HYDRAULIC EXCAVATOR

SHOP MANUAL model SK330(LC)-6E SK330NLC-6E

INDEX

1	SPECIFICATION SECTION
2	MAINTENANCE SECTION
3	SYSTEM SECTION
4	DISASSEMBLY SECTION
5	TROUBLESHOOTING
6	ENGINE SECTION
7	INSTALLATION PROCEDURES FOR OPTIONAL ATTACHMENT

KOBELCO

Book code No. S5LC0009E②

Applicable Machines

LC08-06201～
YC08-03001～
LC09-06323～
YC09-03088～

Revision	Date of Issue	Remarks
First edition	March, 2003	S5LC0209E K
First revision	November, 2003	S5LC0209E① K

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SHOP MANUAL

SK330(LC)-6E
SK330NLC-6E

LC03

ATTACHMENT DIMENSION

TABLE OF CONTENTS

1. BOOM
   1.1 Boom dimensional drawing ····· 1
   1.2 Boom maintenance standard ····· 2
2. ARM
   2.1 Arm dimensional drawing ····· 4
   2.2 Arm maintenance standard ····· 5
3. BUCKET
   3.1 Bucket dimensional drawing ····· 7
   3.2 Bucket dimensional table ····· 7
   3.3 Dimensional drawing of lug section ····· 8
   3.4 Dimensional drawing of boss section ····· 9

KOBELCO CONSTRUCTION MACHINERY CO., LTD.

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LC08-06201～
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First edition	March, 2003	S5LC1109E K
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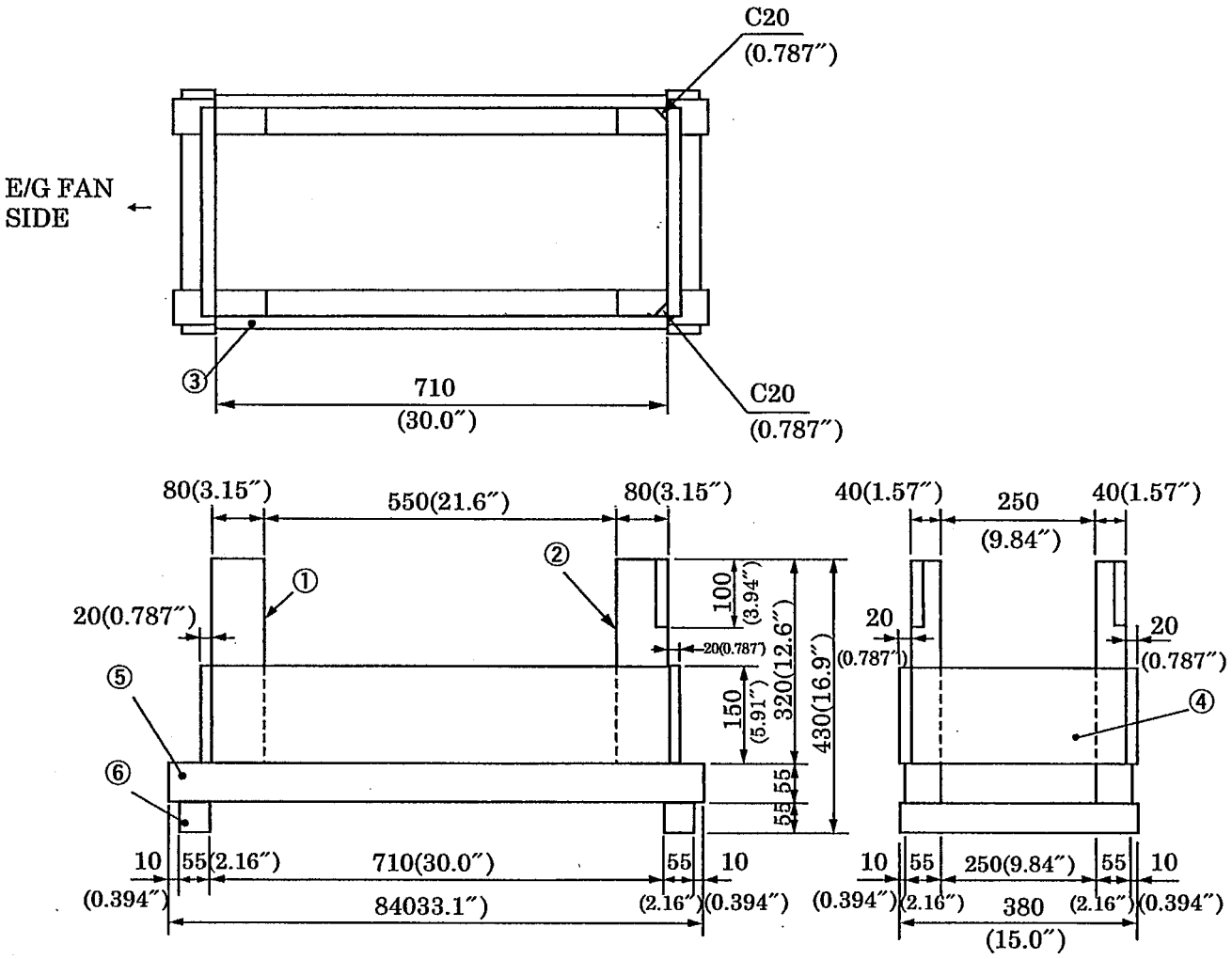
10. ENGINE MOUNTING PEDESTAL



MATERIAL ; WOOD

No.	NAME	Q'TY	REMARKS
1	SUPPORT	2	80X320X40 (3.15X12.6X1.57)
2	SUPPORT	2	80X320X40 (3.15X12.6X1.57)
3	PLATE	2	150X710X20 (5.91X30.0X0.787)
4	PLATE	2	150X330X20 (5.91X13.0X0.787)
5	FRAME	2	55X55X840 (2.16X2.16X33.1)
6	FRAME	2	55X55X380 (2.16X2.16X15.0)

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NAME OF WORK	NAME OF TROUBLE	Unit ; Hour
Oil 03−70		
Replacing engine oil.		0.6
Oil filter 03−71		
Replacing oil filter assy.	Oil leaks from oil filter. Oil filter casing is damaged. Oil filter head is scored. Oil filter system in general is out of order.	1.0
Cleaning or replacing oil filter assy. (1 set)		0.5
Inspecting or replacing relief valve. Detaching and attaching oil filter assy.	Relief valve parts are faulty.	0.4
Turbocharger 03−62		
Detaching/attaching or replacing turbocharger assy.		2.7
Overhauling turbocharger. (single) Incl. : Cleaning (1 pc.).		1.3
Detaching/attaching or replacing 2-stack oil filter assy.	Oil leaks from oil filter. Oil filter casing is damaged. Oil filter head is damaged. Oil filter system in general is out of order.	—
Oil pan 03−72		
Detaching and attaching oil pan and replacing gasket.	Oil leaks from oil pan gasket. Oil pan parts are faulty. Oil pan system in general is out of order.	2.8
Retightening oil pan attaching bolts.		0.5
Replacing oil level gauge guide or packing.	Oil level gauge parts are defective.	—
Oil piping 03−74		
Replacing oil piping. (between filter and cooler)	Oil leaks from oil piping. Oil piping system in general is out of order.	—
Replacing breather pipes. (2 pcs.)	Oil piping system in general is out of order.	0.3
Oil pump 03−75		
Detaching/attaching or replacing oil pump.		4.3
Overhauling oil pump assy. Incl. : Detaching/attaching oil pump.		—
Overhauling oil pump. Excl. : Detaching and attaching oil pump.		1.0
Detaching/attaching or replacing oil strainer.	Oil screen is installed incorrectly. Oil screen is broken. Oil screen is clogged. Oil screen stay is broken. Oil pump system in general is out of order.	3.5

(2) 2-stage main relief valve
(Commom for travel and ATT sections)
Start from the boosting side, first. Loosen nut (1), adjust the pressure with adjusting screw (2) and tighten nut (1) after completion of the adjustment on the boosting side.
Then, loosen nut (3), adjust the pressure on the standard side with adjusting screw (4) and tighten nut (3) after completion of the adjustment.

: 32mm Tightening torque : 2.8~3.2kgf·m (20~23 lbf·ft)
: 22mm Tightening torque : 2.8~3.2kgf·m (20~23 lbf·ft)
: 19mm Adjust screw
: 6mm

Table 3

No. of turns of adjust screw	Pressure change kgf/cm²(psi)
Boosting side 1 turn	Approx. 180 (2560)
STD side 1 turn	Approx. 180 (2560)

(3) Over load relief valve
(Boom, bucket, arm sections)
Loosen lock nut (1) and adjust it with adjust screw (2).

: 22mm Tightening torque : 2.8~3.2kgf·m (20~23 lbf·ft)
: 6mm

Table 4

No. of turns of adjust screw	Pressure change kgf/cm²(psi)
1 turn	Approx. 180 (2560)

(4) Over load relief valve (Swing)
When the adjustment of pressure is required, loosen lock nut (1) and adjust the pressure with cap (2).

: 30,38mm Tightening torque : 12kgf·m (87 lbf·ft)
: 12mm

Table 5

No. of turns of adjust screw	Pressure change kgf/cm²(psi)
1 turn	Approx. 102 (1450)

(5) Travel overload relief valve adjusting procedure
The valve can not be pressure adjusted externally. Loosen cap (5) and adjust it with shim (8). Increasing the shim thickness increases the pressure.

: 35mm Tightening torque : 10~12kgf·m (72~87 lbf·ft)
: 27mm

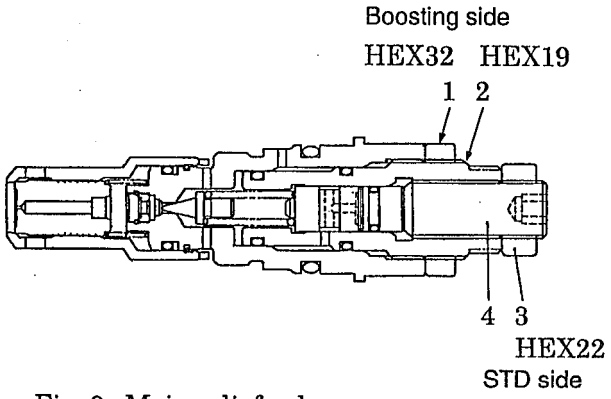


Fig. 9 Main relief valve
(Travel, ATT common section)

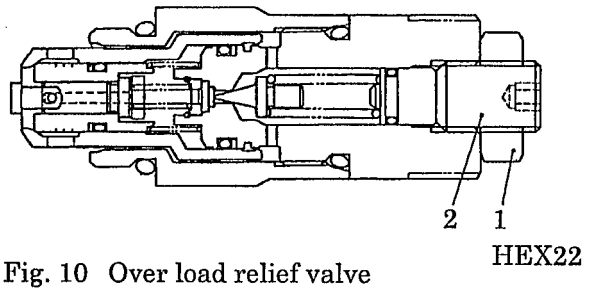


Fig. 10 Over load relief valve
(Boom, bucket, arm sections)

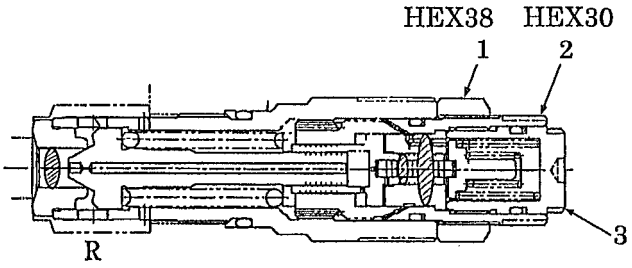


Fig. 11 Swing over load relief valve

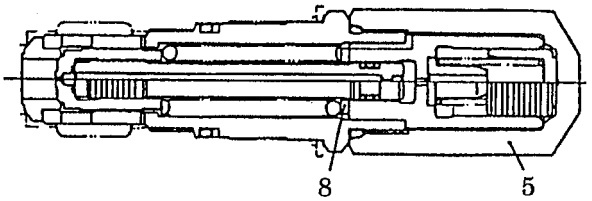
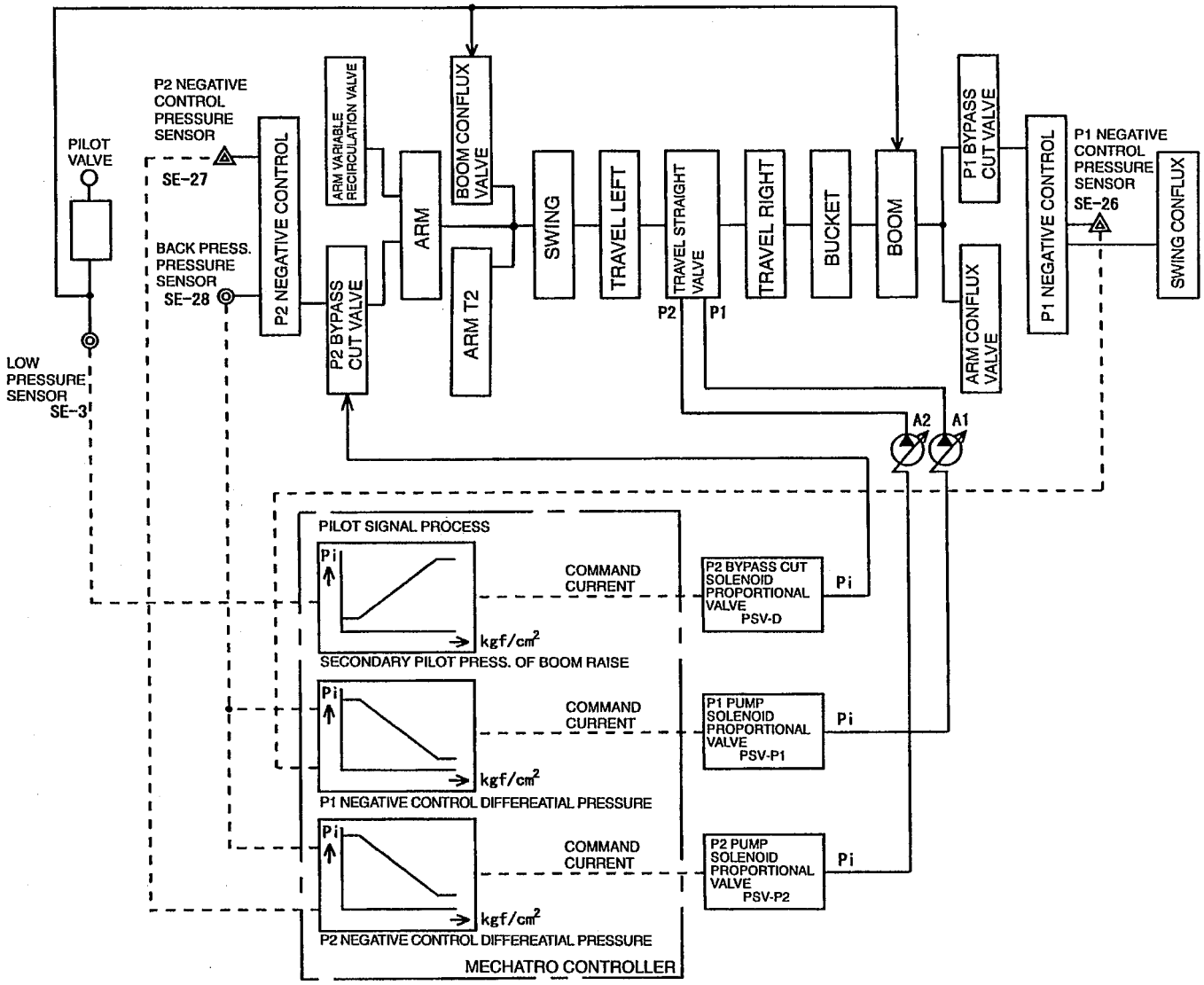


Fig. 12 Travel over load relief valve

O.D, I.D. and thickness of shims (mm)	Pressure change kgf/cm² (psi)
Ø17×Ø10×1	Approx. 50 (710)
Ø17×Ø10×0.5	Approx. 25 (360)

1.3 BOOM UP CONFLUX CONTROL

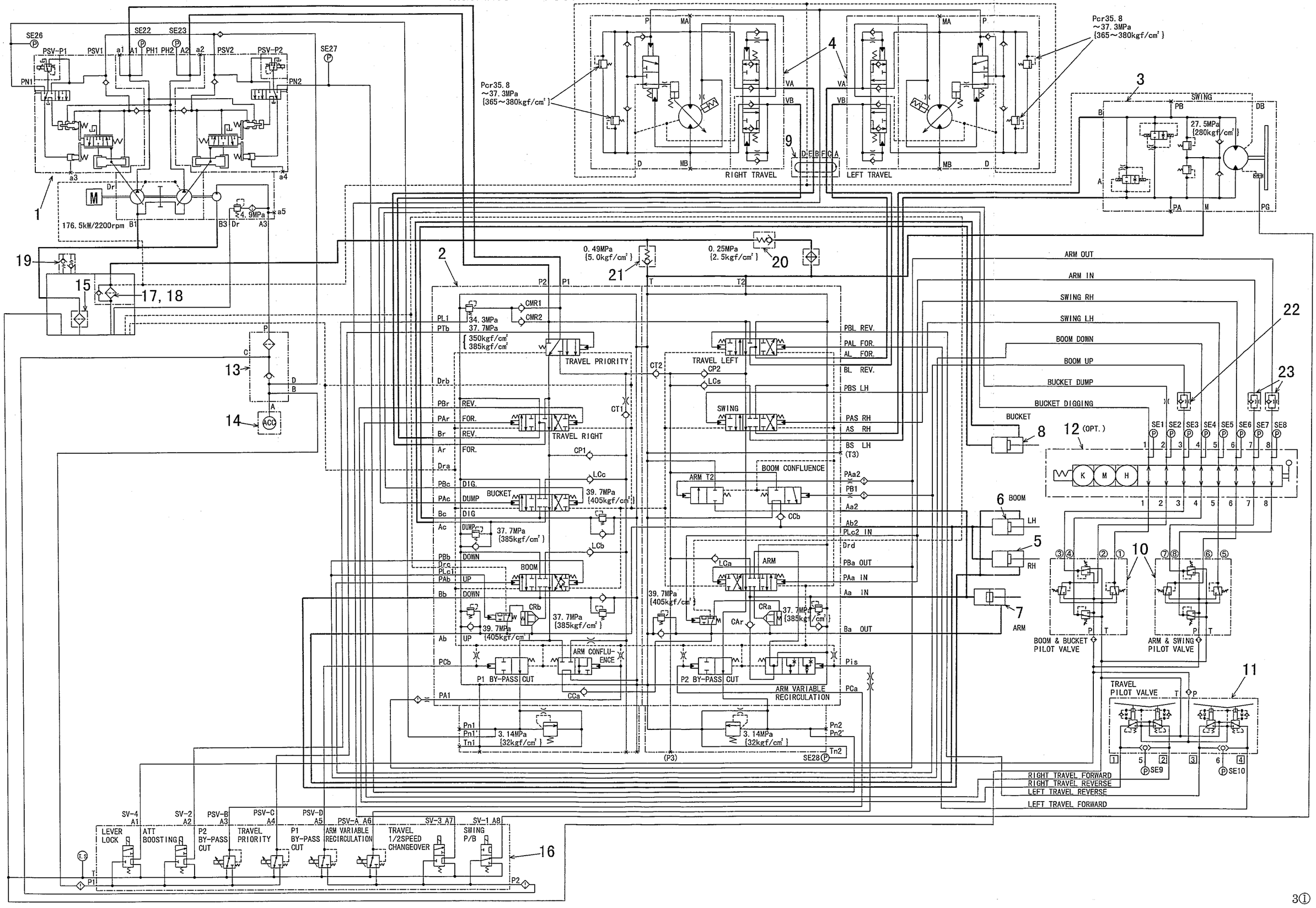


(1) Boom up conflux

1) Start boom up operation, and the boom up operation secondary pilot pressure switches boom spool and boom conflux spool, and inputs into low pressure sensor.
2) The voltage output of the low pressure sensor for the boom is put into the mechatro controller, processed internally and put out to the P2 cut solenoid proportional valve as command current according to the input voltage.
3) The P2 cut solenoid proportional valve puts out the secondary proportional valve pressure according to the current command from the mechatro controller and changes the P2 cut valve.
4) The moment the boom spool and the P2 bypass cut valve are shifted, it is put into the negative control pressure sensor and back pressure sensor.
5) The voltage output of the negative control pressure sensor and back pressure sensor is put into the mechatro controller. The controller processes the negative control signal inside and puts out a current command to the P1 and P2 pump solenoid proportional valves according to the voltage input.
6) The P1 and P2 pump solenoid proportional valves put out the secondary proportional pressure according to the current command from the mechatro controller and changes the delivery rates of the P1 and P2 pumps.
7) A pure hydraulic command changes over the boom main spool and the boom conflux valve. When the mechatro controller command shifts the P2 bypass cut valve, the oil delivered by the P1 pump is combined with that by the P2 pump when the boom up operation is performed.

No.	DISPLAY	REMARKS	No.	DISPLAY	REMARKS
11	No.11 PRESS. SENSOR B—5 BUCKET DIG 4.5V 3.0M B—6 BUCKET DUNP 45V 3.0M	Sensor voltage / Pressure converted value Sensor voltage / Pressure converted value	19	No.21 PROPO-VALVE D—2 P2 CUT COMP. 647mA 2.5M MEAS. 642mA 2.5M	Command current / Pressure converted value Feedback current / Pressure converted value
12	No.12 PRESS. SENSOR B—7 SWING (R) 4.5V 3.0M B—8 SWING (L) 4.5V 3.0M	Sensor voltage / Pressure converted value Sensor voltage / Pressure converted value	20	No.22 PROPO-VALVE D—3 S-TRAVEL COMP. 647mA 2.5M MEAS. 642mA 2.5M	Command current / Pressure converted value Feedback current / Pressure converted value
13	No.13 PRESS. SENSOR B—9 TRAVEL (R) 4.5V 3.0M B—10 TRAVEL (L) 4.5V 3.0M	Sensor voltage / Pressure converted value Sensor voltage / Pressure converted value	21	No.23 PROPO-VALVE D—6 A-RECIRCULAT COMP. 510mA 1.6M MEAS. 510mA 1.6M	Command current / Pressure converted value Feedback current / Pressure converted value
14	No.14 PRESS. SENSOR C—1 PUMP P1 3.3V 35M C—2 PUMP P2 3.3V 35M	Sensor voltage / Pressure converted value Sensor voltage / Pressure converted value	22	No.24 PROPO-VALVE E—1 P1 PUMP COMP. 350mA 0.6M MEAS. 395mA 0.6M POWER SHIFT 0mA	Command current / Pressure converted value Feedback current / Pressure converted value
15	No.15 PRESS. SENSOR B—16 P1 OPT. 4.5V 3.0M B—17 P2 OPT. 4.5V 3.0M	Sensor voltage / Pressure converted value Sensor voltage / Pressure converted value	23	No.25 PROPO-VALVE E—2 P2 PUMP COMP. 350mA 0.6M MEAS. 350mA 0.6M POWER SHIFT 0mA	Command current / Pressure converted value Feedback current / Pressure converted value
16	No.16 PRESS. SENSOR B—16 P1 NEGATIVE CONTROL 0.5V 0.0M B—17 P2 NEGATIVE CONTROL 0.5V 0.0M	Sensor voltage / Pressure converted value Sensor voltage / Pressure converted value	24	No.39 MECHATRO ADJT. CONT. SW TEST CONT. VOL 50% PROG. SW OFF	RUN/TEST indication Inner trimmer ON/OFF indication
17	No.19 PROPO-VALVE B—15 BACK PRESS. 1.6V 0.8M	Sensor voltage / Pressure converted value	25	No.40 RELEASE SW KPSS OFF SWING BRAKE OFF	ON/OFF indication ON/OFF indication
18	No.20 PROPO-VALVE D—3 P1 CUT COMP. 647mA 2.5M MEAS. 642mA 2.5M	Command current / Pressure converted value Feedback current / Pressure converted value	26	No.26 PROPO-VALVE D—13 SWING PRIORITY COMP. 647mA 2.5M MEAS. 642mA 2.5M	Command current / Pressure converted value Feedback current / Pressure converted value Arm in and swing simultaneous operation

Applicable machines LC08-06201～, YC09-06323～
YC08-03001～, YC09-03088～



This section describes boom down operation.

3) Boom down pilot circuit
4) Prevention of natural fall by lock valve and actuation at a down
5) Constant recirculation function of boom down main circuit

7.3 BOOM DOWN PILOT CIRCUIT

Operation :

<Hydraulic>

1) If the boom down operation is performed, the secondary pilot proportional pressure comes out of port④ of the right pilot valve (10) and acts upon the low pressure sensor (SE-4).
   At the same time, the pressure is branched off into two lines and acts upon the PBb port and the PLC1 port of C/V (2).
   <Mechatro>
2) The voltage output of the low pressure sensor (SE-4) enters the mechatro controller.
   By shifting boom spool, the pressure of negative control sensor (SE-26) drops, and the P1 pump flow rate increases with the control of mechatro negative controller.
   <Hydraulic>
3) Then, the proportionl secondary pressure fed into C/V (2) PBb port switches boom spool. And the proportional secondary pressure flown into C/V (2) PLC1 port releases boom lock valve.

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

Purpose :

Prevention of natural fall when the lever is neutral

Principle :

The oil is prevented from returning to the boom spool by the poppet seat of the boom lock valve.

Operation :

In the boom down action, the selector valve is changed over by the boom down pilot pressure. Then the poppet spring chamber of the lock valve gets through the drain line (Drc) and makes the lock valve poppet open.
When the boom lever is at neutral, the drain line on the lock valve poppet spring chamber is closed which causes the poppet closed.
The result is that the oil returning from the boom cylinder head (H) to the boom spool is held and makes the leakage from the boom spool zero.
Thus the boom cylinder is prevented from making a natural fall.

7.5 CONSTANT RECIRCULATION FUNCTION OF BOOM DOWN MAIN CIRCUIT

Purpose :

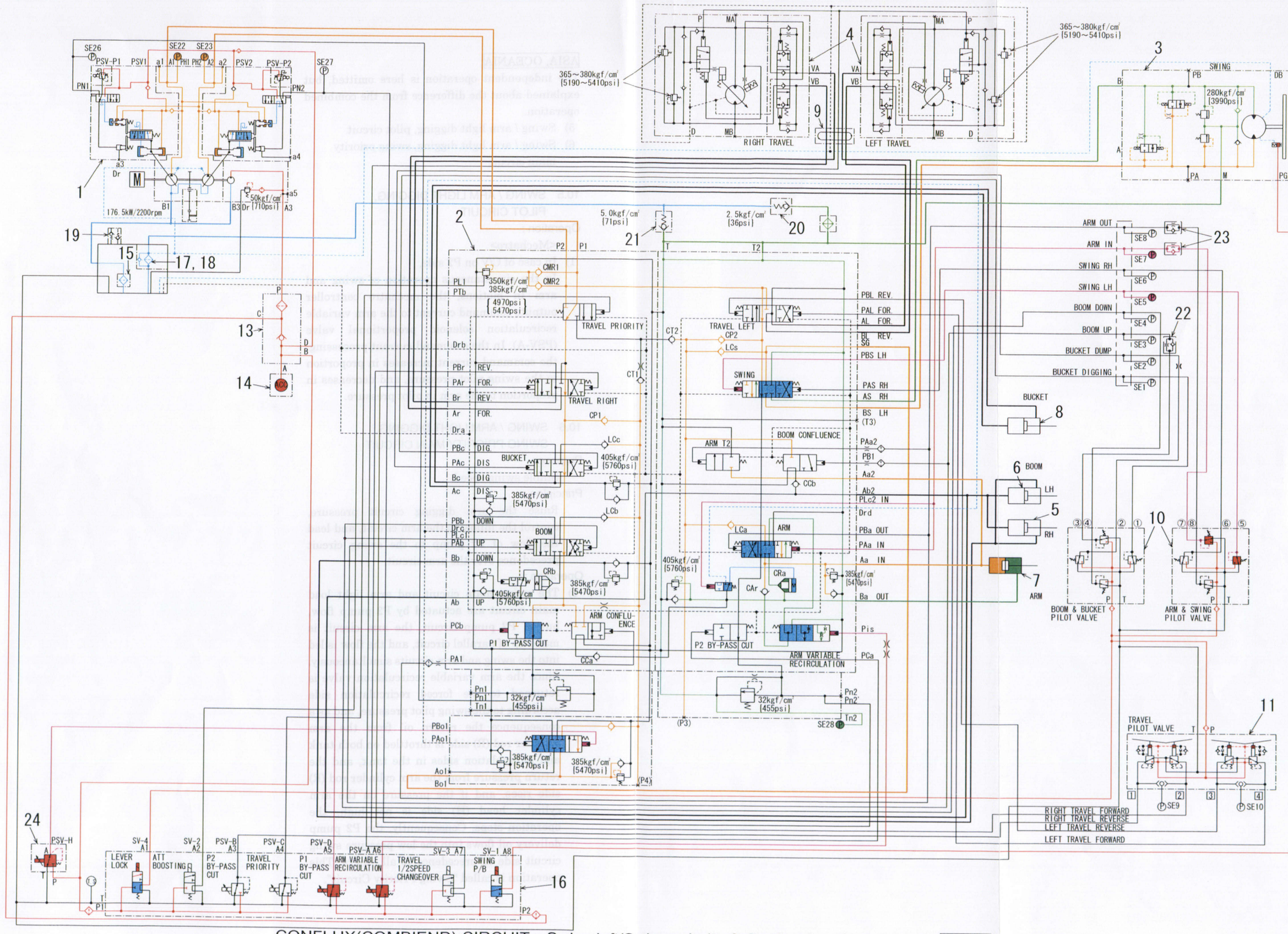
Prevention of cavitation during boom downing motion.

Principle :

The oil returning from the boom cylinder head (H) is recirculated to the rod (R).

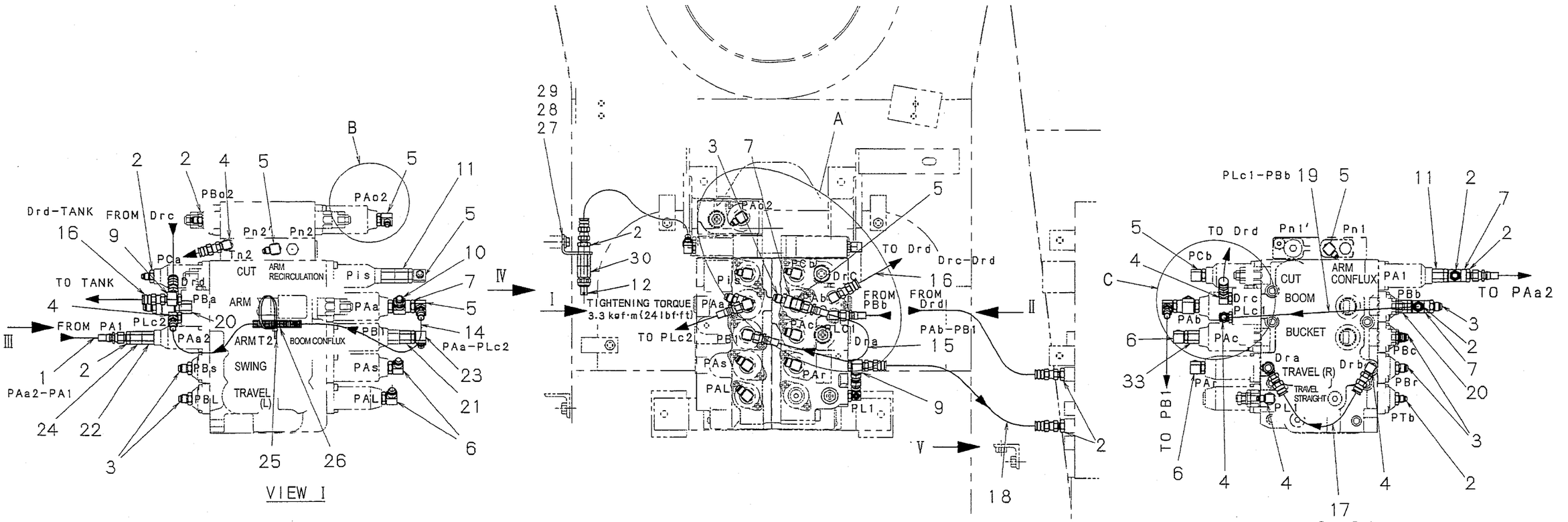
Operation :

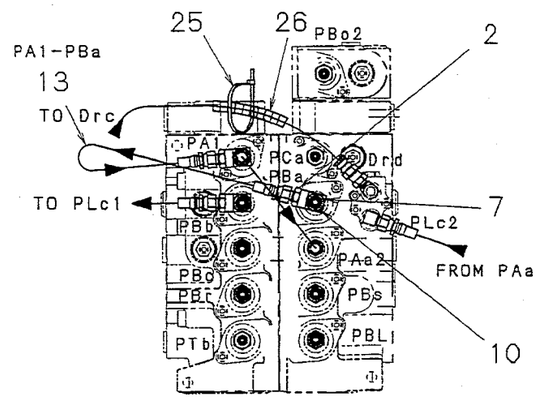
When the oil is supplied to the boom cylinder rod (R) side during boom lower operation, the boom moves faster by the self weight of the attachment.
On that occasion, the circuit pressure on the rod (R) side is on the negative side.
The oil supplied to the boom cylinder rod (R) flows into the A1 port of the P1 pump and the P1 port of C/V. The oil then passes through the boom spool and goes out of the Bb port.
On that occasion, the oil returning from the head (H) goes through the recirculation path in the boom spool, pushes the check valve (C) in the spool open, is recirculated to the Bb port and is supplied to the rod (R). When the (R) pressure is larger than the (H) pressure, the check valve (C) closes.
Thereupon, the recirculation is stopped.

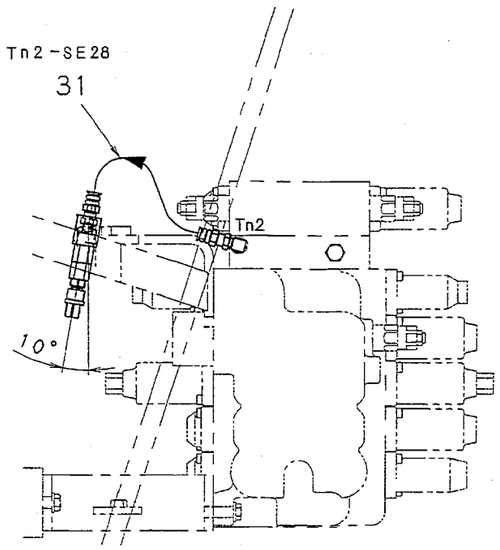


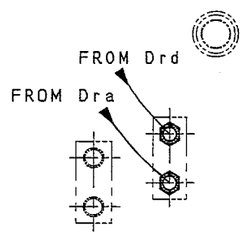
CONFLUX(COMBIEND) CIRCUIT : Swing left/Swing priority & Conflux function at Arm in KCME

(7-1) MAIN C/V CONTROL LINES ; LC06H00028F1 ASIA
LC06H00028F2 OCEANIA N&B









		O-RING TYPE JOINT	HYD. HOSE (30° FLARED)
SCREW PF	TOOL mm	TORQUE kgf·m{lbf·ft}	TORQUE kgf·m{lbf·ft}
1/4	19	3.7 {26.8}	3.0 {21.7}
3/8	22	7.5 {54.2}	

KOBELCO

Book code No. S5LC2309E①

SHOP MANUAL

SK330(LC)-6E
SK330NLC-6E

ELECTRIC SYSTEM

TABLE OF CONTENTS

1. ELECTRIC CIRCUIT DIAGRAM 1
2. ELECTRICAL EQUIPMENT LIST 11
3. HARNESS
   - 3.1 Harness list 13
   - 3.2 Chart of Harness Connection 15
   - 3.3 Operators Controls 17
   - 3.4 Controller Assy 18
   - 3.5 Instrument Panel Assy 27
   - 3.6 Upper Electric Assy 28
   - 3.7 Upper Harness Assy 29
   - 3.8 Engine Harness Assy 45
   - 3.9 Floor Harness Assy 47
   - 3.10 Cab Harness Assy 55
   - 3.11 Cab Assy 58
   - 3.12 Battery & Battery Install 59
   - 3.13 Light Install 59
   - 3.14 Boom Harness Assy 62
   - 3.15 Fuel Pump Assy Install 63
   - 3.16 Alarm Assy 64

LC23

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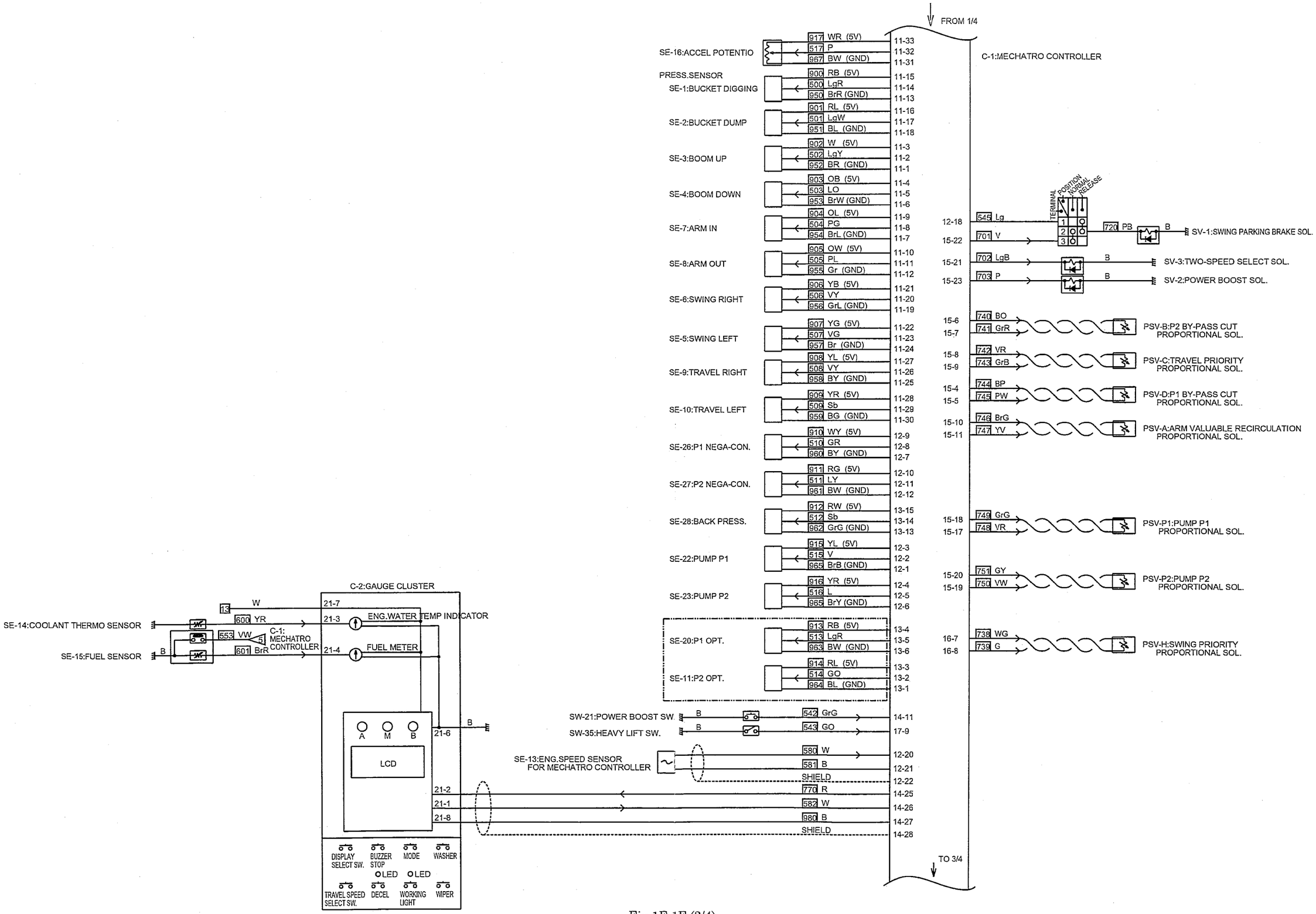
FROM 1/4
C-1:MECHATRO CONTROLLER
SE-16:ACCEL POTENTIO
917 WR (5V)
517 P
967 BW (GND)
11-33
11-32
11-31
PRESS.SENSOR
SE-1:BUCKET DIGGING
900 RB (5V)
500 LgR
950 BrR (GND)
11-15
11-14
11-13
SE-2:BUCKET DUMP
901 RL (5V)
501 LgW
951 BL (GND)
11-16
11-17
11-18
SE-3:BOOM UP
902 W (5V)
502 LgY
952 BR (GND)
11-3
11-2
11-1
SE-4:BOOM DOWN
903 OB (5V)
503 LO
953 BrW (GND)
11-4
11-5
11-6
SE-7:ARM IN
904 OL (5V)
504 PG
954 BrL (GND)
11-9
11-8
11-7
SE-8:ARM OUT
905 OW (5V)
505 PL
955 Gr (GND)
11-10
11-11
11-12
SE-6:SWING RIGHT
906 YB (5V)
506 VY
956 GrL (GND)
11-21
11-20
11-19
SE-5:SWING LEFT
907 YG (5V)
507 VG
957 Br (GND)
11-22
11-23
11-24
SE-9:TRAVEL RIGHT
908 YL (5V)
508 VY
958 BY (GND)
11-27
11-26
11-25
SE-10:TRAVEL LEFT
909 YR (5V)
509 Sb
959 BG (GND)
11-28
11-29
11-30
SE-26:P1 NEGA-CON.
910 WY (5V)
510 GR
960 BY (GND)
12-9
12-8
12-7
SE-27:P2 NEGA-CON.
911 RG (5V)
511 LY
961 BW (GND)
12-10
12-11
12-12
SE-28:BACK PRESS.
912 RW (5V)
512 Sb
962 GrG (GND)
13-15
13-14
13-13
SE-22:PUMP P1
915 YL (5V)
515 V
965 BrB (GND)
12-3
12-2
12-1
SE-23:PUMP P2
916 YR (5V)
516 L
965 BrY (GND)
12-4
12-5
12-6
SE-20:P1 OPT.
913 RB (5V)
513 LgR
963 BW (GND)
13-4
13-5
13-6
SE-11:P2 OPT.
914 RL (5V)
514 GO
964 BL (GND)
13-3
13-2
13-1
SW-21:POWER BOOST SW.
542 GrG
14-11
SW-35:HEAVY LIFT SW.
543 GO
17-9
SE-13:ENG.SPEED SENSOR FOR MECHATRO CONTROLLER
580 W
581 B
SHIELD
12-20
12-21
12-22
770 R
582 W
980 B
SHIELD
14-25
14-26
14-27
14-28
TO 3/4
TERMINAL
POSITION
NORMAL
RELEASE
12-18
545 Lg
15-22
701 V
720 PB
B
SV-1:SWING PARKING BRAKE SOL.
15-21
702 LgB
SV-3:TWO-SPEED SELECT SOL.
15-23
703 P
SV-2:POWER BOOST SOL.
15-6
740 BO
15-7
741 GrR
PSV-B:P2 BY-PASS CUT PROPORTIONAL SOL.
15-8
742 VR
15-9
743 GrB
PSV-C:TRAVEL PRIORITY PROPORTIONAL SOL.
15-4
744 BP
15-5
745 PW
PSV-D:P1 BY-PASS CUT PROPORTIONAL SOL.
15-10
746 BrG
15-11
747 YV
PSV-A:ARM VALUABLE RECIRCULATION PROPORTIONAL SOL.
15-18
749 GrG
15-17
748 VR
PSV-P1:PUMP P1 PROPORTIONAL SOL.
15-20
751 GY
15-19
750 VW
PSV-P2:PUMP P2 PROPORTIONAL SOL.
16-7
738 WG
16-8
739 G
PSV-H:SWING PRIORITY PROPORTIONAL SOL.
C-2:GAUGE CLUSTER
SE-14:COOLANT THERMO SENSOR
SE-15:FUEL SENSOR
13 W
600 YR
553 VW
601 BrR
B
C-1: MECHATRO CONTROLLER
21-7
21-3
21-4
ENG.WATER TEMP INDICATOR
FUEL METER
A M B
LCD
21-6
21-2
21-1
21-8
B
DISPLAY SELECT SW.
BUZZER STOP
MODE
WASHER
LED
LED
TRAVEL SPEED SELECT SW.
DECEL
WORKING LIGHT
WIPER

Fig.1E,1F (2/4)

WIRE NO	WIRE COLOR	WIRE SIZE	FROM	CONNECTION	TO
1A	RY	AVSS0.75sq	CN-14M		CN-53F
1B	RY	AVSS0.75sq	CN-5F		CN-14M
1C	RY	AVSS0.75sq	CN-5F		CN-53F
1D	RY	AVSS0.75sq	CN-20F		CN-53F
1E	RY	AVSS0.75sq	CN-100F		CN-53F
2A	WY	AVSS0.75sq	CN-14M		CN-53F
2B	WY	AVSS0.75sq	CN-16F		CN-53F
2C	WY	AVSS0.75sq	CN-17F		CN-53F
2D	WY	AVSS0.75sq	CN-29F		CN-53F
2E	WY	AVSS0.75sq	CN-39F		CN-53F
2F	WY	AVSS0.75sq	CN-45F		CN-53F
2G	WY	AVSS0.75sq	CN-34F		CN-53F
3A	G	AVSS0.75sq	CN-14M		CN-35M
3B	R	AVSS0.75sq	CN-14M		CN-35M
4A	Y	AVSS0.75sq	CN-14M		CN-53F
4B	Y	AVSS0.75sq	CN-103F		CN-53F
4C	Y	AVSS0.75sq	CN-103F		CN-53F
4D	Y	AVSS0.75sq	CN-35M		CN-53F
4E	Y	AVSS0.75sq	CN-44F		CN-53F
4F	Y	AVSS0.75sq	CN-66M		CN-53F
5	YL	AVSS0.75sq	CN-14M		CN-38M
6A	WG	AVSS0.75sq	CN-14M	DOUBLE SPLICE	CN-15F
6B	WG	AVSS0.75sq	CN-15F		CN-15F
7	YR	AVSS0.75sq	CN-14M		CN-36M
8	WV	AVSS0.75sq	CN-14M		CN-38M
9A	YB	AVSS0.75sq	CN-14M		CN-26F
9B	YB	AVSS0.75sq	CN-36M		CN-26F
9C	YB	AVSS0.75sq	CN-54F		CN-26F
9D	YB	AVSS0.75sq	CN-5F		CN-26F
9E	YB	AVSS0.75sq	CN-26F		CN-26F
9F	YB	AVSS0.75sq	CN-102F		CN-26F
9G	YB	AVSS0.75sq	CN-102F		CN-26F
10	WV	AVSS1.25sq	CN-14M		CN-36M
11	OL	AVSS0.75sq	CN-14M		CN-42F
12A	RG	AVSS1.25sq	CN-14M		CN-26F
12B	RG	AVSS0.75sq	CN-17F		CN-26F
12C	RG	AVSS0.75sq	CN-57F		CN-26F
12D	RG	AVSS0.75sq	CN-56F		CN-26F
13A	W	AVSS0.75sq	CN-14M		CN-26F
13B	W	AVSS0.75sq	CN-38M		CN-26F
13C	W	AVSS0.75sq	CN-38M		CN-26F
13D	W	AVSS0.75sq	CN-34F		CN-26F
14A	RB	AVSS1.25sq	CN-14M		CN-27F
14B	RB	AVSS1.25sq	CN-29F		CN-27F
14C	RB	AVSS0.75sq	CN-61F		CN-27F
14D	RB	AVSS0.75sq	CN-37F		CN-27F
15A	WB	AVSS0.75sq	CN-14M		CN-27F
15C	WB	AVSS0.75sq	CN-32M		CN-27F
15D	WB	AVSS0.75sq	CN-34F		CN-27F
16	RW	AVSS1.25sq	CN-14M		CN-16F
17A	WL	AVSS1.25sq	CN-14M		CN-27F
17B	WL	AVSS1.25sq	CN-49F		CN-27F
17C	WL	AVSS0.75sq	CN-49F		CN-27F

