NEW HOLLAND

EXCAVATOR

E130

SERVICE MANUAL

87360591 NA

Issued 01-2006

NEW HOLLAND

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Revision History			
Issue	Issue Date	Applicable Machines	Remarks
First Edition	01-2006	E130	5-1290 NA

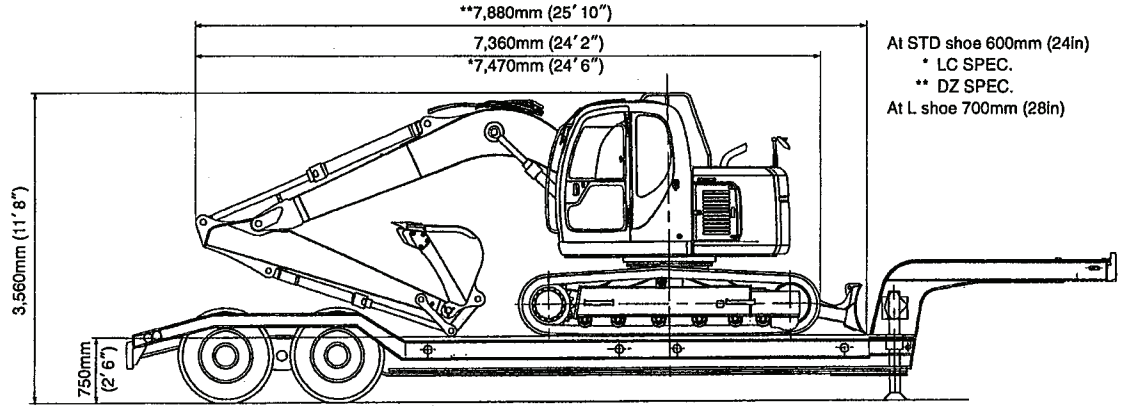
6. Unit Conversion

QUANTITY	GRAVITATIONAL	SI	CONVERSION FACTOR
Mass	kg	kg	
Force	kgf	N	1 kgf=9.807 N
Torque	kgf·m	Nm	kgf m=9.807 Nm
Pressure	kgf/cm^2	MPa	1 kgf/cm^2=0.09807 MPa
Motive Power	PS	kW	1 PS=0.7355 kW
Revolution	rpm	min^{-1}	r/min *1
*1 Units that are allowed to use.			

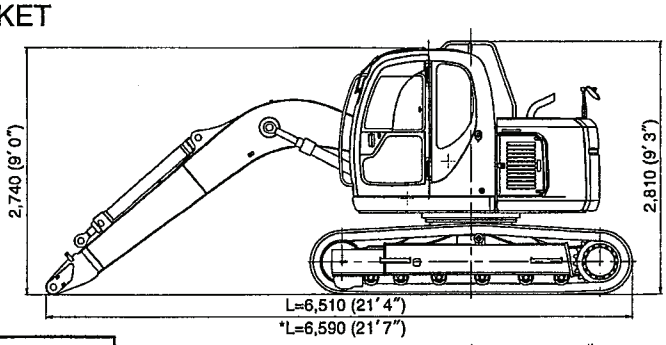
2.2.2 TRANSPORTATION DIMENSIONS AND WEIGHT

● OVERALL DIMENSIONS OF A COMPLETE MACHINE ON A TRAILER

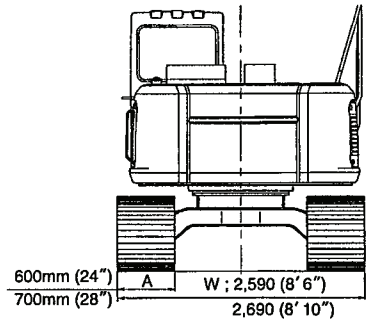
Item \ Model		E130 SR (-1E)	E130 SR (l) (-1E)	E130 SR (LC) (-1E)
Arm & Bucket	2.45M (8′ 05″)+0.50m³ (0.65cu·yd)			2.95M (9′ 8″)+0.38m³ (0.50cu·yd)
Weight kg(lb)	14,400 (31,750)	13,800 (30,420)	15,700 (34,610)	14,000 (30,860)

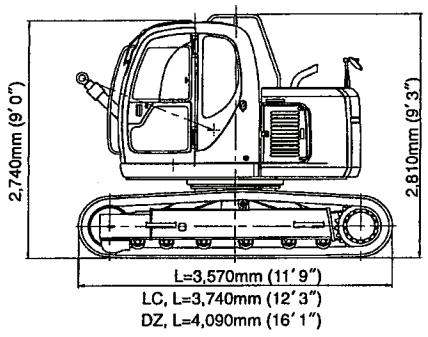


● WITHOUT ARM AND BUCKET
&
● WITHOUT BOOM, ARM AND BUCKET



	A	Model	Weight kg(lb)
WITHOUT ARM & BUCKET	600mm (24in)		
		E130 SR (DZ) (-1E)	12,720 (28,000)
		E130 SR (-1E)	12,920 (28,500)
	700mm (28in)		
		E130 SR (-1E)	13,040 (28,700)
		E130 SR (LC) (-1E)	13,240 (29,200)
		E130 SR (L) (-1E)	15,040 (33,200)
WITHOUT BOOM & ARM & BUCKET	600mm (24in)		
		E130 SR (-1E)	11,780 (26,000)
		E130 SR (LC) (-1E)	11,980 (26,400)
	700mm (28in)		
		E130 SR (-1E)	12,100 (26,700)
		E130 SR (LC) (-1E)	12,300 (27,100)
		E130 SR (L) (-1E)	14,100 (31,100)





CH02-06-01

Figure 4

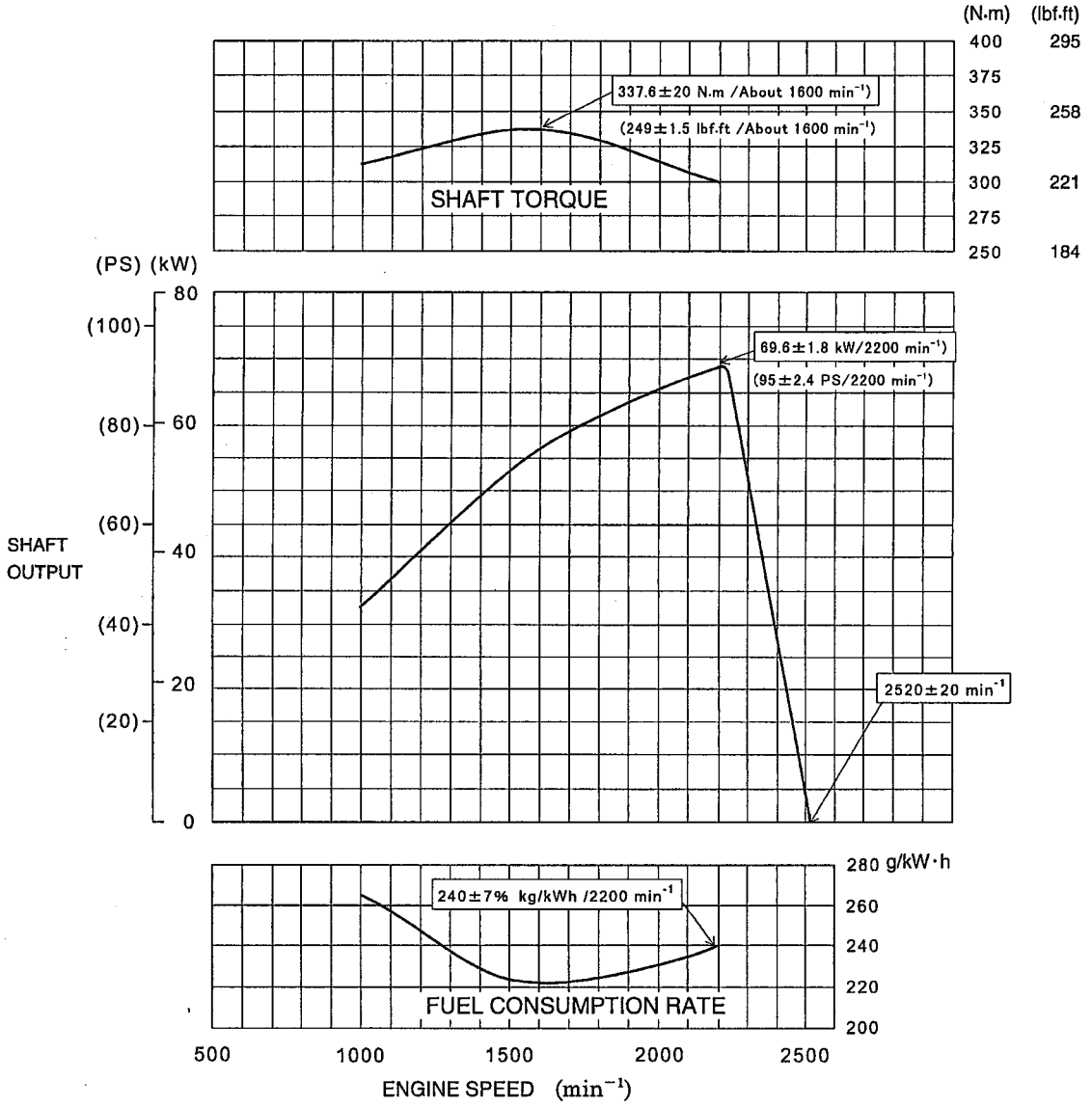
2.4.1 ENGINE CHARACTERISTIC CURVE

E130 SR (-1E); E130 SR (LC) (-1E); E130 SR (L) (-1E)

MODEL	SERIAL NUMBER
E130 SR (-1E)	YY03-04555～
E130 SR (LC) (-1E)	YH03-02097～
E130 SR (L) (-1E)	LK03-01107～

9A.2 ENGINE CHARACTERISTIC CURVE (ISUZU BB—4BG1T)

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



E130 SR (LC) (-1E); E130 SR (L) (-1E)

Fuel consumption volume

$$= \frac{\text{Fuel consumption rate}}{0.835 \times 1000} \times \text{kw} \times \text{Load factor } (\alpha)$$

$$= \frac{245\text{g/kw·h}}{0.835 \times 1000} \times 69.6\text{kw} \times \alpha$$

$=20.4\ \alpha$ ·ℓ/h
$=14.3 \sim 16.3$ ℓ/h

α : Standard load factor (0.70～0.80)

Fuel consumption in regular operation
(load factor : 0.70～0.80)
11.7～13.4ℓ/h

CH02-16-01

3.2.2.2 CLEARANCE IN THRUST DIRECTION ON ARM AND CYLINDER INSTALLATION SECTION

(2) Clearance of arm and cylinder installing sections in thrust direction

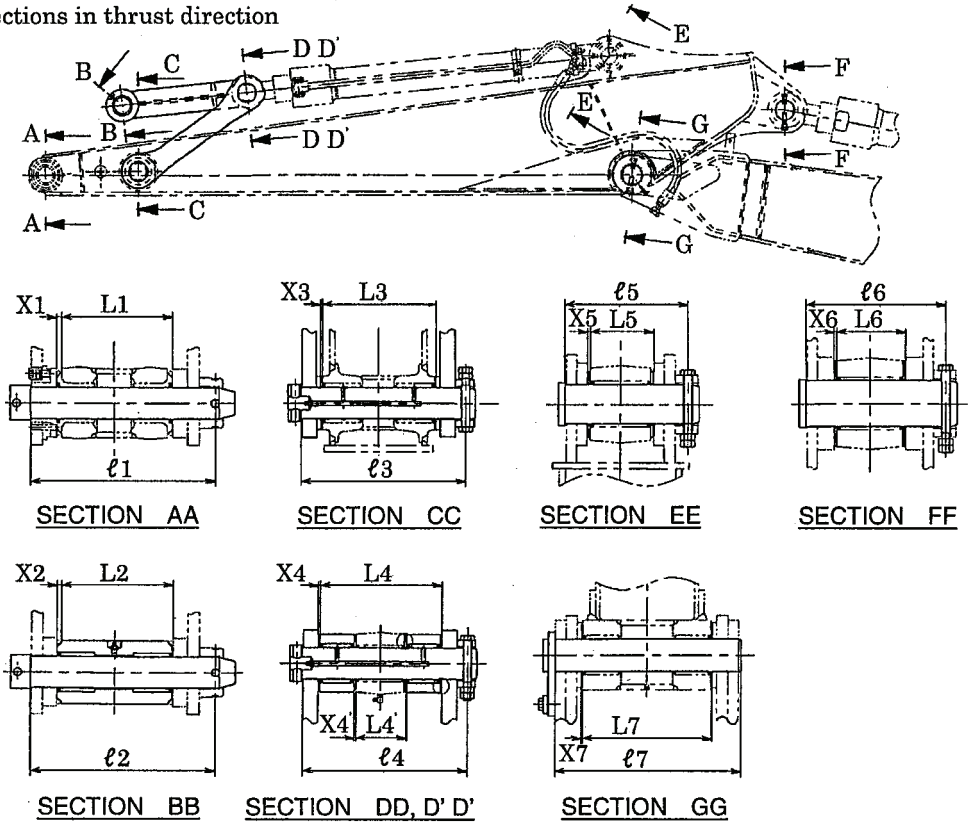


Fig. 2-3 Clearance of arm and cylinder installing sections in thrust direction

Table 2-3 Unit : mm (in)

Section	Item		Basic size No.	Basic size Size	Shim adjusting clearance (Total of both sides) Standard value	Repairable level	Service limit	Length under pin neck No.	Length under pin neck Length	Remedy
A	Arm point	Arm	L1	250 (9.84)	0.6~1.0 (0.02~0.04)	1.2 (0.05)		ℓ1	※391 (15.4)	Shim adjustment
		Bucket		251 (9.88)						
B	Bucket link	Link side	L2	250 (9.84)				ℓ2		
		Bucket		252 (9.92)						
C	Idler link (Arm connection)	Arm	L3	244 (9.61)	0.5 (0.02) or less	1.0 (0.04)	2.0 (0.08)	ℓ3		
		Link side		—						
D	Bucket link: Link connection	Bucket link side	L4	2.44 (9.61)	0.6~1.0 (0.02~0.04)	1.2 (0.05)		ℓ4	※328 (12.9)	
		Idler link side		—						
	Bucket link: Bucket cyinder connection	Rod side	L4'	90 (3.54)						
		Bucket link side		98 (3.86)						
E	Bucket cylinder (Bottom side)	Bottom side	L5	90 (3.54)	0.6~2.0 (0.02~0.08)	2.0 (0.08)	2.5 (0.10)	ℓ5	※196 (7.72)	
		Arm		98 (3.86)						
F	Arm cylinder (Rod side)	Rod side	L6	100 (3.94)				ℓ6	※212 (8.35)	
		Arm		108 (4.25)						
G	Arm foot	Arm	L7	268 (10.6)	0.5 (0.02) or less	1.0 (0.04)	2.0 (0.08)	ℓ7	※386 (15.2)	
		Boom	L7'	274 (10.8)						

Note : The mark ※ shows the length from the under head to the center of pin hole.

CH03-08-01

Figure 6

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Issue	Issue Date	Applicable Machines	Remarks
First edition	01-2006	E130	5-1320 NA

11.5.2.4 PLUG FOR ORS JOINTS

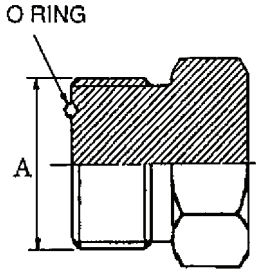


Table 4-8

Screw size A	Applicable hose O.D	Plug parts No.	Opposing flats(HEX)	O ring parts No.	Norminal O ring
1-14UNS	Ø21.7	YN01H01001P1	27	ZD12A01600	1B A16
1 3/16-12UN	Ø27.2	YN01H01002P1	36	ZD12A01800	1B A18
1 7/16-12UN	Ø34.0	YN01H01003P1	41	ZD12A02100	1B A21

CH11-08-01

Figure 16

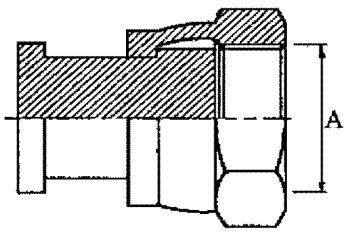


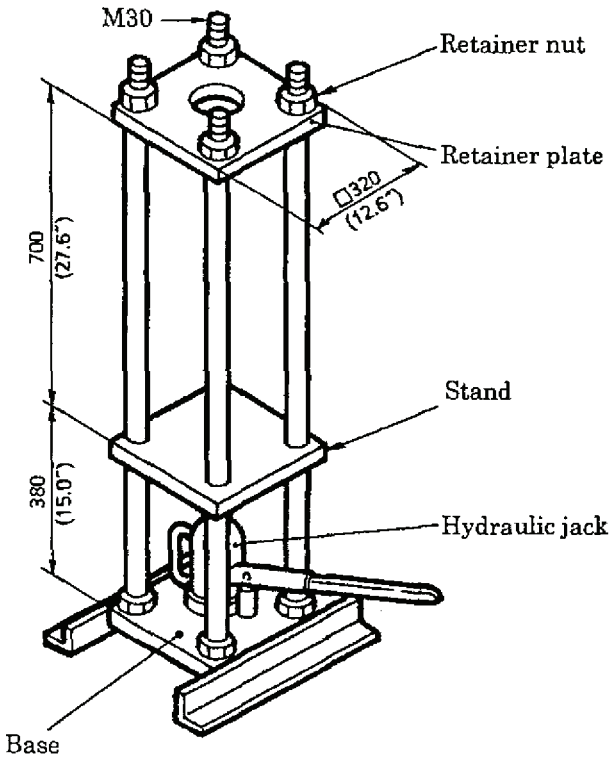
Table 4-9

Screw size A	Applicable tube O.D	Plug parts No.	Opposing flats(HEX)
1-14UNS	Ø21.7	YN01H01004P1	32
1 3/16-12UN	Ø27.2	YN01H01005P1	36
1 7/16-12UN	Ø34.0	YN01H01006P1	41

CH11-08-02

Figure 17

11.14 TRACK SPRING SET JIG



CH11-17-02

Figure 31

12.2.4 TRAVEL SYSTEM, ELECTRIC EQUIPMENT

Group		Location	Work to be done	Unit	Remark	E130 SR (LC)
04 Travel system	00	Travel relation			1. Reference for crawler	
	01	Track link ASSY	Detach/attach	One side	Include adjustment of tension.	1.0
	02	• Track link attaching and detaching position	Preparation	One side		0.1
	03	• Master pin	Detach/attach	One side		0.4
	04	• Track link extending and winding	Detach/attach	One side		0.4
	05	Shoe plate	Replace	1 pc.		0.4
	10	Upper roller relation			2. Reference for upper roller	
	11	Upper roller ASSY	Detach/attach	1	After removing track link	0.2
	12	Upper roller	O/H	1		1.0
	20	Lower roller relation			3. Reference for lower roller	
	21	Lower roller ASSY	Detach/attach	1		0.2
	22	Lower roller	O/H	1		1.0
	30	Front idler relation			4. Reference for front idler	
	31	Front idler ASSY	Detach/attach	One side	After removing track link	0.5
	32	Front idler ASSY slinging	Detach/attach	One side		0.2
	33	Front idler ASSY	Detaching	One side		0.2
	34	Idler ASSY	O/H	One side		1.0
	35	Idler adjuster ASSY	O/H	One side	Replace spring	2.0
	36	• Grease cylinder	O/H	One side		0.5
	40	Sprocket			5. Reference for sprocket	
	41	Sprocket	Replace	One side	After removing track link	0.5
	50	Travel motor relation			8. Reference for travel motor	
	51	Travel motor ASSY	Detach/attach	One side	After removing track link	1.4
	52	• Motor cover	Detach/attach	One side		0.1
	53	• Hydraulic piping	Detach/attach	One side		0.7
	54	• Motor mounting bolt	Detach/attach	One side		0.4
	55	• Motor slinging	Detach/attach	One side		0.1
	56	Motor cleaning	Cleaning	One side		0.1
	57	Travel motor	O/H	One side		3.0
	58	Travel reduction gear	O/H	One side		3.0
	60	Swivel joint relation				
	61	Pipe on swivel joint travel side	Detach/attach	1 pc.	Include bonnet assy removing and installing.	0.5
	62	Swivel joint	O/H	1 pc.	Refer to Upper structure (Group No.100)	
	70	Swing bearing			6. Refer to 6. Swing bearing removing and installing.	
	71	Swing bearing ASSY	Detach/attach	1 pc.	After removing upper flame	0.6
	72	Swing bearing mounting bolt	Detach/attach	1 pc.		0.4
	73	Swing bearing slinging	Detach/attach	1 pc.		0.2
	80	Dozer relation				
	81	Dozer ASSY	Detach/attach	1 pc.		0.6
	82	• Dozer cylinder piping	Detach/attach	1 pc.		0.2
	83	• Dozer cylinder slinging	Detach/attach	1		0.2
	84	Dozer slinging	Detach/attach	1 pc.		0.2
	85	Dozer Cylinder	O/H	1		2.0
06 Electric equipments		Controller				
	C-1	Controller (KPSS)	Replace	1		0.2
	C-2	Gauge cluster	Replace	1		0.2
	C-4	Air conditioner Amplifier	Replace	1		0.2
	C-5	Power window controller (OPT)	Replace	1		0.2
	C-6	IT controller (OPT)	Replace	1		1.0

CH12-08-01

Figure 5

13.2 PERFORMANCE INSPECTION STANDARD TABLES

Table 1 (1/2)

E130 SR (LC))-1E); E130 SR (L) (-1E)

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

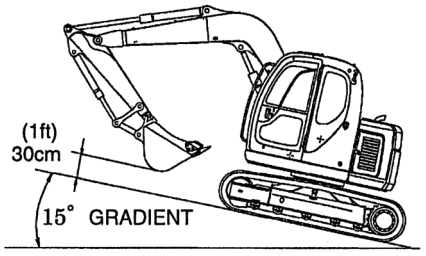
Inspection Item				Measuring Position: Position	Size	Port	Standard value	Hi	Lo	Unit	Adjusting Point	Measuring condition
Standard Measuring condition	Cleanliness of hydraulic oil			Hydraulic oil in tank			NAS 8	+1	−1	Class	—	Sampling
	Hydraulic oil temperature			Tank surface			50 (122)	+5 (41)	−5 (23)	℃ (°F)	—	Atmospheric temp. 50℃～−10℃ (122°F～14°F)
	Water temperature			Radiator surface			75 (167)	+15 (59)	−15 (5)		—	
	Engine speed	Lo idle		Selector switch on the gauge cluster screen (Injection pipe)			1000	+25	−25	min^{-1}	Adjustment not required	LOW throttle
		Hi idle					2350	+30	−30			FULL throttle (H mode)
		S mode					2200	+30	−30			Perform all measurement with the air-conditioner "OFF".
		FC mode					1700	+30	−30			
		Decel					1050	+30	−30			
Pilot primary pressure circuit				G pump			a3	50 (700)	+5 (+70)	0	kgf/cm^2 (Psi)	PR1	HI idle
High pressure circuit	Main relief Valve pressure	Travel & ATT	P1,P2	Main pump		PF1/4	a1,2	350 (5000)	+5 (+70)	0		MR1	L and R Simultaneous
			P1,P2				a1,2						Boom up
		Ex. & Doz.	P4				a4	230 (3300)	+5 (+70)	0		MR4,5	Dozer up
		Extra	P4				a4	210 (3000)	+5 (+70)	0		MR5	Extra ope.
		Dozer	P4				a4	210 (3000)	+5 (+70)	0		MR4	Dozer up
	Port relief valve pressure	Boom	H				a1	385 (5500)	0	−35 (−500)		OR3	Boom up
			R									OR4	Boom down
		Bucket	H				a1	385 (5500)	0	−35 (−500)		OR1	Bucket digging
			R									OR2	Bucket dump
		Travel	RH Forward				a1	—	—	—		—	Simultaneous Operation of travel RH and LH (without port relief)
			RH Reverse									—	
			LH Forward				a2	—	—	—		—	
			LH Reverse									—	
		Swing	LH				a2	285 (4100)	+35 (+500)	+5 (+70)		OR5	Swing LH
			RH									OR6	Swing RH
		Arm	H				a2	385 (5500)	0	−35 (−500)		OR7	Arm in
			R									OR8	Arm out
		N&B	H				a2	250 (3600)	+10 (+150)	0		OR12	Nibbler close
			R									OR11	Nibbler open
		Extra	H				a4	230 (3300)	0	−20 (−300)		OR13	Extra ope.
			R									OR14	Extra ope.

CH13-04-01

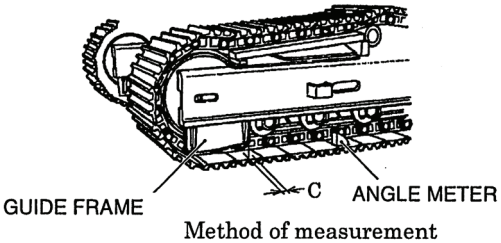
Figure 1

13.6.1.1 PARKING BRAKE PERFORMANCE

1. Confirm the parking brake holds when the machine is stopped in a no-load travel position on a 15 degree gradient slope.
2. Place an angle meter on the shoe plate and confirm that it shows an angle of more than 12 degrees. Hang a perpendicular rod parallel with the guide frame rib on the track frame. Put a matching mark on the shoe plate. Five minutes after the engine stops at park, measure the movement distance of the matching mark.



Parking brake operating position



Method of measurement

8 Unit : mm/5 min

Parking brake Table 8 (in/5min)

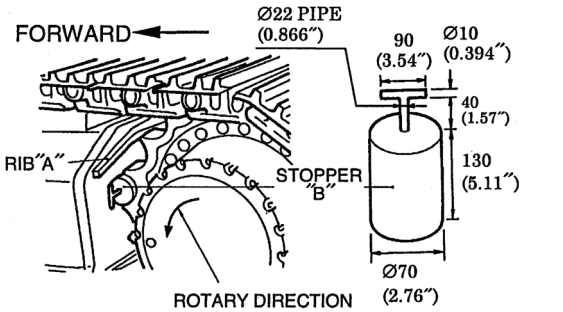
Measuring position	Standard value	Reference value for remedy	Service limit
C	0	1 (0.04)	2 (0.08)

13.6.1.2 DRAIN RATE OF TRAVEL MOTOR

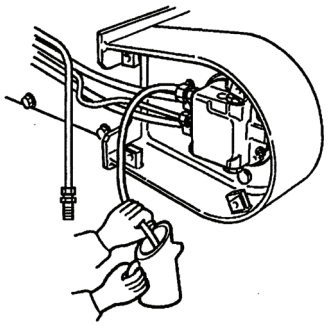
1. Measure the drain rate of the travel motor and confirm the performance of the travel motor.
2. Preparation:
   A. Apply stopper pins for both travel sprockets of left and right.
   B. Stop the engine, and release air in the hydraulic reservoir.
   C. Connect a hose to the drain port of travel motor and place in a container.
   D. Install a plug to the drain line at the tank side.

WARNING: *Make sure of the rotating direction of travel motor. Otherwise, rib "A" may be broken by the stopper pin.*

3. Measurement conditions:
   - Engine: High Idle
   - Hydraulic oil temperature: 45 to 55°C (113 to 131°F)
   - Machine posture: Locked travel and over running the relief on the travel motor
4. Measure the drain volume of oil for 30 seconds. Take three measurements in the forward motion of each side and take an average of the measured value.



Location of stopper applied to travel sprocket



Method of measuring the drain rate of travel motor

Drain rate of travel motor Table 9 Unit : ℓ/30sec (gal/30sec)

Measuring position	Standard value	Reference value for remedy	Service limit
Drain rate	5 (1.3)	13 (3.4)	15 (4.0)

CH13-14-01

Figure 11

NOTES

NOTES

NOTES

(1) Pressure draining (releasing) control

1) If display select switch and buzzer stop switch of gauge cluster are kept pressed for more than five seconds, the mechatro controller judges it as Pressure Releasing Control.
2) If the mechatro controller judges it pressure releasing control, the mechatro controller performs the following regardless of input signals (From operation pilot valve, accel potentiometer, etc.):
   a. Puts out a minimum tilting angle command to the pump proportional valve.
   b. Puts out a command current for pressure releasing control revolution to the governor motor.
   c. Puts out a command current for the pressure position switch to the travel straight proportional valve.
   d. Puts out a standby command current to the P1 bypass cut valve and the P2 bypass cut proportional valve.
3) A command current from the mechatro controller causes the following to occur:
   a. The pump proportional valve puts out a secondary pilot pressure to the pump to minimize the tilting angle of the pump.
   b. The governor motor controls the engine revolution to a pressure releasing control revolution.
   c. The travel straight proportional valve puts out a secondary pilot pressure to switch the travel straight valve to the pressure releasing position.
   d. The P1 bypass cut valve and the P2 bypass cut proportional valve put out a secondary pilot pressure to hold the P1 bypass cut valve and the P2 bypass cut valve in their standby position.
4) The mechatro controller senses the output voltage of the high pressure sensor of the main pump, judges it as pump pressure and displays "DRAINING HYD. PRESS" or "FAIL DRAIN HYD. PRESS" on the gauge cluster.
5) Since the travel straight valve is in the pressure releasing position, the oil discharged by each pump is unloaded to the tank passage.
   If the operating levers are operated and the spools switched, the pressure remaining in the actuators may be discharged.

CH21-07-02

Figure 10

The functions displayed on the multidisplay are classified roughly into the following 7 types.

※ 1. CPU error display ····· Display the error of the mechatro controller, etc. (28 items)

※ 2. Self-diagnosis display ····· Displays the failure of the I/O system of the mechatro controller such as the low and high pressure sensors, governor motor, proportional valve, solenoid valve, etc.

3. Service diagnosis display ····· Displays the information output by the mechatro controller such as the pressure sensor detection, proportional valve, solenoid valve, etc. (22 items)

4. Trouble history display ····· Stores and displays the contents of the troubles detected through the mechatro self diagnosis.

5. Mechatro A adjustment display ····· Displays it by procedure during the mechatro A adjustment.

6. E/G oil supply cumulative (integrated) time ·· Displays the E/G oil supply cumulative time and E/G speed (rpm) list.

7. Warning displays ····· When the machine is normal after self-diagnosis (※) but the actual operation fails, the occurence of any of the following items is indicated every time.

KCMA	KCME	KCMA	KCME	KCMA	KCME
1 CPU MECHATRO CONT FAIL	1 CPU	6 LOW E/G OIL PRESS	6	29 CHANGE E/G OIL	29
2 SWINGBRAKE DISENGAGED	2	7 HIGH E/G COOL TEMP	7	32 (PR) DRAINING HYD. PRESS	32 (PR)
3 KPSS DISENGAGED	3	9 REST'D AIR CLEANER	9	33 (PR) FAIL DRAIN HYD. PRESS	33 (PR)
4 E/G PREHEAT	4	11 CHARGING PROBLEM	11		
5 FINISH PREHEAT	5	12 LOW FUEL LEVEL	12		

Note 1. The buzzer sounds on display No. 2,3,5,6,7,32 and 33.

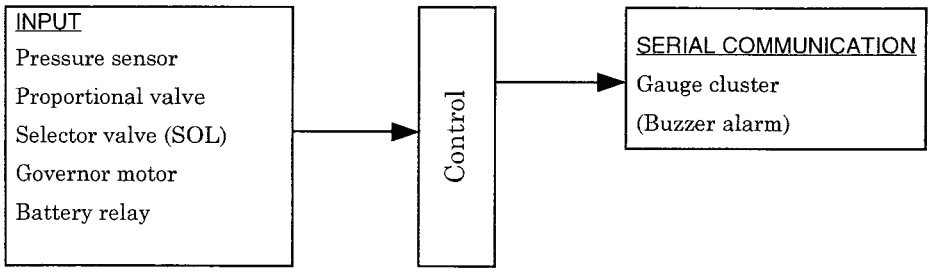
Note 2. The buzzer does not stop by the buzzer stop switch, exept No.7.

2.2 SELF DIAGNOSIS DISPLAY FUNCTION

(1) Summary

It performs self diagnosis of control inputs and outputs of pressure sensors and proportional valves while the machine is in operation. Errors coming out of the self diagnosis are displayed on the multi display of the gauge cluster. Regarding the connector numbers and the pin numbers, refer to the C-1 Mechatro Controller which appears later. Wire numbers and colors may be confirmed on the electric circuit diagram or on the harnesses.

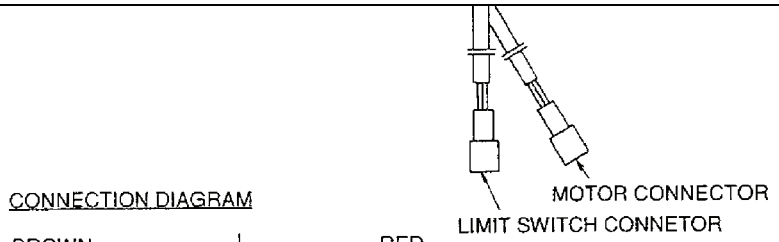
(2) I/O configuration

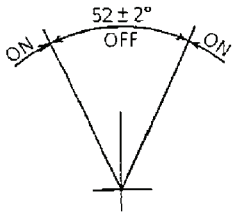


CH21-13-02

Figure 18

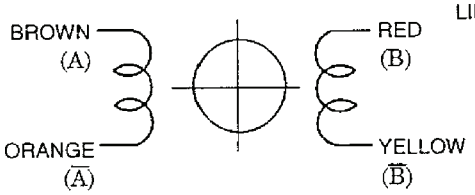
21.2.6.1 GOVERNOR MOTOR (SYMBOL M-S)



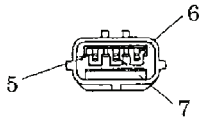


LIMIT SWITCH MOTION RANGE

CONNECTION DIAGRAM



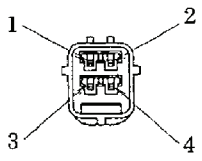
LIMIT SWITCH CONNECTOR WIRE TABLE



No.	Lead color	Connection
5	White	COM
6	Red	NO
7	Yellow	NC

HOUSING : 174359-2 (AMP)
TERMINAL : 171661-1 (AMP)
RETAINER : 1-174360-1 (AMP)
WATER RESISTANCE : 172888-2 (AMP)

MOTOR CONNECTOR WIRE TABLE



No.	Lead color	Connection
1	Brown	A
2	Orange	$\overline{A}$
3	Red	B
4	Yellow	$\overline{B}$

HOUSING : 174259-2 (AMP)
TERMINAL : 171661-1 (AMP)
RETAINER : 1-174260-1 (AMP)
WATER RESISTANCE : 172888-2 (AMP)

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Figure 28

3. COLOR CODING STANDARD FOR HYDRAULIC CIRCUITS

Blue ····· Feed, drain circuit, less than 4.5kgf/cm² (64psi)
Green ····· Return, make up circuit, 4.5～6kgf/cm² (64～85psi)
Purple ····· Secondary pilot pressure, 6～50kgf/cm² (85～710psi)
Red ····· Primary pilot pressure, 35～50kgf/cm² (500～710psi)
Orange ····· Main pump drive pressure, 50～350kgf/cm² (710～4980psi)
Blue tone ····· At valve selection
Red valve ····· When proportional valve (reducing) is operating
Red solenoid ····· In active and exciting

Displaying the flow circuit and standby circuit when operating.

Regarding the electrical symbols in this manual, refer to the electric circuit diagram.

4. NEUTRAL CIRCUIT

This section describes the following.

1) Safety lock lever and pilot circuit
2) Pump control
3) P-Q curve control action of pumps

4.1 SAFETY LOCK LEVER AND PILOT CIRCUIT

Purpose:

To protect attachment from unexpected operation for safety, however, dozer is outside of adaptation.

Principle:

Cut pressure source of pilot valve for operation.

Operation:

After engine starts, push down the safty lock lever (red), and the limit switch (SW-11) is turned on, the pilot operation circuit is changed to standby condition.

4.2 PUMP CONTROL

Type:

Variable displacement pump of electric flow control type.

Principle:

Controls the tilting angle of the pump (delivery rate) by changing the command current I to the solenoid proportional reducing valve.

Operation:

1) Flow increase function (for example; P1 pump):

This is a positive control type that increases the command current I of the mechatro controller. If the attachment other than the dozer is operated, the secondary pilot operating pressure is put in each low pressure sensor. The output voltage of the low pressure sensor is put into the mechatro controller. The mechatro controller processes pilot signals and put out a current command according to the input voltage. If the secondary pressure of the solenoid proportional valve increases, the spool (652) is pushed to the right via the pilot piston (643) and stops where it balances the action of the pilot spring (646).

The larger diameter of the servo piston (532) opens to the tank port, moves to the left by the discharge pressure P1 of the smaller diameter of it and increases the tilting angle (α). The servo piston and the sleeve are linked together by the feedback lever (611). A pin is provided at point A of the feedback lever. Since the feedback lever runs on the fulcrum, the servo piston and the sleeve (651) move in the opposite directions and stop where the spool-sleeve opening is closed.

2) Flow reducing action

If the command current I of the mechatro controller decreases, the secondary pressure of the solenoid proportional valve decreases. This causes the pilot spring (646) to move the spool (652) to the left. If the spool is shifted, the discharge pressure P1 is admitted to the larger diameter chamber of the servo piston by way of the spool.

The discharge pressure P1 is there at the smaller diameter of the servo piston at all times, but because of the difference in the area causes the servo piston to move to the right and to decrease the tilting angle. If the servo piston moves to the right the same way as above, the sleeve moves to the left by the feedback lever, till the opening of the spool-sleeve is closed.

4.3 P-Q CURVE CONTROL ACTION OF PUMPS

Type:

Electrically flow controlled variable-displacement pump

Principle:

Outputs of the high pressure sensor for the pump are converted to P-Q curve control values by the mechatronic controller to give commands to the pump's solenoid proportional valve.

Operation:

The high-pressure sensor of the pump converts the discharge pressure of the pump to voltage outputs.

The mechatronic controller converts the voltage outputs from the high-pressure sensor to command current as it makes P-Q curve control.

In the meantime, the mechatronic controller selects the lower of the command current and the positive control command current from the low-pressure sensor and sends out a current command to each proportional valve of the pump.

8. SWING CIRCUIT

This section describes the following operations.

1) Swing left pilot circuit
2) Swing auto parking brake
3) Prevention of swings on stop of swing action by means of by-pass valve
4) Swing main circuit
5) Swing motor function

8.1 SWING LEFT PILOT CIRCUIT

Operation:

1) If the swing left action is performed, the secondary pilot proportional pressure goes out of port ⑤ of left pilot valve (10) and acts upon the low pressure sensor (SE-5). At the same time, the pressure acts upon the PAS port of C/V (2).
2) The low pressure sensor output voltage enters in the mechatro controller, and after signal processing the mechatro controller outputs the command current to P2 bypass cut solenoid proportional valve (PSV-B), and the proportionl valve secondary pressure is discharged from this the solenoid valve and acts on PCa port of the C/V (2).
3) Then, the secondary pressure entered into PAS port of the C/V (2) switches the slewing spool. And the solenoid proportionl valve secondary pressure entered in PCa port switches the P2 bypass cut spool.

8.2 SWING AUTO PARKING BRAKE

Purpose:

Swing lock and parking brake in neutral position

Principle:

Release mechanical brake only when required to operate swing and arm in

Operation:

1) The swing parking function operates usually when the key switch is ON condition and the mechanical brake spring is actuated.
2) If the swing parking solenoid is de-excited, the mechanical brake is released only when the secondary operating pressure that is built up during swing action or arm in action acts upon either of the low pressure sensors (SE-5.7).
3) The swing parking solenoid (SV-1) is excited five seconds after the pressure of the swing low pressure sensor (SE-5) disappears. In the case of arm in, the swing parking solenoid (SV-1) is excited to operate the mechanical brake the moment the pressure of the low pressure sensor (SE-7) for arm in disappears.

8.3 PREVENTION OF SWINGS ON STOP OF SWING ACTION BY MEANS OF BY-PASS VALVE

Purpose:

Prevention of swings on stop of swing action

Principle:

Reducing pressure surges of main circuit on stop of swing action

Operation:

1) At the start of swing action and during continuous operation, the swing pilot pressure comes out of the PSS port of C/V (2) and acts upon both the Pi1 and pi2 ports of the swing motor. Therefore, the ports A and B are shut off by spring action.
2) If the swing lever is brought back to neutral, the pressure drop on the slow return valve (25) side is delayed. As the result, the pressure pushes the valve leftward against the spring action of the by-pass valve and causes ports A and B to be connected together.

8.4 SWING MAIN CIRCUIT

Operation:

The delivery oil through A2 port of P2 pump flows into P2 port of the C/V (2) and is branched into the bypass circuit and parallel circuit, but the bypass circuit is closed with the movement of the swing spool, the pressure opens load check valve (LCS) through the parallel circuit flows into B port of the swing motor through AS port of the C/V (2) and rotates the swing motor counterclockwise. However, when starting swing operation, the oil flows out in the tank circuit through P2 bypass cut valve from the bleed off passage of the swing spool. The P2 bypass cut valve closes in late and consequently the swing hunting due to the control of the swing flow rate is prevented.

8.5 SWING MOTOR FUNCTION

1) Anticavitation circuit when reducing swing speed.
2) Shockless relief to protect it from reverse rotation.

10. COMBINED CIRCUIT (WITH MULTIPLE C/V CIRCUIT)

This section describles only the difference in combined operation.

1) Boom up/travel, pilot circuit
2) Boom up/travel, main circit

10.1 BOOM UP/TRAVEL, PILOT CIRCUIT

Opreation:

<Points which are differed from the independent operation>

1) With signal processing of mechatro controller, the controller outputs command current to travel straight valve (PSV-C) and P2 bypass cut valve (PSV-B) and this solenoid valve outputs secondary pressure, then acts on C/V (2) PTb and PCa ports.
2) Next, the PTb port pressure changes the travel straight valve by one step. The solenoid proportional secondary pressure which flows into the PCa port of C/V (2) changes over the P2 bypass cut valve.
3) Next, the travel motion is performed by the oil discharged by the P2 pump.
4) Before entering the travel valve, the oil discharged by the P2 pump is branched off into the P1 and P2 bypass lines. The oil then passes through the right and left travel spools and is supplied to the travel motor via the Br and BL ports of the C/V (2).
5) However, part of the oil gets through by way of the notched throttle in the travel straight valve spool. The throttled passage controls the speed of the attachments such as travel and boom motions.

