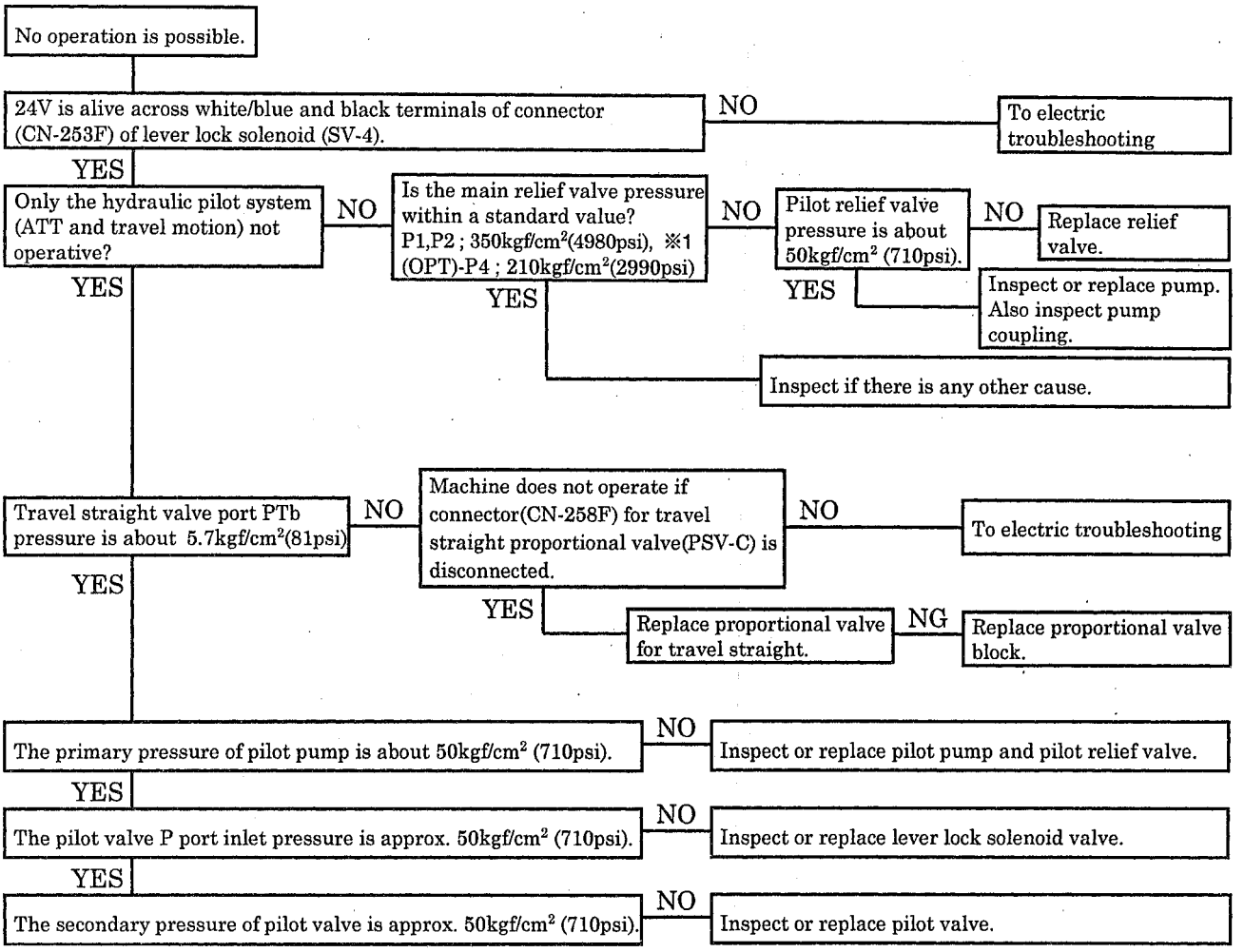
Part No.	Nomenclature	Symptom	Reference value (Standard dimension)	Allowable value (Criterion)
104	Cylinder block	• Spline is worn. • Bore surface is worn badly. • Sliding surface with timing plate [109] is scored or worn unevenly.		
(105) (106)	Piston Ass'y Piston Shoe	• Clearance is present in the axial direction between piston [105] and shoe [106]. • Shoe is worn abnormally. • Shoe is worn unevenly.	Clearance 0.05mm (0.0020″)	0.15mm (0.0059″)
107	Retainer plate	• The end face of the circumference is worn unevenly.		
108 109	Thrust ball Timing plate	• Spherical sliding part with retainer plate [107] is worn unevenly. • Sliding surface is seized or worn unevenly.		
115 116	Friction plate Separator plate	• Both end faces are worn unevenly. • Specified torque can not be reached. • Seizure is seen.	Braking torque 27 kgf·m (195 ft·lbs) or over	Braking torque 27 kgf·m (195 ft·lbs) or under
118	Valve seat	• Seat surface is scored.		
119	Valve	• Outer circumference is scored. • Seat surface is scored.		
(136) (137)	Body kit Body Spool	• Sliding surface with spool [137] is scratched. • Clearance with spool [137] is large. • Outer circumference is scored. • Outer circumference is worn unevenly.	Clearance on diameter 7~15 μ	20 μ
149 150	Roller bearing Ball bearing	• Pressed mark is present. • Flaking is seen. • Uneven wear is present.		
186	Spool	• Outer circumference is scored. • Seat surface is scored.		

2. TABLE OF ACTUATOR FOR TROUBLESHOOTING ; MECHATRO CONTROL

Actuator / Operating condition		Electric												Hydraulic																				
														Control valve												Motor			Cylinder			Other	
		Hi pressure sensor (P1)	Hi pressure sensor (P2)	Low pressure sensor	Arm variable recirculation Proportional valve	P2 bypass cut proportional valve	Travel straight proportional valve	P1 bypass cut proportional valve	Swing P/B Solenoid valve	Travel 1-2spead Solenoid valve	Safety look lever Solenoid valve	P1 Pump proportional valve	P2 Pump proportional valve	Boom	Arm	Bucket	Swing	Travel right	Travel left	P1 bypass cut valve	P2 bypass cut valve	Travel straight valve	Boom conflux valve	Arm conflux valve	Arm variable recirculation valve	Travel right motor	Travel left motor	Swing motor	Boom	Arm	Bucket	Boom lock valve	Arm lock valve
		SE—22	SE—23		PSV—A	PSV—B	PSV—C	PSV—D	SV—1	SV—3	SV—4	PSV—1	PSV—2																					
Independent operation	Boom raising inching operation	○	○	○							○	○		○															○				
	Boom raising full lever operation	○	○	○		○					○	○	○	○							○		○						○				
	Boom lowering operation	○	○	○							○	○		○															○			○	
	Arm out inching operation	○	○	○							○		○		○															○				
	Arm out full lever operation	○	○	○				○			○	○	○		○					○				○						○				
	Arm in inching operation	○	○	○	○				○		○		○		○										○					○			○	
	Arm in full lever operation	○	○	○	○			○	○		○	○	○		○					○					○					○			○	
	Heavy duty arm in full lever operation	○	○	○			○	○	○		○	○	○		○					○		○								○			○	
	Bucket digging	○	○	○							○	○				○															○			
	Bucket dump	○	○	○							○	○				○															○			
	Swing operation	○	○	○		○			○		○		○				○				○							○						
	Travel LH / RH operation (1st. speed)	○	○	○							○	○	○					○	○							○	○						
	Travel LH / RH operation (2nd speed)	○	○	○						○	○	○	○					○	○							○	○						

