HYDRAULIC EXCAVATOR

SHOP MANUAL model SK30SR-2 SK35SR-2

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KOBELCO

Book Code No. S5PW0002E ②

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SK30SR-2
SK35SR-2

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1.1 GENERAL SAFETY INFORMATION

WARNING

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

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

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

3. Messages of safety appear in the manual and on the machine : All messages of safety are identified by eighter word of "DANGER", "WARNING" and "CAUTION".
   a. DANGER- Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury and is represented as follows:

DANGER

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

WARNING

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

CAUTION

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

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

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

1.2 SAFETY PRECAUTIONS

WARNING

The proper and safe lubrication and maintenance for this machine, recommended by KOBELCO, are outlined in the OPERATOR'S MANUAL for the machine.
Improper performance of lubrication or maintenance procedures are dangerous and could result in injury or death. Read and understand the MANUAL before performing any lubrication or maintenance.

The serviceman or mechanic may be unfamiliar with many of the systems on this machine. This makes it important to use caution when performing service work. A knowledge of the system and or components is important before the removal or disassembly of any component.

Because of the size of some of the machine components, the serviceman or mechanic should check the weights noted in this manual. Use proper lifting procedures when removing any components. Weight of components table is shown in the section ; SPECIFICATIONS.

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3. SPCIFICATIONS AND PERFORMANCE

■ SPEED AND GRADEABILITY

Model		SK30SR-2				SK35SR-2			
Item \ Shoe Type		Rubber shoe		Steel shoe (OPT)		Rubber shoe		Steel shoe (OPT)	
Slewing Speed		9.0 rpm				8.6 rpm			
		Low (1st)	High (2nd)	Low (1st)	High (2nd)	Low (1st)	High (2nd)	Low (1st)	High (2nd)
Travel Speed km/h (mph)	EU	2.6 (1.6)	4.5 (2.8)	2.5 (1.6)	4.3 (2.7)	2.5 (1.6)	4.5 (2.8)	2.5 (1.6)	4.4 (2.7)
	USA	↑	↑	↑	↑	2.3 (1.4)	4.1 (2.5)	2.3 (1.4)	4.0 (2.5)
Gradeability % (degree)		58 % (30°)				58 % (30°)			

■ SIDE DIGGING & DOZER

Type		Boom swing by hydraulic cylinder	Boom swing by hydraulic cylinder
Boom Swing Angle	Right	60°	60°
	Left	CANOPY:80° / CAB:70°	CANOPY:80° / CAB:70°
Stroke of Dozer(above/below) mm(in)		305 / 390 (12.0 / 15.4)	330 / 390 (13.0 / 15.4)

■ ENGINE

Model	YANMAR 3TNE82A - YBC	YANMAR 3TNE82A - YBD
Type	Water-cooled, 4-cycle type Swirl chamber type diesel engine	
Number of cylinders-Bore x Stroke	3 - 82mm X 84mm (3.23in X 3.31in)	
Total Displacement	1.33 liters (81.1 cu.in)	
Output Rating	23PS / 2,300rpm {16.9kW / 2,300min^{-1}}	24PS / 2,400rpm {17.7kW / 2,400min^{-1}}
Maximum Torque	8.1kgf-m / 1,400rpm {59lbf-ft/1,400rpm}	8.1kgf-m / 1,500rpm {59lbf-ft/1,500rpm}
Starting Motor	12V / 1.2 kW	
Generator	12V / 40 A	

■ HYDRAULIC COMPONENTS

Hydraulic Pump	Variable displacement axial piston + gear pump
Hydraulic Motor	Axial piston
Hydraulic Motor w/Reducer (Travel)	2-Axial piston, 2-Speed motor
Control Valve	10-spool multiple control valve
Cylinder (Boom, Arm, Swing, Bucket, Dozer, Frame width)	Double action cylinder
Return Filter	Safety valve containing/Filter Type (30μ)

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2.1 HYDRAULIC CIRCUIT DIAGRAM [EU • OCEANIA]