10.2 BOOM UP/TRAVEL, MAIN CIRCUIT

Purpose:

Trevel straight operation is available even if the attachment is operated during travel operation.

Principle:

The travel motion and attachment operations are performed by respective pump.

Operation:

1) The boom and other attachments operate on the P1 pump circuit.
2) The oil discharged by the P1 pump runs into the travel straight section.
3) Since the travel straight valve spool has moved, the oil discharged by the P1 pump passes the travel straight valve, pushes the load check valves (CT1 and CT2) open and branches off into the P1 and P2 parallel lines. The oil from the load check valve (CT1) which has run into the P1 parallel line attempts to get out of the Ab port of the C/V (2) past the load check valve (LCb) and the boom spool. However, since the back pressure of the boom lock valve (CRb) is raised and closed, the oil enters the P2 parallel line, passes through the boom conflux valve and the load check valve(Ccb) and is supplied to the boom cylinder(H) via the Ab port of the C/V (2).

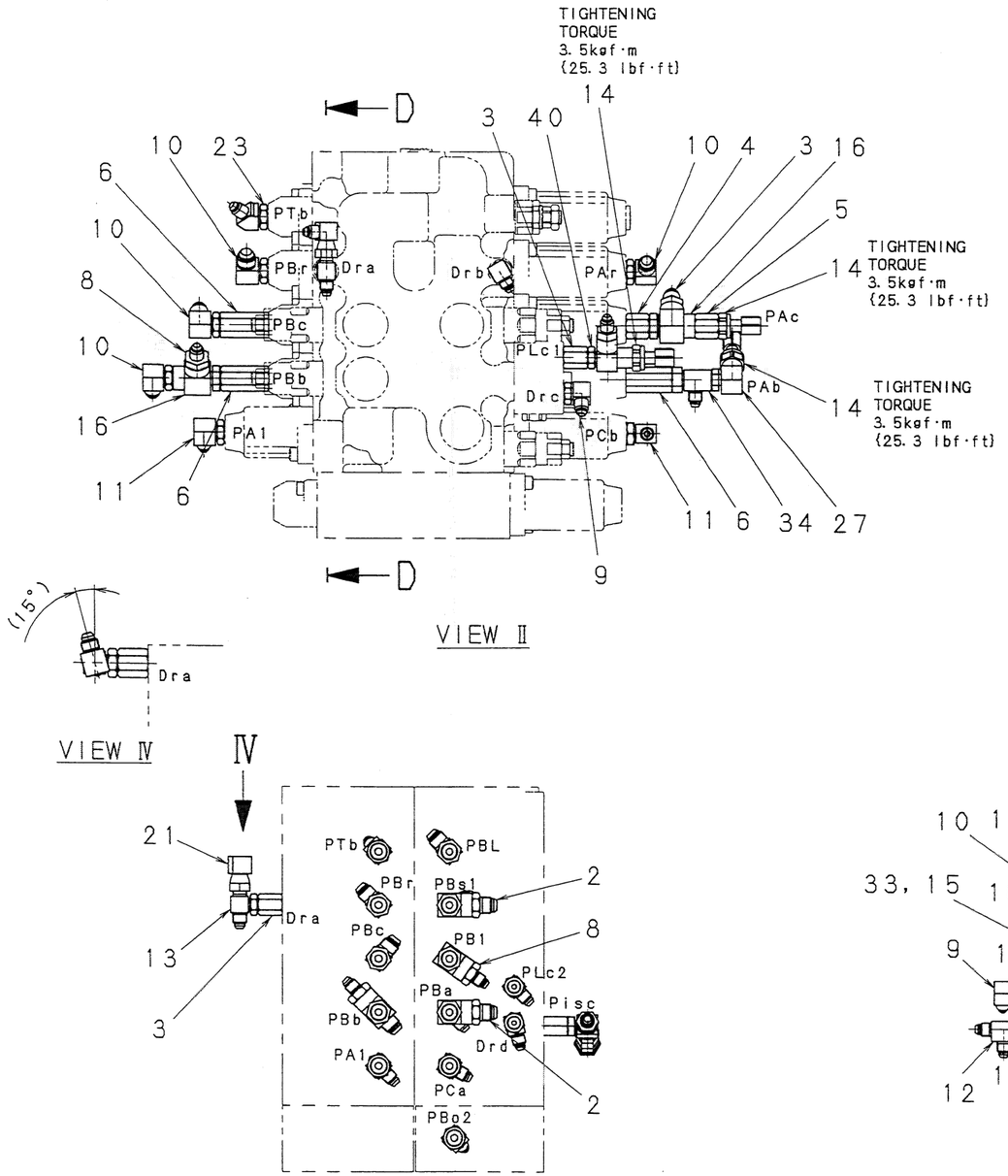
ITEM	PART NAME	Q'TY		REMARKS or PART No.
(8-1)	N&B REMOTE CONTROL	↓		YY68H00028F1
1	PILOT VALVE	1		YN30V00080F1
2	PRESSURE SENSOR	1		LC52S00011P1
3	CONNECTOR	1		PF1/4 L=23
4	PLUG	1		PF1/4
5	ELBOW	3		PF1/4
6	ELBOW	1		PF1/4 with filter
7	WASHER	3		M8
8	HOSE ; PF1/4 L=500	1		Drain
9	HOSE ; PF1/4 L=400	1		P/V prime. Press.
10	HOSE ; PF1/4 L=3200	1		B ; N&B close
11	HOSE ; PF1/4 L=2900	1		A ; N&B open
12	PIN	1		
13	PEDAL	1		
14	RUBBER	1		
15	LOCK ASSY	1		RH
16	CAPSCREW	2		M8×20
17	CAPSCREW	2		M10×25
18	SOCKET BOLT	2		M10×20
19	LOCK WASHER	2		M10
20	WASHER	4		M10
21	NUT	1		M8
(8-2)	N&B REMOTE CONTROL	↓		YY68H00048F1
1	HOSE ; PF1/4 L=3200	1		B ; N&B close
2	HOSE ; PF1/4 L=2900	1		A ; N&B open
3	HOSE ; PF1/4 L=400	1		SOL. prime. Press.
4	HOSE ; PF1/4 L=600	1		Drain
5	SOENLID VALVE	1		LC35V00004F2
6	BRACKET	1		
7	SUPPORT	1		
8	CAPSCREW	4		M10×20
9	WASHER	4		M10
10	ELBOW	1		PF1/4
11	CONNECTOR	1		PF1/4 L=51
12	ELBOW	3		PF1/4
13	ELBOW	1		PF1/4 with filter
(11-1)	PUMP HYD. LINES			YY30H00002F1
(11-2)		↓	↓	YY30H00002F2
1	TUBE	1	—	Suction
2	O RING	1	←	1A G75
3	RUBBER	2	←	L=200
4	HOSE	1	←	Suction
5	HOSE	1	←	1″3/16-12UN L=900
6	HOSE	1	←	1″3/16-12UN L=1050
7	O RING	2	←	1″3/16-12UN
8	O RING	2	←	1B P26

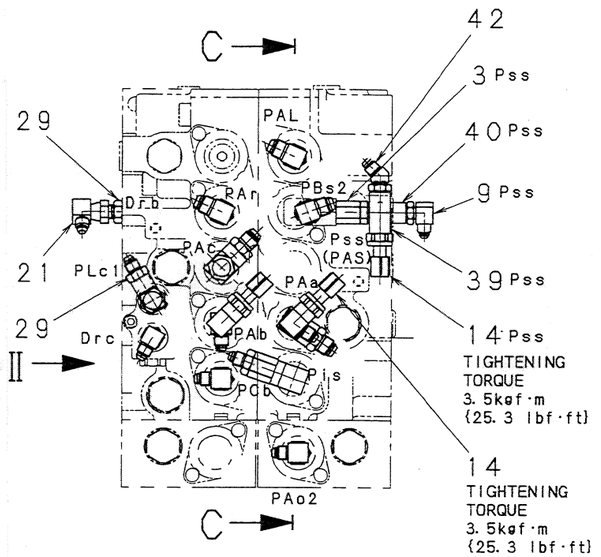
ITEM	PART NAME	Q'TY		REMARKS or PART No.
9	ELBOW	1	←	1″3/16-12UN- PF3/4
10	CONNECTOR	1	←	1″3/16-12UN-PF3/4
11	HALF CLAMP	4	←	3/4
12	CAPSCREW	8	←	M10×35
13	SOCKET BOLT	4	←	M12×30
14	LOCK WASHER	8	←	M10
15	LOCK WASHER	4	←	M12
16	CLIP	4	←	
17	PRESSURE SENSOR	2	←	LC52S00012P1
18	TUBE	—	1	YX30H01010P1
19	RUBBER	2	←	L=170
(12-1)	UPPER HYD. LINES			YY03H00023F2
(12-2)		↓	↓	YY03H00023F1
1	BRACKET	1	—	
2	BUSHING	1	←	2-Ø26.5
3	BUSHING	1	←	Ø26.5-Ø30.4
4	CLAMP	1	—	
6	TUBE	1	←	
7	SUPPORT	1	←	
8	SUPPORT	1	←	
9	CONNECTOR	7	←	1-14UNS-PF3/4
10	CONNECTOR	1	←	1-3/16-12UN-PF3/4
11	CONNECTOR	4	←	1-14UNS-PF3/4
12	CLIP	3	←	
13	ELBOW	1	←	1-14UNS-PF1/2
14	ELBOW	1	←	1-14UNS-PF1/2
15	RUBBER	1	←	L=100
16	HOSE	1	←	1-14UNS L=1070
18	HOSE	1	←	1-14UNS L=920
19	HOSE	1	←	1″3/16-12UN L=2930
20	HOSE	1	←	1-14UNS L=2970
21	HOSE	1	←	1-14UNS L=2620
22	HOSE	1	←	1-14UNS L=2570
23	WASHER	6	←	
24	WASHER	5	4	
25	GROMMET	1	←	2-Ø29
26	CLIP	2	←	
27	HOSE ; 1-14UN L=1680	1	←	A ; LH Reverse
28	HOSE ; 1-14UN L=1200	1	←	B ; RH Reverse
29	HOSE ; 1-14UN L=1120	1	←	D ; RH Forward
30	HOSE ; 1-14UN L=1600	1	←	C ; LH Forward
31	HOSE ; Ø21.7 L=16.5	2	←	
32	HOSE ; 1-14UN L=1950	2	←	A ; RH Swing, B ; LH swing
33	RUBBER	1	←	
34	O RING	19	←	
35	O RING	1	←	
36	CLAMP	2	←	Ø21.7

ITEM	PART NAME	Q'TY		REMARKS or PART No.
37	GROMMET	1	←	
38	CAPSCREW	4	←	M10×25
39	CAPSCREW	2	←	M10×45
40	CAPSCREW	3	←	M12×45
41	CAPSCREW	2	1	M12×90
44	RUBBER	1	←	L=125
45	BRACKET	—	1	
46	CLAMP	—	1	
47	TUBE	1	←	
48	BUSHING	1	←	
(12-3)	UPPER HYD. LINES	↓		YY03H00030F1
1	BRACKET	1		
2	SELECTOR VALVE	1		24100P1005F1
3	BUSHING	1		Ø26.5-Ø30.5
4	CONNECTOR	1		PF1-PF3/4
5	CONNECTOR	2		1-14UNS-PF3/4
7	ELBOW	1		PF1
8	ELBOW	1		1-14UNS-PF3/4
9	ELBOW	1		1″3/16-12UNS-PF3/4
10	O RING	3		1-14UNS
11	O RING	1		1″3/16-12UNS
12	HOSE	1		1-14UNS L=3050
13	HOSE	1		1-14UNS L=1540
14	HOSE	1		1″3/16-12UNS L=1950
15	HOSE	1		PF1 L=850
16	CAPSCREW	4		M8×25
17	CAPSCREW	3		M12×30
18	WASHER	4		M8
19	WASHER	4		M12
20	CLIP	1		
21	CONNECTOR	1		PF1
22	BUSHING	1		
23	CLIP	1		
24	CAPSCREW	1		M12×20
25	LABEL	1		
(12-4)	UPPER HYD. LINES	↓		YV03H00005F1
1	ELBOW	2		PF1/2-Ø18
2	TEE	1		2-PF1/2-PF1/4
3	ELBOW	1		PF1/2
4	HOSE	1		Ø18 L=1300
5	HOSE	1		Ø18 L=1200
6	HOSE	1		PF1/2 L=680
7	O RING	2		1B P18
8	PLUG	1		PF1/4
9	CONNECTOR	1		PF1/2 L=32
10	HOSE GUARD	1		L=600

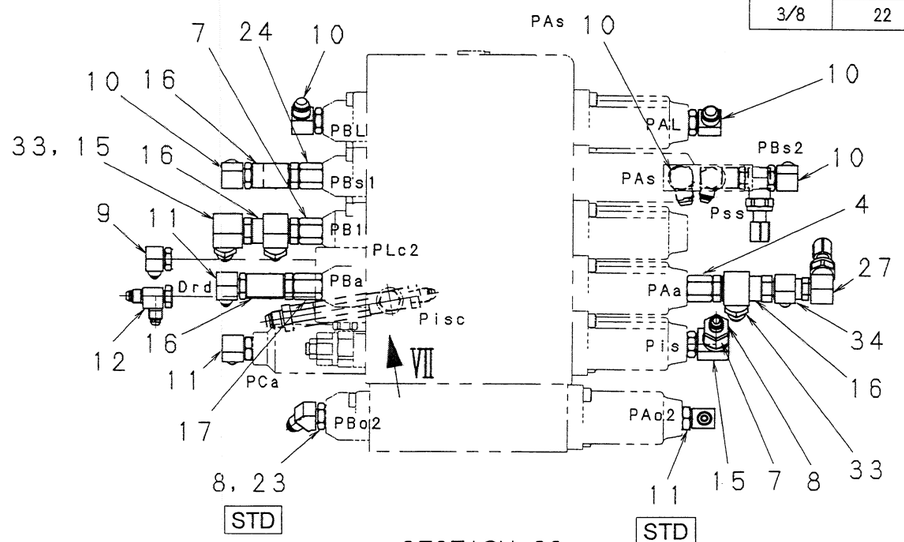
(6-1) MAIN C/V CONTROL LINES ; YY06H00018F2 (2/2) STD

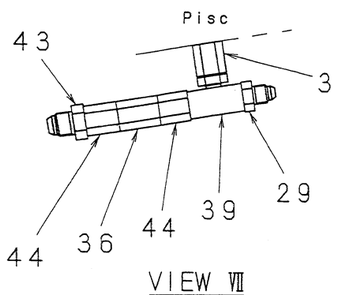
(6-2) MAIN C/V CONTROL LINES ; YY06H00018F1 (2/2) E130 SR (L)





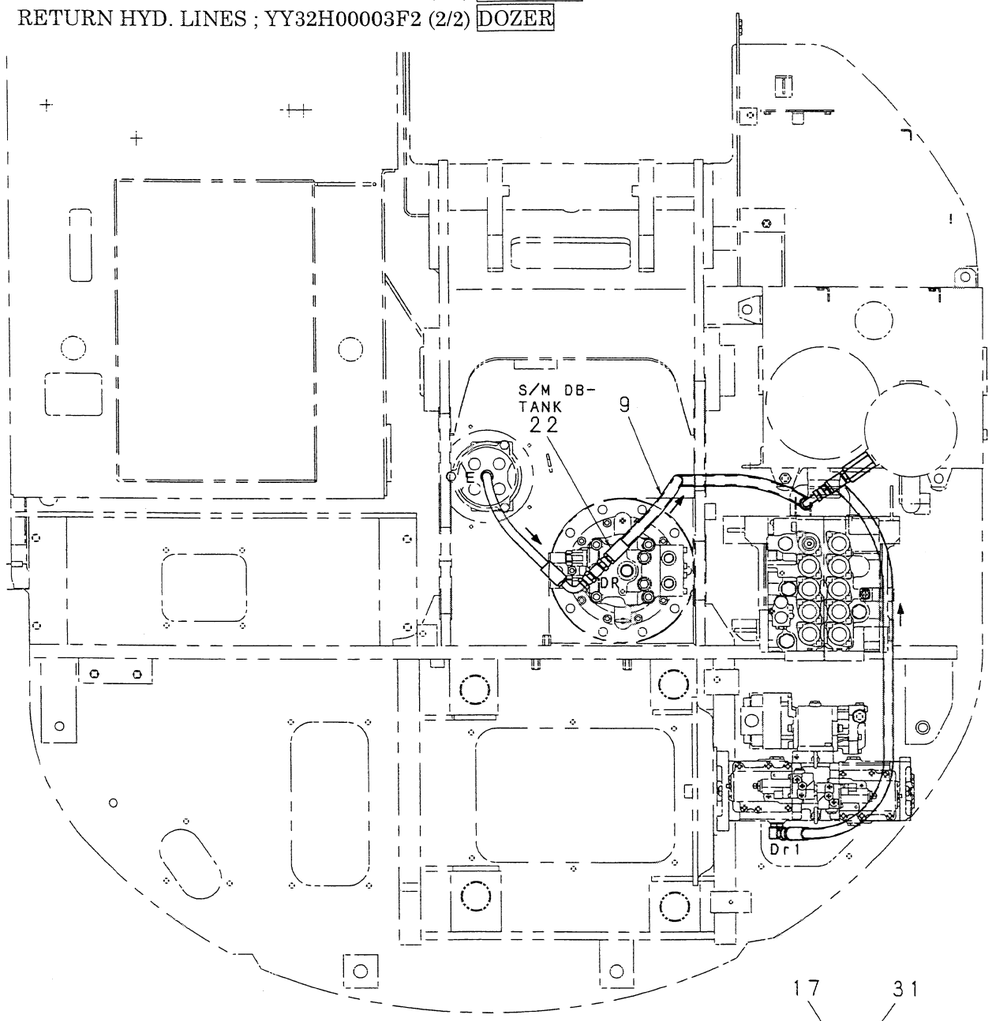
		O-RING TYPE JOINT		HYD. HOSE (30° FLARED)	
SCREW PF	TOOL mm	TORQUE kgf·m{lbf·ft}		TORQUE kgf·m{lbf·ft}	
1/4	19	3.7	{26.8}	3.0	{21.7}
3/8	22	7.5	{54.2}	5.0	{36.1}

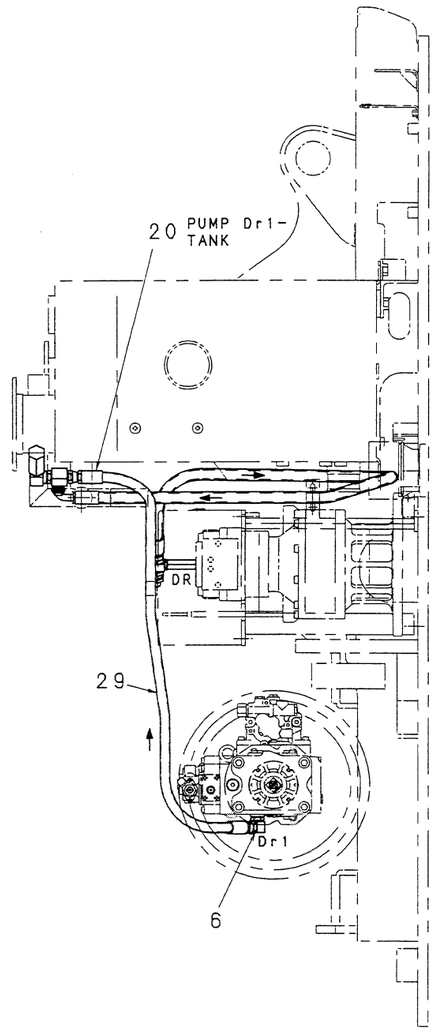


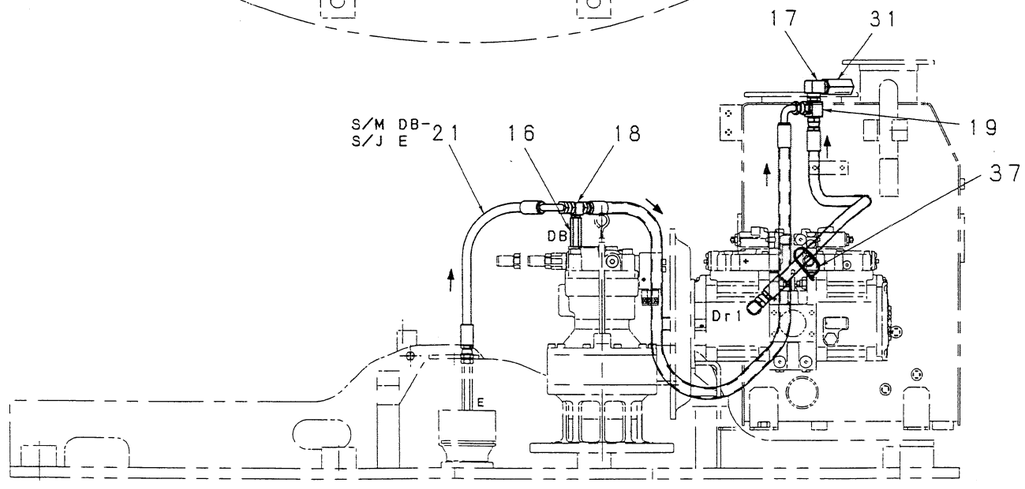


CONNECTOR INSTALLING DWG.

(13-1) RETURN HYD. LINES ; YY32H00003F1 (2/2) STD, N&B
(13-2) RETURN HYD. LINES ; YY32H00003F2 (2/2) DOZER



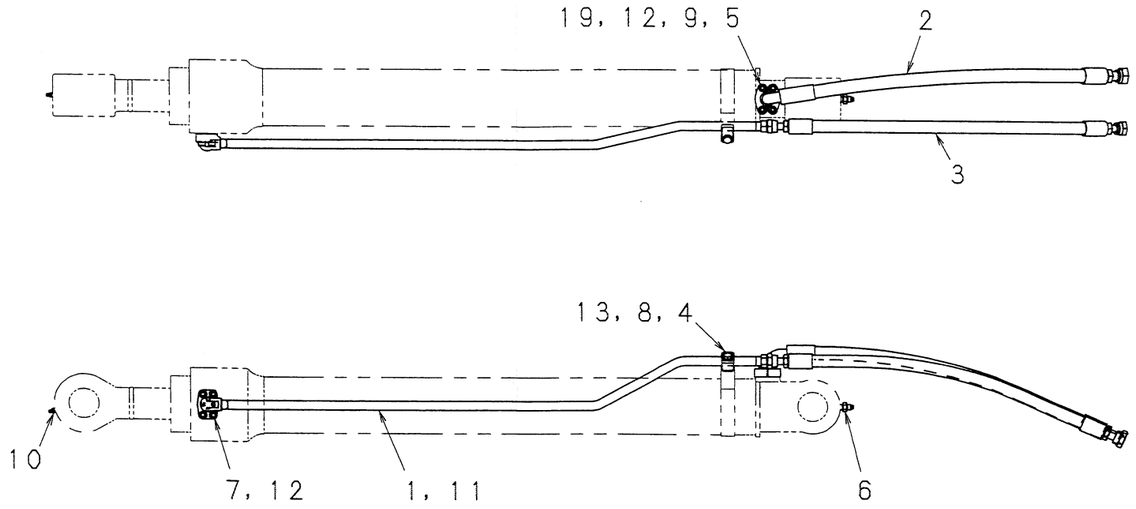




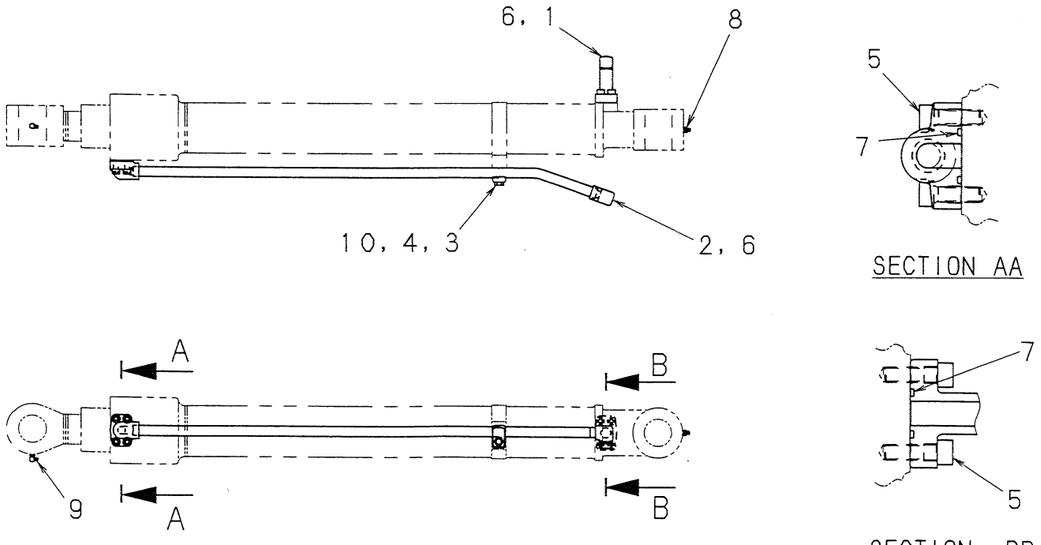
		O-RING TYPE JOINT	HYD. HOSE (30° FLARED)
SCREW PF	TOOL mm	TORQUE kgf·m{lbf·ft}	TORQUE kgf·m{lbf·ft}
3/8	22	7.5 {54.2}	
1/2	27	11.0 {79.7}	8.0 {57.9}
3/4	36	16.5 {119}	12 {87}
1	41	26 {188}	14 {101}

	CAPSCREW
SCREW	TORQUE kgf·m{lbf·ft}
M8	3.6 {26.0}

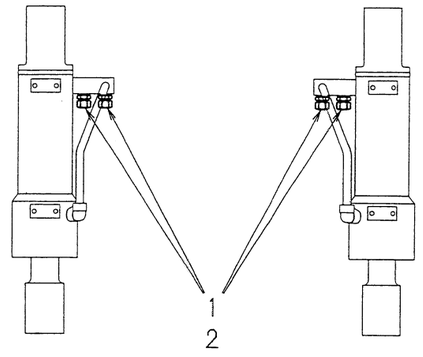
(23-2) ARM CYLINDER HYD. LINES ; YY42H00004F1



(23-3) BUCKET CYLINDER HYD. LINES ; LP43H00002F1



(23-4) DOZER CYLINDER HYD. LINES ; YX13H00001F1



NOTES

1. APPLY LOCTITE #242 AT THE SETTING BOLTS OF CLAMP.
2. PAY ATTENTION TO DROPPING OFF O-RING AT ASSEMBLING.
3. TIGHTENING TORQUES FOR M-THREADS

THREADS SIZE	TIGHTENING TORQUES
M10	6.7kgf·m{48.5 lbf·ft}

4. TIGHTENING TORQUES FOR PF, PT-THREADS

THREADS SIZE	TIGHTENING TORQUES
1/8	1.7kgf·m{12.3 lbf·ft}
1/4	3.7kgf·m{26.8 lbf·ft}
1/2	11.0kgf·m{79.6 lbf·ft}
1	26.0kgf·m{188 lbf·ft}

5. TIGHTENING TORQUES FOR ORS-JOINT NUT

THREADS SIZE	TIGHTENING TORQUES
1′-14UNS	14.0kgf·m{101 lbf·ft}
1 3/16-12UNS	18.1kgf·m{131 lbf·ft}

23.1.3 ELECTRIC EQUIPMENT LIST

Note : ● The part numbers and serial numbers of machine may be changed due to modification, so use only the numbers for references.
● Part number in [ ] shows the number before modification of machines.
YY02-03001～, YH02-01301～, LK02-01041～
● Part number marked ※ shows the change and additional parts according to modification of machine.
YY03-04555～, YH03-02097～, LK03-01107～

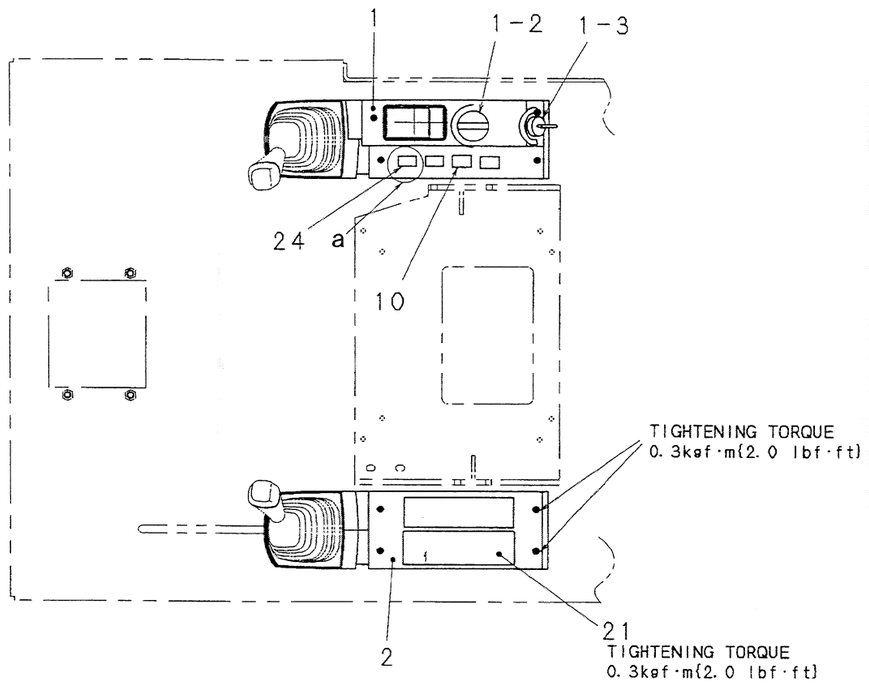
Group	Code	PARTS	Part No.
CONTROLLER	C－1	Mechatro controller	[YY22E00021F1] YY22E00065F1※
	C－2		
	C－2	Gauge cluster (KCMA)	YY59S00003F1
	C－4	Air conditioner controller (A/C Acc.)	YT20M00004S036
DIODE	D－1	Diode	YN02D01001P1
	D－2	Diode	↑
	D－3	Diode	↑
	D－4	Diode	2475R132
	D－5	Diode	YN02D01001P1
	D－6,7,8,9,10	Diode	↑
ELECTRIC FITTINGS	E－1	Fuse box	YY73E00001F2
	E－2	Alternator	[181200-4710]
	E－2	Alternator	181200-5303※
	E－3	Hour meter	YT58S00006P1
	E－4	Horn (Low)	CM53S00002F2
	E－5	Horn (High)	CM53S00002F1
	E－6	Cigarette lighter	2421R180F1
	E－7	Tuner AM & FM (Option)	LB54S00001P1
	E－8	Speaker (Left)	YT54S00006P1
	E－9	Speaker (Right)	↑
	E－10	Receiver drier (A/C Accessory)	YT54S00002P1
	E－11	A/C compressor (A/C Accessory)	YX91V00001F1
	E－14	Resistor (P1, P2 pump proportional valve)	LC22E01001D1
	E－15	Travel alarm	YN53S00002F1
	E－16	DC－DC converter	YT77S00001P1
	E－17	Power socket 12V	YN81S00001P1
	E－25	Battery (95E41R)	2484U171
	E－A	Antenna	YT54S00001P1
LIGHT	L－1, 9	Boom work light (RH, LH)	YW80S00001F1
	L－2	Work light right	YN80S00010F1
	L－3	Room light (Cab)	YT80S00001P1
	L－4,5,6,7	Cab work light	Locally procured
	L－8	E/G room light	4056R4F1
	L－10	Cab work light (Rear)	Locally procured
	L－11,12	Swing flasher (RH, LH)	YY80S00001F1
	L－15	Rotary light	Locally procured
MOTOR	M－1	Starter motor (24V×4.5kW)	[897029－1991]
	M－1	Starter motor (24V×4.5kW)	897029－8637※
	M－2	Governor motor	YN20S00002F1
	M－3	Wiper motor assy	YT53C00011F1
	M－4	Washer motor (tank assy)	YT54C00003F1
	M－9	Fuel pump	YR22P00001P1
	M－11	Fuel supply pump	YT22P00001F6

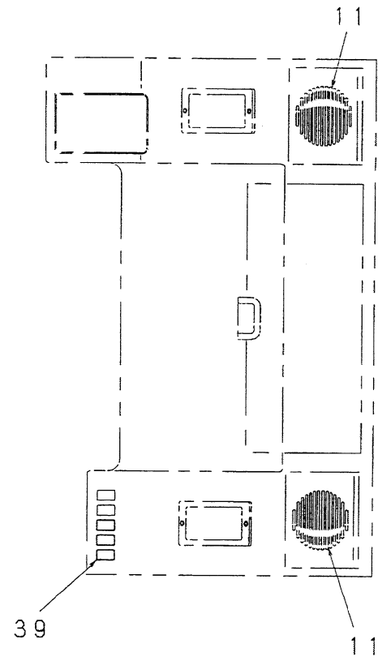
Group	Code	PARTS	Part No.
RELAY	R－1	Battery relay	YN24S00003F1
	R－3	Glow relay	894258－0140
	R－4	Safety relay	897226－6550
	R－5	Wiper motor relay	EN24S00008P1
	R－6	Washer motor relay	↑
	R－7	Horn relay	↑
	R－8	Work light relay	↑
	R－9	Extra dis-press relay	↑
	R－10	Cab work light relay 1	↑
	R－18	Travel alarm relay	↑
	R－19	Flasher relay	YT24S00001P1
	R－20	Timer relay	YN25S00001P1
	R－22	Clockwise relay	EN24S00008P1
	R－23	Counterclockwise relay	↑
	R－24	Nibbler open relay	↑
	R－25	Nibbler close relay	↑
	R－26	Angle right relay	↑
	R－27	Float relay	↑
	R－28	Lever lock interlock relay	↑
	R－29	Angle left relay	↑
SENSOR	SE－1	Pressure sensor (low pressure) bucket digging	LC52S00011P1
	SE－2	Pressure sensor (low pressure) bucket dump	↑
	SE－3	Pressure sensor (low pressure) boom up	↑
	SE－4	Pressure sensor (low pressure) boom down	↑
	SE－5	Pressure sensor (low pressure) swing	↑
	SE－7	Pressure sensor (low pressure) arm in	LC52S00011P1
	SE－8	Pressure sensor (low pressure) arm out	↑
	SE－9	Pressure sensor (low pressure) travel right	↑
	SE－10	Pressure sensor (low pressure) travel left	↑
	SE－11	Pressure sensor (low pressure) ; P2 option LH	↑
	SE－12	Pressure sensor (low pressure) ; P2 option RH	↑
	SE－13	E/G speed sensor	181510－5130
	SE－14	E/G water temperature sensor	YT52S00001P1
	SE－15	Fuel sensor	YN52S00034F1
	SE－16	Accel potentiometer	YN52S00032P1
	SE－20	Pressure sensor (low pressure) ; P1 option	LC52S00011P1
	SE－22	Pressure sensor (high pressure) ; P1 pump	LC52S00012P1
	SE－23	Pressure sensor (high pressure) ; P2 pump	↑
	SE－24	Pressure sensor (high) ; Extra	↑
	SE－26	Pressure sensor (low) ; Revolution R/L Opt.	LC52S00011P1
	SE－29	Pressure sensor (low) ; Dozer down	↑
	SE－30	Pressure sensor (low) ; Dozer up	↑
SOLENOID	SV－1	Swing parking sol.	YY35V00006F1 (VALVE ASSY)
	SV－3	2-speed travel sol.	
	SV－4	Safety lock lever sol.	
	SV－6	Clockwise sol.	LC35V00004F2

Group	Code	PARTS	Part No.
SOLENOID	SV－7	Counter-clockwise sol.	LC35V00004F2
	SV－9	Nibbler open sol.	↑
	SV－10	Nibbler close sol.	↑
	SV－20	Dozer sol.	↑
	SV－21	Angle left sol.	↑
	SV－22	Angle right sol.	↑
	SV－23	Float sol.	↑
	SV－24	Extra dis-press sol.	LS52S00012P1
SOLENOID PROPORTIONAL VALVE	PSV－A	Arm variable recirculation proportional valve	YY35V00006F1 (VALVE ASSY)
	PSV－B	P2 bypass cut proportional valve	
	PSV－C	Travel straight proportional valve	
	PSV－D	P1 bypass cut proportional valve	
	PSV－P1	P1 pump proportional valve	YY10V00001F4 (PUMP ASSY)
	PSV－P2	P2 pump proportional valve	YB35V00003F1 (VALVE ASSY)
SWITCH	SW－1	Key switch	YN50S00026F1
	SW－3	2-speed travel switch	YN03M01286F1
	SW－4	Swing parking release switch	YT50E00001F1
	SW－5	KPSS release switch	YN50S01003P1
	SW－6	E/G water temperature switch [105℃(221°F)]	897125－6010
	SW－7	E/G oil pressure switch	182410－0082
	SW－8	Air filter clogging switch	LE11P01015S001
	SW－10	Horn switch (LH) (RH)	YN50E01001P1
	SW－10	Horn switch left (Handle Assy)	LF03M01005F3
	SW－11	Safety lock lever switch (Limit SW.)	YN50S01001P1
	SW－13	Air conditioner switch (Panel assy)	YT20M01104F1
	SW－16	Auto accel release switch (Decel)	2479U1190F7
	SW－17	Swing flasher select switch	2479U1190F19
	SW－20	Horn switch right (Handle Assy)	LF03M01005F1
	SW－21	Work light switch	2479U1190F1
	SW－22	Single/Conflux flow select switch	2479U1190F32
	SW－23	Wiper inter lock switch	YT50E00003P1
	SW－36	Rotary light switch	2479U1190F20
	SW－37	Hydraulic oil temp. switch	2479R2348
	SW－38	Warm-up switch	2479U1190F31
	SW－41	Travel alarm switch	2479U1190F16
	SW－42	Engine room light switch	YT50S00005P1
	SW－43	Jib press switch : option	GB50S00049F2
	SW－44	Extra press switch : option	↑
	SW－46	Clockwise switch	LF03M01005F3
	SW－47	Counter-lockwise swith	↑
	SW－48	Nibbler open switch	↑
	SW－49	Nibbler close switch	↑
	SW－50	Dozer switch	2479U1190F15
	SW－51	Angle switch	YM03M01012P1
	SW－52	Float switch	↑
	SW－53	Pressure switch ; Float cancel	YT50S00013P1

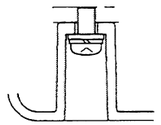
23.1.13 INSTRUMENT PANEL ASSY

INSTRUMENT PANEL ASSY		YY17M00008F4		
ITEM	PART NAME	PART No.	Q'TY	REMARKS
1	RH PANEL ASSY	YT17M00008F2	1	
1-2	POTENTIOMETER	YN52S00032P1	1	Accel
1-3	KEY SWITCH	YN50S00026F1	1	
2	PANEL	YT17M01001P1	1	
10	SWITCH	2479U1190F31	1	Warm-up
11	SPEAKER	YT54S00006P1	2	
21	TUNER	LB54S00001P1	1	
22	GAUGE CLUSTER	YY59S00003F1	1	
24	SWITCH	2479U1190F7	1	Decel release
26	CONVERTER	YT77S00001P1	1	DC-DC
38	SOCKET	YN81S00001P1	1	12V
39	SWITCH	2479U1190F32	1	Single / Conflux
40	ANTENNA	YN54S00012D1	1	
46	HOUR METER	YT58S00006P1	1	