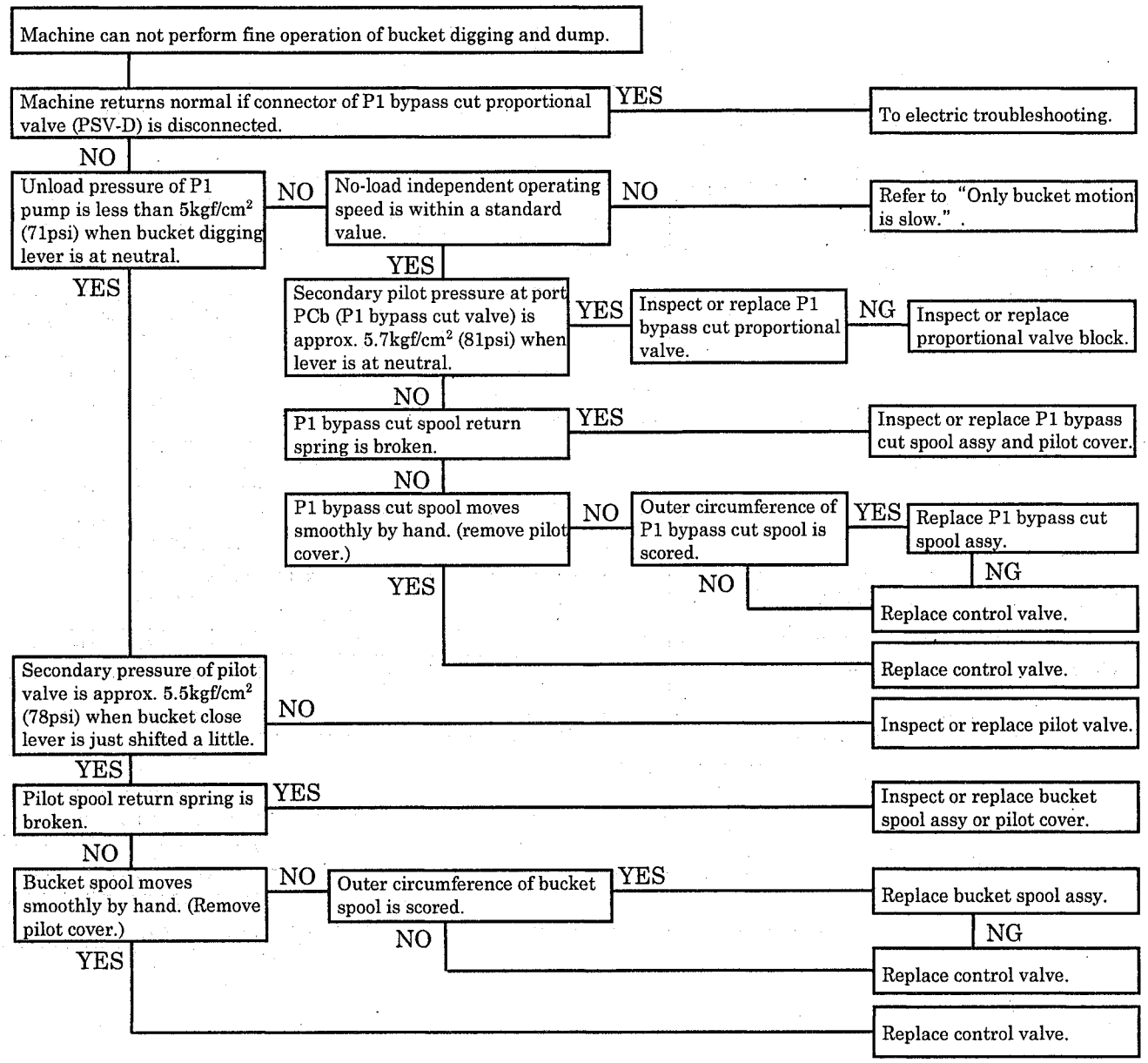
2. TROUBLESHOOTING

(1)-1

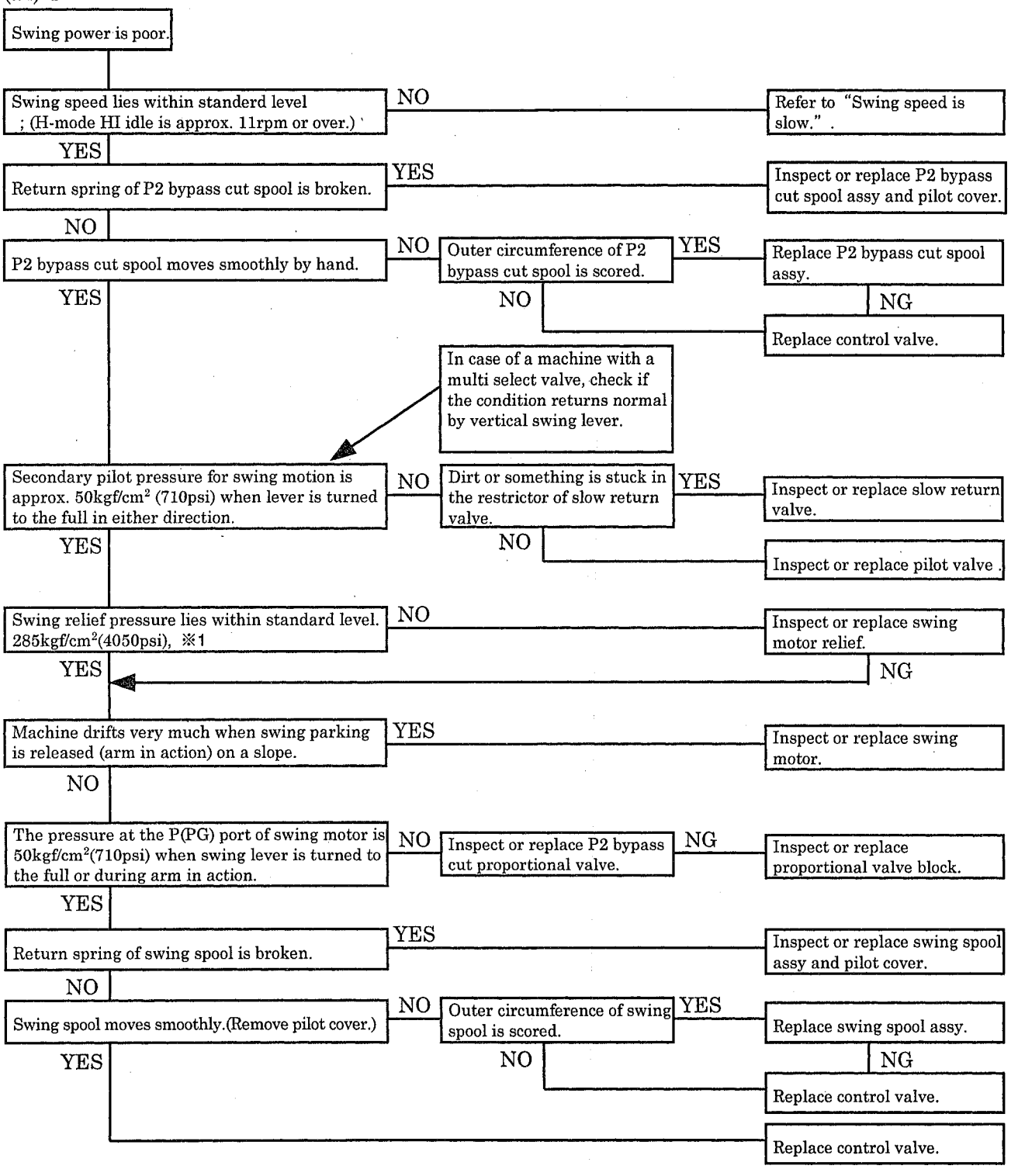


Note ; ※1 marked shows SK115SRDZ, SK135SRLC and SK135SR.
In the case of SK115SR value is P1,P2 330kgf/cm² (4690psi).

(4)-1


Machine can not perform fine operation of bucket digging and dump.
Machine returns normal if connector of P1 bypass cut proportional valve (PSV-D) is disconnected.
YES
To electric troubleshooting.
NO
Unload pressure of P1 pump is less than 5kgf/cm² (71psi) when bucket digging lever is at neutral.
NO
No-load independent operating speed is within a standard value.
NO
Refer to "Only bucket motion is slow."
YES
YES
Secondary pilot pressure at port PCb (P1 bypass cut valve) is approx. 5.7kgf/cm² (81psi) when lever is at neutral.
YES
Inspect or replace P1 bypass cut proportional valve.
NG
Inspect or replace proportional valve block.
NO
P1 bypass cut spool return spring is broken.
YES
Inspect or replace P1 bypass cut spool assy and pilot cover.
NO
P1 bypass cut spool moves smoothly by hand. (remove pilot cover.)
NO
Outer circumference of P1 bypass cut spool is scored.
YES
Replace P1 bypass cut spool assy.
NG
YES
NO
Replace control valve.
Replace control valve.
Secondary pressure of pilot valve is approx. 5.5kgf/cm² (78psi) when bucket close lever is just shifted a little.
NO
Inspect or replace pilot valve.
YES
Pilot spool return spring is broken.
YES
Inspect or replace bucket spool assy or pilot cover.
NO
Bucket spool moves smoothly by hand. (Remove pilot cover.)
NO
Outer circumference of bucket spool is scored.
YES
Replace bucket spool assy.
NG
YES
NO
Replace control valve.
Replace control valve.