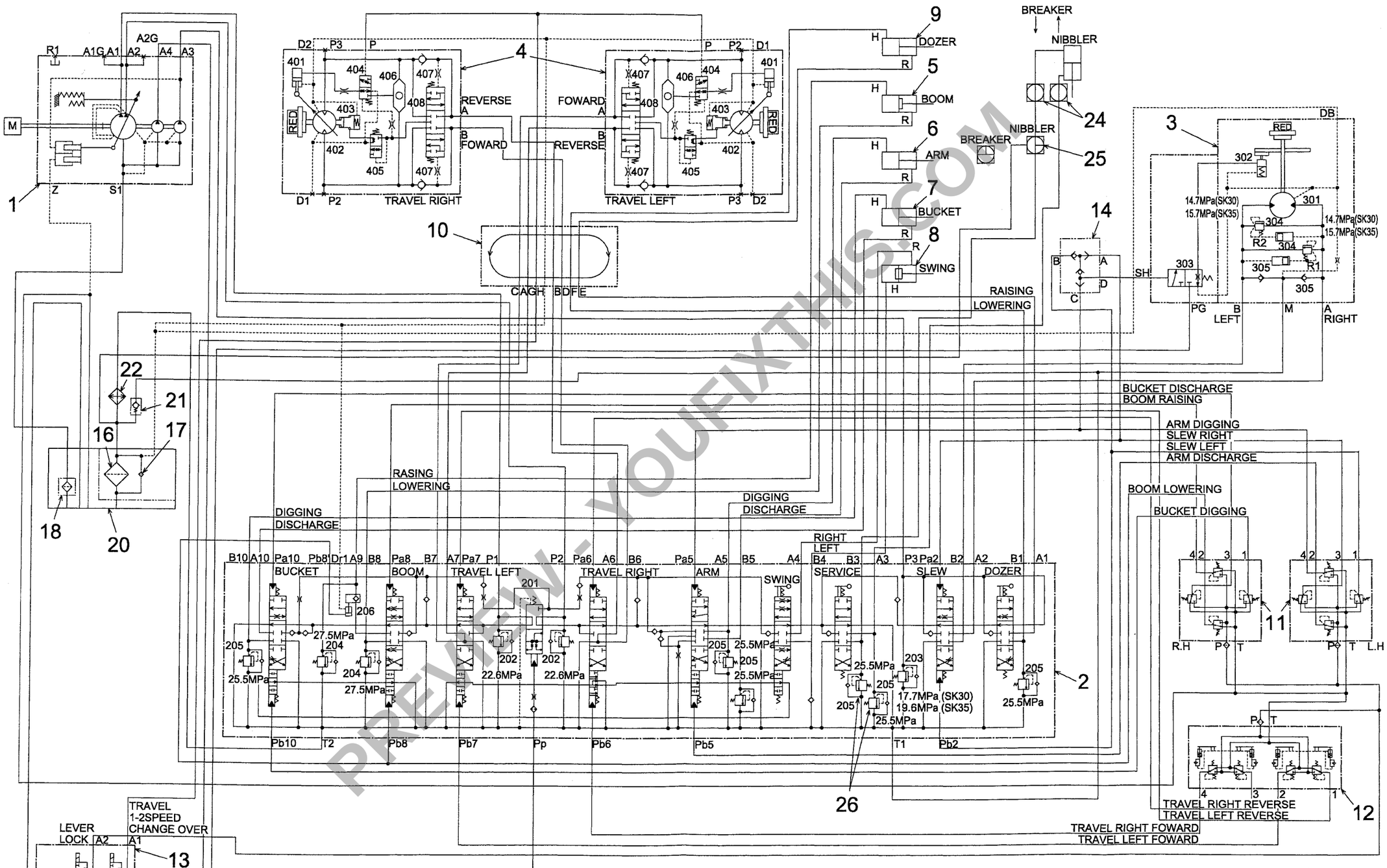


Fig.1 Hydraulic circuit diagram

SETTING PRESSURE OF RELIEF VALVE

No.	NAME		PRESSURE:MPa {kgf/cm²} (psi)	No.	NAME		PRESSURE:MPa {kgf/cm²} (psi)
202	Main relief valve P1,P2		22.6 {230} (3270)	205	Over load relief valve		25.5 {260} (3700)
203	Main relief valve P3	SK30SR-2	17.7 {180} (2560)	304	Slew relief valve	SK30SR-2	14.7 {150} (2130)
		SK35SR-2	19.6 {200} (2840)			SK35SR-2	15.7 {160} (2280)
204	Over load relief valve		27.5 {280} (3980)	13-1	Pilot relief valve		3.4 {35} (500)