WIRE NO	WIRE COLOR	WIRE SIZE	FROM	CONNECTION	TO
18	WG	AVSS1.25sq	CN-14M		CN-36M
19	RL	AVSS0.75sq	CN-14M		CN-36M
20A	WR	AVSS1.25sq	CN-14M	DOUBLE SPLICE	CN-43F
20B	WR	AVSS1.25sq	CN-62F		CN-43F
30	G	AVSS0.75sq	CN-12F		CN-30F
50	L	AVSS1.25sq	CN-14M		CN-36M
51	W	AVS2sq	CN-14M		CN-30F
52	R	AVS5sq	CN-14M		CN-33M
53	Y	AVS5sq	CN-14M		CN-33M
54	R	AVS2sq	CN-14M		CN-30F
55	WP	AVSS1.25sq	CN-14M		CN-30F
58	P	AVSS0.75sq	CN-30F		CN-103F
59	W	AVSS0.75sq	CN-30F		CN-101F
60A	WL	AVSS0.75sq	CN-46F		CN-26F
60B	WL	AVSS0.75sq	CN-36M		CN-26F
60C	WL	AVSS0.75sq	CN-45F		CN-26F
60D	WL	AVSS0.75sq	CN-2F		CN-26F
60E	WL	AVSS0.75sq	CN-40F		CN-26F
61A	GrB	AVSS0.75sq	CN-36M		CN-27F
61B	GrB	AVSS0.75sq	CN-2F		CN-27F
61C	GrB	AVSS0.75sq	CN-40F		CN-27F
62	W	AVSS0.75sq	CN-35M		CN-45F
63A	WY	AVSS0.75sq	CN-36M		CN-27F
63B	WY	AVSS0.75sq	CN-30F		CN-27F
63C	WY	AVSS0.75sq	CN-35M		CN-27F
64	LW	AVSS0.75sq	CN-30F		CN-12F
65A	WR	AVSS0.75sq	CN-30F		CN-26F
65B	WR	AVSS0.75sq	CN-2F		CN-26F
65C	WR	AVSS0.75sq	CN-38M		CN-26F
65D	WR	AVSS0.75sq	CN-12F		CN-26F
65E	WR	AVSS0.75sq	CN-42F		CN-26F
67	BG	AVSS0.75sq	CN-103F		CN-35M
70A	YW	AVSS0.75sq	CN-101F		CN-27F
70B	YW	AVSS0.75sq	CN-46F		CN-27F
70C	YW	AVSS0.75sq	CN-12F		CN-27F
71A	YL	AVSS0.75sq	CN-40F		CN-27F
71B	YL	AVSS0.75sq	CN-101F		CN-27F
71C	YL	AVSS0.75sq	CN-101F		CN-27F
80	GrR	AVSS0.75sq	CN-38M		CN-29F
81	GrB	AVSS0.75sq	CN-38M		CN-29F
82	GO	AVSS0.75sq	CN-30F		CN-29F
83	GO	AVSS0.75sq	CN-30F		CN-15F
84A	WR	AVSS0.75sq	CN-15F		CN-27F
84B	WR	AVSS0.75sq	CN-32M		CN-27F
84C	WR	AVSS0.75sq	CN-36M		CN-27F
85A	WB	AVSS1.25sq	CN-16F		CN-26F
85B	WB	AVSS1.25sq	CN-30F		CN-26F
85D	WB	AVSS0.75sq	CN-36M		CN-26F
86A	OW	AVSS0.75sq	CN-27F		CN-32M
86B	OW	AVSS0.75sq	CN-27F		CN-30F
86C	OW	AVSS0.75sq	CN-27F		CN-46F

WIRE NO	WIRE COLOR	WIRE SIZE	FROM	CONNECTION	TO
87	YV	AVSS0.75sq	CN-32M		CN-7F
88	PG	AVSS0.75sq	CN-17F		CN-30F
89	BrL	AVSS0.75sq	CN-32M		CN-49F
90A	RY	AVSS1.25sq	CN-49F		CN-26F
90B	RY	AVSS1.25sq	F-1		CN-26F
90C	RY	AVSS1.25sq	F-3		CN-26F
90D	RY	AVSS0.75sq	CN-30F		CN-26F
98	LW	AVSS0.75sq	CN-36M		CN-25F
99	Br	AVSS0.75sq	CN-36M		CN-25F
100	LR	AVSS0.75sq	CN-36M		CN-24F
101	OB	AVSS0.75sq	CN-36M		CN-24F
150	BP	AVSS0.75sq	CN-36M		CN-30F
151	R	MVVS0.75sq	CN-36M		CN-32M
152	G	4 CORES SHIELD	CN-36M		CN-32M
153	W		CN-36M		CN-32M
154	B		CN-36M		CN-32M
SH4	Gr		CN-36M		CN-32M
202	GR	AVSS0.75sq	CN-38M		CN-22F
203	GB	AVSS0.75sq	CN-38M		CN-22F
204	BL	AVSS0.75sq	CN-38M		CN-23F
205	BP	AVSS0.75sq	CN-38M		CN-23F
210	LB	AVSS0.75sq	CN-37F		CN-61F
211	LW	AVSS0.75sq	CN-37F		CN-61F
214	YG	AVSS0.75sq	CN-18F		CN-19F
215	GR	AVSS0.75sq	CN-18F		CN-19F
216	O	AVSS0.75sq	CN-18F		CN-80F
217A	LO	AVSS0.75sq	CN-18F		CN-26F
217B	LO	AVSS0.75sq	CN-41F		CN-26F
217C	LO	AVSS0.75sq	CN-36M		CN-26F
218	P	AVSS0.75sq	CN-19F		CN-80F
219A	GY	AVSS0.75sq	CN-19F		CN-27F
219B	GY	AVSS0.75sq	CN-41F		CN-27F
219C	GY	AVSS0.75sq	CN-32M		CN-27F
220A	LW	AVSS0.75sq	CN-26F		CN-46F
220B	LW	AVSS0.75sq	CN-26F		CN-18F
220C	LW	AVSS0.75sq	CN-26F		CN-19F
220D	LW	AVSS0.75sq	CN-26F		CN-39F
222	LW	AVSS0.75sq	CN-61F		CN-34F
230	VR	AVSS0.75sq	CN-42F		CN-30F
231	VY	AVSS0.75sq	CN-42F		CN-30F
232	Gr	AVSS0.75sq	CN-42F		CN-30F
233	GrB	AVSS0.75sq	CN-42F		CN-30F
301	Sb	AVSS0.75sq	CN-35M		CN-63F
328	GrR	AVSS0.75sq	CN-35M		CN-65F
329	LgR	AVSS0.75sq	CN-35M		CN-44F
330	Lg	AVSS0.75sq	CN-35M		CN-44F
401	GR	AVSS0.75sq	CN-55F		CN-56F
402	YG	AVSS0.75sq	CN-55F		CN-56F
403	Br	AVSS0.75sq	CN-55F		CN-56F
500	LgR	AVSS0.75sq	CN-1F		CN-30F
501	LgW	AVSS0.75sq	CN-1F		CN-30F

WIRE NO	WIRE COLOR	WIRE SIZE	FROM	CONNECTION	TO
502	LgY	AVSS0.75sq	CN-1F		CN-30F
503	LO	AVSS0.75sq	CN-1F		CN-30F
504	PG	AVSS0.75sq	CN-1F		CN-30F
505	PL	AVSS0.75sq	CN-1F		CN-30F
506	VY	AVSS0.75sq	CN-1F		CN-30F
507	VG	AVSS0.75sq	CN-1F		CN-30F
508	VY	AVSS0.75sq	CN-1F		CN-31M
509	Sb	AVSS0.75sq	CN-1F		CN-31M
510	GR	AVSS0.75sq	CN-2F		CN-30F
511	LY	AVSS0.75sq	CN-2F		CN-30F
512	Sb	AVSS0.75sq	CN-3F		CN-30F
513	LgR	AVSS0.75sq	CN-3F		CN-31M
514	GO	AVSS0.75sq	CN-3F		CN-31M
515	V	AVSS0.75sq	CN-2F		CN-30F
516	L	AVSS0.75sq	CN-2F		CN-30F
517	P	AVSS0.75sq	CN-1F		CN-36M
518	L	AVSS0.75sq	CN-34F		CN-7F
519	V	AVSS0.75sq	CN-34F		CN-7F
524	WR	AVSS0.75sq	CN-34F		CN-7F
525	WY	AVSS0.75sq	CN-3F		CN-80F
526	LgY	AVSS0.75sq	CN-3F		CN-80F
541	PL	AVSS0.75sq	CN-2F		CN-31M
542A	GrG	AVSS0.75sq	CN-4F		CN-27F
542B	GrG	AVSS0.75sq	CN-32M		CN-27F
542C	GrG	AVSS0.75sq	CN-36M		CN-27F
545	Lg	AVSS0.75sq	CN-2F		CN-10F
547	GB	AVSS0.75sq	CN-4F		CN-30F
548	GY	AVSS0.75sq	CN-4F		CN-30F
549	Lg	AVSS0.75sq	CN-4F		CN-30F
550	BG	AVSS0.75sq	CN-4F		CN-30F
551	GL	AVSS0.75sq	CN-4F		CN-30F
552	BrL	AVSS0.75sq	CN-4F		CN-30F
553A	VW	AVSS0.75sq	CN-27F		CN-30F
553B	VW	AVSS0.75sq	CN-27F		CN-4F
553C	VW	AVSS0.75sq	CN-27F		CN-20F
556	BrW	AVS0.5sq	CN-4F		CN-51F
557	L	AVSS0.75sq	CN-4F		CN-38M
558	G	AVSS0.75sq	CN-4F		CN-38M
559A	PB	AVSS0.75sq	CN-7F		CN-27F
559B	PB	AVSS0.75sq	CN-38M		CN-27F
559C	PB	AVSS0.75sq	CN-60F		CN-27F

WIRE NO	WIRE COLOR	WIRE SIZE	FROM	CONNECTION	TO
560	LgY	AVSS0.75sq	CN-7F		CN-38M
562	O	AVS0.5sq	CN-52F		CN-32M
563	O	AVSS0.75sq	CN-7F		CN-30F
564	LY	AVS0.5sq	CN-32M		CN-52F
566	LW	AVSS0.75sq	CN-6F		CN-30F
580	W	PEXBS0.5fsq	CN-2F		CN-30F
581	B	2 CORES SHIELD	CN-2F		CN-30F
SH1	Gr		CN-2F		CN-30F
582	W	MVVS0.75sq	CN-4F		CN-38M
770	R	3 CORES SHIELD	CN-4F		CN-38M
980	B		CN-4F		CN-38M
SH2	Gr		CN-4F		CN-38M
583	VW	AVSS0.75sq	CN-30F		CN-44F
590	LY	AVS0.5sq	CN-30F		CN-52F
591	WY	AVSS0.75sq	CN-41F		CN-4F
592	VY	AVSS0.75sq	CN-41F		CN-7F
593	GY	AVSS0.75sq	CN-41F		CN-30F
594	LgY	AVSS0.75sq	CN-41F		CN-30F
600	YR	AVSS0.75sq	CN-38M		CN-30F
601	BrR	AVSS0.75sq	CN-38M		CN-30F
700	WG	AVSS0.75sq	CN-5F		CN-30F
701	V	AVSS0.75sq	CN-5F		CN-10F
702	LgB	AVSS0.75sq	CN-5F		CN-30F
703	P	AVSS0.75sq	CN-5F		CN-30F
704	LgR	AVS0.5sq	CN-4F		CN-51F
705	LG	AVS0.5sq	CN-4F		CN-51F
706	VW	AVS0.5sq	CN-4F		CN-51F
707	LY	AVS0.5sq	CN-4F		CN-51F
708	LR	AVSS0.75sq	CN-4F		CN-29F
709	GB	AVSS0.75sq	CN-4F		CN-29F
710	Gr	AVSS0.75sq	CN-4F		CN-29F
711	GrL	AVSS0.75sq	CN-4F		CN-29F
713	BrY	AVSS0.75sq	CN-4F		CN-16F
714	WB	AVSS0.75sq	CN-4F		CN-56F
715	GW	AVSS0.75sq	CN-7F		CN-56F
716	WV	AVSS0.75sq	CN-7F		CN-56F
720	PB	AVSS0.75sq	CN-10F		CN-30F
738	WG	AVSS0.75sq	CN-6F		CN-30F
739	G	AVSS0.75sq	CN-6F		CN-30F
740	BO	AVSS0.75sq	CN-5F		CN-30F
741	GrR	AVSS0.75sq	CN-5F		CN-30F
742	VR	AVSS0.75sq	CN-5F		CN-30F
743	GrB	AVSS0.75sq	CN-5F		CN-30F
744	BP	AVSS0.75sq	CN-5F		CN-30F
745	PW	AVSS0.75sq	CN-5F		CN-30F
746	BrG	AVSS0.75sq	CN-5F		CN-30F

WIRE NO	WIRE COLOR	WIRE SIZE	FROM	CONNECTION	TO
747	YV	AVSS0.75sq	CN-5F		CN-30F
748	VR	AVSS0.75sq	CN-5F		CN-30F
749	GrG	AVSS0.75sq	CN-5F		CN-30F
750	VW	AVSS0.75sq	CN-5F		CN-30F
751	GY	AVSS0.75sq	CN-5F		CN-30F
762	GL	AVSS0.75sq	CN-6F		CN-45F
780	W	MVVS0.75sq	CN-35M		CN-6F
781	R	2 CORES SHIELD	CN-35M		CN-6F
SH3	Gr		CN-35M	SPLICE	
E25	B	AVSS0.75sq	P-4	DOUBLE SPLICE	
E24	B	AVSS0.75sq	P-4		CN-64M
900	RB	AVSS0.75sq	CN-1F		CN-30F
901	RL	AVSS0.75sq	CN-1F		CN-30F
902	W	AVSS0.75sq	CN-1F		CN-30F
903	OB	AVSS0.75sq	CN-1F		CN-30F
904	OL	AVSS0.75sq	CN-1F		CN-30F
905	OW	AVSS0.75sq	CN-1F		CN-30F
906	YB	AVSS0.75sq	CN-1F		CN-30F
907	YG	AVSS0.75sq	CN-1F		CN-30F
908	YL	AVSS0.75sq	CN-1F		CN-31M
909	YR	AVSS0.75sq	CN-1F		CN-31M
910	WY	AVSS0.75sq	CN-2F		CN-30F
911	RG	AVSS0.75sq	CN-2F		CN-30F
912	RW	AVSS0.75sq	CN-3F		CN-30F
913	RB	AVSS0.75sq	CN-3F		CN-31M
914	RL	AVSS0.75sq	CN-3F		CN-31M
915	YL	AVSS0.75sq	CN-2F		CN-30F
916	YR	AVSS0.75sq	CN-2F		CN-30F
917	WR	AVSS0.75sq	CN-1F		CN-36M
930	RG	AVS0.5sq	CN-4F		CN-51F
950	BrR	AVSS0.75sq	CN-1F		CN-30F
951	BL	AVSS0.75sq	CN-1F		CN-30F
952	BR	AVSS0.75sq	CN-1F		CN-30F
953	BrW	AVSS0.75sq	CN-1F		CN-30F
954	BrL	AVSS0.75sq	CN-1F		CN-30F
955	Gr	AVSS0.75sq	CN-1F		CN-30F
956	GrL	AVSS0.75sq	CN-1F		CN-30F
957	Br	AVSS0.75sq	CN-1F		CN-30F
958	BY	AVSS0.75sq	CN-1F		CN-31M
959	BG	AVSS0.75sq	CN-1F		CN-31M
960	BY	AVSS0.75sq	CN-2F		CN-30F
961	BW	AVSS0.75sq	CN-2F		CN-30F
962	GrG	AVSS0.75sq	CN-3F		CN-30F
963	BW	AVSS0.75sq	CN-3F		CN-31M
964	BL	AVSS0.75sq	CN-3F		CN-31M
965	BrB	AVSS0.75sq	CN-2F		CN-30F
966	BrY	AVSS0.75sq	CN-2F		CN-30F

WIRE NO	WIRE COLOR	WIRE SIZE	FROM	CONNECTION	TO
967	BW	AVSS0.75sq	CN-1F		CN-36M
981	GW	AVS0.5sq	CN-4F		CN-51F
982A	BG	AVS0.5sq	CN-51F		CN-26F
982B	BG	AVSS0.75sq	CN-32M		CN-26F
982C	BG	AVSS0.75sq	CN-30F		CN-26F
E1	B	AVS5sq	P-1	DOUBLE SPLICE	CN-33M
E21	B	AVSS1.25sq	P-1		CN-62F
E2	B	AVSS0.75sq	CN-5F	DOUBLE SPLICE	CN-30F
E3	B	AVSS0.75sq	CN-5F		CN-30F
E4	B	AVSS0.75sq	CN-30F	DOUBLE SPLICE	CN-35M
E5	B	AVSS0.75sq	CN-30F		CN-35M
E6	B	AVSS0.75sq	CN-29F		CN-28F
E7	B	AVSS0.75sq	CN-36M		CN-28F
E8	B	AVSS1.25sq	CN-32M		CN-28F
E9	B	AVSS1.25sq	CN-36M		CN-28F
E10	B	AVSS1.25sq	CN-43F		CN-28F
E11	B	AVSS0.75sq	CN-12F		CN-28F
E12	B	AVSS0.75sq	CN-60F		CN-28F
E13	B	AVSS1.25sq	M-1	DOUBLE SPLICE	P-3
E17	B	AVS5sq	P-2	DOUBLE SPLICE	P-3
E14	B	AVSS1.25sq	P-2		M-2
E15	B	AVSS0.75sq	M-3		CN-28F
E16	B	AVSS0.75sq	M-4		CN-28F
E18	B	AVSS0.75sq	M-5		CN-28F
E22	B	AVSS0.75sq	M-6		CN-28F

CONNECTORS SELECTION TABLE

CONNECTOR NAME (PIN NUM.)	MANUFUC.	PART. NUMBER	
		HOUSING	TERMINAL
3FA-CNA	AMP	172132-1	170032-2
2FA-CNA	AMP	172130-1	170032-2
1FA-CNA	AMP	172128-1	170032-2
1MA-CNA	AMP	172127-1	170340-1
2MA-CNA	AMP	172129-1	170340-1
2FA-CNA(L)	AMP	172128-5	170032-2
11FY-0900	YAZAKI	7283-1110 7322-7616	7116-4021
4FY-0090A	YAZAKI	7123-7144	7116-1181P
CA104	YAZAKI	7120-8012	7113-1020-02
CB104	YAZAKI	7120-1010	7115-1050-02
5FS-MITSUBA	SUMITOMO	6098-1493	1500-0207 8240-4242
15FS-1SS	SUMITOMO	6441-6695 5409-8599	8169-6485
3MA-D5	AMP	1-353046-3	917803-2
100FA-SAI	AMP YAZKI	179216-6	175266-2 175269-1 7116-2871
34MA-NEWSCCS	AMP	177511-2	175272-1 175273-1
32MA-NEWSCCS	AMP	178688-1	917067-5 175273-1
18MA-NEWSCCS(Gr)	AMP	6-178692-6	175266-2 175269-1
12FA-070MLI	AMP	176116-6	173631-1
34FA-040IPM	AMP	316022-6	175266-2
28FA-040IPM	AMP	316019-6	175266-2
22FA-040IPM	AMP	316016-6	175266-2
16FA-040IPM	AMP	316013-6	175266-2
16FA-HB	AMP	917981-6	175266-2 175265-1
26FA-HB	AMP	917992-6	175266-2 175269-1
22FA-HB	AMP	917982-6	175266-2 175269-1
6FM-MWP	MITSUBISHI	PF805-06020	MT095-27250
12FA-040IPM	AMP	175965-2	173681-1
16FA-040IPM	AMP	175966-2	173681-1
12FA-070MLI	AMP	173631-1 (PLATING) 173631-2 (GOLD PLATING)	
8FA-070MLI	AMP	173850-1	173631-1

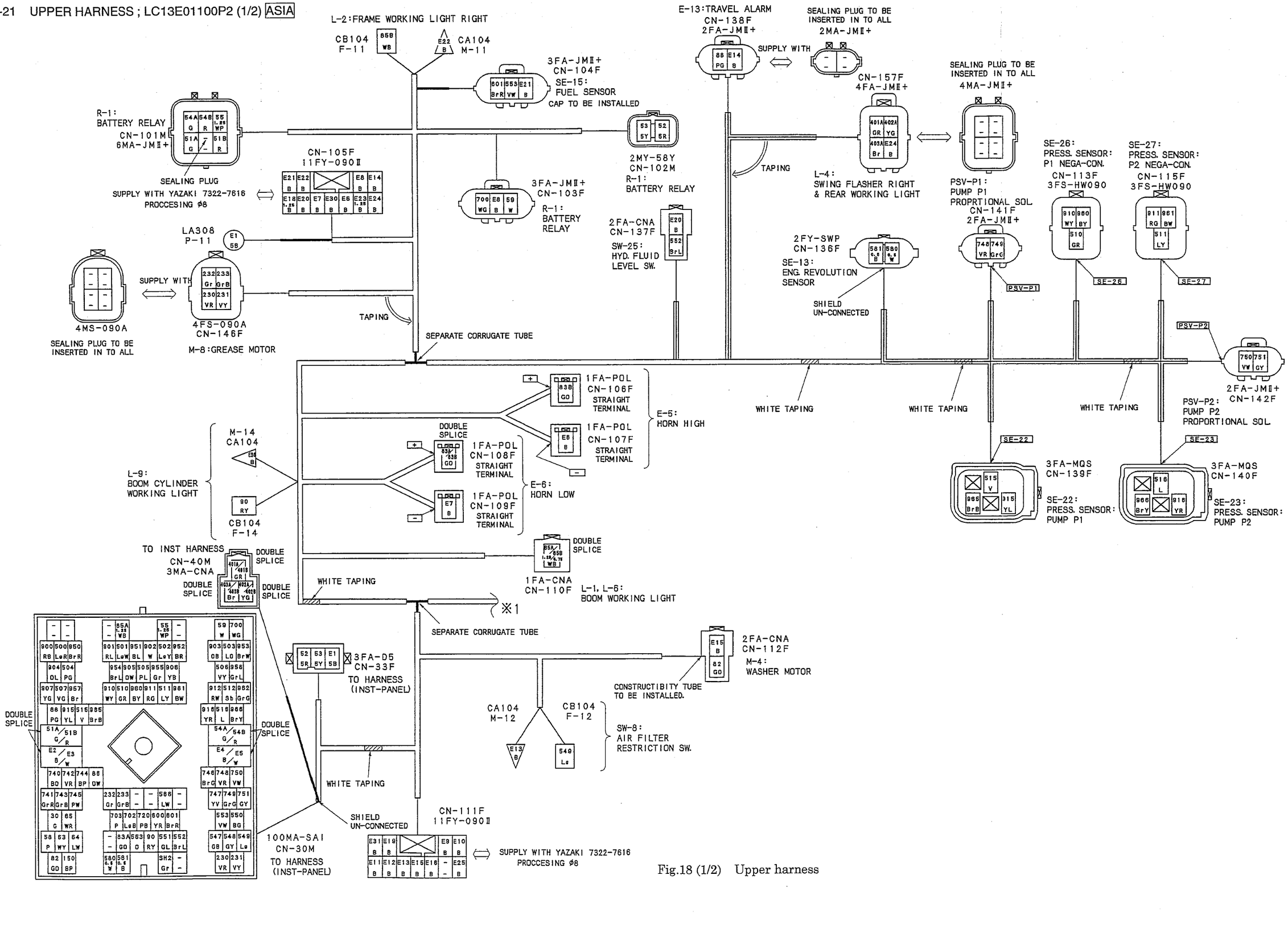

Fig.18 (1/2) Upper harness

3.9-12B INSTRUMENT PANEL LH HARNESS ; LC13E01127P1 KCME

LC09-06323～, YC09-03088～

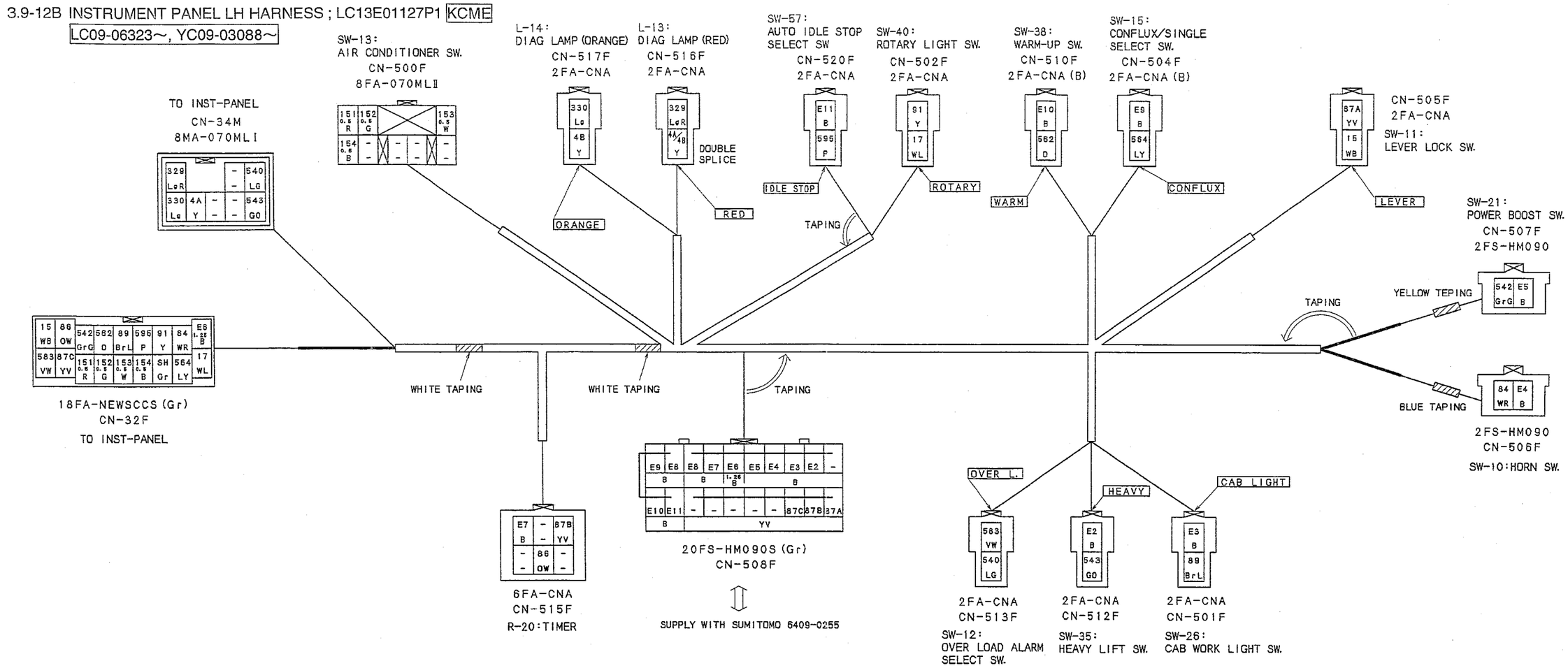

Fig. 26E Instrument Panel LH Harness

CONNECTORS SELECTION TABLE

CONNECTOR NAME (PIN NUM.)	MANUFUC.	PART. NUMBER	
		HOUSING	TERMINAL
18FA-NEWSCCS(Gr)	AMP	6-178692-6	175266-2
			175269-1
8FA-070MLII	AMP	176113-6	173631-1
			173631-2
2FS-HM090	SUMITOMO	6090-1001	6240-4422
2FA-CNA	AMP	172130-1	170032-2
2FA-CNA(B)	AMP	172130-2	170032-2
20FS-HM090S(Gr)	SUMITOMO	6400-0081	6240-4422
		6409-0255	
6FA-CNA	AMP	171898-1	170032-2
8MA-070MLI	AMP	174931-1	173645-1

WIRE NO	WIRE COLOR	WIRE SIZE	FROM	CONNECTION	TO
4A	Y	AVSS0.75sq	CN-34M	DOUBLE SPLICE	CN-516F
4B	Y	AVSS0.75sq	CN-517F		CN-516F
15	WB	AVSS0.75sq	CN-505F		CN-32F
17	WL	AVSS0.75sq	CN-502F		CN-32F
84	WR	AVSS0.75sq	CN-506F		CN-32F
86	OW	AVSS0.75sq	CN-515F		CN-32F
87A	YV	AVSS0.75sq	CN-508F		CN-505F
87B	YV	AVSS0.75sq	CN-508F		CN-515F
87C	YV	AVSS0.75sq	CN-508F		CN-32F
89	BrL	AVSS0.75sq	CN-501F		CN-32F
91	Y	AVSS0.75sq	CN-502F		CN-32F
151	R	MVVS0.5sq 4芯シールド	CN-500F		CN-32F
152	G		CN-500F		CN-32F
153	W		CN-500F		CN-32F
154	B		CN-500F		CN-32F
SH	Gr		UNCONNECTED		CN-32F
329	LgR	AVSS0.75sq	CN-516F		CN-34M
330	Lg	AVSS0.75sq	CN-517F		CN-34M

WIRE NO	WIRE COLOR	WIRE SIZE	FROM	CONNECTION	TO
540	LG	AVSS0.75sq	CN-513F		CN-34M
542	GrG	AVSS0.75sq	CN-507F		CN-32F
543	GO	AVSS0.75sq	CN-512F		CN-34M
562	O	AVSS0.75sq	CN-510F		CN-32F
564	LY	AVSS0.75sq	CN-504F		CN-32F
583	VW	AVSS0.75sq	CN-513F		CN-32F
595	P	AVSS0.75sq	CN-520F		CN-32F
E2	B	AVSS0.75sq	CN-508F		CN-512F
E3	B	AVSS0.75sq	CN-508F		CN-501F
E4	B	AVSS0.75sq	CN-508F		CN-506F
E5	B	AVSS0.75sq	CN-508F		CN-507F
E6	B	AVSS1.25sq	CN-508F		CN-32F
E7	B	AVSS0.75sq	CN-508F		CN-515F
E8	B	AVSS0.75sq	CN-508F		CN-508F
E9	B	AVSS0.75sq	CN-504F		CN-508F
E10	B	AVSS0.75sq	CN-510F		CN-508F
E11	B	AVSS0.75sq	CN-520F		CN-508F

3.15A FUEL PUMP ASSY INSTALL LC08-06201~, YC08-03001~

FUEL PUMP ASSY INSTALL		LC22P00001F1		KCME 35L
ITEM	NAME	PART No.	Q'TY	REMARKS
1	FUEL PUMP ASSY	YT22P00001F5	1	M-11

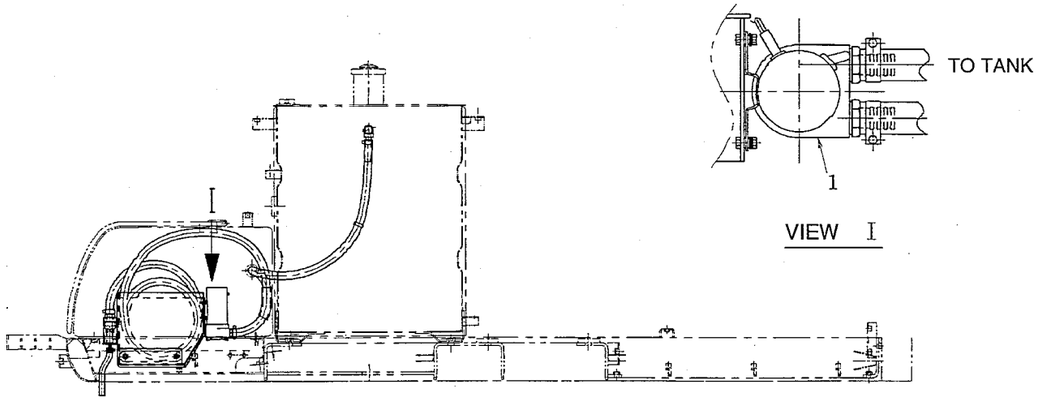

Fig.50-1 Fuel pump assy install

3.15A-1 FUEL PUMP ASSY

FUEL PUMP ASSY		YT22P00001F5		KCME
ITEM	NAME	PART No.	Q'TY	REMARKS
10	ELECTRIC MOTOR	YT22P00001S010	1	
22	FUSE	YT22P00001S022	1	

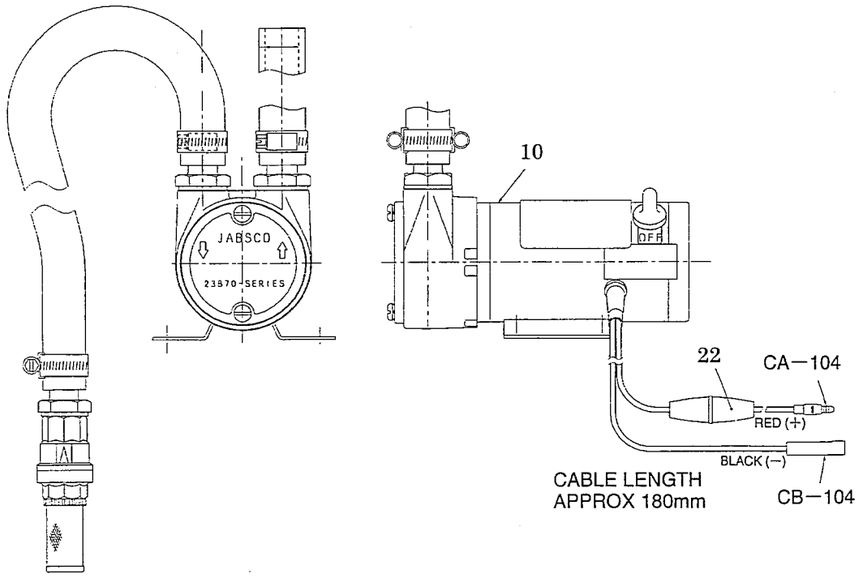

Fig.51 Fuel pump assy

3.15B FUEL PUMP ASSY INSTALL LC09-06323~, YC09-03088~

FUEL PUMP ASSY		LC22P00002F1		KCME 50L
ITEM	NAME	PART No.	Q'TY	REMARKS
1	FUEL PUMP ASSY	YN22P00011F1	1	
1-1	FUEL PUMP	YN22P00010P1	1	

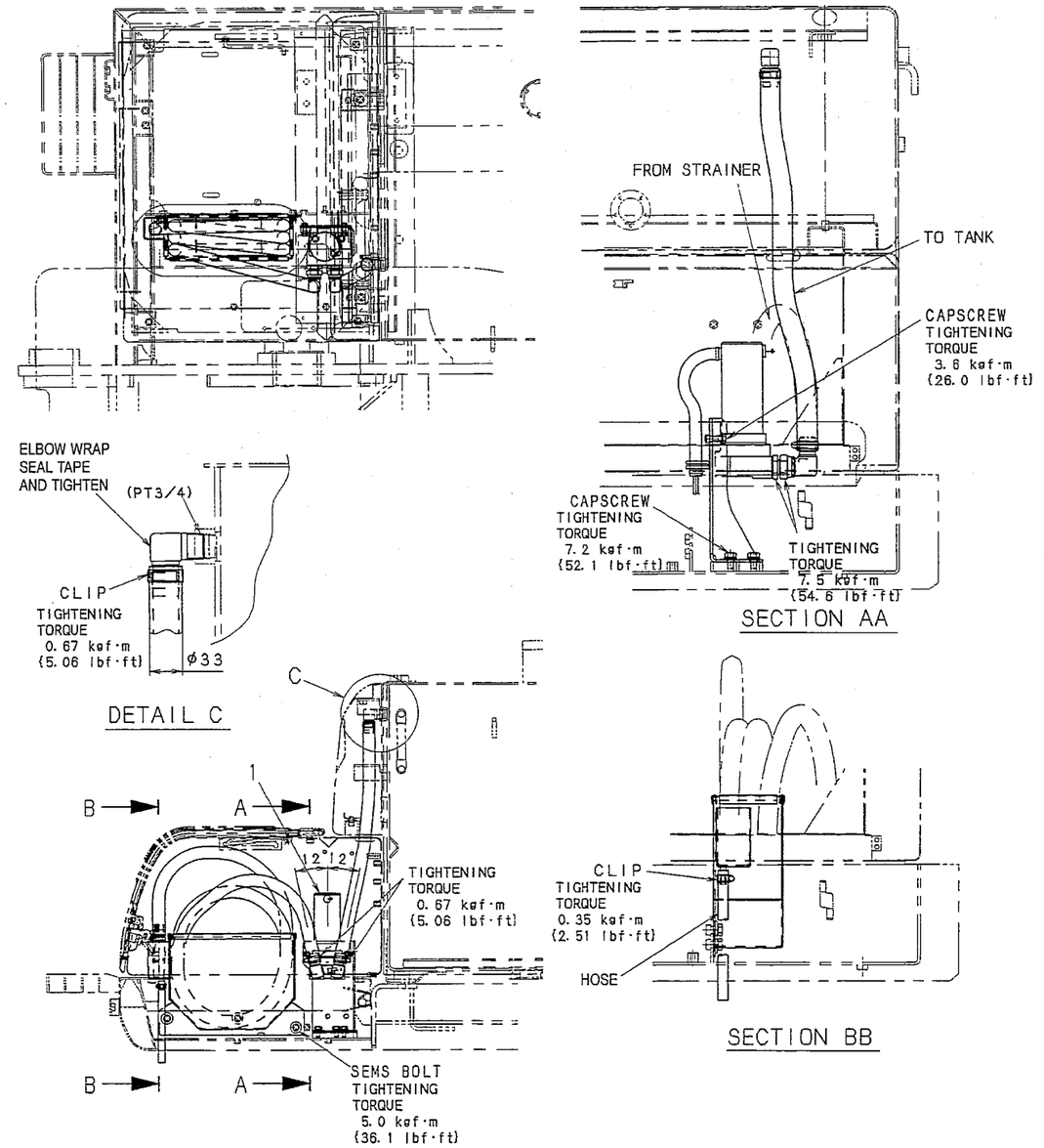

Fig.50-2 Fuel pump assy install

2) Flow return

When the front pump delivery pressure P1 or rear pump delivery pressure P2 is lowered, compensating rod (623) is pushed back by the spring force of outer spring (625) and inner spring (626) and lever 1 rotates centered on the E section. Feed back lever 1 (611) rotates putting fulcrum on the D point and spool moves leftward. Consequently the pressure flows into the tank port through Cℓ port, the pressure of the large bore section of the servo piston is released, servo piston moves leftward, and the pump delivery flow rate is raised.

The movement of servo piston is transmitted to spool with the feed back mechanism, and continues the action until the openings of spool and sleeve are closed.

(5) Low tilt angle (low flow rate) command priority mechanism

As described above, the tilt angle command for the flow rate control and horse power control is transmitted to feed back lever and spool through lever 1 and large bore sections (C,F sections) of lever 2, but the C and F sections are constructed so that pin Ø4 (0.157in) is protruded from large hole Ø8 (0.315in), and the pin (897) comes in contact with the large hole Ø8 (0.315in) of lever which makes the tilt angle smaller, and other large hole Ø8 (0.315in) of the lever in the condition of tilt angle in large radius is free without contact with pin (897). This way, the command for smaller tilt rotation side of flow control and horse power control has a priority according to the mechanical selecting system.

(6) Back-up function

As shown in Fig.1-14, loosen nut (801) and change the position of rod (642). This causes the electric flow control to be switched to the hydraulic control.

In the electric flow control, the secondary pressure Pi of the solenoid proportional reducing valve is admitted to the pilot piston to perform flow control of the pump.

In case the solenoid proportional reducing valve is disabled, the control mode is switched over to the hydraulic control if rod (642) is switched over.

The primary pressure PSV of the solenoid proportional reducing valve is admitted to pin (898) and controlled at a constant power level in a power shifted (reduced power) condition. The pressure of the Pn1 port is admitted to the pilot piston and performs flow control as the pressure goes up and down.

<Note>

Do not use the back-up select rod(642) when the front and rear regulators are fully closed or fully loosened. The pump can not be controlled if the position of the front regulator differs from that of the rear regulator.

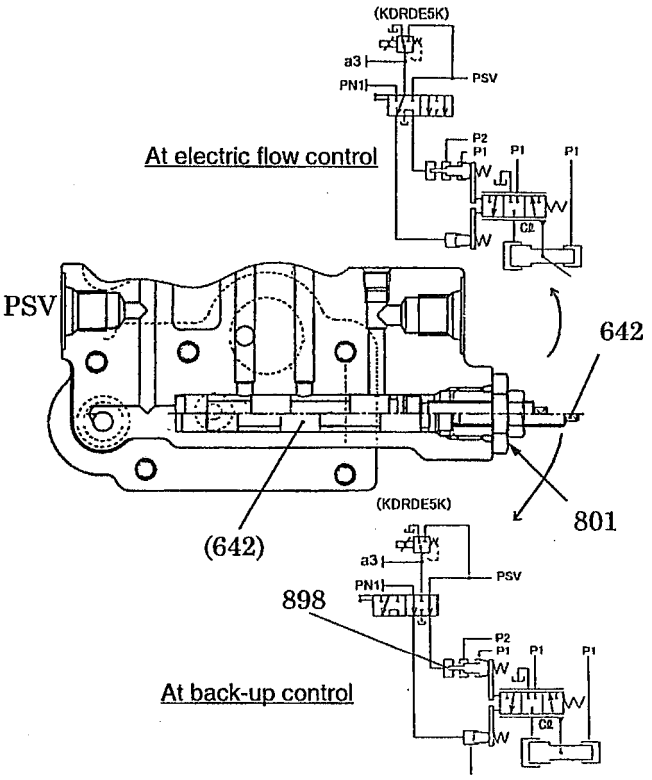

Fig.1-16 Switching to back-up function

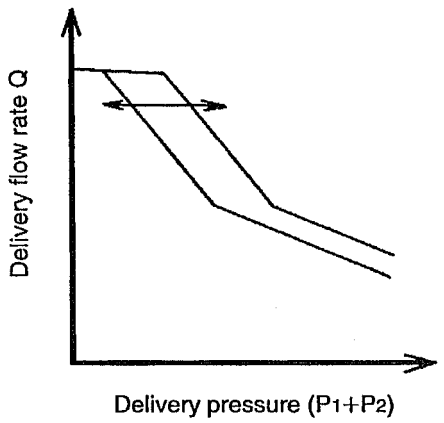

Fig.1-17 Power shift control

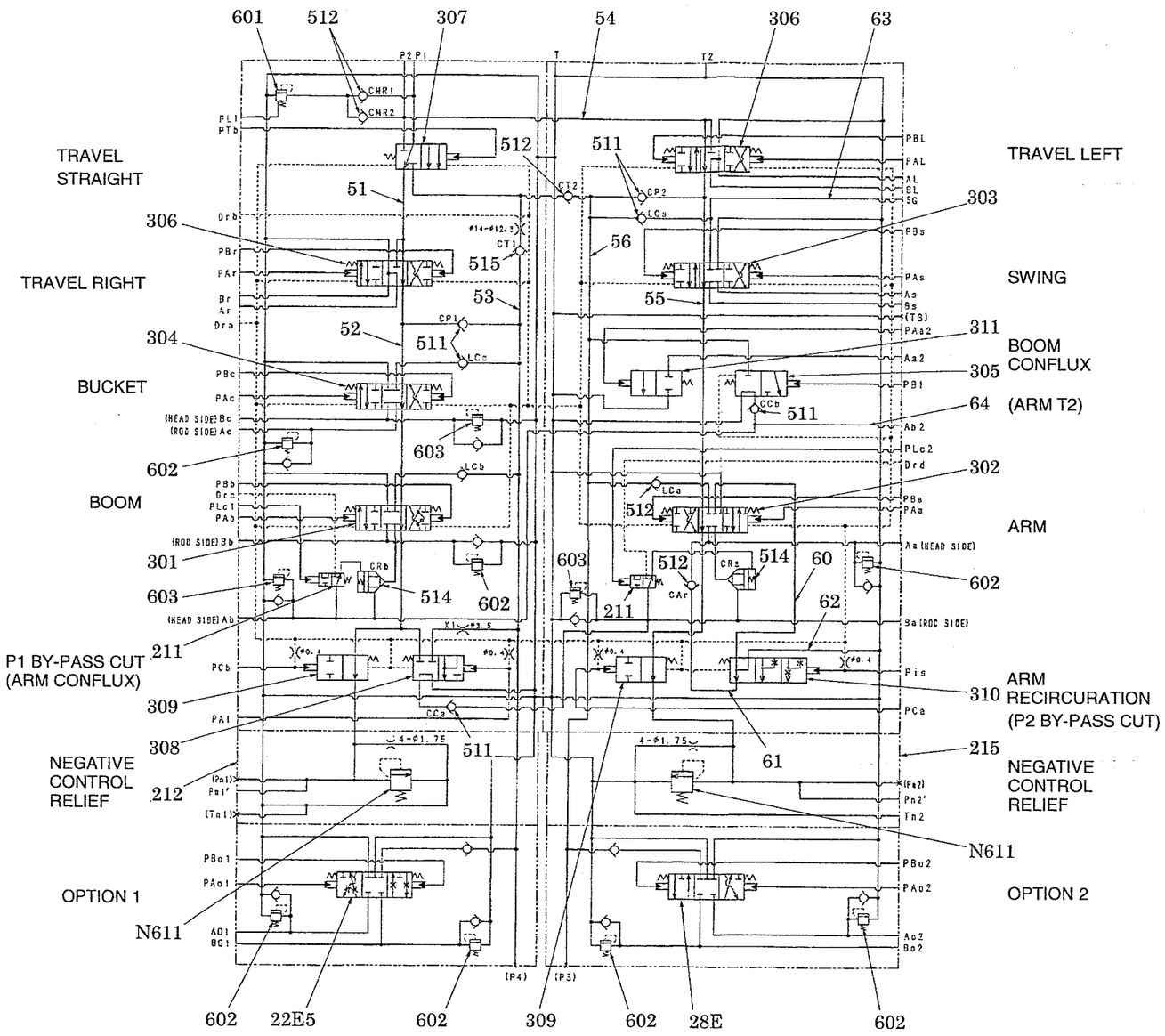

Fig. 2-13 Hydraulic circuit

Table 2-4

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)
60	Arm recirculation passage
61	Arm recirculation low pressure passage
62	Arm recirculation cut passage
63	Swing conflux passage
64	Boom outer conflux passage
211	Lock valve selector spool
212	Negative control relief valve block
215	Negative control relief valve block
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 spool
310	Arm recirculation spool
311	Arm T2 spool
511	Poppet (D=25)
512	Poppet (D=20)
514	Lock valve poppet
515	Poppet (with restrictor)
601	Main relief valve
602	Over load relief valve
603	Over load relief valve
22E5	Spool for option valve 1
28E	Spool for option valve 2
N611	Negative control relief valve

2) Arm out conflux

In operation 1), the oil delivered by pump P1 flows into the bypass circuit (52) through the main passage (51), but since the bypass circuit (52) and the low pressure circuit (D) are blocked by the bypass cut spool (309), it does not run into the low pressure circuit (D). Meanwhile, since the arm conflux spool (308) has now been changed over, the pressure oil of the bypass circuit (52) goes between the outer circumference of the arm conflux spool (308) and the casing.

Part of the delivered oil passes through the parallel circuit (53) and the restrictor, combines with the pressure oil of the bypass circuit (52), pushes the conflux check poppet (511) open, enters port Ba by way of the conflux circuit in the casing and finally combines with the pressure oil on the pump P2 side.

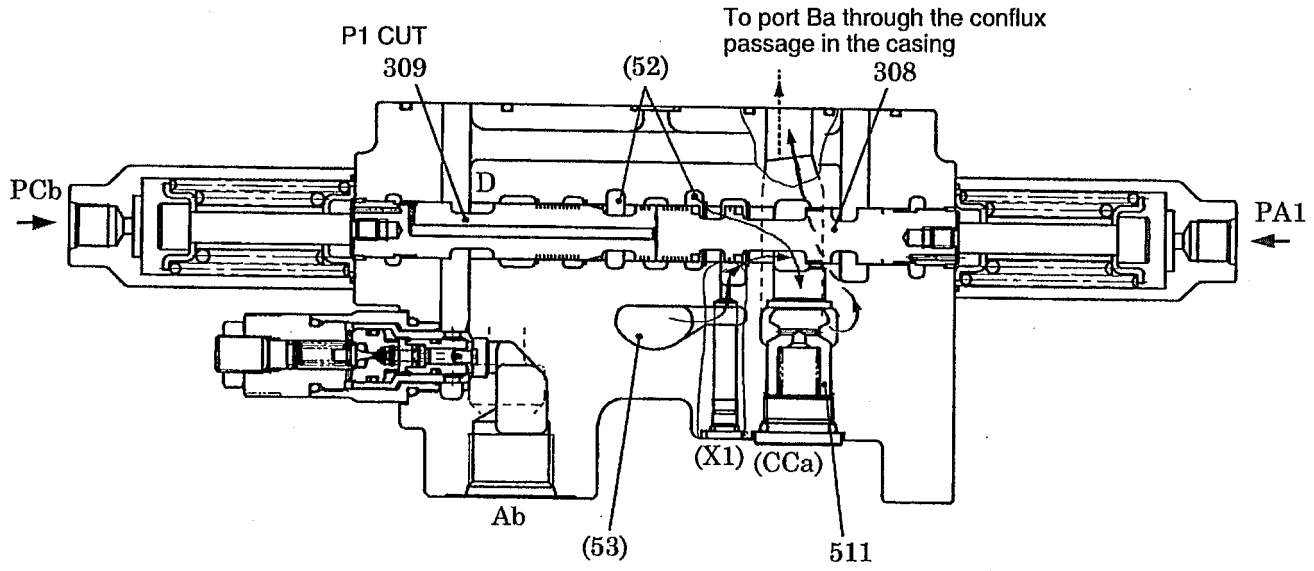

Fig. 2-25 At arm out operation (Bypass cut spool and arm conflux spool)

(10) Operation of over load relief valve

The over load 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).