(12)-1

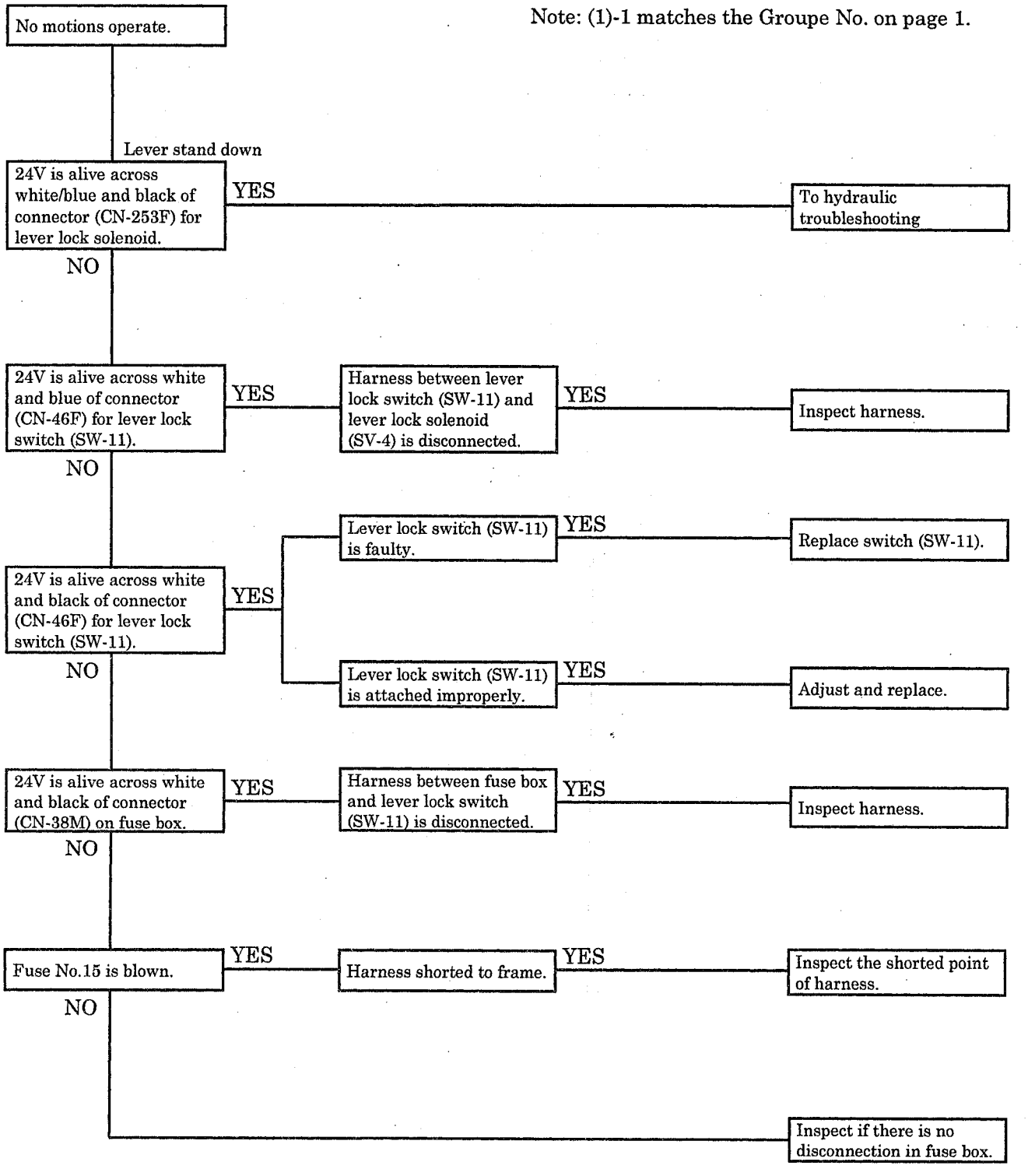


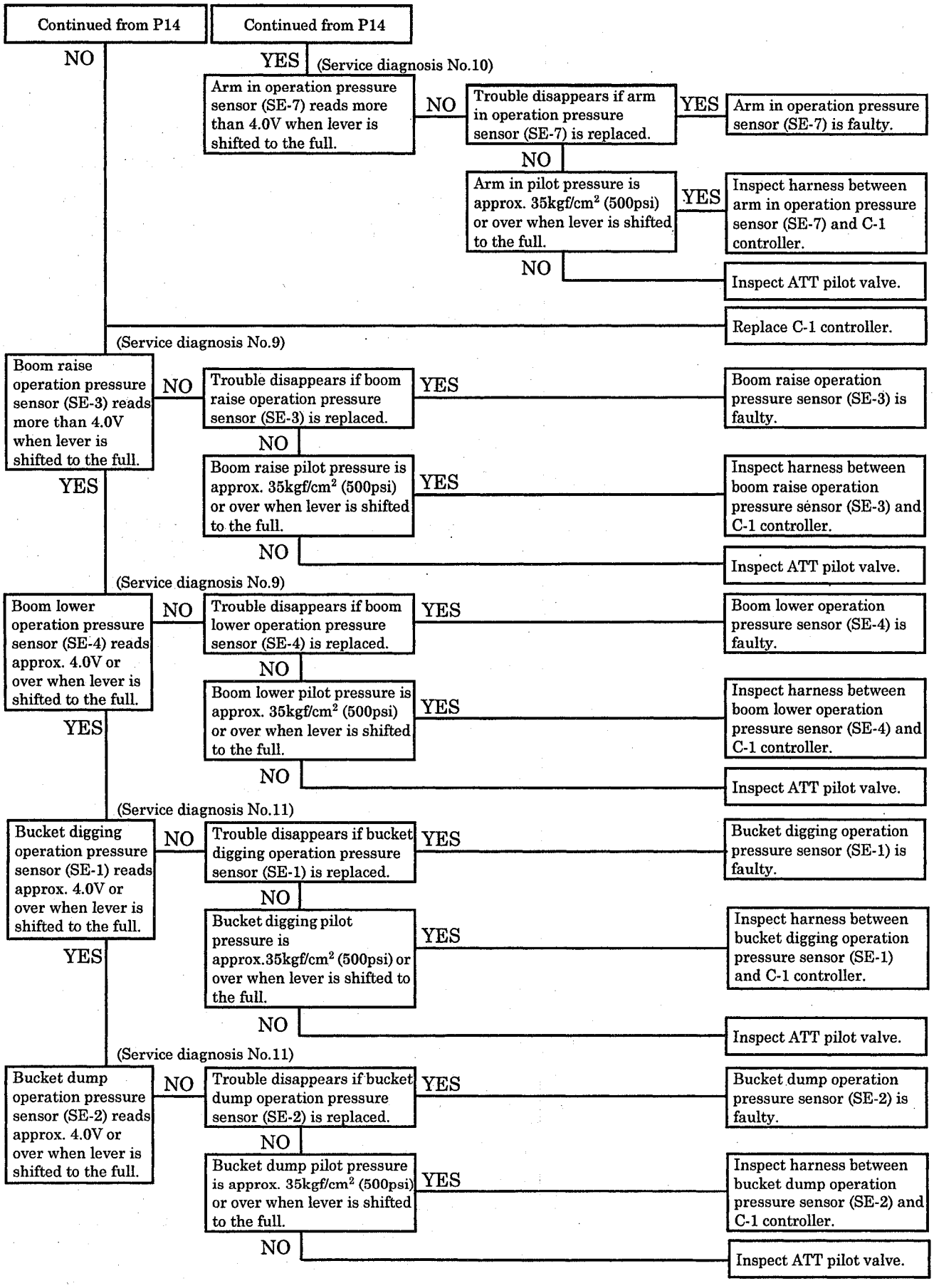
Note ; ※1 marked shows SK115SRDZ, SK135SRLC and SK135SR.
In the case of SK115SR value is 265kgf/cm² (3770psi).

4. TROUBLESHOOTING

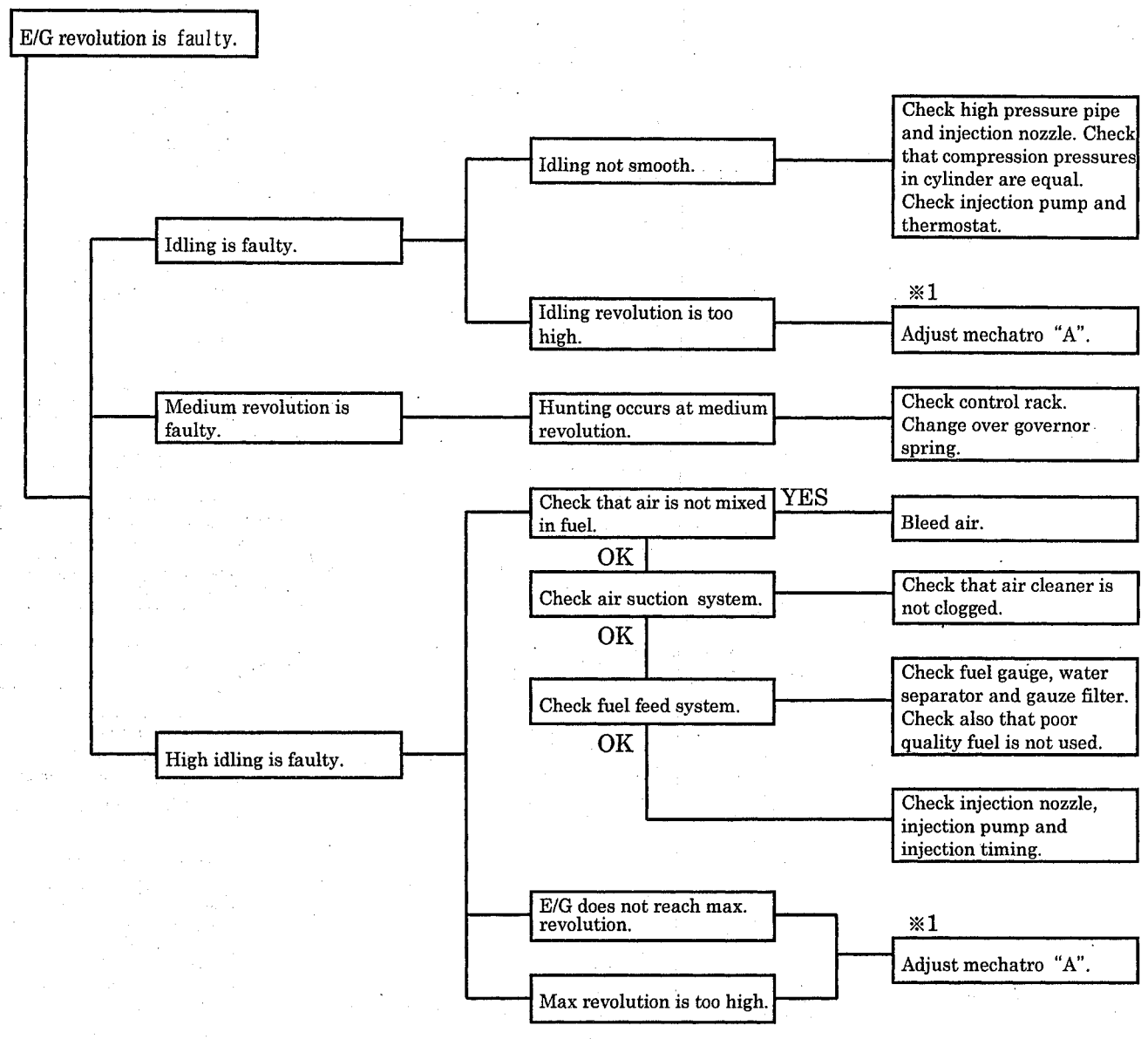
(1)-1

Note: (1)-1 matches the Groupe No. on page 1.




Continued from P14
Continued from P14
NO
YES
(Service diagnosis No.10)
Arm in operation pressure sensor (SE-7) reads more than 4.0V when lever is shifted to the full.
NO
Trouble disappears if arm in operation pressure sensor (SE-7) is replaced.
YES
Arm in operation pressure sensor (SE-7) is faulty.
NO
Arm in pilot pressure is approx. 35kgf/cm² (500psi) or over when lever is shifted to the full.
YES
Inspect harness between arm in operation pressure sensor (SE-7) and C-1 controller.
NO
Inspect ATT pilot valve.
Replace C-1 controller.
(Service diagnosis No.9)
Boom raise operation pressure sensor (SE-3) reads more than 4.0V when lever is shifted to the full.
NO
Trouble disappears if boom raise operation pressure sensor (SE-3) is replaced.
YES
Boom raise operation pressure sensor (SE-3) is faulty.
NO
YES
Boom raise pilot pressure is approx. 35kgf/cm² (500psi) or over when lever is shifted to the full.
YES
Inspect harness between boom raise operation pressure sensor (SE-3) and C-1 controller.
NO
Inspect ATT pilot valve.
(Service diagnosis No.9)
Boom lower operation pressure sensor (SE-4) reads approx. 4.0V or over when lever is shifted to the full.
NO
Trouble disappears if boom lower operation pressure sensor (SE-4) is replaced.
YES
Boom lower operation pressure sensor (SE-4) is faulty.
NO
YES
Boom lower pilot pressure is approx. 35kgf/cm² (500psi) or over when lever is shifted to the full.
YES
Inspect harness between boom lower operation pressure sensor (SE-4) and C-1 controller.
NO
Inspect ATT pilot valve.
(Service diagnosis No.11)
Bucket digging operation pressure sensor (SE-1) reads approx. 4.0V or over when lever is shifted to the full.
NO
Trouble disappears if bucket digging operation pressure sensor (SE-1) is replaced.
YES
Bucket digging operation pressure sensor (SE-1) is faulty.
NO
YES
Bucket digging pilot pressure is approx.35kgf/cm² (500psi) or over when lever is shifted to the full.
YES
Inspect harness between bucket digging operation pressure sensor (SE-1) and C-1 controller.
NO
Inspect ATT pilot valve.
(Service diagnosis No.11)
Bucket dump operation pressure sensor (SE-2) reads approx. 4.0V or over when lever is shifted to the full.
NO
Trouble disappears if bucket dump operation pressure sensor (SE-2) is replaced.
YES
Bucket dump operation pressure sensor (SE-2) is faulty.
NO
Bucket dump pilot pressure is approx. 35kgf/cm² (500psi) or over when lever is shifted to the full.
YES
Inspect harness between bucket dump operation pressure sensor (SE-2) and C-1 controller.
NO
Inspect ATT pilot valve.