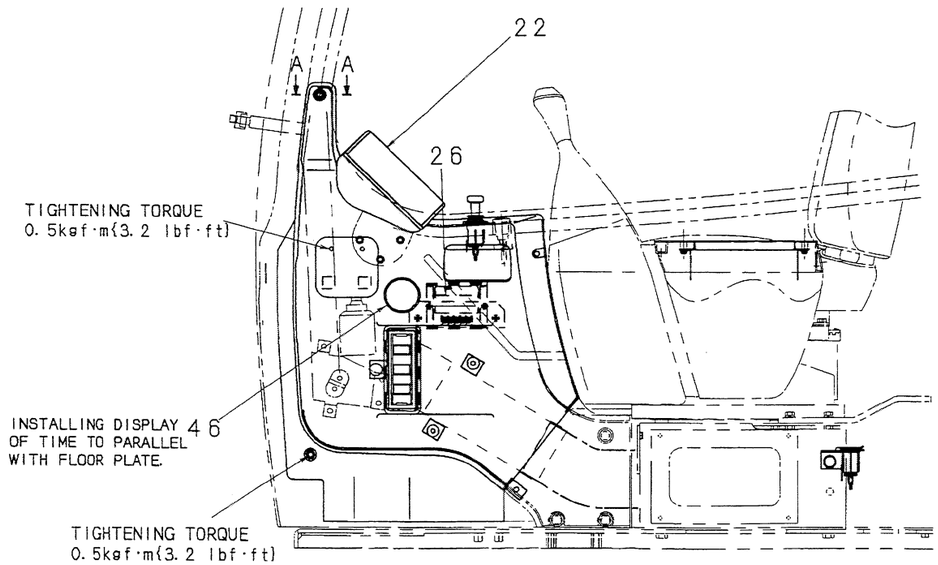


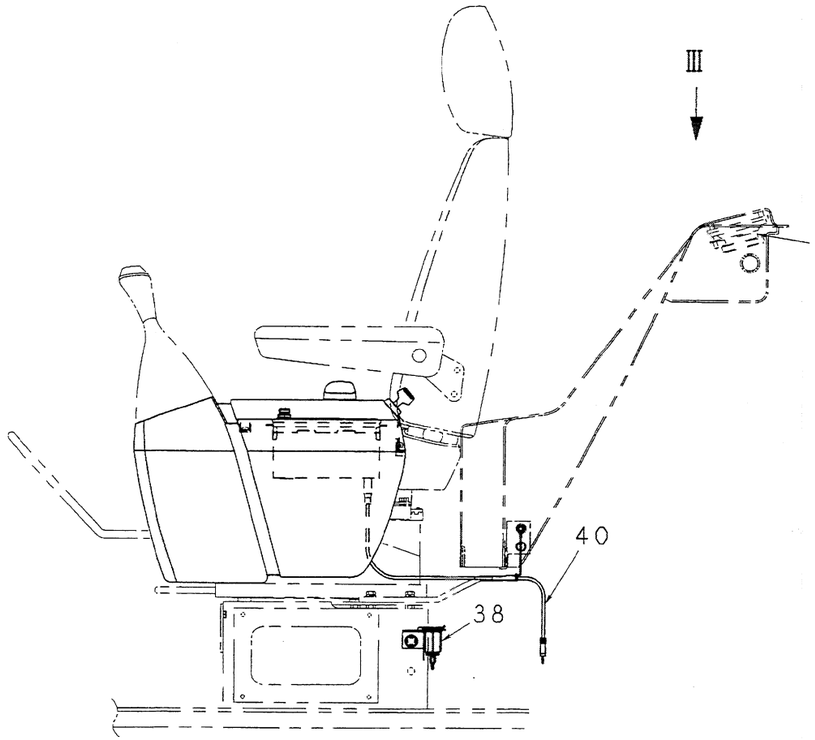


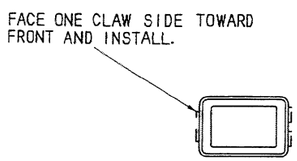
VIEW Ⅲ



SECTION AA

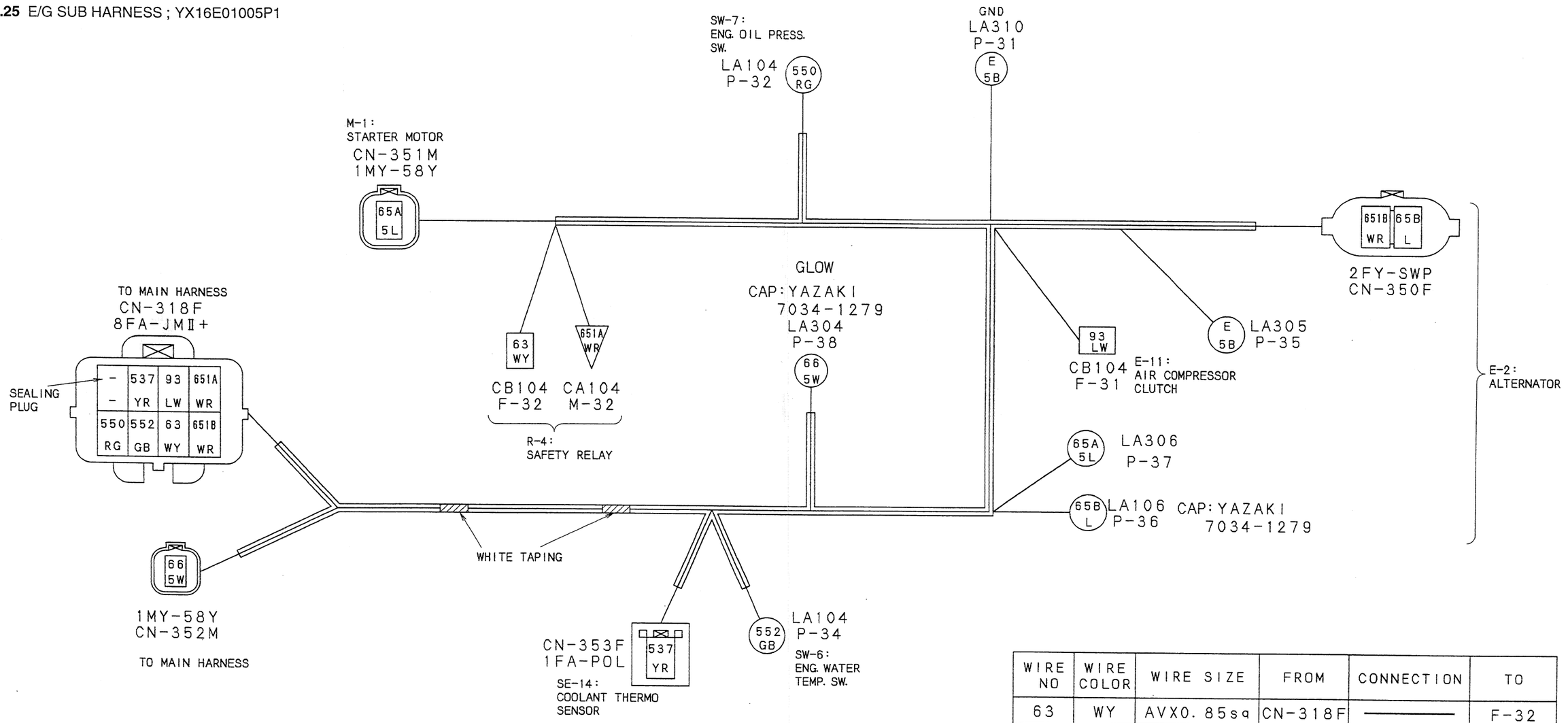






DETAIL a

Instrument panel assy



CONNECTORS SELECTION TABLE

CONNECTOR NAME (PIN NUM.)	ANUFUC.	PART. NUMBER		
		HOUSING	TERMINAL	HARNESS SEAL
2FY-SWP	YAZAKI	7123-1424-40	7116-1471	7157-7812
1MY-58Y	YAZAKI	7222-4210-30	7114-3250	7157-3580-60
1FA-POL	AMP	171809-2	170233-1	
8FA-JMII+	AMP	174982-2	171662-1	176886-2
CA104	AMP	170002-5	170887-1	
CB104	AMP	170003-5	170889-1	

WIRE NO	WIRE COLOR	WIRE SIZE	FROM	CONNECTION	TO
63	WY	AVX0.85sq	CN-318F	———	F-32
65A	L	AVX5sq	P-37	———	CN-351M
65B	L	AVX0.85sq	P-36	———	CN-350F
66	W	AVX5sq	CN-352M	———	P-38
93	LW	AVX0.85sq	CN-318F	———	F-31
550	RG	AVX0.85sq	CN-318F	———	P-32
552	GB	AVX0.85sq	CN-318F	———	P-34
537	YR	AVX0.85sq	CN-318F	———	CN-353F
651A	WR	AVX0.85sq	CN-318F	———	M-32
651B	WR	AVX0.85sq	CN-318F	———	CN-350F
E	B	AVX5sq	P-35	———	P-31

E/G sub harness

23.1.35 WIPER HARNESS : YT02C01106P1

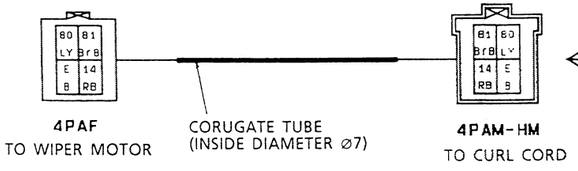


Fig. 29

3.11.61 CURL CORD HARNESS : YT02C01104P1

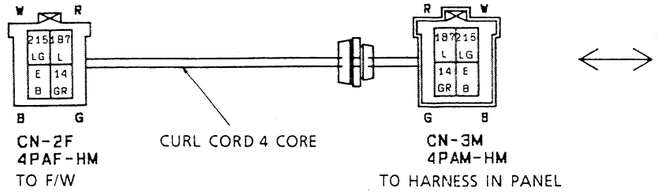
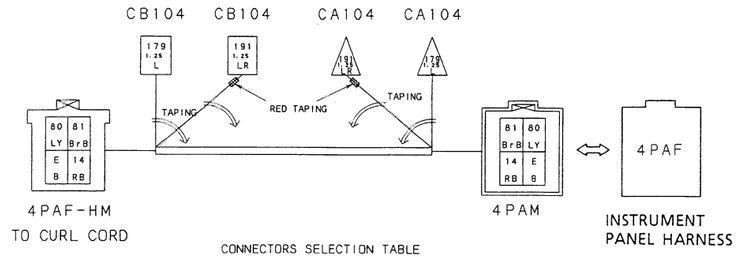


Fig. 30

3.11.64 CAB WIPER MOTOR HARNESS : YT02C01216P3



CONNECTORS SELECTION TABLE

CONNECTOR NAME (PIN NUM)	MAKER	PART NO	
		HOUSING	TERMINAL
CA104	YAZAKI	7120-6012	7113-1020-02
CB104	YAZAKI	7120-1010	7115-1050-02
4PAF-HM	SUMITOMO	6090-1011	8240-4422
4PAM	YAZAKI	7122-2446	7114-2020
4PAF	YAZAKI	7123-2446	7116-2090
4PAF-HM	SUMITOMO	7120-1010	8240-4422
4PAM-HM	SUMITOMO	6090-1041	8230-4282

Fig. 31

3.11.65 ANTENNA : YT54S00001P1

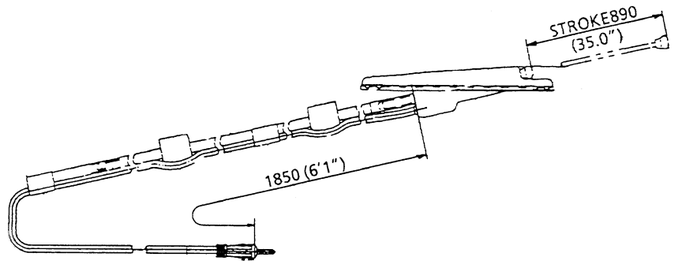
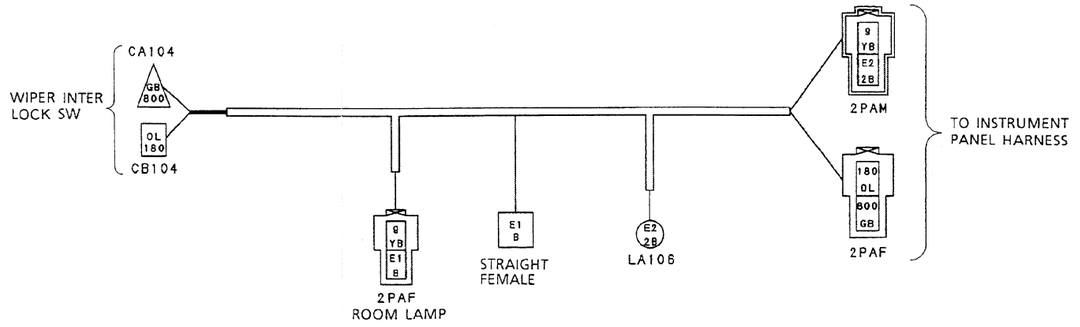


Fig. 32 Antenna

3.11.189 ROOM LAMP HARNESS : YT02C01513P1



CONNECTORS SELECTION TABLE

CONNECTOR NAME (PIN NUM)	MAKER	PART NO	
		HOUSING	TERMINAL
2PAF	YAZAKI	7123-2228	7116-2090
2PAM	YAZAKI	7122-2228	7114-2020
STRAIGHT FEMALE	YAZAKI	7120-3011	7116-2270

F Room lamp harness

WINDOW WASHER TANK & MOTOR : YT54C00003F1 & YT54C00003S001

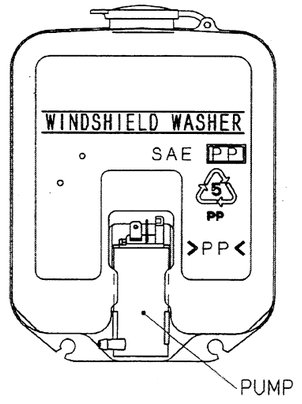
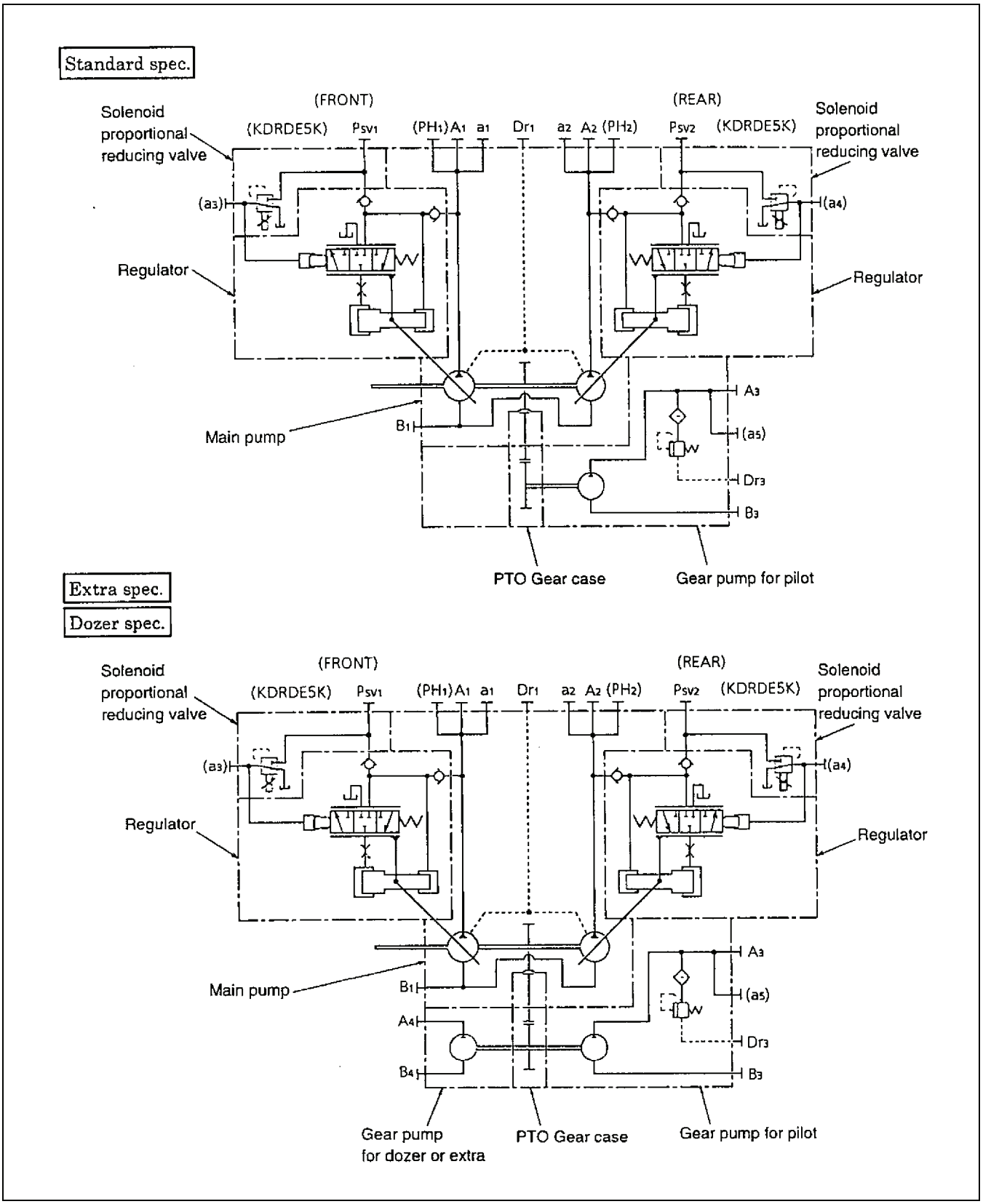


Fig. 34

24.1.1.2 HYDRAULIC CIRCUIT DIAGRAM



C24-04-01

Figure 2

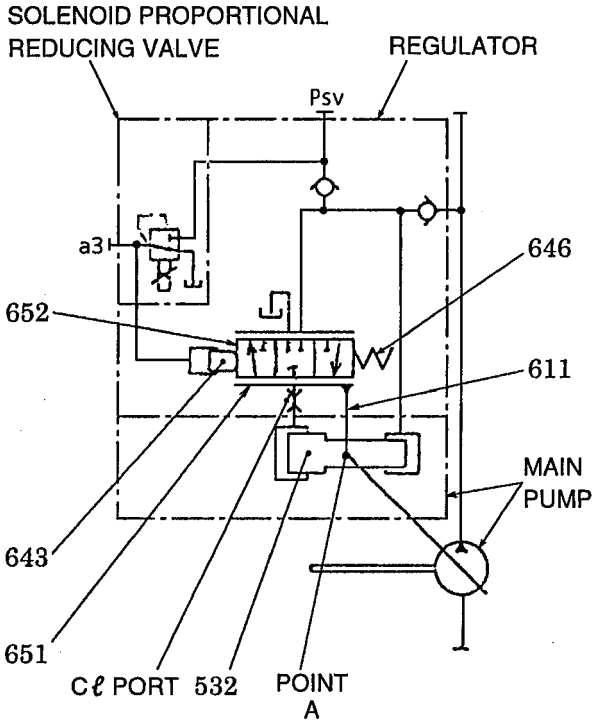


Fig. 1-13 Regulator hydraulic circuit

C24-14-01

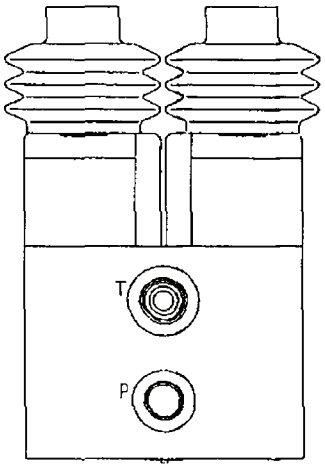
Figure 16

The feed back lever (611) is linked with the servo piston and sleeve (651). As the servo piston moves to the left, the feed back lever rotates on point A which causes the sleeve to move to the right. As the servo piston moves to the right, the feed back lever rotates on point A to move the sleeve to the right. This causes the spool sleeve opening to close gradually and the servo piston settles down when the opening of the spool sleeve closes completely.

FLOW DECREASE FUNCTION

As the command current I decreases, the secondary pressure of the solenoid proportional valve decreases. This causes the spool to move to the left. When the spool (652) has moved, delivery pressure P1 reaches port Cl via the spool and is admitted to the large diameter chamber of the servo piston. Delivery pressure P1 is admitted to the small diameter section of the servo piston at all times. The servo piston moves right to decrease the tilting angle (a). As the servo piston moves to the right, the feed back lever rotates on point A to move the sleeve to the left. The sleeve will move until the opening of the spool closes completely.

24.1.2.3 PILOT VALVE (TRAVEL)



VIEW FROM MACHINE FRONT SIDE

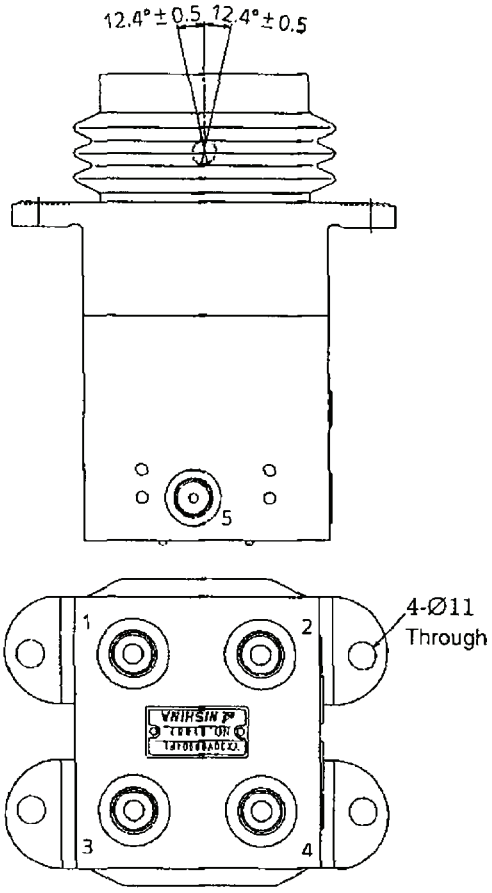
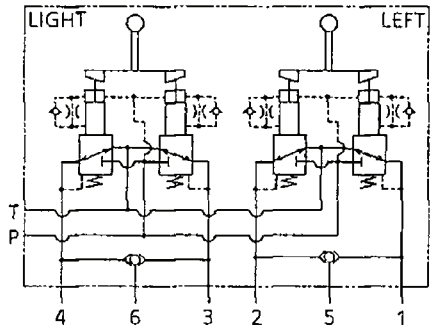


Fig. 3-1 Out side view of travel pilot valve

Port size	Tightening torque kgf·m (lbf·ft)	Port name	Function
PF3/8	7.5±0.5 (54±3.6)	1	LH travel forward port
		2	LH travel reverse port
		3	RH travel forward port
		4	RH travel reverse port
		T	Tank port
PF1/4	3.7±0.2 (27±1.4)	5	Travel pressure sensor port
		6	Travel pressure sensor port
		P	Pilot primary pressure port

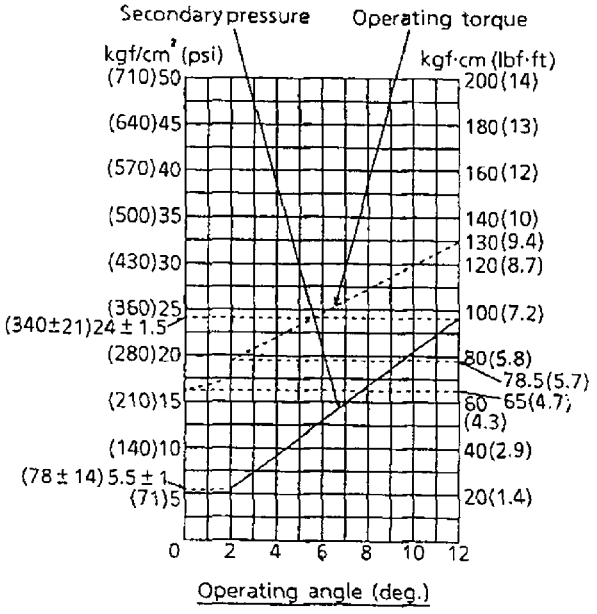
(2) Specification

Item	Specification
Parts No.	YX30V00004F1
Type	07291-00000
Primary pressure	50kgf/cm² (710psi)
Secondary pressure	5.5~24kgf/cm² (78~340psi)
Rated flow	10 ℓ/min (2.6gal/min)
Weight	Approx. 11kg (24 lbs)



Hydraulic simbol

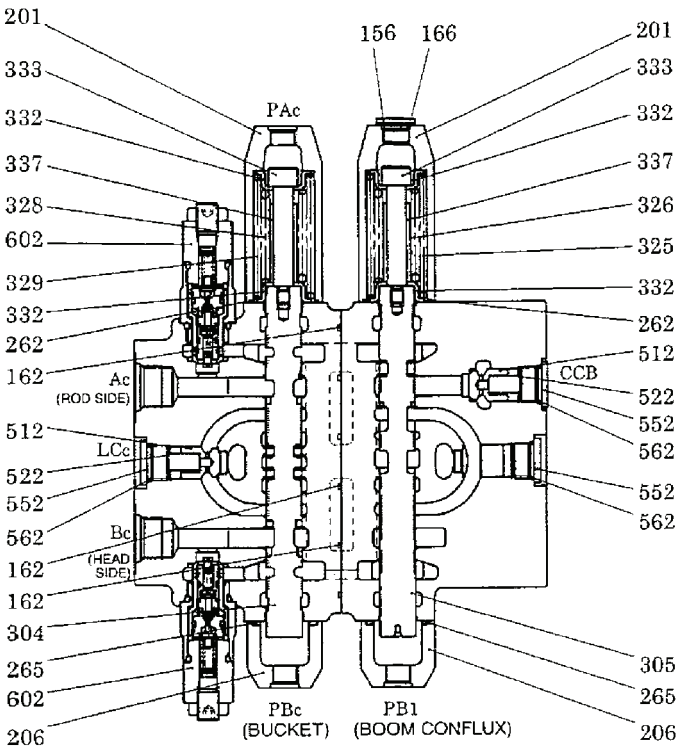
(3) Performance characteristics



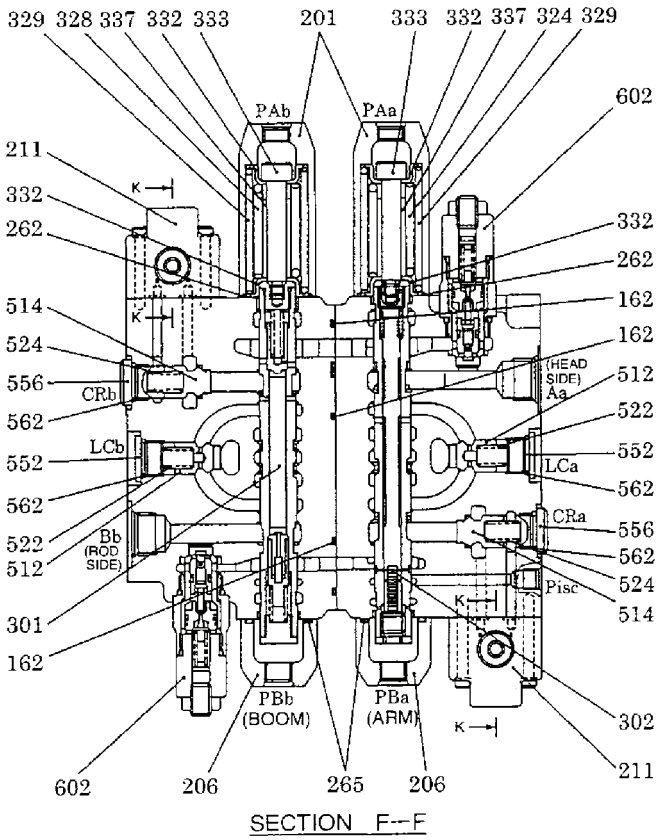
Control diagram

CH24-25-01

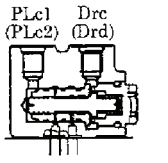
Figure 32



SECTION E—E



SECTION F—F



SECTION K—K

Fig. 4-2 (2/3) Construction of control

CH24-35AF-02

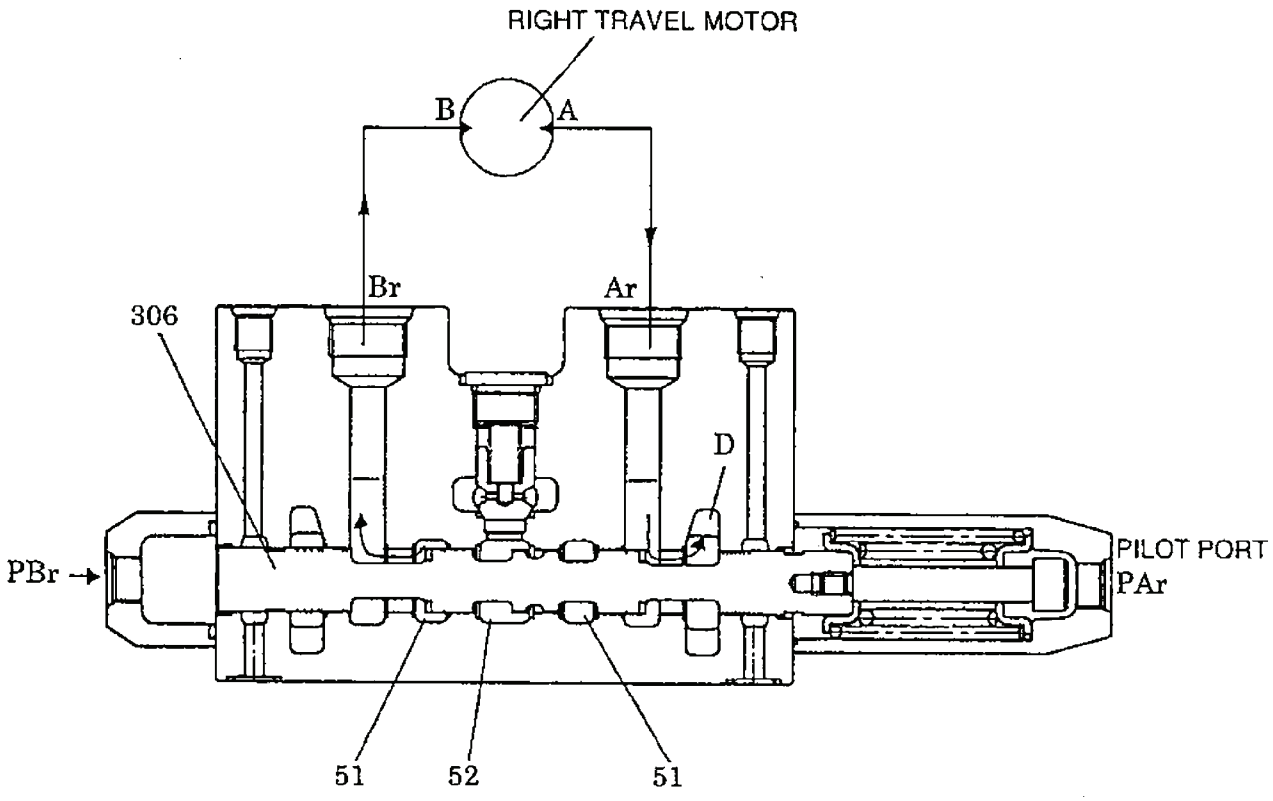


Fig. 4-11 At right travel forward (when PBr is pressurized)

C24-34-01

Figure 49

24.1.8.0.2 FUNCTIONS FOR TRAVEL ACTION

Independent travel

If forward travel is performed, the secondary pilot pressure from ports (2) and (4) of the travel pilot valve act upon ports PBr and PBL of the control valve and moves the right and left travel spools (306).

The pressurized oil delivered by pump (P1) flows to the main passage (51) past the travel straight spool (307) and passes between the outer circumference of the right travel spool (306) and the casing. This pressurized oil is supplied to the right travel motor B by way of port Br.

At the same time, the pressurized oil delivered by pump (P2) passes between the outer circumference of the left travel straight spool (306) and the casing and runs to port BL. This oil supplies the left travel motor (A) in the same way the pressured oil is supplied to the right side travel motor.

The oil which has returned from right travel A and the left travel B side passes between the outer circumference of the right and left travel spool (306) and the casing from ports Ar and AL and returns to the hydraulic tank via the tank port (T) of the low pressure circuit (D).

The pressurized oil works the same way in reverse as in forward (when the secondary pilot pressure acts upon ports PAr and PAL of the control valve.

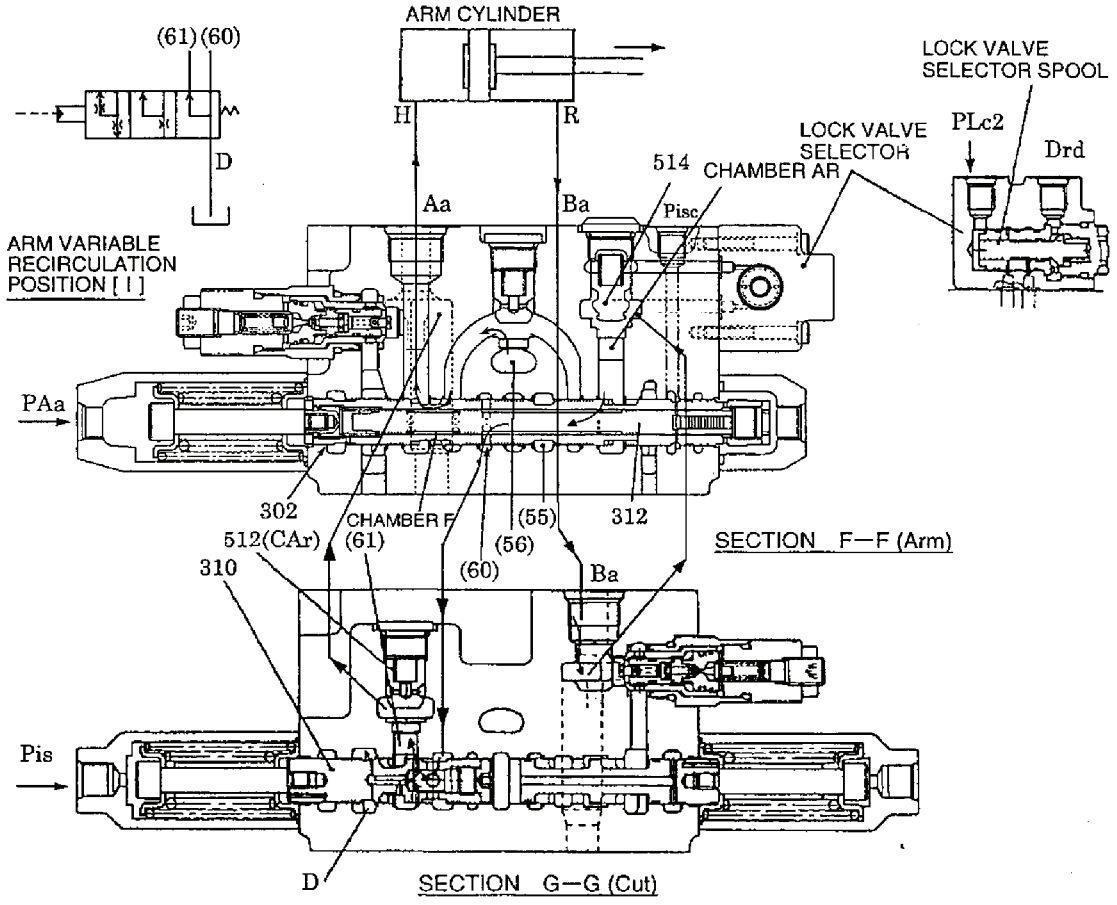


Fig. 4-22 When arm in is operated (under heavy duty)

CH24-45-01

Figure 59

24.1.8.3.3 ARM IN OPERATION UNDER HEAVY LOAD

When the arm is operated under a heavy load, the arm oil recirculation function is effective as when the arm cylinder is operating under a light load.

The control valve switches automatically between oil recirculation under light load conditions and no recirculation under heavy load conditions by detecting pump pressure. This is called variable recirculation. When the arm is under a heavy load, when no recirculation occurs, the oil supply passage to the arm cylinder is the same as during recirculation for a light load, but the return oil passage is different.

The system detects the pump pressure at heavy load conditions (more than 200 kgf/cm^2 (2840 psi) of pump pressure. This causes the secondary pressure of solenoid proportional valve (A) to operate and changes the arm recirculation spool (310) to position (I).

The hydraulic oil that flowed into the arm recirculation spool (310) does not flow to the arm cylinder head (H) that is heavily loaded, but flows to tank port (T) from low pressure circuit (D) and returns to the hydraulic oil tank.

Sequenced conflux:

If the arm cylinder head (H) is loaded heavily, the solenoid proportional valves (C) and (D) operate in addition to the above mentioned recirculation cut action. As a result, each secondary pressure acts upon the PTb and Pcb ports of the control valve, changes the travel straight spool (307) to position (II) and changes the P1 bypass cut spool (309).

As a result, the oil flow from the pumps P1 opens check poppet CT2 as P1 bypass cut spool (309) has shifted and hydraulic oil of pump P2 is flowing in the parallel circuit (56) of the control valve. This supplies the arm cylinder head (H).

24.1.9.3 CONSTRUCTION

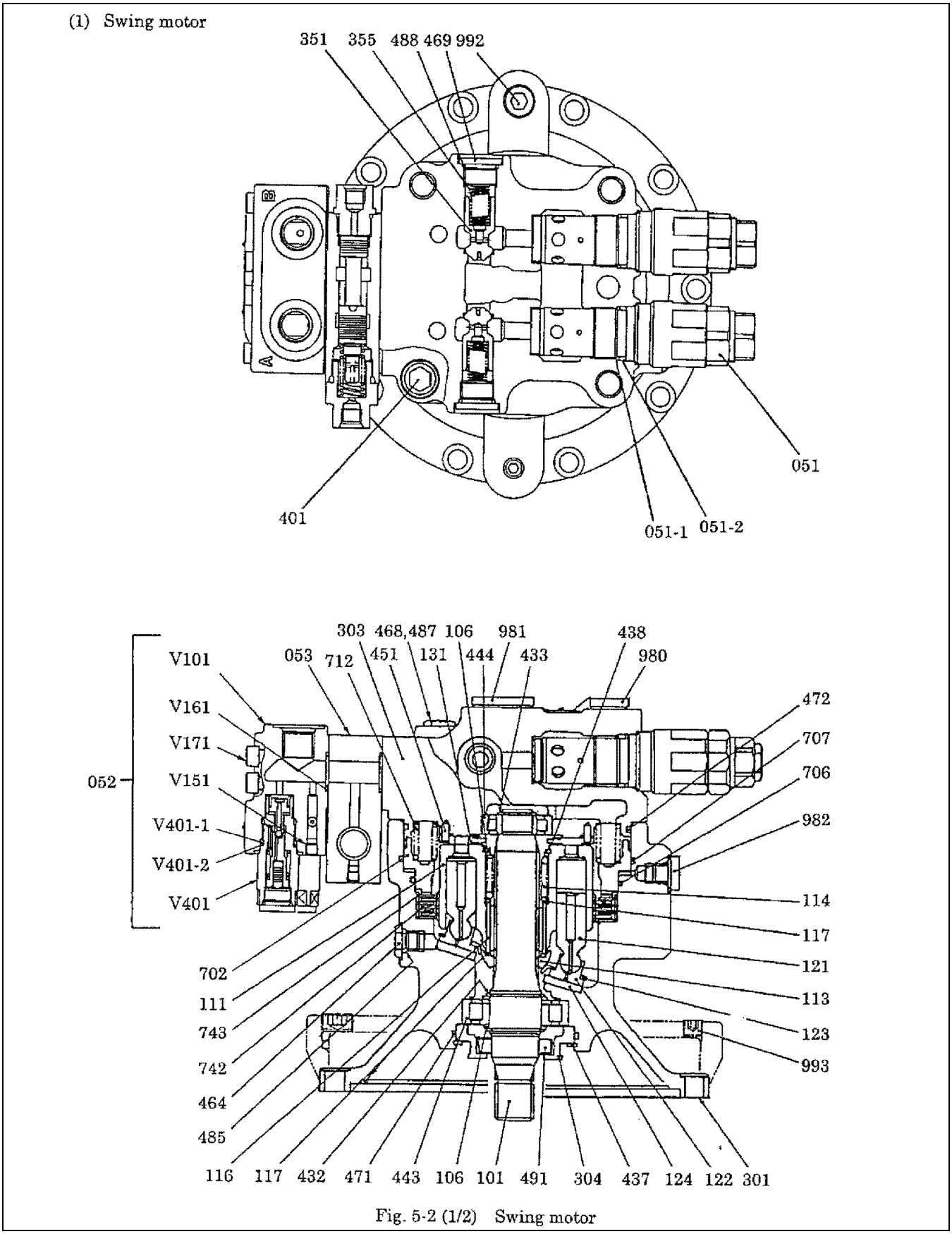


Fig. 5-2 (1/2) Swing motor

CH24-55-011

Figure 70

24.1.11.2 TRAVEL MOTOR (FOR L TYPE)

24.1.11.2.1 SPECIFICATIONS

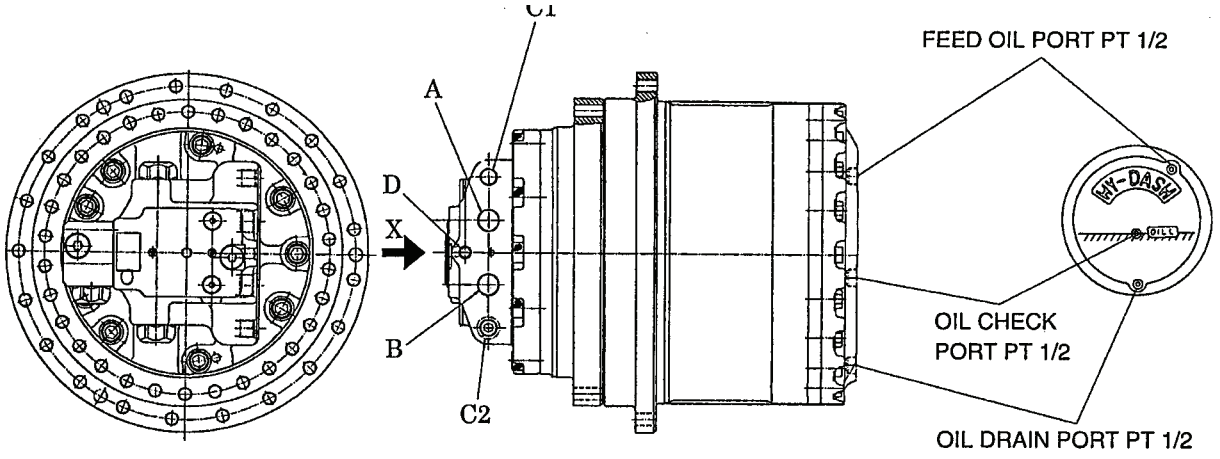


Fig. 1 Outside View of Travel Motor (with Reduction unit & Brake Valve)

Rotating direction (As seen from X side)	Oil inlet	Oil outlet
CW	A	B
CCW	B	A

	Port name	Port size
A , B	Oil inlet or Oil outlet	PF 3 / 4
C1 , C2	Drain port	PF 1 / 2
D	Two speed changeover signal port	PF 1 / 4

(2) Specifications

Table 1

Item			Model: GM24V-A-58/105-1
Reduction Unit	Reduction ratio		48
	Output torque	kgf·m	1470 / 2640
		(ft·lbs)	(10,700 / 19,100)
	Revolution H /L	rpm	42.1 / 23.5
	Recommended gear oil		A.P.I. Classification GL-4, SAE #90
	Oil capacity	ℓ (gal)	3.0 (0.793)
Motor	Stroke displacement H /L	cc /rev	58.4 / 104.7
		(cuin /rev)	(3.56 / 6.39)
	Working pressure	kgf /cm² (psi)	330 (4,690)
	2-speed changeover pressure	kgf /cm² (psi)	40 (570)
Parking Brake	Braking torque	kgf·m (ft·lbs)	27 (195)
	Brake release pressure	kgf /cm² (psi)	11 (156)
Surge cut valve	Cracking pressure	kgf /cm² (psi)	210 (2,990)
Total weight		kg (lbs)	240 (529)