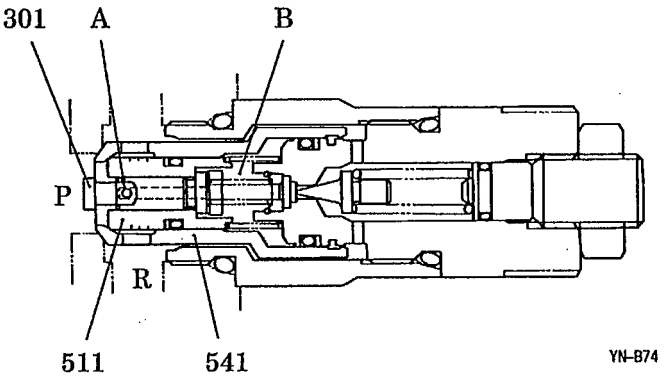

Fig. 2-37

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).

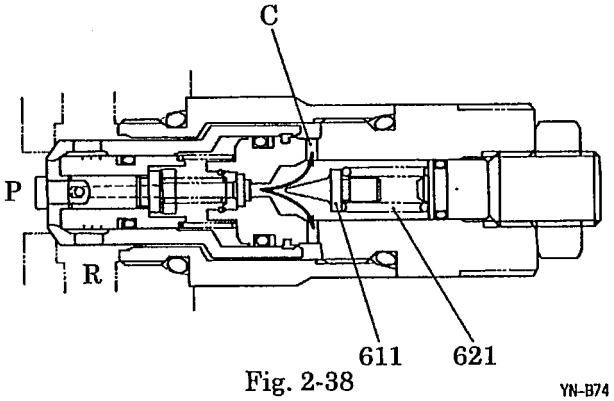

Fig. 2-38

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).

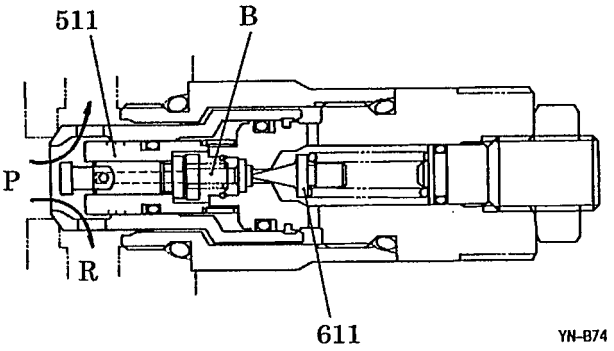

Fig. 2-39

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.

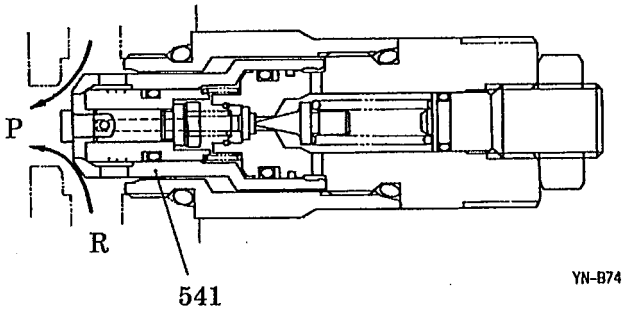

Fig. 2-40

- The numbers of the parts of the over load relief valve in this section correspond to those in Fig.2-4.

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6.2.2 REDUCTION UNIT

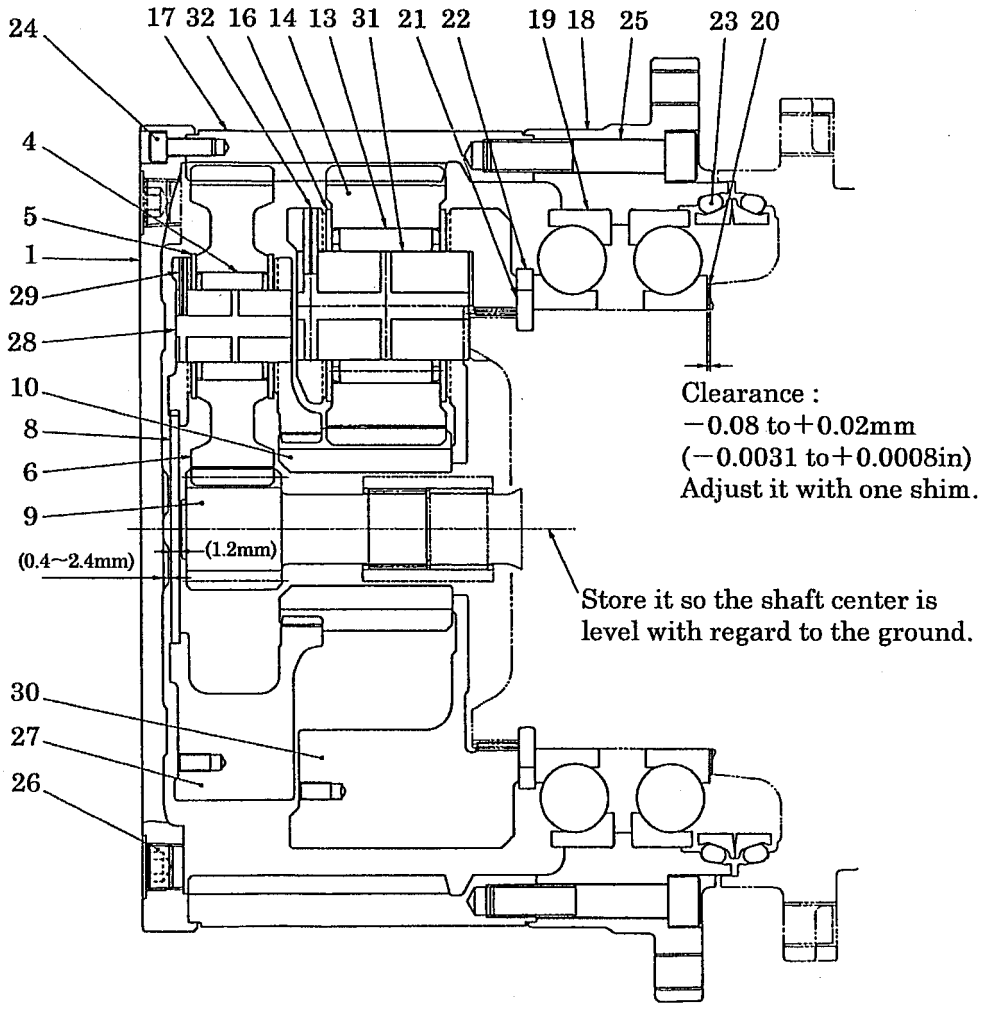
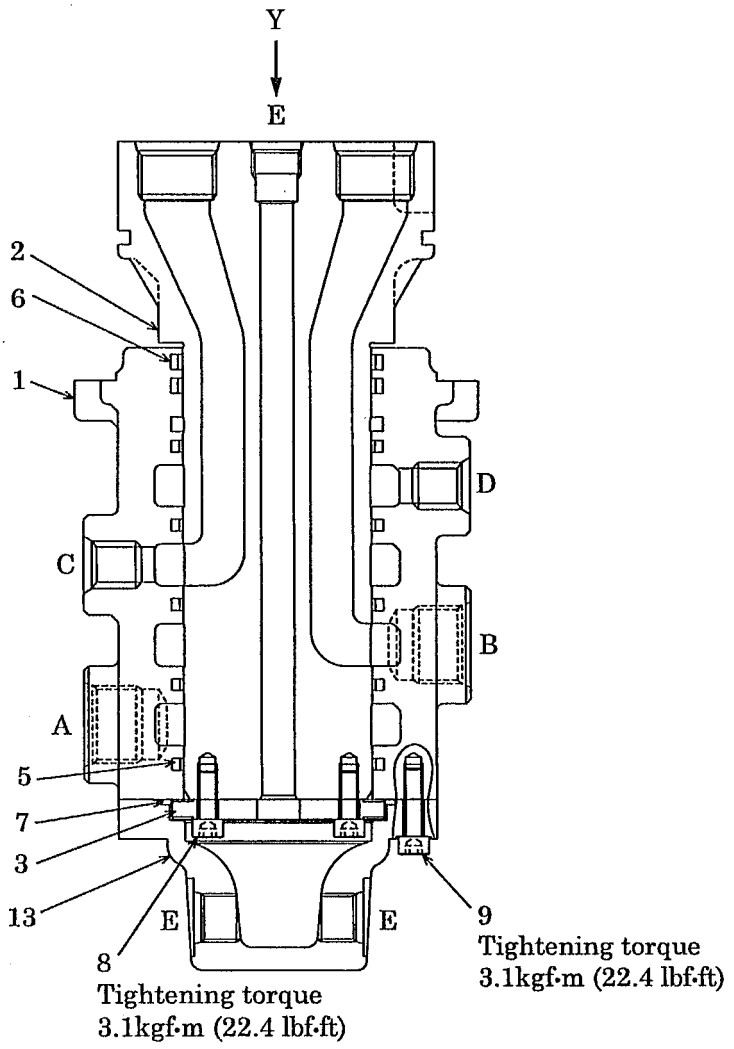
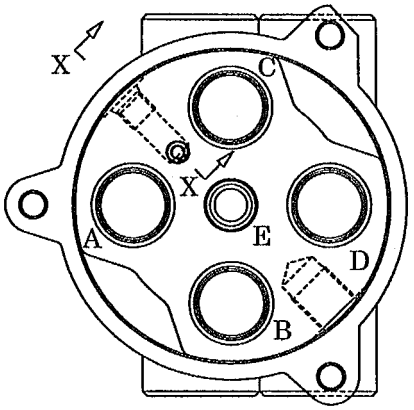


Fig6-3 Reduction unit

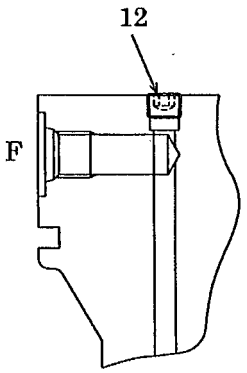
No.	NAME	Q'TY	No.	NAME	Q'TY	No.	NAME	Q'TY
1	COVER	1	16	THRUST WASHER 2	6	25	SOCKET BOLT ; M18×100	22
4	NEEDLE BEARING	3	17	RING GEAR	1	26	SOCKET PLUG ; PT3/4	2
5	THRUST WASHER 1	6	18	HOUSING	1	27	CARRIER 1	1
6	PLANETARY GEAR 1	3	19	BEARING	2	28	CARRIER PIN 1	3
8	THRUST PLATE	1	20	SHIM	1	29	SPRING PIN ; Ø6×36	3
9	SUN GEAR 1	1	21	LOCK WASHER	2	30	CARRIER 2	1
10	SUN GEAR 2	1	22	SUPPORT RING	1	31	CARRIER PIN 2	3
13	NEEDLE BEARING	3	23	FLOATING SEAL	1	32	SPRING PIN ; Ø10×56	3
14	PLANETARY GEAR 2	3	24	SOCKET BOLT ; M10×25	22			

7.3 CONSTRUCTION





VIEW Y



SECTION XX

Fig. 7-2 Construction

Table 7-2

No.	NAME	Q'TY	No.	NAME	Q'TY
1	BODY	1	7	O RING ; 1A G95	1
2	STEM	1	8	SOCKET BOLT; M8×20	2
3	THRUST PLATE	1	9	SOCKET BOLT; M8×30	4
5	SEAL ASSY	5	12	PLUG	1
6	SEAL ASSY	2	13	COVER	1

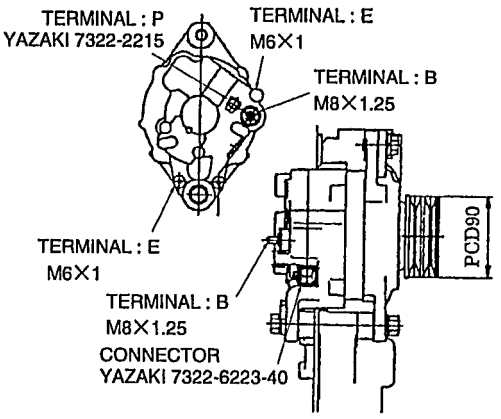
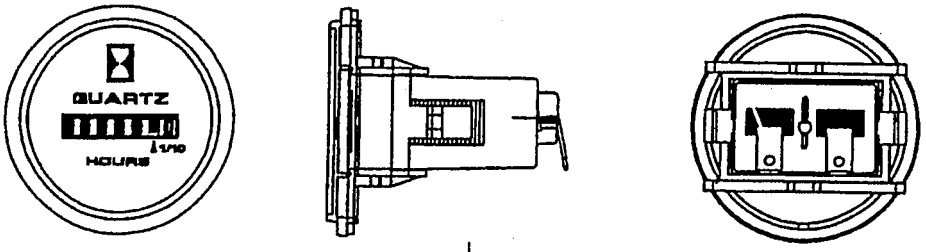
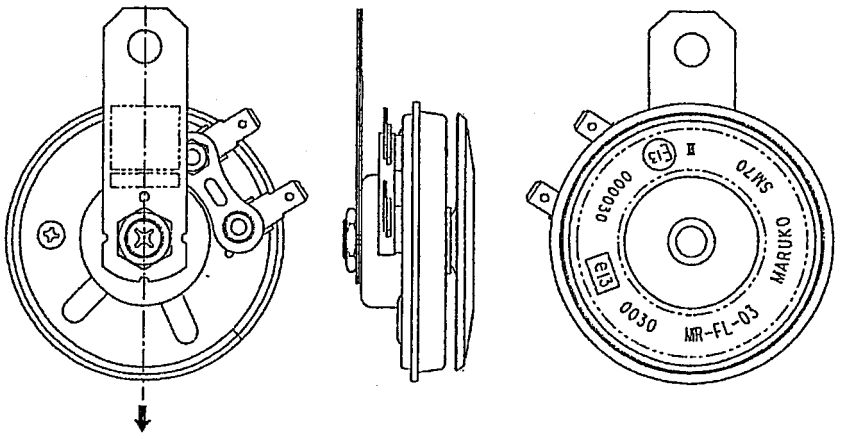
7.4 OPERATION

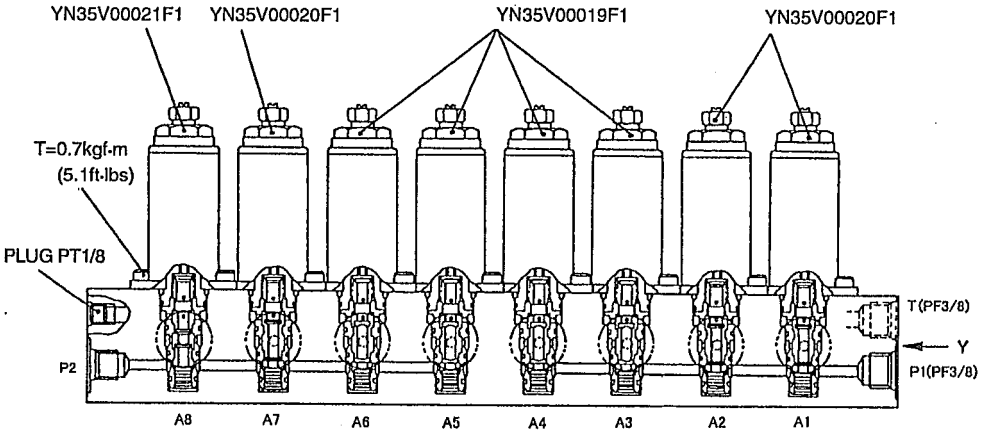
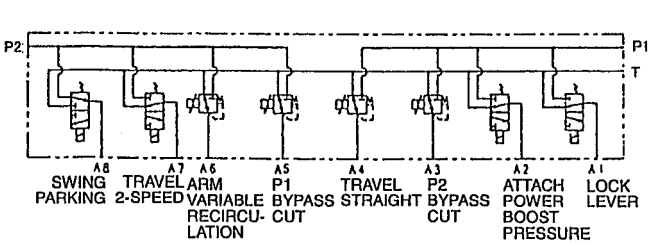
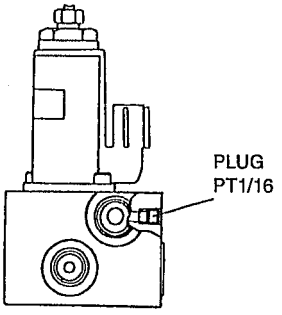
The swivel joint consists mainly of body(1) and stem(2) that rotate mutually, thrust plate(3) preventing both components from falling off, cover(13) closing one side of body(1), seal(5) that partitions off the circuits and O rings(6) and (7) that prevent external leaks.

Four ports for the travel main circuits are provided on body (1) and stem (2). Further, four oil passing grooves are arranged in the inner surface of body (1), with seal (5) fixed above and below the circumferential groove.

The body (1) and the stem (2) rotate mutually. The oil flowing in from body (1) or stem (2) keeps on flowing to stem (2) or body (1) past the circumferential groove between body (1) and stem (2); the oil flow is never shut off because of rotation. Further, an oil groove for lubrication that connects with the drain port is provided, in order to prevent the body (1) from seizure with the stem (2).

This construction keeps on connecting the circuits between the swing bodies by means of a swivel joint.

File No. Name of part Part No. Use Applicable Machine	Specification	Description
E−2 Alternator ME049321 Generator YN23301~,YQ02801~ YN07-30001~,YQ07-03501~ LC08-06201~,YC08-03001~ LC09-06323~,YC09-03088~	Type: 3-phase AC method Voltage: 24V Output: 35A(900W) Drive: A-Belt drive by pulley Speed increasing ratio: 1.87 (Ø168 / Ø90)	
E−3 Hour meter YT58S00006P1 Service meter LC08-06201~ YC08-03001~ LC09-06323~ YC09-03088~	Maker: Hobbs Corp. Rated voltage: DC 10~32V	
E−5,6 Horn CM53S00002F2 (HIGH) CM53S00002F1 (LOW) Warning sound LC08-06201~ YC08-03001~ LC09-06323~ YC09-03088~	Maker: Maruko Rated voltage: DC24V Operating voltage range: DC 22~28V Sound level: 113±5 dB/2m Basic frequency: 420±20 Hz high sound 350±20 Hz low sound Insulation resistance: More than 3MΩ/DC500V	STAMP MARK MR-FH-03 : HIGH MR-FL-03 : LOW 

File No. Name of part Part No. Use Applicable Machine	Specification	Description
SV−1,2,3,4 Solenoid valve (8 solenoid) Selector valve assy Refer to hydraulic symbol A1,A2,A7,A8 YN35V00022F1 YN07-30001~,YQ07-03501~ LQ08-04501~,LL08-03001~ LC06-05501~,YC06-02501~ LC08-06201~,YC08-03001~ LC09-06323~,YC09-03088~	Rated voltage: 90kgf/cm² (1280psi) Solenoid selector valve: Rated voltage DC 24V Solenoid proportional valve: Dither current 100Hz,300mA P-P Coil resistance 17.5±1Ω (at20℃) Connector specification: SUMITOMO DENSO HW : 090 connector M(2P) HOUSING part No. : Equivalent 6181-0070 TERMINAL part No. : Equivalent 1500-0105	P1,T,A1 port PF3/8 A2~A8 port PF1/4
PSV−A,B,C,D Proportional solenoid valve Refer to hydraulic symbol A3~A6 YN07-30001~ YQ07-03501~ LC06-05501~ YC06-02501~ LC08-06201~ YC08-03001~ LC09-06323~ YC09-03088~	  Hydraulic symbol  VIEW Y	

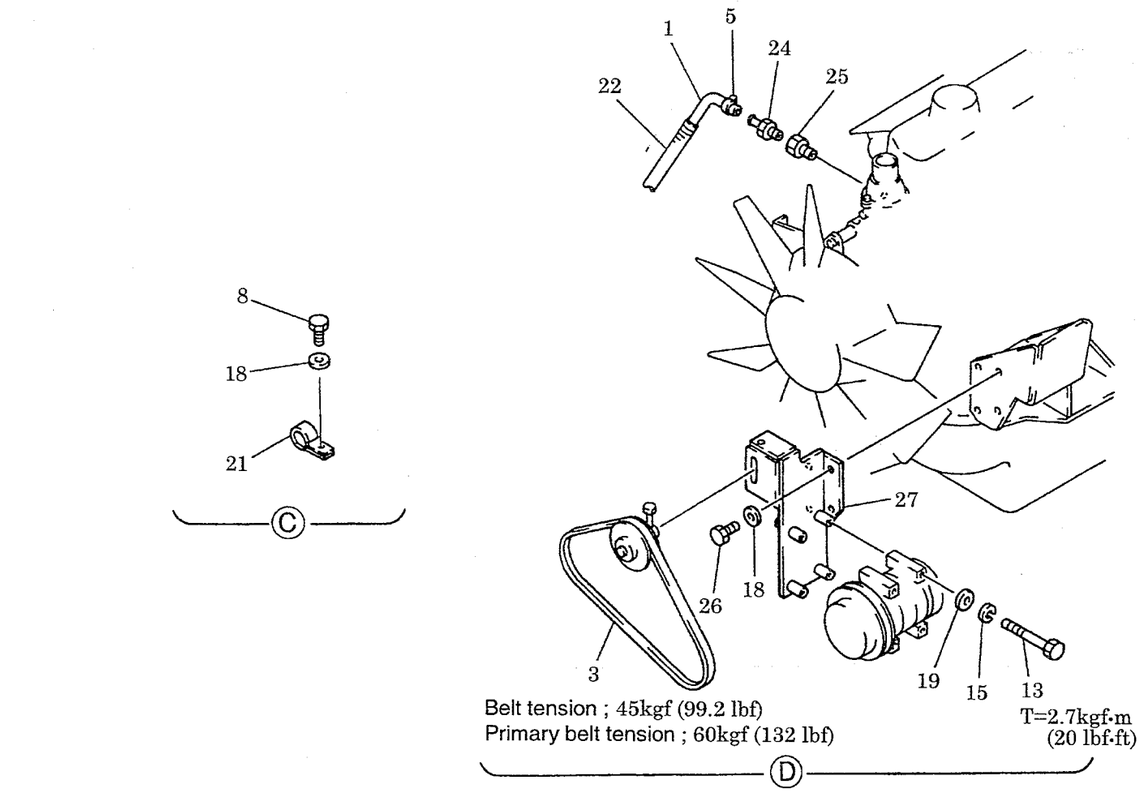
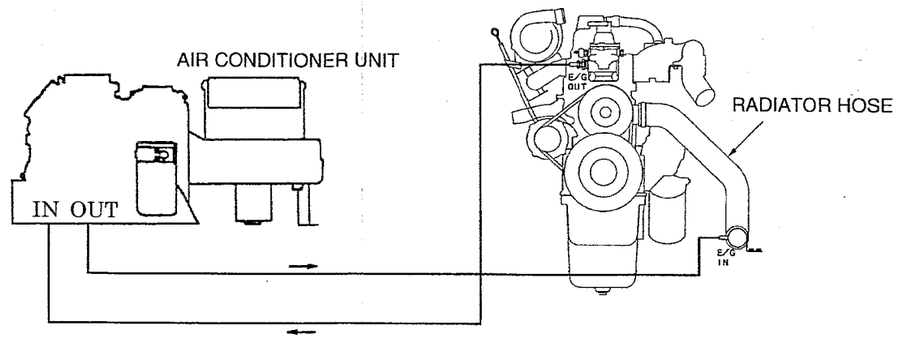


Fig. 2(2/3) Installing air conditioner and heater

HEATER CIRCUIT



AIR CONDITIONER CIRCUIT

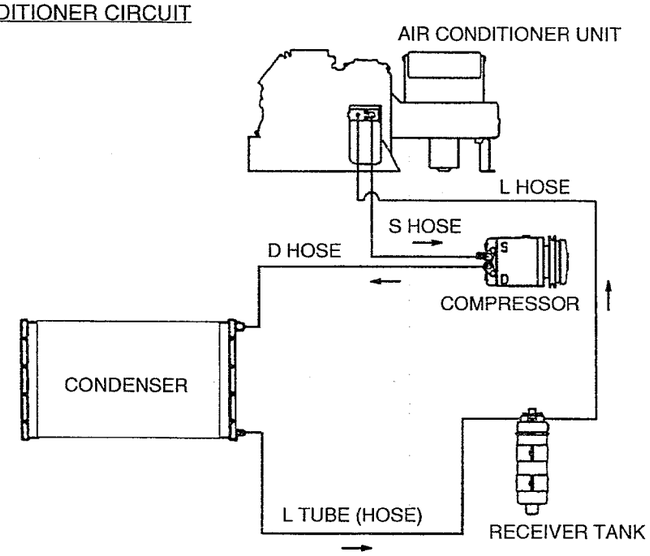


Fig. 2(3/3) Installing air conditioner and heater

A/C PIPING		LC20M00020F1					
Tightening torque kgf·m (lbf·ft)	No.	NAME	Q'TY	Tightening torque kgf·m (lbf·ft)	No.	NAME	Q'TY
	1	HOSE ; L=3700	1		19	WASHER	10
	2	SUPPORT	2		20	WASHER	8
	3	V BELT : B-47.5 COG	1		21	CLIP	2
	4	GROMMET	1		22	TUBE ; L=1200	1
	5	CLIP	4		23	TUBE ; L=350	1
	6	CLIP	6		24	CONNECTOR	1
	8	CAPSCREW ; M10×20	2		25	BUSHING	1
1.7 (12.3)	9	CAPSCREW ; M8×30	4	5.3 (38.4)	26	CAPSCREW ; M10×30	6
	10	CAPSCREW ; M6×20	2		27	BRACKET	1
	11	CAPSCREW ; M8×16	2		28	CLIP	1
0.45 (3.3)	12	CAPSCREW ; M6×50	6		29	NUT	1
2.7 (20)	13	CAPSCREW ; M8×100	4		30	WASHER	4
	14	LOCK WASHER	6		31	HOSE ; L=500	1
	15	LOCK WASHER	8		32	TUBE ; L=600	1
	16	CLIP	3		33	TUBE ; L=450	1
	18	WASHER	9				

2) Replacing the air mix motor actuator
Disconnect the connector connected with the motor actuator.
Separate the rod 67 linking the motor actuator with the lever AM, from the rod holder.
Remove three cross-recessed screws T4×14 (T1) fastening the motor actuator. Then remove the motor actuator with the rod holder and the lever MAL1, from the unit. Remove the rod holder and the lever MAL1 from the motor actuator and install them to a new motor actuator. Assembly is the reverse order of disassembly.

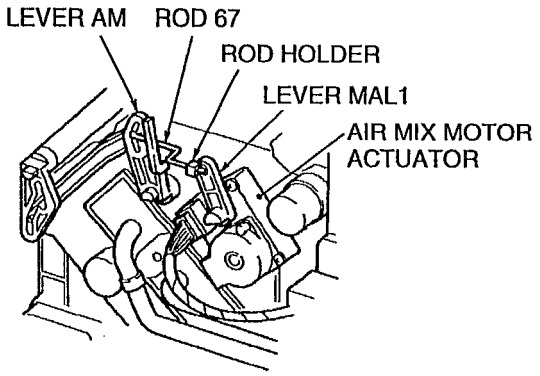


Fig. 23

3) Replacing the inner/outer air select motor actuator
Disconnect the connector connected with the motor actuator.
Separate the motor actuator with lever MAL2 from the unit.
Remove the lever MAL2 from the motor actuator and install it to a new motor actuator, in the reverse order of disassembly.

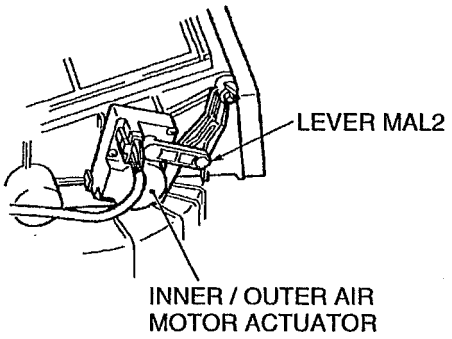
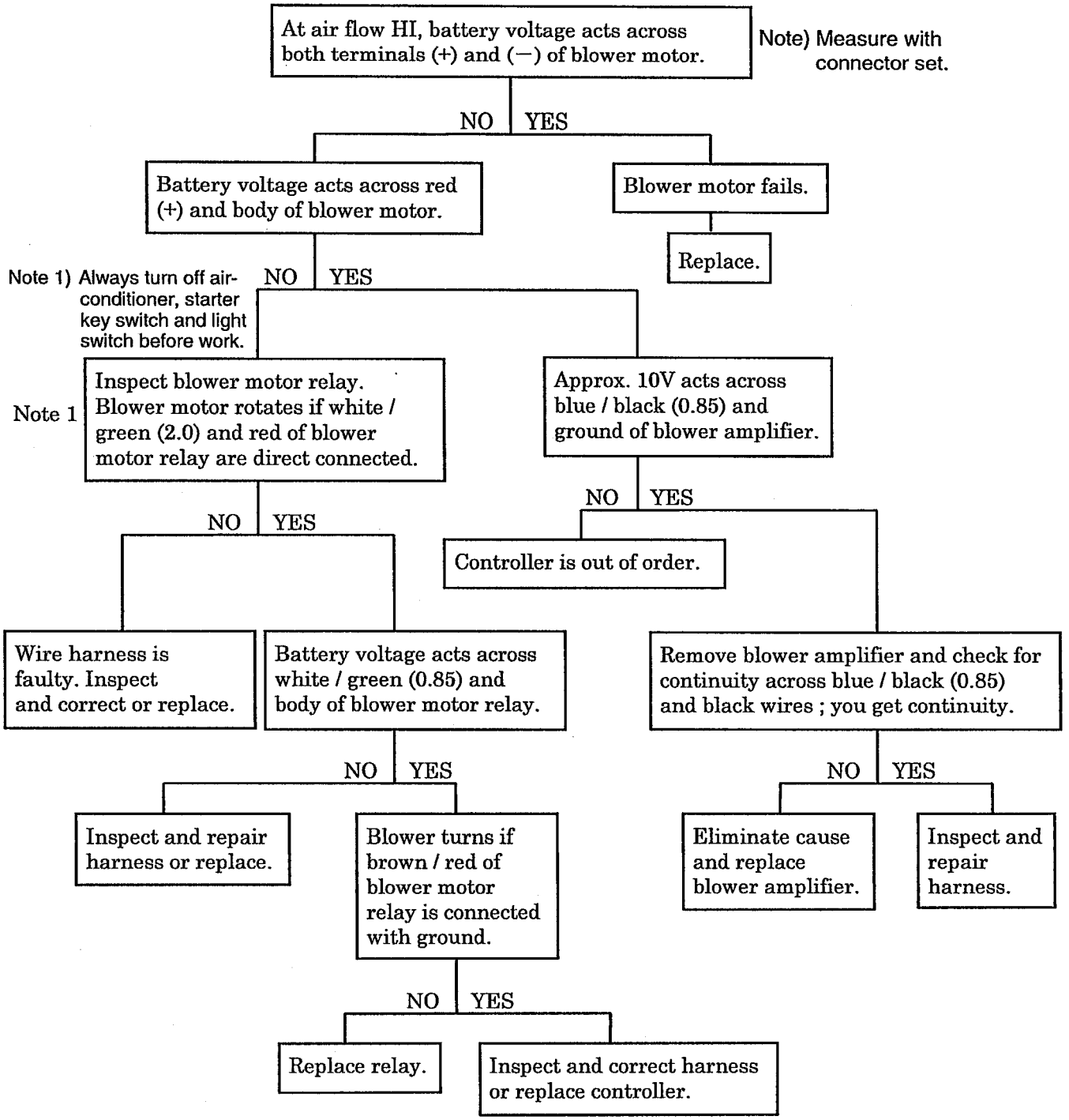
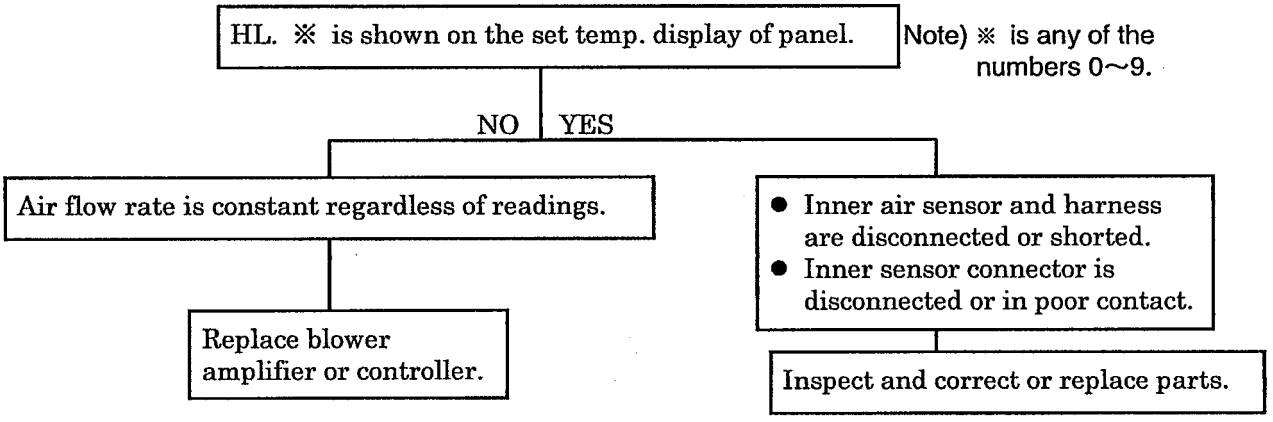


Fig. 24

【Blower motor does not run.】



【Blower motor speed does not change.】



3. ARM

3.1 REMOVING ARM

(1) Put the machine in position to remove arm.
Extend the arm cylinder, retract the bucket cylinder and bring the arm down on the ground.

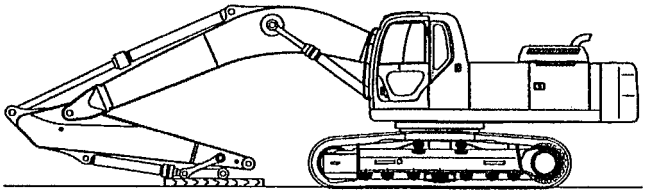


Fig. 3-1 Position to remove arm

(2) Disconnecting piping of bucket cylinder
Release pressure of hydraulic tank, place oil pan to prepare for oil leaking, and separate pipes.

⚠ Plug both section of separated pipes.
ORS Plug : 4-(4)

When the removal of bucket cylinder is not required, skip to procedure (6).

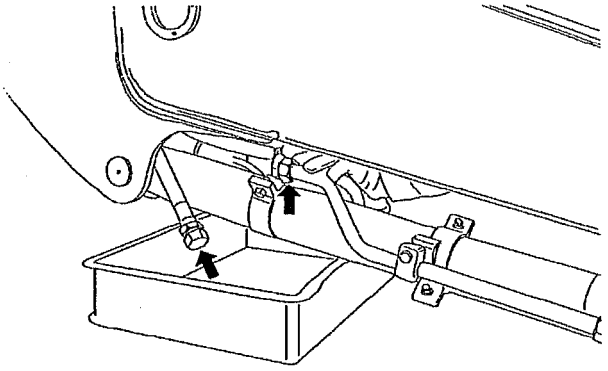
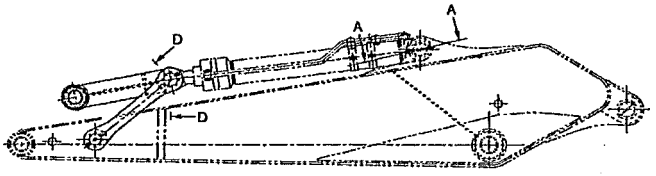


Fig. 3-2 Disconnecting piping of bucket cylinder

(3) Removing bucket cylinder rod pin (H)
1) Loosen nut (13), remove capscrew M20×180 (12), and push out pin (H).

: 30mm

2) Retract cylinder rod.



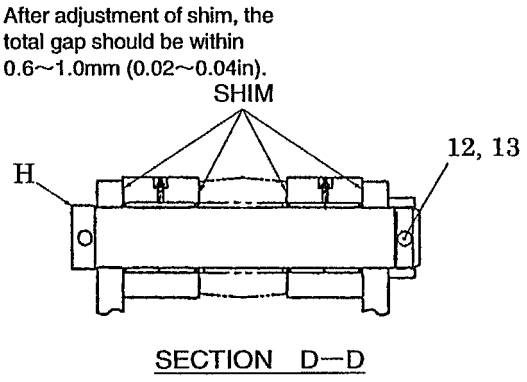


Fig. 3-3 Detail of bucket cylinder rod pin (H)

(4) Removing cylinder head pin (G)
Loosen nut (3), remove capscrew M20×165 (2), and push out pin (G).

: 30mm

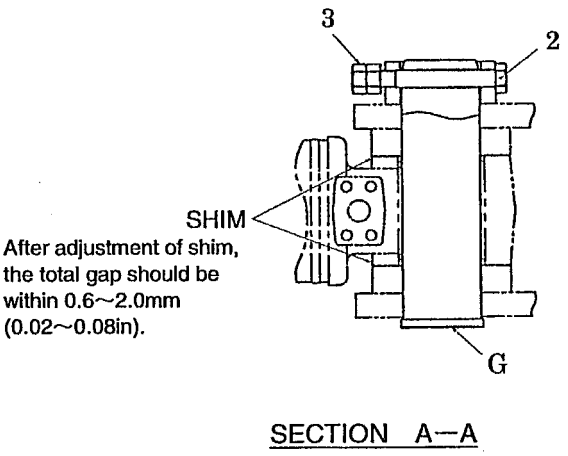


Fig. 3-4 Detail of bucket cylinder head pin (G)

5) After removing cushion bearing (13) and cushion seal (14), separate rod cover (3) from piston rod (2). If it is too hard to slide it, knock the flanged part of rod cover (3) with a plastic mallet. But when drawing it out, lift rod cover (3) by crane and pull it straight horizontaly.

⚠ Take care so rod bushing (4) and the lip of packings (6,7,8,9) may not be damaged by thread of the piston rod (2).

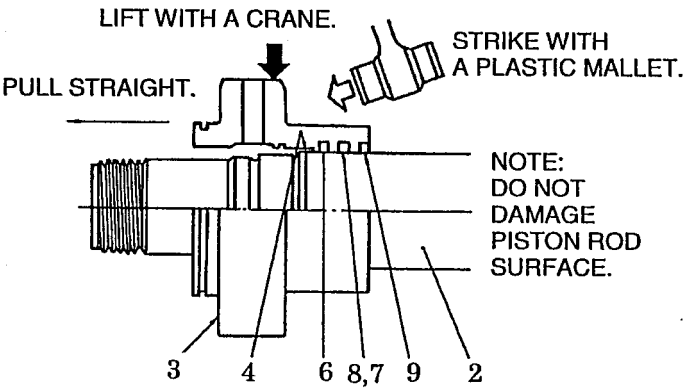


Fig. 1-14 Removing rod cover (3)

1.3.3 DISASSEMBLING PISTON ASSY

1) Remove seal ring (16) and back-up ring (17).

⚠ Cut the seal ring (16) by tapping it with a screwdriver or a chisel. Take care not to strike it too hard, otherwise the groove may be damaged.

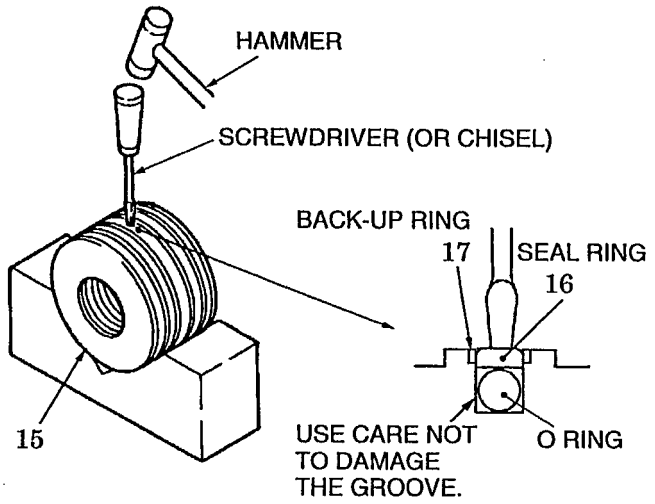


Fig. 1-15 Removing seal ring (16) and back-up ring (17)

1.9.2 OTHER SPECIAL JIGS
(PREPARED BY SERVICE SHOP)

1) Bushing extraction jig (Symbol J)

MATERIAL : Mild steel

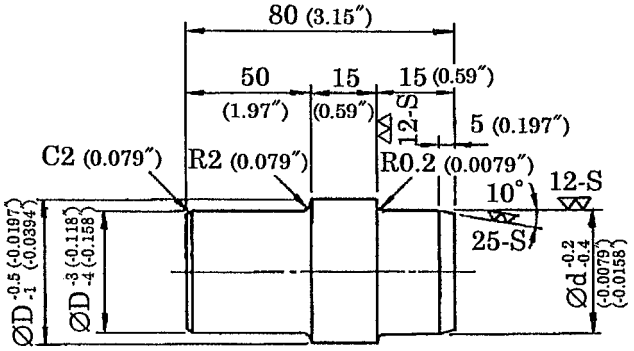


Fig. 40 Bushing extraction jig

Table 9 Unit : mm (inch)

d	D	Cylinder Used
90 (3.54)	105 (4.13)	Bucket
110 (4.33)	125 (4.92)	Arm
110 (4.33)	125 (4.92)	Boom (Rod side)
100 (3.94)	115 (4.53)	Boom (Bottom side)

2) Wrench for piston nut

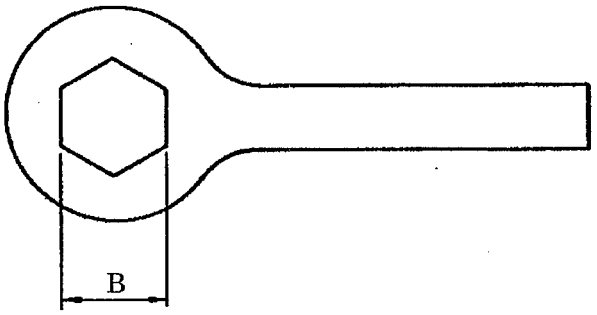


Fig. 41 Wrench for piston nut

Table 10 Unit : mm (inch)

B	Cylinder Used
135 (5.32)	Arm
110 (4.33)	Boom
115 (4.53)	Bucket

3. BATTERY

3.1 REMOVING

(1) Open right cover assy.
1) Open it with starter key. (Marked ➡)
2) Open cover assy (7). (Refer to 4. GUARD)
3) Fix it with stay.

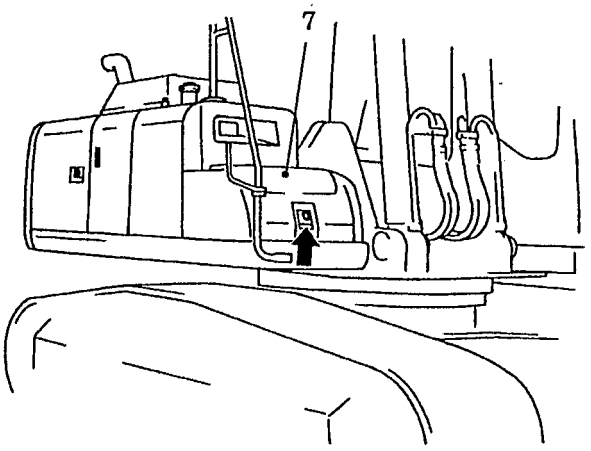


Fig. 3-1 Preparation for removing battery

(2) Remove battery cable
1) Remove cable (C4) [between the ground and battery ⊖]. (Always remove ⊖ terminal first and install it at last.)
2) Cable (C2) [between battery ⊕ and ⊖]
3) Cable (C3) [between battery ⊕ and battery relay]
: 13mm

⚠ Follow the battery removal order. Start removing battery from grounding side, and finish attaching to grounding side. If this order is missed, short-circuits may occur.

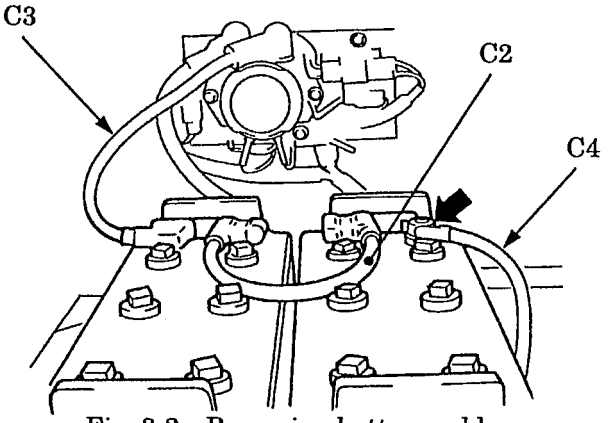


Fig. 3-2 Removing battery cable

(3) Remove battery (B1)
1) Remove four nuts (A3) M8.
: 13mm
2) Remove bracket (A1) and rod (A2).
3) Remove battery (B1).

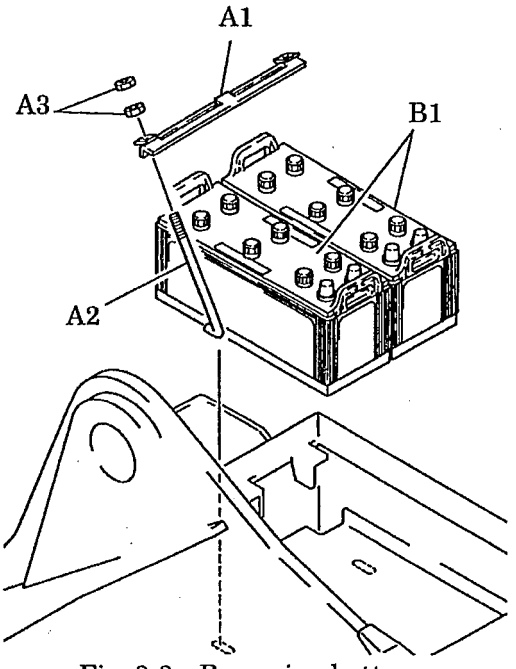


Fig. 3-3 Removing battery

3.2 INSTALL

(1) Install the battery in the reverse procedure of removing.
Nut (A3) of battery attaching rod (A2)
: 13mm,
Tightening torque : 1.1kgf·m (8.0 lbf·ft)

(2) Installing grounding cable
Install grounding cable last. Especially care must be taken that the grounding face is free from painting, rust, etc.
: 13mm

(3) Removing other hoses

1) Disconnect hoses of the following ports. (See Fig. 8-4.)

Port	Tool	Remarks
Pn1	19	P1 pump negative control pressure
Pn2	19	P2 pump negative control pressure
Dr3	19,22	Drain
Psv1	19	Pilot primary pressure P1 side
Psv2	19	Pilot primary pressure P2 side
A3	19,22	Pilot pump delivery
B3	36	Pilot pump suction

2) Attach tags to hoses to identify.

3) Put a plug in the hoses and the pump.

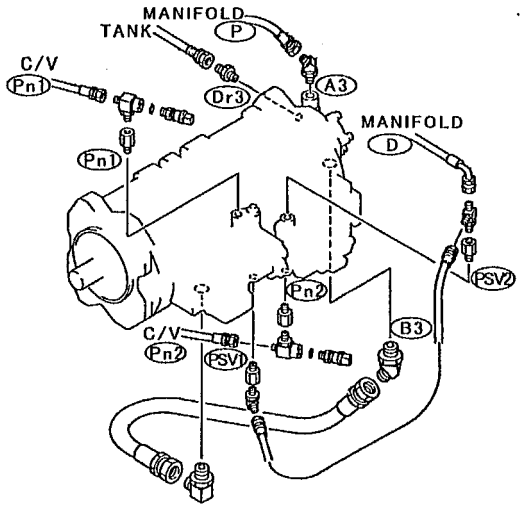


Fig. 8-4 Hydraulic pump port

(4) Remove connector

Remove six connectors of all pressure sensors and proportional valves.