(3)



Checking condition ; E/G water temperature is more than 50±5℃ (122±41°F).
※1 ; Refer to Electric Troubleshooting.

SECTION 1.

GENERAL

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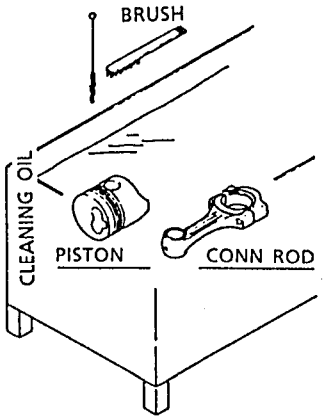
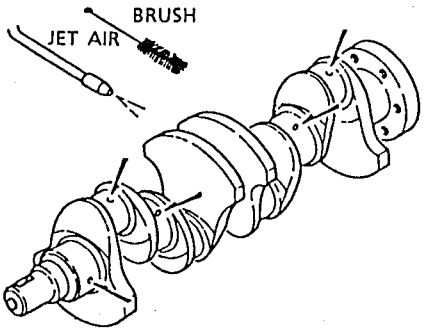
REPAIR IN GENERAL

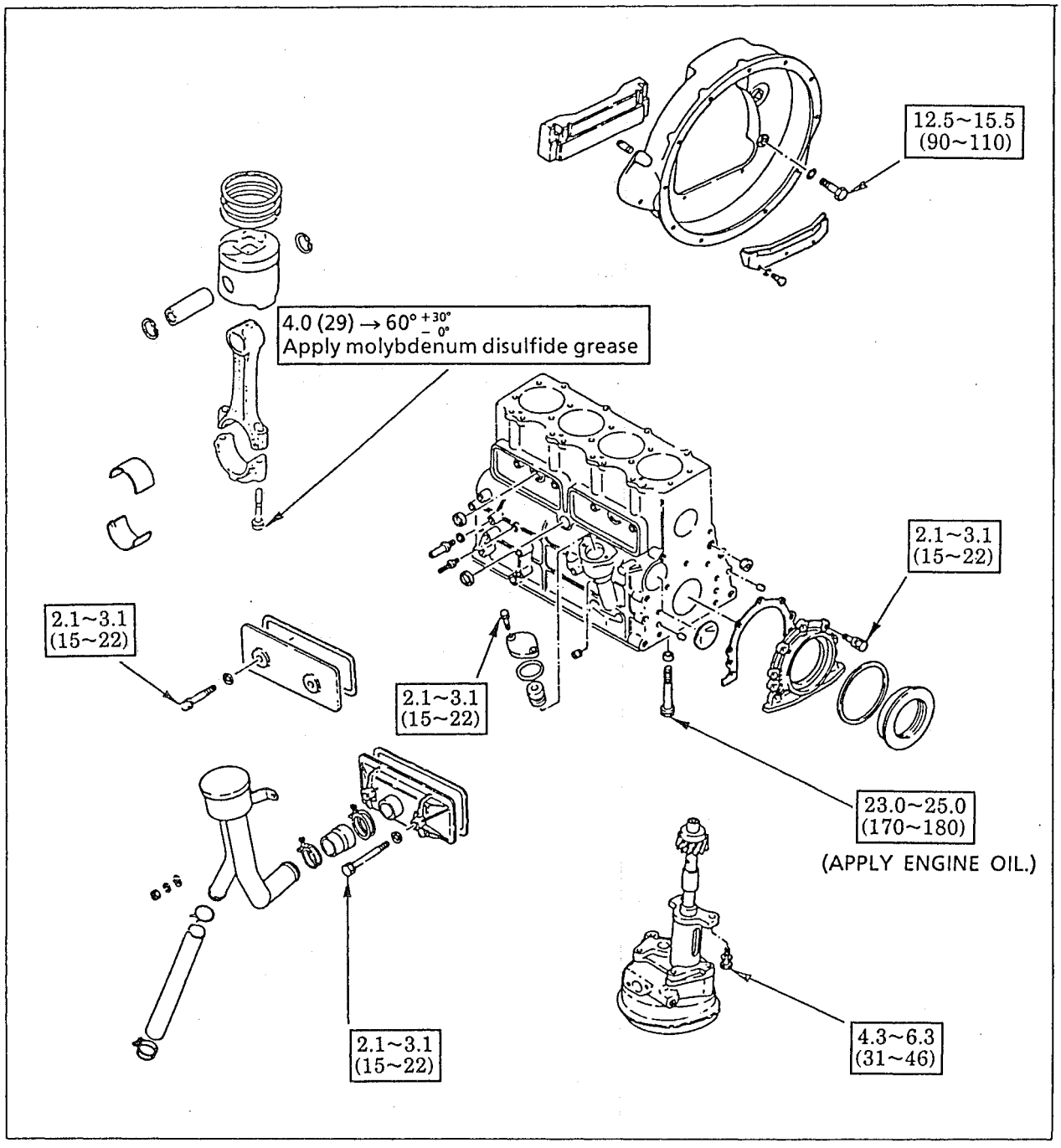
1. Before performing inspection and maintenance, disconnect the cable from the battery to prevent the harness from burning because of shorting.
2. Use special tools designated by ISUZU.
3. Use ISUZU genuine parts.
4. Do not re-use gaskets, oil seals and lock washers as a rule.
5. Arrange disassembled parts in groups so as to facilitate operation.
6. Clean parts thoroughly before inspection and assembly. Make sure that oil holes are not clogged, using jet air.





ENGINE BODY (1)

kgf·m (ft·lbs)



SECTION 2.

ENGINE PROPER

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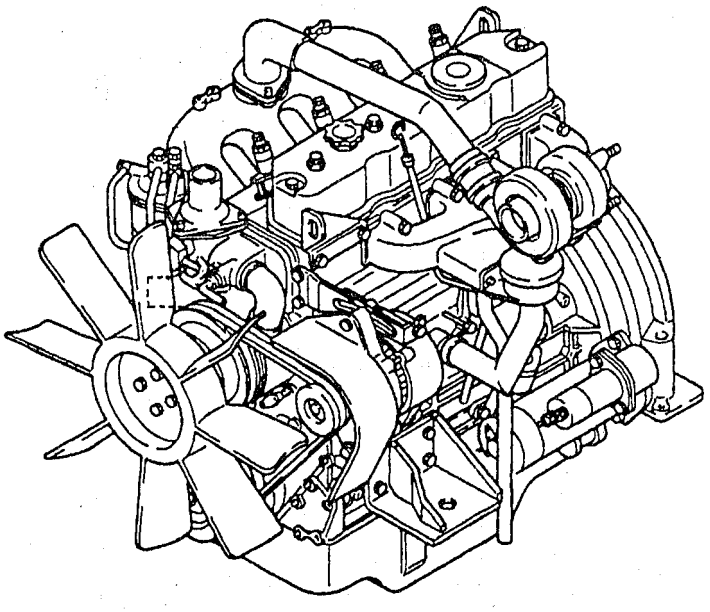
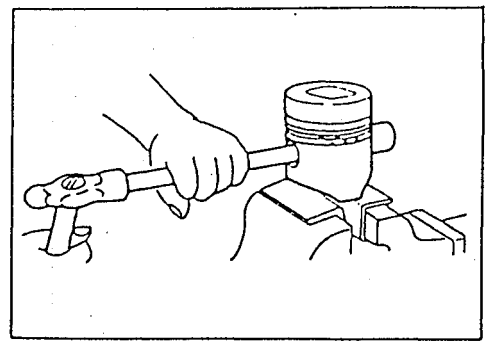
GENERAL VIEW OF ENGINE (4BG1T)



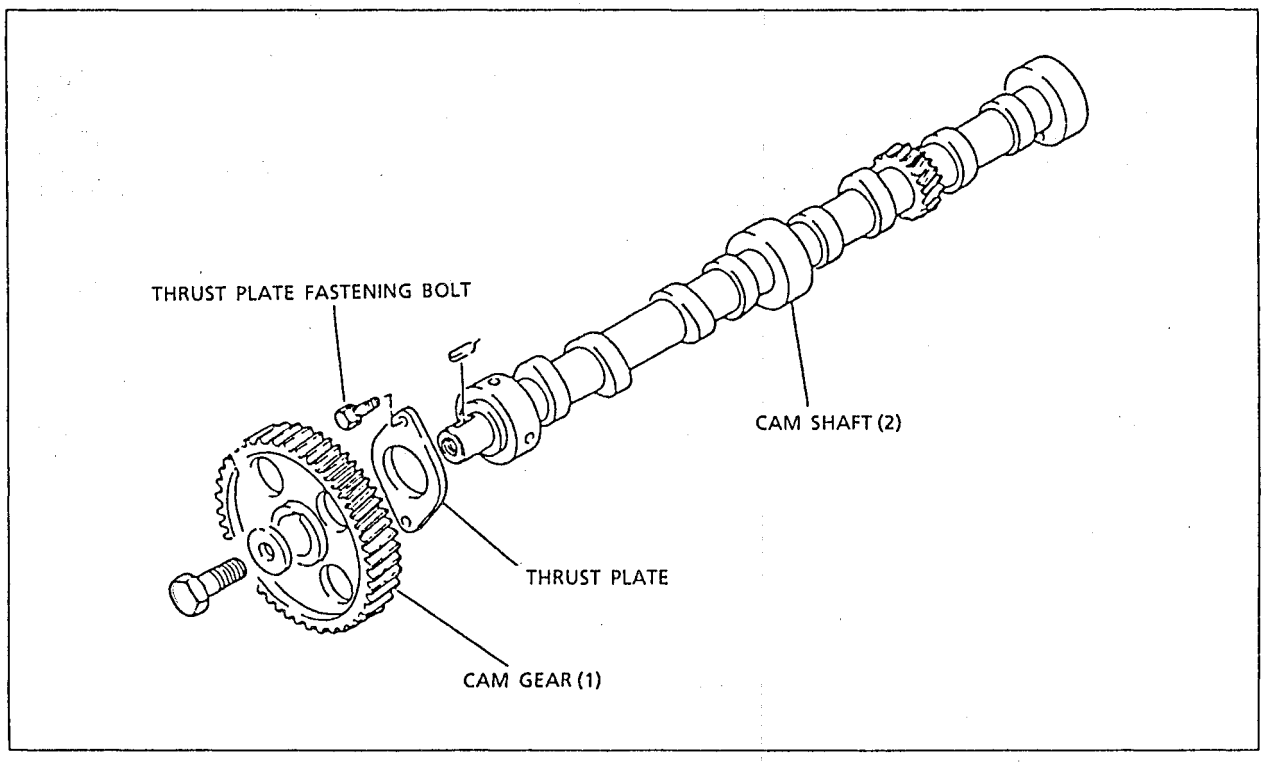
※ This shows the engine with turbo

PISTON PIN

Place a rod to the piston pin and tap it lightly with a hammer till it comes out of the piston.