C24-65-01

Figure 81

24.1.14 HYDRAULIC MOTOR

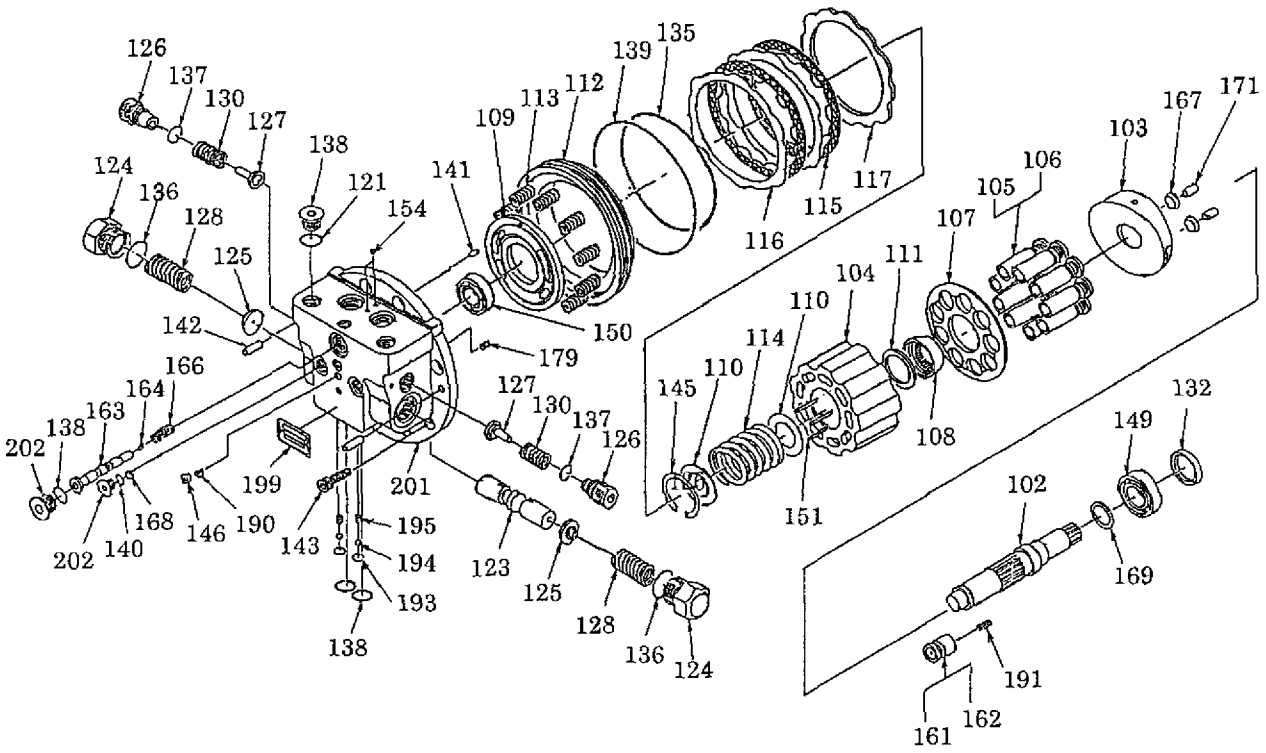


Fig. 6-3

No.	NAME	Q'TY	No.	NAME	Q'TY	No.	NAME	Q'TY
102	(DRIVE) SHAFT	1	127	ANTICAVITATION VALVE	2	162	SHOE	1
103	(SWASH) PLATE	1	128	SPRING	2	163	SPOOL	1
104	CYLINDER BLOCK	1	130	SPRING	2	164	OIL STOPPER	1
105	PISTON	9	132	OIL SEAL	1	166	SPRING	1
106	SHOE	9	135	O RING	1	167	PILOT	2
107	RETAINER PLATE	1	136	O RING	2	168	BALL	2
108	THRUST BALL	1	137	O RING	2	169	COLLAR	1
109	TIMNG PLATE	1	138	O RING	4	170	SOCKET BOLT ; M8×65	4
110	WASHER	2	139	O RING	1	171	PARALLEL PIN	2
111	WASHER	1	140	O RING	2	174	SUPER LOCK WASHER	4
112	PISTON	1	141	PARALLEL PIN	1	179	FILTER	1
113	SPRING	8	142	PARALLEL PIN	2	190	ORIFICE	1
114	SPRING	3	143	SOCKET BOLT ; M10×30	8	191	SPRING	1
115	PLATE (FRICTION PLATE)	3	144	PLUG	1	193	O RING	2
116	PLATE (SEPARATOR PLATE)	3	145	SNAP RING	1	194	BALL	2
121	PLUG	1	149	BEARING	1	195	ORIFICE	2
123	SPOOL	1	150	BEARING	1	199	NAME PLATE	1
124	PLUG	2	151	NEEDLE ROLLER	3	201	REAR FLANGE	1
125	SPRING RETAINER	2	154	SOCKET PLUG (1/16)	9	202	PLUG	2
126	PLUG	2	161	PISTON	1			

C24-75-01

Figure 93

24.1.17 SWIVEL JOINT SPECIFICATION

24.1.17.1 GENERAL VIEW (SPEC.1)

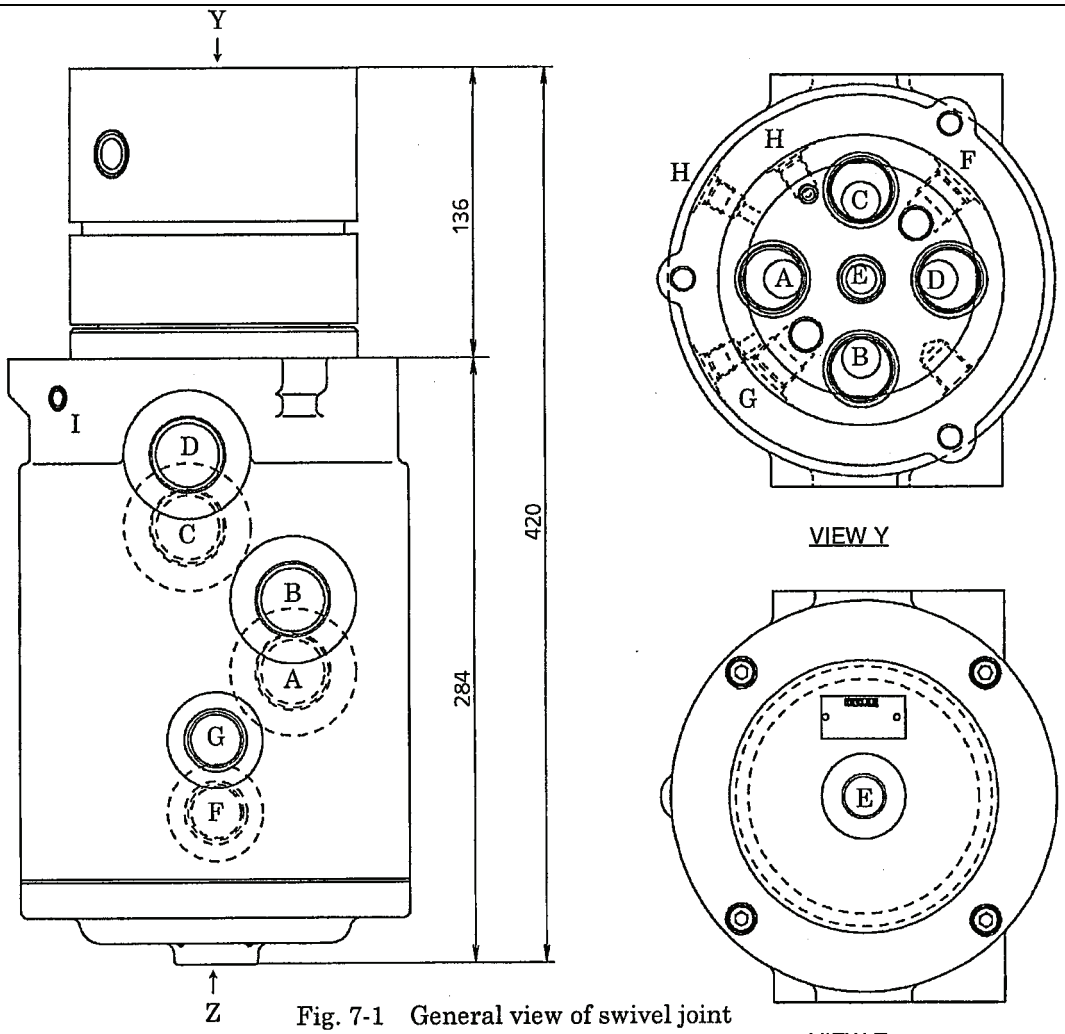


Fig. 7-1 General view of swivel joint

7.1.2 SPECIFICATION

Table 7-1

Item		Spec.1
Assy parts No.		YX55V00001F2
High pressure ports A,B,C,D	Working pressure Max. impact pressure Rated flow	350kgf/cm²(4980psi) 525kgf/cm²(7470psi) 315 ℓ/min(83gal/min)
High pressure ports F,G	Working pressure Max. impact pressure Rated flow	210kgf/cm²(2990psi) 525kgf/cm²(7470psi) 210 ℓ/min(55gal/min)
Low pressure ports E	Working pressure Rated flow	5kgf/cm²(71psi) 50 ℓ/min(13gal/min)
Low pressure ports H,I	Working pressure Rated flow	50kgf/cm²(710psi) 15 ℓ/min(4gal/min)
Revolution		15rpm
Ports size	A,B,C,D E,F,G H,I	PF1 PF1/2 PF1/4
Length : L		420mm(16.5″)
Weight		63kg(139 lbs)

CH24-85-01

Figure 103

Cushion on head side

The construction of the head side cushion is similar to that of the rod side. In a state of intermediate stroke on the pressing rod side, oil in chamber “A” returns to the tank by passing through paths “B” and “C” at a fixed flow rate.

Prior to the stroke end, the plunger blocks path “B”. The oil in chamber “A”, path clearance “D”, and restricted path “C” suddenly drops as the oil flow volume is returning to the tank. This causes the piston movement to slow.

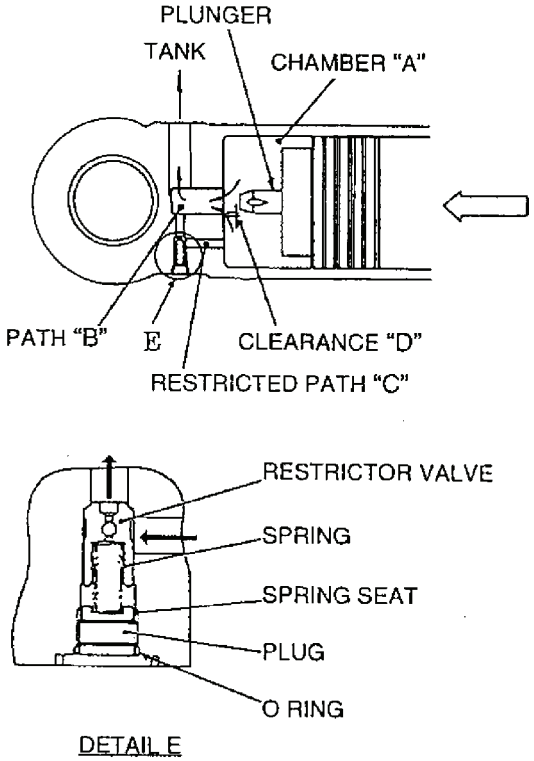
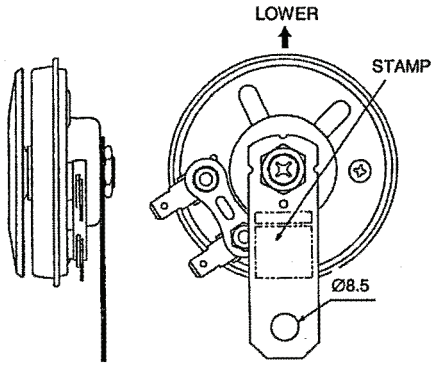
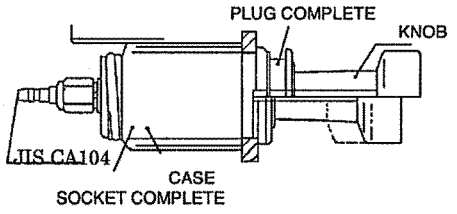
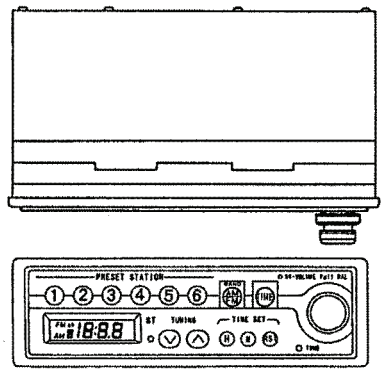


Fig. 8-9 Cushioning action on the head side

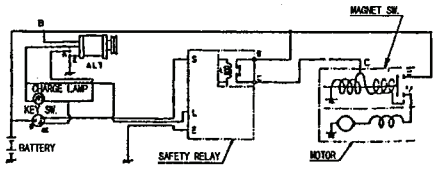
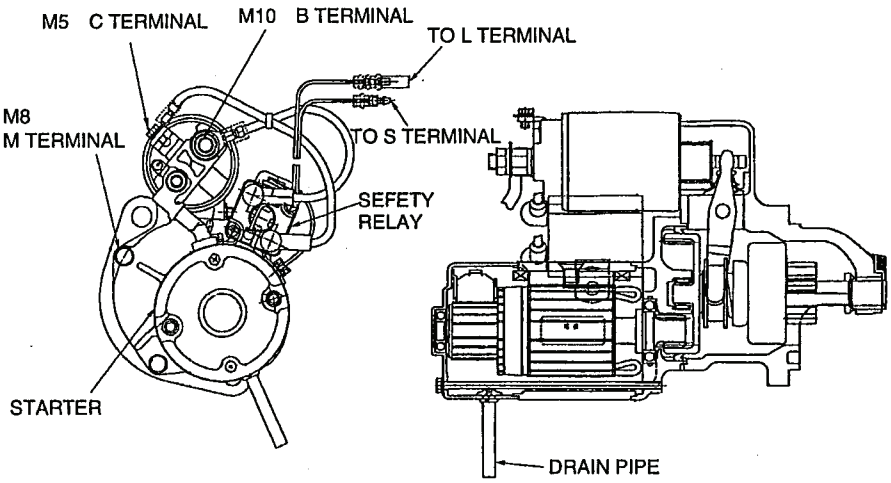
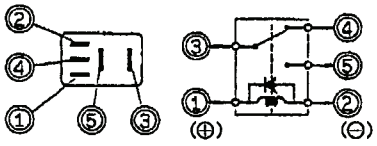
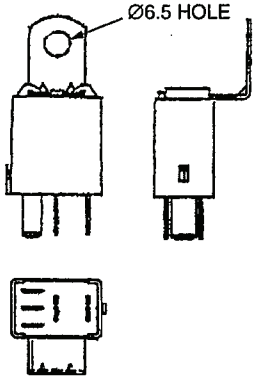
CH24-95-01

Figure 113

File No. Name of part Part No. Use Applicable Machine	Specification	Description
E−4,5 Horn CM53S00002F1 (high) CM53S00002F2 (low) Warning sound YY02-03001~ YH02-01301~ LK02-01041~ YY03-04555~ YH03-02097~ LK03-01107~	Type: — Rated voltage: DC24V Operating voltage range: DC 20~30V Sound level: 113±5 Db Basic frequency: 420±20 Hz high sound / 350±20 Hz low sound Insulation resistance: More than 3MΩ / DC500V	
E−6 Cigar lighter 2421R180F1 Cigar lighter YV02-01701~ YY02-03001~ YH02-01301~ LK02-01041~ YY03-04555~ YH03-02097~ LK03-01107~	Model: 409112-0000 Rated voltage: DC 24V Max. current: 5A Return time: Less than 18sec Insulation resistance: More than 3MΩ / 500V megger Fusing temp.: 180℃~250℃ (356°F~482°F)	
E−7 Tuner LB54S00001P1 (Option) Radio (AM & FM) YV02-01701~ YY02-03001~ YH02-01301~ LK02-01041~ YY03-04555~ YH03-02097~ LK03-01107~	Rated voltage: DC 24V Maker: SANYO Range: AM : 530~1710kHz (10 kHz step) FM : 87.5~107.9MHz (0.2 MHz step) 1 L SPEAKER(+) 2 R SPEAKER(+) 3 ACC(+B) 4 OPEN 5 L SPEAKER(−) 6 R SPEAKER(−) 7 GND(−) 8 BACK UP(+) 9 OPEN	

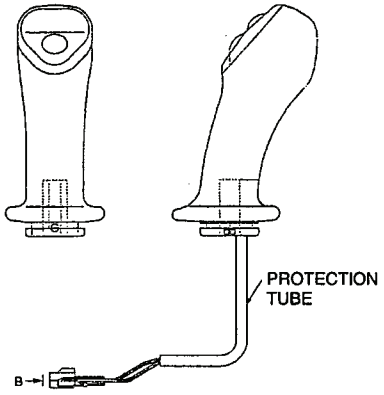
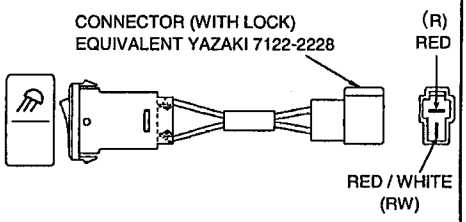
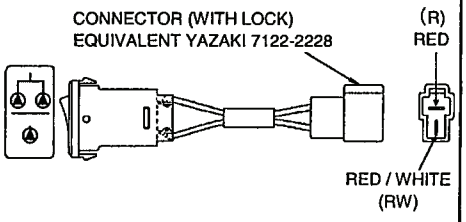
CH24-105-01

Figure 123

File No. Name of part Part No. Use Applicable Machine	Specification	Description
R−4 Relay 897226−6550 Safety relay (Starter) YV02-01701~ YY02-03001~ YH02-01301~ LK02-01041~ YY03-04555~ YH03-02097~ LK03-01107~	ISUZU part No. 897226−6550 Rated voltage DC 24V	 CIRCUIT 
R−5,6,7,8,9,10,18 Relay EN24S00008P1 Wiper motor, Washer motor, Horn relay, Work light relay, Cab work light Travel alarm, Hand control extra YV02-01701~ YY02-03001~ YH02-01301~ LK02-01041~ YY03-04555~ YH03-02097~ LK03-01107~	Rated voltage DC 24V Insulation resistance More than 1MΩ (500V megger) Rated current 20A (Continuous)	 CIRCUIT 

CH24-115-01

Figure 133

File No. Name of part Part No. Use Applicable Machine	Specification	Description
SW−20 Switch (left) LF03M01005F1 (Handle assy) Horn YV02-01701~ YY02-03001~ YH02-01301~ LK02-01041~ YY03-04555~ YH03-02097~ LK03-01107~	Maker: KHI Voltage: DC30V Current: 3A  VIEW B	
SW−21 Switch 2479U1190F1 Work light (switch) YV02-01701~ YY02-03001~ YH02-01301~ LK02-01041~ YY03-04555~ YH03-02097~ LK03-01107~	Type: Single-pole single-throw (Alternate) Rated voltage: DC 24V Insulation resistance: More than 1MΩ / 500V megger TERMINAL CONNECTION Terminal / Position: R, RW OFF ON	
SW−22 Switch 2479U1190F32 Single / Conflux select switch YV02-01701~ YY02-03001~ YH02-01301~ LK02-01041~ YY03-04555~ YH03-02097~ LK03-01107~	Type: Single-pole single-throw (Alternate) Rated voltage: DC 24V Insulation resistance: More than 1MΩ / 500V megger TERMINAL CONNECTION Terminal / Position: R, RW OFF ON	

CH24-125-01

Figure 143

25.1.1.2 COMPONENT CONSTRUCTION

25.1.1.3 INTAKE UNIT

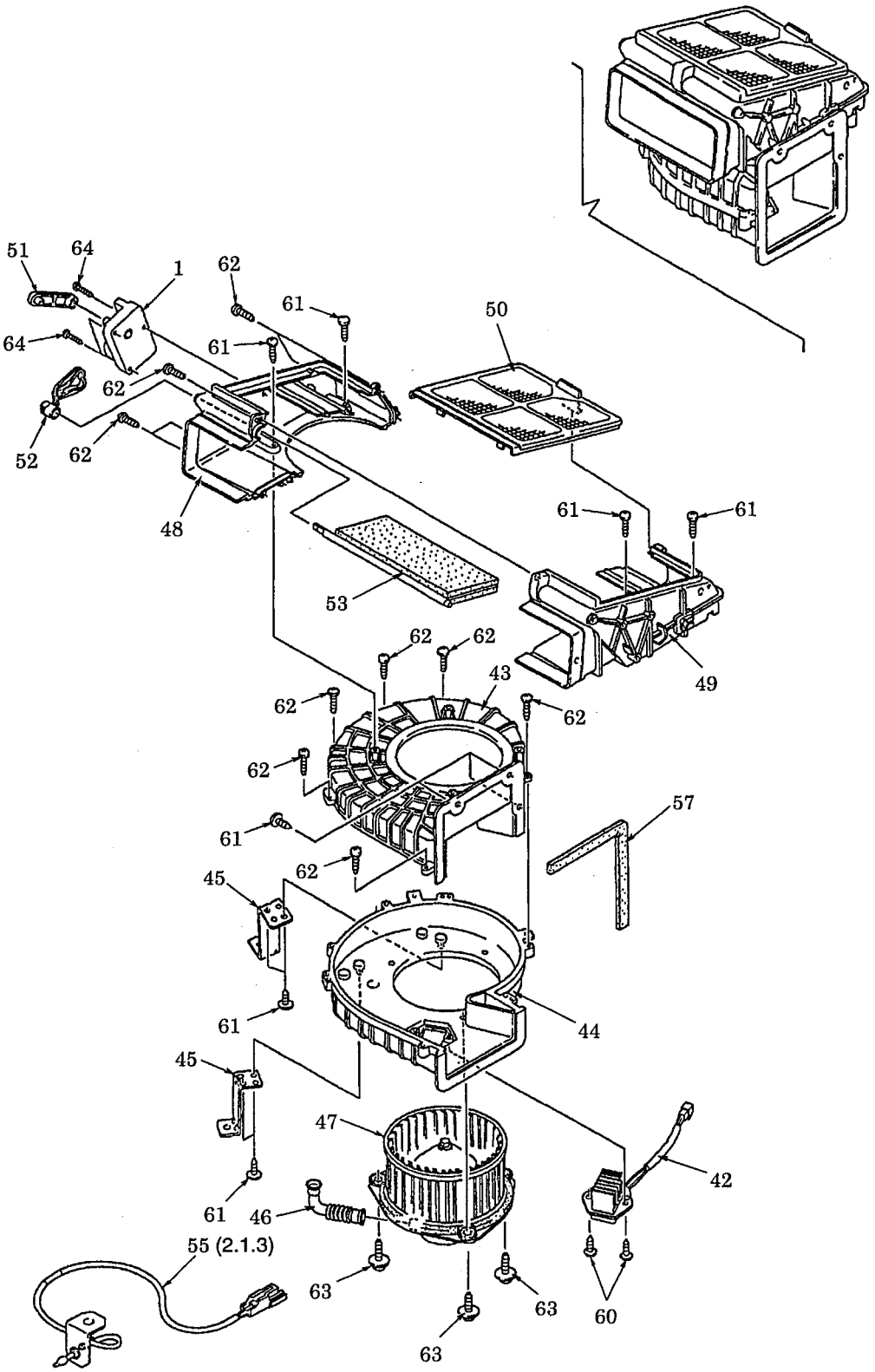


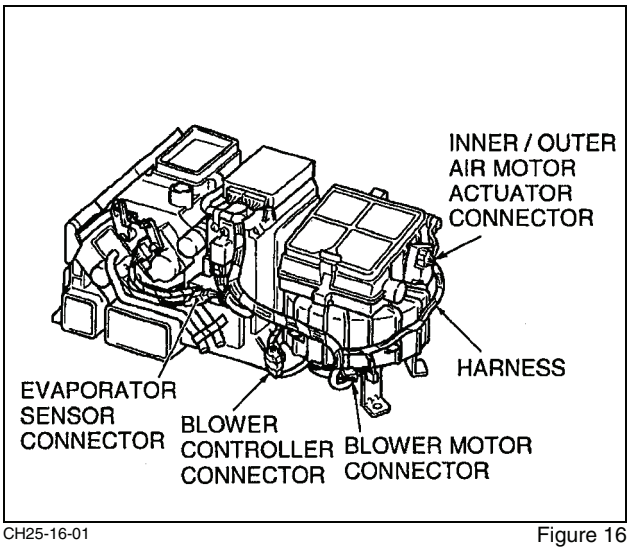
Fig. 3 Intake unit

CH25-06-01

Figure 4

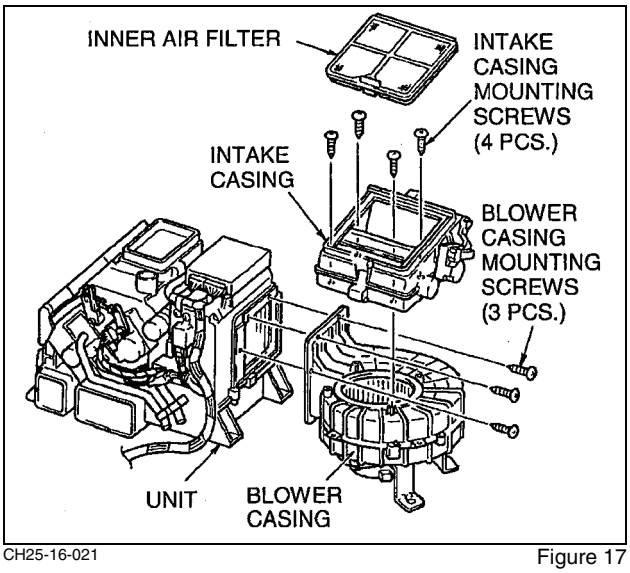
25.2.1 REMOVAL AND INSTALLATION

25.2.1.0.1 REMOVING THE BLOWER UNIT



CH25-16-01 Figure 16

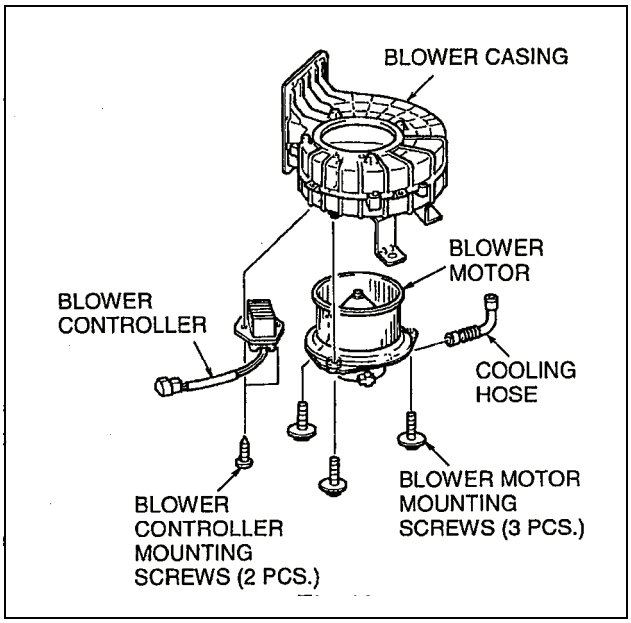
Remove the connectors fastening the inner/outer air select motor actuator, the blower motor and the blower controller. Remove the electrical harness from the blower casing.



CH25-16-021 Figure 17

Remove the inner air filter from the intake casing. Remove the 4 Phillips screws T5 X 14 (T1) from the top of the intake casing. Then remove the intake casing. Remove the 3 screws T5 X14 (T1) fastening the blower casing to the unit casing. Separate the blower unit from the air conditioner unit.

25.2.1.0.2 REPLACING THE BLOWER MOTOR



CH25-16-03 Figure 18

To replace the blower motor, disconnect the cooling hose connecting the blower motor and the blower casing. Remove the 3 Phillips screws N5 X16 (W) from the bottom of the blower unit casing. Remove the blower motor.

NOTE: *Do not separate the fan from the blower motor.*

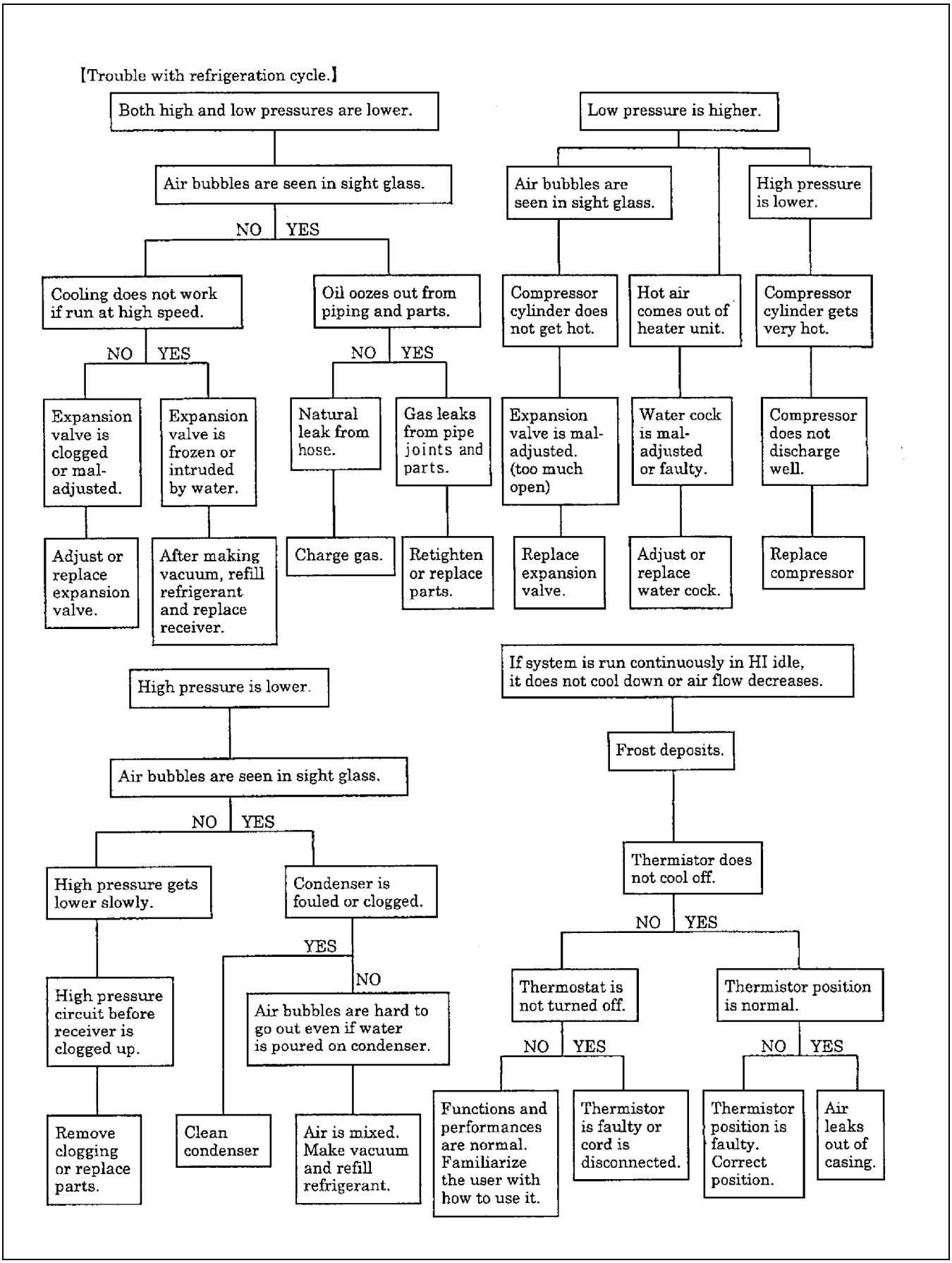
Assembly is the reverse order of disassembly.

25.2.1.0.3 REPLACING THE BLOWER CONTROLLER

Remove the 2 Phillips screw T4X14 (T1) from the bottom of the blower unit casing and draw out the blower controller. Install a new blower controller in the reverse order of removal.

NOTE: *Do not disassemble the blower controller under any circumstances. Replace it as a complete unit.*

NOTES



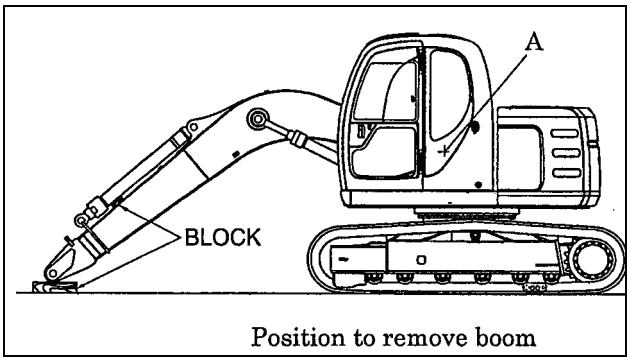
CH25-36-1ID

Figure 52

NOTES

32.1.4 BOOM

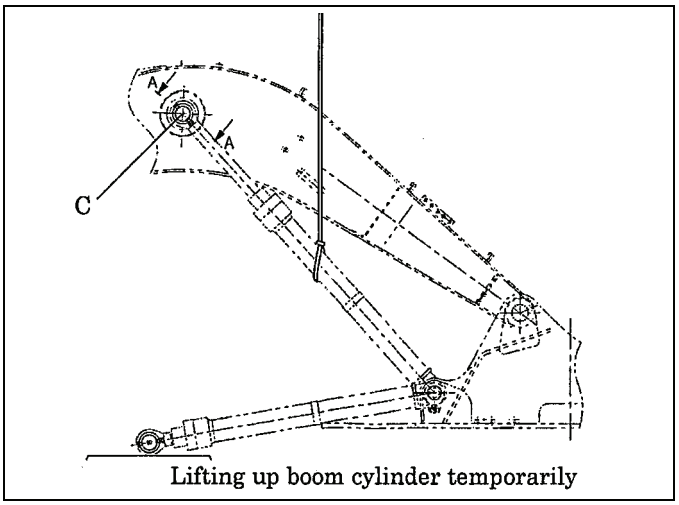
32.1.4.1 REMOVAL OF BOOM



Position to remove boom

CH32-09-01 Figure 15

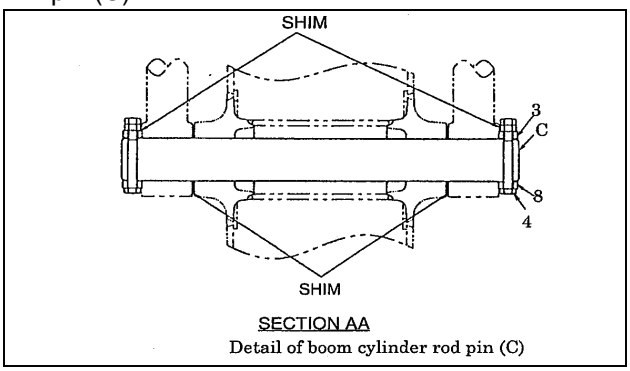
1. Lower the boom and support the boom end with a suitable stand.
2. Disconnect all hoses from the bucket cylinder, arm cylinder and boom cylinder, install plugs in all the openings.
3. Disconnect the wiring for working light at the connector.



Lifting up boom cylinder temporarily

CH32-09-02 Figure 16

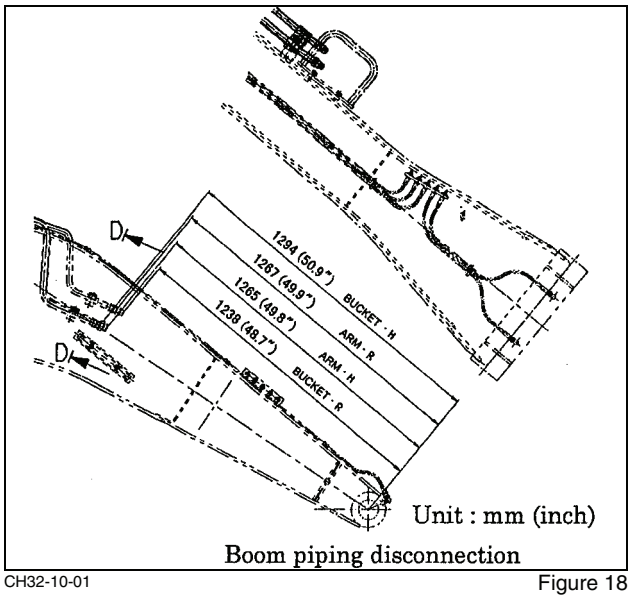
4. To remove boom cylinder, lift up boom with an appropriate lifting device or nylon sling to prevent the boom cylinder from falling. Remove the cap screw and nuts that secure pin (C), then remove pin (C).



Detail of boom cylinder rod pin (C)

CH32-09-03 Figure 17

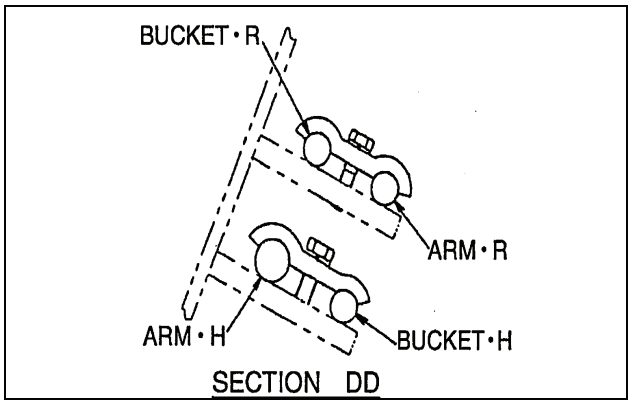
5. After adjustment of shim, the total gap should be within 0.6-2 mm (0.02-0.08 inches).



Boom piping disconnection

CH32-10-01 Figure 18

6. To disconnect cylinder pipes, retract boom cylinder rod and place one side of cylinder on block.



CH32-10-02 Figure 19

7. To disconnect arm cylinder piping, release the pressure in the hydraulic tank and disconnect pipe at section DD. After disconnection, plug pipes to prevent dust, debris contamination.

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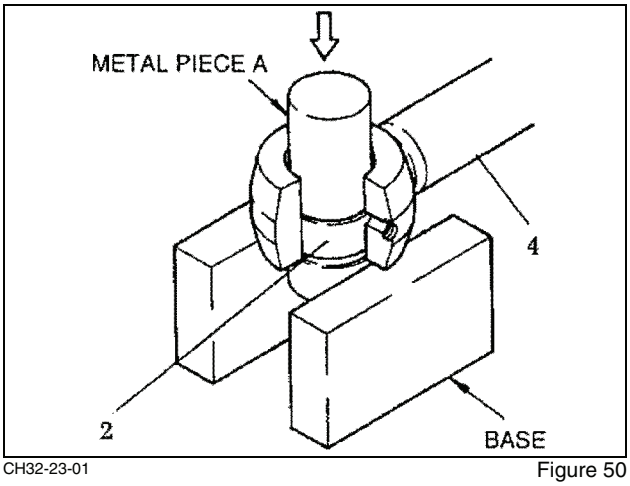
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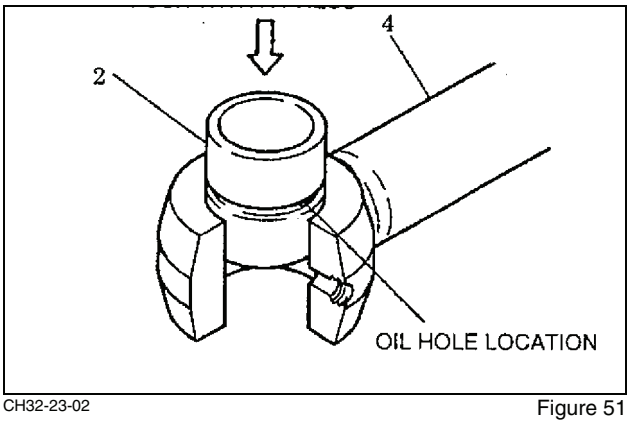
32.1.7.4 REMOVING PIN BUSHINGS



CH32-23-01 Figure 50

1. The cylinder tube is pressed into the pin bushing (2) of the piston rod. When disassembling, use a jig (A) and push the rod out.
2. When all cylinder parts have been disassembled, wash all parts with a suitable solution. Do not use volatile agents such as gasoline or thinner, as they deteriorate rubber. Do not reuse the oil seals, o-rings, or back-up rings. Dry all parts with jet air and protect them from damage.

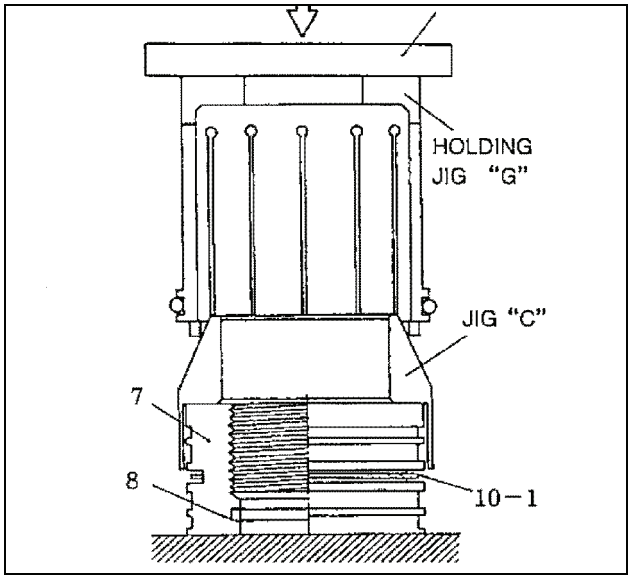
32.1.7.4.1 CYLINDER TUBE AND PISTON ROD ASSEMBLY



CH32-23-02 Figure 51

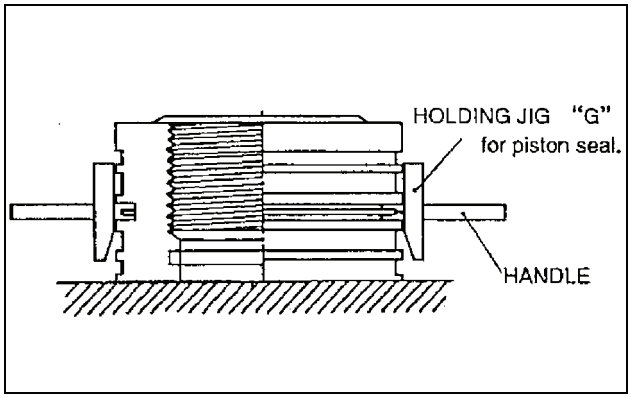
1. Press fit pin bushing (2) into cylinder tube (12) and piston rod (4).

32.1.7.4.2 ASSEMBLING PISTON ASSEMBLY



CH32-24-01 Figure 52

2. Coat O-ring (8) with hydraulic oil and set in place using inserting jig. Push slipper seal (10-1) in place. Slipper seal will soften if heated, but do not heat the seal above 100° C (212° F).



CH32-24-02 Figure 53

3. Hold the heated seal in place, using a holding jig (G). Wind vinyl tape around seal and leave in place before piston (7) is set into cylinder tube. Attach wear ring and dust ring when inserting piston (7) into cylinder tube.