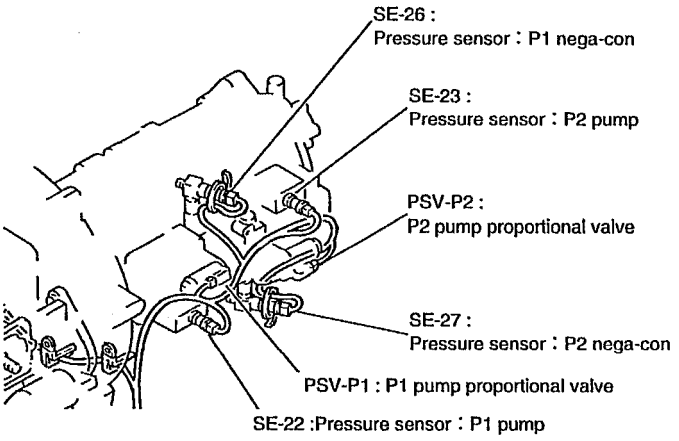


Fig. 8-5 Removing connector

15. MULTI CONTROL VALVE (IF EQUIPPED)

15.1 PREPARATION FOR REMOVAL

(1) Discharge inner pressure from the hydraulic circuit system.
(Refer to 8. HYDRAULIC PUMP)

(2) Bleed pressure air in hydraulic tank
(Refer to 7. HYDRAULIC TANK.)

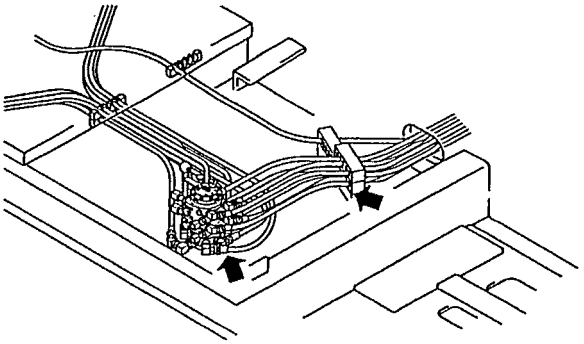


Fig. 15-1 Removing multi control valve

15.2 REMOVAL

(1) Attach tag on which hose name is entered to the remote control hoses between multi control valve and main control valve, and write numbers C1 to C8 on it.
Remove the hose on the multi valve side and put a plug in each opening.
Refer to. LC11 Tool of Plug (3).

(2) Attach tag on which hose name is entered to the remote control hoses between multi control valve and pilot V, and write numbers P1 to P8 on it.

(3) Remove hoses P1 to P8 on multi control valve side and plug connection.
Refer to. LC11 Tool of Plug (3).

(4) Take off four capscrews (B8) M8×16. Then remove multi control valve (B1) from the body.

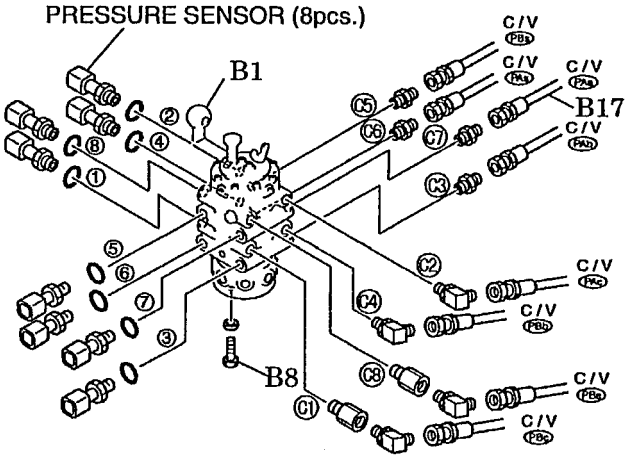


Fig. 15-2 Connection between multi control valve and C/V

15.3 INSTALLATION

(1) Installing is done in the reverse order of removing

(2) Relations between pilot valve and multi control valve hose

P/V port		Hose Size	Hose Color	ISO operation pattern	multi port	mark -ing
Right side	1	3/8	Red	Bucket digging	P1	1
	2	3/8	Blue	Bucket dump	P2	2
	3	3/8	Green	Boom up	P3	3
	4	3/8	Gray	Boom down	P4	4
	P	1/4	Black	Pilot primary	—	—
	T	3/8	Black	Drain	—	—
Left side	5	3/8	Gray	Swing left	P5	5
	6	3/8	Red	Swing right	P6	6
	7	3/8	Blue	Arm in	P7	7
	8	3/8	Green	Arm out	P8	8
	P	1/4	Black	Pilot primary	—	—
	T	3/8	Black	Drain	—	—

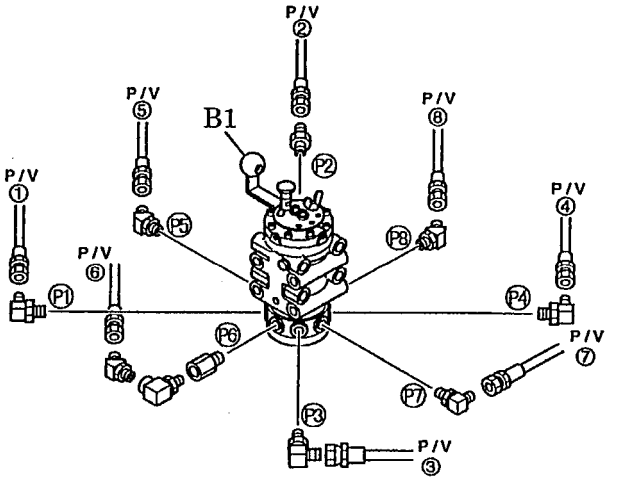


Fig. 15-3 Connection between P/V and multi control valve

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1.2 REGULATOR

1.2.1 STRUCTURAL EXPLODED VIEW

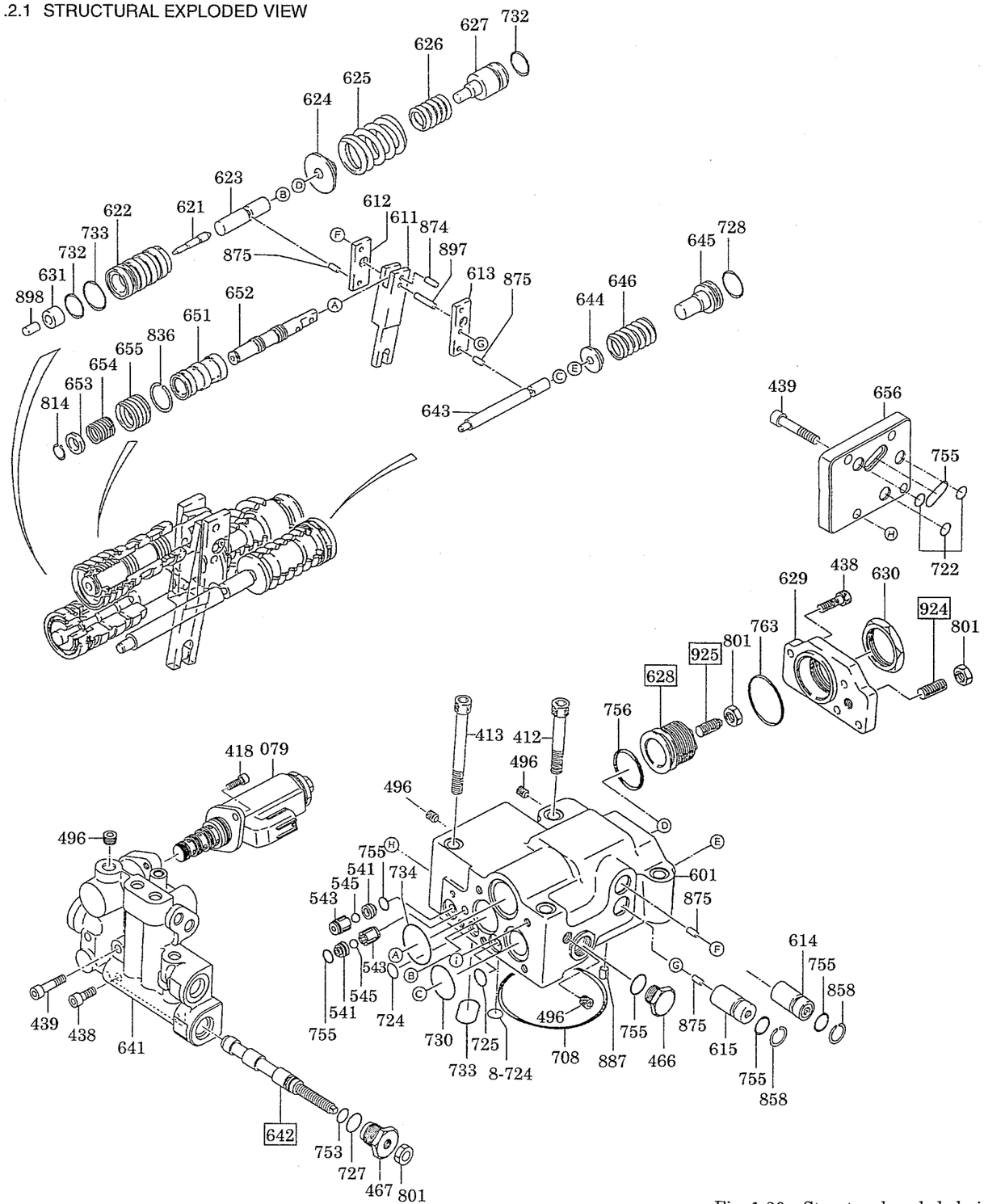


Fig. 1-20 Structural exploded view of regulator

Table 1-4

TIGHTENING TORQUE kgf·m (lbf·ft)	No.	NAME	Q'TY
3.0 (22)	412	SOCKET BOLT: M8×50	2
3.0 (22)	413	SOCKET BOLT: M8×70	2
0.7 (5.1)	418	SOCKET BOLT: M5×12	2
1.2 (8.7)	438	SOCKET BOLT: M6×20	10
1.2 (8.7)	439	SOCKET BOLT: M6×35	3
3.7 (27)	466	VP PLUG: PF1/4	1
3.5 (25)	467	PLUG ; PF3/8×M6	1
0.9 (6.5)	496	PLUG ; SEAL COATED	12
	541	SEAT	2
	543	STOPPER 1	2
	545	STEEL BALL	2
	601	CASING	1
	611	FEED BACK LEVER	1
	612	LEVER (1)	1
	613	LEVER (2)	1

TIGHTENING TORQUE kgf·m (lbf·ft)	No.	NAME	Q'TY
	614	FULCRUM PLUG	1
	615	ADJUST PLUG	1
	621	COMPENSATING PISTON	1
	622	PISTON CASE	1
	623	COMPENSATING ROD	1
	624	SPRING SEAT (C)	1
	625	OUTER SPRING	1
	626	INNER SPRING	1
	627	ADJUST STEM (C)	1
	628	ADJUST SCREW (C)	1
16 (120)	629	COVER (C)	1
	630	LOCK NUT: M30×1.5	1
	631	SLEEVE	1
	641	PILOT COVER	1
	642	ROD	1
	643	PILOT PISTON	1
	644	SPRING SEAT (Q)	1
	645	ADJUST STEM (Q)	1
	646	PILOT SPRING	1
	651	SLEEVE	1
	652	SPOOL	1
	653	SPRING SEAT	1
	654	RETURN SPRING	1
	655	SET SPRING	1
	656	BLOCK COVER	1
	708	O RING : 1B G75	1
	722	O RING : 1B P6	3
	724	O RING : 1B P8	8
	725	O RING : 1B P10	1
	727	O RING : 1B P14	1
	728	O RING : 1B P18	1
	730	O RING : 1B P22	1
	732	O RING : 1B P16	2
	733	O RING : 1B P20	1
	734	O RING : 1B P25	1
	753	O RING : 1B P9	1
	755	O RING : 1B P11	5
	756	O RING : 1B P26	1
	757	O RING : 1B P12	1
	763	O RING : 1B G35	1
1.6 (12)	801	NUT : M8	3
	814	SNAP RING	1
	836	SNAP RING	1
	858	SNAP RING	2
	874	PIN ; Ø4×11.7L	1
	875	PIN ; Ø4×8L	4
	887	PIN	1
	897	PIN ; Ø4×19L	1
	898	PIN ; Ø8.5×10L	1
	924	SET SCREW: M8×20	1
	925	ADJUST SCREW (Q)	1
	079	SOLENOID PROPORTIONAL REDUCING VALVE	1

□ The codes in a rectangle represent adjust screws.
Do not tamper with the adjust screws as much as possible.

(1) Remove option valve block and negative control relief valve

1) Remove P2 side option valve block and negative control relief valve block
Loosen the socket bolts (272) and remove the option valve block (214) and negative control relief valve block (215).
: 10mm

⚠
- Regarding the disassembly of the optional valve block, refer to the Disassembling option valve under (20) on page Ⅱ−2−17.
- Regarding the disassembly of the negative control relief valve block, refer to the Disassembling option valve under (21) on page Ⅱ−2−17.

2) Remove P1 side option valve block and negative control relief valve block
Loosen the socket bolts (271) and remove the option valve block (213) and negative control relief valve block (215).
: 10mm

⚠
- Regarding the disassembly of the optional valve block, refer to the Disassembling option valve under (20) on page Ⅱ−2−17.
- Regarding the disassembly of the negative control relief valve block, refer to the Disassembling option valve under (21) on page Ⅱ−2−17.

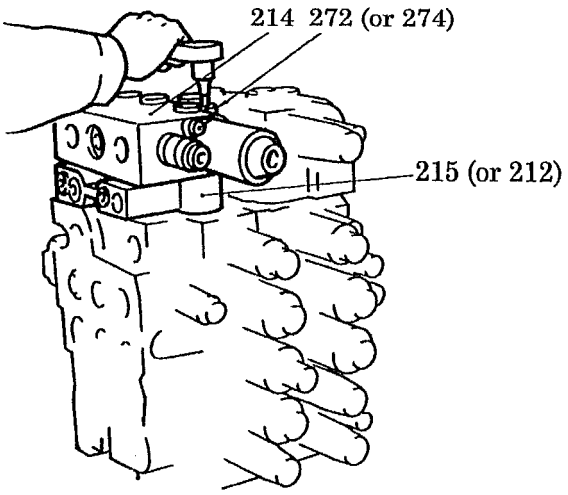


Fig.2-3 Removing optional valve block (OPT-2) and the negative control relief valve block. (The numbers in the parentheses are the ones without an optional valve.)

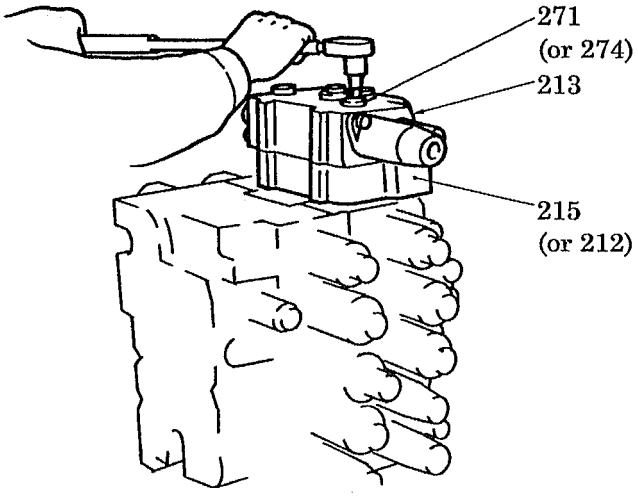


Fig.2-4 Removing optional valve block (OPT-1) and the negative control relief valve block. (The numbers in the parentheses are the ones without an optional valve.)

(16) Remove check valve

1) Conflux check valve (CCb)
Loosen plug (551) and remove poppet (511) and spring (521).
: 12mm
Remove the load check valve the same way.
(CP1,LCc,LCb,CCa)
(CP2,LCa,LCs)

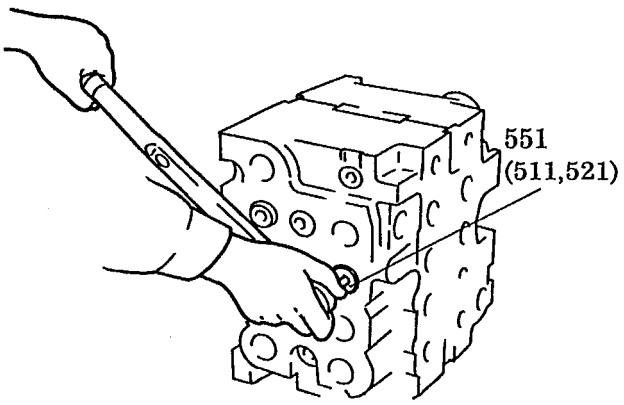


Fig. 2-43 Removing check valve

2) Lock valve section (Arm ; CRa, Boom ; CRb)
Loosen plug (556) and remove poppet (514) and spring (524).
: 12mm

⚠ Exercise care so as not to mistake them as they all differ in kind from 1) above.

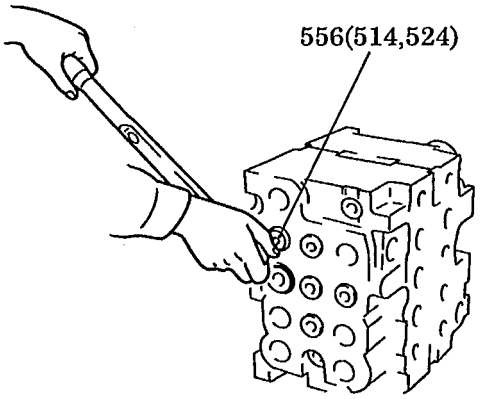


Fig. 2-44 Removing poppet in the lock valve section

3) Travel straight section (CT1)
Remove plug (552). Then remove poppet (515) and spring (522).
: 10mm

⚠ Poppet (515) is a special poppet for travel straight that is used at one location only. Therefore, be careful so as not to mix it up with others when reassembling it.

4) Main relief valve section (CMR1,CMR2)
Remove plug (552) and remove poppet (512) and spring (522).
: 10mm

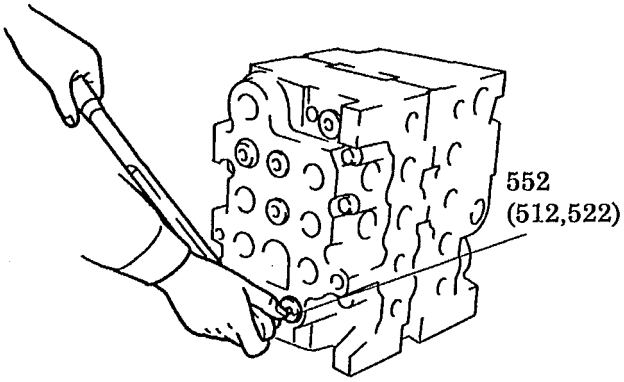


Fig. 2-45 Removing poppet in the main relief section

5) Recirculation check valve (CAr)
Remove plug (552) and remove poppet (512) and spring (522).
Remove the load check valve the same way.
: 10mm

Those plugs that are not mentioned in the foregoing disassembly procedure are blind for extra holes and cast-on holes; do not remove them unless necessary.

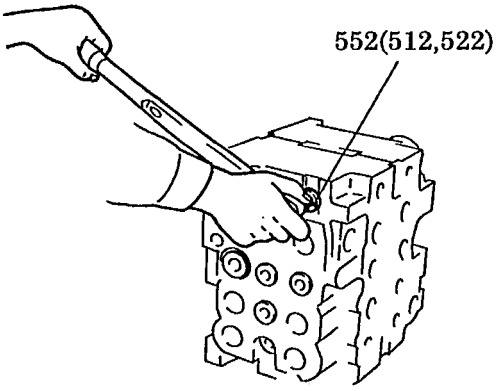


Fig. 2-46 Removing arm recirculation check valve

Trouble	Cause	Remedy
3. Excessive natural falls of attachment under its own weight when spool is in neutral.	1) Excessive clearance between casing and spool.	1) Replace spool.
	2) Spool is not completely in neutral position.	2) Measure secondary pilot pressure.
	● Foreign matter between casing and spool, or sticking spool.	● Disassemble, clean and smooth sticking part with oil stone.
	● Broken or deformed spring.	● Replace spring.
	● Clogged pilot circuit.	● Remove foreign matter.
	3) Malfunctioning overload relief valve. Refer to item 1. 1) above.	3) Measure overload relief valve pressure. Refer to item 1. 1) above.
	4) Malfunctioning anti-cavitation check valve.	4) Checking the overload relief valve
	● Foreign matter between poppet and casing.	● Disassemble and clean.
	● Broken or deformed spring.	● Replace spring.
	5) Lock valve function is faulty.	5)
	● Foreign matter between poppet and casing.	● Disassemble and clean. In case scratches are excessive, replace casing.
	● Poppet is stuck.	● Correct stuck part with oil stone.
	● Broken or deformed spring.	● Replace spring.
	● Selector spool is stuck.	● Replace lock valve selector sub assy.
	● Dirt is included between selector spool and bushing.	● Replace lock valve selector sub assy.
	● O ring in bushing is worn out.	● Replace lock valve selector sub assy.
4. When raising attachment, at first it drops.	1) Malfunctioning load check valve.	1)
	● Foreign matter between poppet and casing.	● Disassemble and clean. If heavily damaged, replace control valve.
	● Sticking poppet.	● Smooth sticking part with oil stone.
	● Broken or deformed spring.	● Replace spring.
5. Bucket, boom, arm or swing does not operate. Slow to start up (or poor power). Slow response.	1) Malfunctioning main spool.	1) Measure secondary pilot pressure.
	● Excessive clearance between casing and spool.	● Replace spool.
	● Foreign matter between casing and spool.	● Disassemble and clean.
	● Sticking spool.	● Smooth stuck part with oil stone.
	● Broken or deformed return spring.	● Replace spring.
	● Clogged pilot circuit.	● Remove foreign matter.
	2) Malfunctioning main relief valve. Refer to item 1. 1) above.	2) Measure main relief valve pressure. Refer to item 1. 1) above.
	3) Malfunctioning overload relief valve. Refer to item 1. 1) above.	3) Measure overload relief valve pressure. Refer to item 1. 1) above.
	4) Malfunctioning pilot valve. Refer to Pilot valve section.	4) Refer to Pilot valve section.

4. PILOT VALVE (FOR TRAVEL)

4.1 CONSTRUCTION

(1) Sectional view

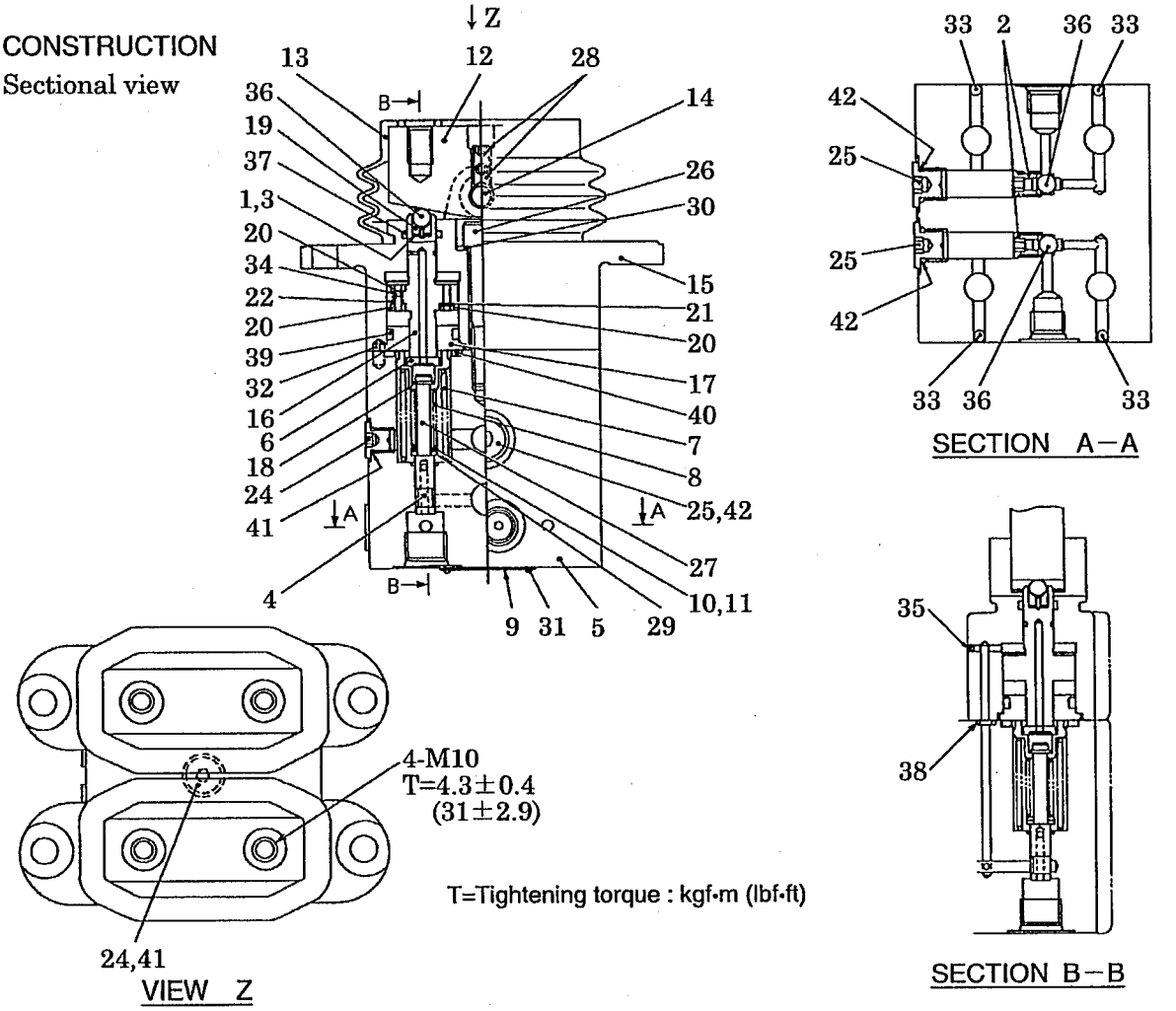


Fig.4-1 Sectional view of pilot valve (for travel)

☆Apply Loctite #262

TIGHTENING TORQUE kgf·m (lbf·ft)	NO.	NAME	Q'TY	TIGHTENING TORQUE kgf·m (lbf·ft)	NO.	NAME	Q'TY
	1	ORIFICE (SHIM)	4		22	SPRING	4
☆1.5 (11)	2	SEAT	2	1.0 (7.2)	24	PLUG ; PF1/8	3
	3	ORIFICE (SHIM)	4	2.5 (18)	25	PLUG ; PF1/4	3
	4	SPOOL	4	6.0 (43)	26	SOCKET BOLT ; M10×60	2
	5	BODY	1	0.5 (3.6)	27	FLANGE BOLT	4
	6	STOPPER	4	1.5 (11)	28	SET SCREW ; M8	4
	7	SPRING	4		29	WASHER	4
	8	SPRING	4		30	WASHER	2
	9	NAME PLATE	1		31	RIVET	2
	10	SHIM t=0.2	4		32	PIN ; Ø5	4
	11	SHIM t=0.1	4		33	BALL	6
	12	CAM	2		34	BALL	4
	13	BOOTS	2		35	BALL	4
	14	PIN	2		36	BALL	6
	15	COVER	2		37	U PACKING	4
	16	PISTON	4		38	O RING ; 1A P5	4
	17	GUIDE	4		39	O RING ; 1A P24	4
	18	SLEEVE	4		40	O RING ; 1A P26	4
	19	HOLDER	4		41	O RING ; 1B P8	3
	20	RING	12		42	O RING ; 1B P11	3
	21	ORIFICE (SHIM)	4				

5.2.3 ASSEMBLY

(1) General precautions

1) Repair those parts damaged after disassembly and prepare replacement parts beforehands.

2) Clean all parts thoroughly in cleaning oil and dry them with jet air.

3) Always coat the moving parts with clean hydraulic oil, before assembly.

4) Replace such seals as O ring and oil seal in principle.

5) Tighten socket bolts and plugs to specified torques, using a torque wrench.

(2) Assembly procedure

The figures in parentheses after part names in this manual represent those item numbers in the Fig. 5-1 and Fig. 5-2.

1) Assemble snap ring (432) and bearing spacer (106) into drive shaft (101). Heat the inner race of roller bearing (443) to 100～120℃ (212～248°F) and put it into the shaft. Then insert bearing spacer (106) and place snap ring (432).

⚠ Assemble the round corner side of the bearing into the bearing spacer (106) side.

2) Heat the inner race of roller bearing (444) to 100～120℃ (212～248°F), put it into drive shaft (101), and fit snap ring (433).

⚠ Assemble the round corner side of the bearing into the bearing spacer (106).

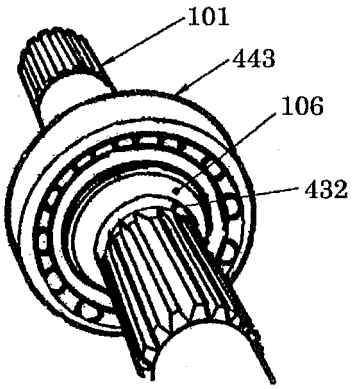


Fig.5-11 Fitting roller bearing (443)

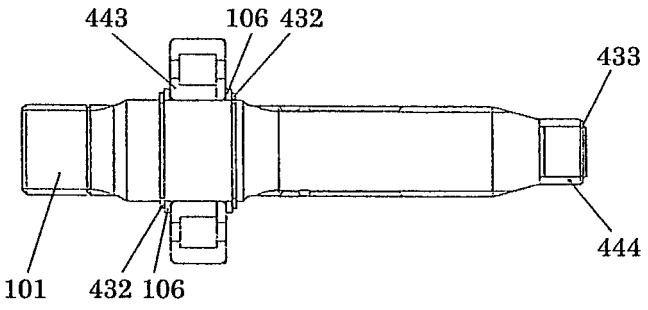


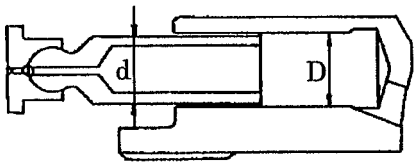
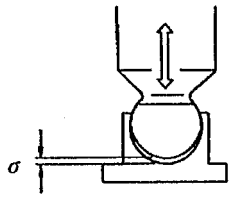
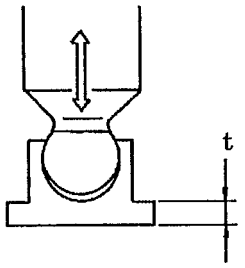
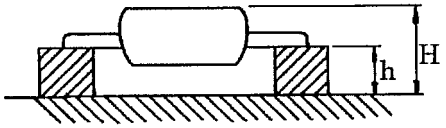
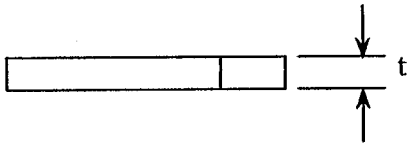
Fig.5-12 Fitting roller bearing (444)

5.4 MAINTENANCE STANDARDS

5.4.1 SWING MOTOR

(1) Replacement standards for parts

The following are the standards to determine whether or not parts may be reused from values taken at disassembly. These are only general standards and in case the motor displays poor performance or parts shows extreme damage and discoloration before disassembly, it is most important to determine which parts should be replaced, depending upon the purpose of disassembly and the remaining service life of the motor.

Item	Standard Dimension mm (in)	Recommended Value for Replacement mm (in)	Remedy
Clearance between piston and cylinder bore (D-d) 	0.032 (0.00126)	0.062 (0.00244)	Replace piston or cylinder.
Gap between piston and caulked part of shoe (σ) 	0	0.3 (0.0112)	Replace piston and shoe assy.
Thickness of shoe (t) 	6 (0.236)	5.8 (0.228)	Replace piston and shoe assy.
Assembled height of retainer plate and spherical bushing (H-h) 	7 (0.276)	6.5 (0.256)	Replace a spherical bushing and a retainer plate as a pair.
Thickness of friction plate 	4 (0.157)	3.6 (0.142)	Replace.

6.3 MAINTENANCE STANDARDS

6.3.1 INSPECTION PROCEDURE AND REMEDY

Table 6-3

Interval	Check Item	Checking Procedure	Remedy
2,000Hrs.	Seal for oil leakage outside	Check oil leakage outside	Replace O ring or dust seal , if any oil leakage can be found.
4,000Hrs. In principle, disassemble and check regardless of oil leakage or not.	All sealing parts		Replace all sealing parts such as slipper seal with back-up ring and O ring.
	All sliding parts	Check abnormal wear, scoring or corrosion caused by foreign matters or seizure.	Repair or replace referring to their limit of service.
When disassembled for repair	All parts	Check them for seizure, foreign matters, abnormal wear, and defect of seals.	Repair or replace referring to their limit of service. O rings and dust seal should be replaced.

6.3.2 SERVICE LIMIT OF THE PARTS

Table 6-4

Parts		Maintenance Standards	Remedy
Body, Stem	Sliding surface with sealing sections	Plating worn or peeled due to seizure or contamination.	Replace
	Sliding surface between body and stem other than sealing sections	1) Worn abnormally or damaged more than 0.1mm (0.004in) in depth due to seizure or contamination.	Replace
		2) Damaged less than 0.1mm (0.004in) in depth.	Smooth with oilstone.
	Sliding surface with thrust plate	1) Worn more than 0.5mm (0.02in) or abnormality.	Replace
		2) Worn less than 0.5mm (0.02in).	Smooth
		3) Damage due to seizure or contamination repairable within wear limit 0.5mm (0.02in).	Smooth
Cover	Sliding surface with thrust plate	1) Worn more than 0.5mm (0.02in) or abnormality.	Replace
		2) Worn less than 0.5mm (0.02in).	Smooth
		3) Damage due to seizure or contamination repairable within wear limit 0.5mm (0.02in).	Smooth

7) Removing floating seal (12). (Upper roller side)
Take out floating seal (12) from roller (1).

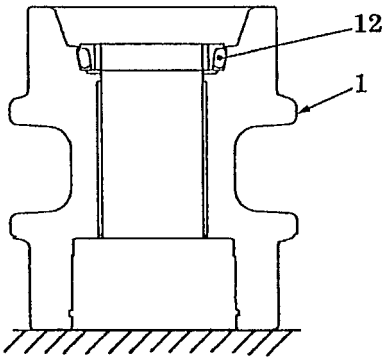


Fig. 3-6 Taking out floating seal

8) Removing floating seal (12). (Shaft side)
Remove from collar (3), floating seal (12) that is located on the side from which shaft (2) was disparted.

⚠ Collar (3) is press fitted into shaft (2). Therefore do not disassemble it.

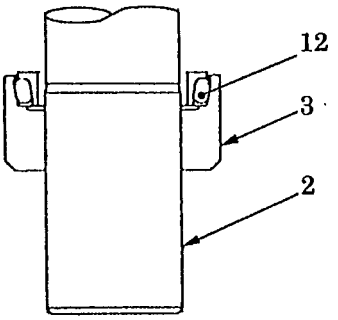


Fig. 3-7 Removing floating seal

9) Removing bushing (6)
Since the bushing is thin, machine it on a lathe or scrape it off, exercise care so as not to damage the bore of roller (1).

(2) Assembly
Assembly of the upper roller is done in the reverse order of disassembly.

1) Place upper roller (1) on the top end face of jig (f), with its floating seal setting side facing down.
2) Confirm that the outer surface of bushing (6) is not seized and coat the outer surface of the inserting side of the bushing, with molybdenum disulfide grease.
3) Put jig (i) into bushing (6) and press it in, using the bore of the bushing and the bore of the roller as guides.

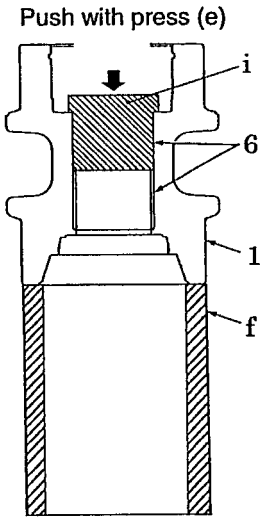


Fig. 3-8 Pushing in bushing

⚠ If you fail in this operation by pressing the bushing unevenly, the bushing is distorted and gets unserviceable. In that case, do not re-use the bushing as it may develop malfunctioning after assembly.

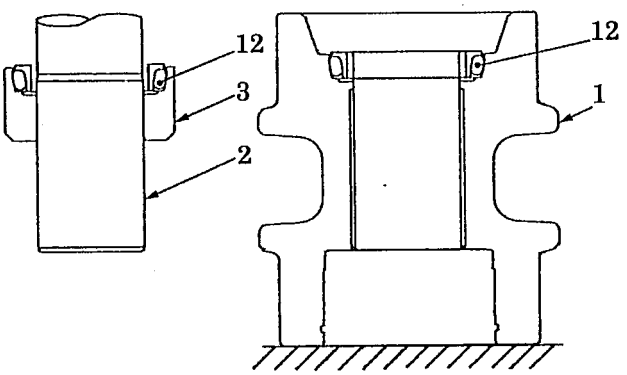


Fig. 3-9 Fixing floating seal

5) Removing bushing (4)
With idler (1) mounted on the stand, tap bushing (4) lightly by hammer, while placing the bushing drawing rod (T) against the end face of bushing (4) evenly all round, till it comes out.

6) Removing floating seals (6)
Take out floating seals (6) from idler (1), collar (2). If you intend to re-use floating seals (6), confirm that there is no scoring and rusting on the contact surface and store the floating seals in pairs by placing card board between the sealing faces.

7) Removing O ring (7)
Separate O ring (7) from shaft (3).

(2) Assembly

1) Pressing in bushing (4)
Align inner hole of idler (1) and bushing (4) and press fit it vertically with press so that jig (V) for bushing press-fitting is inserted into bushing (4).

2) Installing O ring (7)
Fit O ring (7) to O ring groove on shaft (3).

- Apply grease to O ring

3) Installing collar (2) (See Fig. 5-10)
Press fit the O ring (7) installed side of shaft (3) into collar (2), and drive pin (5).

4) Installing floating seal (6)
Fit the half of floating seal (6) on each side of collar (2) and idler (1).

5) Inserting idler (1)
Insert floating seal (6) fitted side of idler (1) into shaft (3).

6) Installing floating seal (6)
Fit floating seal (6) on the other side of idler (1).

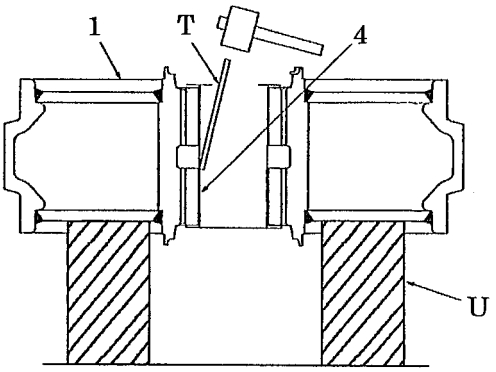


Fig. 5-8 Removing bushing (2)

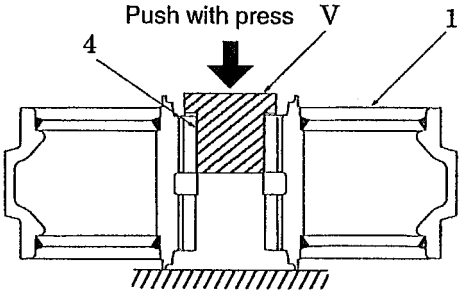


Fig. 5-9 Pressing in bushing (4)

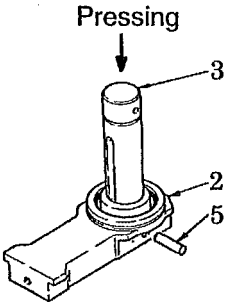


Fig. 5-10 Installing collar (2), shaft (3)

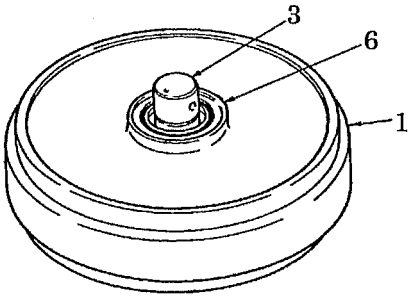
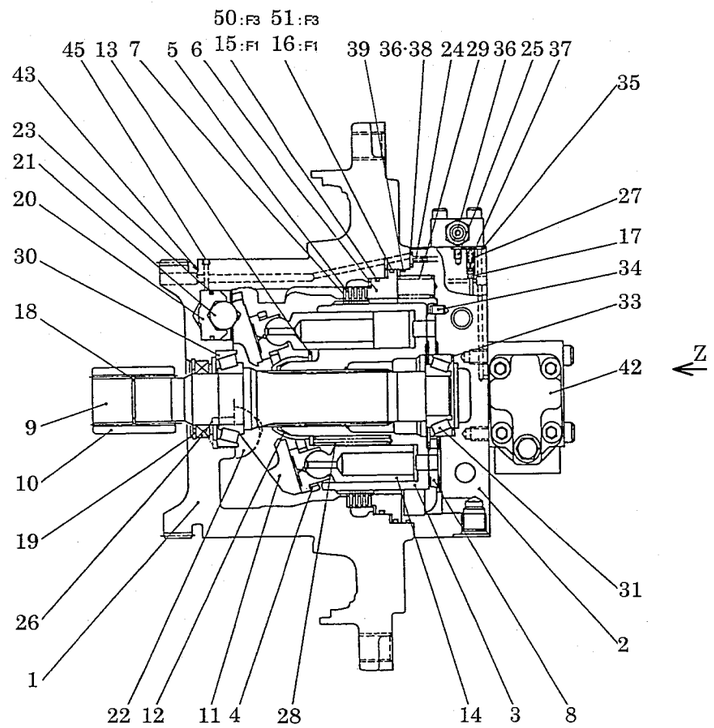
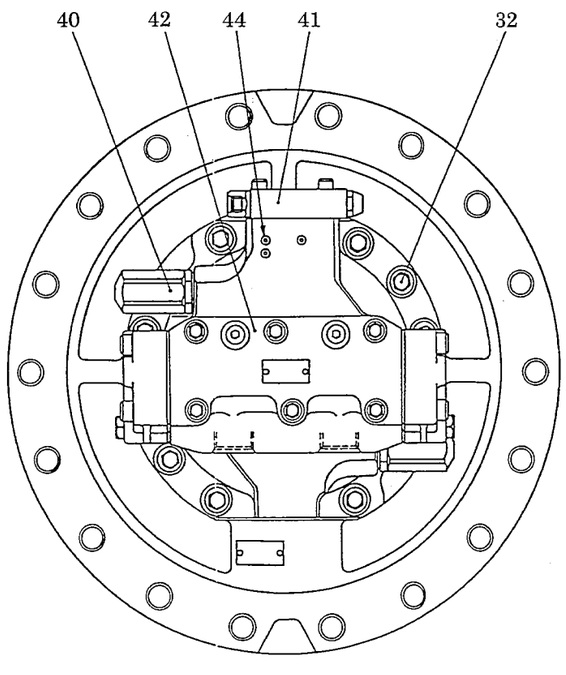


Fig. 5-11 Inserting idler (1) and installing floating seal (6)

1. REMOVAL AND INSTALLATION OF TRAVEL MOTOR UNIT

1.1 CONSTRUCTION OF TRAVEL MOTOR



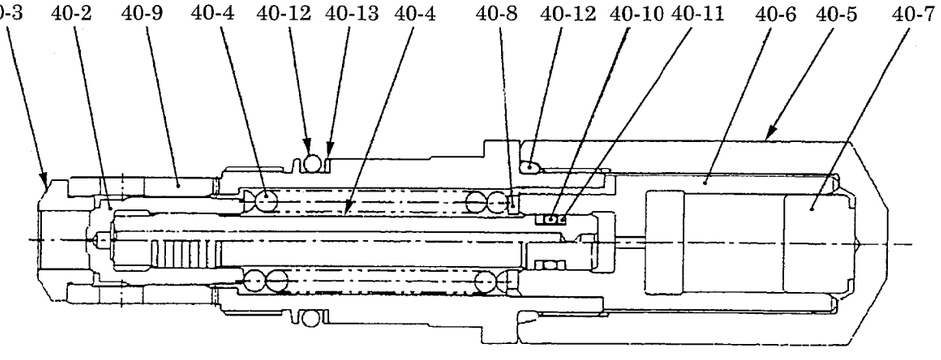


VIEW Z

Fig.1-1 Construction of travel motor

LC08-06261～, LC09-06323～ YC08-03039～, YC09-03088～			LC15V00007F3							
LC08-06201～ YC08-03001～			LC15V00007F1							
T. torque kgf·m(lbf·ft)	Opposing flats mm	No.	NAME	Q'TY		T. torque kgf·m(lbf·ft)	Opposing flats mm	No.	NAME	Q'TY	
		1	CASING	1	←			25	M6 ORIFICE ; Ø0.8	1	←
		2	REAR COVER	1	←			26	OIL SEAL	1	←
		3	CYLINDER BLOCK	1	←			27	SPRING	3	←
		4	SHOE RETAINER	1	←			28	SPRING(CYLINDER)	9	←
		5	FRICTION PLATE	4	←			29	SPRING(BRAKE)	14	←
		6	BRAKE PISTON	1	←			30	BEARING	1	←
		7	SEPARATOR PLATE	5	←			31	REAR BEARING	1	←
		8	VALVE PLATE	1	←	33 (240)	14	32	SOCKET BOLT ; M18×50	10	←
		9	SHAFT	1	←			33	SHIM	1or2	←
		10	COUPLING	1	←			34	PARALLEL PIN ; Ø8×12	1	←
		11	SHOE PLATE	1	←			35	O RING ; 1B P6	3	←
		12	BALL JOINT	1	←			36	O RING ; 1B P8	2	←
		13	SPRING RETAINER	1	←			37	O RING ; 1B P9	3	←
		14	PISTON ASSY	9	←			38	O RING ; 1B S10	1	←
		15	D RING (SMALL)	1	—			39	O RING ; 215.57×2.62	1	←
		16	D RING (LARGE)	1	—	10～12 (72～87)	32	40	OVER LOAD RELIEF VALVE ; M27	2	←
		17	CHECK VALVE	3	←			41	PILOT VALVE	1	←
		18	SNAP RING	1	←			42	BRAKE VALVE	1	←
		19	SNAP RING	1	←			43	PLUG ; NPT 1/16	—	1
		20	TILTING PISTON	1	←			44	PLUG ; NPT 1/16 MEC	—	4
		21	BALL	1	←			45	EXPANDER	—	1
		22	PIVOT	2	←			50	O RING ; Ø200	—	1
		23	PISTON SEAL	1	←			51	O RING ; Ø214 B	—	1
		24	M6 ORIFICE ; Ø0.6	1	←						

• Over load relief valve



Note) Quantities are worth one overload relief valve.

Tightening torque kgf·m(lbf·ft)	Opposing flats mm	No.	NAME	Q'TY	Tightening torque kgf·m(lbf·ft)	Opposing flats mm	No.	NAME	Q'TY
11 (80)	32	40-1	SOCKET	1			40-8	SHIM	1
		40-2	VALVE	1			40-9	ADJUSTMENT SPRING	1
		40-3	VALVE SEAT	1			40-10	O RING ; 1B P7	1
		40-4	CONNECTING PISTON	1			40-11	BACK UP RING	2
16 (120)	35	40-5	PLUG	1			40-12	O RING ; 1B G25	2
		40-6	PILOT BODY	1			40-13	BACK UP RING	1
		40-7	PISTON	1					

Inspection Item/Method	Criterion and Remedy
(5) Shaft Measure the wear of the shaft seal by means of a roughness meter.	Allowable stepped wear is up to 0.5mm (0.002in). ⚠ When the shaft is to be replaced, replace the oil seal (26) at the same time. When replacing the shaft, the thickness of shims (33) must be adjusted.
(6) Bearing Replace bearing	Replace bearing (30) and bearing (31) within 10,000 hours on the hour meter. ⚠ When replacing the bearings, replace the inner race and the outer race at the same time. When the bearings have been replaced, the thickness of shims (33) must be adjusted.
(7) Spline Replace spline if it is worn beyond its allowable limit.	Serviceable stepped wear is up to 0.3mm (0.012in) on the contact surface.
(8) Overload relief valve section This is the overload relief valve section. Pressure can not be checked and regulated without a special test bench.	Replace the sub assembly every 10,000 hours on the hour meter.

1.9 MAINTENANCE STANDARD

1.9.1 INSPECTION BEFORE REASSEMBLY

(1) Thrust washer

1) Check to see that there is no seizure, abnormal wear and uneven wear.
2) Check that the wear does not exceed an allowable value.

(2) Gears

1) There is no pitching and seizure on the gear tooth surface.
2) Inspect that the root of gears is not cracked by liquid penetrant examination technique.

(3) Bearing

Turn it by hand and check to see that it turns without unusual sound and resistance.

(4) Floating seal

Inspect that the moving parts and O rings are not scored.

1.9.2 SERVICING PARTS

The following are reference values by which the serviceability of used parts is determined. Since these serve as general reference, it is recommended that the extent of disassembly be decided depending upon performances, excessive damage or discoloration of components, the purpose of disassembly and remaining service life that is expected.