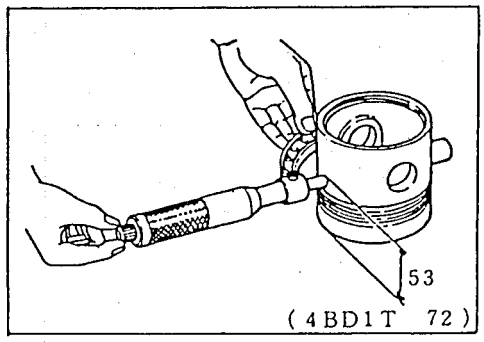
CAM SHAFT ASSEMBLY



PISTON, PISTON PIN AND PISTON RING

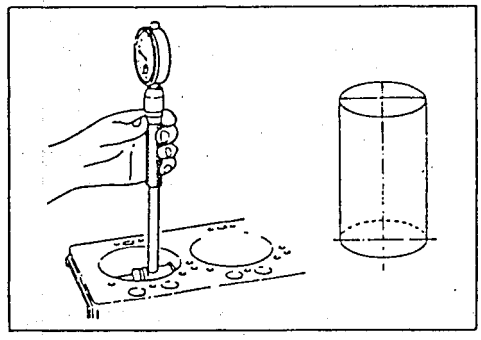
O.D. OF PISTON

O.D. of piston	Standard value	
	4BG1	104.830~104.869 (4.1272"~4.1287")
	4BG1T	104.850~104.889 (4.1280"~4.1295")



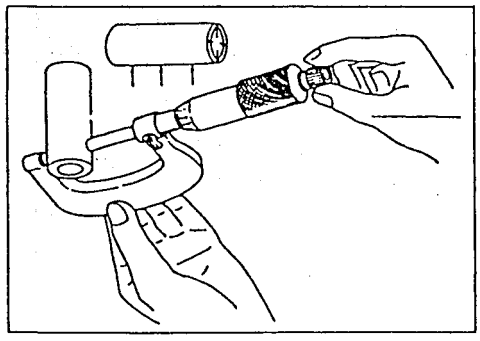
CLEARANCE BETWEEN CYLINDER LINER AND PISTON

	Standard value	
Bore diameter of cylinder liner	ø105.060~ø105.021 (4.1363"~4.1347")	
Clearance between cylinder liner and piston (grade difference in cold state)	4BG1	0.152~0.230 (0.0060"~0.0091")
	4BG1T	0.132~0.210 (0.0052"~0.0083")



WEAR OF PISTON PIN

O.D. mm (in)	Nominal size	Service limit	Remedy
	ø35 (1.378)	ø34.95 (1.376)	Replace.



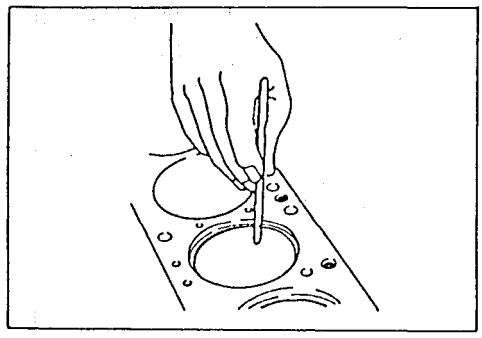
INTERFERENCE BETWEEN PISTON AND PISTON PIN

Interference between piston pin and piston mm (in)	4BG1	4BG1T (Clearance)
	less than 0.005 (0.0002)	0.010~0.023 (0.0004~0.0009)

CLEARANCE AT THE MATING PART OF PISTON RING

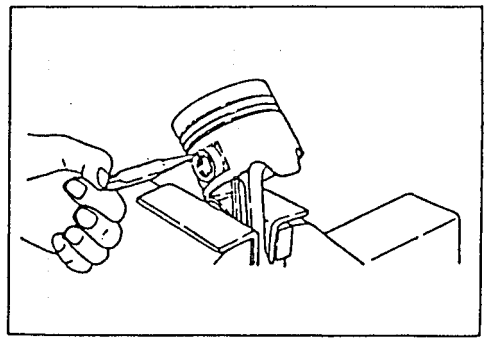
Put the piston ring in the cylinder bore and press it in with the head of the piston so it forms right angles with the cylinder.

	Standard value	Service limit	Remedy
No. 1 pressure ring	0.25 ~0.45 (0.010"~0.018")	1.5 (0.06")	Replace.
No. 2 pressure ring	0.2 ~0.45 (0.08"~0.018")	1.5 (0.06")	
Oil ring	0.2 ~0.4 (0.08"~0.016")	1.5 (0.06")	



SNAP RING

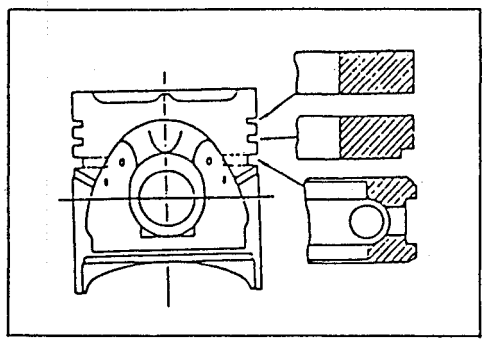
Secure the snap ring with the piston pin. Make sure that the piston and the connecting rod move smoothly.



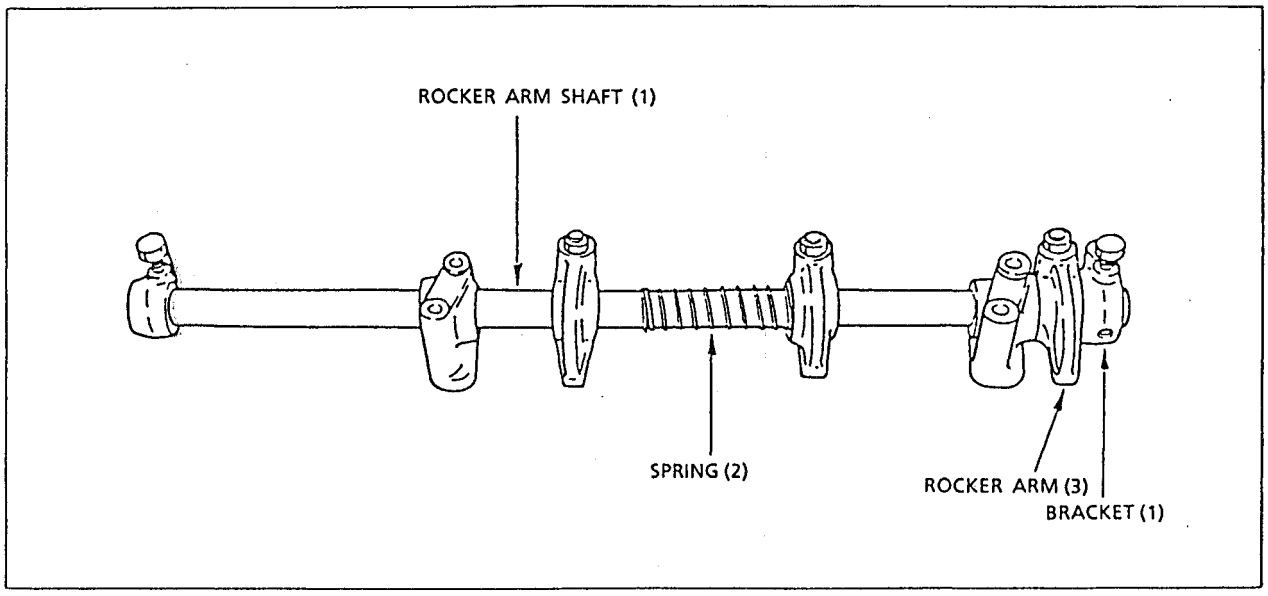
PISTON RING

Place the piston rings so the letters like "NPR", N or T face up.

There should be no clearance in the jointing part of the coil expander.



ROCKER ARM SHAFT ASSEMBLY



SECTION 3.