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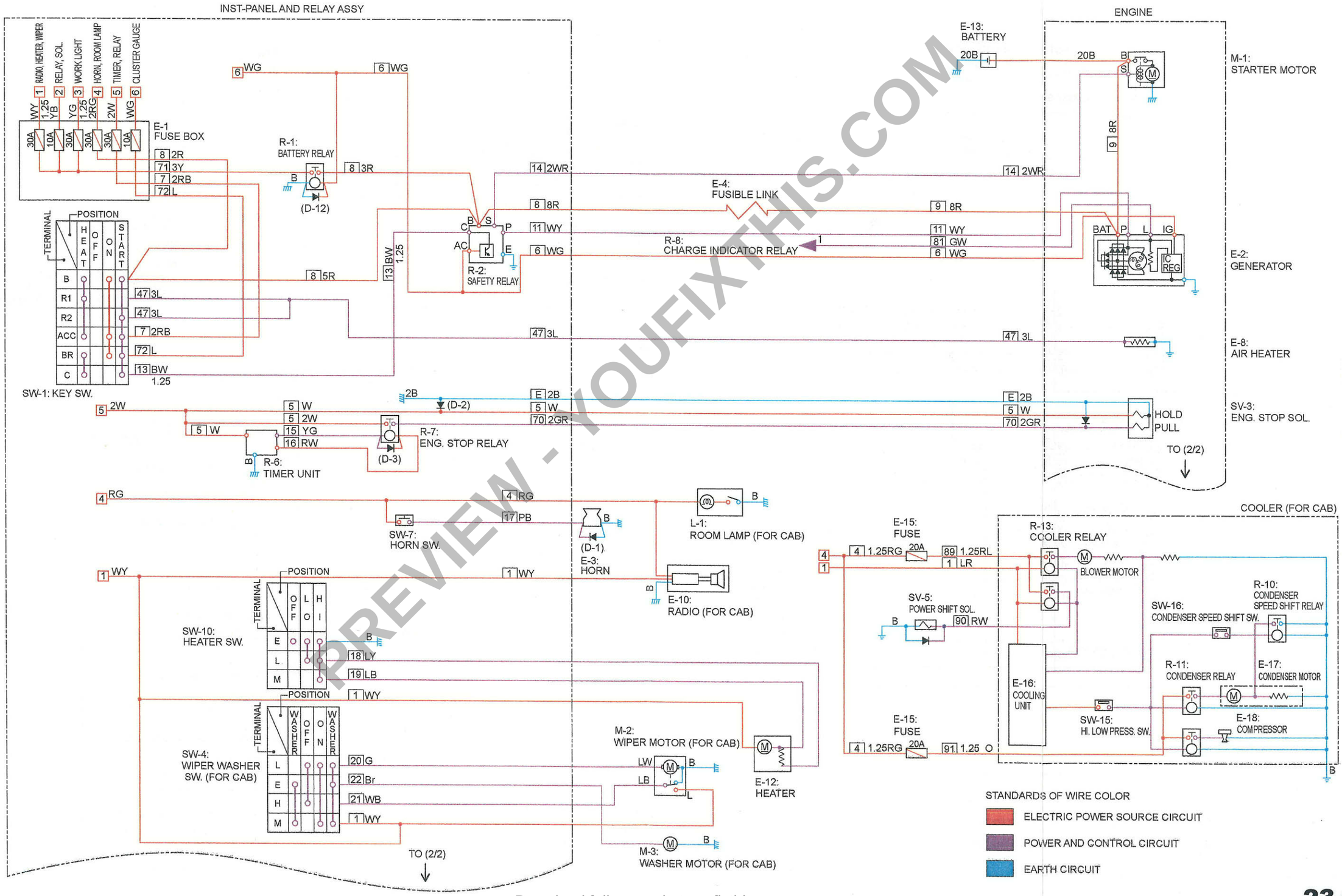
2. ELECTRIC CIRCUIT DIAGRAM

2A. ELECTRIC CIRCUIT DIAGRAM (1/3)

Applicable Machines

SK30SR-2 : PW08-20001~

SK35SR-2 : PX09-08001~



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2. BUCKET

2.1 REMOVAL OF BUCKET

(1) Operate the operating lever and place the bucket on the ground, so the bucket and arm connecting pins are not loaded.

(2) Move the O-rings (3)toward the bucket bosses using a spatula.

(3) In order to remove pin (K) which links arm and bucket, remove the ring (2) and the pin (3) by means of straight driver, and draw out pin (K).

- If the pin does not come off easily, the pin is loaded. Take off the load by manipulating the operating lever.
- Take care so the dust seal between the arm and the bucket bosses is not damaged.

(4) Adjust the bucket by manipulating the operating lever so the pin (J) between the bucket link and the bucket is not loaded.

(5) Remove the ring (2) and pin (1) then pull out the pin (J).