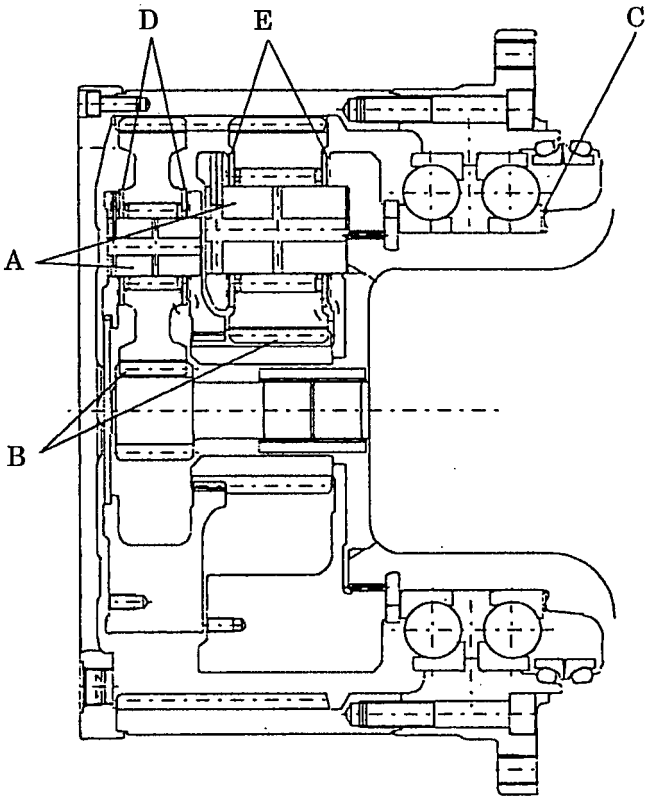


Fig.1-45

Maintenance Standard

Code	Item	Standard value	Allowable value	Remedy
A	Planetary shaft is worn.	To be smooth, no abnormal wear and seizure.	←	Replace 3 shafts as a set.
B	Tooth face and root condition	To be smooth, no abnormal wear and seizure.	No pitching over Ø1.6mm (0.063) and no crack at root of gear.	Replace3 planetary gears as a set.
C	Thrust clearance of angular bearing inner race	−0.08mm (0.0032) [Interference] to+0.02mm (0.0008) [Clearance]	←	Replace shims. [See.1.8 (6)]
D	Thickness of thrust washer 1	2.7±0.2mm (0.106±0.008)	Wear 0.1mm (0.004)	Replace
E	Thickness of thrust washer 2	3.2±0.2mm (0.126±0.008)	Wear 0.1mm (0.004)	Replace

1.2 HYDRAULIC PRESSURE MEASUREMENT BY SERVICE DIAGNOSIS

(1) Main circuit pressure.

E/G Hi, Full lever, at relief	E/G Hi, No load, at neutral
No.14 PRESS. SENSOR C—1 PUMP P1 3.3V 35M C—1 PUMP P2 3.3V 35M	Main pump P1,P2 0.7V 3.0M 0.7V 3.0M
No.15 PRESS. SENSOR B—16 P1 OPT. 4.5V 3.0M B—17 P2 OPT. 4.5V 3.0M	OPT 0.5V 0.0M 0.5V 0.0M
No.16 PRESS. SENSOR B—16 P1 NEGA-CON 0.5V 0.0M B—17 P2 NEGA-CON 0.5V 0.0M	Negative control P1,P2 3.0V 3.1M 3.0V 3.1M
No.19 PRESS. SENSOR B—15 BACK PRESS.	Back pressure (Nega-con pressure) 0.9V 0.3M

- Conversion for pressure
  1MPa=10.2kgf/cm²=145psi

(2) Secondary pilot pressure

(Att. operation No.①~⑧ Travel operation [1]~[4])

E/G Hi, Full lever, at relief	E/G Hi, No load, at neutral
No.9 PRESS. SENSOR B—1 BOOM RAISE 4.5V 3.0M B—2 BOOM LOWER 4.5V 3.0M	③ ④ 0.5V 0.0M 0.5V 0.0M
No.10 PRESS. SENSOR B—3 ARM OUT 4.5V 3.0M B—4 ARM IN 4.5V 3.0M	⑦ ⑧ 0.5V 0.0M 0.5V 0.0M
No.11 PRESS. SENSOR B—5 BUCKET DIG 4.5V 3.0M B—6 BUCKET DUMP 4.5V 3.0M	① ② 0.5V 0.0M 0.5V 0.0M
No.12 PRESS. SENSOR B—7 SWING (R) 4.5V 3.0M B—8 SWING (L) 4.5V 3.0M	⑥ ⑤ 0.5V 0.0M 0.5V 0.0M
No.13 PRESS. SENSOR B—9 TRAVEL (R) 4.5V 3.0M B—10 TRAVEL (L) 4.5V 3.0M	[1,2] [3,4] 0.5V 0.0M 0.5V 0.0M

LH. control lever		RH. control lever	
⑤	Swing left	①	Bucket digging
⑥	Swing right	②	Bucket dump
⑦	Arm in	③	Boom raise
⑧	Arm out	④	Boom lower

LH. travel lever		RH. travel lever	
[3]	Travel left reverse	[1]	Travel right reverse
[4]	Travel left forward	[2]	Travel right forward

(3) Solenoid primary pressure

Operation is not working		In operation
No.5 SOL. VALVE F—2 SWING-BRAKE		Swing P/B Swing & arm digging
COMP.	ON	OFF indication } 5.0M
MEAS.	ON	OFF indication } 5.0M
RELEASE SW	OFF	ON/OFF indication
No.6 SOL. VALVE F—3 1/2-TRAVEL		Travel 2-speed select
COMP.	OFF	ON indication } 5.0M
MEAS.	OFF	ON indication } 5.0M
SWITCH	OFF	ON/OFF indication
No.7 SOL. VALVE F—1 POWER UP		Boost pressure select
COMP.	OFF	ON indication } 5.0M
MEAS.	OFF	ON indication } 5.0M
SWITCH	OFF	ON/OFF indication

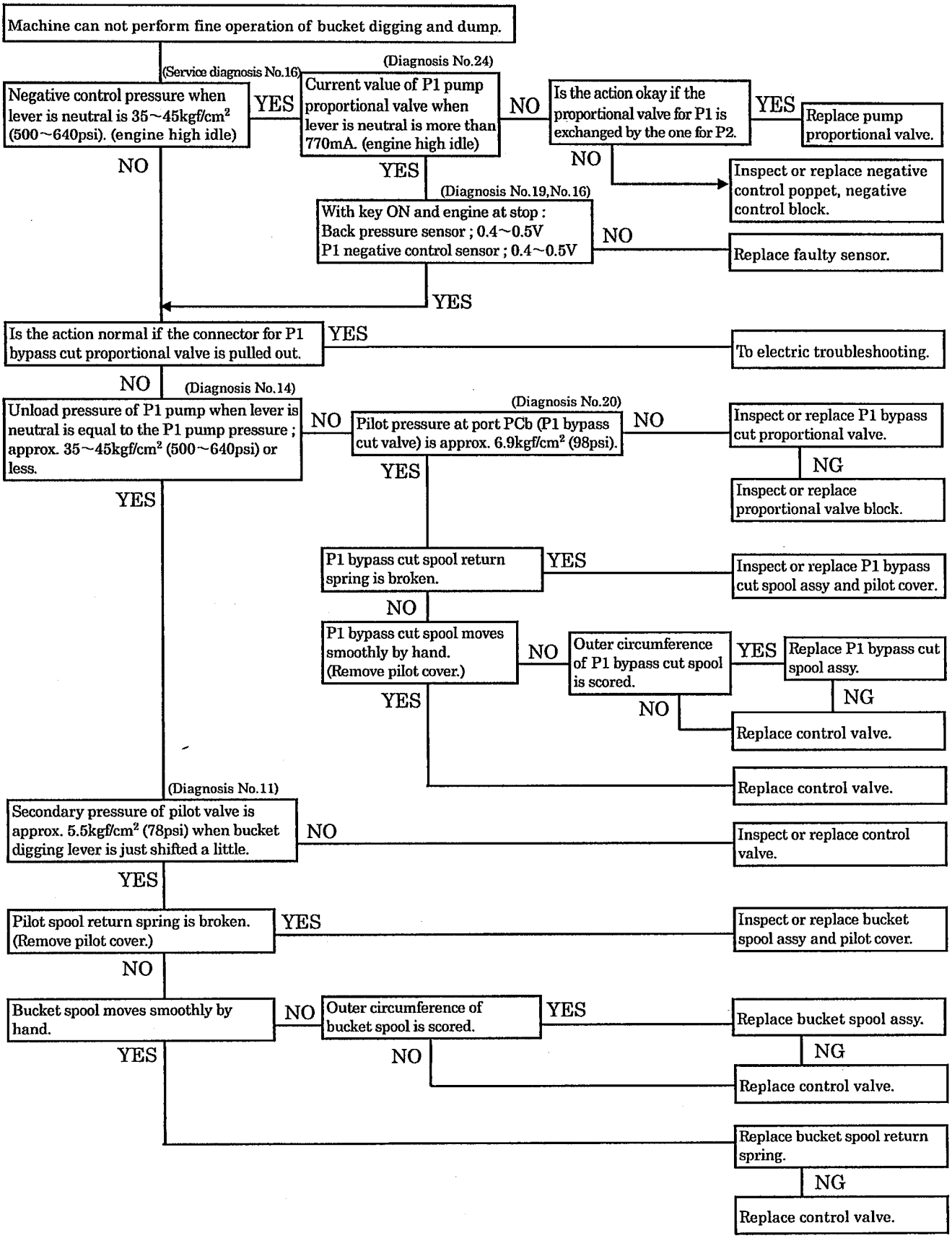
(4) Solenoid proportional valve secondary pressure

E/G Hi, Full lever ※ operation			E/G Hi, No load, at neutral	
No.20 PROPO-VALVE D—1 P1 BYPASS			P1 bypass cut	
COMP.	647mA	2.4M	350mA	0.6M
MEAS.	642mA	2.4M	345mA	0.6M
No.21 PROPO-VALVE D—2 P2 BYPASS			P2 bypass cut	
COMP.	647mA	2.4M	350mA	0.6M
MEAS.	642mA	2.4M	345mA	0.6M
No.22 PROPO-VALVE D—3 TRAVEL STRAIGHT			Travel straight	
COMP.	647mA	2.4M	350mA	0.6M
MEAS.	642mA	2.4M	345mA	0.6M
No.23 PROPO-VALVE D—6 A-RECIRCULAT			Arm variable recirculation	
COMP.	510mA	1.6M	713mA	2.8M
MEAS.	510mA	1.6M	712mA	2.8M
No.24 PROPO-VALVE E—1 P1 PUMP			P1 pump	
COMP.	350mA	0.6M	770mA	3.0M
MEAS.	345mA	0.6M	770mA	3.0M
POWER SHIFT	0mA			
No.25 PROPO-VALVE E—2 P2 PUMP			P2 pump	
COMP.	350mA	0.6M	770mA	3.0M
MEAS.	345mA	0.6M	765mA	3.0M
POWER SHIFT	0mA			
No.42 PROPO-VALVE D—13 SW. PRIORITY			Swing priority	
COMP.	657mA	2.5M	350mA	0.6M
MEAS.	652mA	2.5M	345mA	0.6M

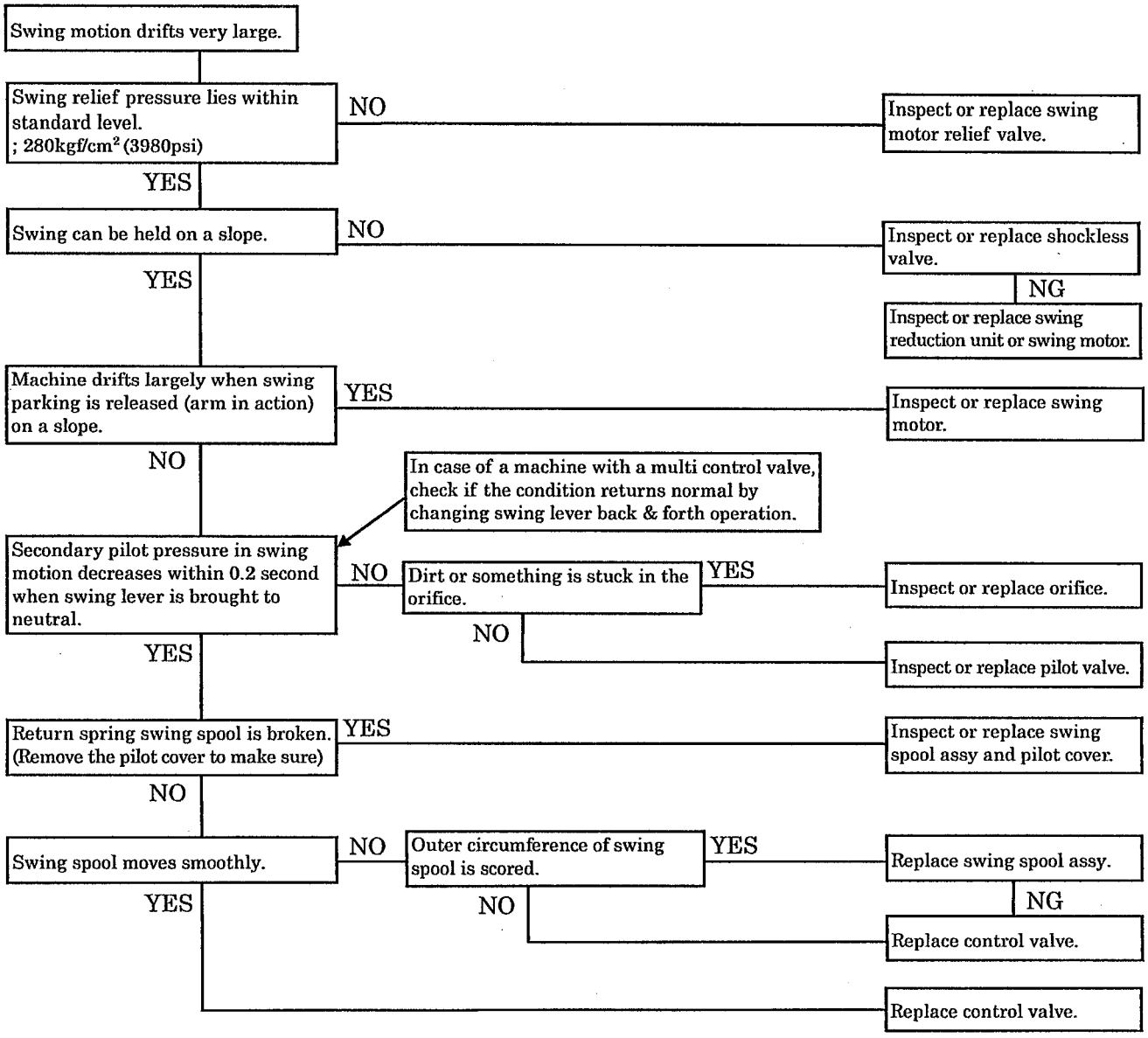
NOTE ; ※OPERATION

No.20 ARM OUT or ARM IN RELIEF OPERATION
No.21 BOOM RAISE RELIEF OPERATION
No.22 ARM IN RELIEF OPERATION
No.23 ARM IN OPERATION LEVER TURNED TO FULL (At 200mA ARM IN RELIEF)
No.24 DURING BUCKET DIGGING OPERATION
No.25 DURING ARM IN OPERATION

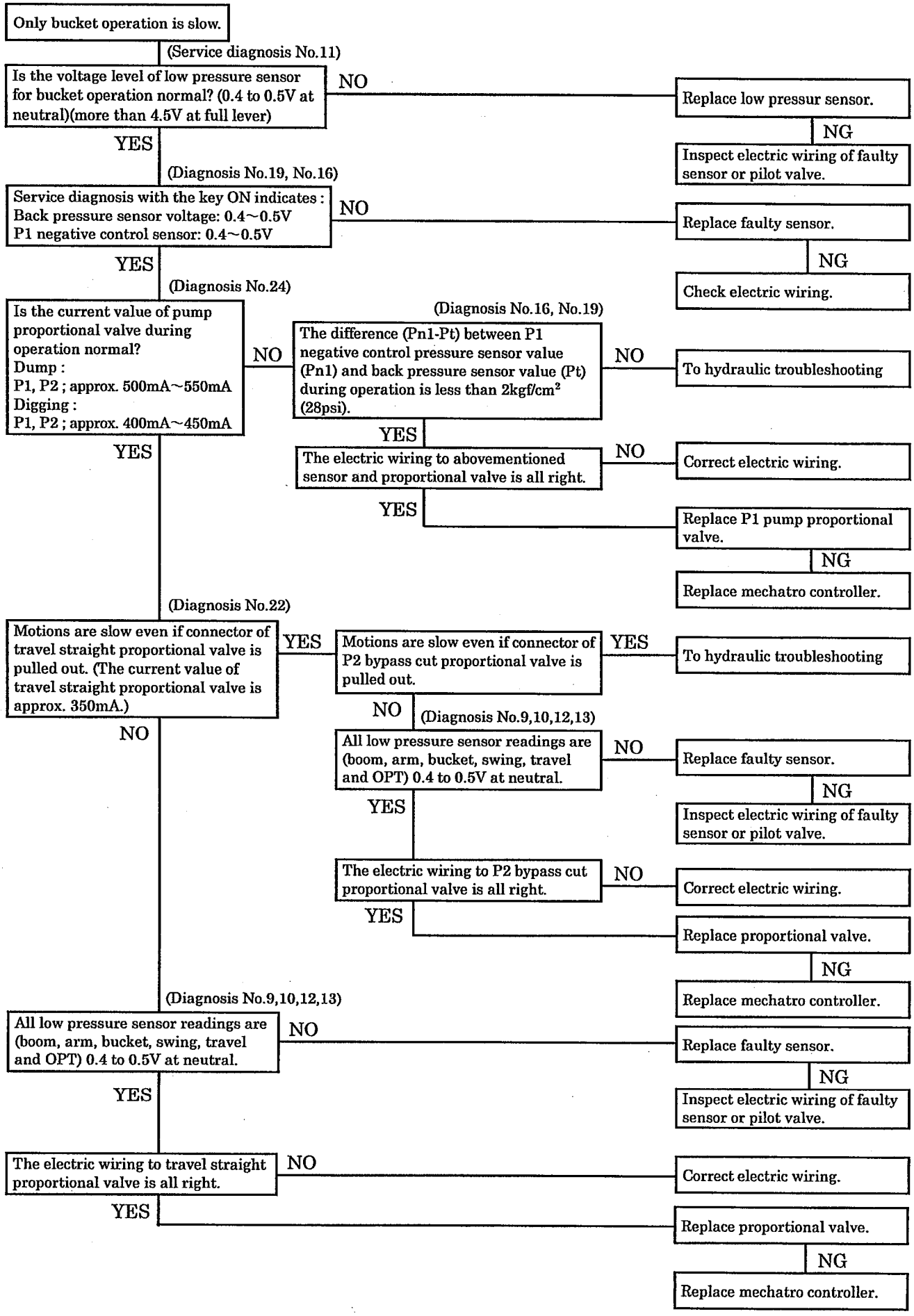
(4)-1


Machine can not perform fine operation of bucket digging and dump.
(Service diagnosis No.16)
Negative control pressure when lever is neutral is 35~45kgf/cm² (500~640psi). (engine high idle)
YES
(Diagnosis No.24)
Current value of P1 pump proportional valve when lever is neutral is more than 770mA. (engine high idle)
NO
Is the action okay if the proportional valve for P1 is exchanged by the one for P2.
YES
Replace pump proportional valve.
NO
Inspect or replace negative control poppet, negative control block.
YES
(Diagnosis No.19,No.16)
With key ON and engine at stop :
Back pressure sensor ; 0.4~0.5V
P1 negative control sensor ; 0.4~0.5V
NO
Replace faulty sensor.
NO
YES
Is the action normal if the connector for P1 bypass cut proportional valve is pulled out.
YES
To electric troubleshooting.
NO
(Diagnosis No.14)
Unload pressure of P1 pump when lever is neutral is equal to the P1 pump pressure ; approx. 35~45kgf/cm² (500~640psi) or less.
NO
(Diagnosis No.20)
Pilot pressure at port PCb (P1 bypass cut valve) is approx. 6.9kgf/cm² (98psi).
NO
Inspect or replace P1 bypass cut proportional valve.
NG
Inspect or replace proportional valve block.
YES
YES
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
NO
Replace control valve.
YES
Replace control valve.
(Diagnosis No.11)
Secondary pressure of pilot valve is approx. 5.5kgf/cm² (78psi) when bucket digging lever is just shifted a little.
NO
Inspect or replace control valve.
YES
Pilot spool return spring is broken. (Remove pilot cover.)
YES
Inspect or replace bucket spool assy and pilot cover.
NO
Bucket spool moves smoothly by hand.
NO
Outer circumference of bucket spool is scored.
YES
Replace bucket spool assy.
NG
YES
NO
Replace control valve.
Replace bucket spool return spring.
NG
Replace control valve.

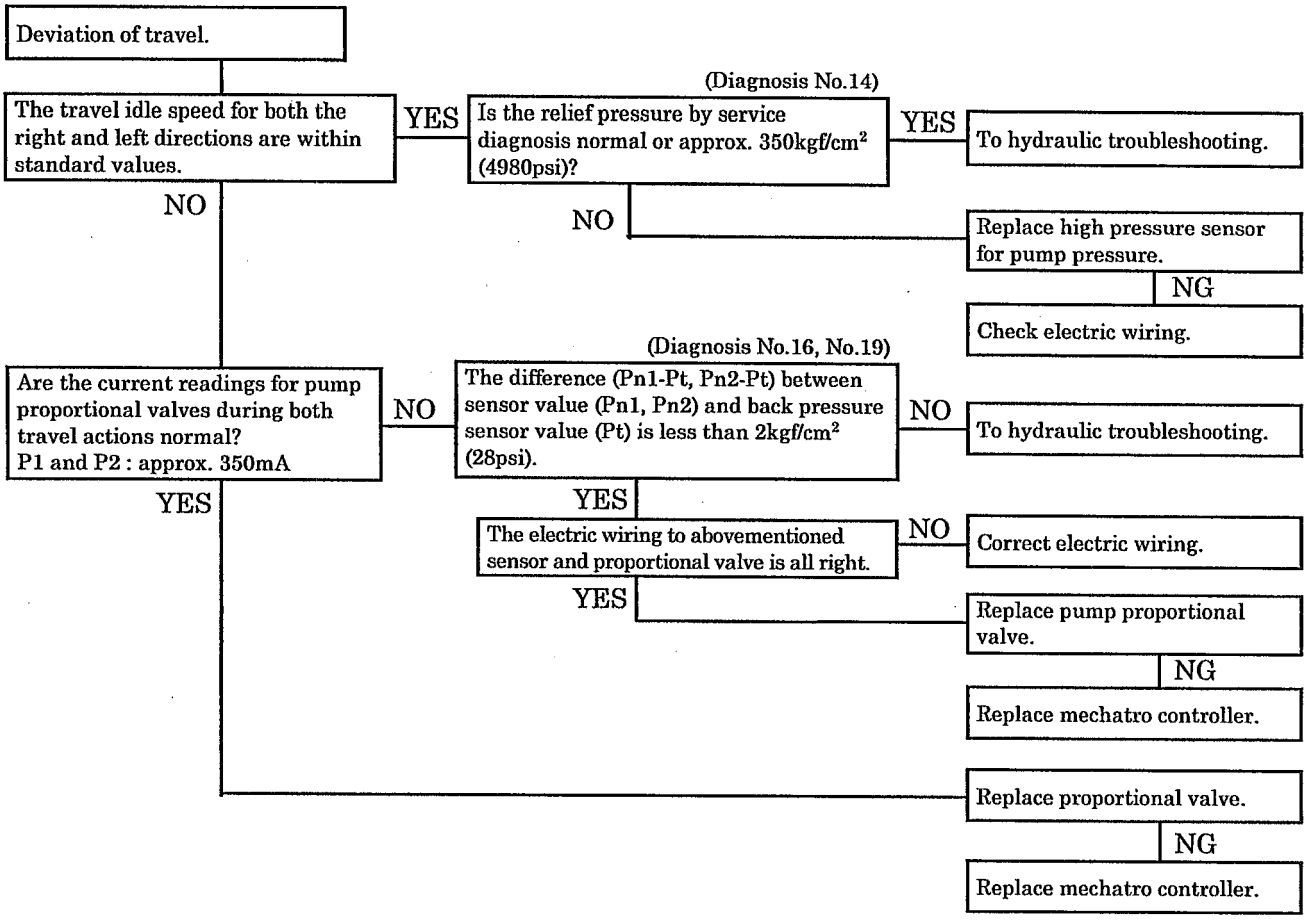
(12)-2


Swing motion drifts very large.
Swing relief pressure lies within standard level.
; 280kgf/cm² (3980psi)
NO
Inspect or replace swing motor relief valve.
YES
Swing can be held on a slope.
NO
Inspect or replace shockless valve.
NG
Inspect or replace swing reduction unit or swing motor.
YES
Machine drifts largely when swing parking is released (arm in action) on a slope.
YES
Inspect or replace swing motor.
NO
In case of a machine with a multi control valve, check if the condition returns normal by changing swing lever back & forth operation.
Secondary pilot pressure in swing motion decreases within 0.2 second when swing lever is brought to neutral.
NO
Dirt or something is stuck in the orifice.
YES
Inspect or replace orifice.
NO
Inspect or replace pilot valve.
YES
Return spring swing spool is broken. (Remove the pilot cover to make sure)
YES
Inspect or replace swing spool assy and pilot cover.
NO
Swing spool moves smoothly.
NO
Outer circumference of swing spool is scored.
YES
Replace swing spool assy.
NG
NO
Replace control valve.
YES
Replace control valve.

(2)-2


Only bucket operation is slow.
(Service diagnosis No.11)
Is the voltage level of low pressure sensor for bucket operation normal? (0.4 to 0.5V at neutral)(more than 4.5V at full lever)
NO
Replace low pressur sensor.
NG
Inspect electric wiring of faulty sensor or pilot valve.
YES
(Diagnosis No.19, No.16)
Service diagnosis with the key ON indicates :
Back pressure sensor voltage: 0.4~0.5V
P1 negative control sensor: 0.4~0.5V
NO
Replace faulty sensor.
NG
Check electric wiring.
YES
(Diagnosis No.24)
Is the current value of pump proportional valve during operation normal?
Dump :
P1, P2 ; approx. 500mA~550mA
Digging :
P1, P2 ; approx. 400mA~450mA
NO
(Diagnosis No.16, No.19)
The difference (Pn1-Pt) between P1 negative control pressure sensor value (Pn1) and back pressure sensor value (Pt) during operation is less than 2kgf/cm² (28psi).
NO
To hydraulic troubleshooting
YES
The electric wiring to abovementioned sensor and proportional valve is all right.
NO
Correct electric wiring.
YES
Replace P1 pump proportional valve.
NG
Replace mechatro controller.
YES
(Diagnosis No.22)
Motions are slow even if connector of travel straight proportional valve is pulled out. (The current value of travel straight proportional valve is approx. 350mA.)
YES
Motions are slow even if connector of P2 bypass cut proportional valve is pulled out.
YES
To hydraulic troubleshooting
NO
(Diagnosis No.9,10,12,13)
All low pressure sensor readings are (boom, arm, bucket, swing, travel and OPT) 0.4 to 0.5V at neutral.
NO
Replace faulty sensor.
NG
Inspect electric wiring of faulty sensor or pilot valve.
YES
The electric wiring to P2 bypass cut proportional valve is all right.
NO
Correct electric wiring.
YES
Replace proportional valve.
NG
Replace mechatro controller.
NO
(Diagnosis No.9,10,12,13)
All low pressure sensor readings are (boom, arm, bucket, swing, travel and OPT) 0.4 to 0.5V at neutral.
NO
Replace faulty sensor.
NG
Inspect electric wiring of faulty sensor or pilot valve.
YES
The electric wiring to travel straight proportional valve is all right.
NO
Correct electric wiring.
YES
Replace proportional valve.
NG
Replace mechatro controller.

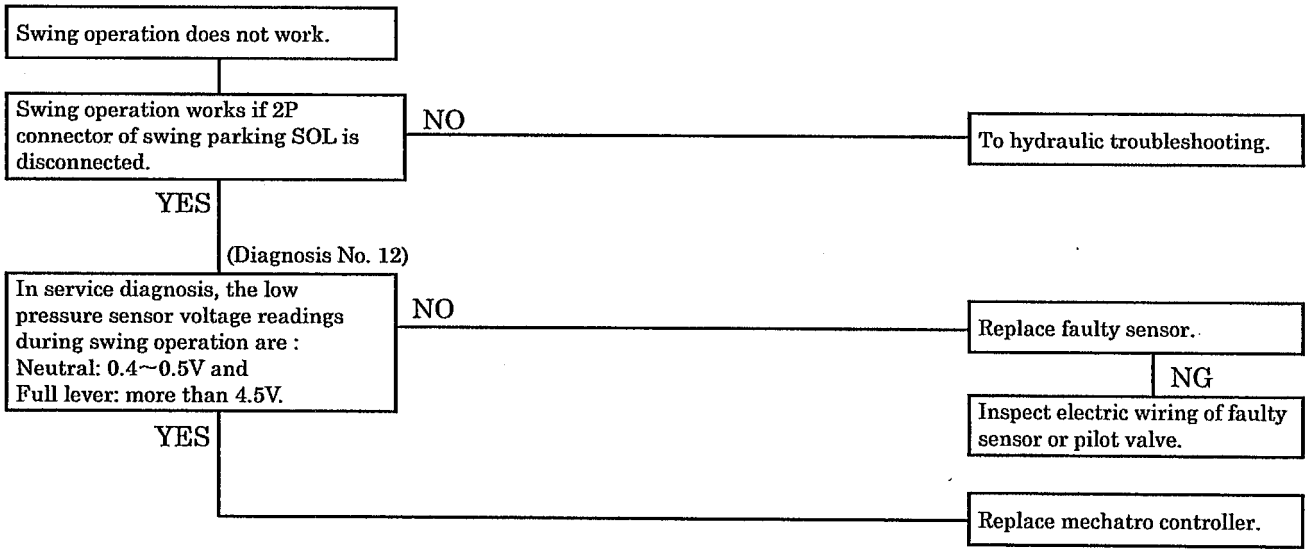
(8)-2


Deviation of travel.
The travel idle speed for both the right and left directions are within standard values.
YES
(Diagnosis No.14)
Is the relief pressure by service diagnosis normal or approx. 350kgf/cm² (4980psi)?
YES
To hydraulic troubleshooting.
NO
NO
Replace high pressure sensor for pump pressure.
NG
Check electric wiring.
(Diagnosis No.16, No.19)
Are the current readings for pump proportional valves during both travel actions normal?
P1 and P2 : approx. 350mA
NO
The difference (Pn1-Pt, Pn2-Pt) between sensor value (Pn1, Pn2) and back pressure sensor value (Pt) is less than 2kgf/cm² (28psi).
NO
To hydraulic troubleshooting.
YES
YES
The electric wiring to abovementioned sensor and proportional valve is all right.
NO
Correct electric wiring.
YES
Replace pump proportional valve.
NG
Replace mechatro controller.
YES
Replace proportional valve.
NG
Replace mechatro controller.

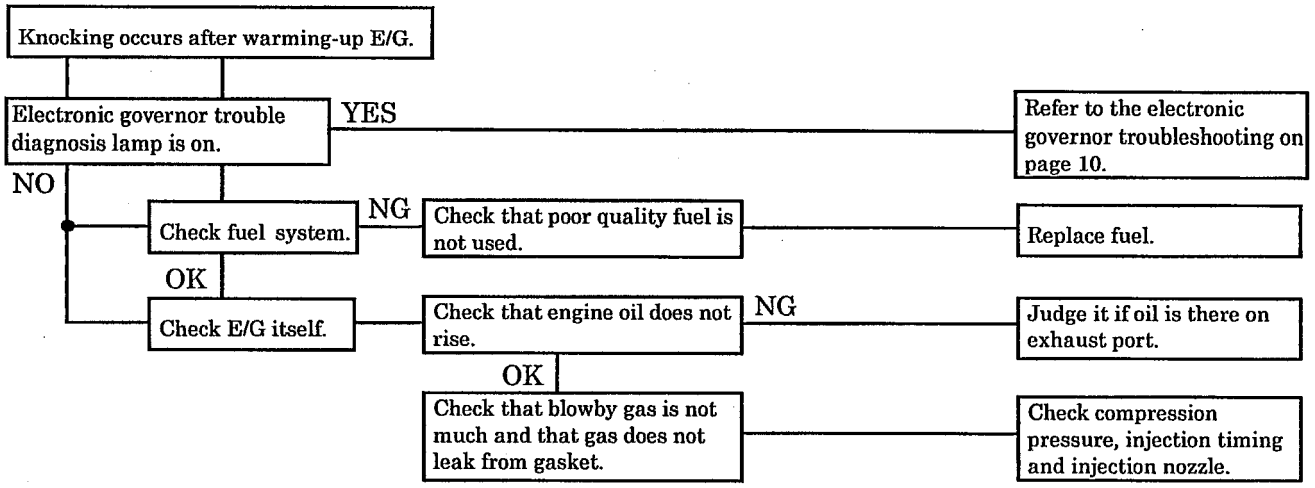
(9)


Machine drifts on a slope.
To hydraulic troubleshooting.

(10)

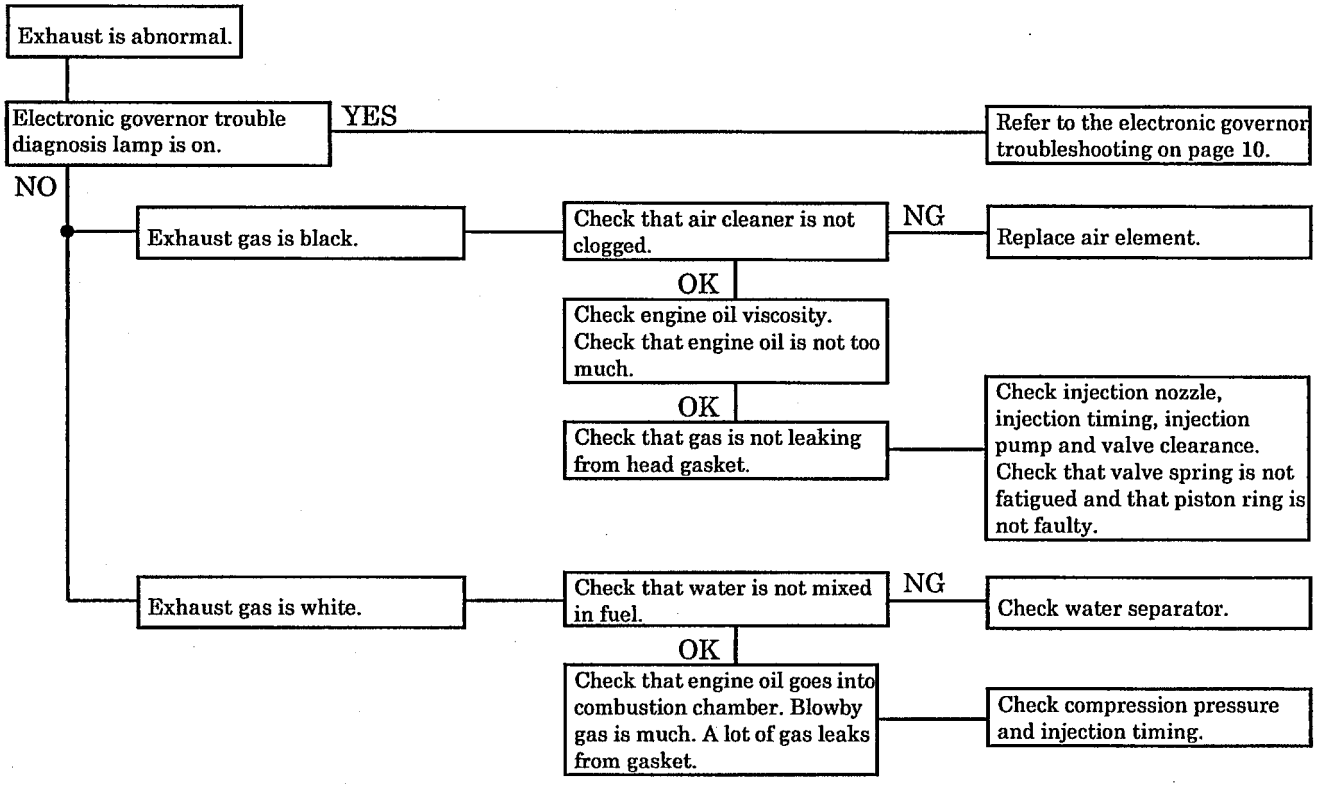

Swing operation does not work.
Swing operation works if 2P connector of swing parking SOL is disconnected.
NO
To hydraulic troubleshooting.
YES
(Diagnosis No. 12)
In service diagnosis, the low pressure sensor voltage readings during swing operation are :
Neutral: 0.4~0.5V and
Full lever: more than 4.5V.
NO
Replace faulty sensor.
NG
Inspect electric wiring of faulty sensor or pilot valve.
YES
Replace mechatro controller.

(5)

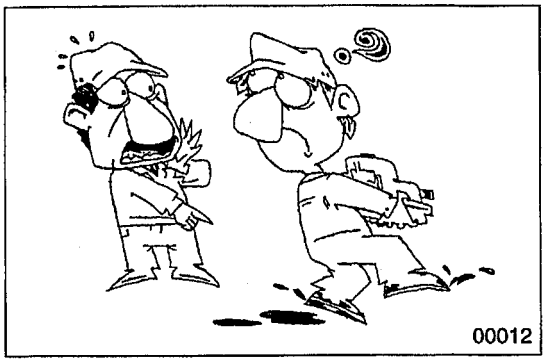


Checking condition ; Engine coolant temperature is more than 50℃ (122℉).

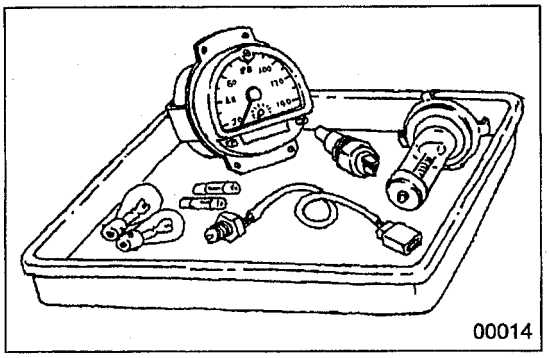
(6)



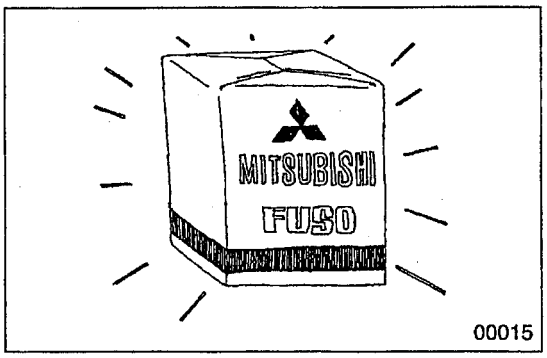
Checking condition ; Engine coolant temperature is more than 50℃ (122℉).


00012

Be particularly careful not to work in shoes that have oily soles and are slippery. When working as a team of two or more, arrange signals in advance and keep confirming safety. Be careful not to accidentally bump switches or levers.

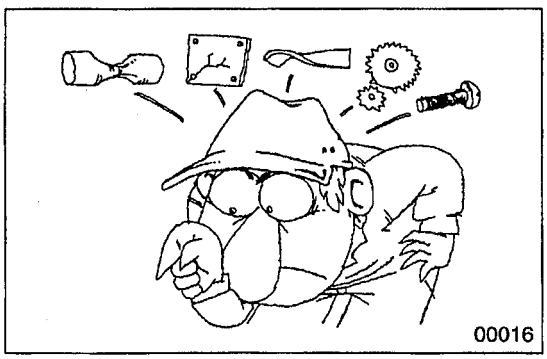

00014

Check for oil leakage before cleaning the area having the fault otherwise you might miss detecting the leakage.
Prepare replacement part(s) beforehand.



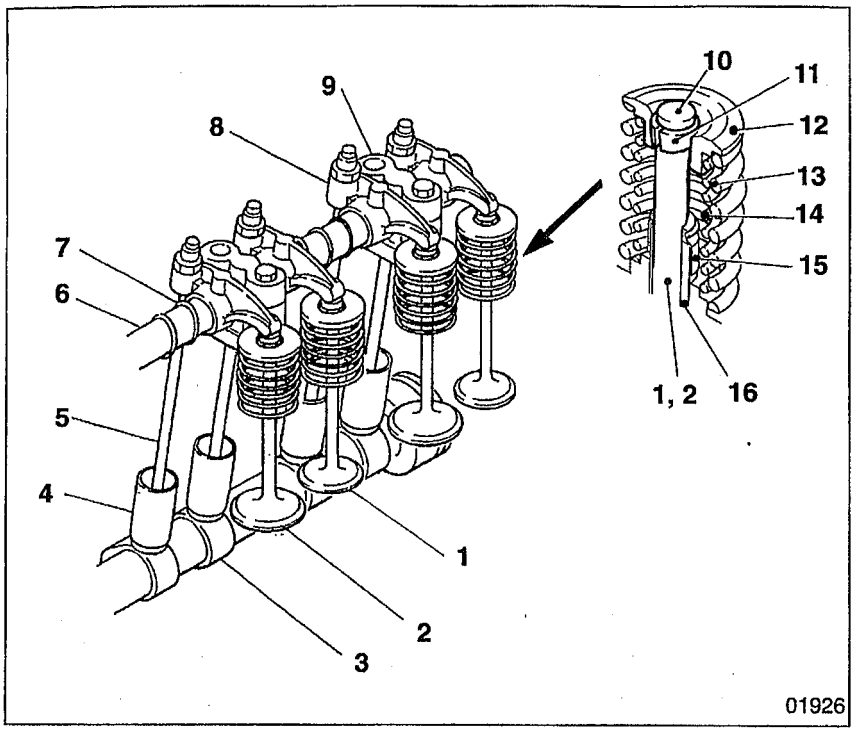
00015

Replace oil seals, packing, O-rings and other rubber parts; gaskets and split pins with new parts whenever any of them has been removed. Use only genuine MITSUBISHI replacement parts.


00016

On disassembly, visually inspect all parts for wear and tear, cracks, damage, deformation, degradation, rust, corrosion, smoothness in rotation, fatigue, clogging and any other possible defect.

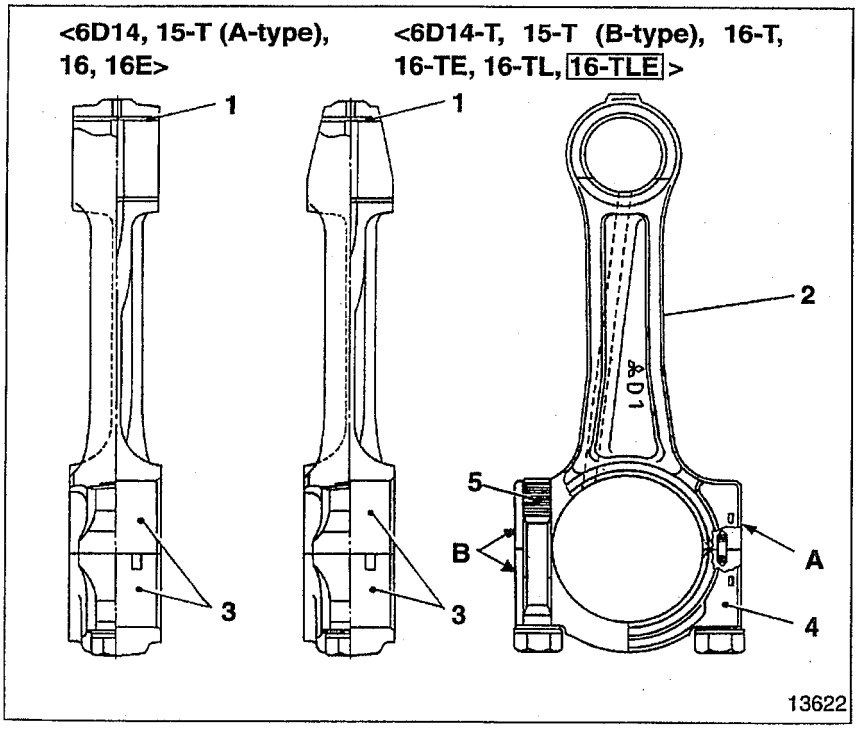
2. Valve Mechanism



1 Exhaust valve
2 Inlet valve
3 Camshaft
4 Tappet
5 Push rod
6 Rocker shaft
7 Rocker shaft spring
8 Rocker
9 Rocker shaft bracket
10 Valve cap
11 Valve cotter
12 Upper retainer
13 Outer valve spring
14 Inner valve spring
15 Valve stem seal
16 Valve guide

- The valve stem seals **15** are fitted onto the valves **1**, **2** to control the amount of lubricant flowing onto the sliding surfaces of the valves **1**, **2** and valve guides **16**.
- The valve springs **13**, **14** are unevenly pitched to prevent abnormal vibration at high speeds. To prevent the inner and outer springs from meshing with each other, the springs are wound in opposite directions.
- To facilitate removal and reinstallation of the camshaft from the rear end of the crankcase, the diameter of each bushing is smaller toward the front of the engine.

3. Connecting Rods

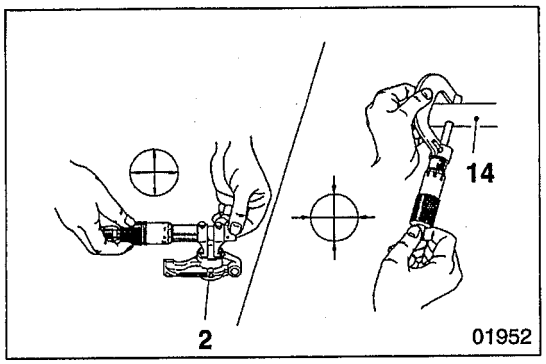


1 Connecting rod bushing
2 Connecting rod
3 Connecting rod bearing
4 Connecting rod cap
5 Connecting rod bolt

A: Alignment mark
B: Weight mark stamp
(A, B, C, D, E, F, G, H, I, V, W, X, Y, Z: <except 6D16-TLE>)
(A, B, C, D, E, F: <6D16-TLE>)

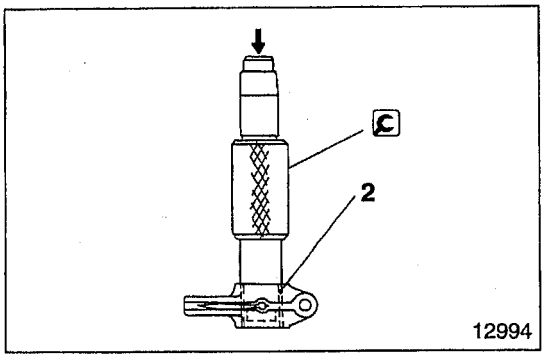
◆ Service procedure

2 14 Rocker bushing and rocker shaft

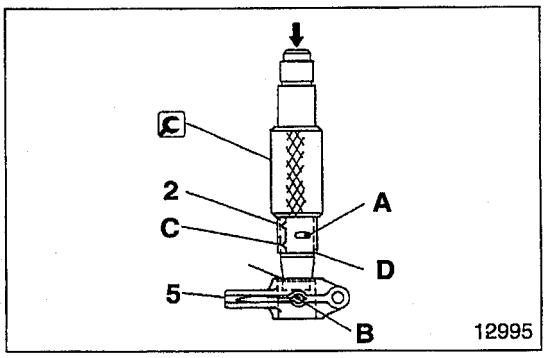


[Inspection]
If any clearance exceeds the specified limit, replace the defective part(s).