LUBRICATION SYSTEM

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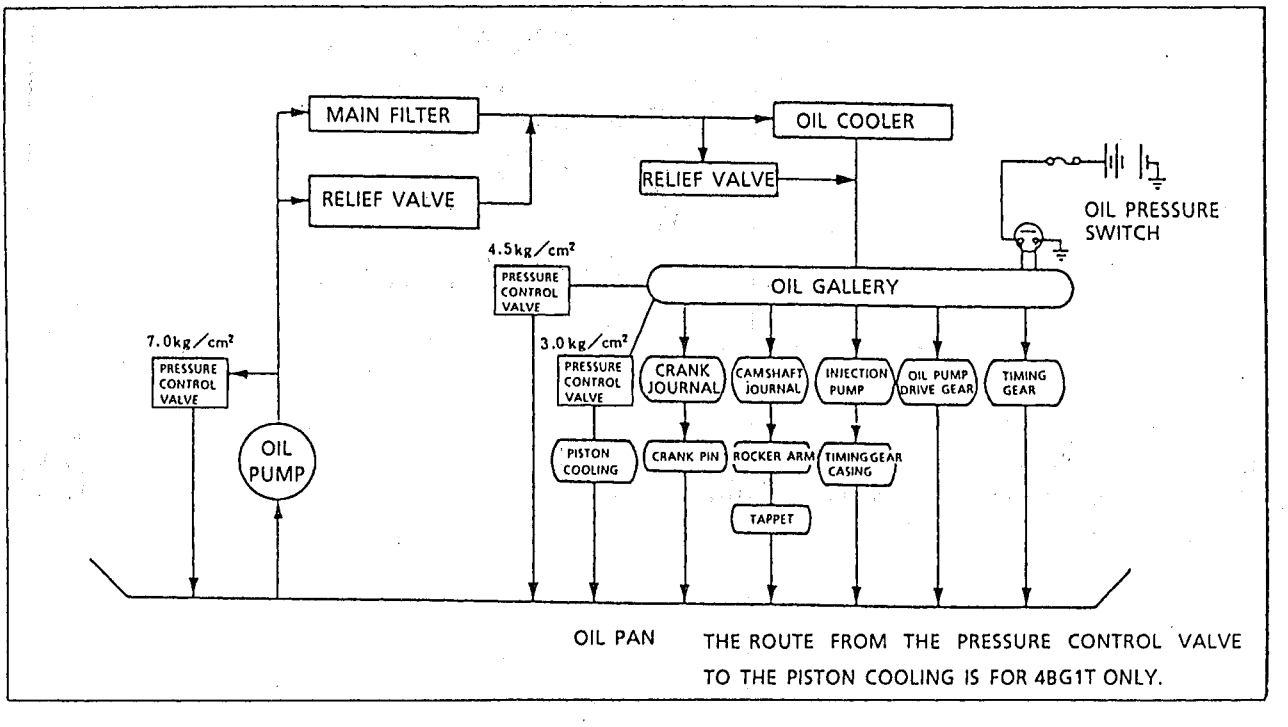
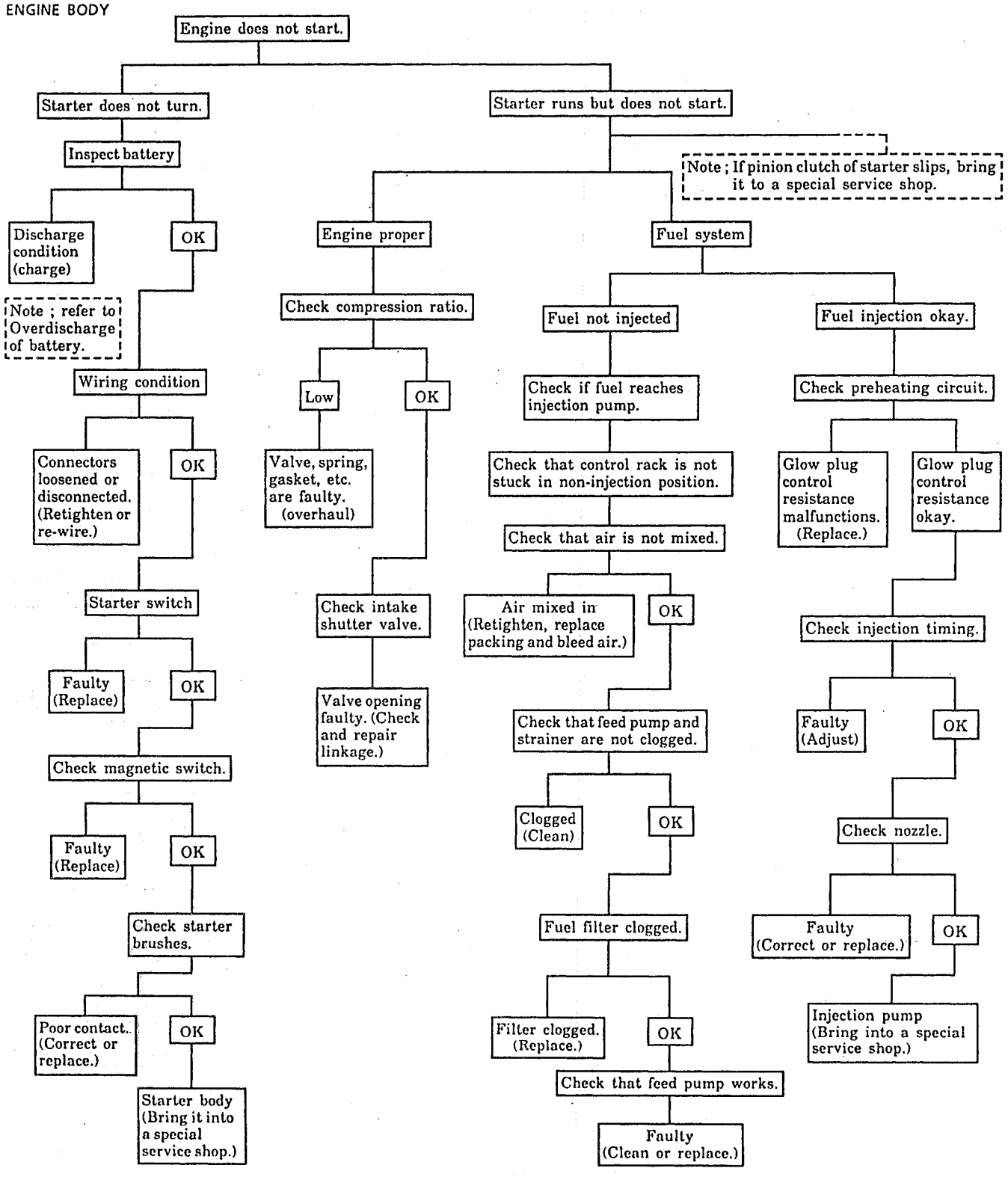
LUBE OIL CIRCULATION DIAGRAM



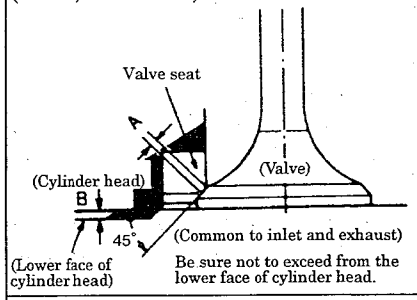
SECTION 6.

TROUBLESHOOTING

ENGINE BODY



(Note) What is stated "Bring into a special service shop." means that a faulty injection pump and electrical fittings should be brought into a special service shop.

Section	Sub section	Inspection item	Nominal size	Standard assembly value	Limit	Repair procedure	Remark
Engine proper	Cylinder head	Sink of valve seat (Inlet, Exhaust)  		B=1.0 (0.04)	More than 2.5 (0.10)	Replace valve seat.	Valve seat angle: 45°
		Contact width with valve seat		A=1.5 (0.06)	More than 2.0 (0.079)	Correct with a valve seat cutter.	After correction, lap the contact surface thoroughly.
		Distortion of the bottom surface of cylinder head (mounting surface) (Flatness)		Less than 0.025 (0.001)	More than 0.2 (0.008)	Correct with a surface grinder.	Max. amount of correction 0.3 (0.012) Make sure that piston does not contact with valve.
		Distortion of the mounting surface of manifold		Less than 0.05 (0.002)	More than 0.4 (0.016)	Correct.	
		Hydrostatic test (three minutes) kgf/cm² (psi)		5 (71)		Correct of replace one that develops water leaks.	
		Tightening of head bolts — Angle method		(1) Tighten to 7kgf·m (50.6ft·lbs) (2) Loosen (3) Tighten to 9kgf·m (65.1ft·lbs) (4) Tighten at a rotating angle of 90° to 120°		Coat bolts with molybdenum disulfide grease and tighten in the specified order.	(1) Tighten to 7kgf·m (50.6ft·lbs) (2) Loosen (3) Tighten to 9kgf·m (65.1ft·lbs) (4) Tighten at a rotating angle of 90° to 120°
Main moving parts	Piston	Clearance between piston and cylinder (position 82mm (3.23in) grade from the top surface)	4BG1	0.047~0.085 (0.00185~0.00335)	0.182~0.200 (0.0072~0.0079)	When notable noise due to the contact is detected, replace piston pin or piston.	
			4BG1T	0.057~0.095 (0.00225~0.00374)			

Section	Sub section	Inspection item		Nominal size	Standard assembly value	Limit	Repair procedure	Remark
Electeic device	Starter 24V/4.5KW Nikko 8-97029-863-2	Loosening of installation					Correct.	
		Height of brush			19~20 (0.748~0.787)	12 (0.4724)	Replace	
		Magnetic switch	Resistance value of pressure coil C1 (Ω)		0.17 [20℃ (68.0°F)]			When coil resistance is remarkably differed, replace switch.
			Resistance value of pressure coil C2 (Ω)		1.54 [20℃ (68.0°F)]			
			Deflection of contact	Less than 0.6	1.5~2.5	0.6	Replace contact or switch	
		Commutator	O.D		Ø36 (1.4173)	Ø35 (1.378)	Replace armature	
			Depth of undercut		0.5~0.8 (0.0197~0.0315)	0.2 (0.0079)	Correct.	
		Ball bearing	Rear side (armature)	Ø10 (0.3937)			6200 DDU	
			Front (armature)	Ø17 (0.6693)			6003 DDU	When it does not rotate smoothly and noise is made, replace it
			Pinionshaft (shaft)	Ø25 (0.9843)			6005 DDU	
		Performance	No-load characteristics (Less than 24V,100A)		More than 4500rpm			Make sure that pinion actuates smoothly and noise is not made.
	Prehe-ating device	Control resistor, Glow plug					Replace if disconnected or shorted.	
	Battery	Battery terminal						
		Electrode plate, isolation plate, battery case, etc.						
		Clouding of electrolyte						
		Specific gravity of electrolyte [at 20℃ (68.0°F) after charge]						
		Capacity (20 hr. ratio)						
		Terminal voltage						
		Electrolyte level						

SECTION 10.

STARTER

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d) If the base current to transistor (TR1) is cut off, transistor (tr1) is turned off. This blocks the current that has been flowing to starter relay coil (SC) and opens the starter relay contact (P2). This also cuts off the current that has been running to magnetic switch coils (EC1) , (EC2) of the starter, which in turn opens the main contact (P1) of the starter, cuts off the current to the starter, This causes the starter to deactuate the engine.