32.1.9.3 SLIPPER SEAL - HOLD DOWN JIG

SLIPPER SEAL HOLDING-DOWN JIG
(SYMBOL D)

MATERIAL : NYLON

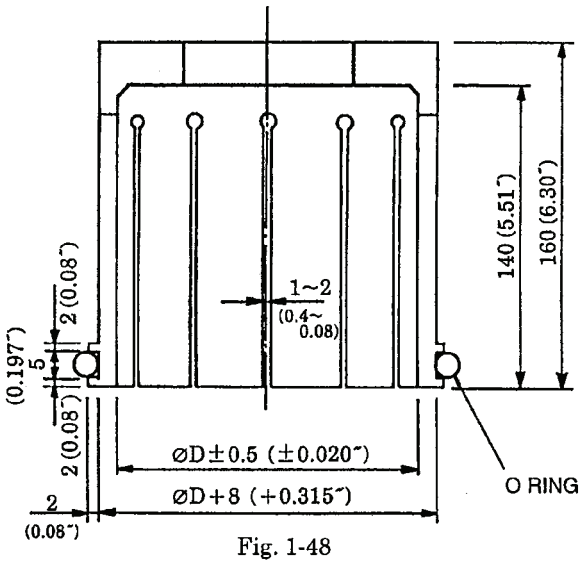
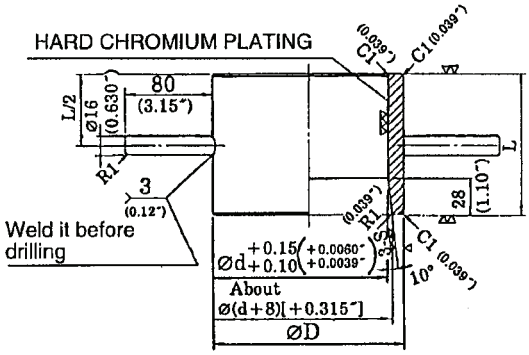


Fig. 1-48

Table 1-13 Unit : mm (inch)

Cylinder Used	D	O ring
Bucket	95 (3.74")	1B P95
Boom	100 (3.94")	1B P100
Arm	115 (4.53")	1B P115
Dozer	115 (4.53")	1B P115

SLIPPER SEAL HOLDING-DOWN JIG
(SYMBOL G)



MATERIAL : SS400

Fig. 1-49

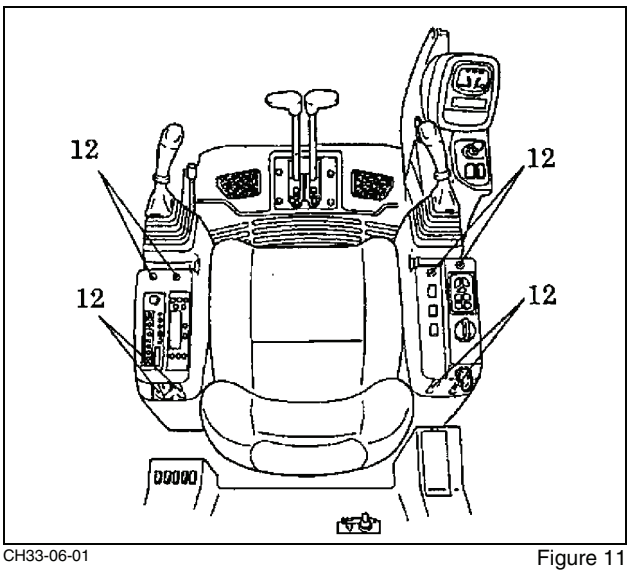
Table 1-14 Unit : mm (inch)

Cylinder	d	D	L
Bucket	95 (3.74")	110 (4.33")	40 (1.57")
Boom	100 (3.94")	115 (4.53")	40 (1.57")
Arm	115 (4.53")	130 (5.12")	40 (1.57")
Dozer	110 (4.33")	125 (4.92")	40 (1.57")

CH32-35-01

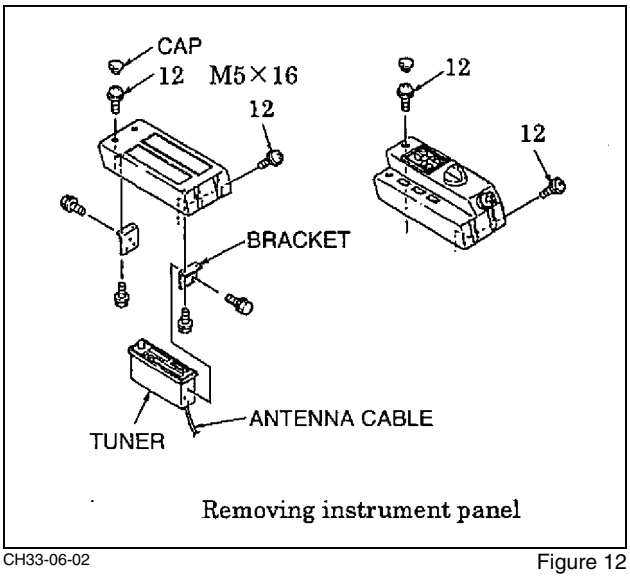
Figure 76

33.0.8 INSTRUMENT PANEL



CH33-06-01 Figure 11

1. Prepare for removal of instrument panel by disconnecting the negative terminal of the battery. To remove the right hand and left hand instrument panel, remove 8 sems bolts (12) M5.



CH33-06-02 Figure 12

2. Lift the panel up slightly to remove the two connectors for air conditioning (8P), tuner (9P) and the antenna cable on rear side of the left instrument panel.

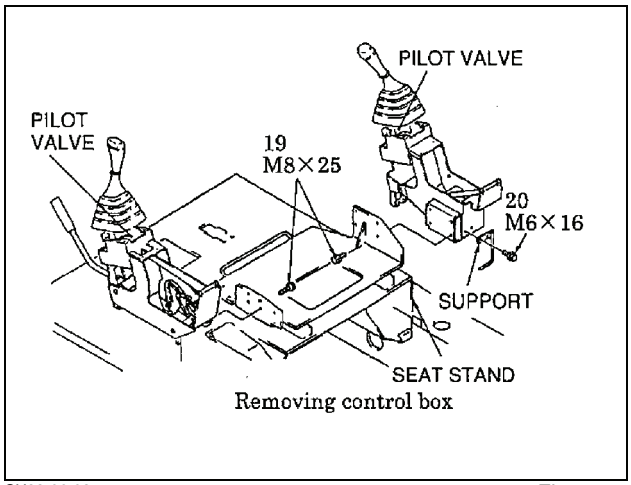
   8P - Air conditioning panel

   9P - Tuner

   6P - Key switch

   3P - Accelerator panel

   2P and 8P - Switch panel



CH33-06-03 Figure 13

3. To remove the control box, remove the four sems bolts (19) M8 on right and left side. Separate the control box from its support.

   Left control box weight: 8.5 kg (19 pounds)

   Right control box weight: 7 kg (15 pounds) including pilot valve

33.0.9 INSTRUMENT PANEL INSTALLATION

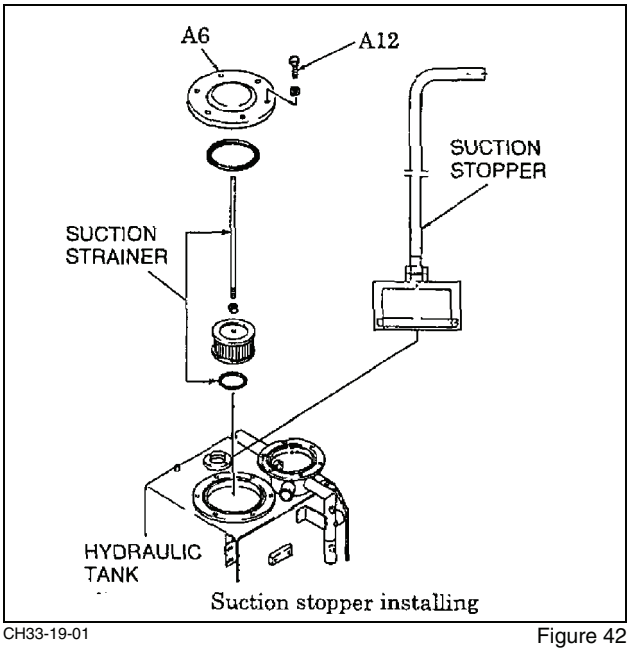
Install the instrument panel in the reverse order of removal, tightening all bolts according to recommended torque.

Tightening position	Tool	Tightening torque kgf m (lbf ft)
Sems bolt (19)	13	2 4 (17)
Sems bolt (12)	cross recessed screw driver	0 27 (2.0)

CH33-06-04 Figure 14

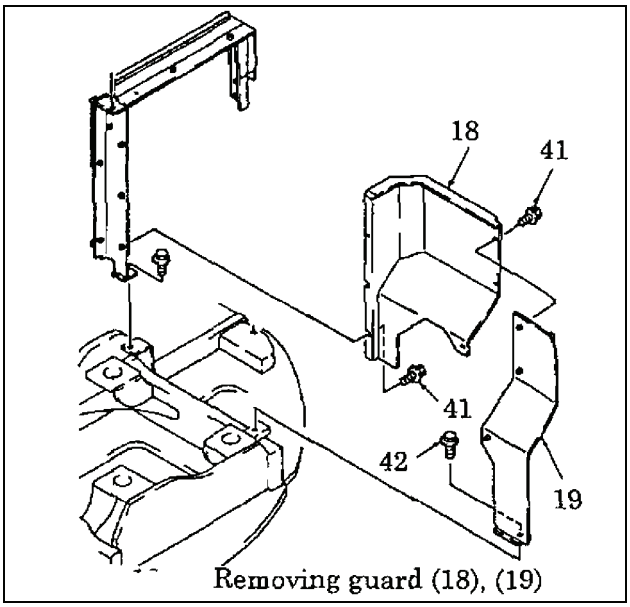
33.0.15 PUMP (MAIN)

33.0.15.1 REMOVAL PREPARATION



CH33-19-01 Figure 42

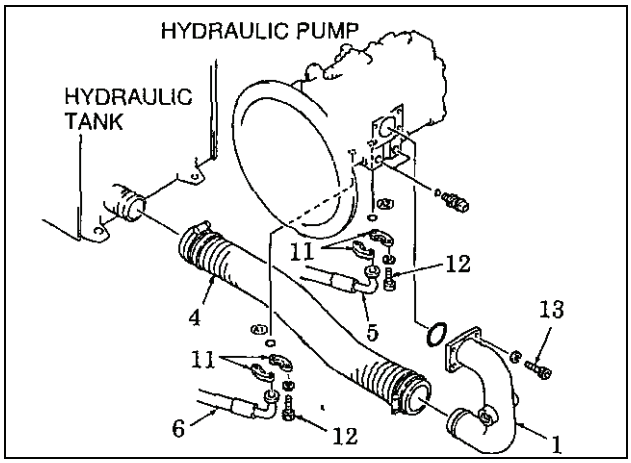
1. To remove main hydraulic pump, first remove counterweight. Though pump can be removed without removing counterweight, the removal of counterweight will reduce working time.
2. Release pressure in hydraulic oil tank. Remove the six cap screws (A12) M10, remove cover (A6) and remove suction strainer.



CH33-19-02 Figure 43

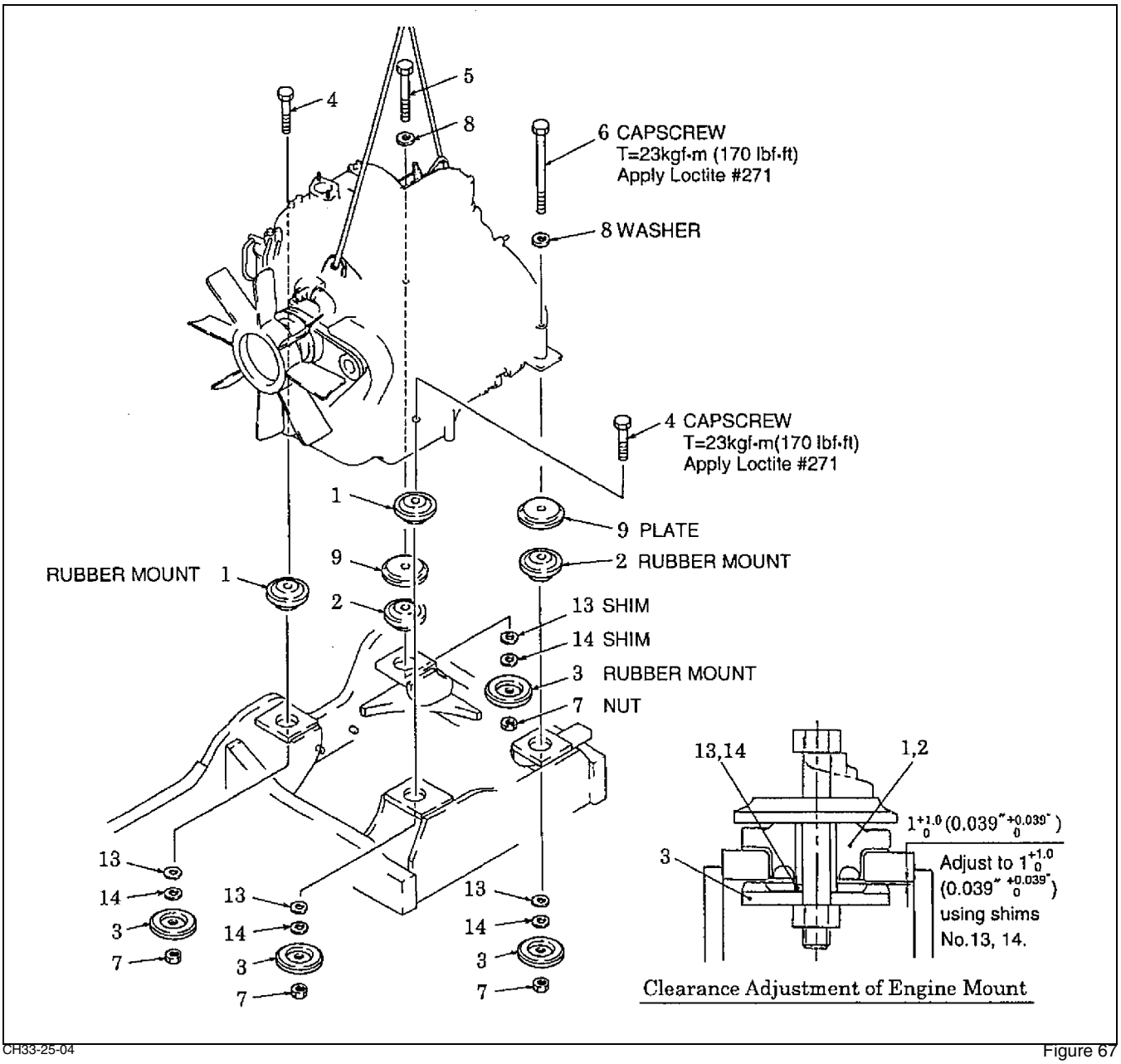
3. Remove the six cap screws (41) M12 X 25 and the two cap screws (42) M12 X 30. Then remove guard (18, 19) and disconnect drain pipe installed under the engine muffler.

33.0.15.2 PUMP (MAIN) REMOVAL



CH33-19-03 Figure 44

1. Loosen half clamp (11) on the hoses (5), (6) and the cap screws (12) M10 X 35. Disconnect two hoses (A1), (A2) on the delivery side.
2. Remove four cap screws (13) M12 X 30, then remove suction tube (1) of suction hose (4) from the pump.



CH33-25-04

Figure 67

33.0.17.2 REMOVAL

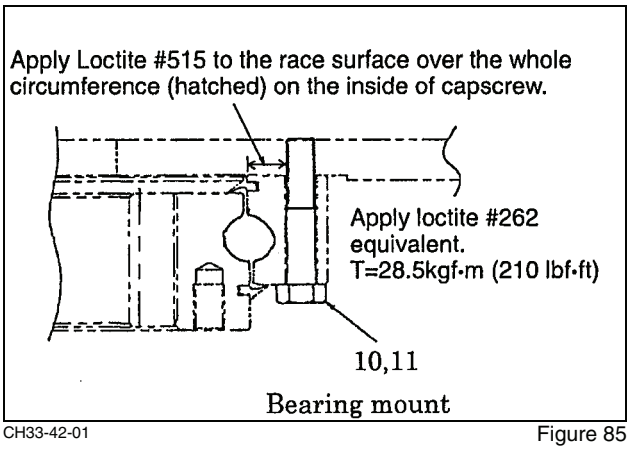
1. The engine is bolted to the frame. In order to remove it, first remove the four nuts (7) M18, the rubber mounts (3) and metal shims (13), (14).
2. Remove the four cap screws (4), (5), (6), the two washers (8), two plates (9), and two rubber mounts (1), (2). Make note of which cap screws these parts were removed from.
3. Prepare to sling the engine. A lifting devise capable of holding the weight of engine must be available.

   Engine Weight: Approx. 370 kg (820 pounds)
4. Hook the lifting devise to the lifting lugs and the front and rear of the engine. Lift slowly, first removing any slack from the lifting line.
5. Position the engine on the engine mounting stand in a safe and stable fashion.

33.0.17.3 INSTALLATION

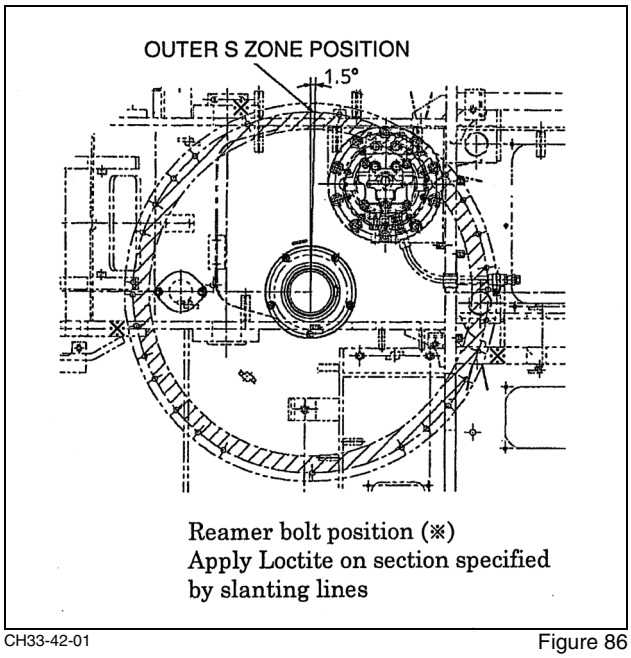
1. Installation is the reverse order of disassembly.
2. Adjust the clearance between the lower mounting surface of the engine and rubber mount (3) to 1.0 mm (0.039) using shims (13) and (14).
3. Refer to the above figure for tightening torques and Loctite information.

33.0.25.2 INSTALLATION



CH33-42-01 Figure 85

1. Installation is performed in the reverse order of disassembly.
2. Cleaning mating surfaces of upper frame and swing bearing.
3. Apply Loctite #515 to the inside of the cap screws on the contact surface.
4. Match the previously indicated marks on the upper frame and install with three reamer bolts (11) temporarily.



CH33-42-01 Figure 86

5. Confirm reamer bolt position, and apply Loctite #262.

   Tightening Torque: 28.5 kgfm (210 pound-foot)
6. Install the swing bearing by installing the twenty-five cap screws (10) M16 X 80. Apply Loctite #262.

   Tightening Torque: 28.5 kgfm (210 pound-foot)

33.0.29 TROUBLESHOOTING

Locating causes of trouble

The pump is usually fitted with a regulator, auxiliary valves, and auxiliary pumps. This makes fault location difficult to pinpoint. Check the following items to help locate problems:

1. Inspect the filter and drain oil to check for abnormal contamination. Some metallic particles will be deposited as the shoe and the cylinder wear. In the case of metallic particles in large quantities, check to see if the filter element has been damaged. Check the drain oil in the pump casing also.
2. Check for abnormal vibration and sound when the pump is running. If there is severe vibration or sound, the pump may be damaged internally or there may be cavitation.
3. When two single pumps or motors are used or when a double pump is used, change the pump pipe lines. This will help identify if the pumps are faulty or the circuit after the pump is faulty.
4. Check the pressure measurements. If problems are related to control functions, check pressure prior to disassembling the pumps.

1) Overloading to engine

Cause	Remedy	Remarks
1. Revolution and pressure are higher than set values.	1) Set pressure to specified value.	
2. Regulator torque is set higher than normal.	2) Readjust regulator.	2) Refer to Regulator Manual.
3. Pump's internal parts are seized or broken.	3) Replace damaged parts.	3) Check filter and drain oil to see if abnormal wear particles are present.
4. Regulator is piped incorrectly.	4) Pipe regulator correctly.	

CH33-54-01

Figure 107

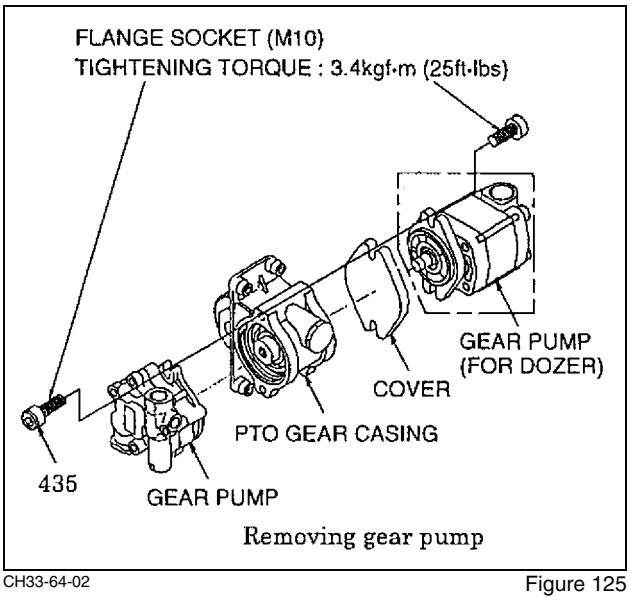
33.0.30.6 PREPARATION FOR DISASSEMBLY

1. Select a clean work place. Spread a protective sheet on the work bench to protect parts from damage.
2. Drain oil from the pump casing by removing the drain port plugs (467), (468).
3. Clean parts by removing dust and rust with cleaning solution. Do not use gasoline.
4. The following tools are required to remove and install the regulator:

Tool name	Dimension
Allen wrench	Opposing flats 8mm
Eye wrench Socket wrench Wrench with double heads (single head)	Opposing flats 27mm
Plier	For snap ring RR-20 For snap ring RR-72

CH33-64-01 Figure 124

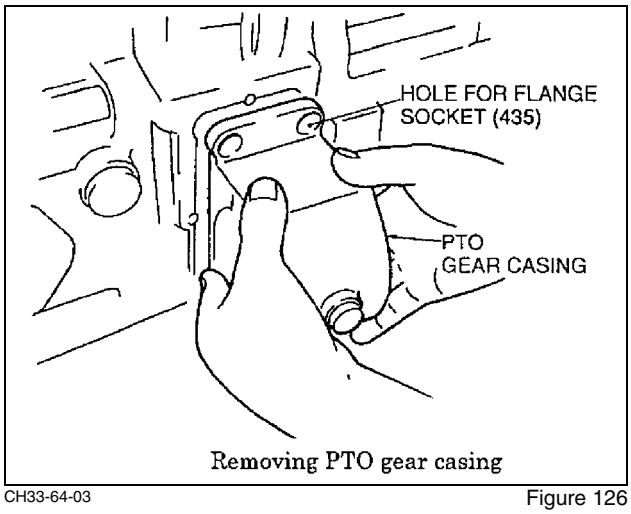
33.0.30.7 DISASSEMBLY



Removing gear pump

CH33-64-02 Figure 125

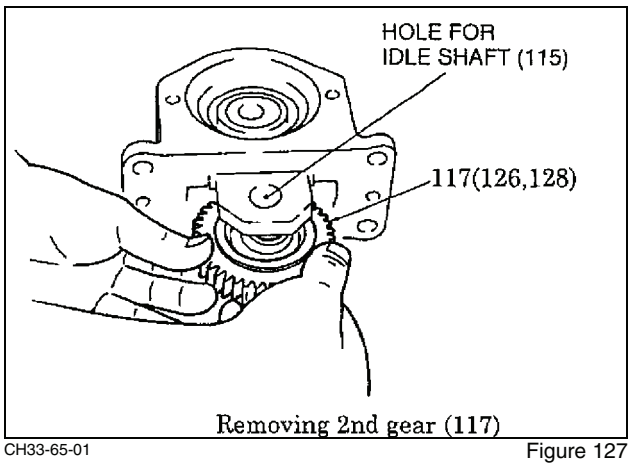
1. To remove the gear pump and cover, first remove the flange socket and the socket bolts.



Removing PTO gear casing

CH33-64-03 Figure 126

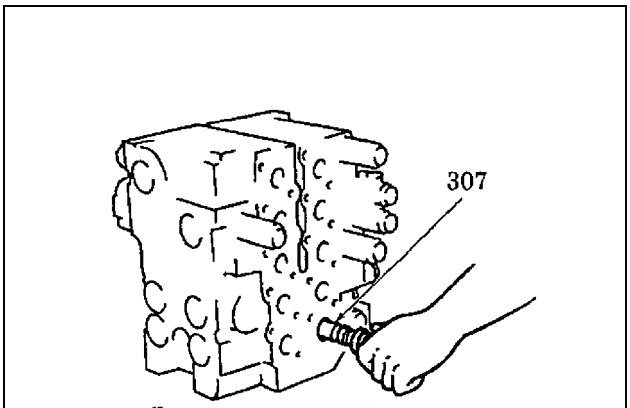
2. Remove flange socket (435) and the PTO gear casing.



Removing 2nd gear (117)

CH33-65-01 Figure 127

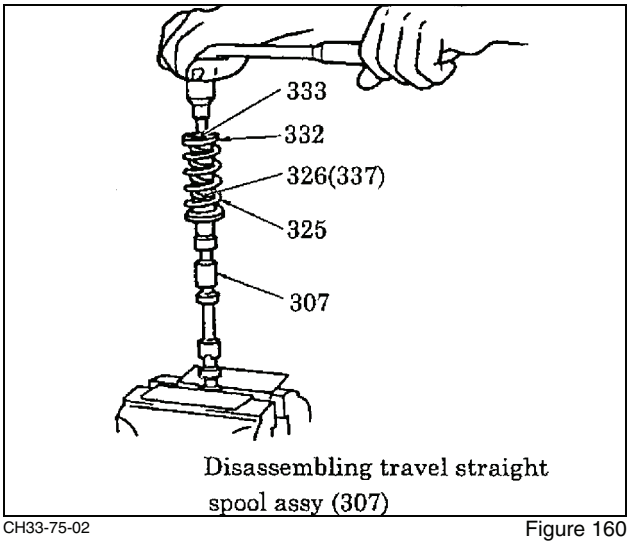
3. Remove the snap ring (827) and the idle shaft (115). Draw out second gear (117), the roller bearing (126) and the bearing spacer (128). The roller bearing (126) cannot be separated from second gear (117).



Drawing out travel straight spool assy (307)

CH33-75-01 Figure 159

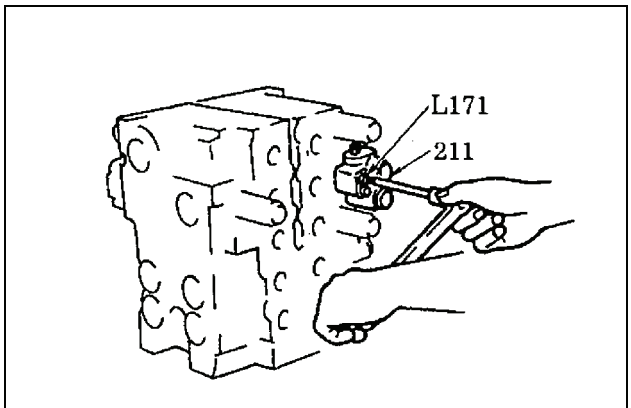
30. Remove the travel straight spool assembly (307), spring seat (332) springs (325), (326), stopper (337), and bolt (333) from casing B.



Disassembling travel straight spool assy (307)

CH33-75-02 Figure 160

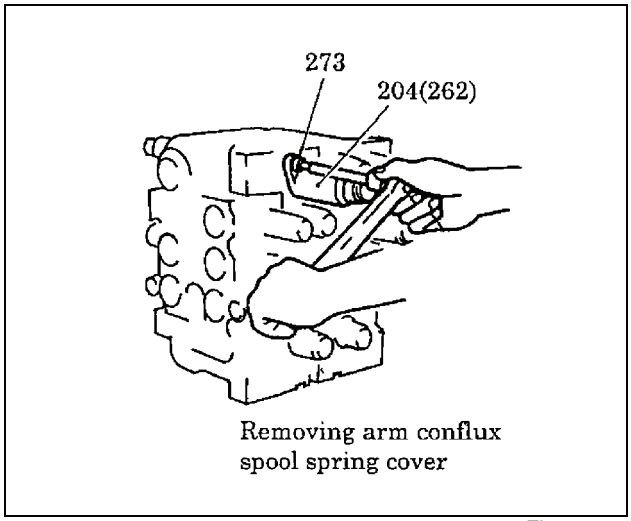
31. Place the travel straight spool assembly in a vise being careful to protect the assembly from the vise jaws. Remove the bolt (333) and separate spring seat (332), springs (325), (326), and stopper (337) from the travel spool (307).



Removing lock valve selector sub assy

CH33-5-03 Figure 161

32. To remove the lock valve selector sub, loosen and remove socket bolts (L171) and remove the lock valve selector. Do not disassemble the lock valve selector assembly.



Removing arm conflux spool spring cover

CH33-75-04 Figure 162

33. To disassemble the arm conflux spool, loosen socket bolts (273) and remove the spring cover (204) and the O-ring 9262) for arm conflux.

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

(2) Relief valve

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

GRAPHIC_1D

Figure 177

33.0.35.3 PILOT VALVE (FOR TRAVEL)

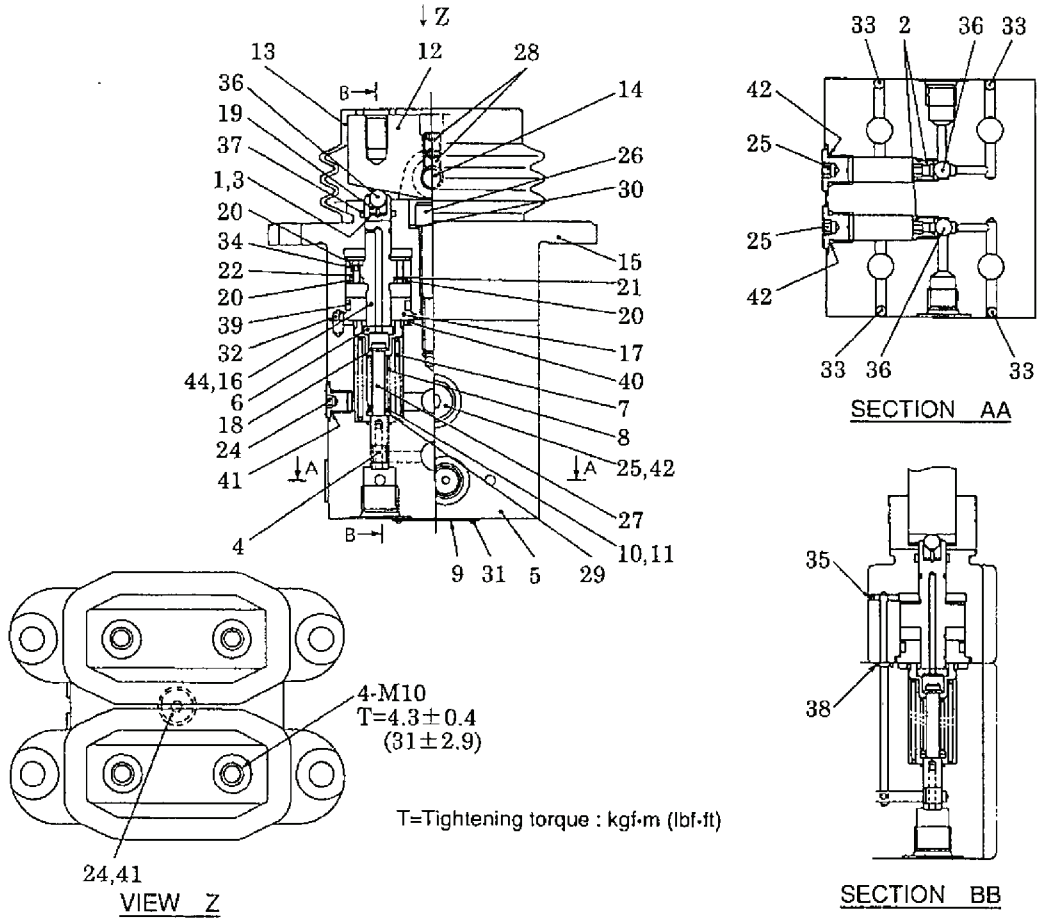


Fig. 4-1 Sectional view of pilot valve (for travel)

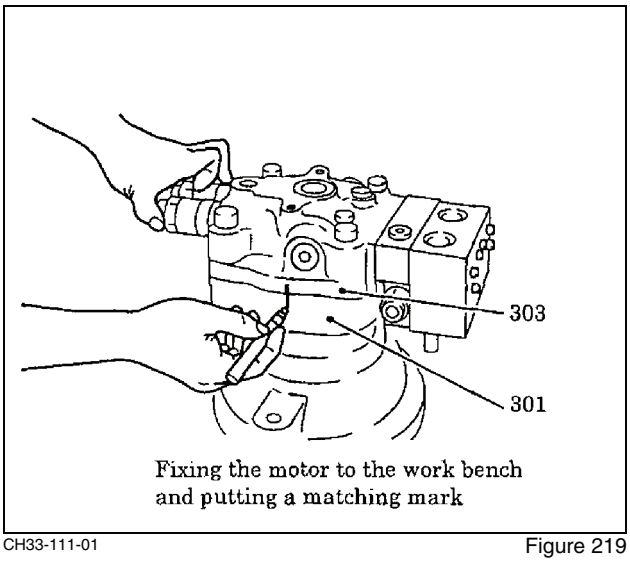
☆Apply Loctite #262

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		44	PISTON ASSY	4

CH33-100-01

Figure 206

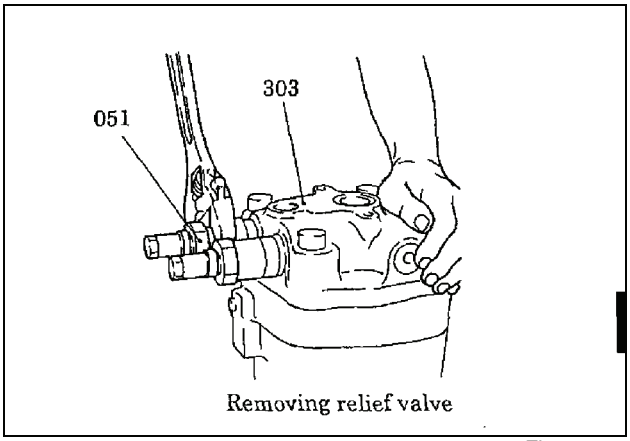
33.0.36.5 DISASSEMBLY



Fixing the motor to the work bench and putting a matching mark

CH33-111-01 Figure 219

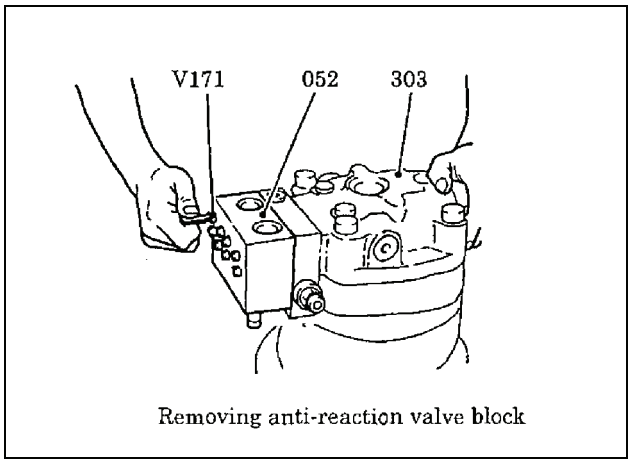
1. Lift the motor with an appropriate lifting devise, and plug all the ports to protect against the entry of foreign matter.
2. Drain lubrication oil from drain port of casing (301).
3. Choose a clean work space and place a rubber sheet or cloth on workbench to protect parts.
4. Place the motor on the workbench with the shaft end of the drive shaft (101 down). Make a match mark on the casing (301) and the valve cover (303).



Removing relief valve

CH33-111-02 Figure 220

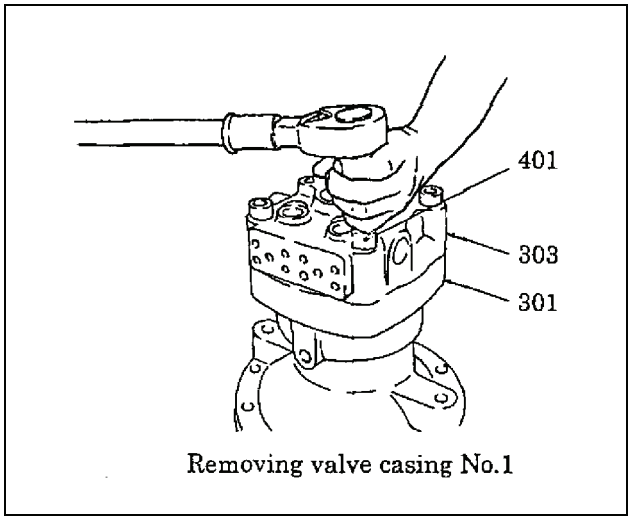
5. Loosen relief valve (051), and separate from valve cover (303).



Removing anti-reaction valve block

CH33-111-03 Figure 221

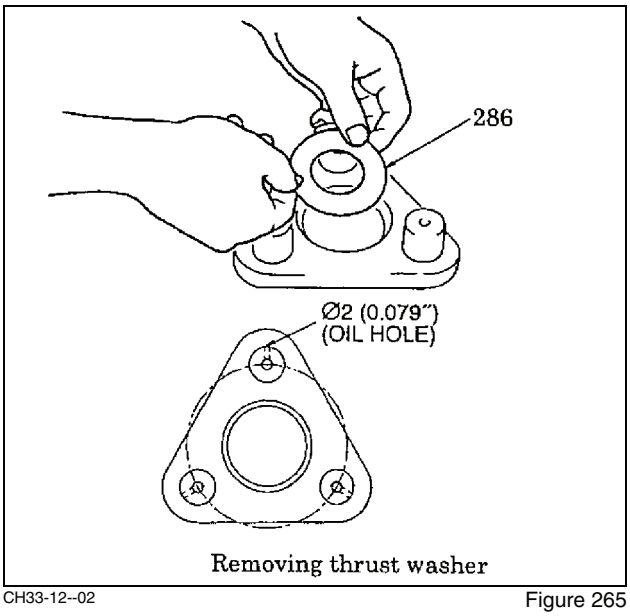
6. To remove the anti-reaction valve block and bypass valve block, loosen socket bolt (V171) and separate from the valve casing (303). Remove the anti-cavitation check plunger by separating RO plug from valve casing and remove spring and plunger. Be careful not to score plunger seat.



Removing valve casing No.1

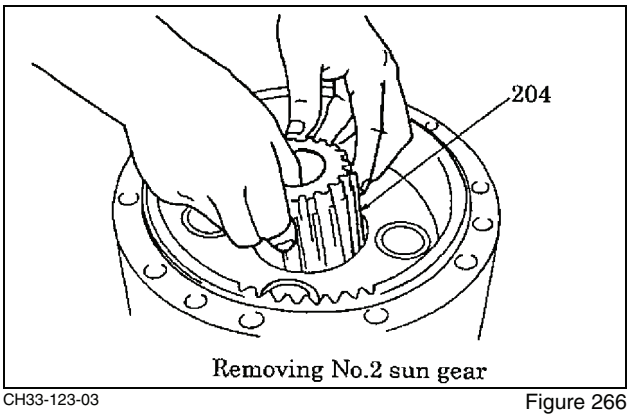
CH33-112-01 Figure 222

7. Remove the valve casing and valve plate by loosening and removing socket bolt (401). Separate the valve casing (303) from casing (301). The force of brake spring will push the valve casing off.



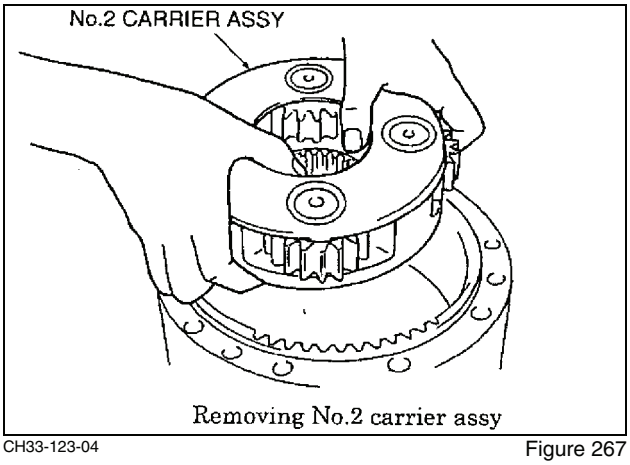
CH33-12--02 Figure 265

7. After removing the three No. 1 planetary gears (210), remove the thrust washer (286) in the center. Do not remove No. 1 pin (283) from No. 1 carrier (231) unless it is absolutely necessary.



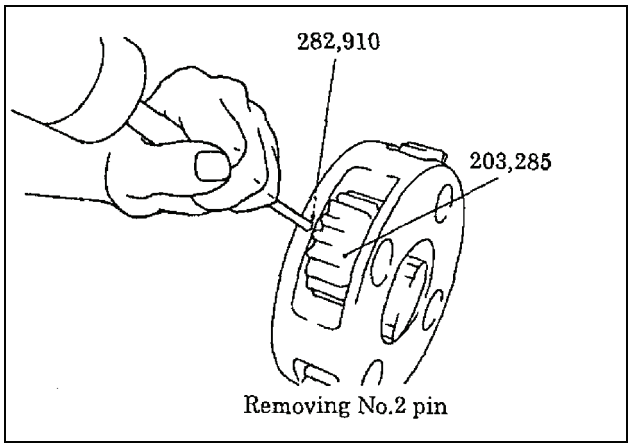
CH33-123-03 Figure 266

8. Remove the No. 2 sun gear (204).



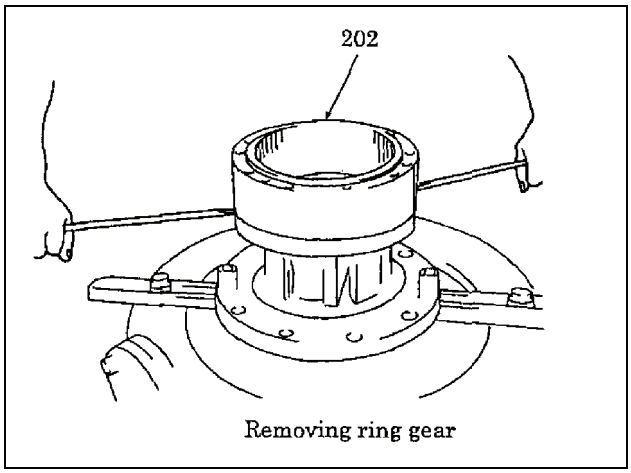
CH33-123-04 Figure 267

9. Remove the No. 2 carrier assembly. Do not disassemble further. It is recommended that the No. 2 carrier assembly be replaced as a pair.