Rocker bushing



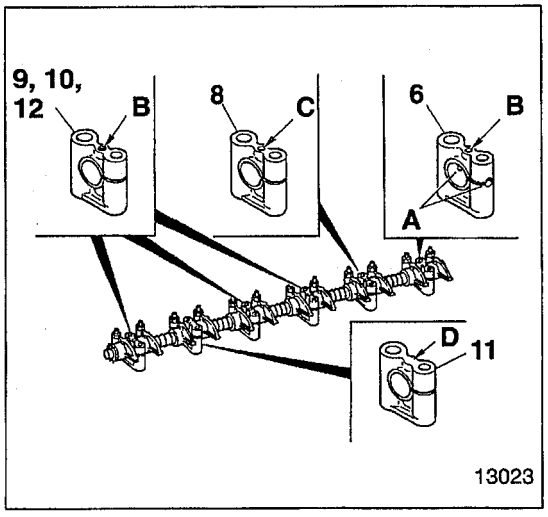
[Removal]



[Installation]

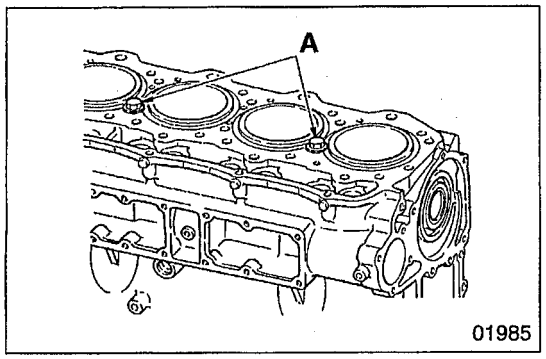
- Align the oil hole **A** in the rocker bushing **2** with the oil hole **B** in the rocker **5**.
- Position the notch **C** and seam **D** on the rocker bushing **2** as shown.
- Install the rocker bushing **2** into the rocker **5** from the chamfered side **F**.

6 8 to 12 14 Installing rocker shaft brackets and rocker shaft



Rocker shaft brackets
Be sure to fit the rocker shaft brackets **6**, **8**, **12** in their correct positions.

A: Oil hole
B: Threaded hole (for M8 rocker cover bolt)
C: Threaded hole (for M6 set screw)
D: No threaded hole



◆ Service procedure

● Pre-disassembly inspection

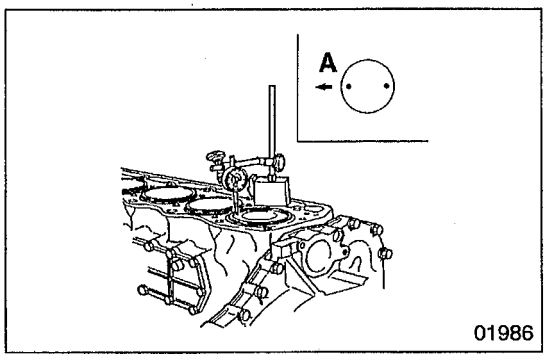
(1) Piston projection from crankcase top surface

NOTE

The piston projections affect engine performance and must therefore be checked.

WARNING ⚠

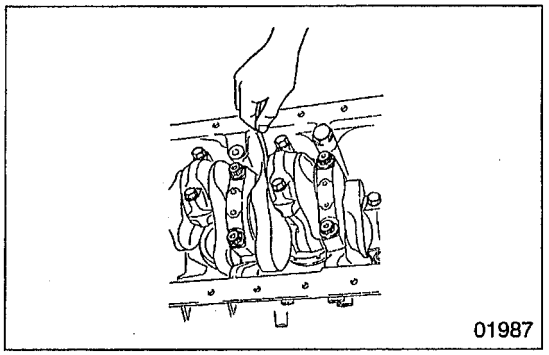
With 6D16, 16-E, 16-T, 16-TE, 16-TL and 16-TLE engines, the cylinder liners may rise out of position when the crankcase is turned over or the crankshaft is turned. Hold their flanges down using bolts and washers A.



- Measure the projection of each piston at two points and calculate the average of the two values.

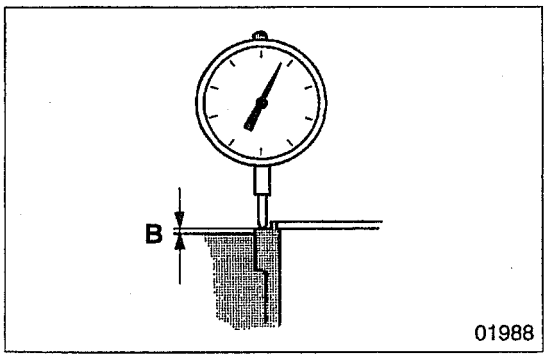
A: Front of engine

- If the average value is out of specification, check the clearances between all relevant parts.



(2) Connecting rod end play

- Measure the end play of every connecting rod.
- If any measurement exceeds the specified limit, replace the defective part(s).



(3) Cylinder liner flange projection

If any measurement is out of specification, replace the defective part(s).

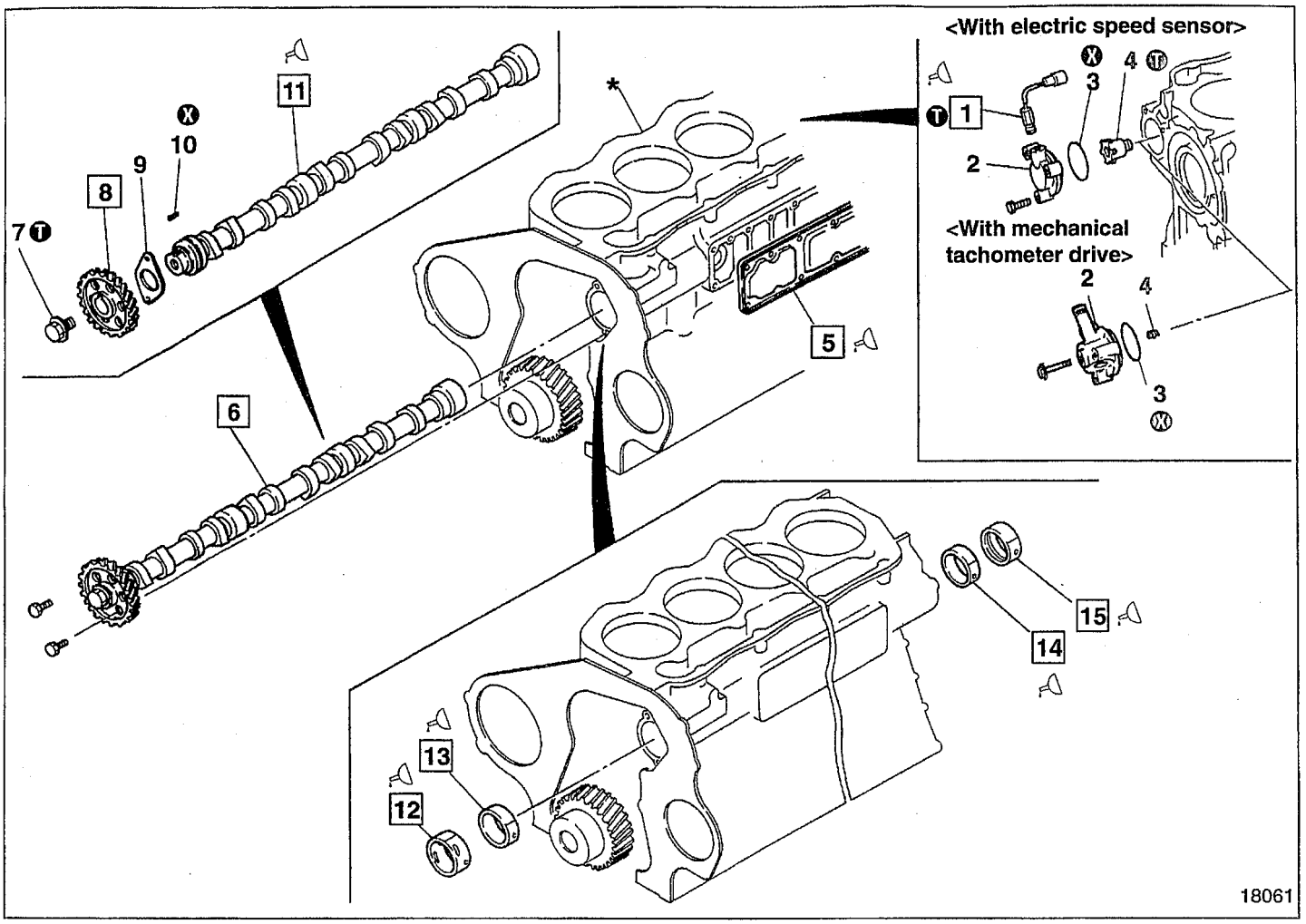
B: Flange projection

CAUTION ⚠

If the cylinder liner 6 flange projection is insufficient, bearing pressure on the cylinder head gasket will be too low in the region of the bore, possibly causing gas to leak.

MEMO

CAMSHAFT



● **Pre-disassembly inspection**

📖 P.11-66

● **Disassembly sequence**

1 Engine speed sensor <models with electric speed sensor>
2 Adapter <models with electric speed sensor>
Tachometer drive case <models with mechanical tachometer>
3 O-ring
4 Pulse rotor <models with electric speed sensor>
Tachometer drive coupling <models with mechanical tachometer>
5 Side cover
6 Camshaft assembly
7 Bolt
8 Camshaft gear
9 Thrust plate
10 Key
11 Camshaft
12 No. 4 camshaft bushing
13 No. 3 camshaft bushing
14 No. 2 camshaft bushing
15 No. 1 camshaft bushing

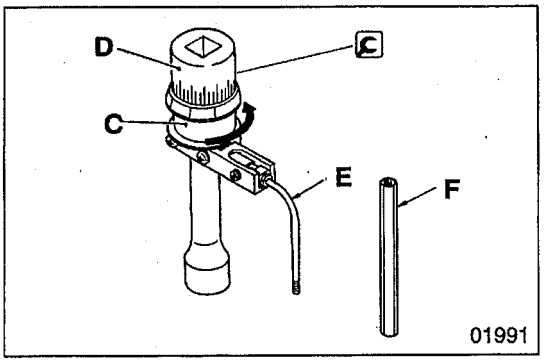
*: Crankcase 📖 P.11-72
Ⓧ: Non-reusable part

NOTE

- **Do not remove the engine speed sensor 1 unless defects are evident.**
- **Do not remove the camshaft gear 8 unless defects are evident.**

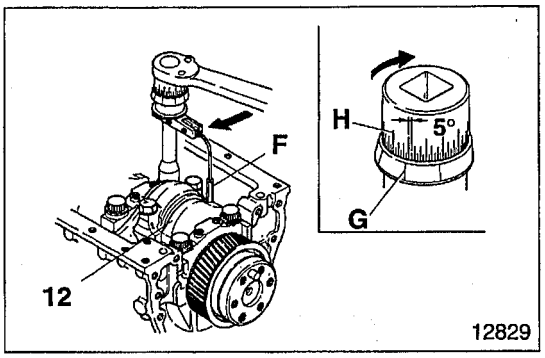
● **Assembly sequence**

Reverse the order of disassembly.



- Tighten the bolts **8** to the specified torque. Then, turn the bolts further in accordance with the following procedure:
- Turn the holder **C** of the [C] Socket Wrench counter-clockwise to tension the built-in spring.

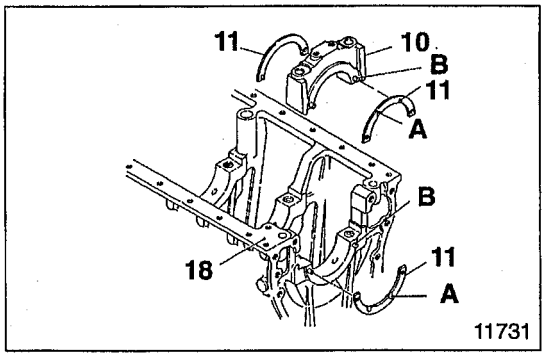
D: Socket
E: Rod
F: Rod (extension)



- Set the socket wrench such that the built-in spring force forces the rod **F** against the crankshaft assembly **12**.
- On the holder **C**, select the inscribed line **G** that is easiest to see.
- Using the selected line as a reference, turn the socket **D** 90° clockwise. (One gradation on the scale **H** represents 5°.)

CAUTION ⚠

Since the bolts utilize the plastic region tightening method, they must not be tightened further after this procedure.



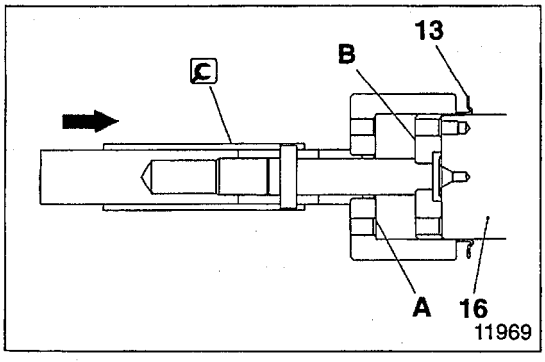
[11] Installing thrust plates

Fit a thrust plate **11** on each side of the main bearing caps **10** and at the rear end of the crankcase **18** such that the oil grooves **A** are on the outside.

B: Locating pin

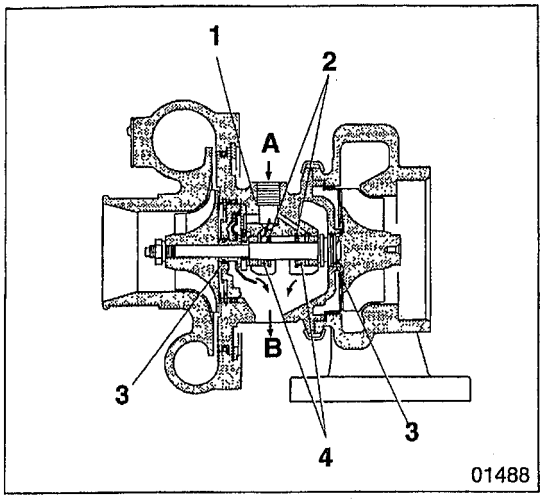
NOTE

If oversize thrust plates 11 are used, they must be fitted on both sides of the bearing caps 10. Ensure that the bearing cap rear thrust plates and the rearmost thrust plate in the crankcase 18 are the same size. Note, however, that the front and rear thrust plates on each bearing cap may be of different sizes.



[13] Installing front oil seal slinger

Using the [C] Front Oil Seal Slinger Installer, drive the front oil seal slinger **13** onto the crankshaft **16** until the tool's end face **A** is pressed firmly against the guide **B**.

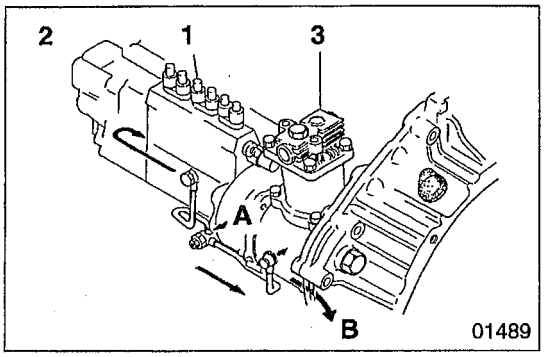


● **Turbocharger <6D14-T, 15-T, 16-T, 16-TE, 16-TL, 16-TLE>**

1 Bearing housing
2 Snap ring
3 Piston ring
4 Bearing

A: From main oil gallery
B: To oil pan

Via an oil pipe, engine oil is delivered from the main oil gallery to the bearing housing **1** to lubricate the inside of the bearing housing. At each end of the turbine wheel shaft, piston ring **3** acts as an oil seal.

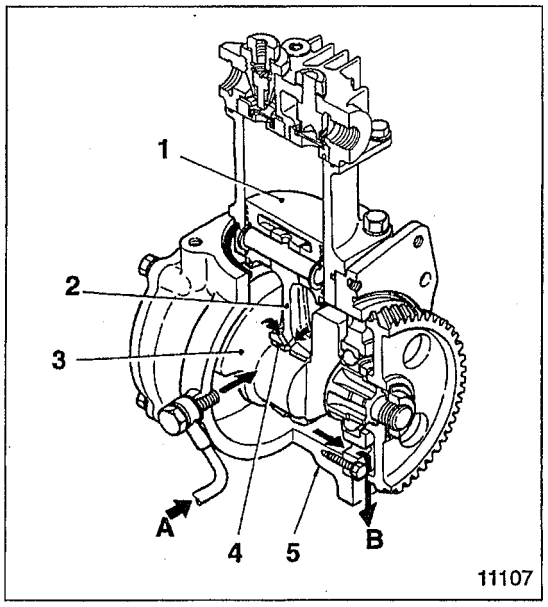


● **Injection pump**

1 Injection pump
2 Governor
3 Air compressor (or injection pump drive)

A: From main oil gallery
B: To oil pan

Engine oil that has lubricated injection pump **1** and governor **2** returns to the oil pan via the timer case, air compressor **3** (or injection pump drive), and timing gear train.



● **Air compressor**

1 Piston
2 Connecting rod
3 Crankshaft
4 Connecting rod bushing
5 Crankcase

A: From main oil gallery
B: To oil pan

Engine oil from the main oil gallery splashes onto connecting rod **2** and lubricates connecting rod bushing **4**. Piston **1** and the connecting rod's small end are lubricated by oil that is splashed onto them by the rotation of the crankshaft **3**.

Service standards

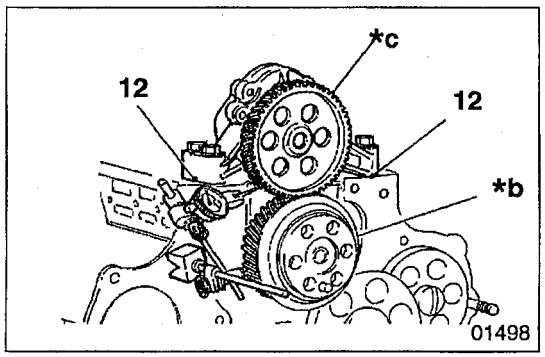
Unit: mm

Location	Maintenance item	Maintenance item	Standard value (Basic diameter in [ ])	Limit	Remedy
5, 11	Clearance between drive gear shaft and inner diameter of cover		[20] 0.04 to 0.07	0.15	Replace
5, 6, 11	Clearance between driven gear shaft and inner diameter of case and cover		[20] 0.04 to 0.07	0.15	Replace
6, 11	Clearance between case and tooth tips of each gear		0.10 to 0.19	0.2	Replace
	Difference between height of each gear and depth of case		0.06 to 0.11	0.15	
8	Relief valve opening pressure		980 to 1175 kPa {10 to 12 kgf/cm^2}	—	Replace
9	Relief valve spring load (installed length = 30)		84 N {8.6 kgf}	—	Replace
*b, *c	Backlash between oil pump gear and crankshaft gear	Without PTO	0.08 to 0.18	0.35	Adjust with shims
		With PTO	0.10 to 0.22		

❶ Tightening torque

Unit: N·m {kgf·m}

Location	Parts to be tightened	Tightening torque	Remarks
4	Oil pump cover mounting bolt	25 ± 4.9 {2.5 ± 0.5}	—



◆ Service procedure

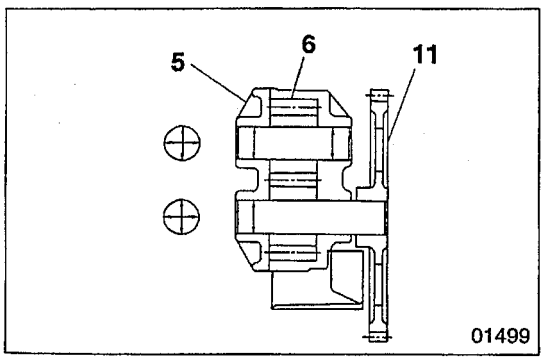
● Inspection before disassembly

Measure the backlash between oil pump gear ***c** and crankshaft gear ***b**. If the amount of backlash exceeds the specified limit, adjust it with shims **12**.

Shim thickness	Change in amount of backlash
0.1 mm	0.073 mm
0.2 mm	0.146 mm

NOTE

Shim 12 must have the same thickness on the left and right sides.



[5] [6] [11] Inspection of cover, driven gear assembly, and gear and case assembly

Measure the clearance between each gear shaft and the internal diameters of the cover and case.

SPECIFICATIONS

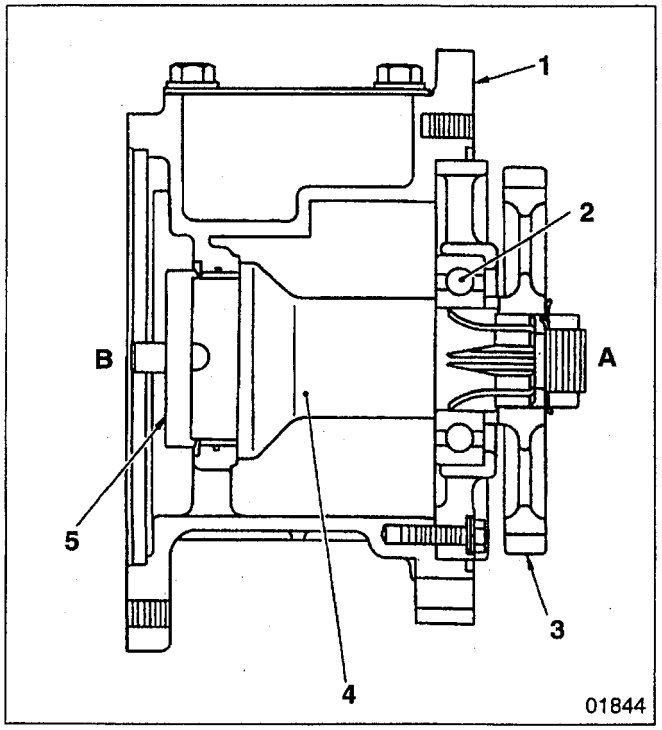
Injection Pump

Item \ Engine model	6D14	6D14-T		6D15-T	
	STD	STD	OPT	STD	OPT
Model	Bosch A	Bosch A	Bosch A	Bosch A	Bosch A
Governor type	RSV-type all-speed mechanical governor	RSV-type all-speed mechanical governor	RFD-type minimum-maximum mechanical governor	RSV-type all-speed mechanical governor	RFD-type minimum-maximum mechanical governor
Feed pump type	KE	KE	KE	KE	KE
Automatic timer type	SA-type mechanical timer	SA-type mechanical timer	SA-type mechanical timer	—	—
Manufacturer	DENSO	BOSCH AUTOMOTIVE SYSTEMS	BOSCH AUTOMOTIVE SYSTEMS	BOSCH AUTOMOTIVE SYSTEMS	BOSCH AUTOMOTIVE SYSTEMS

Item \ Engine model	6D16, 16-E			6D16-T, 16-TE	
	STD	OPT	OPT	STD	OPT
Model	Bosch A	Bosch A	Bosch AD	Bosch AD	Bosch AD
Governor type	RSV-type all-speed mechanical governor	RFD-type minimum-maximum mechanical governor	RSV-type all-speed mechanical governor	RSV-type all-speed mechanical governor	RFD-type minimum-maximum mechanical governor
Feed pump type	KE	KE	KE	KE	KE
Automatic timer type	SA-type mechanical timer	SA-type mechanical timer	—	SA-type mechanical timer	SA-type mechanical timer
Manufacturer	DENSO	BOSCH AUTOMOTIVE SYSTEMS	BOSCH AUTOMOTIVE SYSTEMS	BOSCH AUTOMOTIVE SYSTEMS	BOSCH AUTOMOTIVE SYSTEMS

Item \ Engine model	6D16-TL	6D16-TLE	
	STD	STD	OPT
Model	Bosch AD	Bosch MD	Bosch MD
Governor type	RFD-type minimum-maximum mechanical governor	RSV-type all-speed mechanical governor	RED-IV-type electronic governor
Feed pump type	KE	KE	KE
Automatic timer type	SA-type mechanical timer	SPG mechanical timer	SPG mechanical timer
Manufacturer	BOSCH AUTOMOTIVE SYSTEMS	BOSCH AUTOMOTIVE SYSTEMS	BOSCH AUTOMOTIVE SYSTEMS

10. Injection Pump Drive



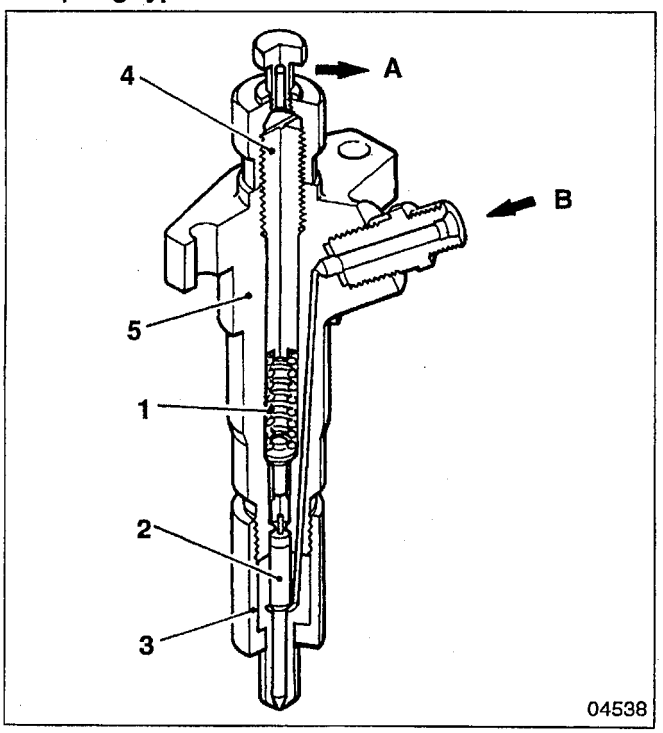
1 Pump drive case
2 Bearing
3 Pump drive gear
4 Pump drive shaft
5 Coupling

A: Timing gear side
B: Timer side

The injection pump drive is fitted onto the flywheel housing on the left of the engine. It is driven by the engine timing gear at half the engine speed.
The pump drive shaft **4** drives the injection pump via the coupling **5** on its timer side.

11. Injection Nozzle

<1-spring type>

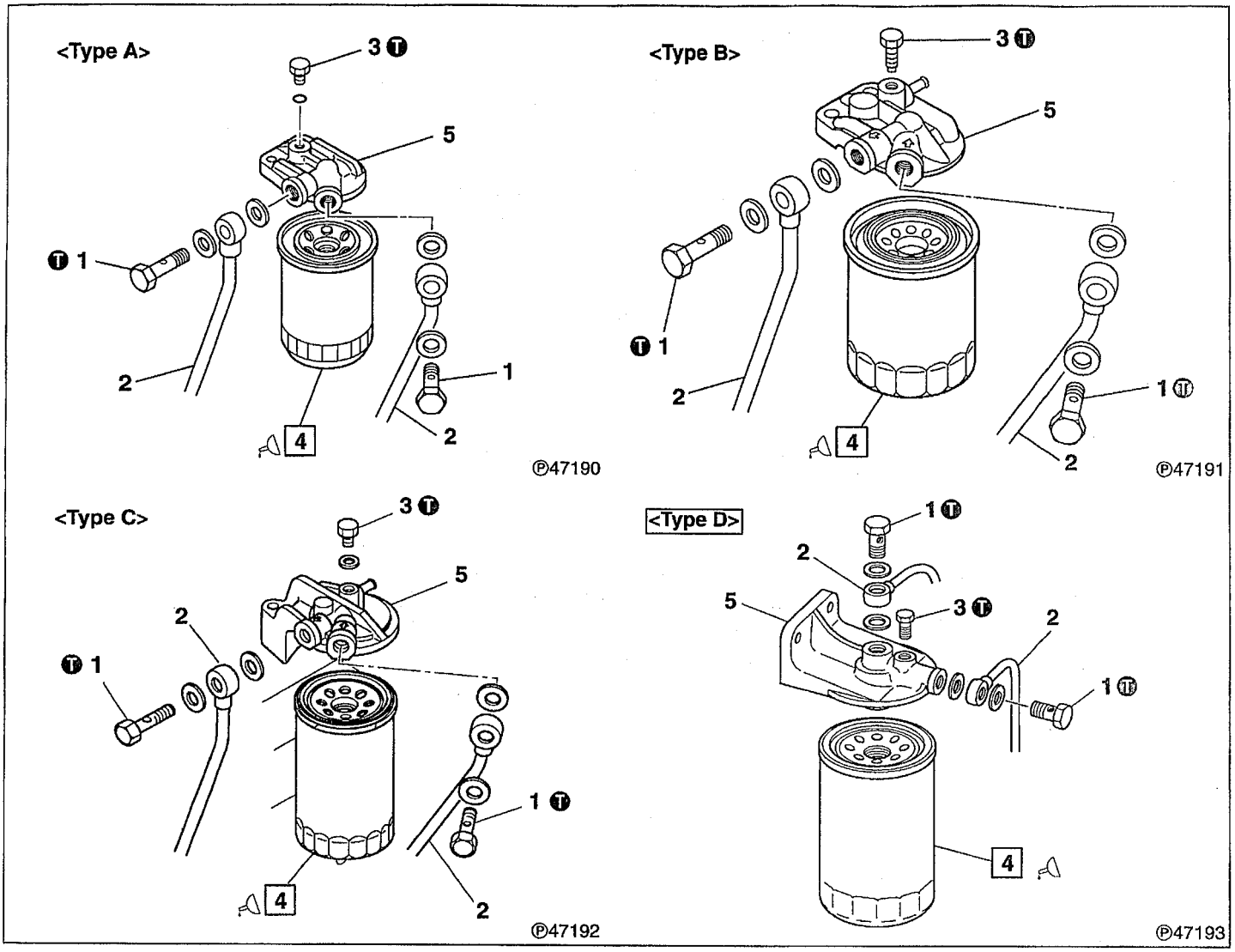


1 Nozzle spring
2 Needle valve
3 Nozzle
4 Adjusting screw
5 Nozzle holder

A: To leak-off pipe
B: From injection pump

Fuel fed from the injection pump enters the nozzle holder **5**. When the fuel pressure in the nozzle holder exceeds a preset pressure, it overcomes the nozzle spring **1**, pushes up the needle valve **2**, and the fuel is sprayed into the cylinder from the orifice at the end of the nozzle **3**.
Some of the high-pressure fuel lubricates the needle valve **2** and returns to the fuel tank via the leak-off pipe.

FUEL FILTER



● **Disassembly sequence**

1 Eyebolt
2 Fuel pipe
3 Air vent plug
4 Fuel filter
5 Fuel filter head

● **Assembly sequence**

Reverse the order of disassembly.

T Tightening torques

Unit: N·m {kgf·m}

Location	Parts to be tightened	Tightening torque	Remarks
1	Eyebolt	34 {3.5}	—
3	Air vent plug	9.8 ± 2.0 {1 ± 0.2}	—

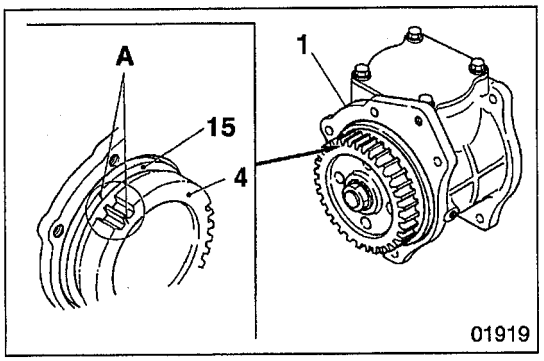
Lubricant

Location	Points of application	Specified lubricant	Quantity
4	Gasket between fuel filter and fuel filter head	Engine oil	As required

Lubricant

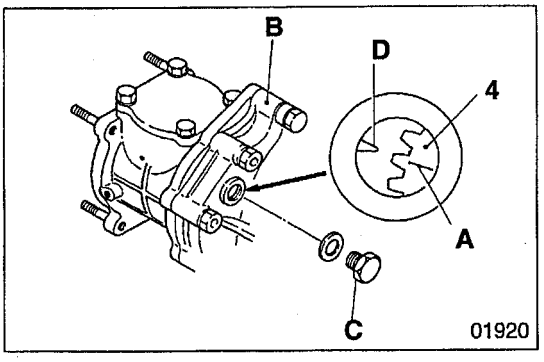
Location	Points of application	Specified lubricant	Quantity
16	O-ring	Engine oil	As required

◆ Service procedure

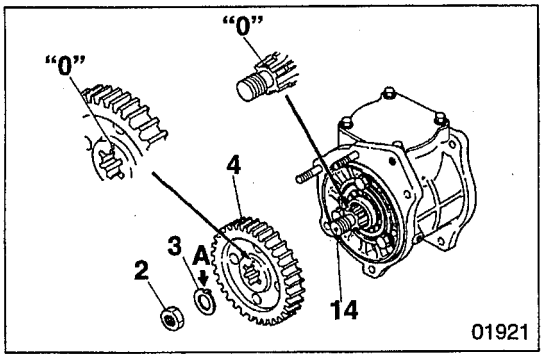


1 Installing injection pump drive assembly

- Bring cylinder No. 1 of the engine to the TDC position of its compression stroke. 🕮 Gr. 11
- Align the inscribed line **A** on the drive gear **4** of the injection pump drive assembly **1** with the inscribed line **A** on the pump drive case **15**.

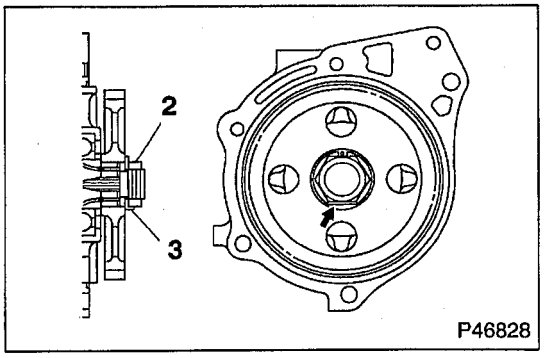


- Remove the plug **C** from the flywheel housing **B**, then check that the inscribed line **A** on the drive gear **4** is aligned with the pointer **D**. If the line and pointer are not aligned, remove and refit the injection pump drive assembly.



4 Installing drive gear

- Fit the drive gear **4** such that its "0" alignment mark is aligned with the "0" alignment mark on the shaft **14**. Then, fit the lock washer **3** such that its notch **A** is aligned with the drive gear alignment mark, and tighten the nut **2** to the specified torque.



- When the assembly is complete, bend the lock washer **3** down onto the nut **2**.

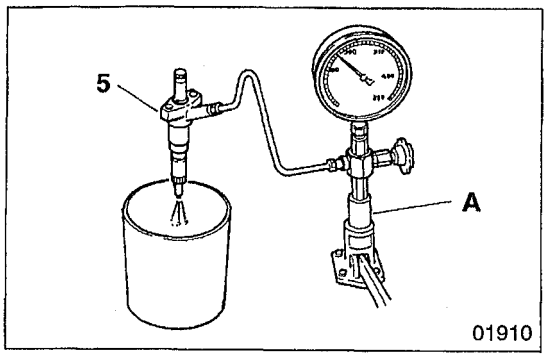
◆ Service procedure

● Pre-disassembly inspection

Fit the injection nozzle assembly **5** onto the nozzle tester **A** ready for inspection.

NOTE

Before commencing inspection, operate the lever on the nozzle tester A two or three times to bleed all air out of the arrangement.

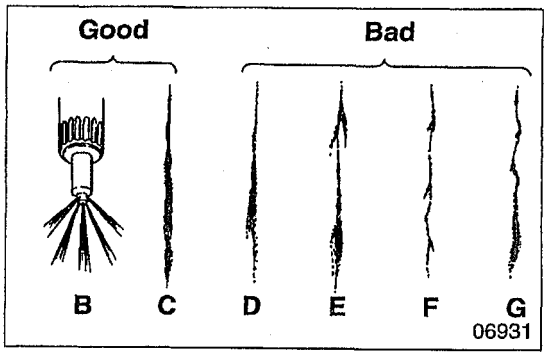


(1) Checking valve opening pressure

- Push down the lever on the nozzle tester **A** at a rate of 1–2 seconds per stroke. The pressure gauge reading will gradually rise, then the needle will suddenly deflect. Note the pressure when the needle starts to deflect.
- If the measurement is out of specification, disassemble the nozzle, clean it, and make adjustments using the shims **12**, **14**.
- If the measurement is still out of specification after adjustment, replace the injection nozzle assembly **5**.

WARNING ⚠

Do not touch the spray that comes out of the nozzle.



(2) Inspecting spray condition

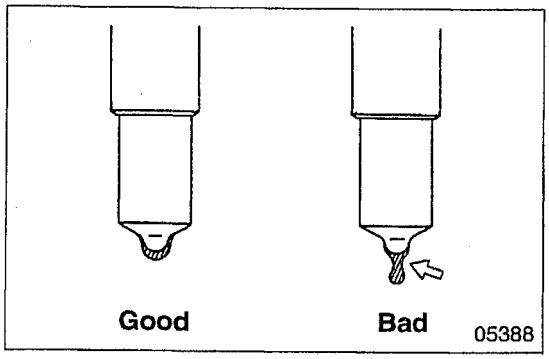
- Pump the lever on the nozzle tester **A** at a rate of about 1–2 seconds per stroke, and maintain a continuous spray.

B: Even spray from all five injection orifices (Good)
C: Even and symmetrical spray (Good)
D: Asymmetrical spray (Bad)
E: Branched spray (Bad)
F: Thin spray (Bad)
G: Irregular spray (Bad)

- If the spray is unsatisfactory, disassemble and clean the injection nozzle assembly **5**, then inspect the spray again. If the spray is still unsatisfactory, replace the injection nozzle assembly **5**.
- Check that no fuel drips from the nozzle after the spray is complete.

WARNING ⚠

Do not touch the spray that comes out of the nozzle.



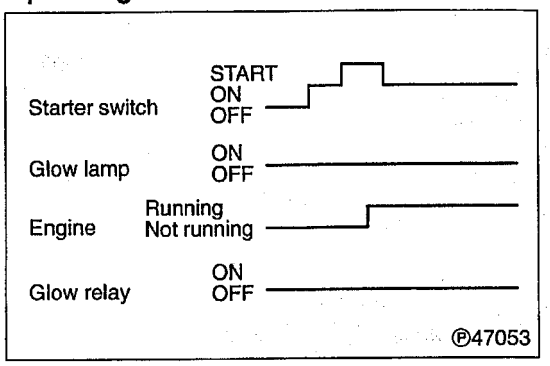
(3) Inspecting for leaks

- Slowly increase the nozzle pressure to 1.96 MPa {20 kgf/cm^2} below the specified 1st valve opening pressure. Maintain this pressure for 10 seconds and check that no fuel drips from the end of the nozzle.
- If the injection nozzle assembly **5** appears defective, disassemble and clean it, then inspect it again. If the injection nozzle assembly **5** still appears defective, it must be replaced.

2.3 Glow Control

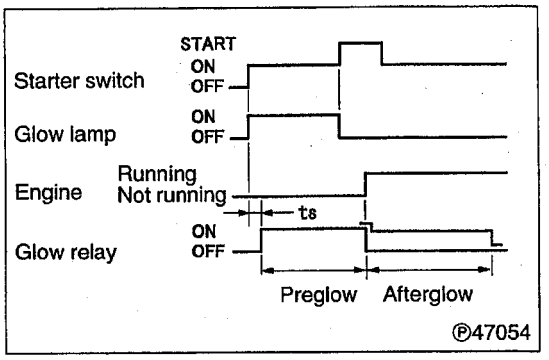
Glow control improves startability when the engine's coolant temperature is low.

Operating modes



(1) Engine coolant temperature higher than 60°C

No preheating is necessary at the time of engine startup, so the heater relay is kept OFF.



(2) Engine coolant temperature 60°C or lower

- "ts" seconds after the starter switch is turned ON, the glow relay is turned ON, causing preglow to begin. The glow lamp illuminates simultaneously.
- When preheating finishes, the glow lamp goes off to indicate that the engine can be started. The glow relay remains ON until the engine is started.
- When the engine is started, the engine ECU determines whether afterglow is necessary in accordance with the engine coolant temperature. If the engine ECU determines that afterglow is not necessary, preglow control is terminated. If it deems that afterglow is necessary, the glow relay remains ON for a certain period after engine startup to cause afterglow.

16 ACCEL. SNSR-2		
Code issue condition [Reset condition]	Diagnostic trouble code **16** indicates short or open circuit in accelerator position sensor 2 harness and faulty sensor proper. (If diagnostic trouble code 16 is issued, inspections for diagnostic trouble code **24** must also be performed.) The code is issued when accelerator position sensor 2 voltage is out of specified limits. [When accelerator position sensor 2 voltage is back within specified limits, a reset is made.]	
Action taken by ECU	• Normal control is effected using only non-faulty accelerator pedal position sensor **1**. • If accelerator pedal position 1 is also faulty, control is effected using assumptions of 100% with the pedal depressed and 0% with the pedal released.	
Probable cause and check item	• Open or short circuit in harness between ECU and accelerator position sensor 2 • Accelerator position sensor 2 faulty or poorly adjusted • ECU faulty	• Perform checks on basis of Multi-Use Tester-II service data. 🕮 P13E-24 No. **03, 04**: Measurement of throttle opening indicated by accelerator pedal position sensor No. **5**: Measurement of accelerator pedal position sensor's output voltage • Inspection of accelerator pedal position sensor • Check of circuit between ECU and accelerator pedal position sensor 2

19 AIR PRES SNSR		
Code issue condition [Reset condition]	Diagnostic trouble code **19** indicates short or open circuit in air pressure sensor harness and faulty air pressure sensor (built in ECU). The code is issued when air pressure sensor voltage is out of specified limits. [When air pressure sensor voltage falls back within specified limits, a reset is made.]	
Action taken by ECU	Air pressure is defaulted to 100 kPa {760 mmHg}.	
Probable cause and check item	• Air pressure sensor (built in ECU) faulty. • ECU faulty	• Perform checks on the basis of Multi-Use Tester-II service data. 🕮 P13E-24 No. **18**: Air pressure measurement

21 WTR TEMP SNSR		
Code issue condition [Reset condition]	Diagnostic trouble code **21** indicates open circuit in water temperature sensor harness and faulty sensor proper. The code is issued when water temperature sensor voltage is out of specified limits. [When water temperature sensor voltage falls back within specified limits, a reset is made.]	
Action taken by ECU	Controls are continued assuming that coolant temperature is –20°C when engine is started and 80°C when engine is running.	
Probable cause and check item	• Open or short circuit in harness between ECU and water temperature sensor • Water temperature sensor faulty • ECU faulty	• Perform checks on basis of Multi-Use Tester-II service data. 🕮 P13E-24 No. **16**: Measurement of engine coolant temperature • Inspection using ECU connector 🕮 P13E-27 02 : Measurement of resistance of coolant temperature sensor • Inspection of coolant temperature sensor 🕮 P13E-30: Inspection of Electrical Equipment 262 • Check of circuit between ECU and coolant temperature sensor

GROUP 14 COOLING

SPECIFICATIONS 14-2

STRUCTURE AND OPERATION
1. Cooling System (Water Flow) 14-2
2. Water Pump 14-3
3. Thermostat 14-3

TROUBLESHOOTING 14-4

ON-VEHICLE INSPECTION AND ADJUSTMENT
1. Replacing Coolant and Cleaning Coolant System 14-6
2. Air Bleeding of Cooling System 14-8
3. Gas Leak Testing 14-8

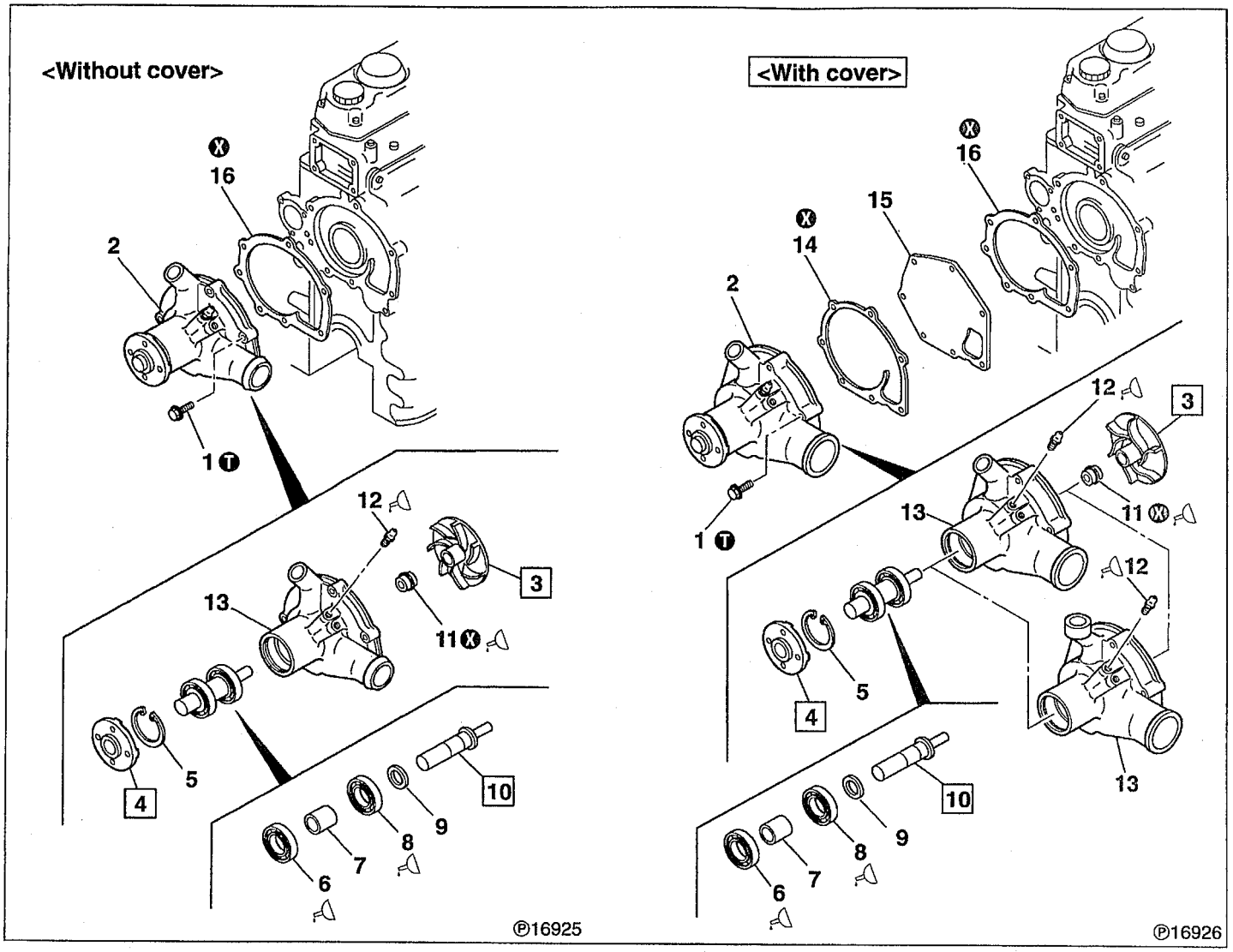
RADIATOR 14-9

COOLING FAN AND V-BELT 14-10

WATER PUMP 14-14

THERMOSTAT 14-18

WATER PUMP



● **Disassembly sequence**

1 Bolt
2 Water pump assembly
3 Impeller
4 Flange
5 Snap ring
6 Bearing
7 Spacer
8 Bearing
9 Washer
10 Water pump shaft
11 Unit seal
12 Grease nipple
13 Water pump case
14 Gasket (pump with cover)
15 Cover (pump with cover)
16 Gasket

Ⓧ: Non-reusable part

● **Assembly sequence**

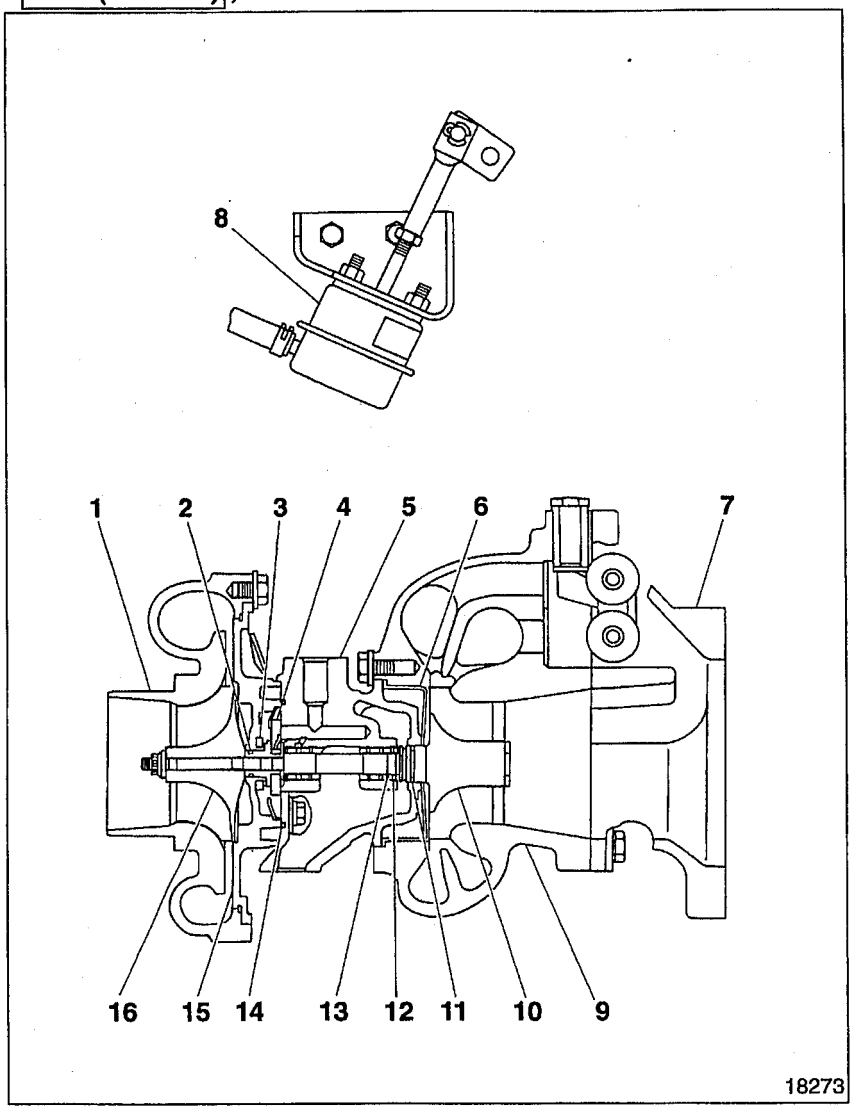
16 → 15 → 14 → 2 → 1

2 : 13 → 12 → 5 → 11 → 4 → 3
10 → 9 → 8 → 7 → 6 ↑

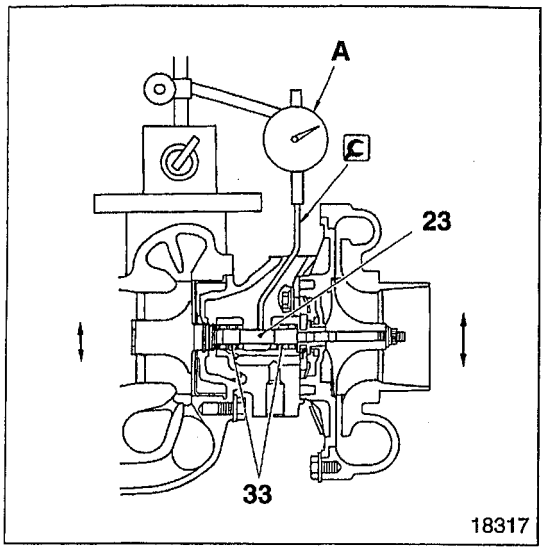
● **Inspection after assembly**

📖 P.14-16

<T04E (6D16-TL), TBP4>

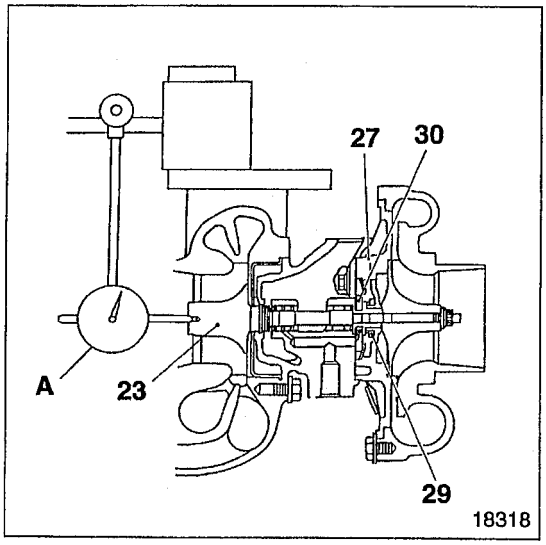


1 Compressor housing
2 Piston ring
3 Thrust collar
4 Thrust bearing
5 Center housing
6 Wheel shroud
7 Exhaust coupler
8 Actuator assembly
9 Turbine housing
10 Turbine wheel
11 Piston ring
12 Retaining ring
13 Bearing
14 Seal ring
15 Back plate
16 Compressor wheel



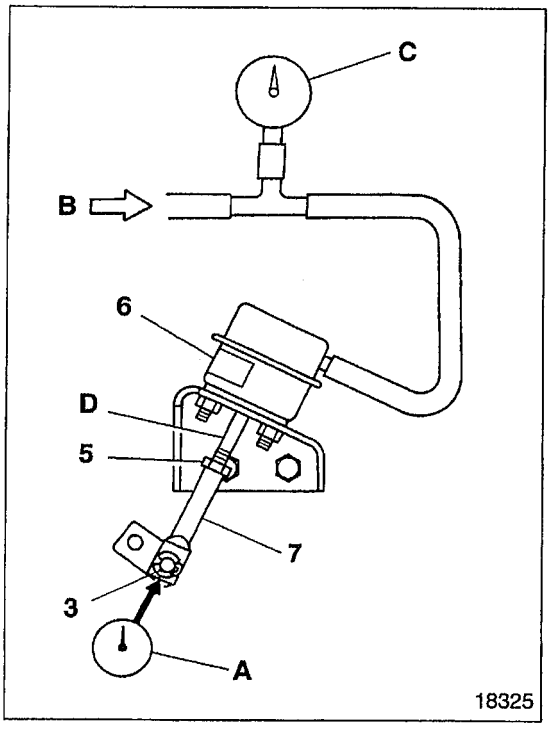
(2) Play of turbine wheel in radial direction

- Mount the C Measuring Element to the dial gauge **A** and insert it from the oil outlet and press it against the shaft of the turbine wheel **23** at right angles.
- Move the shaft of the turbine wheel **23** up and down by both hands to measure the play in the radial direction.
- If the reading exceeds the limit, replace the bearing **33**.