3) Preventing the starter from being spontaneously actuated while the engine is running

a) If the start switch is turned to "START" accidentally during engine rotation, the starter is jerkily driven and may break the ring gear of the engine or the pinion gear of the starter on some occasions.
The safety relay prevents the starter from suddenly running by such accidental action, as mentioned below :

b) As explained in para. 2, the voltage generated by the alternator rises as the engine runs. This increases the voltage at the R terminal of the alternator accordingly. As the result the base current of transistor (Tr2) of the safety relay flows as indicated by ⑤, keeping transistor (Tr2) "On". If, for example, the start switch is in closed in this condition, the current flowing in resistor (R1) is switched to transistor (Tr2). This prevents starter coil (SC) from being energized, i.e. no current goes to the starter. Consequently, the starter is prevented from being actuated when the engine is running.

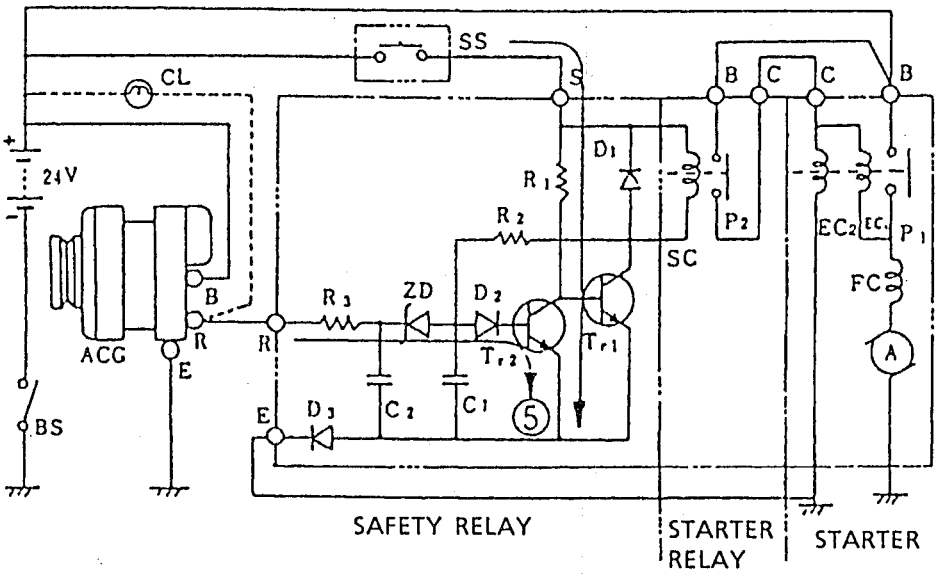
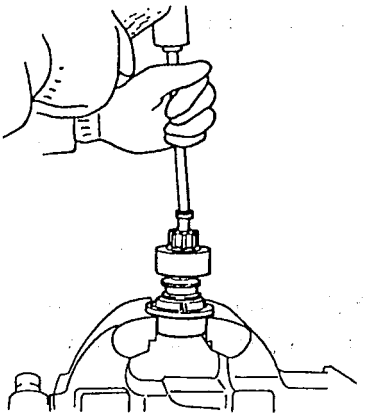


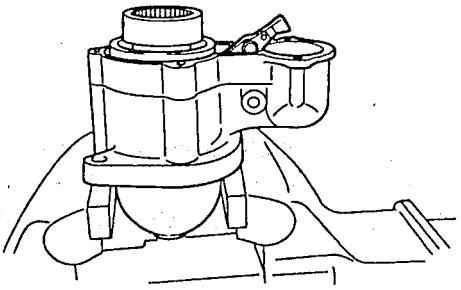
Fig. 18

7. ASSEMBLY

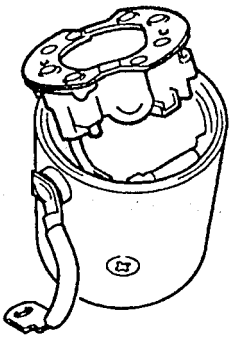
(1) Fit the bearing, inner housing and overrunning clutch to the pinion shaft and caulk the pinion stopper.



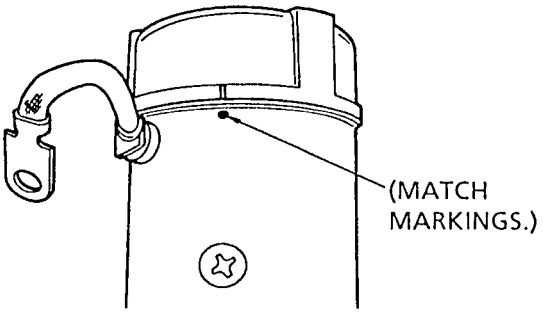
(2) Fit the shift lever and the pinion shaft to the front bracket.
(Match the markings on the shift lever.)



(3) Fit the armature, yoke, brush holder and brush to the center bracket.



(4) Fit the rear bracket. (Match markings.)



3. CONSTRUCTION

3.1 ALTERNATOR

This alternator is a ventilating type AC generator which contains semiconductor rectifying device, that is IC regulator for the interior self cooling as shown in Figure 2, and is made up of stator, rotor core, field coil, silicon diode, IC regulator, fan and pulley.

The front and rear brackets are composed of light alloy and are installed by through bolts attaching with stator. And there is a bearing chamber to support the rotor core and the flange to allow the installation of the engine.

In addition, the rectifier assembly which is equipped with 8 main diodes and three diodes for excitation, resistance for initial excitation, diode for initial excitation (inversion protection), and IC regulator are installed on the rear bracket.

The stator is formed by winding three set of coil on the core of which the punched silicon steel plates are laminated (Y connection) to generate three phase alternating current, and the coil is connected to the diode.

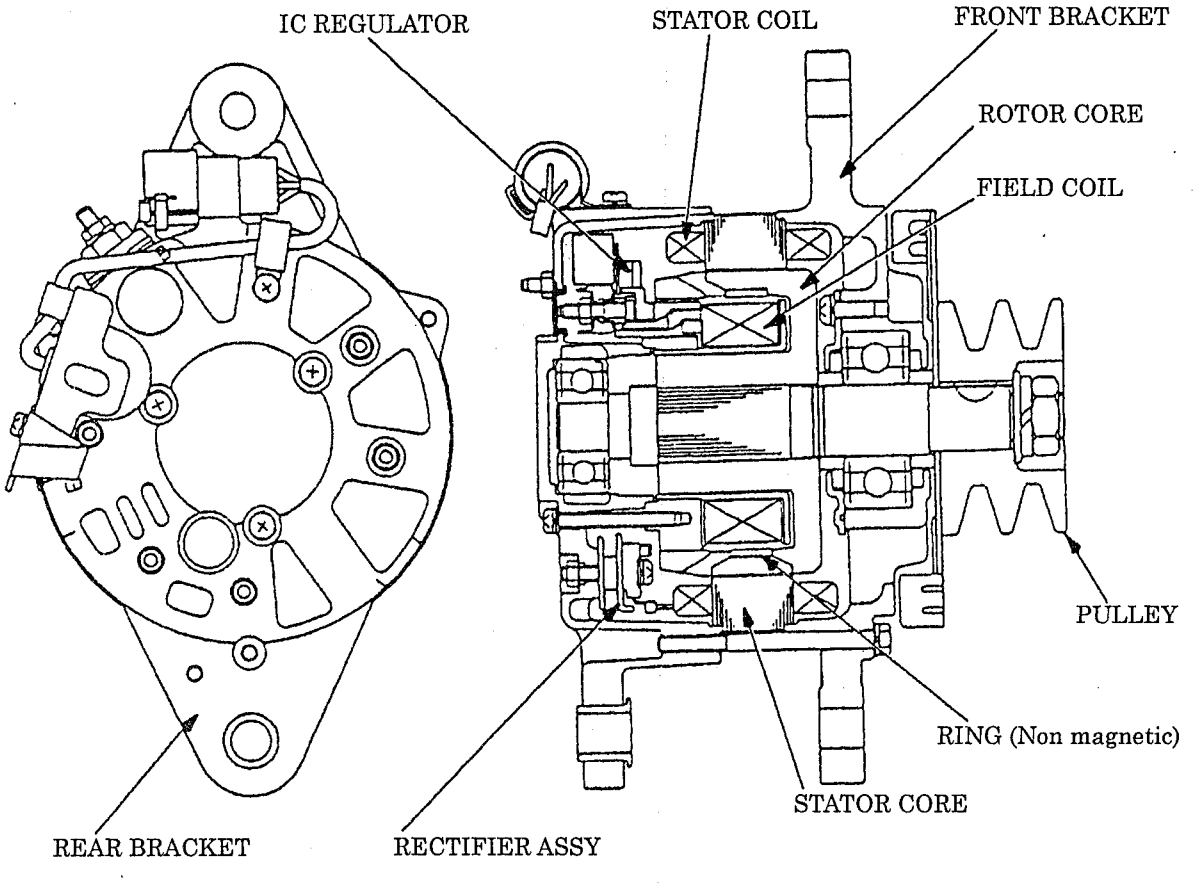


Fig.2 Cross-sectional view of alternator

The rotor core is supported by the ball bearing (wide bearing) press fitted in the shaft, and at the center, two sets of rotor core are integrated by welding the claw section to the non magnetic ring, and only this rotor core is allowed to rotate.

And, the field coil is secured on the rear bracket side, thereby eliminating the need for consumable part, brush, and improving maintainability with the goal of maintenance-free performance.

After the excited rotor starts rotating, the alternator generates the three-phase alternating current on the stator coil, and the current is rectified to full wave and finally charges the battery as direct current.

6. PERFORMANCE TEST

The performance test of the alternator is carried out by connecting wires as shown in the figure 10, and by measuring the adjusting voltage and the output current.