(6) Remove bucket assy.
Weight : 89kg (196lb) — SK30SR-2
92kg (203lb) — SK35SR-2

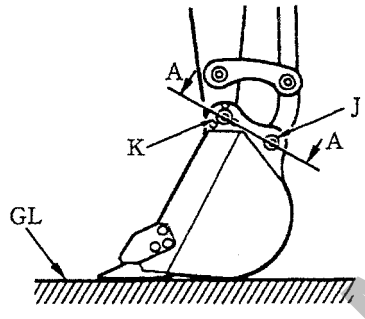


Fig. 2-2 To place Bucket on ground

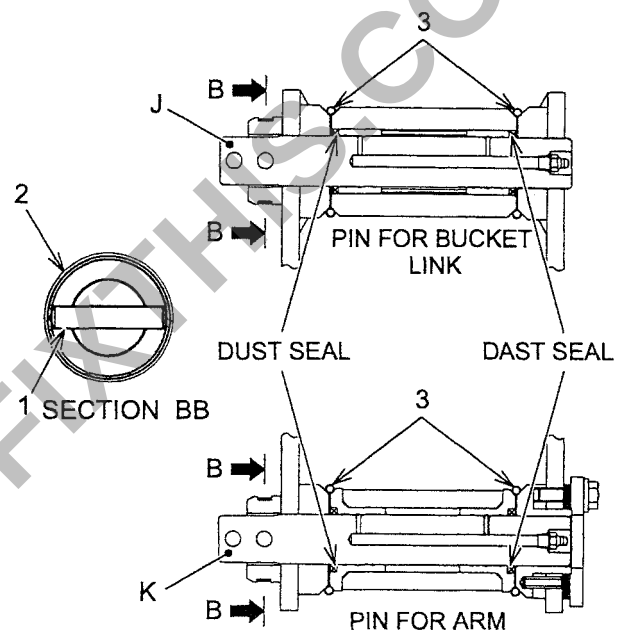


Fig. 2-3Assembly of pin (SECTION A-A)

2.2 INSTALLATION OF BUCKET

Installation is performed in the reverse order of removal, including the following workings :

⚠ • When aligning the pin borees, do not put your finger in the pin holes in any circumstances, but align them visually.

(1) Clean the welded part of the structures and check that there is no crack on the part.

(2) Check that the dust seal is not damaged, and replace a faulty one if necessary.

(3) Adjust the clearance between the bucket and the arm according to Item 2.3.

(4) Replace the worn pins and bushings according to the Section "ATTACHMENT DIMENSIONS" of "SPECIFICATIONS".

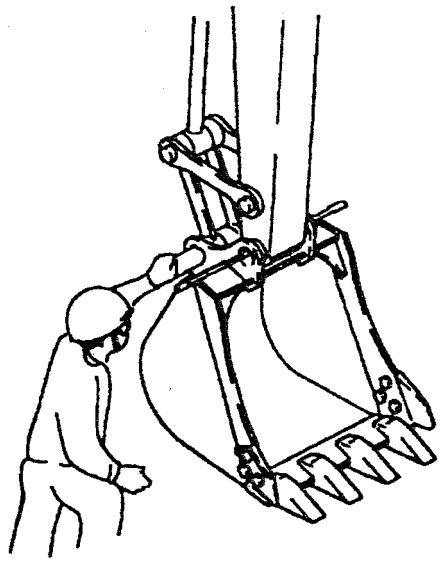


Fig. 2-4 Installation of bucket

(5) When inserting the pin, coat the shaft with grease.

• The bucket can be mounted easily if the bucket link is installed in the beginning.

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2. TROUBLE DIAGNOSIS: HYDRAULIC