(3) Play of turbine wheel in thrust direction

- Set the dial gauge **A** on the end of the turbine wheel **23** and move the shaft of the turbine wheel in the axial direction to measure the play.
- If the reading exceeds the limit, worn or defective back plate **27**, thrust collar **29** and thrust bearing **30** are suspected. Replace.



(4) Measurement of operating pressure of actuator assembly

- Set the dial indicator **A** on the end of the rod end **7**.
  (In this case, set the scale of the dial indicator to 0.)
- Extend the rod end 0.38 mm by use of the external air **B**.)
  (The scale of the dial indicator **A** is 0.38 mm.)
- With the scale of the dial indicator **A** at 0.38 mm, read the value of the pressure gauge **C**, and check to ensure that the reading is between 83 and 90 kPa {625 to 675 mmHg}.

(5) Adjustment of operating pressure of actuator assembly

- If the reading of the pressure gauge **C** is not between 83 and 90 kPa {625 to 675 mmHg}, remove the retaining ring **3**, loosen the nut **5**, and adjust the length of the rod end **7**.

  Rod end length adjusting direction
  Rod end extending direction → Reduces the pressure.
  Rod end retracting direction → Increases the pressure.

CAUTION

When the rod end length is adjusted, if the piston assembly D is rotated, damage to the diaphragm in the actuator assembly 6 will result. Secure the piston assembly through use of a vice, pliers, etc. to make sure that it is not rotated.

GROUP 21 CLUTCH

SPECIFICATIONS ..... ※

STRUCTURE AND OPERATION
1. Clutch Body ..... ※
2. Bearing Case ..... ※

TROUBLESHOOTING ..... ※

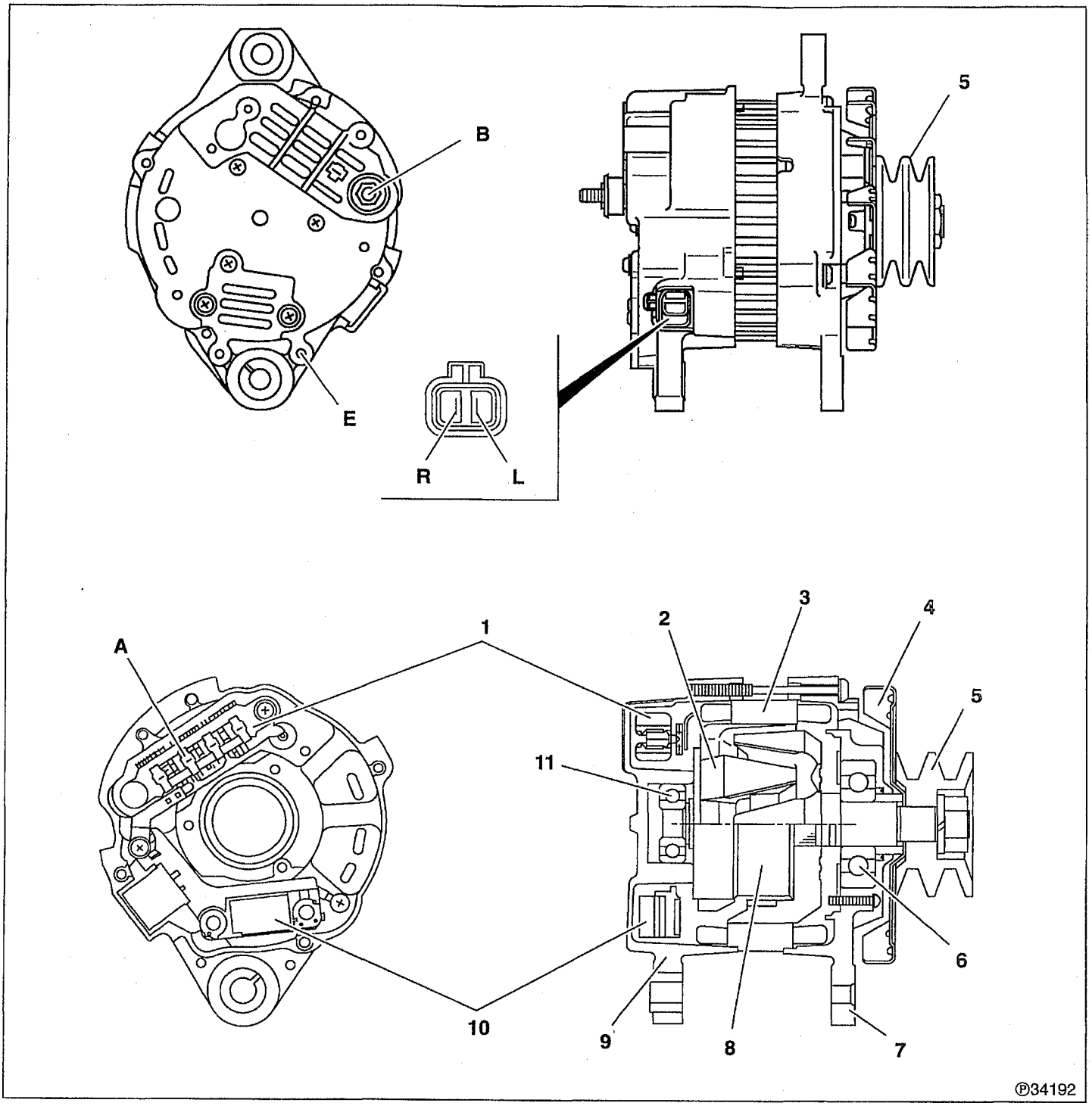
CLUTCH BODY
<C5> ..... ※
<C8> ..... ※

BEARING CASE
<PC4: DIRECT COUPLING TYPE> ..... ※
<PC4: LATERAL TRANSMISSION TYPE> ..... ※
<PC8> ..... ※

NOTE ; The parts marked "※" are deleted as they are not applicable to the SK330(N)LC-6E.

STRUCTURE AND OPERATION

<24V–50A>



1 Rectifier
2 Rotor assembly
3 Stator assembly
4 Fan
5 Pulley
6 Front bearing
7 Front bracket
8 Field coil
9 Rear bracket
10 Regulator
11 Rear bearing

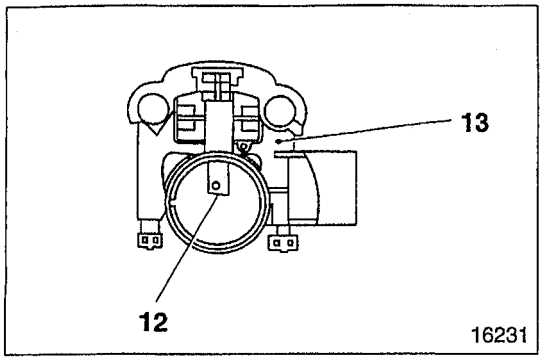
A: Neutral point diode
B: Terminal B
E: Terminal E
L: Terminal L
R: Terminal R

Starter

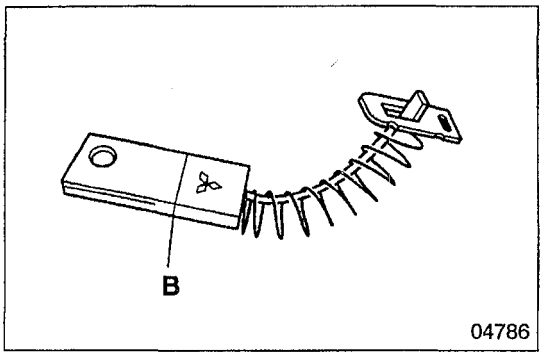
Possible causes \ Defective condition		Starter does not start	Starter starts but engine does not start: Pinion does not come in mesh with ring gear	Starter starts but engine does not start: Pinion comes in mesh with ring gear but does not rotate	Starter starts but engine does not start: Flywheel rotates but engine does not start	Engine does not stop	Engine cannot be preheated	Engine is hard to start	Remarks
Connector incorrectly connected, harness open-circuited, defective grounding		○			○	○	○	○	
Blown fuse		○							
Insufficient capacity of battery		○		○					
Starter	Contact of magnet switch binding or deposited	○							
	Coil of magnet switch open-circuited	○							
	Overrunning clutch in defective operation		○						
	Worn or damaged pinion		○						
Defective starter relay		○							
Defective starter switch		○				○			
Worn or damaged ring gear of flywheel			○						🕮 Gr 11

Starter, Preheater

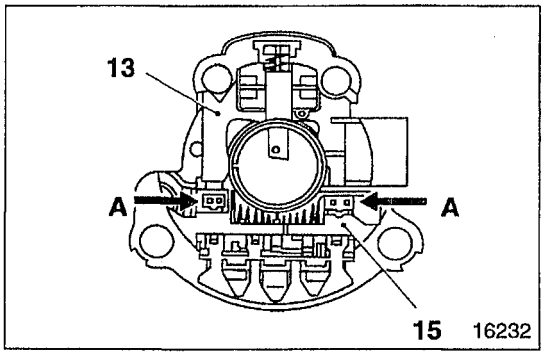
Possible causes \ Defective condition	Engine hard to start	Engine cannot be preheated	Remarks
Defective heater relay or glow relay wiring	○	○	
Defective battery wiring	○	○	
Defective air heater or glow plug wiring	○	○	
Defective air heater or glow plug	○	○	
Defective coolant temperature sensor	○		🕮 Gr 14
Defective coolant temperature sensor wiring	○		



[Installation]
- Install the brush **12** in the regulator & brush holder **13** in the direction shown.
- After installation, solder the leads of the brush **12** to the regulator & brush holder **13**.
  Thereafter, fit the cover **A** as before.

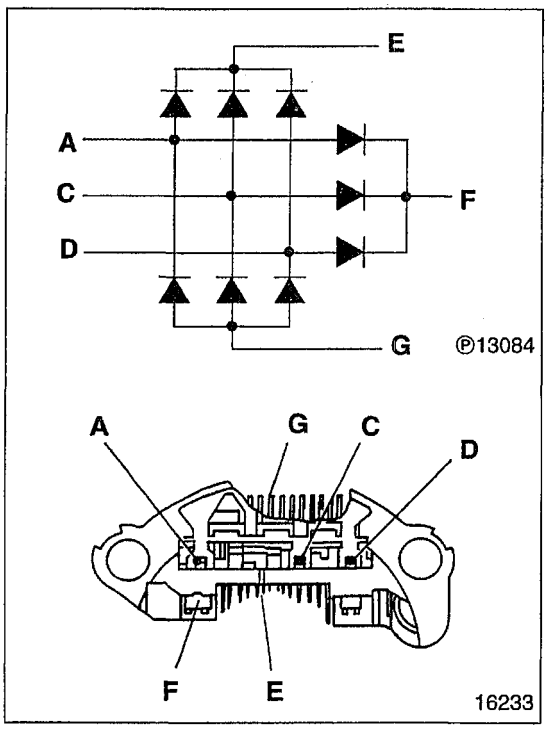


[Inspection]
If the length of the brush **12** is near the wear limit **B**, replace.



13 Removal of regulator & brush holder

- Remove the regulator & brush holder **13** by de-soldering the two illustrated points **A**.
- For installation, reverse the order of removal.



15 Inspection of rectifier

- Check the rectifier **15** to see if the internal diodes function properly.

  Resistance infinite in both cases....Open
  Resistance close to Ω in both cases...Short

  A, **B**, **C**, **D**: Leads of stator coil connected
  E, **G**: Heat sink portion
  F: Regulator connected

- Exchange the ⊕ and ⊖ sides of the tester and perform checks in both cases.

CAUTION ⚠

When a tester is used for the checks, the current that flows out from the tester is feebler than the current that normally flows through the rectifier 15, so the tester may indicate a questionable resistance value. In a low range, this tendency will be stronger. Therefore, it is advisable to use the highest possible range.

MEMO

B. Parts to be provided additionally

(1) Install two foot-operated pilot valves to the front of the floor plate so as to actuate the jib cylinder and the crusher (nibbler).
(2) Add two low-pressure sensors to the two pilot valves thus installed additionally.
(3) Add one stroke end switch and one solenoid valve to protect the bucket cylinder.
(4) Add a solenoid valve so as to reverse the arm in/out action for backhoe.

Note:
Since the arm cylinder is located under the arm, reverse the cylinder motion so it is the same as the backhoe.

---

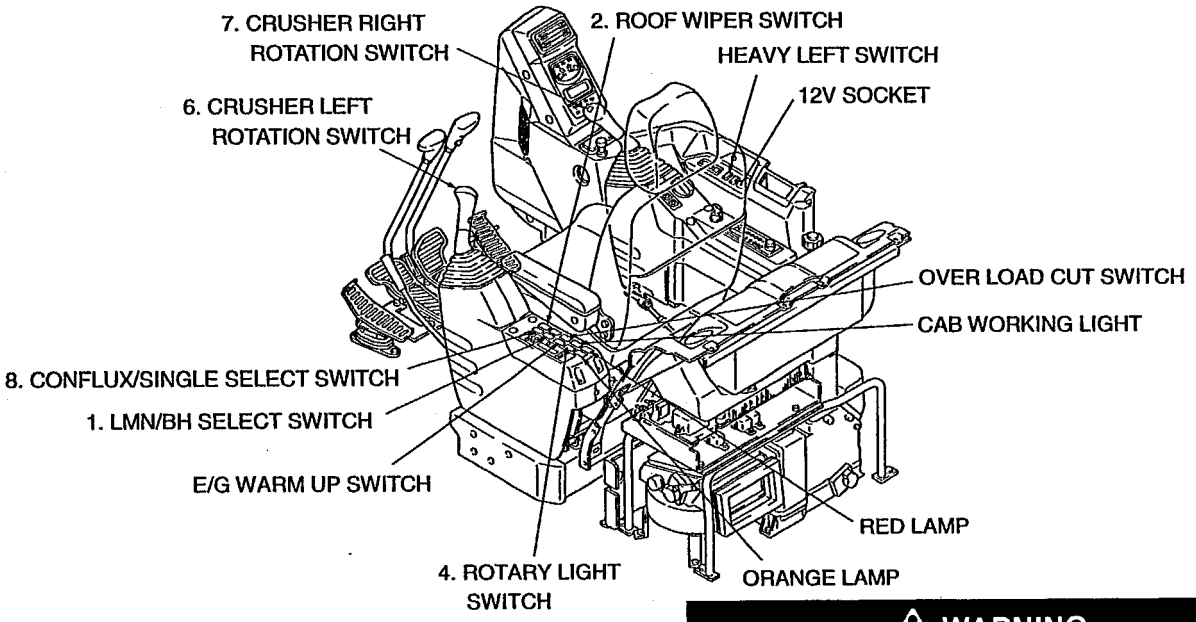
(5) Add one solenoid valve for crusher (nibbler) rotation and one restrictor Ø1.5 (0.06″) to the P line.
(6) Add one jib cylinder to actuate the 2.3M (7ft-7in) inter boom.
(7) Add one LMN/BH (Crusher / Back-hoe) select switch.
(8) Add one conflux/single flow select switch.
(9) Add 3-face guard and skylight wiper to the cab.
(10) Add three potentiometers to the main boom, front boom and inter-boom.
(11) Add two slow return check valves to the boom cylinder head, one slow return check valve to the boom cylinder head and one slow return check valve to the arm cylinder head.
(12) Add one set of auto greaser.
(13) Add one set of one-way call unit.

Supplement:
Regarding the electric circuit diagram, refer to Electric System in the previous chapter of this manual.

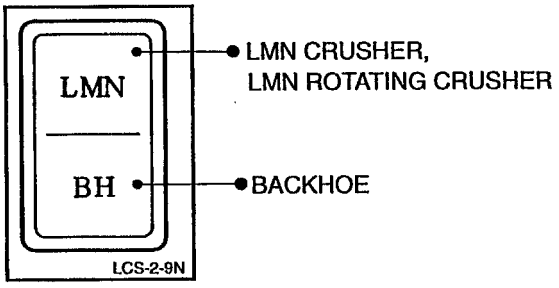
3. CONTROL SYSTEM

The LMN (special demolition machine) is equipped with the below control devices in its cab:

3.1 ARRANGEMENT OF SWITCHES



(1) LMN/BH select switch (SW-18)



⚠ WARNING

On the LMN crusher & LMN rotating crusher machine and the backhoe machine, always bring the LMN/BH select switch to "LMN" for special demolition work. It is dangerous to operate the machine in the "BH" shift, because the arm operates in the opposite direction.

- The following control is performed if the select switch is turned to "LMN":

1) The machine is started up in the A mode. A and M modes may be selected with the mode select switch. Even in the A mode, however, the engine speed control is the same as in the M mode.
2) The stability control device is actuated.
3) Since the arm cylinder rod and head are installed oppositely, the solenoid valve is energized by arm in/out actions and the pilot piping systems are reversed.
4) In the A mode, the swing speed of LMN (special demolition attachment) is decreased than the swing speed of backhoe.
5) Releases the auto acceleration.
6) The overheat prevention is activated.
7) Releases the attachment boost pressure function.
8) Changes the swing parking brake release to actuate in condition that arm in operation is performed.
9) Energizes the solenoid valve when the bucket digging stroke end switch is turned to [ON] and releases the bucket digging pilot pressure to the tank circuit.
10) Cuts off the arm sequence conflux flow.
11) Cuts off the conflux control in the bucket independent operation.
12) Brings the arm variable displacement proportional valve to the normal recirculation position by arm out operation.
13) Cuts off the conflux control at arm out operation.
14) Minimizes the delivery rate of the P1 pump at crusher rotating independent operation.
15) When crusher rotation and P1-side attachment are operated at the same time, the delivery rate of the P1 pump increases. The oil flow is regulated by the restrictor that is located at this side of the crusher rotation solenoid valve.

(3) JIB circuit:

3-1) Jib up operation

[Electric system: LMN/BH switch select action]

Two solenoid valves are added to the standard machine to change the operating circuit.

For the LMN operation, turn the LMN side of the LMN/BH select switch to [ON]. If the LMN side is turned [ON], the arm out / in reverse solenoid (SV-8) is energized which in turn changes over the reverse valve (56). The solenoid (SV-11) is energized at the bucket stroke end to changes over the bucket control valve(63).

[Pedal action and operation]

Operating pedal (LH pedal)	P/V (51) Secondary pressure outlet port	C/V (66) Inlet port	Jib action
Front (toe action)	B	PA	UP

[Pilot circuit]

If the toe of the jib operating pedal is depressed, the secondary pilot proportional pressure flows out of the B port of pilot valve (51), enters the PA port of control valve (66) and changes over the spool. At the same time, the pressure acts on the low-pressure sensor (SE-20).

[Mechatro controller]

The output voltage of the low-pressure sensor (SE-20) is put into the mechatro controller that puts out a command current. The command current causes the P1 bypass cut solenoid proportional valve (PSV-D) to send out secondary pressure and changes over the P1 bypass cut valve.

[Main circuit]

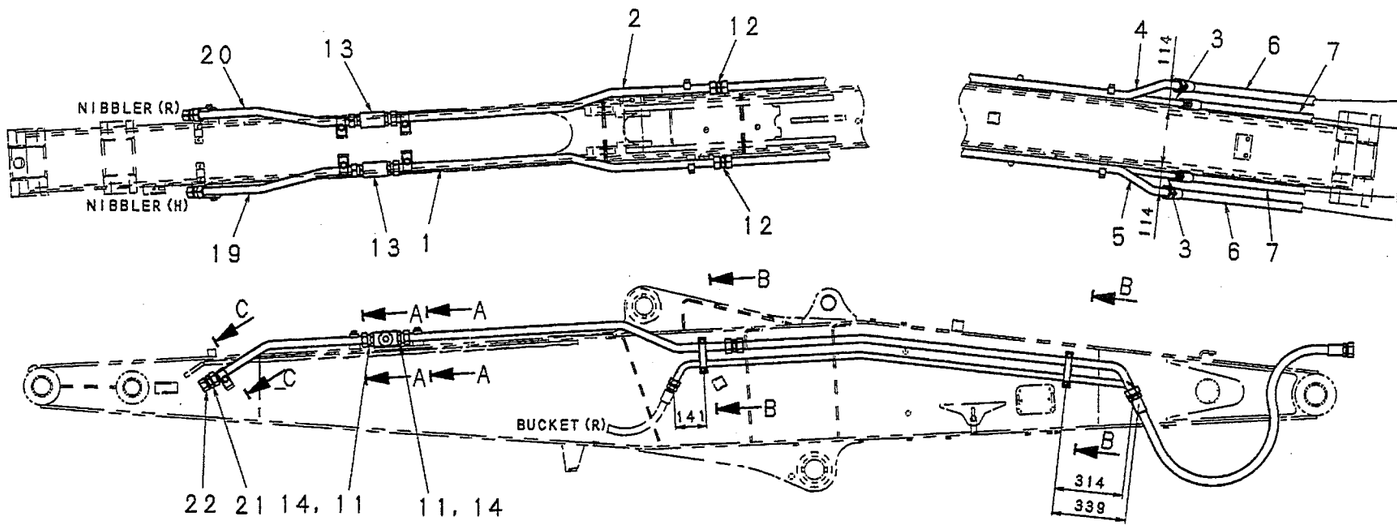
1) If the P1 bypass cut valve is changed over by the pilot circuit, the oil delivered by the No.1 pump flows out of the P4 port of C/V (50). The oil then enters the P port of the control valve (66) and flows out of the A port. The oil then enters the H side of jib cylinder (60) via ports A and B of holding valve (67) to perform jib up action.
2) The oil returning from the R side of the jib cylinder enters the B port of control valve (66) and flows out of the T port. The oil then enters the T3 port of control valve (50) and returns to the tank line.

4.3 HYD. LINES

4.3.1 HYD. LINES DWG. LIST

Gr.	ITEM	DWG. NAME	LMN, ROTARY N&B	REMARKS
REMOTE CONTROL	1	PUMP CONTROL LINES	LC06H00017F1	Same as STD.
	2	SOL. VALVE CONTROL LINES	LC64H00041F1	
	3	P-T BLOCK CONTROL LINES	YN64H00069F3	
	4	ATT. REMOTE CONTROL LINES	LC68H00007F1	Same as STD.
	5	TOWER BLOCK CONTROL LINES	LC64H00063F2	Same as STD.
	6	MAIN C/V CONTROL LINES	LC06H00033F5	
	7	TRAVEL CONTROL LINES	LC62H00007F1	Same as STD.
	8	H/V SAFETY CONTROL LINES	LC64H00017F2	Same as STD.
	9	LMN CONTROL LINES	LC68H00042F2	
MAUN HYD. LINES	11	PUMP HYD. LINES	LC30H00014F1	Same as STD.
	12-1	UPPER HYD. LINES	LC03H00014F2	Same as STD.
	12-2	UPPER HYD. LINES (JIB)	LC03H00025F1	
	12-3	UPPER HYD. LINES (ROTARY)	LC03H00035F2	
	12-4	UPPER HYD. LINES (N&B)	LC03H00031F1	
	12-5	UPPER HYD. LINES (SWING PRIORITY)	LC03H00010F1	Same as STD.
	13	RETURN HYD. LINES	LC32H00015F6	
	14	S/J HYD. LINES ; FOR UPPER	LC19H00001F1	Same as STD.
	15	LOWER HYD. LINES	LC02H00010F1	Same as STD.
	16	TRAVEL MOTOR HYD. LINES	LC12H00001F1	Same as STD.
	17	S/J HYD. LINES ; FOR LOWER	LC19H00012F1	Same as STD.
ATT HYD. LINES	21-1	ARM HYD. LINES	LC43H00009F1	
	21-2	ARM HYD. LINES (ROTARY)	LC43H00014F1	
	22-1	JIB HYD. LINES	LC42H00029F1	
	22-2	JIB HYD. LINES (SAFETY)	LC42H00071F1	
	22-3	JIB HYD. LINES (ROTARY)	LC42H00040F1	
	23-1	FRONT BOOM HYD. LINES	LC42H00030F1	
	23-2	FRONT BOOM HYD. LINES (SAFETY)	LC42H00070F1	
	23-3	FRONT BOOM HYD. LINES (ROTARY)	LC42H00039F1	
	24-1	INTER BOOM HYD. LINES	LC42H00031F1	
	24-2	INTER BOOM HYD. LINES (SAFETY)	LC42H00069F1	
ATT. HYD.	24-3	INTER BOOM HYD. LINES (ROTARY)	LC42H00038F1	
	25-1	MAIN BOOM HYD. LINES	LC42H00020F2	
	25-2	BOOM HYD. LINES (SAFETY)	LC42H00068F1	
	25-3	BOOM HYD. LINES (ROTARY)	LC42H00025F1	
CYLINDER	26-1	BUCKET CYL. HYD. LINES	LC43H00010F1	
	26-2	ARM CYL. HYD. LINES	LC42H00067F1	
	26-3	JIB CYL. HYD. LINES	LC42H00066F1	
	26-4	BOOM CYL. HYD. LINES	LC42H00024F1	
PLUG ASSY	27-1	PLUG ASSY FOR ARM CYL.	24100T800F1	
	27-2	PLUG ASSY FOR ARM	24100T790F2	
	27-3	PLUG ASSY FOR JIB	24100T789F2	
	27-4	PLUG ASSY FOR FRONT BOOM	24100T788F2	
	27-5	PLUG ASSY FOR INTER BOOM	24100T799F2	
	27-6	PLUG ASSY FOR MAIN BOOM	LC50T00003F1	
	27-7	CONNECTOR ASSY FOR BOOM	LC42H01197F1	
	27-8	PLUG ASSY FOR UPPER FRAME	LC50T00002F1	

(21-1) Arm hyd. lines : LC43H00009F1



NOTE
1 MAKE SURE NOT TO MISS O-RING AT ASSEMBLING.
2 TIGHTENING TORQUE FOR M THREAD.

THREAD SIZE	TORQUE
M8	3.4kgf·m (24.6lbf·ft)
M10	6.7kgf·m (48.5lbf·ft)
M12	11.7kgf·m (84.9lbf·ft)
M14	18.5kgf·m (134lbf·ft)

3 TIGHTENING TORQUE FOR PF, PT THREAD.

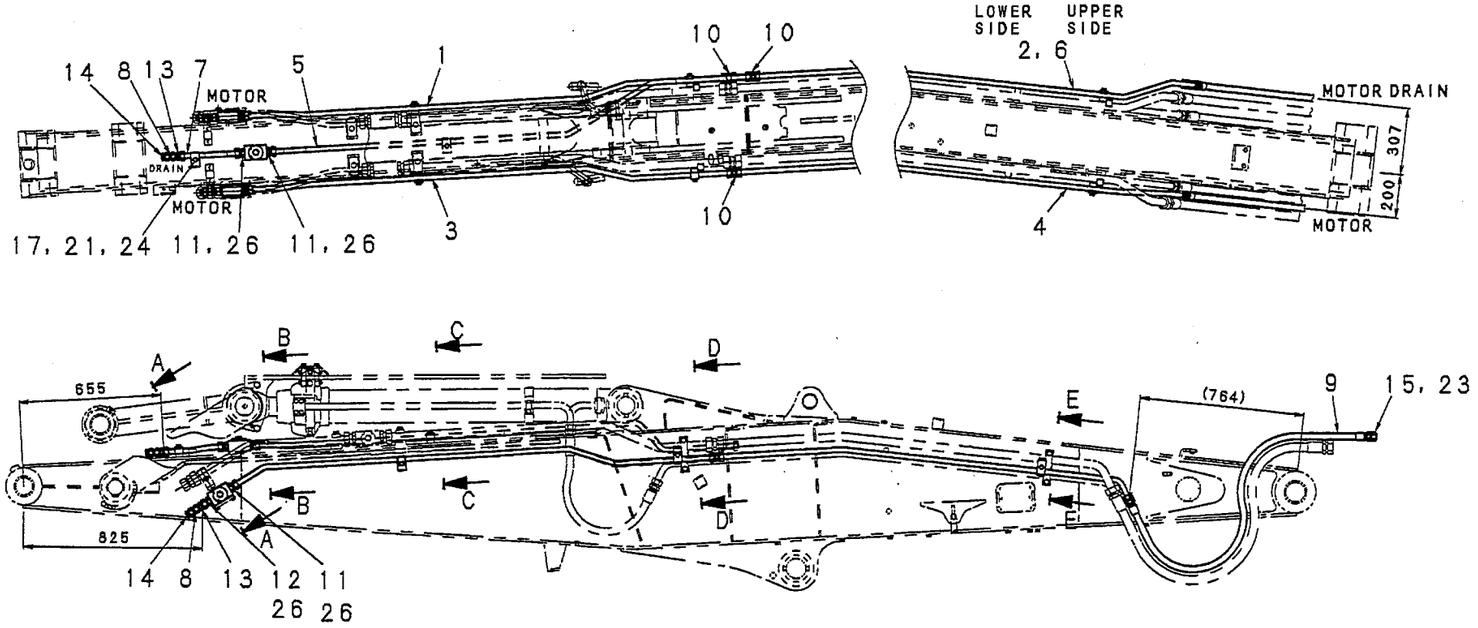
THREAD	TORQUE
3/4	16.5kgf·m (119lbf·ft)
1	26.0kgf·m (187lbf·ft)
1"1/4	40.0kgf·m (289lbf·ft)

4 TIGHTENING TORQUES FOR NUTS AND SLEEVES.

TUBE SIZE	
φ18×2.5	15.0kgf·m (108lbf·ft)
φ22×3.0	22.0kgf·m (159lbf·ft)
φ35×5.0	45.0kgf·m (325lbf·ft)

5 APPLY LOCTITE #242 TO CLAMP ATTACHING BOLT.

(21-2) Arm hyd. rotary lines : LC43H00014F1



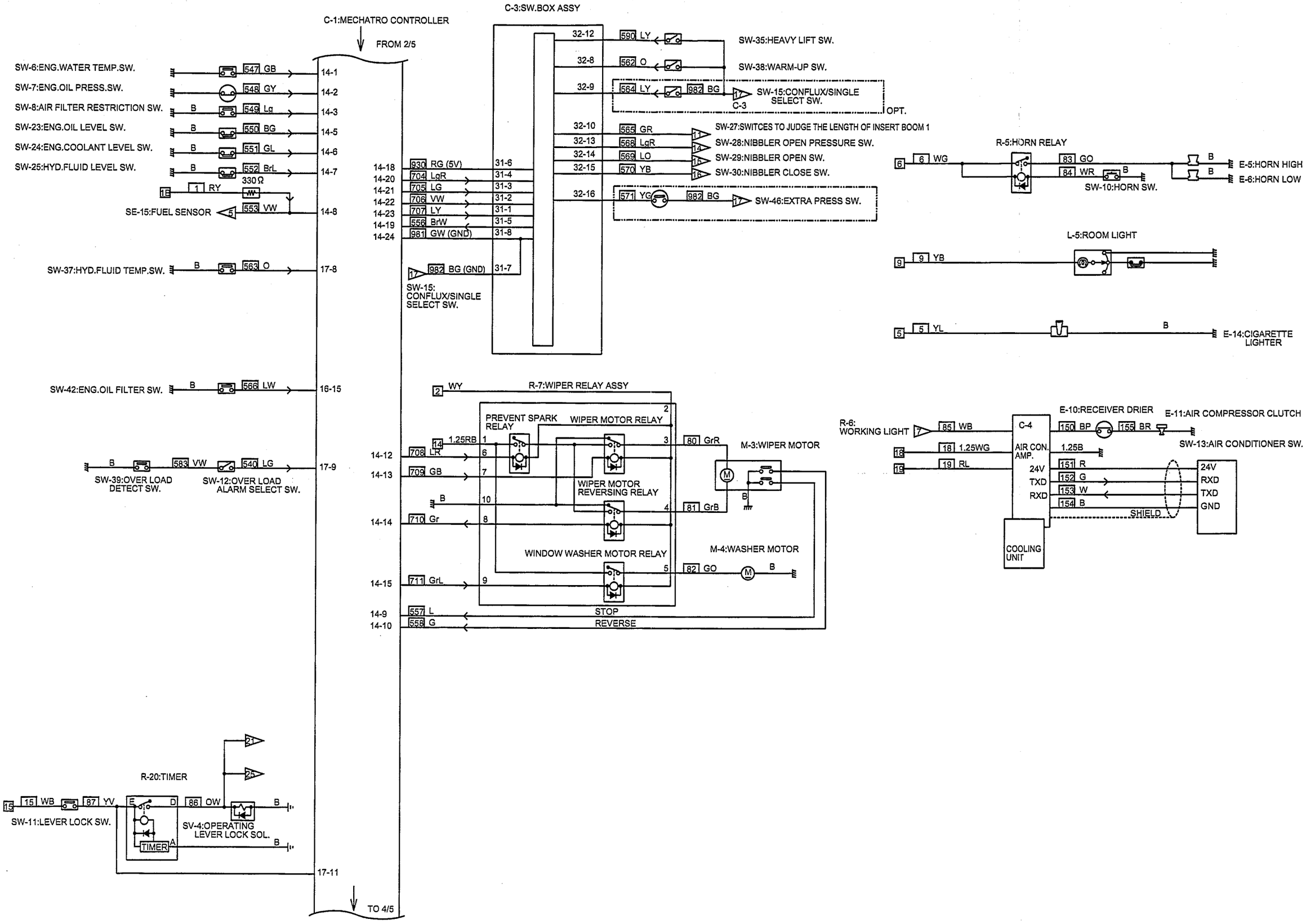

C-1:MECHATRO CONTROLLER
FROM 2/5
C-3:SW.BOX ASSY
SW-6:ENG.WATER TEMP.SW.
SW-7:ENG.OIL PRESS.SW.
SW-8:AIR FILTER RESTRICTION SW.
SW-23:ENG.OIL LEVEL SW.
SW-24:ENG.COOLANT LEVEL SW.
SW-25:HYD.FLUID LEVEL SW.
330Ω
SE-15:FUEL SENSOR
SW-37:HYD.FLUID TEMP.SW.
SW-42:ENG.OIL FILTER SW.
SW-39:OVER LOAD DETECT SW.
SW-12:OVER LOAD ALARM SELECT SW.
SW-15: CONFLUX/SINGLE SELECT SW.
SW-35:HEAVY LIFT SW.
SW-38:WARM-UP SW.
SW-15:CONFLUX/SINGLE SELECT SW.
OPT.
SW-27:SWITCES TO JUDGE THE LENGTH OF INSERT BOOM 1
SW-28:NIBBLER OPEN PRESSURE SW.
SW-29:NIBBLER OPEN SW.
SW-30:NIBBLER CLOSE SW.
SW-46:EXTRA PRESS SW.
R-7:WIPER RELAY ASSY
PREVENT SPARK RELAY
WIPER MOTOR RELAY
WIPER MOTOR REVERSING RELAY
WINDOW WASHER MOTOR RELAY
M-3:WIPER MOTOR
M-4:WASHER MOTOR
STOP
REVERSE
R-20:TIMER
SW-11:LEVER LOCK SW.
SV-4:OPERATING LEVER LOCK SOL.
TIMER
17-11
TO 4/5
R-5:HORN RELAY
SW-10:HORN SW.
E-5:HORN HIGH
E-6:HORN LOW
L-5:ROOM LIGHT
E-14:CIGARETTE LIGHTER
R-6: WORKING LIGHT
E-10:RECEIVER DRIER
E-11:AIR COMPRESSOR CLUTCH
SW-13:AIR CONDITIONER SW.
C-4
AIR CON. AMP.
24V
TXD
RXD
SHIELD
COOLING UNIT
GND

Fig.1 (3/5)

WIRE NO	WIRE COLOR	WIRE SIZE	FROM	CONNECTION	TO
1A	RY	AVSS0.75sq	CN-5F		CN-9M
1B	RY	AVSS0.75sq	CN-9M		CN-27F
1C	RY	AVSS0.75sq	CN-5F		CN-27F
1D	RY	AVSS0.75sq	CN-20F		CN-27F
2A	WY	AVSS0.75sq	CN-9M		CN-26F
2B	WY	AVSS0.75sq	CN-16F		CN-26F
2C	WY	AVSS0.75sq	CN-34F		CN-26F
2D	WY	AVSS0.75sq	CN-29F		CN-26F
2E	WY	AVSS0.75sq	CN-26F		CN-26F
2F	WY	AVSS0.75sq	CN-26F		CN-45F
2G	WY	AVSS0.75sq	CN-26F		CN-65F
3A	G	AVSS0.75sq	CN-9M		CN-35M
3B	R	AVSS0.75sq	CN-9M		CN-35M
4A	Y	AVSS0.75sq	CN-9M		CN-26F
4B	Y	AVSS0.75sq	CN-14F		CN-26F
4C	Y	AVSS0.75sq	CN-14F		CN-26F
4D	Y	AVSS0.75sq	CN-35M		CN-26F
4G	Y	AVSS0.75sq	CN-26F		CN-26F
4E	Y	AVSS0.75sq	CN-26F		CN-44M
4F	Y	AVSS0.75sq	CN-26F		CN-66M
5	YL	AVSS0.75sq	CN-9M		CN-38M
6A	WG	AVSS0.75sq	CN-9M	DOUBLE SPLICE	CN-15F
6B	WG	AVSS0.75sq	CN-15F		CN-15F
7	YR	AVSS0.75sq	CN-9M		CN-42F
8	WV	AVSS1.25sq	CN-9M		CN-30F
9A	YB	AVSS0.75sq	CN-9M		CN-26F
9B	YB	AVSS0.75sq	CN-30F		CN-26F
9C	YB	AVSS0.75sq	CN-54F		CN-26F
9D	YB	AVSS0.75sq	CN-5F		CN-26F
9E	YB	AVSS0.75sq	CN-38M		CN-26F
10	WV	AVSS1.25sq	CN-9M		CN-36M
11	OL	AVSS0.75sq	CN-9M		CN-38M
12A	RG	AVSS1.25sq	CN-9M		CN-27F
12B	RG	AVSS1.25sq	CN-56F		CN-27F
12C	RG	AVSS0.75sq	CN-61F		CN-27F
13A	W	AVSS0.75sq	CN-9M		CN-27F
13B	W	AVSS0.75sq	CN-38M		CN-27F
13C	W	AVSS0.75sq	CN-34F		CN-27F
14A	RB	AVSS1.25sq	CN-9M		CN-27F
14B	RB	AVSS1.25sq	CN-29F		CN-27F
14C	RB	AVSS0.75sq	CN-68F		CN-27F
14D	RB	AVSS0.75sq	CN-37F		CN-27F
15A	WB	AVSS0.75sq	CN-9M		CN-27F
15B	WB	AVSS0.75sq	CN-32M		CN-27F
15C	WB	AVSS0.75sq	CN-34F		CN-27F
16	RW	AVSS1.25sq	CN-9M		CN-16F
17A	WL	AVSS1.25sq	CN-9M		CN-26F
17B	WL	AVSS1.25sq	CN-17F		CN-26F
17C	WL	AVSS0.75sq	CN-17F		CN-26F
17D	WL	AVSS1.25sq	CN-49F		CN-26F
17G	WL	AVSS0.75sq	CN-26F		CN-26F
17E	WL	AVSS0.75sq	CN-26F		CN-49F
17F	WL	AVSS0.75sq	CN-26F		CN-32M

WIRE NO	WIRE COLOR	WIRE SIZE	FROM	CONNECTION	TO
18	WG	AVSS1.25sq	CN-9M		CN-36M
19	RL	AVSS0.75sq	CN-9M		CN-36M
20A	WR	AVSS1.25sq	CN-9M	DOUBLE SPLICE	CN-43F
20B	WR	AVSS1.25sq	CN-62F		CN-43F
30	G	AVSS0.75sq	CN-12F		CN-30F
50	L	AVSS1.25sq	CN-9M		CN-36M
51	W	AVS2sq	CN-9M		CN-30F
52	R	AVS5sq	CN-9M		CN-33M
53	Y	AVS5sq	CN-9M		CN-33M
54	R	AVS2sq	CN-9M		CN-30F
55	WP	AVSS1.25sq	CN-9M		CN-30F
58	P	AVSS0.75sq	CN-30F		CN-14F
59A	W	AVSS0.75sq	CN-30F		CN-27F
59B	W	AVSS0.75sq	CN-46F		CN-27F
59C	W	AVSS0.75sq	CN-12F		CN-27F
60A	WL	AVSS0.75sq	CN-46F		CN-26F
60B	WL	AVSS0.75sq	CN-36M		CN-26F
60C	WL	AVSS0.75sq	CN-45F		CN-26F
60D	WL	AVSS0.75sq	CN-2F		CN-26F
60E	WL	AVSS0.75sq	CN-46F		CN-26F
61A	GrB	AVSS0.75sq	CN-36M		CN-27F
61B	GrB	AVSS0.75sq	CN-2F		CN-27F
61C	GrB	AVSS0.75sq	CN-46F		CN-27F
62	W	AVSS0.75sq	CN-35M		CN-45F
63A	WY	AVSS0.75sq	CN-36M		CN-27F
63B	WY	AVSS0.75sq	CN-30F		CN-27F
63C	WY	AVSS0.75sq	CN-35M		CN-27F
64	LW	AVSS0.75sq	CN-30F		CN-12F
65A	WR	AVSS0.75sq	CN-30F		CN-26F
65B	WR	AVSS0.75sq	CN-2F		CN-26F
65C	WR	AVSS0.75sq	CN-38M		CN-26F
65D	WR	AVSS0.75sq	CN-12F		CN-26F
65E	WR	AVSS0.75sq	CN-42F		CN-26F
67	BG	AVSS0.75sq	CN-14F		CN-35M
80	GrR	AVSS0.75sq	CN-38M		CN-29F
81	GrB	AVSS0.75sq	CN-38M		CN-29F
82	GO	AVSS0.75sq	CN-30F		CN-29F
83	GO	AVSS0.75sq	CN-30F		CN-15F
84A	WR	AVSS0.75sq	CN-15F		CN-27F
84B	WR	AVSS0.75sq	CN-32M		CN-27F
84C	WR	AVSS0.75sq	CN-36M		CN-27F
85A	WB	AVSS1.25sq	CN-16F		CN-26F
85B	WB	AVSS1.25sq	CN-30F		CN-26F
85C	WB	AVSS0.75sq	CN-36M		CN-26F
86A	OW	AVSS0.75sq	CN-27F		CN-30F
86B	OW	AVSS0.75sq	CN-27F		CN-32M
86C	OW	AVSS0.75sq	CN-27F		CN-65F
86D	OW	AVSS0.75sq	CN-27F		CN-67F
87	YV	AVSS0.75sq	CN-32M		CN-7F
89A	BrL	AVSS0.75sq	CN-32M		CN-27F
89B	BrL	AVSS0.75sq	CN-17F		CN-27F
89C	BrL	AVSS0.75sq	CN-49F		CN-27F