CH33-124-01 Figure 268

10. If the No. 2 carrier assembly must be repaired, do not reuse the No. 2 pin once it is removed. Push spring pin (910) in further and remove the No. 2 pin (282). Remove the No. 2 planetary gear (203) and side plate (285).



CH33-124-02 Figure 269

11. To remove the ring gear (202), thread motor mounting socket bolts (602) into the M12 screw threads. The screws will allow leverage to remove the ring gear.

(3) Revolution does not rise to set value.

Trouble	Cause	Remedy
Revolution does not rise to set value	1. Oil inflow is deficient.	1. Check pump's delivery rate and circuits to motor.
	2. Oil leaks are excessive due to high temperature.	2. Lower oil temperature.
	3. Sliding surfaces are worn or broken.	3. Replace.
	4. Movement of bypass valve is faulty.	4. Replace.

(4) Brake torque is insufficient.

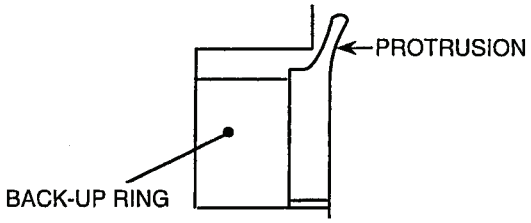
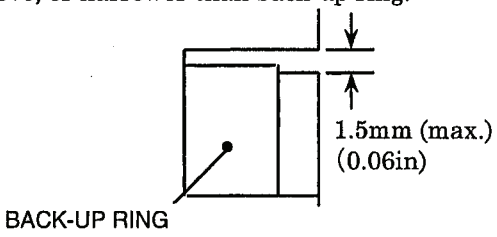
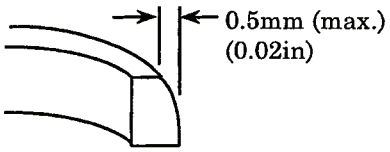
Trouble	Cause	Remedy
Brake torque is insufficient.	1. Friction plate is worn.	1. Disassemble and check. Replace if wear is beyond standard value.
	2. Brake piston is stuck.	2. Disassemble and check.
	3. Brake release pressure is not released.	3. Check and correct circuit.
	4. Spline of friction plate is broken.	4. Disassemble and check. Replace broken part.

(5) The swing motor drifts much.
Check the drain rate of the hydraulic motor.
If it is less than 200cc/min(12cu·in/min), you should think that the motor is not faulty.

Trouble	Cause	Remedy
The swing motor drifts much when it is actuated by external torques. (e.g. Machine is on a slope.)	1. Relief valve malfunctions. Same as (1).	1. Same as (1).
	2. Plunger seat is faulty.	2. Replace.
	3. Seat of the swing shockless valve is no good.	3. Replace the anti-reaction valve cartridge or block.
	4. Bypass valve seat and movement of valve are faulty.	4. Replace.

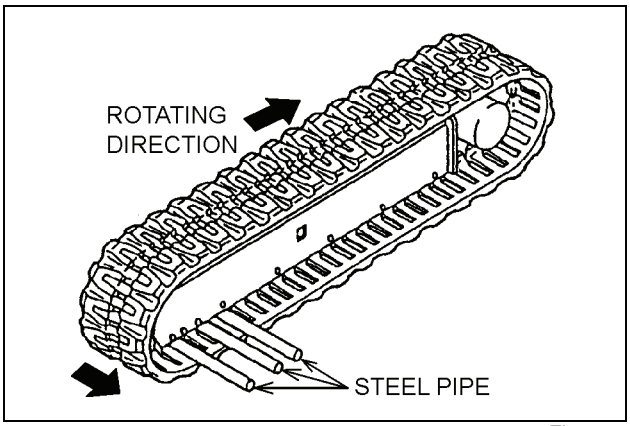
CH33-133-01

Figure 293

Parts		Maintenance Standards	Remedy
Slipper ring		1) Protruded excessively from seal groove.  	Replace (With back-up ring)
		2) Slipper ring 1.5mm (0.06in) narrower than seal groove, or narrower than back-up ring.  	Replace (With back-up ring)
		3) Worn unevenly more than 0.5mm (0.02in)  	Replace (With back-up ring)

CH33-145-01

Figure 311



SPW34000004E01 Figure 4

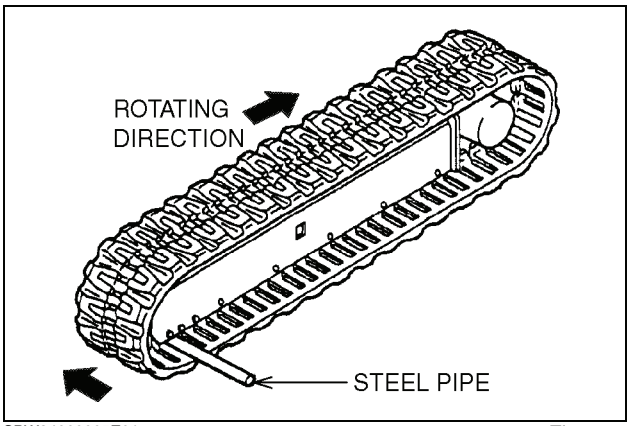
REMOVING RUBBER TRACK

3. Put steel pipes in the rubber track, turn the sprocket in the reverse direction slowly and when the rubber track is off of the idler stop the rotation.
4. Slide the rubber track sideways, and remove it.
5. Weight of rubber track: 790 Kg (1740 pounds)

34.1.2.1.2 INSTALLING RUBBER TRACK

NOTE: *Installation is performed in reverse order of removal.*

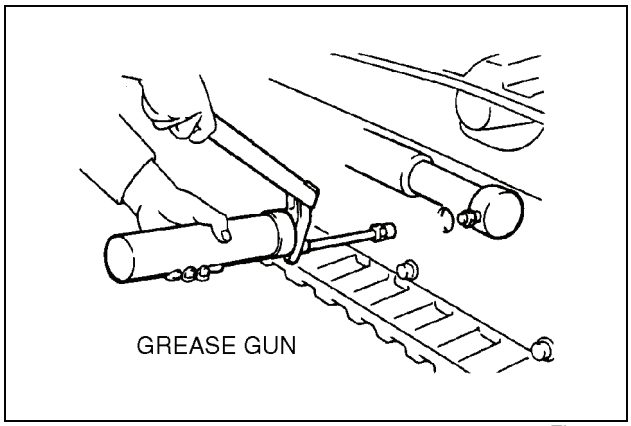
1. Engage the rubber track with the sprocket and mount it on the idler.



SPW34000005E01 Figure 5

INSTALLING RUBBER TRACK

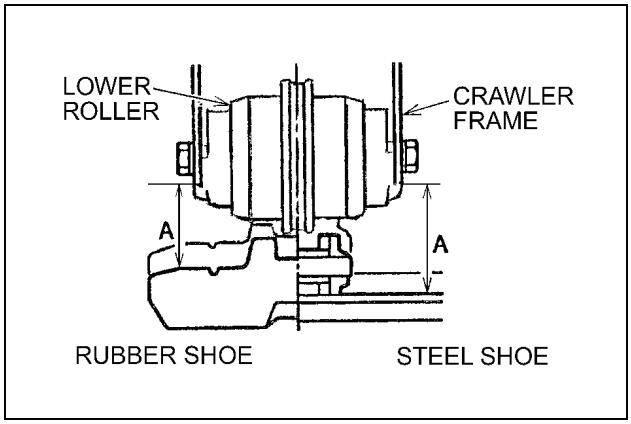
2. Put steel pipes in the rubber track, turn the sprocket in the reverse direction slowly and when the rubber track is positioned with the idler, stop rotating.
3. Slide the rubber track onto the idler.
4. Confirm that the rubber track is engaged securely with the sprocket, idler and lower roller.



SPW34000006E01 Figure 6

FEEDING GREASE

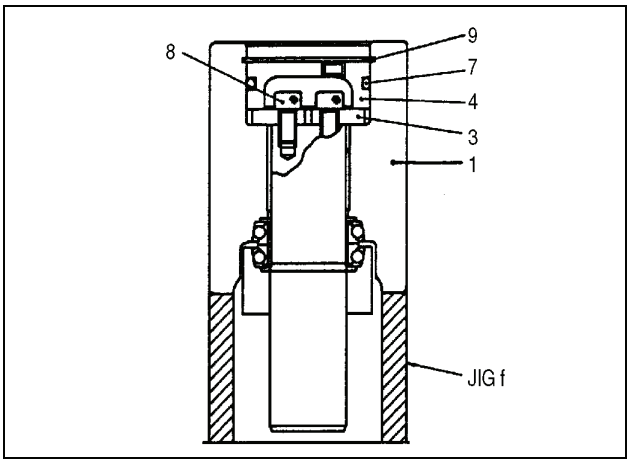
5. Tighten the grease fitting for the track adjuster.
   Tightening Torque: 6 kgfm (43 pound-foot)
6. Adjust the track tension according to specifications.



SPW34000007E01 Figure 7

TRACK TENSION

Rubber track Appropriate tension:
165 to 170 mm (6.5 to 6.7 inch)



SPH34000028E01 Figure 38

INSTALLING COVER

Figure 39

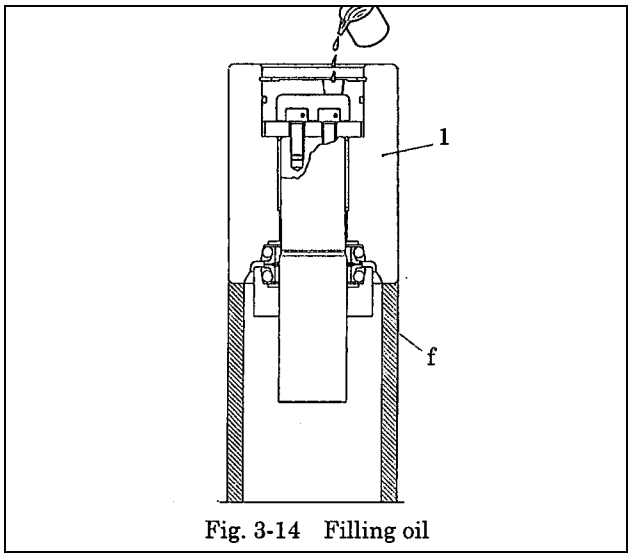
5. Place upper roller (1) on the stand jig (f) and attach plate (4) to the end face of the shaft with socket bolts (9). Coat the threaded part of socket bolts (8) with Loctite #242.

   Tightening torque:

   6.7 kgfm (48 pound-foot)

   11.7 kgfm (85 pound-foot)

6. Coat O-ring with grease and install O-ring (8) in the groove of cover (5).
7. Press cover (5) into upper roller (1).
8. Install snap ring (10) into upper roller (1) using snap ring pliers.



SPH34000029E01 Figure 40

FIG. 34-33 FILLING WITH OIL

9. Fill with API grade CD #30 engine oil through the plug in the cover (4).
   STD, LC, DZ: 20cc (1.2 cubic inches)
   L: 50 cc (3.05 cubic inches)
10. To installing plug (11), wrap sealing tape around plug (10) and tighten.

    Tightening torque: 23 Nm (17 lb ft)

NOTE: *After assembling the upper roller, confirm that oil is not leaking from it and that it rotates smoothly by hand.*

34.2.3 IDLER ASSEMBLY CONSTRUCTION

No.	NAME	Q'TY	REMARKS
1	IDLER	1	YX52D00004P1
2	SHAFT	1	
3	BUSHING	2	
4	COLLAR	2	LP52D01009P1
5	PIN	2	
6	FLOATING SEAL	2S	
7	O RING	2	1A G55
8	PLUG	2	PT1/8

IDLER ASSY	YN52D00009F1	L

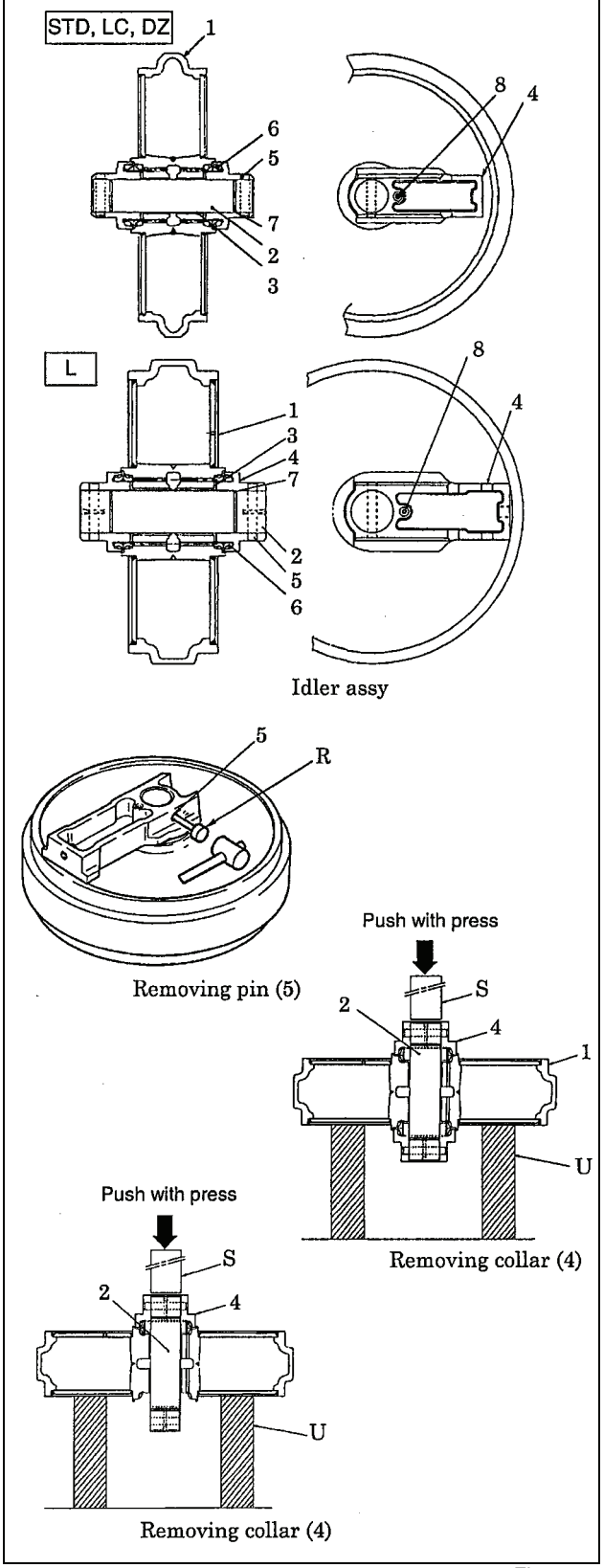
No.	NAME	Q'TY	REMARKS
1	IDLER	1	YN52D01006P1
2	SHAFT	1	
3	BUSHING	2	
4	COLLAR	2	YN52D01011P1
5	PIN	2	
6	FLOATING SEAL	2S	
7	O RING	2	1A G70
8	PLUG	2	PT1/8

CH34-25-01

Figure 66

34.2.3.0.1 REMOVAL

1. Remove plug (8) on the side of collar (4) to drain oil.
2. Apply pin push bar (Jig R) to the top of pin, and take out striking bar (Jig R) lightly tapping with a hammer.
3. Put idler (1) on repair stand (u), apply push out jig (S) on shaft (2), push out shaft (2) with collar (4), then remove collar (4).
4. If removal of collar (4) on the opposite side is required, turn over front idler and proceed with the procedure described in Item 3.



CH34-25-02

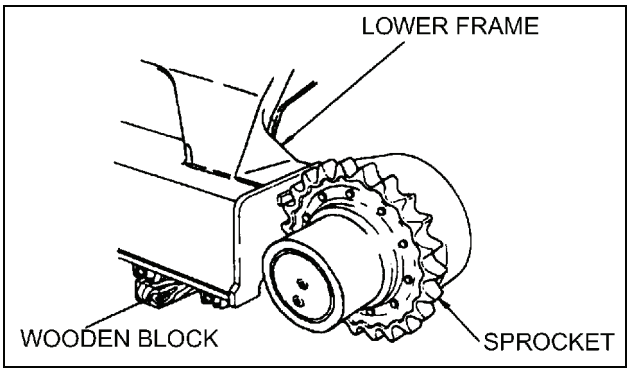
Figure 67

34.2.5 SPROCKET

34.2.5.1 REMOVAL AND INSTALLATION PROCEDURES

34.2.5.1.1 REMOVING

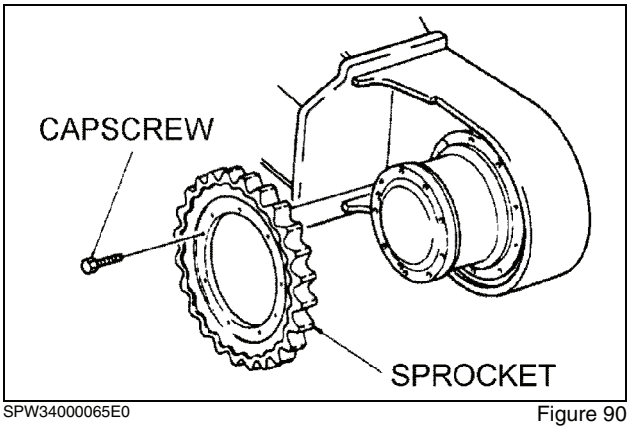
1. Remove the track assembly.



SPW34000064E01 Figure 89

PREPARATION FOR REMOVAL

2. Place wooden block under the lower frame so the sprocket is off the ground.



SPW34000065E0 Figure 90

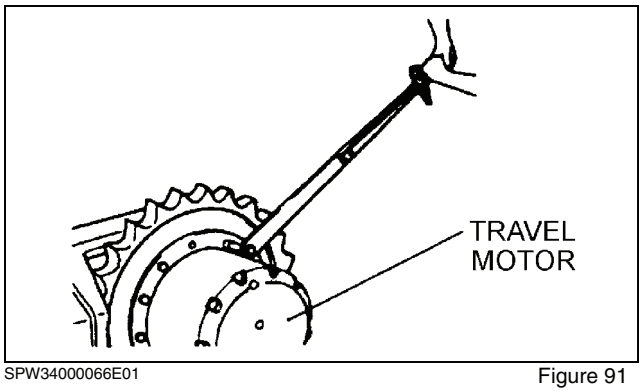
REMOVING SPROCKET

3. Loosen cap screw (M16) for the mounting of the sprocket with an Allen wrench. Remove the sprocket.

   Single weight of sprocket: L - 65 kg (143 pounds)

   STD, LC, DZ: 65 kg (143 pounds)

34.2.5.1.2 INSTALLING



SPW34000066E01 Figure 91

TIGHTENING CAP SCREW

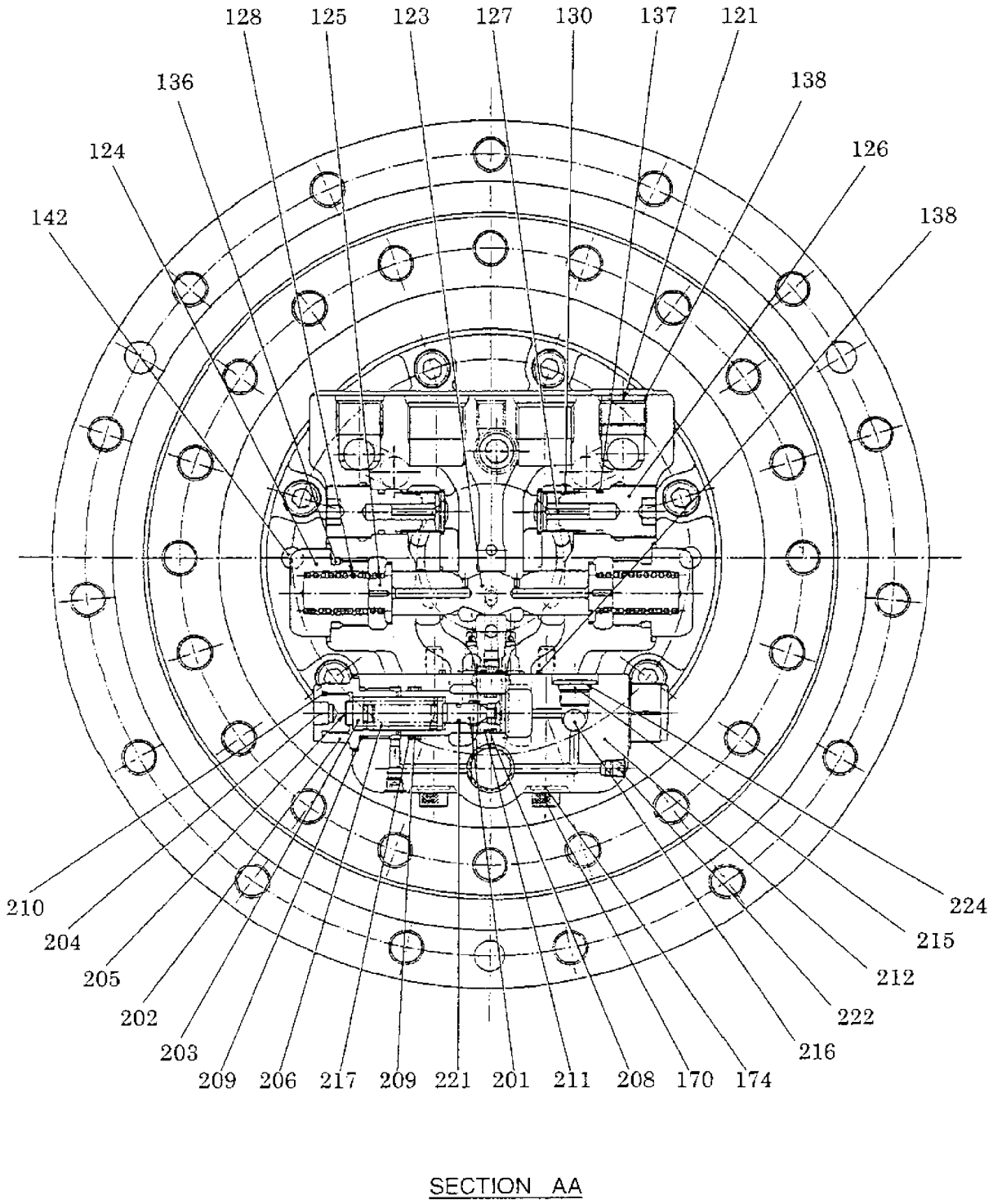
1. Check the mounting surfaces of the travel motor and the sprocket, eliminate burrs and dirt, and reinstall the sprocket.
2. Apply Loctite #262 to the cap screws, install and hand tighten.
3. Remove the wooden block under the lower frame, lower the frame until the sprocket engages the track. Tighten cap screws.

   Tightening Torque: 28.5 kgfm (210 pound-foot)

4. Install track.

34.2.8 REMOVAL AND INSTALLATION OF TRAVEL MOTOR UNIT

34.2.8.1 CONSTRUCTION CROSS SECTION VIEW AA



SECTION AA

CH34-47-01

Figure 111

34.2.15.1 DISASSEMBLY PROCEDURE

1. Cleaning travel motor
2. Place travel motor
3. Drain lubricating oil
4. Remove cover
5. Remove input gear and spur gear
6. Remove rear flange
7. Remove parts installing rear flange
8. Disassemble brake valve section on rear flange
9. Disassemble the two-speed selector valve
10. Disassemble the inner parts of shockless relief valve
11. Disassemble parking brake section
12. Disassemble hydraulic motor section
13. Remove spring from cylinder block
14. Remove shaft
15. Remove bearing inner race
16. Remove hold flange
17. Remove retainer metal
18. Remove spindle
19. Remove bearing, RV gear assembly and pin
20. Remove bearing
21. Remove spindle
22. Disassemble hold flange
23. Rough cleaning all parts
24. Finish clean

34.2.15.1.1 WEIGHT OF COMPONENTS

(Approximate)

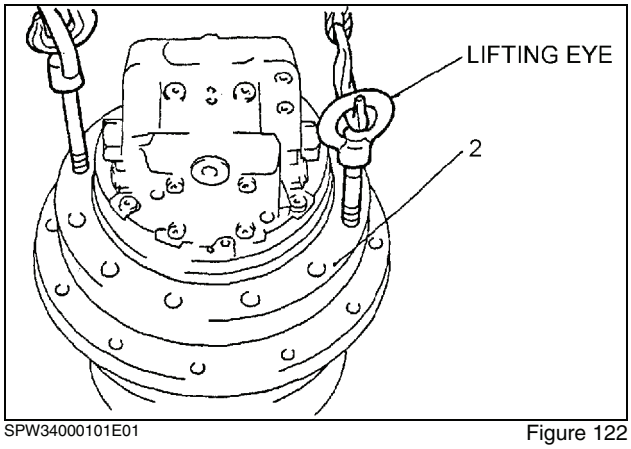
Travel motor assembly 144 kg (320 pounds)

Hub 30 kg (70 pounds)

Spindle 38 kg (85 pounds)

Rear flange assembly 13 kg (30 pounds)

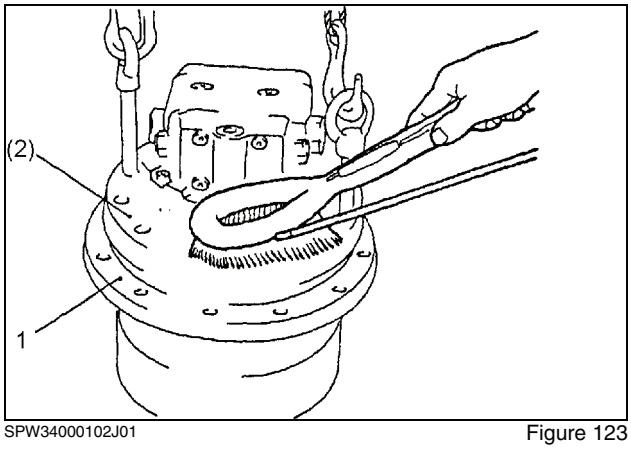
34.2.15.1.2 DISASSEMBLING



SPW34000101E01 Figure 122

MOUNTING LIFTING EYE

1. Cleaning travel motor
   A. Tighten the lifting eyes into the spindle (2).
   B. Attach suitable lifting equipment and place it into a cleaning bath.



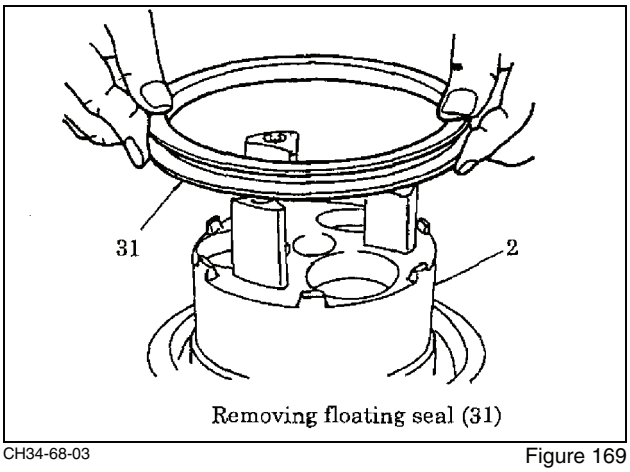
SPW34000102J01 Figure 123

CLEANING TRAVEL MOTOR

   C. Clean the travel motor with a brush.

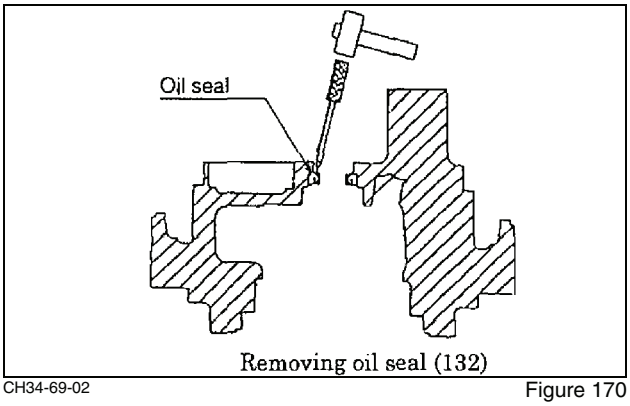
NOTE: *Since dirt and sand can accumulate in the clearance where the floating seal is located, between the hub (1) and the spindle (2), clean it with particular care.*

34.2.15.1.12 REMOVING THE SPINDLE FITTINGS



CH34-68-03 Figure 169

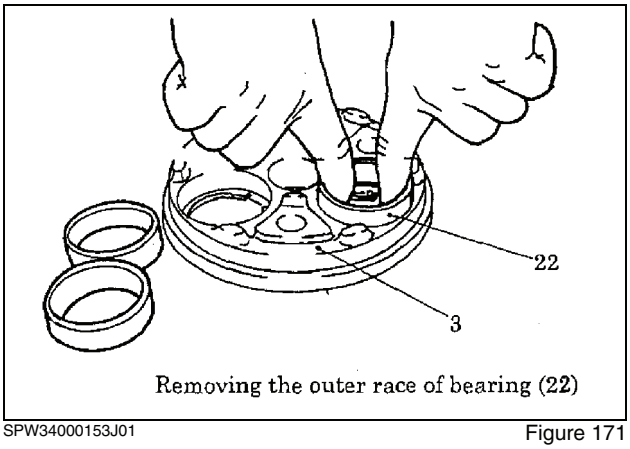
1. Remove floating seal (31) from spindle (2). Remove the outer races of bearing (22) from spindle.



CH34-69-02 Figure 170

2. Remove the oil seal (132) from spindle (2). Do not reuse the removed oil seal.

34.2.15.1.13 DISASSEMBLING THE HOLD FLANGE

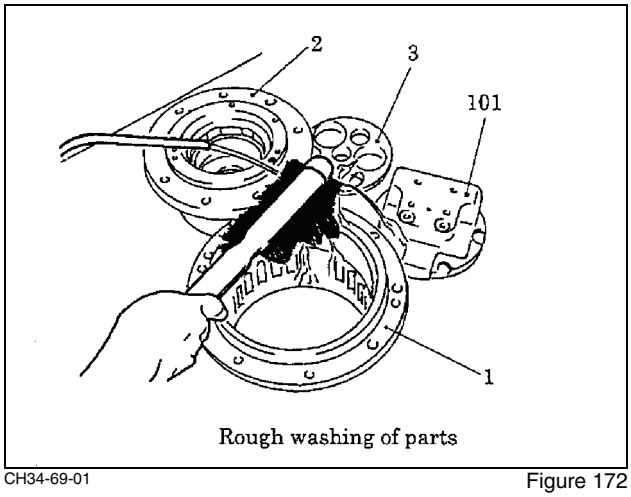


SPW34000153J01 Figure 171

3. To remove the hold flange, remove the outer race of bearing (22) from the hold flange (3).

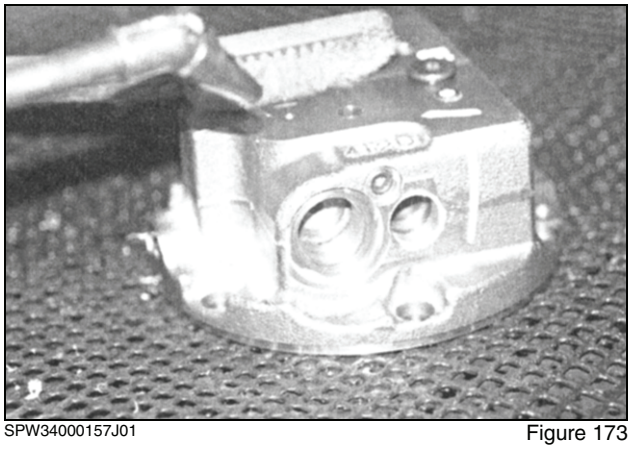
34.2.15.1.14 CLEANING PARTS

1. Rough washing of parts



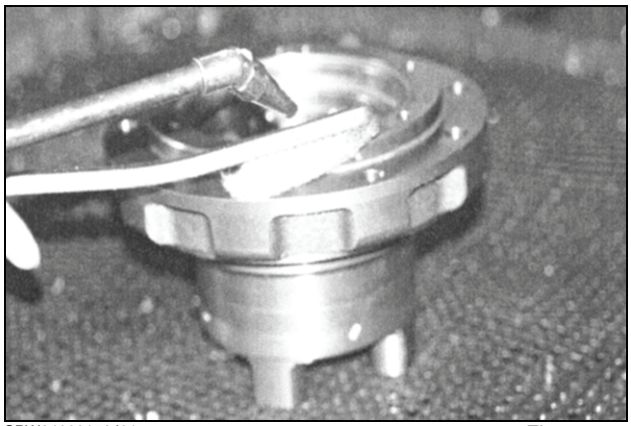
CH34-69-01 Figure 172

A. Separate the four main parts, the hub (1), spindle (2), cover (13), and rear flange (201), from the other parts.



SPW34000157J01 Figure 173

CLEANING EACH PART



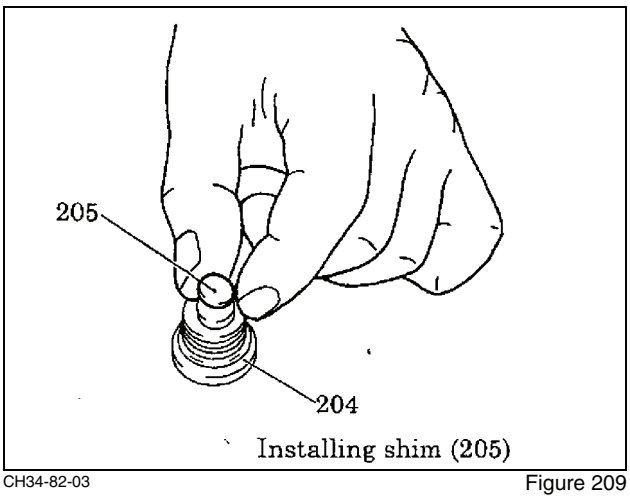
SPW34000158J01 Figure 174

CLEANING EACH SECTION

B. Put the hub, spindle, cover, and rear flange in a cleaning bath and clean them.

C. Put the remaining parts in a rough cleaning bath and clean them.

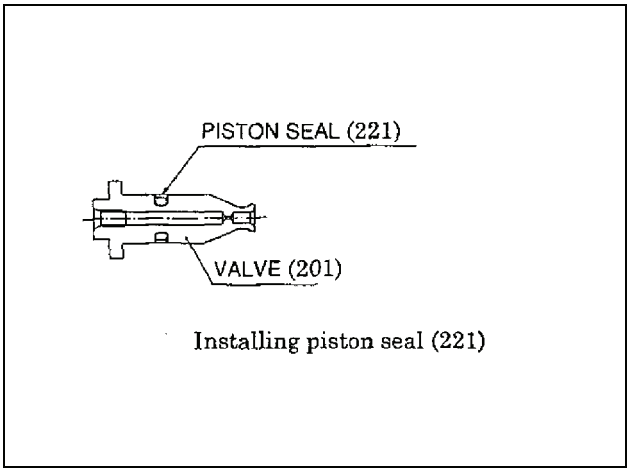
34.2.16.1.12 ASSEMBLING SHOCKLESS RELIEF VALVE



CH34-82-03 Figure 209

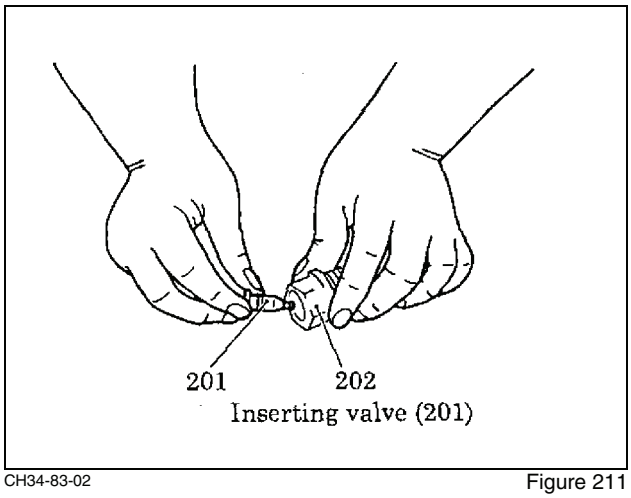
1. Coat O-ring (208), (209), (210) with grease. Attach O-ring (209) and the two backup rings (217) to body (212).
2. Fit the O-rings (210) to plug (204). It may be necessary to coat shim (205) with hydraulic oil to keep it in place. Place shim (205) on plug (204).
3. Relief pressure is set with shims, so be certain to install the removed shim in its original position.

34.2.16.1.13 INSTALLING PISTON SEAL TO VALVE



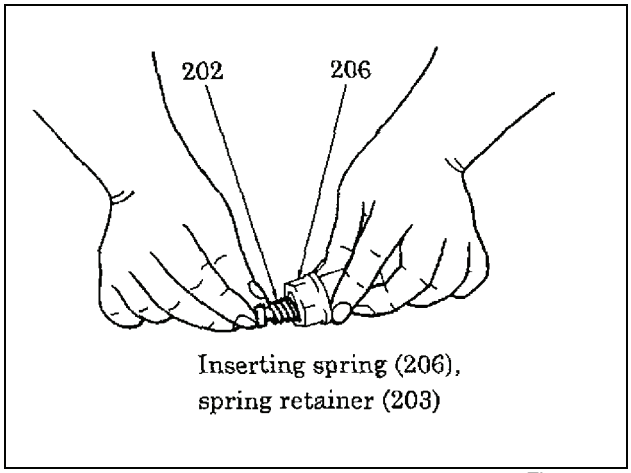
CH34-83-01 Figure 210

1. The piston seal (221) consists of an O-ring and a Teflon ring. When installing place the O-ring first, then the Teflon ring.



CH34-83-02 Figure 211

2. Apply hydraulic oil to valve (201) and insert it in sleeve (202). Align centers of sleeve hole and the valve. Inside of sleeve is precisely manufactured and is available as a kit. Make certain the components are inserted correctly.

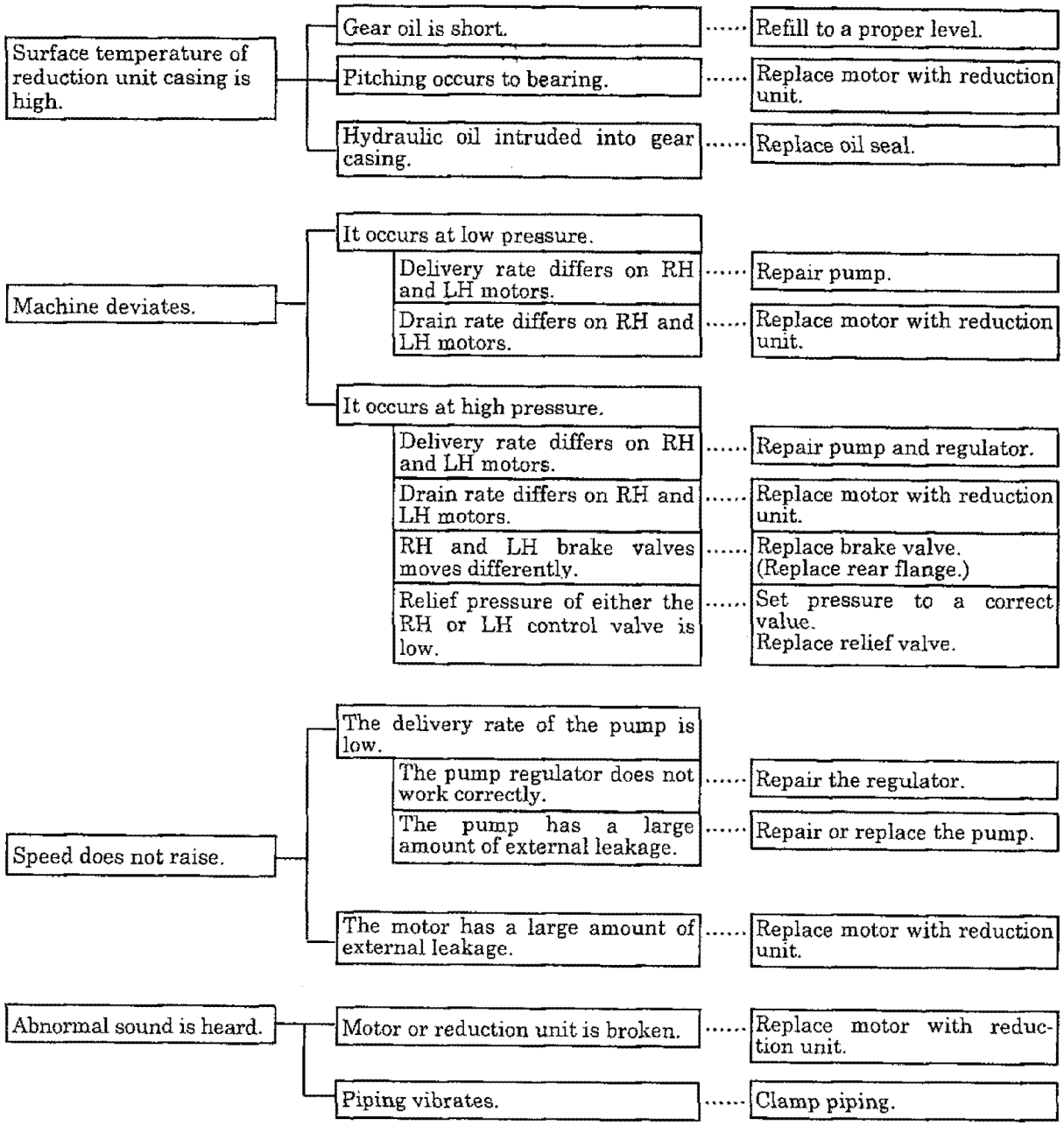


CH34-83-03 Figure 212

3. Insert valve (201), spring (206), spring retainer (203) in sleeve (202) and install plug (204) with shim (205) in place.