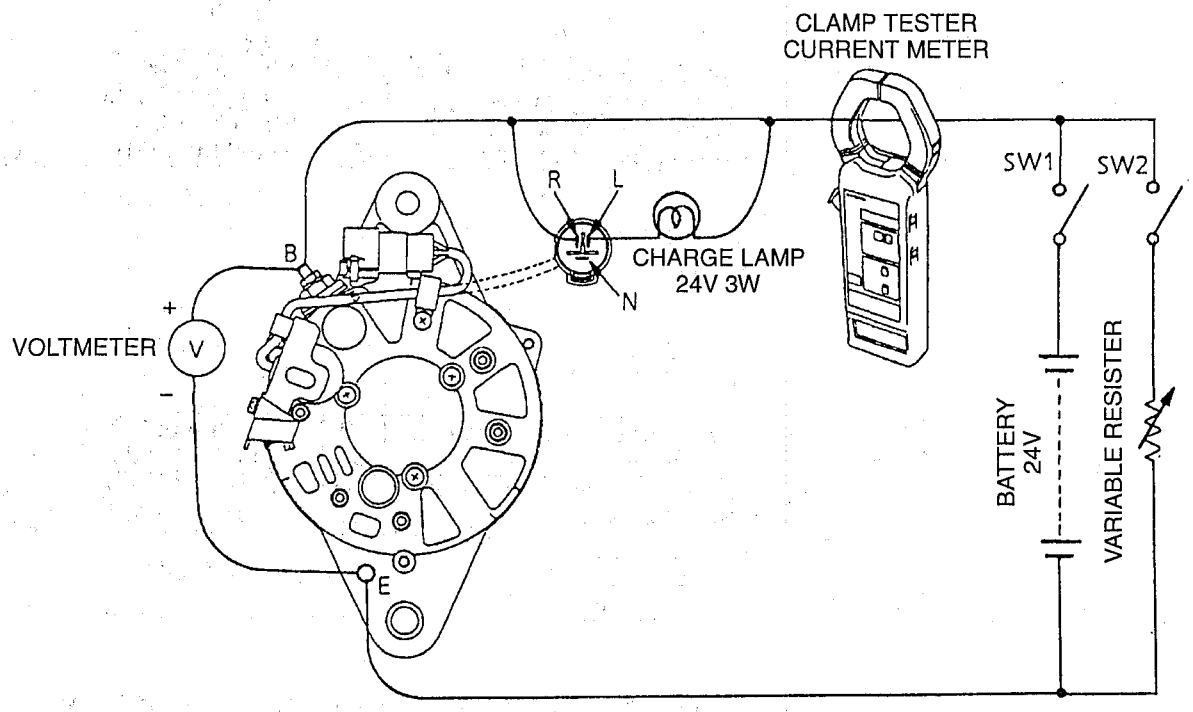


Fig.10 Wiring Diagram for Performance Test of Alternator Containing Regulator

6.1 MEASURING ADJUSTING VOLTAGE OF REGULATOR

Turn SW1 switch on, and warm up the regulator for 5 to 10 minutes until the pointer of ammeter indicates 6A or less in the condition where the number of revolution is Approx. 1500rpm. After making sure that the pointer of ammeter indicates 2 to 6A, when the number of revolution of alternator rises to Approx. 3000 to 4000rpm and the pointer of voltmeter is in the range of 27.5 to 29.5V, the voltage is well adjusted. When the pointer of ammeter is 6A or higher, charge it for a while or replace it with the fully charged battery.
When the pointer of voltmeter is not in the range of 27.5 to 29.5V, replace the regulator.

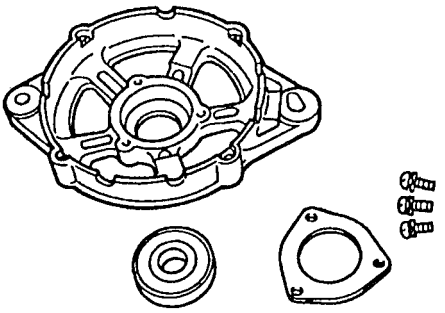
Adjusting voltage reference value: 27.5 to 29.5V(+25 C)

6.2 MEASURING OUTPUT CURRENT

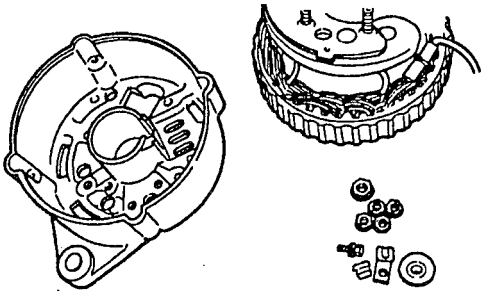
Turn SW1 and SW2 switches on, raise the number of revolution of alternator to 5000rpm, and measure the Max. value of the output current with variable resistor holding the pointer of voltmeter to 27V constantly. In this time, when the output current is 37A or higher , it is acceptable.

⚠
1. Never cut out the battery circuit while the alternator is rotated.
2. When the charge lamp (24V 3W) is not required to be used, don't connect it to L terminal. Never connect it L terminal and B circuit directly, it may cause damage to the diode for excitation.

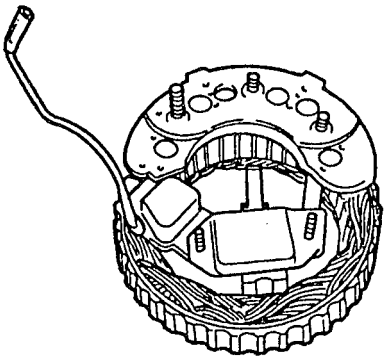
(5) Remove the retainer screws and the bearing.



(6) Loosen and remove the nut of the B terminal of the rear bracket and the rectifier fastening nuts.

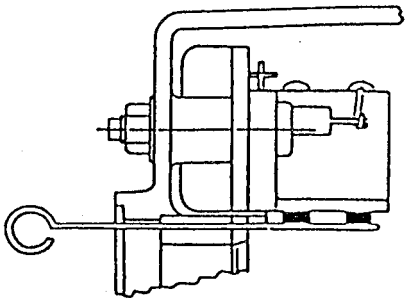


(7) Remove the rectifier and the IC regulator from their soldered areas.



4.2 ASSEMBLY

(1) Assembly shall be performed in the reverse order of disassembly.
When attaching the rotor (after mounting the front bracket) to the rear bracket, push up the brush as shown in the figure on the right, secure it with a pin and fix it to the rotor.



After assembly, turn the rotor by hand and check for abnormal sound, abnormal gap and other faults.

1.2 ADDITIONAL PARTS FOR THE MODIFICATION OF THE BREAKER

(1) UPPER STRUCTURE BREAKER KAI

B. KAI

No.	PART No.	NAME	Q'TY	REMARK	Applicable Machines
	YY32T01002FA	Upper structure modification kit No. BREAKER			
	YY30V00007F1	•MODIFICATION OF THE CONTROL VALVE			
	(YY30V00006F1)	••CONTROL VALVE	(1)	For standard machine	
0-1	YV30V00005F1	••OPTION VALVE	1	ADD-ON	
0-1B	ZS23C12065	••CAPSCREW	4		
0-1C	ZD12G03000	••O RING	3		
	YY21C00003F2	•INSTALL OF THE GUARD			
87	YX21C01178F1	••GUARD ASSY	(1)		
87-4	YX21C01209P1	•••RUBBER	1	50×250 t=15	
87-5	YT21C01037D6	•••TRIM	1	L=120	
87-6	YT21C01159D5	•••WEATHER STRIP	1	L=90	
	YY33H00003F2	•HYDRAULIC TANK ASSY			
17	YV50V00001P1	••RETURN FILTER	1		
	YY17M00003F7	•INSTRUMENT PANEL ASSY			
39	2479U1190F32	••SWITCH (SINGLE/CONFLUX)	1		
	YV68H00004F1	•REMOTE CONTROL PIPING			
1	2420R349D320	••HOSE	1		
2	2420R349D040	••HOSE	1		
3	2444R1120D045	••HOSE	1		
4	ZN18C08007	••NUT	1		
5	PY03M01026P1	••PIN	1		
6	ZW16X08000	••WASHER	3		
7	ZS18C08045	••CAPSCREW	2		
8	ZW16H08000	••WASHER	2		
9	YN68H01038P1	••BRACKET	1		
10	2419T3757D6	••PIN	1		
11	2419RD4	••SNAP PIN	1		
12	HH25R04004G5	••CONNECTOR	1	With filter	
13	2416Z566	••CUSHION RUBBER	1		
14	ZH42X04000	••ELBOW	2		
15	YT30V00004F1	••PILOT VALVE ASSY	1		
16	YX52S00005P1	••PRESSURE SENSOR	1		
17	ZS18C08020	••CAPSCREW	2		
18	YT30M01002F1	••LOCK ASSY	1		
19	YN68H01039P2	••PEDAL	1		
20	YR03M01134P1	••COVER	1		
21	ZW16X12000	••WASHER	1		
22	ZH22X04000	••CONNECTOR	1		
23	2418T18004	••PLATE	2		
24	2444Z2526	••TEE	1		

(2) BOOM BREAKER OCEANIA etc. B. OCEANIA

No.	PART No.	NAME	Q'TY	REMARK	Applicable Machines
	YY32T01002F7	Boom modification kit No. BREAKER			
	YY02B00001F2	•4.6M (15′1″) BOOM ASSY			
1	(YY02B00001F1)	••4.6M (15′1″) BOOM ASSY	(1)	With bushing	
2	YW42H01011P1	••TAPPED BLOCK	1		
3	YW42H01013P1	••TAPPED BLOCK	1		
4	2416T12200	••TAPPED BLOCK	2		
5	YW42H01012P1	••TAPPED BLOCK	2		
6	2416T13009	••TAPPED BLOCK	1		
	YY42H00002F1	•4.6M (15′1″) BOOM HYDRAULIC PIPING			
1	YY42H01005P1	••TUBE	1		
2	YY42H01006P1	••TUBE	1		
3	YW42H01005P1	••TUBE	1		
4	YW42H01004P1	••TUBE	1		
5	HG23T10010G1	••CONNECTOR	1		
6	HG23T12012G1	••CONNECTOR	1		
7	ZE72X16000	••PLUG	2		
8	ZC26X22011	••CLAMP	3		
9	ZC26X28014	••CLAMP	3		
10	2432T2242	••CLAMP	1		
11	ZS18C10045	••CAPSCREW	3		
12	ZS18C12055	••CAPSCREW	4		
13	ZW26X10000	••LOCK WASHER	3		
14	ZW26X12000	••LOCK WASHER	4		
15	ZD12A01800	••O RING	5		
16	ZD12A01600	••O RING	3		