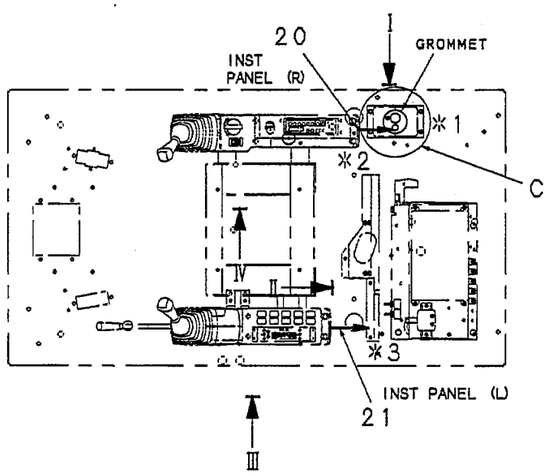
WIRE NO	WIRE COLOR	WIRE SIZE	FROM	CONNECTION	TO
90A	RY	AVSS1.25sq	CN-49F		CN-26F
90B	RY	AVSS1.25sq	F-1		CN-26F
90C	RY	AVSS1.25sq	F-2		CN-26F
90D	RY	AVSS0.75sq	F-5		CN-26F
91	Y	AVSS0.75sq	CN-32M		F-3
92A	RW	AVSS0.75sq	CN-17F		CN-26F
92B	RW	AVSS0.75sq	F-4		CN-26F
92C	RW	AVSS0.75sq	F-6		CN-26F
92D	RW	AVSS0.75sq	CN-30F		CN-26F
96	WG	AVSS0.75sq	CN-36M		CN-38M
97	YV	AVSS0.75sq	CN-36M		CN-38M
98	LW	AVSS0.75sq	CN-36M		CN-25F
99	Br	AVSS0.75sq	CN-36M		CN-25F
100	LR	AVSS0.75sq	CN-36M		CN-24F
101	OB	AVSS0.75sq	CN-36M		CN-24F
150	BP	AVSS0.75sq	CN-36M		CN-30F
151	R	MVVS0.75sq	CN-36M		CN-32M
152	G	4 CORES SHIELD	CN-36M		CN-32M
153	W		CN-36M		CN-32M
154	B		CN-36M		CN-32M
SH4	Gr		CN-36M		CN-32M
210	LB	AVSS0.75sq	CN-68F		CN-37F
211	LW	AVSS0.75sq	CN-68F		CN-37F
214	YG	AVSS0.75sq	CN-18F		CN-19F
215	GR	AVSS0.75sq	CN-18F		CN-19F
216	O	AVSS0.75sq	CN-18F		CN-77F
217A	LO	AVSS0.75sq	CN-18F		CN-27F
217B	LO	AVSS0.75sq	CN-41F		CN-27F
217C	LO	AVSS0.75sq	CN-36M		CN-27F
218	P	AVSS0.75sq	CN-19F		CN-77F
219A	GY	AVSS0.75sq	CN-19F		CN-26F
219B	GY	AVSS0.75sq	CN-41F		CN-26F
219C	GY	AVSS0.75sq	CN-44M		CN-26F
220A	LW	AVSS0.75sq	CN-18F	DOUBLE SPLICE	CN-67F
220B	LW	AVSS0.75sq	CN-18F		CN-19F
222	LW	AVSS0.75sq	CN-34F		CN-68F
230	VR	AVSS0.75sq	CN-57F		CN-42F
231	VY	AVSS0.75sq	CN-57F		CN-42F
232	Gr	AVSS0.75sq	CN-57F		CN-42F
233	GrB	AVSS0.75sq	CN-57F		CN-42F
301	Sb	AVSS0.75sq	CN-35M		CN-63F
328	GrR	AVSS0.75sq	CN-35M		CN-65F
329	LgR	AVSS0.75sq	CN-35M		CN-44M
330	Lg	AVSS0.75sq	CN-35M		CN-44M
401	GR	AVSS0.75sq	CN-55F		CN-56F
402	YG	AVSS0.75sq	CN-55F		CN-56F
403	Br	AVSS0.75sq	CN-55F		CN-56F
500	LgR	AVSS0.75sq	CN-1F		CN-30F
501	LgW	AVSS0.75sq	CN-1F		CN-30F
502	LgY	AVSS0.75sq	CN-1F		CN-30F
503	LO	AVSS0.75sq	CN-1F		CN-30F
504	PG	AVSS0.75sq	CN-1F		CN-30F

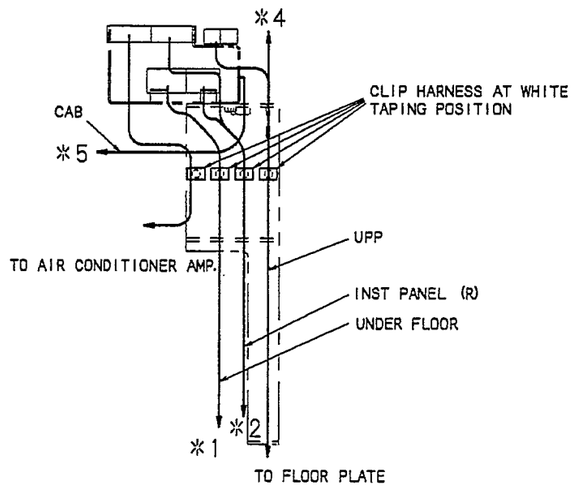
WIRE NO	WIRE COLOR	WIRE SIZE	FROM	CONNECTION	TO
505	PL	AVSS0.75sq	CN-1F		CN-30F
506	VY	AVSS0.75sq	CN-1F		CN-30F
507	VG	AVSS0.75sq	CN-1F		CN-30F
508	VY	AVSS0.75sq	CN-1F		CN-31M
509	Sb	AVSS0.75sq	CN-1F		CN-31M
510	GR	AVSS0.75sq	CN-2F		CN-30F
511	LY	AVSS0.75sq	CN-2F		CN-30F
512	Sb	AVSS0.75sq	CN-3F		CN-30F
513	LgR	AVSS0.75sq	CN-3F		CN-31M
514	GO	AVSS0.75sq	CN-3F		CN-31M
515	V	AVSS0.75sq	CN-2F		CN-30F
516	L	AVSS0.75sq	CN-2F		CN-30F
517	P	AVSS0.75sq	CN-1F		CN-36M
518	L	AVSS0.75sq	CN-7F		CN-34F
519	V	AVSS0.75sq	CN-7F		CN-34F
524	WR	AVSS0.75sq	CN-7F		CN-34F
540	LG	AVSS0.75sq	CN-7F		CN-44M
542A	GrG	AVSS0.75sq	CN-4F		CN-27F
542B	GrG	AVSS0.75sq	CN-32M		CN-27F
542C	GrG	AVSS0.75sq	CN-36M		CN-27F
545	Lg	AVSS0.75sq	CN-2F		CN-10F
547	GB	AVSS0.75sq	CN-4F		CN-30F
548	GY	AVSS0.75sq	CN-4F		CN-30F
549	Lg	AVSS0.75sq	CN-4F		CN-30F
550	BG	AVSS0.75sq	CN-4F		CN-30F
551	GL	AVSS0.75sq	CN-4F		CN-30F
552	BrL	AVSS0.75sq	CN-4F		CN-30F
553A	VW	AVSS0.75sq	CN-27F		CN-30F
553B	VW	AVSS0.75sq	CN-27F		CN-4F
553C	VW	AVSS0.75sq	CN-27F		CN-20F
556	BrW	AVS0.5sq	CN-4F		CN-51F
557	L	AVSS0.75sq	CN-4F		CN-38M
558	G	AVSS0.75sq	CN-4F		CN-38M
559	PB	AVSS0.75sq	CN-7F		CN-60F

5.8 E/G HARNESS ASSY ; LC16E00005F1
(Same as STD ; Refer to STD page 45)

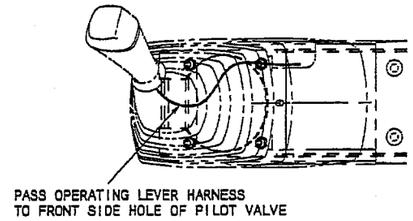
5.9 FLOOR HARNESS ASSY

FLOOR HARNESS ASSY		YN13E00071F5		ROTARY LMN & B
ITEM	NAME	PART No.	Q'TY	REMARKS
10	CABLE	LE13E01005P1	1	Floor ground
13	HARNESS	YN13E01290P2	1	Under floor
20	HARNESS	LC13E01108P1	1	Instrument panel (RH)
21	HARNESS	LC13E01067P1	1	Instrument panel (LH)

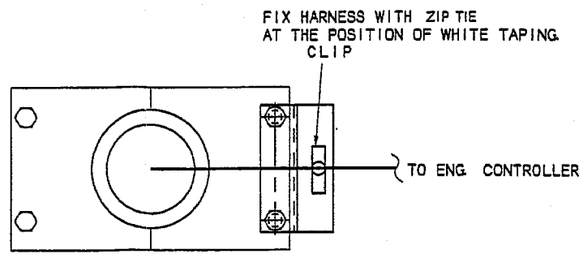




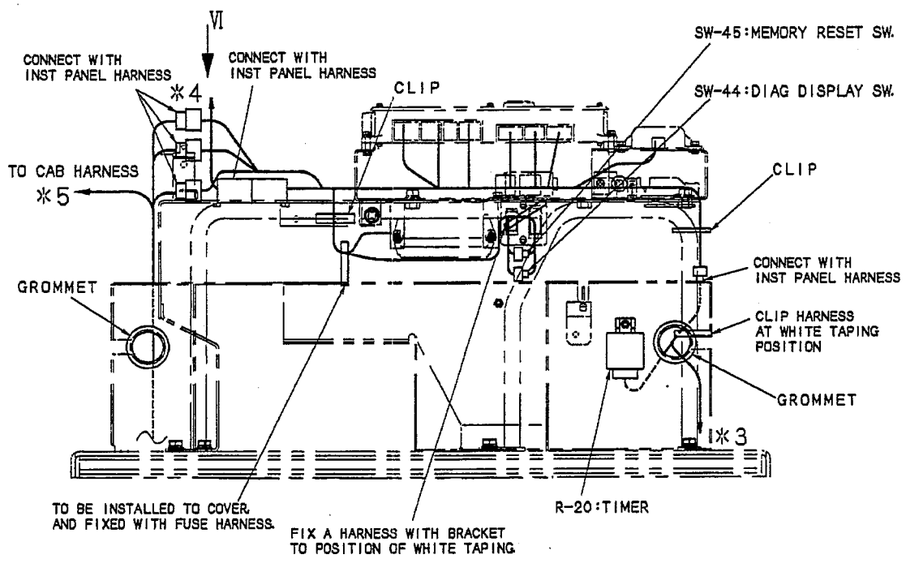
VIEW I



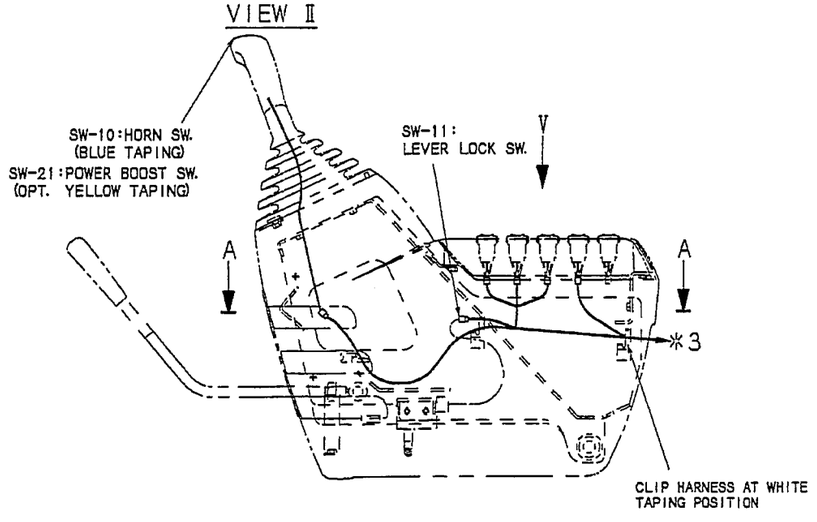
DETAIL OF B



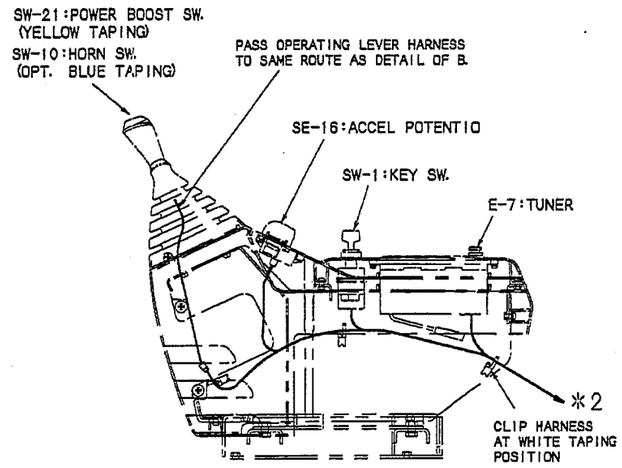
DETAIL OF C



VIEW II



VIEW III



VIEW IV

Fig.18 (1/2) Floor harness assy

5.18 PROXIMITY SWITCH INSTALL

PROXIMITY SWITCH INSTALL		LC50E00001F1		
ITEM	PART NAME	PART NO.	Q'TY	REMARKS
4	SWITCH ; SW-32	2479R2096	1	Proximity sw.

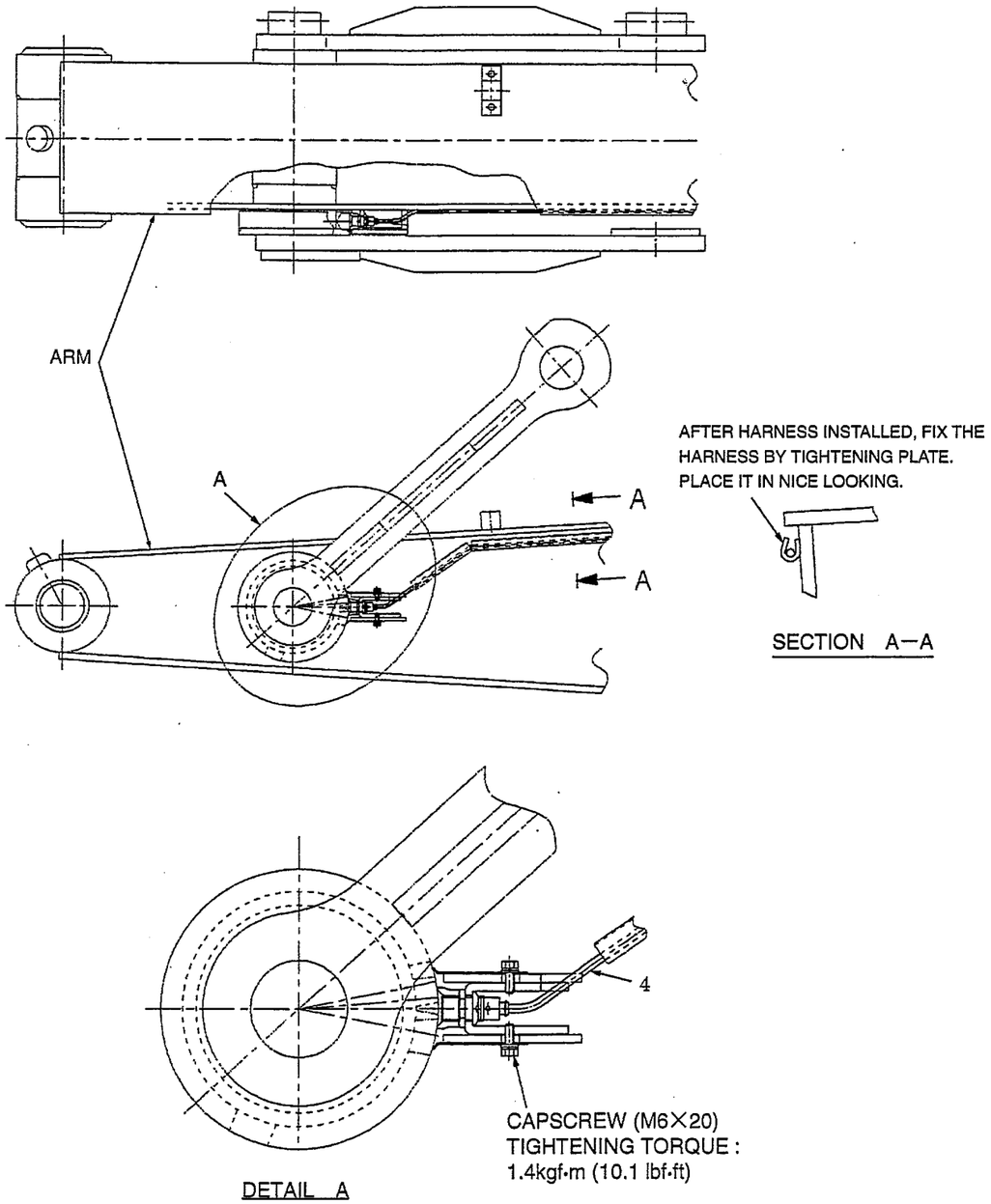
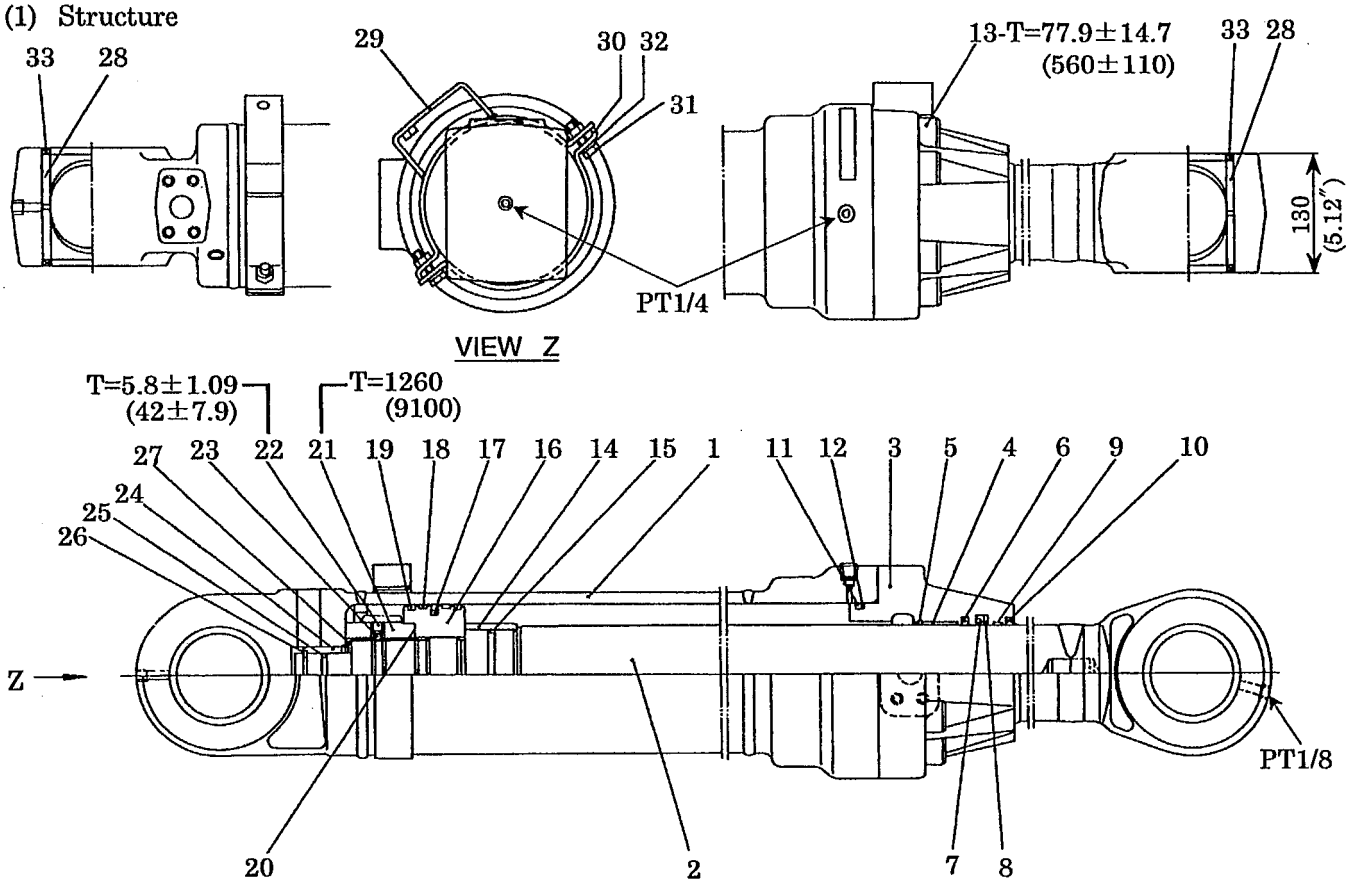


Fig. 47 Proximity switch install

7.7.2 JIB CYLINDER

(1) Structure



T : Tightening torque kgf·m (lbf·ft)

Fig.2

P/No.	2438U1137F2							
NO.	PART NAME	Q'TY	NO.	PART NAME	Q'TY	NO.	PART NAME	Q'TY
1	CYLINDER TUBE	1	12	BACKUP RING	1	23	BALL	1
2	PISTON ROD	1	13	SOCKET BOLT ; M24×80	8	24	CUSHION BEARING	1
3	CYLINDER HEAD	1	14	CUSHION BEARING	1	25	SEAL	1
4	BUSHING	1	15	SEAL	1	26	STOPPER	2
5	SNAP RING	1	16	PISTON	1	27	SNAP RING	1
6	BUFFER RING	1	17	SEAL RING	1	28	BUSHING	2
7	U RING	1	18	RING	2	29	BAND ASSY	1
8	BACKUP RING	1	19	RING	2	30	BAND	1
9	RING	1	20	SHIM	1	31	BOLT	2
10	WIPER RING	1	21	NUT ; M80×2	1	32	WASHER	2
11	O RING ; 1B P14	1	22	SETSCREW ; M14×2	1	33	WIPER RING	4

(2) Specification

Unit : mm (ft-in)

Item / Name	Cylinder bore / Rod dia	Stroke	Center distance of pins Full extend / Full retract	Cushion	Weight kg (lb)
Jib cylinder	150 / 105 (5.91" / 4.13")	1,630 (5' 4")	3,930 / 2,300 (12' 11" / 7' 6")	With cushion on both sides	320 (705)

Table 1-2 BREAKER

Class		NAME	KCME	ASIA	ASIA (Middle East)
(1) Upper		Upper structure modification kit No.	Ⓔ Ⓟ	Ⓠ Ⓡ	
		• Upper frame	—	LC52F00085P1	
		• Modification of the control valve	—	LC30V00002F3	
		• Hydraulic tank assy	[—]	[LC33H00020F2]	
			LC33H00020F5	←	
		• Remote control piping ; P/V	LC68H00041F1	LC68H00040F1	
		• Remote control block	YN64H00069F2	YN64H00141F2	
		• Remote control piping ; C/V	LC06H00033F3	LC06H00028F3	
		• Upper hydraulic piping	LC03H00011F1	LC03H00034F1	
		• Install of the name plate	YN22T00269F3	←	
(2) Boom		Boom modification kit No.	Ⓑ	Ⓑ	
		• 6.5M (21′ 4″) Boom	LC02B00035F2	←	
		• 6.5M (21′ 4″) Boom hydraulic piping	LC42H00014F1	←	
(3) Arm	STD	3.3M (10′ 10″) Arm modification kit No.	Ⓒ	Ⓘ	Ⓜ
		• 3.3M (10′ 10″) STD Arm	LC12B00040F7	LC12B00035FB	LC12B00040FB
		• 3.3M (10′ 10″) STD Arm hydraulic piping	LC43H00005F1	←	LC43H00057F1
		• Arm group	LC12B00136F2	←	←
	LONG	4.15M (13′ 7″) Arm modification kit No.	Ⓕ	—	Ⓢ
		• 4.15M (13′ 7″) LONG Arm	LC12B00041F9	—	LC12B00041FE
		• 4.15M (13′ 7″) LONG Arm hydraulic piping	LC43H00018F1	—	LC43H00056F1
		• Arm group	LC12B00136F2	—	LC12B00136F2
(4) Connector		Kit No. is not given because it is provided after selection	—		
		• Connector assy	YN43H00004F1		
			YN43H00005F1		

• [ ] shows before modification

NOTE : If kit numbers are the same, the ordered parts are the same, provided the assembly numbers differ in some cases.

Kit No. Ⓔ ; LC32T01007F8
Ⓕ ; LC32T01001FR
Ⓟ ; LC32T01007FH
Ⓠ ; LC32T01007F9
Ⓡ ; LC32T01007FJ
Ⓢ ; LC32T01007FA

1.2 ADDITIONAL PARTS FOR THE MODIFICATION OF THE BREAKER

(1) UPPER STRUCTUR KCME

BREAKER

No.	PART No.	NAME	Q'TY	REMARK	Applicable Machines
Ⓔ	LC32T01007F8	Upper structure modification kit No. BREAKER		Before modification	LC08-06201~, YC08-03001~
Ⓟ	LC32T01007FH	Upper structure modification kit No. BREAKER		After modification	LC09-06323~, YC09-03088~
	LC33H00020F5	• HYDRAULIC TANK ASSY		After modification	LC09-06323~, YC09-03088~
10-100	YN52V01008R100	• • REPAIR KIT	1		LC09-06323~, YC09-03088~
	LC68H00041F1	• REMOTE CONTROL PIPING ; P/V			
1	2420R349D090	• • HOSE	1		
2	2444R1120D110	• • HOSE	1		
3	2420R349D360	• • HOSE	1		
4	ZN18C08007	• • NUT	1		
5	PY03M01026P1	• • PIN	1		
6	ZW16X08000	• • WASHER	9		
7	ZS18C08065	• • CAPSCREW	6		
8	YN68H01035P1	• • CLAMP	3		
9	ZS18C08045	• • CAPSCREW	2		
10	ZW16H08000	• • WASHER	2		
11	YN68H01038P1	• • BRACKET	1		
12	2419T3757D6	• • PIN	1		
13	2419R9D4	• • PIN	1		
14	HH35X04004G3	• • ELBOW	1	With filter	
15	ZH32X04000	• • ELBOW	1		
16	YT30V00004F1	• • PILOT VALVE ASSY	1		
17	2416Z566	• • CUSHION RUBBER	1		
18	ZS18C08020	• • CAPSCREW	2		
19	YT30M01002F1	• • LOCK ASSY	1		
20	YN68H01039P2	• • PEDAL	1		
21	YR03M01134P1	• • COVER	1		
22	ZW16X12000	• • WASHER	1		
23	2418T18004	• • PLATE	2		
24	YX52S00010P1	• • PRESSURE SENSOR (LOW PRESSURE)	1		
25	2444Z4239	• • TEE	1		
26	ZH22X04000	• • CONNECTOR	1		
27	2444Z2525	• • CONNECTOR	1		
	YN64H00069F2	• CONTROL BLOCK PIPING			
4	2444Z2336	• • TEE	1		
10	ZH32X04006	• • ELBOW	1		
11	2416N6141	• • BLOCK	1		
12	ZE72X04000	• • PLUG	1		
13	ZE72X06000	• • PLUG	1		
14	ZH22X04000	• • CONNECTOR	1		
	LC06H00033F3	• REMOTE CONTROL PIPING ; C/V			
4	ZH32X04000	• • ELBOW	1		

2.3 LAYING OF PIPING

(1) Breaker specification

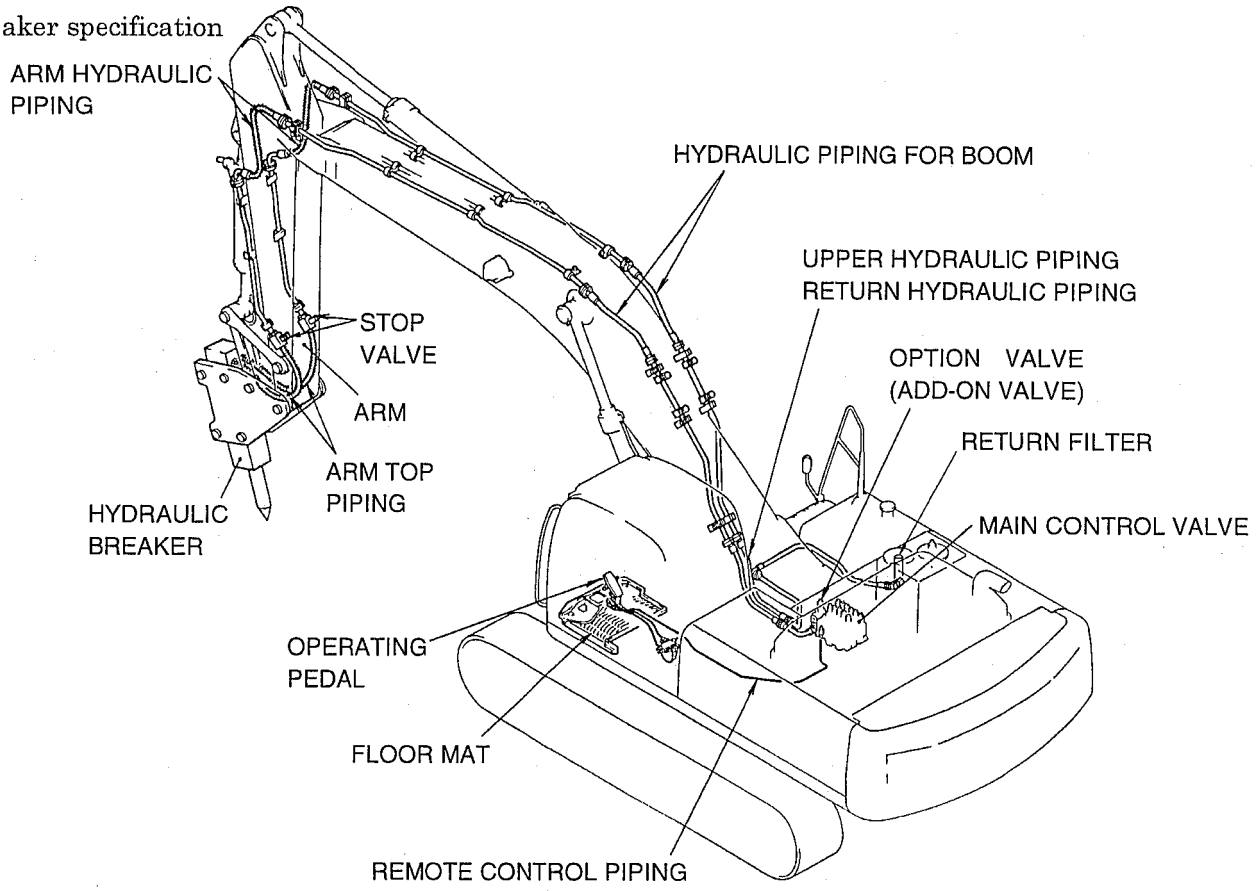


Fig. 1 Outside view of Breaker-attached machine

(2) Nibbler & Breaker specification

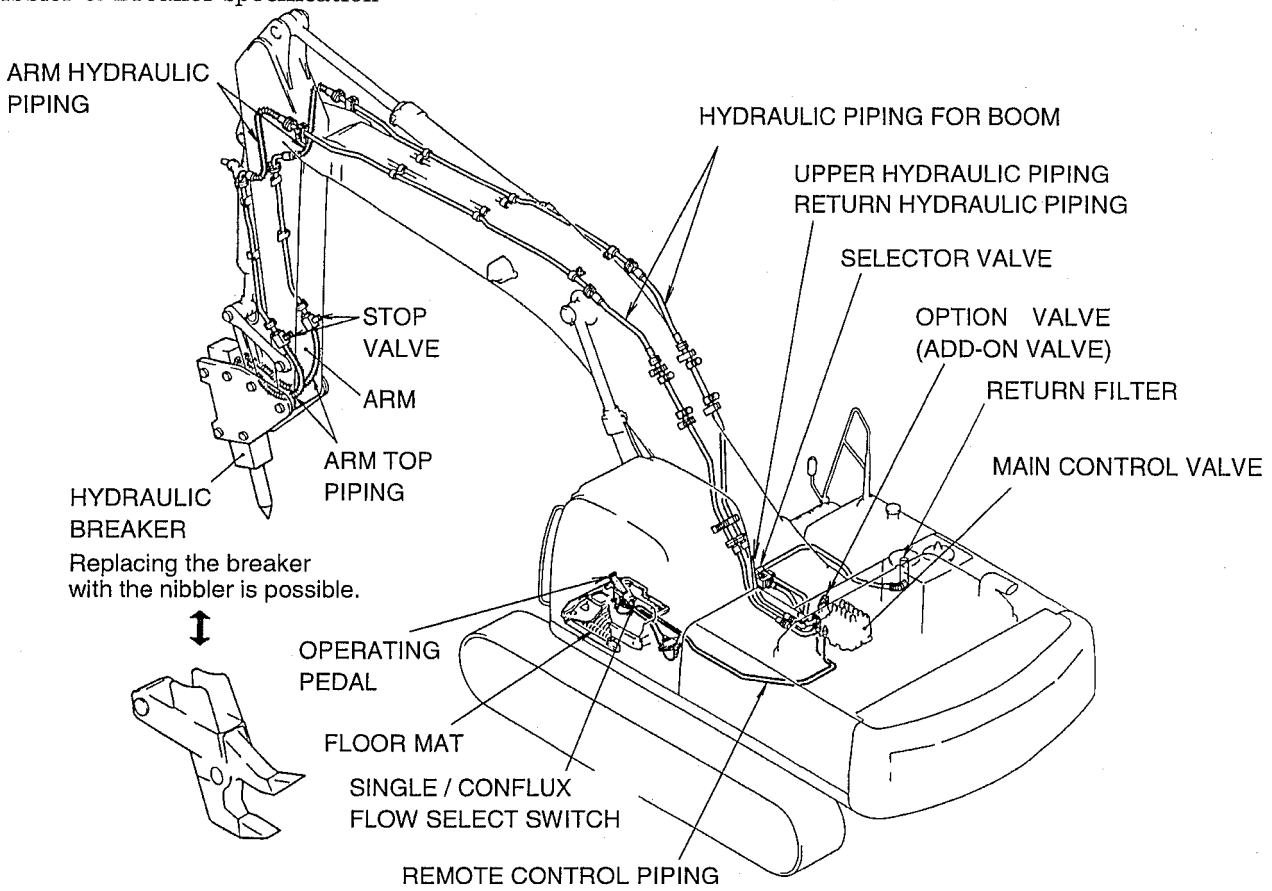


Fig. 2 Outside view of Nibbler & Breaker-attached machine

5.9 UPPER HYDRAULIC PIPING (NIBBLER & BREAKER)

(1) Modification Procedure

Fit the additional parts in Table 11, according to Fig. 12.

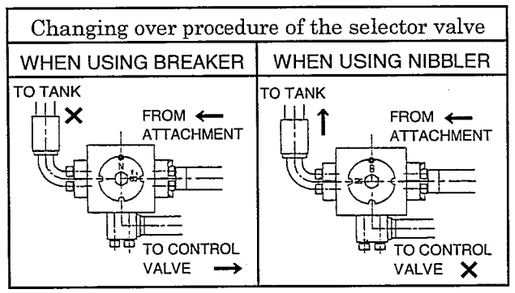
Table 11

UPPER HYDRAULIC PIPING	LC03H00031F1								
No.	PART No.	NAME	Q'TY	REMARK	No.	PART No.	NAME	Q'TY	REMARK
1	LC03H01063P1	TUBE	1		15	ZS18C10030	CAPSCREW	4	M10×30
2	LC03H01095P1	TUBE	1		16	ZS18C12035	CAPSCREW	8	M12×35
3	LC03H01197P1	TUBE	1		17	ZS18C12090	CAPSCREW	1	M12×90
4	LC03H01025D1	HOSE ; L=1700	1		18	ZS28C12040	CAPSCREW	16	M12×40
5	HH25R16016G2	CONNECTOR	1	PF1	19	ZW16H10000	WASHER	4	M10
6	HH35X16016G1	ELBOW	1	PF1	20	ZW16H12000	WASHER	9	M12
7	24100P2599F2	SELECTOR VALVE	1		21	2418T10357	WASHER	3	
8	LC03H01064P1	SUPPORT	1		22	ZW26K12000	LOCK WASHER	20	M12
9	LC03H01218P1	BRACKET	1		23	ZN18C12010	NUT	1	M12
10	LC03H01194P1	CLAMP	1		24	LC03H01070P1	SUPPORT	1	
11	ZS28C12065	CAPSCREW	4	M12×65	25	YN32H01066P1	CLAMP	2	
12	ZE13X16000	HALF CLAMP	8		26	YN03H01431P1	BUSHING	2	
13	ZD12P03400	O RING	5	1B P34	27	ZS18C12055	CAPSCREW	2	M12×55
14	ZD12A02100	O RING	2	1B A21	28	LC03H01200P1	SUPPORT	1	

	Capscrew
Thread size	Tightening torque kgf·m (lbf·ft)
M10	7.2 (52.1)
M12	12.3 (89.0)

		O ring type coupling	Hydraulic hose (30° flare)
Thread size (PF)	Spanner (mm)	Tightening torque kgf·m (lbf·ft)	Tightening torque kgf·m (lbf·ft)
1	41	26.0 (188)	14.0 (101)

Changing over procedure of the selector valve



5.10 RETURN HYRAULIC PIPING N&B

(1) Parts to be disused

Concerning the return hydraulic piping, the parts listed in Table 11 and Fig. 13 is disused from the standard machine.

Table 11

UPPER HYDRAULIC PIPING	LC32H00015F1			
No.	PART No.	NAME	Q'TY	REMARKS
40	ZE72X16000	PLUG	1	With O RING

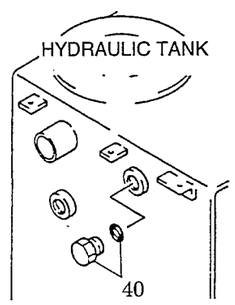


Fig. 13 Parts to be disused

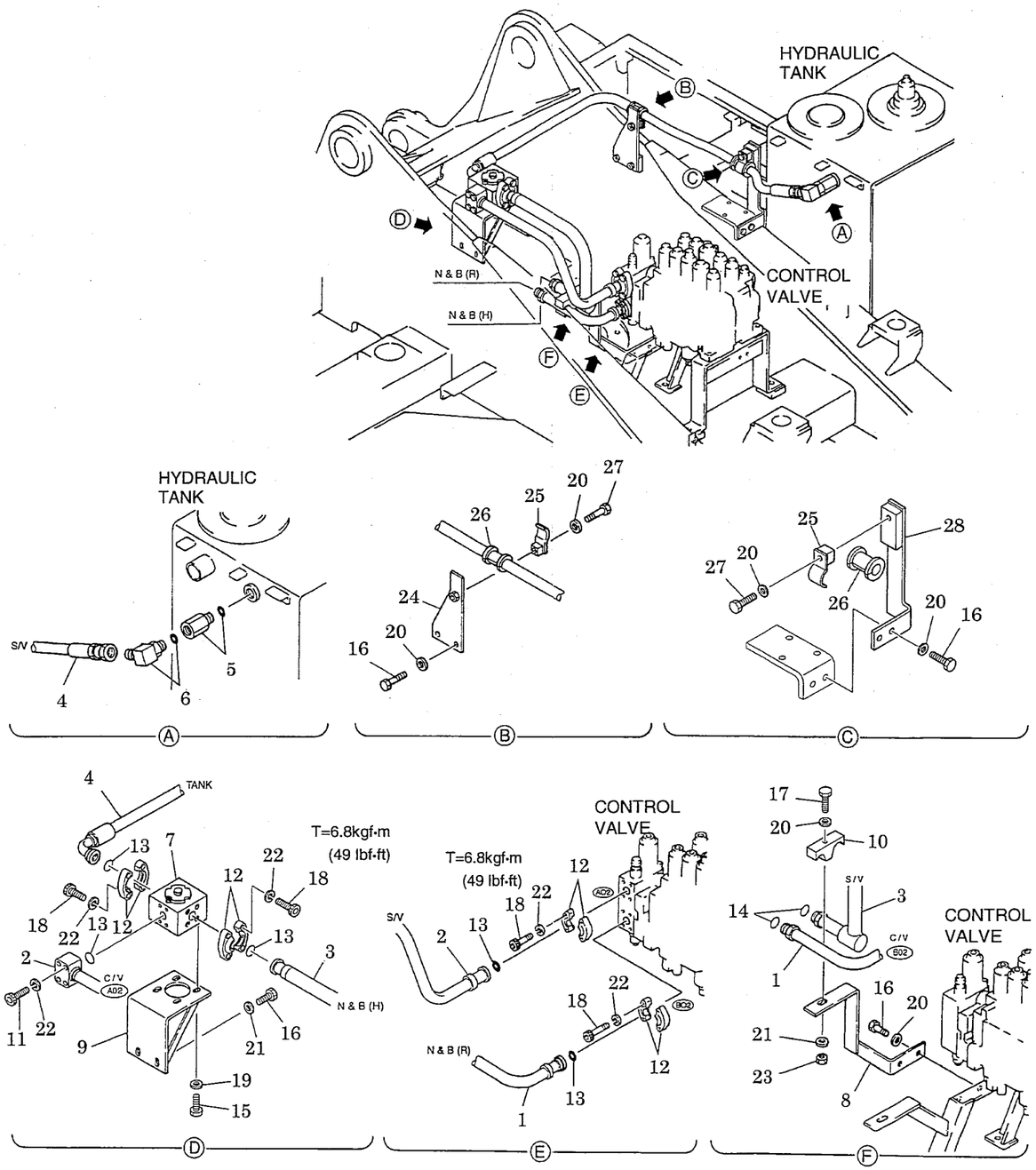


Fig. 12 Upper hydraulic piping (Nibbler & Breaker)

7.3 HYDRAULIC PIPING FOR 6.5M (21ft-4in) BOOM

(1) Nibbler & Breaker, Breaker

Install the additional parts listed in Table 3 to the 6.5m (21ft-4in) boom modified as shown in Fig. 2.

Table 3

BOOM HYDRAULIC PIPING		LC42H00014F1							
No.	PART No.	NAME	Q'TY	REMARK	No.	PART No.	NAME	Q'TY	REMARK
3	LC42H01062P1	TUBE	1		14	ZD12P03800	O RING	6	1B P38
4	LC42H01063P1	TUBE	1		15	ZS18C12065	CAPSCREW	16	M12×65
5	2444R1166D7	HOSE	2		16	ZS18C10030	CAPSCREW	12	M10×30
6	LC42H01041D1	HOSE	2		17	ZW16H12000	WASHER	16	M12
7	ZE72X16000	PLUG	4		18	ZW16H10000	WASHER	12	M10
8	LS42H01018P1	CLAMP	4		19	ZE13X20001	HALF CLAMP	12	
9	LS42H01019P1	CLAMP	8		20	ZS28C14050	CAPSCREW	24	M14×50
11	LC42H01269P1	CLAMP	8		21	ZW26K14000	LOCK WASHER	24	M14
12	LC42H01020P1	BUSHING	4		22	LC42H01123P1	TUBE	1	
13	LC43H01013P1	BUSHING	6		23	LC42H01124P1	TUBE	1	

NOTE :

- Remove item 7 plug as necessary, and install an accumulator recommended by the breaker maker.

NOTE :

1. Pay attention to dropping off O ring at assembling.
2. Tightening torque for M-threads

Thread size	Tightening torque
M10	6.70kgf·m (48.5 lbf·ft)
M12	11.7kgf·m (84.8 lbf·ft)

3. Tightening torque for ORS joint nut

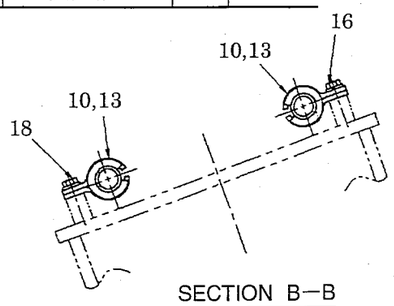
Thread size	Tightening torque
1 7/16-12UN	21.0kgf·m (152 lbf·ft)

4. Apply loctite #242 at the setting bolts of clamp.

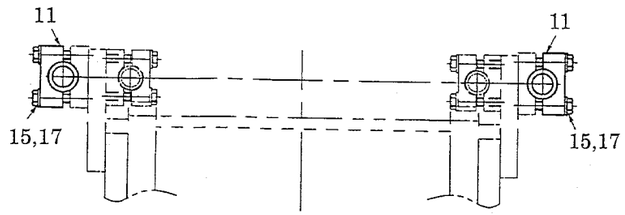
(2) Parts to be disused

Table 4

BOOM HYDRAULIC PIPING		LC42H00013F1	STD	
No.	PART No.	NAME	Q'TY	REMARK
10	LS43H01005P1	CLAMP	8	
13	LC42H01020P1	BUSHING	4	
16	ZS18C1030	CAPSCREW	8	
18	ZW16H10000	WASHER	8	



SECTION B—B



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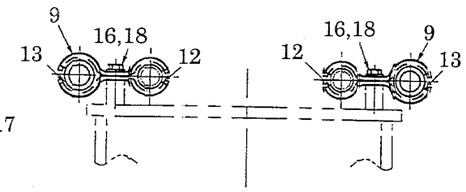

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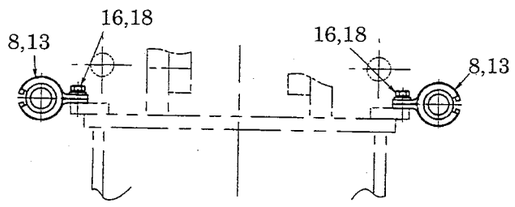

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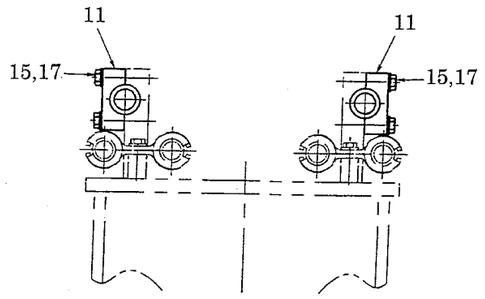

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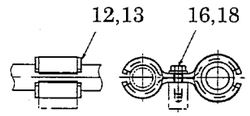
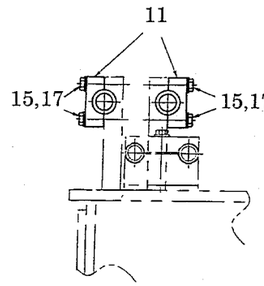


DETAIL OF CLAMP



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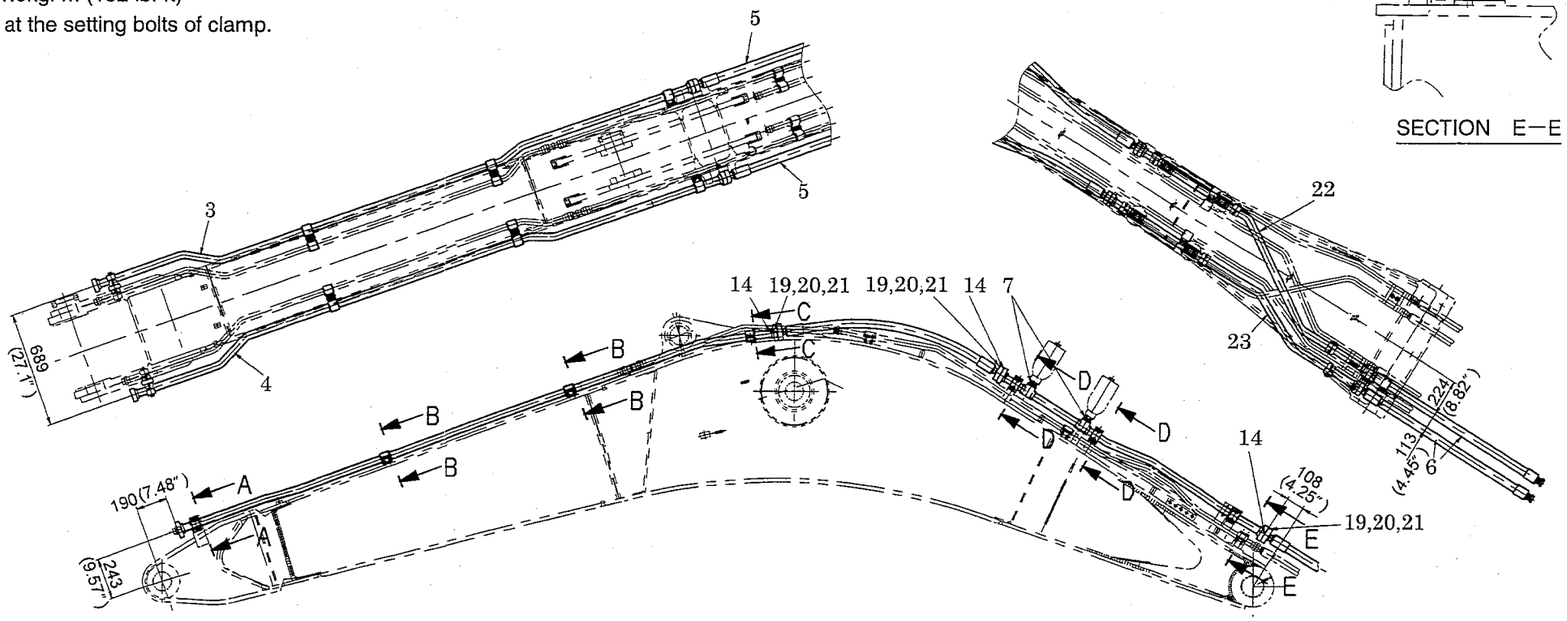

Fig.2 Hydraulic piping for 6.5M (21ft-4in) boom (Nibbler & Breaker, Breaker)