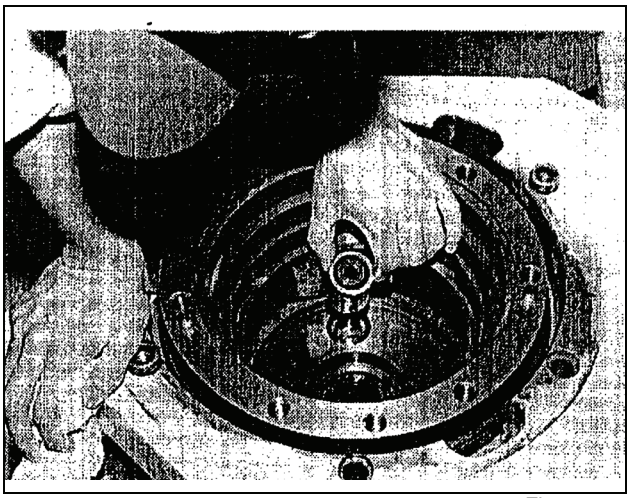
   Tightening Torque: 8 kgfm (58 pound-foot)

4. Repeat procedure with other sleeves.

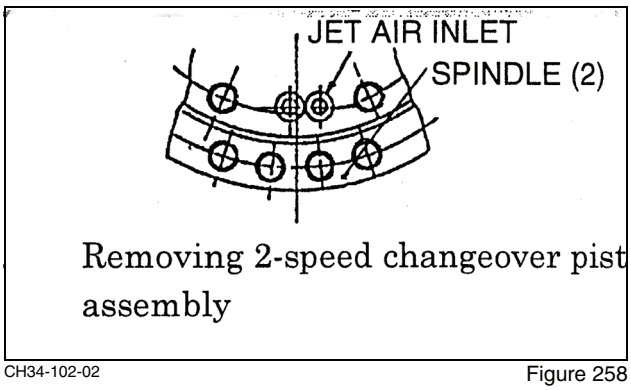


CH34-91-01

Figure 234



CH34-106-02 Figure 257

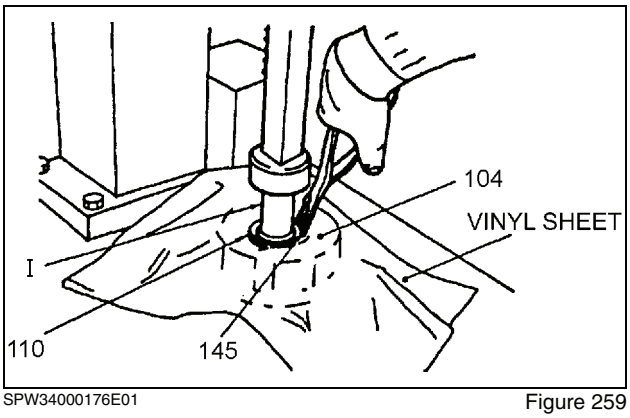


CH34-102-02 Figure 258

10. Remove the two-speed change over piston assembly from the spindle by blowing compressed air through the passage hole of spindle (2). The change over piston assembly will consist of piston (161), shoe (162), and spring (191).

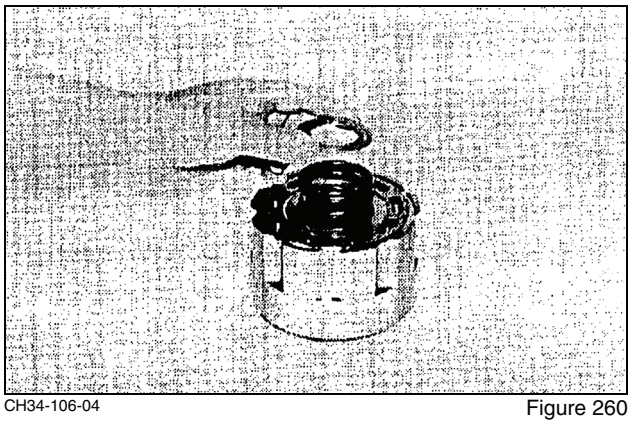
NOTE: *Piston (161) is integrated with shoe (162) when manufactured. When replacing either of these components, replace as an assembly.*

34.2.23.2.8 DISASSEMBLING CYLINDER BLOCK



SPW34000176E01 Figure 259

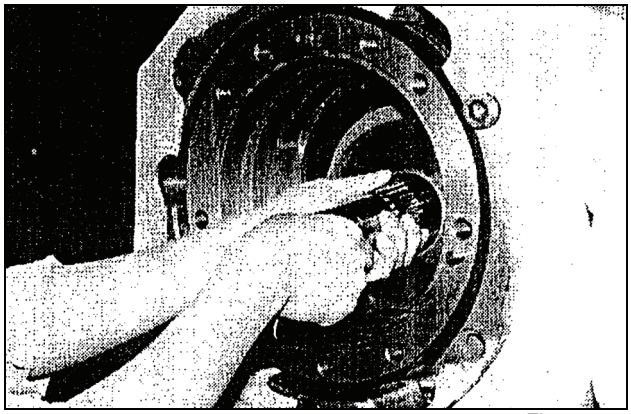
1. Before disassembling cylinder block, place a vinyl sheet over the sliding surface of the cylinder block, as snap ring can eject suddenly.



CH34-106-04 Figure 260

2. Place cylinder block (104) on a bench press, remove snap ring (145) using snap ring pliers while pressing hold down Jig against washer (110).
3. Remove washer (110), spring (114) and washer (110) in sequence from inside cylinder block. Remove spring (114) only when it is a necessary replacement.

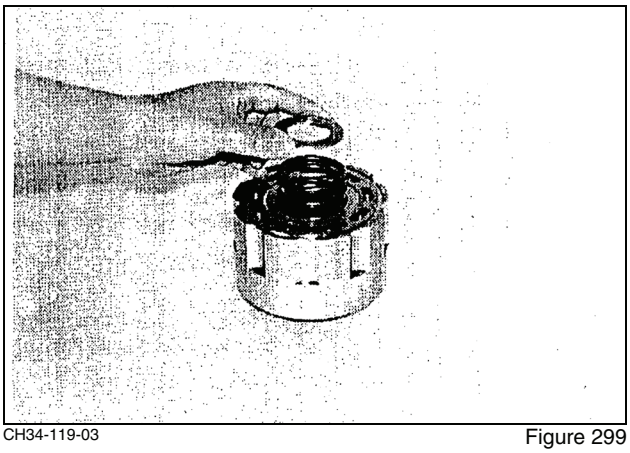
34.2.23.2.9 REMOVING DRIVE SHAFT



CH34-107-01 Figure 261

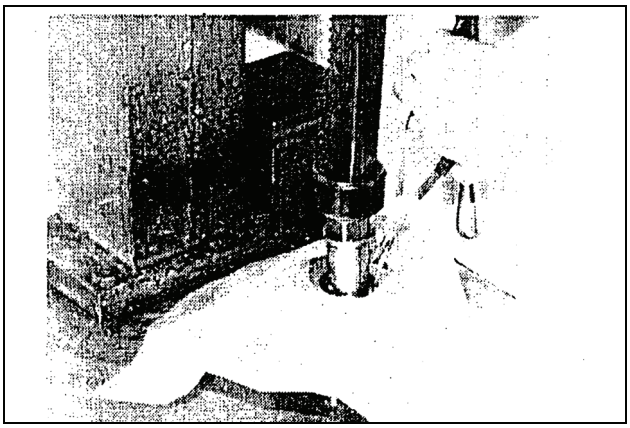
1. Remove shaft (102) from spindle (2). The roller bearing (149) will come out with shaft, but the oil seal (132) cannot be removed.

34.2.24.2.6 ASSEMBLING CYLINDER BLOCK PARTS



CH34-119-03 Figure 299

1. Place washer (110), spring (114) and washer (110) into cylinder block (104) and fit snap ring (145) in place.

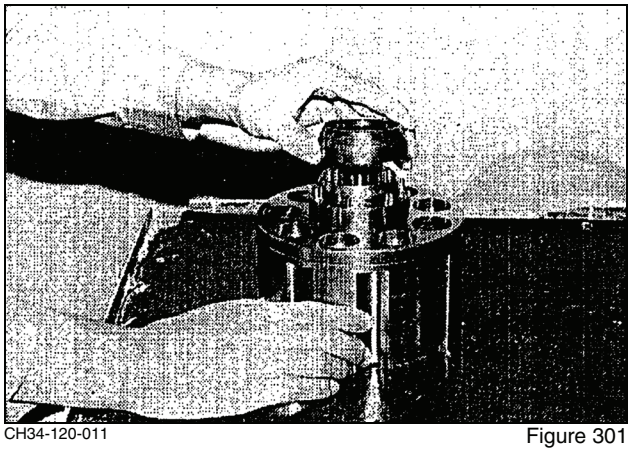


CH34-119-04 Figure 300

FITTING SNAP RING

2. Place the cylinder block on a bench press and place the hold down Jig (I) against washer (110). Hold down spring (114) and place snap ring with snap ring pliers. Cover the sliding surface of cylinder block with a vinyl sheet to protect against snap ring ejecting. The pressing force of spring is more than 100 kg (200 pounds force)

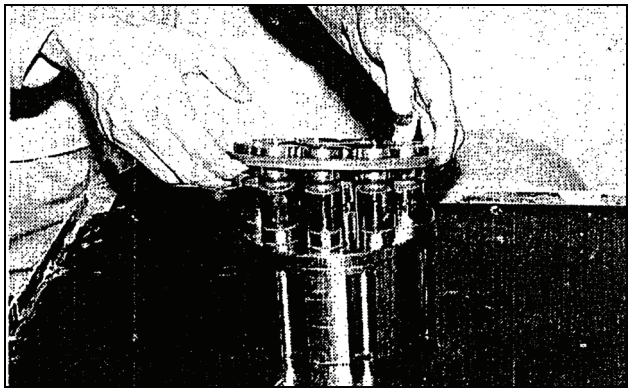
34.2.24.2.7 INSTALLING MOTOR ASSEMBLY



CH34-120-011 Figure 301

ATTACHING ROLLER AND THRUST BALL

1. Put six rollers (151) into the holes of the cylinder block (104).
2. Place the thrust ball (108) on the cylinder block (104).



CH34-120-021 Figure 302

ASSEMBLING PISTON ASSEMBLY INTO RETAINER PLATE

3. Install seven piston assemblies to the retainer plate (107).
4. After assembling, immerse the whole unit in hydraulic oil.
5. Install the swash plate (103), thrust plate (153), thrust ball (108), retainer plate (107), roller (151), cylinder block (104) and piston assembly (105) (106) to shaft (102),

34.2.25.2 SERVICE STANDARD FOR PARTS

When disassembling and inspecting the motor, follow the standards below. Handle parts carefully, particularly moving and sliding parts. Replace any part that shows damage in appearance.

Replace such parts that show damage or wear according to the chart.

Replace all seals and O-rings when reinstalling.

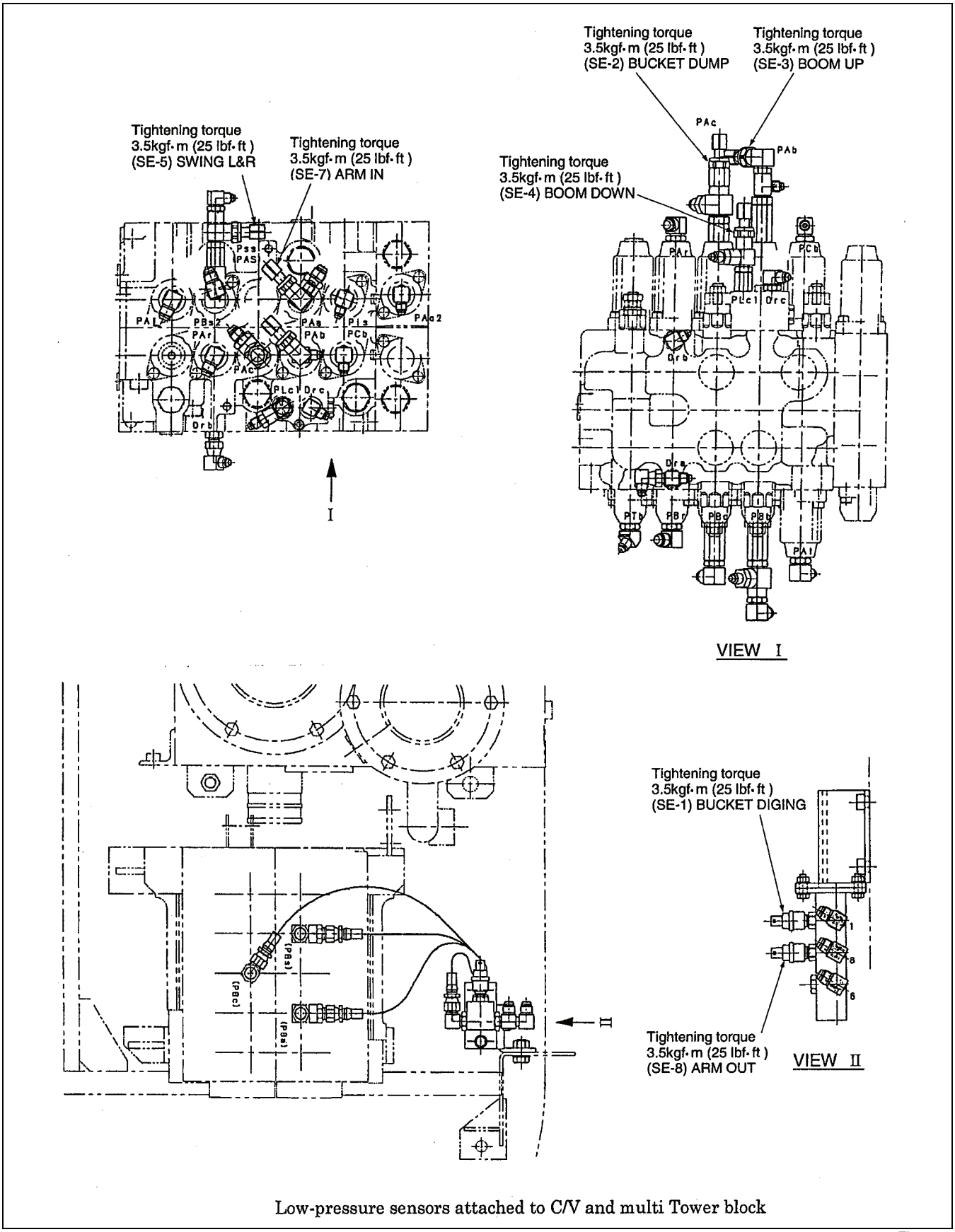
Part No.	Nomenclature	Symptom	Reference value (Standard dimension)	Allowable value (Criterion)
(2) (8) (17)	Spindle kit • Spindle assy •• Spindle •• Coupling gear • Pin	• Critical damage to appearance. • Abnormal wear such as score is present.		
(3) (6) (9) (14) (25) (34)	Carrier assy Carrier Cluster gear Shaft Thrust collar Needle roller bearing Parallel pin	• The cluster gear (6) tooth surface is worn unevenly or scratched. • The cluster gear do not move smoothly when the cluster gear (6) is turned.		
(1) (4) (27)	Hub kit Hub Ring gear (A) Parallel & Pin	• Tooth surface is worn unevenly or scored.		
5	Ring gear (B)	• Tooth surface is worn unevenly or scored.		
7	Sun gear	• Tooth surface is worn unevenly or scored. • Spline is worn.		
19	Coupling	• Spline is worn.		
20	Thrust bearing	• Thrust bearing is worn.	Clearance between coupling gear and cover (13) 0.3 to 0.6(0.012~0.024″)	Clearance 0.8 (0.031″)
12	Distance piece	• Sliding surface is scored. • Sliding surface is abnormally worn.		
24	Ball bearing	• Pressed mark is present. • Flaking is seen. • Uneven wear is present.		
(101) (123) (154) (192) (193) (198) (199)	Rear flange kit Rear flange Spool Expander Plug O ring Hex. socket plug Name plate	• Part in contact with spool (123) is scratched. • Clearance with spool (123) is large. • Surface in contact with valve (127) is scratched. • Depth to the contact surface with valve (127) is large.	Clearance on diameter 10~20 μ	Clearance on diameter 25 μ
102	Shaft	• Contact surface with oil seal (132) is worn. • Spline is worn.		
103	Swash plate	• Seizure is present.		

CH34-130-01

Figure 337

NOTES

41.1.3.2 ATTACHING POSITION OF LOW PRESSURE SENSOR

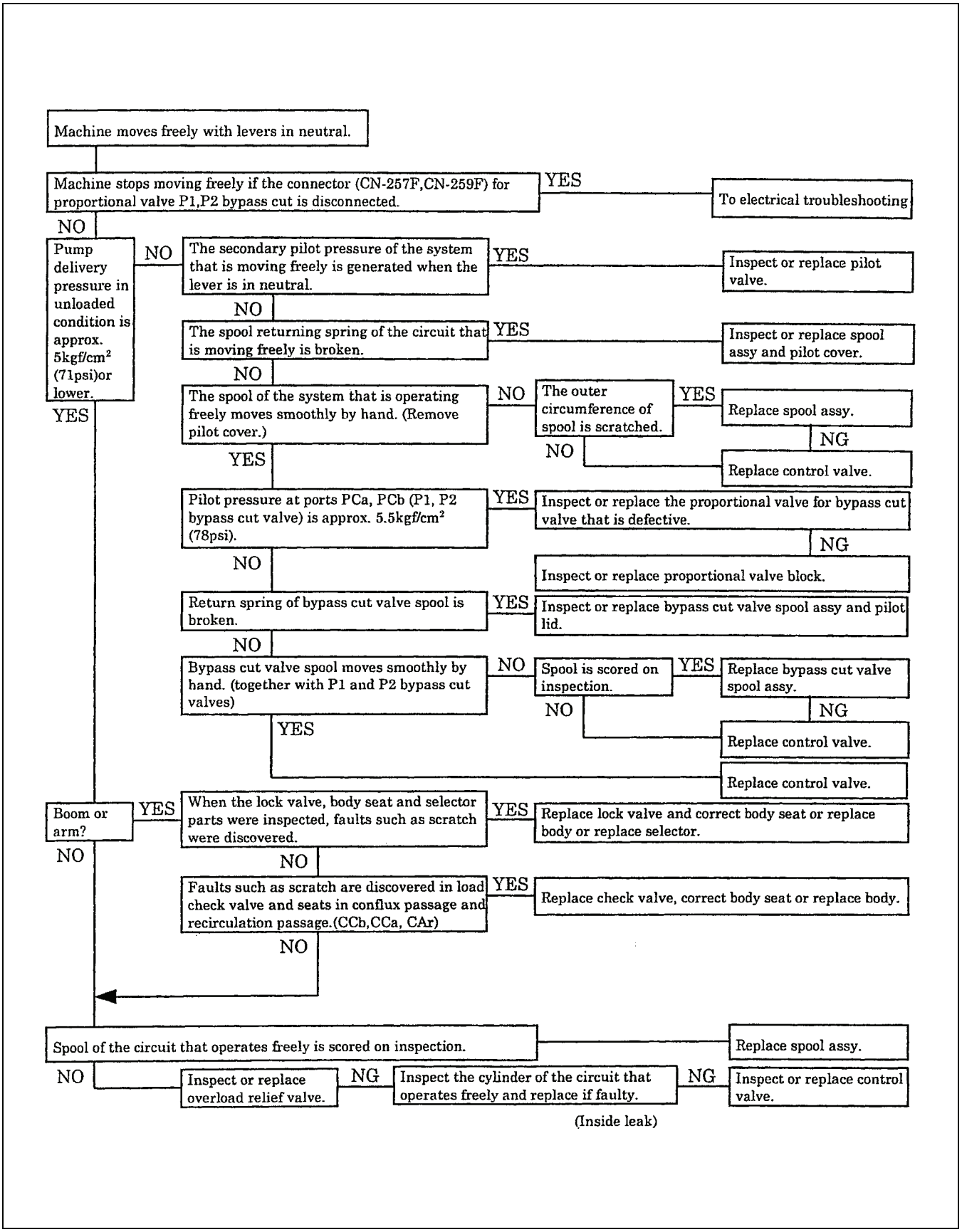


Low-pressure sensors attached to C/V and multi Tower block

CH41-08-01

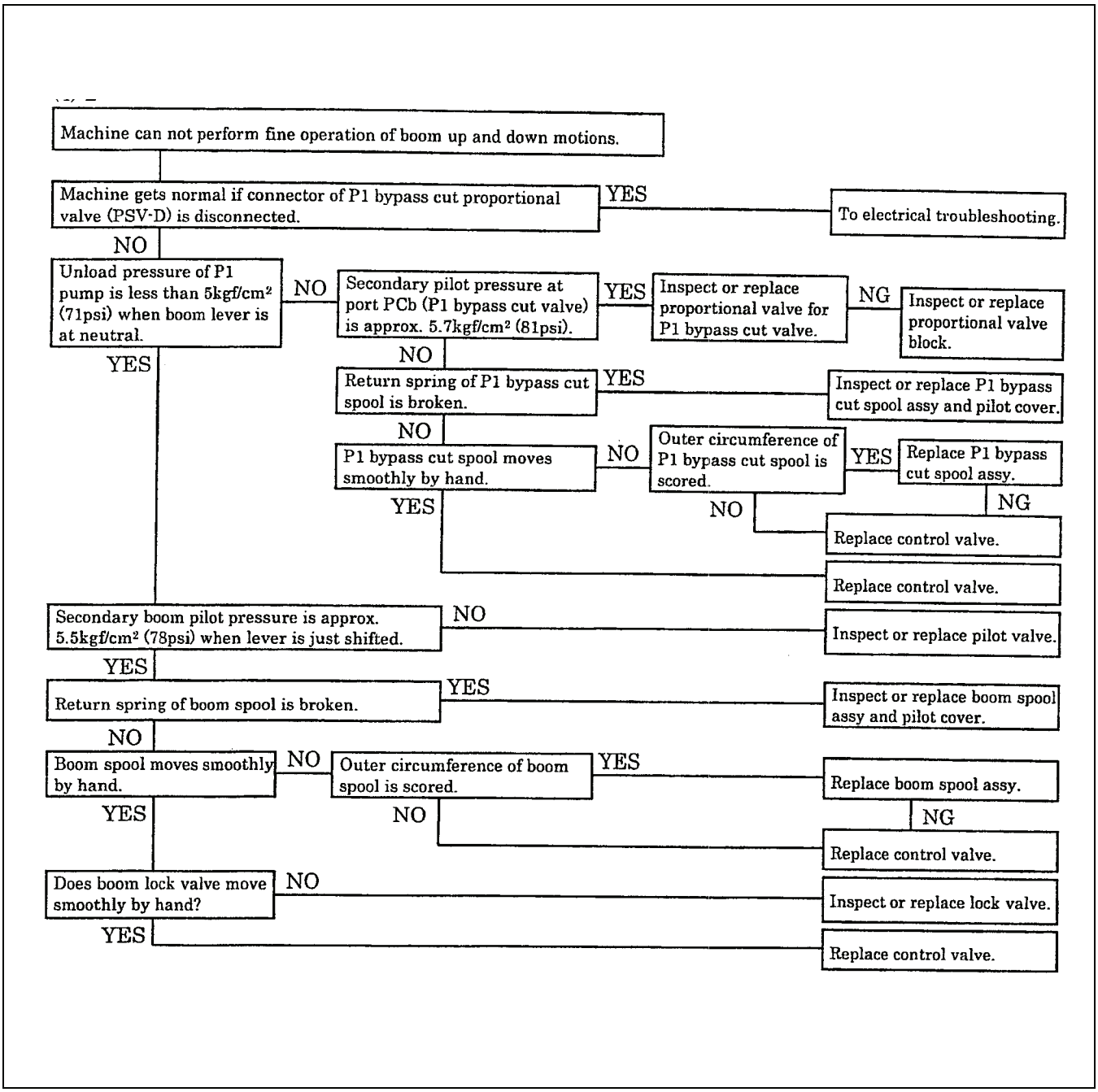
Figure 2

42.1.2 MACHINE MOVEMENT



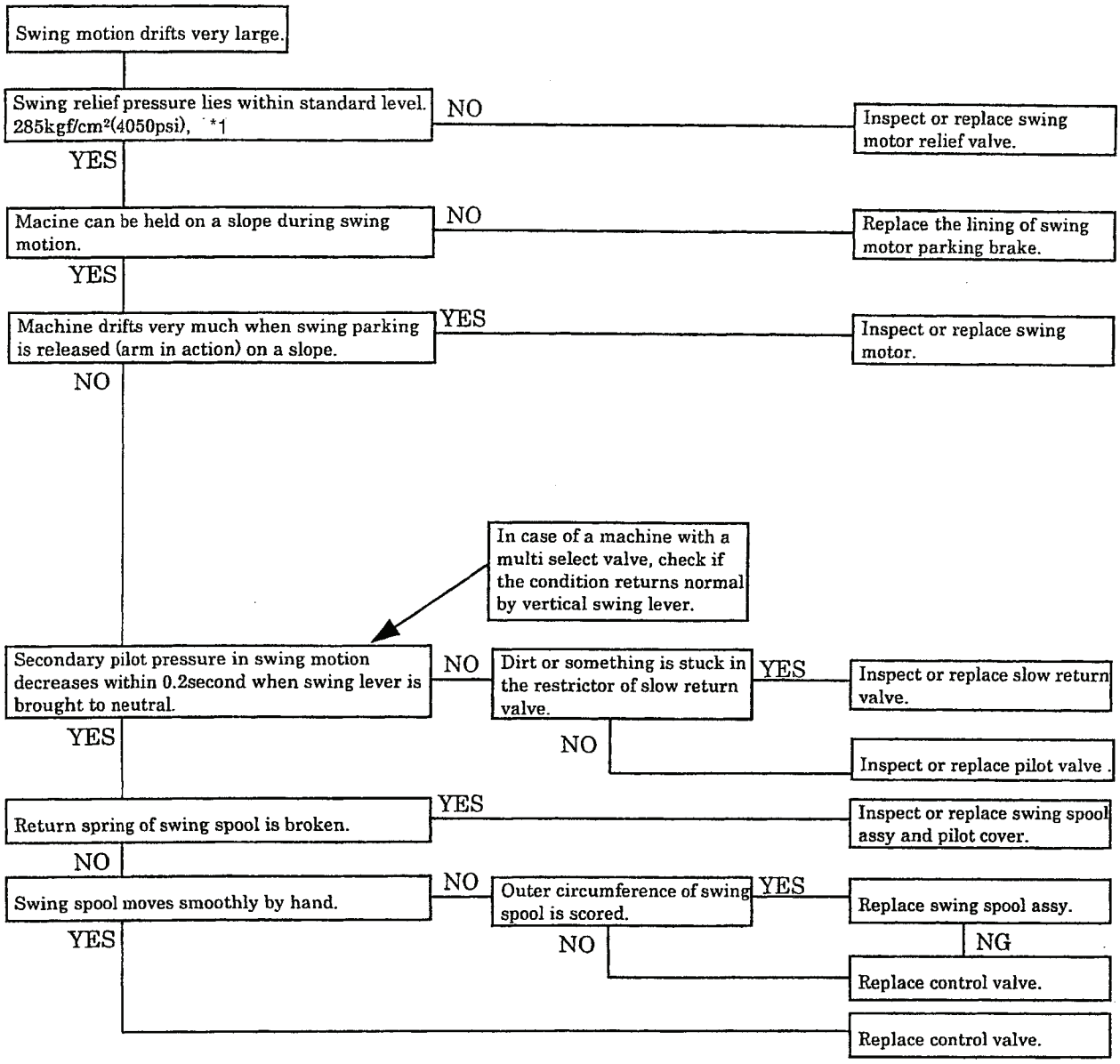
CH42-06-01

Figure 2



CH42-16-01

Figure 12



*1 marked shows E130 SR (LC) (-1E)

CH42-26-01

Figure 22

2. SELF DIAGNOSIS TABLE

The self diagnosis detects errors in the control I/O's of the pressure sensors and the proportional valves while the machine is in operation and shows them on the multi display of the gauge cluster.

DISPLAY ITEM

No	Contents	Display of monitor
1	Mechatro controller fail	CPU MECHATRO CONT. FAIL
2	ROM data	CPU ROM DATA FAILURE
3	Mechatro set error	CPU MECHATRO SET ERROR
4	Boom up pressure sensor fail	BOOM RAISE SENSOR
5	Boom down pressure sensor fail	BOOM LOWER SENSOR
6	Arm in pressure sensor fail	ARM IN SENSOR
7	Arm out pressure sensor fail	ARM OUT SENSOR
8	Bucket digging pressure sensor fail	BUCKET DIG SENSOR
9	Bucket dump pressure sensor fail	BUCKETDUMP SENSOR
10	Swing right pressure sensor fail	SWING(R) SENSOR
12	Travel right pressure sensor fail	TRAVEL(R) SENSOR
13	Travel left pressure sensor fail	TRAVEL(L) SENSOR
14	Pump P1 pressure sensor fail	PUMP P1 SENSOR
15	Pump P2 pressure sensor fail	PUMP P2 SENSOR

No	Contents	Display of monitor
16	P1 by-pass cut propo-valve fail	PSV P1 BY-PASS PROPO-VALV
17	P2 by-pass cut propo-valve fail	PSV P2 BY-PASS PROPO-VALV
18	Travel priority propo-valve fail	PSV TRAVEL PROPO-VALV
19	Arm variable recircula-tion propo-valve fail	PSV RECIRCULAT PROPO-VALV
20	Pump P1 pressure sensor fail	PSV PUMP P1 SENSOR
21	Pump P2 pressure sensor fail	PSV PUMP P2 SENSOR
22	Travel two-speed solenoid valve fail	SV TWO-SPEED SOLENOID
23	Swing parking solenoid valve fail	SV SWINGBRAKE SOLENOID
24	Governor motor current fail	M STEP MOTOR CURRENT-NG
25	Governor motor starting point indexing fail	M STEP MOTOR S/PT. ERROR
26	Accel potentio meter fail	POT ACCELERATR POTENTIO
27	Gauge cluster→ Mechatro controller communication failure	RECEIVE ERROR
28	Battery relay fail	BAT. RELAY
29	Draining hyd. pressure	PR DRAINING HYD. PRESS
30	Fail drain hyd. pressure	PR FAIL DRAIN HYD. PRESS

3. SERVICE DIAGNOSIS TABLE

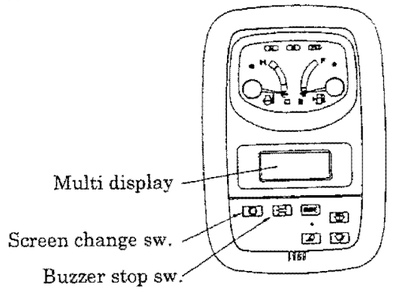
The results of service diagnosis at this time point are displayed in up to 22 items according to data from the mechatro controller.

Displaying procedure:

1) Turn "ON" the starter switch with the buzzer stop switch pressed.
2) A mechatro controller parts number and a program version are displayed as the No.1 item.
3) The display advances like No.2, No.3.... each time the screen change switch is pressed.
4) The display returns like No.40, No.39... each time the buzzer stop switch is pressed.
5) The display does not disappear unless the starter switch is turned "OFF".

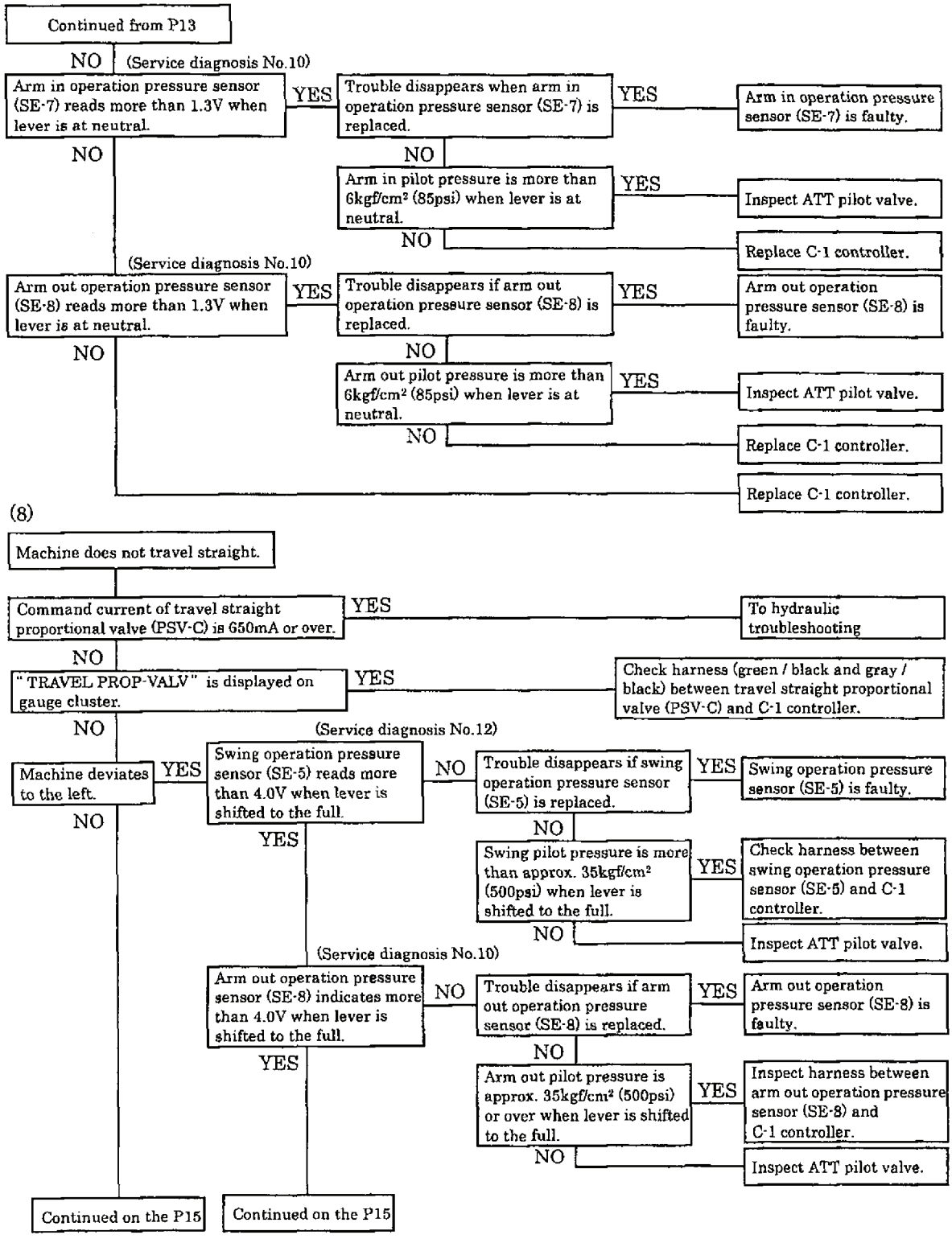
E130 SR (DZ)

No.1
MAIN CONTROLLER P/No.
YY22E00021F9
PROGRAM VERSION
VER 5.50



SERVICE DIAGNOSIS DISPLAY

No.	DISPLAY	No.	DISPLAY	No.	DISPLAY	No.	DISPLAY
1	No.1 MAIN CONT. P/No. YY22E00021F9 PROGRAM VER VER 5.50	8	No.8 RELAY I—2 BAT. RELAY COMP. OFF MEAS. OFF KEY SWITCH OFF	14	No.14 PRESS. SENSOR C—1 PUMP P1 3.4V 350k C—2 PUNP P2 3.4V 350k	24	No.24 PROPO-VALVE E—1 P1 PUMP COMP. 727mA 29k MEAS. 727mA 29k POWER SHIFT 100mA
2	No.2 E/G SET 2310 MEAS 2310 E/G PRS. LIVE KPSS SW H	9	No.9 PRESS. SENSOR B—1 BOOM UP 4.9V 30k B—2 BOOM DOWN 4.9V 30k	15	No.15 PRESS. SENSOR B—16 P1 OPT. 4.9V 30k B—17 P2 OPT. 4.9V 30k	25	No.25 PROPO-VALVE E—2 P2 PUMP COMP. 727mA 29k MEAS. 727mA 29k POWER SHIFT 100mA
3	No.3 H—1 ACCEL VOLT. 4.2V POS. 100% MOTOR STEP 440 POS. 100%	10	No.10 PRESS. SENSOR B—3 ARM OUT 4.9V 30k B—4 ARM IN 4.9V 30k	20	No.20 PROPO-VALVE D—1 P1 BYPASS COMP. 670mA 25k MEAS. 670mA 25k	39	No.39 MECHATRO ADJT. CONT. SW TEST CONT. VOL 100% PROG. SW OFF
4	No.4 GOVERNOR MOTOR G—1 COIL A 1.0A G—1 COIL B 1.0A G—2 LIMIT OFF	11	No.11 PRESS. SENSOR B—5 BUCKET DIG 4.9V 30k B—6 BUCKET DUNP 4.9V 30k	21	No.21 PROPO-VALVE D—2 P2 BYPASS COMP. 670mA 25k MEAS. 670mA 25k	40	No.40 RELEASE SW KPSS TEST SWING BRAKE OFF
5	No.5 SOL.VALVE F—2 SWING-BRAKE COMP. OFF MEAS. OFF RELEASE SW OFF	12	No.12 PRESS. SENSOR B—7 SWING (R) 4.9V 30k B—8 SWING (L) 4.9V 30k	22	No.22 PROPO-VALVE D—3 S-TRAVEL COMP. 670mA 25k MEAS. 670mA 25k		
6	No.6 SOL.VALVE F—3 1/2-TRAVEL COMP. OFF MEAS. OFF SWITCH OFF	13	No.13 PRESS. SENSOR B—9 TRAVEL (R) 4.9V 3.0k B—10 TRAVEL (L) 4.9V 3.0k	23	No.23 PROPO-VALVE D—6 A-RECIRCULAT COMP. 670mA 25k MEAS. 670mA 25k		



CH43-14-01

Figure 10

NOTES

NOTES

NOTES

51.1.2 STANDARD TIGHTENING TORQUE TABLE FOR FLANGED HEX HEAD BOLTS

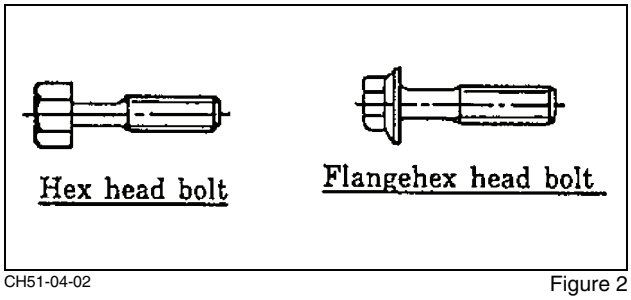
Use the tightening torques in the table below to tighten areas that do not specifically call for special tightening torques.

Some engines will have different types of bolts depending on the age and model. The newer bolts were put in use during the latter part of August 1995.

Newer bolts will have a hex head and the tightening torques have been increased by approximately 10% as compared to flange hex head bolts.

This does not apply to some special bolts such as connecting rod bolts, etc. The bolts on other parts will interchange.

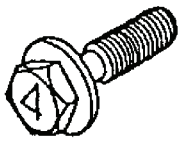
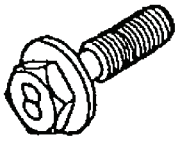
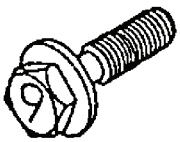
Applicable engine model: All



CH51-04-02

Figure 2

NEW HEX HEAD BOLT AND PRIOR FLANGE HEX HEAD BOLT

Strength bracket / Bolt Head Display / Nominal Screw Size (Dia. × pitch)	4.8 	8.8 	9.8 
M6×1.0	0.5~0.9 (3.6~6.5)	0.6~1.2 (4.6~8.7)	——
M8×1.25	1.1~2.0 (8.0~14)	1.6~2.9 (12~21)	2.1~3.4 (15~25)
M10×1.25	2.4~3.9 (17~28)	3.6~6.1 (26~44)	4.3~7.2 (31~52)
※ M10×1.5	2.3~3.8 (17~27)	3.5~5.8 (25~42)	4.1~6.8 (30~49)
M12×1.25	5.6~8.4 (41~61)	7.9~11.9 (57~86)	8.7~13.0 (63~94)
※ M12×1.75	5.2~7.8 (38~56)	7.2~10.9 (52~79)	8.1~12.2 (59~88)
M14×1.5	8.5~12.7 (61~92)	11.7~17.6 (85~127)	12.6~18.9 (91~137)
※ M14×2.0	7.9~11.8 (57~85)	11.1~16.6 (80~120)	11.8~17.7 (85~128)
M16×1.5	11.8~17.7 (85~128)	17.4~26.2 (126~190)	18.0~27.1 (130~196)
※ M16×2.0	11.2~16.7 (81~121)	16.6~24.9 (120~180)	17.2~25.8 (124~187)

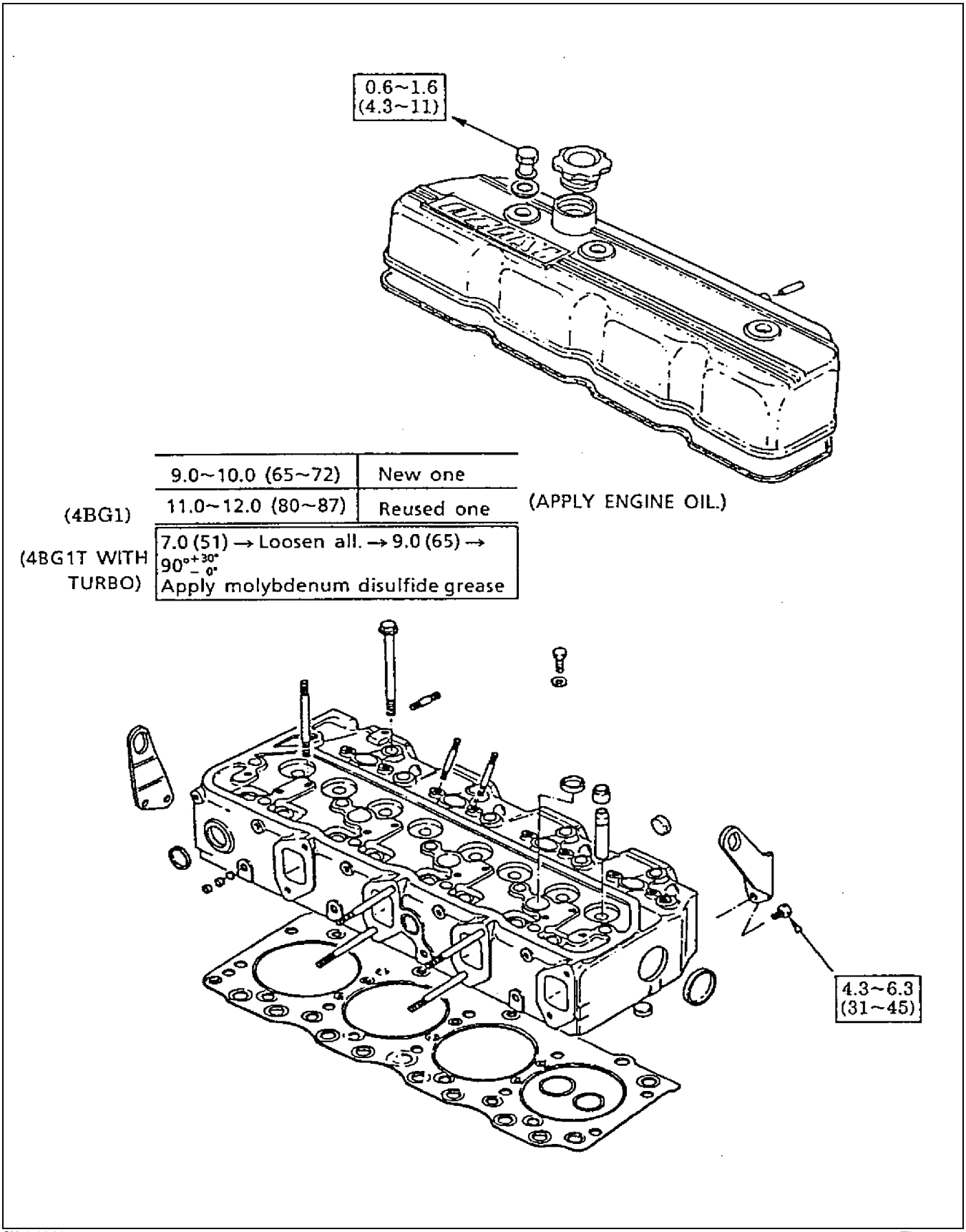
CH51-04-01B

Figure 3

* Indicates female parts (constructed of soft material such as casting)

51.1.9 TIGHTENING TORQUE FOR CYLINDER HEAD AND CYLINDER HEAD COVER

kgfm (pound-foot)



CH51-14-01

Figure 13

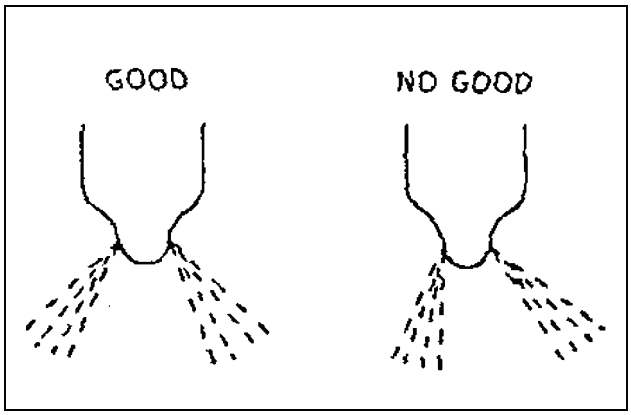
51.1.16.8 FUEL INJECTION NOZZLE

Check and adjust the atomizing condition and the injection pressure.

Injection pressure

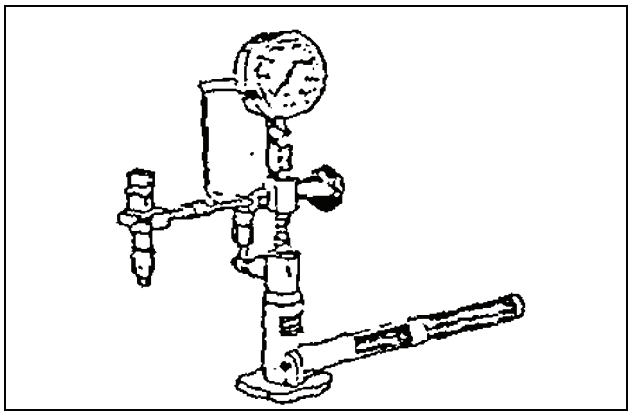
4BG1: 150 kgf/cm^2 (2130 psi)

4BG1T with turbo: 185 kgf/cm^2 (2630 psi)



CH51-25-01 Figure 32

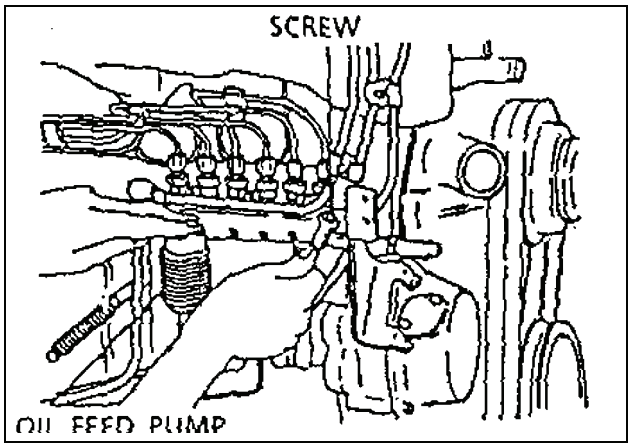
Adjust the injection pressure with the adjust screw, using the nozzle tester.



CH51-25-02 Figure 33

51.1.16.9 AIR BLEEDING

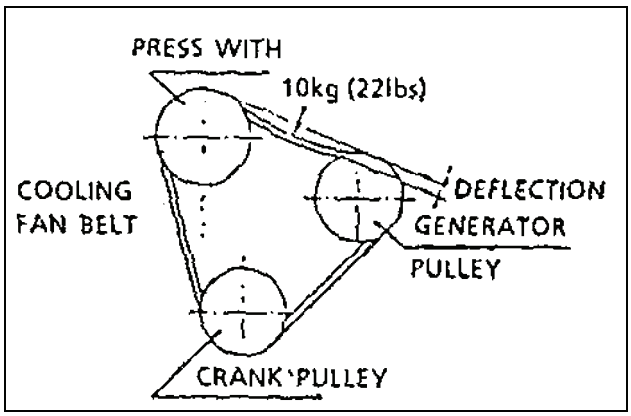
Loosen the joint bolts of the fuel filter and the breather screws of the injection pump. Run the oil feed pump and bleed air.



CH51-25-03 Figure 34

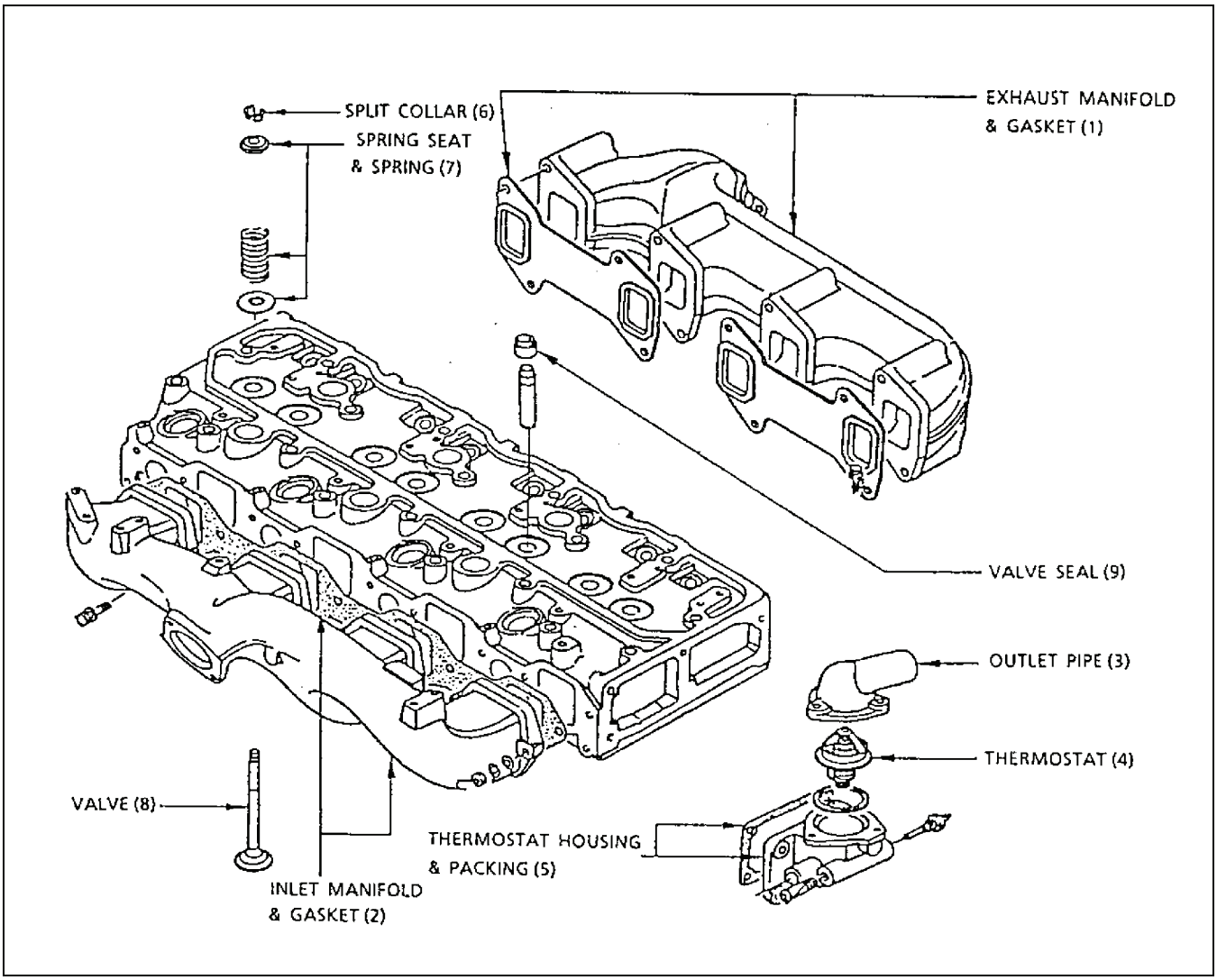
51.1.16.10 FAN BELT

Belt deflection: 10 mm (0.394 inches).



CH51-24-02 Figure 35

51.2.0.16 CYLINDER HEAD ASSEMBLY



CH51-35-01

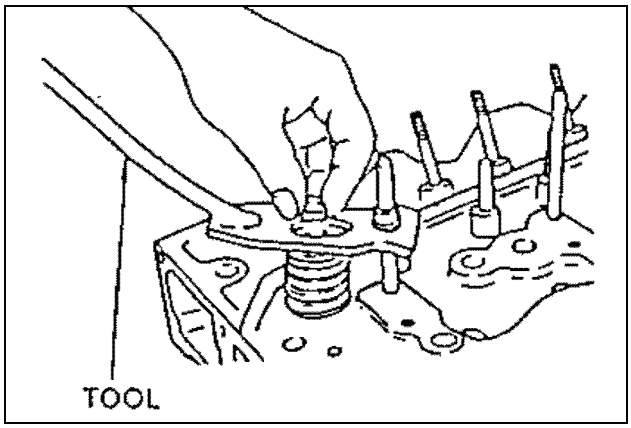
Figure 52

51.2.0.17 VALVE SPRING/VALVE GUIDE

Compress the valve spring and remove the snap ring, spring seat, valve spring, and valve.

Special Tool: Replacer (Valve Spring) 9-8523-1423-0

NOTE: *Before disassembling the valve mechanism, remove the nozzle holder, the connector, and the glow plug. Also remove the inlet manifold, the exhaust manifold (with gasket) and the thermostat housing.*



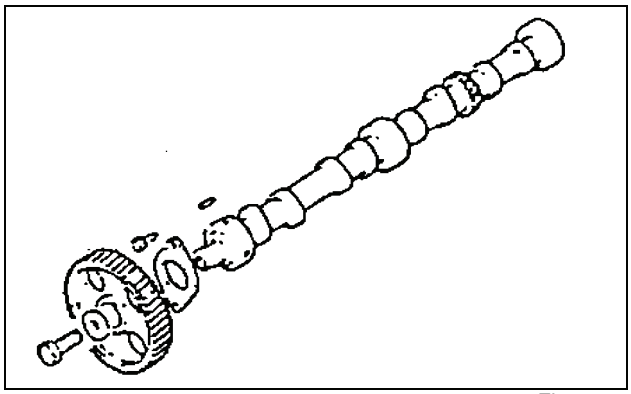
CH51-33-02

Figure 53

51.2.1.5 CAM SHAFT ASSEMBLY

51.2.1.5.1 INSPECTION

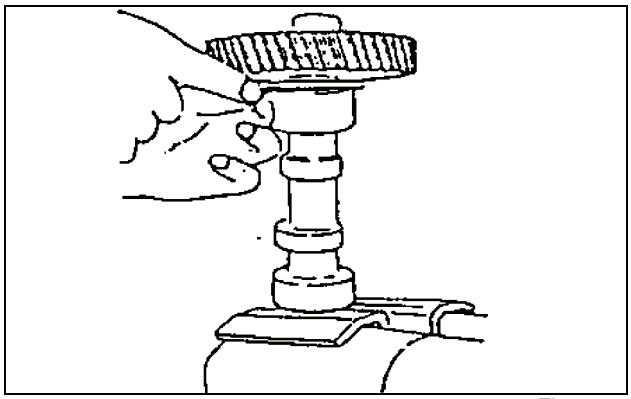
Check that the journal and the cam are free from wear, damage, or other problems.



CH51-45-01 Figure 86

51.2.1.5.2 CLEARANCE AT THE END FACE

	Standard Value	Service Limit	Remedy
Clearance	0.050 - 0.114 mm (0.0020-0.0045 inches)	0.2 mm (0.008 inches)	Replace

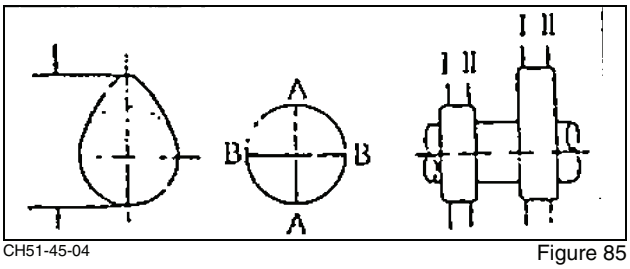


CH51-45-02 Figure 87

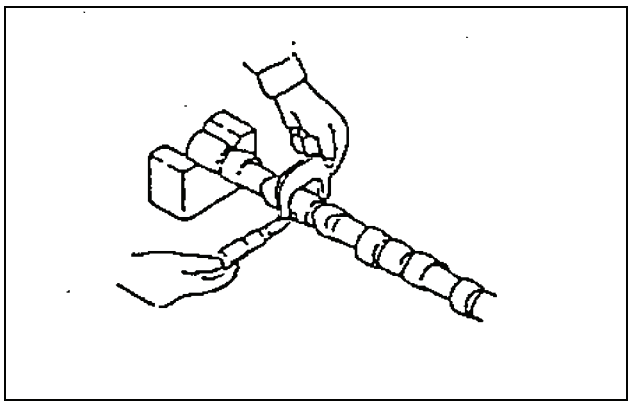
51.2.1.5.3 JOURNAL AND CAM

HEIGHT OF CAM			
	Standard Value	Service Limit	Remedy
Wear of Cam	47.7 mm (1.88 inches)	46.5 mm (1.83 inches)	Replace

JOURNAL DIAMETER			
	Standard Value	Service Limit	Remedy
Wear of Journal	55.94 - 55.97 mm (2.202 -2.203 inches)	55.60 mm 2.189 inches)	Replace



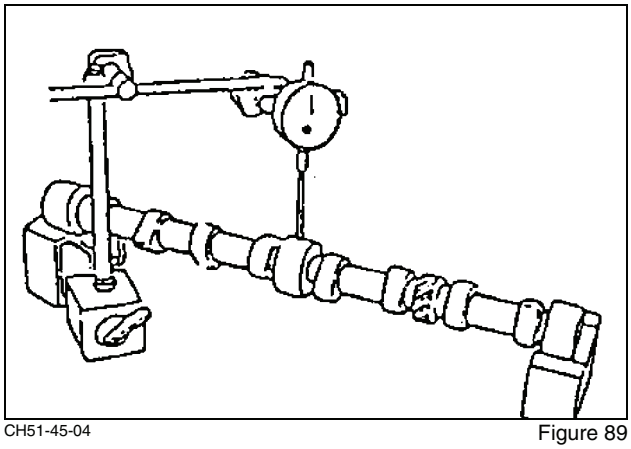
CH51-45-04 Figure 85



CH51-45-03 Figure 88

51.2.1.5.4 RUNOUT OF CAM SHAFT

	Standard Value	Service Limit	Remedy
Runout	Less than 0.05 mm (0.002 inches)	More than 0.2 mm (0.008 in.)	Replace

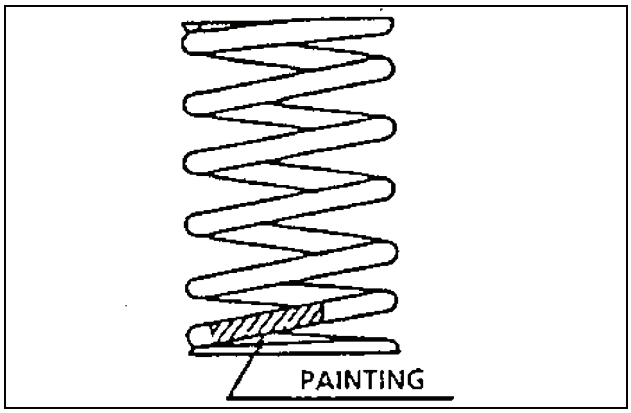


CH51-45-04 Figure 89

51.2.2.2 VALVE

51.2.2.2.1 VALVE SPRING

Coat the stem of the valve with engine oil. Attach the valve spring with its mall pitch (painted side) facing down.



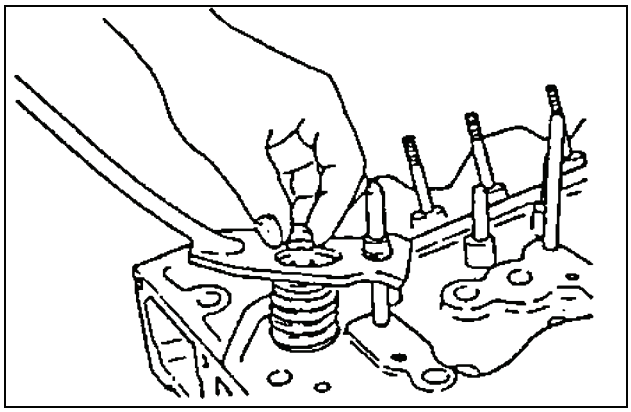
CH51-55-01

Figure 120

51.2.2.2.2 SPRING SEAT AND SPLIT COLOR

Compress the spring with the special tool and insert.

Special Tool: Replacer 9-8523-1423-0



CH51-55-02

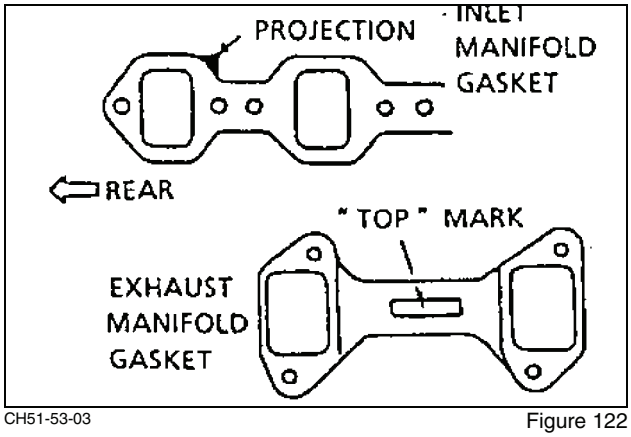
Figure 121

51.2.2.2.3 INLET MANIFOLD, EXHAUST MANIFOLD, AND GASKET

Direct the projected part of the inlet manifold gasket back up and attach to the exhaust manifold so the “Top” mark faces the outside. Tighten to the specified torque.

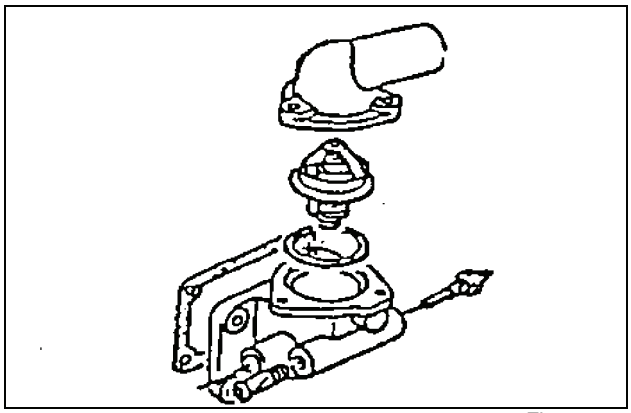
Tightening Torque: 1.6 - 2.6 kgfm (11- 19 pound-foot)

	Standard Value	Service Limit	Remedy
Clearance	0.009 - 0.060 mm (0.00035 - 0.0024 inches)	More than 0.2 mm (0.008 inches)	Replace bushing and shaft



CH51-53-03

Figure 122

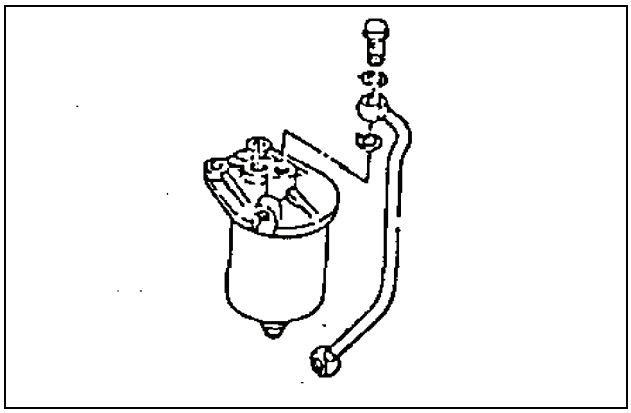


CH51-55-04

Figure 123

51.2.4.3.5 FUEL FILTER

Tightening Torque:
2.0 - 2.5 kgfm (15 - 18 pound-foot)



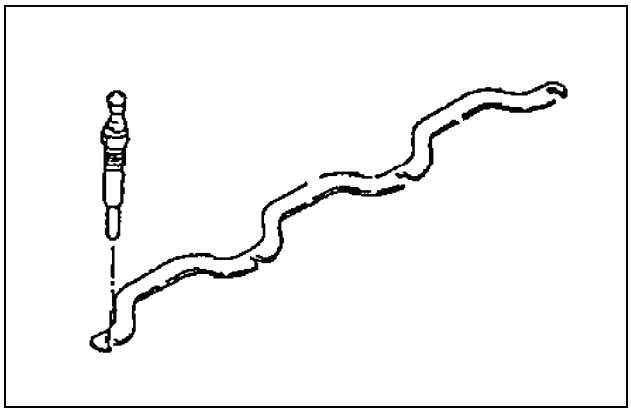
CH51-65-01

Figure 155

51.2.4.3.6 GLOW PLUG

Tightening Torque:

2.3 - 2.8 kgfm (17 - 20 pound-foot)



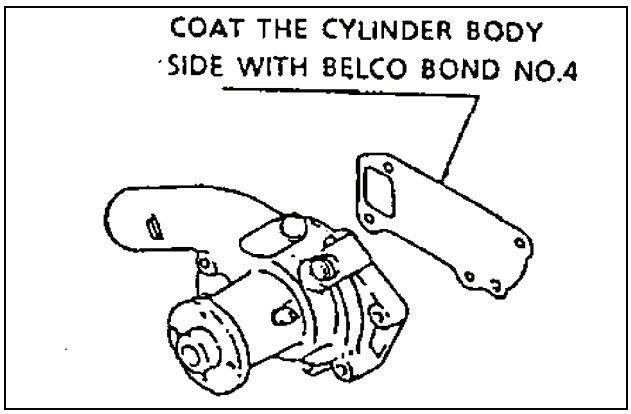
CH51-65-02

Figure 156

51.2.4.3.7 WATER PUMP

Coat the water pump packing with a uniform film of liquid packing such as Belco Bond No. 4.

Tightening Torque:
4.3 - 6.3 kgfm (31 - 46 pound-foot)



CH51-65-03

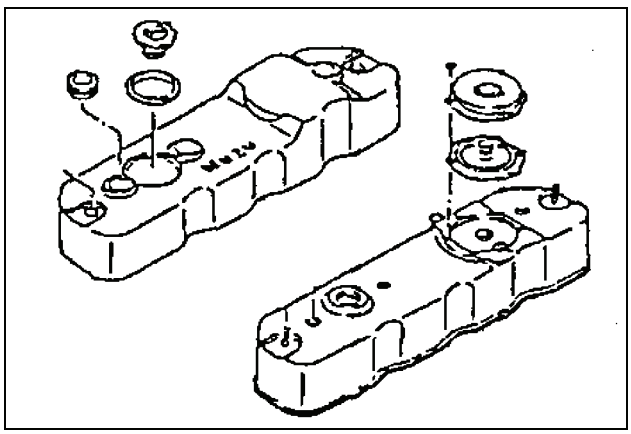
Figure 157

51.2.4.3.8 CYLINDER HEAD COVER

Tightening Torque:

Aluminum cover: 1.6 - 2.6 kgfm (12 - 19 pound foot)

Plated cover: 0.6 - 1. 6 kgfm (4.3 - 12 pound-foot)

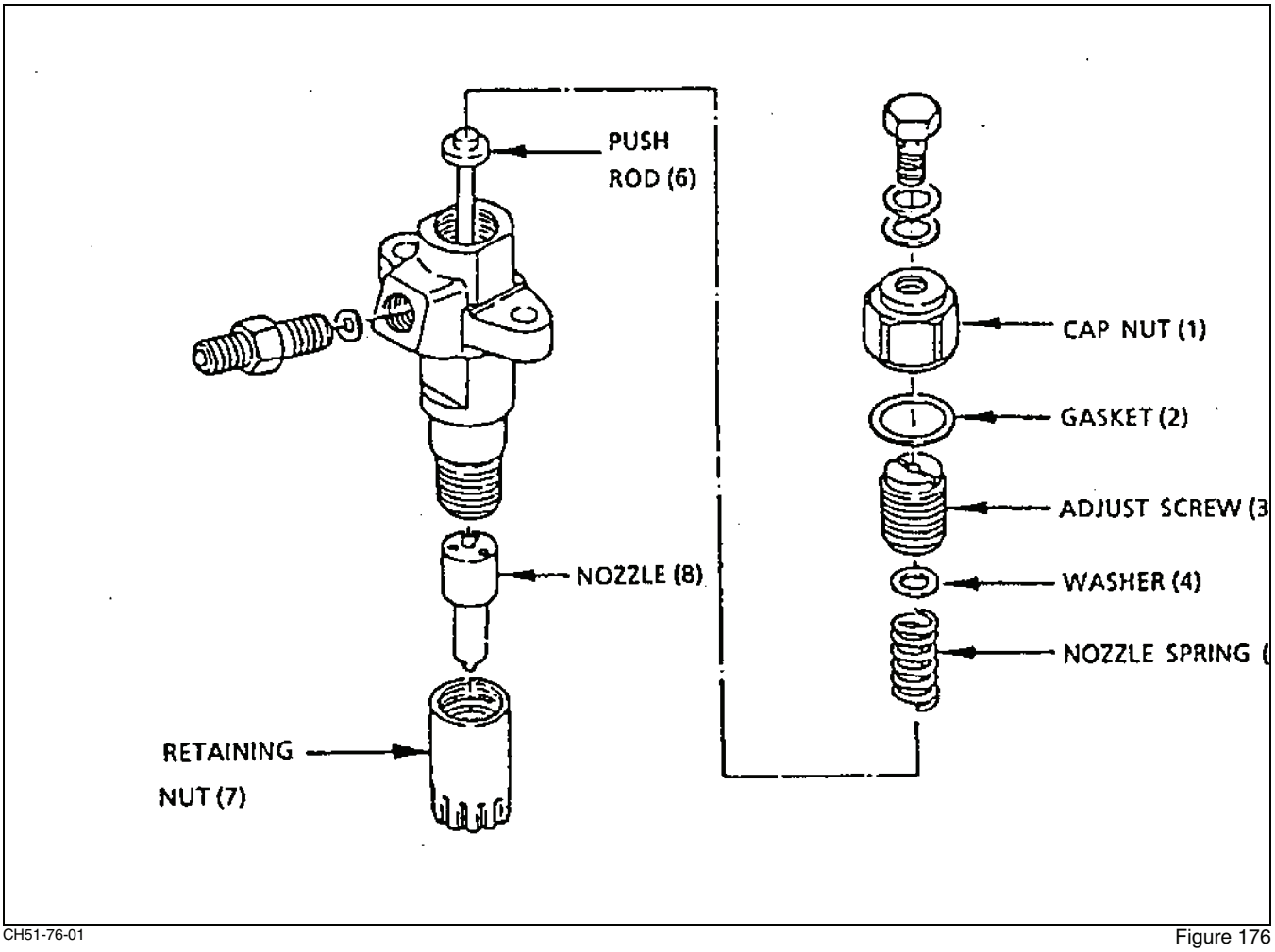


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Figure 158

51.5.2 INJECTION NOZZLE AND HOLDER

51.5.2.1 DISASSEMBLY



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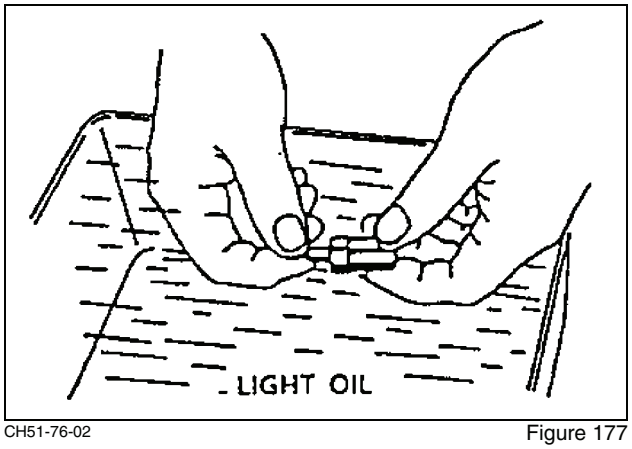
Figure 176

51.5.2.1.1 NOZZLE ASSEMBLY

Put the removed nozzle in clean, light oil. Separate the nozzle body from the needle valve. Clean and inspect the valve to make sure it moves smoothly in the body. If the valve does not move smoothly, correct the problem by additional cleaning or replace the valve.

51.5.2.1.2 ADJUSTMENT

For the adjustment of the injection pressure and the atomizing condition, refer to the Fuel System Section General Information.



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Figure 177

51.8.3 ARTICLE III

Explanation of terminology.

1. The wear is a difference in dimension between the not worn portion (or a nominal dimension unless such a portion exists) and the most worn portion.
2. The uneven wear refers to a difference between the minimum and maximum wear values.

51.8.4 ARTICLE IV

If a request is made to repair the engine as a whole, the engine shall be disassembled and repaired to a minimum required after portions requiring repair shall be confirmed by an as mounted test or the like. If repair of part of the engine is requested, it shall be repaired according to the repair standard for the requested item.

Section	Sub section	Inspection item	Nominal size	Standard assembly value	Limit	Repair procedure	Remark
Fuel device	Fuel feed pump	Suction Capacity (Hand pump speed 60-100 cycles/min., at 1m (3.28ft) head, pipe I.D. × length 8mm(0.315in) × 2m(6.56ft))		Suck in within 25 cycles/min.	120 cycles	Correct or replace.	
		Oil delivery rate cc (cu·in) (Pump speed: 1000rpm for 15 sec. Suction head: 1m (3.28ft) Discharge head: 0.3m (11.8in))		More than 405 (24.71)	300 (18.3)	Correct or replace.	
		Air tightness [at 2.0kgf/cm² (28.4 psi)]		Bubbles from push rod is millet grain in size or smaller, and does not exceed 30cc/min. in quantity.		In case of other leakage, correct or replace.	
	Injection nozzle & pump	For adjustment, contact store specializing in pump.					
		Oiltight of needle valve seat section (At 80kgf/cm²) (1140psi)				When leaking from seat section, repair or replace it.	
		Oiltight of needle valve shaft section Second (Time that it takes the oil pressure with an initial pressure of 300kgf/cm² (4270psi) applied until the pressure drops from 200kgf/cm² (2840psi) to 50kgf/cm² (710psi).)		More than 5.0		Replace	Oil in use: Light oil Viscosity (Redwood) 37 to 40seconds 120℃ (248°F)
		Spray and injection (Adjust needle valve open pressure to the specified value.)	(1) Do not spray large oil droplet visible to the naked eye. (2) Do not spray sideways (3) Do not scatter the water sprayed from nozzle.			Replace abnormal nozzle with new one.	

Figure 195

51.10 STARTER

The reduction type starter has a high speed compact motor as compared with conventional starter motors. It has the torque necessary to start the engine by reducing speed with the contained gears. The reduction starter has the following features as compared to conventional starters.

51.10.1 FEATURES

51.10.1.0.1 COMPACTNESS

As compared to convention starters of the same output, the starter is lighter by about 36% and improves an output ratio per unit weight by more than 60%.

51.10.1.0.2 DURABILITY

Ball bearings are used in the armature and the reduction gear. This provides the starter with improved high-speed resistance and durability.

The reduction gear system uses internal gears to insure stabilized lubrication to the gearing.

The starter uses a roller clutch in order to promote reliability against overrun from the engine.

The armature is molded with heat resistant resin. It has a molded type commutator. This gives it excellent heat resistance, high speed resistance, and durability.

The brush use materials that will with stand high speed sliding action, improving the high speed resistance.

Packing in the joint between the yoke and the bracket improves the dust and drip proof features.

51.10.2 SPECIFICATIONS

Table 1

Item		Type: Engage magnet type
Output	(KW-V)	4.5~24
Rating	(sec)	30
Yoke O.D.	mm (in)	90 (3.54)
Rotating direction		CW
Protection		Dustproof / dripproof
Reduction gearing		Internal gear
Weight	kg (lbs)	Abt. 9 (20)
Pinion	Module	3
Pinion	Pressure angle	14.5
Pinion	No. of teeth	11
Pinion	Gear ratio (ring gear/pinion)	11.7 (129 / 11)
No load	Voltage (V)	24
No load	Current (A)	less than 100
No load	Revolution (r.p.m)	more than 4,500
Lock	Voltage (V)	24~16
Lock	Current (A)	less than 1,100
Lock	Torque kgf-m (ft-lbs)	more than 6.5 (47)
Pinion engagement Voltage (V)		less than 16

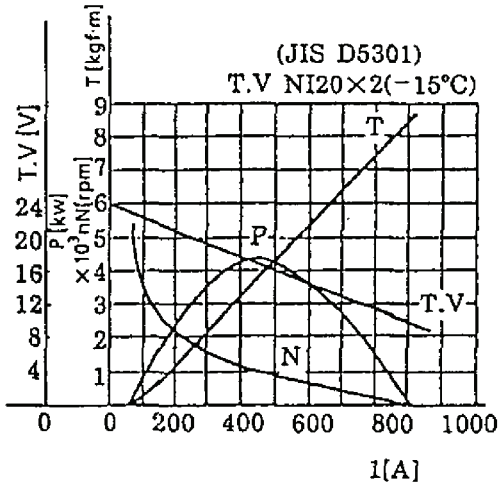
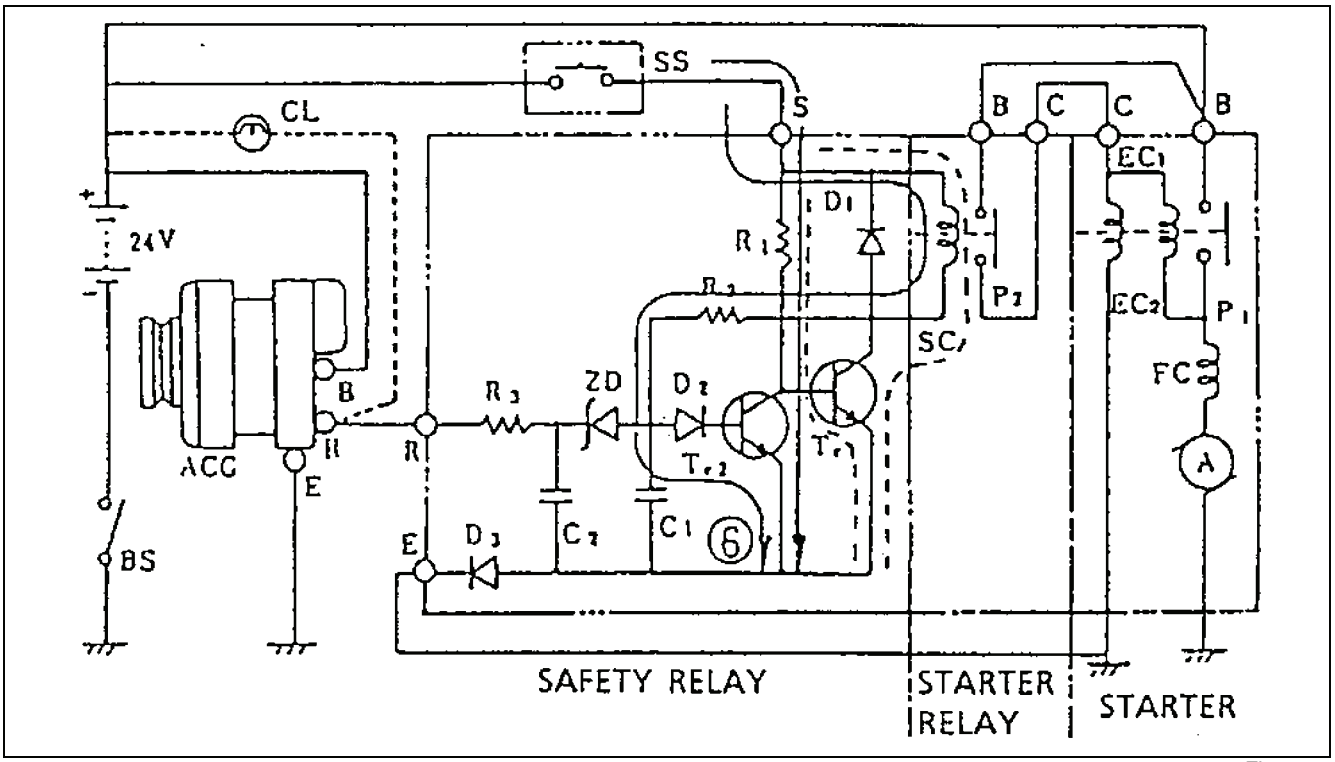


Fig. 1 Output characteristics

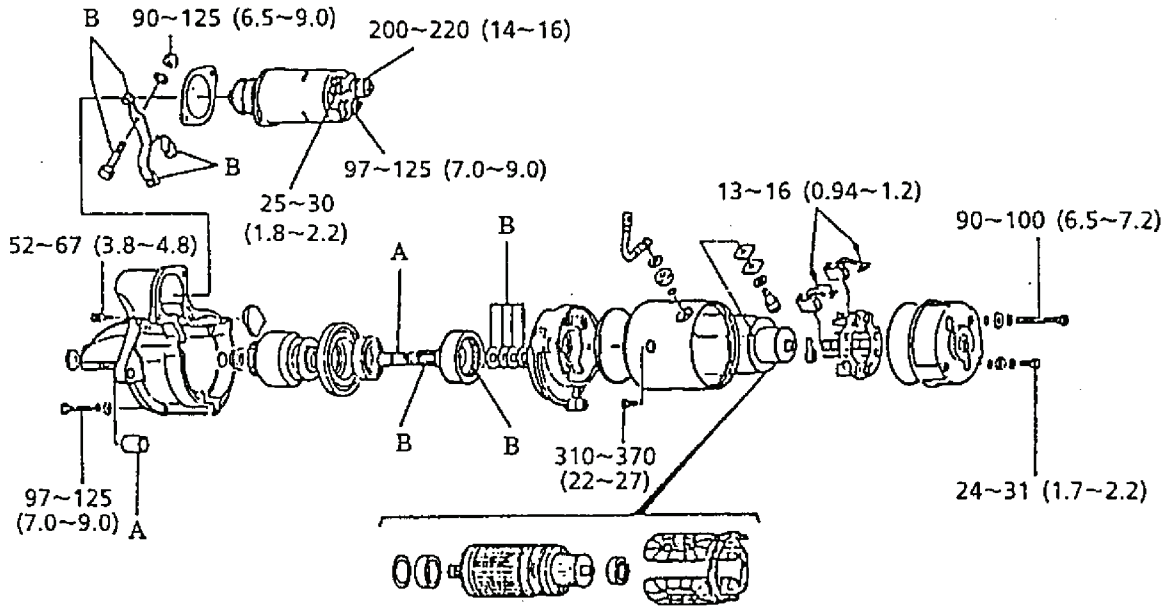
CH51-103-01

Figure 206



CH51-119-01 Figure 225

5. If the voltage at alternator R terminal ceases, the base current to transistor (Tr2) stops as well. Transistor (Tr2) then attempts to turn “Off”.
6. The circuit containing resistor (R2) prevents this from occurring.
7. Current the flows to the base of transistor (Tr2) through starter coil (SC) and resistor (R2) as long as the start switch is closed even though the voltage at the R terminal of the alternator cases after the safety relay has operated.
8. This prevents current running from the S terminal of the safety relay to resistor (R1) from flowing to the base of transistor (Tr1).
9. Current then flows to the starter relay coil (SC), but is so minimal that the starter relay contact (P2) is not closed.
10. The circuit formed here disappears once the start switch is opened. If the start switch is closed again, the function of the starting circuit will be repeated.



Lubrication and tightening torque

CH51-127-01

Figure 257

9. Perform lubrication at assembly.

   A: Molybdenum disulfide oil 5% + SAE 20W 95%

   B. Nikko grease R (Item No. 7-85021-0803)

Follow tightening torques as indicated.

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