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

Abbreviation

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

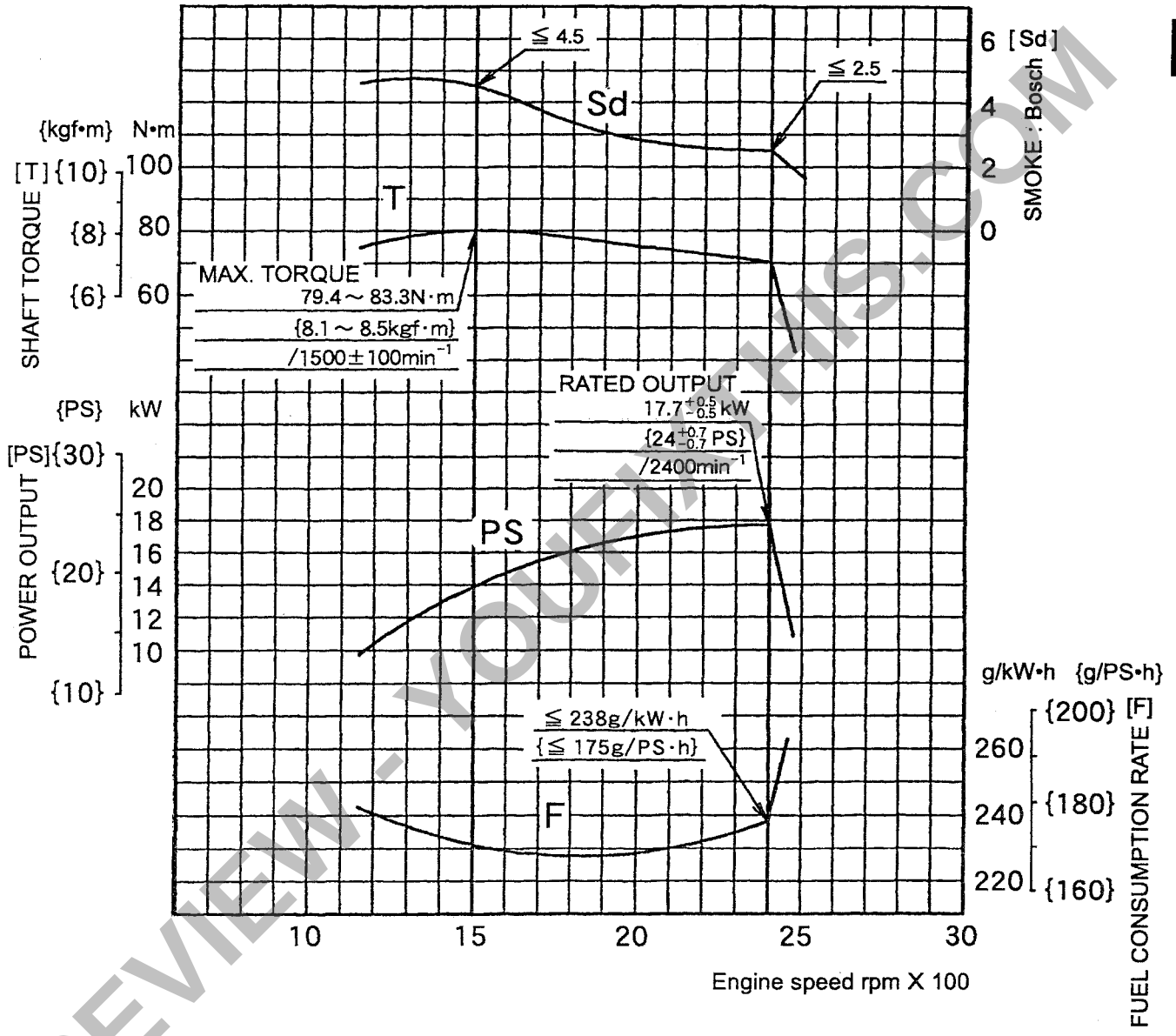
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■ SK35SR-2

Model : 3TNE82A-YBD

Rated Output : 24 PS / 2,400 rpm (17.7 kW / 2400min^{-1})



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$$\text{Fuel consumption volume} = \frac{F}{\rho \times 1000} \times P \times \alpha$$

$$= \frac{175}{0.835 \times 1000} \times 24 \times \alpha$$

$$= 5.03\,\alpha$$

F : Fuel consumption rate (g / PS·h)

P : Shaft output (ps)

ρ : Specific gravity

α : Standard load factor (0.60 ~ 0.70)

Fuel consumption in normal operation ;

3.02 ~ 3.52 ℓ / h (load factor : (0.60 ~ 0.70))

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GROUP No.		EQUIPMENT PORTION	WORK TO BE DONE	UNIT	REMARK	UNIT : HOUR
02 Canopy & Guard	25	Bonnet assy (5)	Removal / Inst.	1 pc.		0.1
	26	Cover assy (6)	– ditto –	1 pc.		0.2
	27	Cover assy (7)	– ditto –	1 pc.		0.2
	—	—	—	—		—
	29	Cover (36)	Removal / Inst.	1 pc.		0.1
	30	Bracket assy (9)	– ditto –	1 pc.		0.1
	31	Cover assy (17)	– ditto –	1 pc.		0.1
	32	Suport (10)	– ditto –	1 pc.		0.2
	40	Floor plate portion			Refer to 33-1 item3	
	41	Floor plate assy	Removal / Inst.	1 set		0.5
		Othen necessary works	– ditto –	1 pc.	Canopy removal/inst	0.2
	50	Counter weight portion			Refer to 33-I item 6	
	51	Counter weight ASSY	Removal / Inst.	1 pc.		0.4
	52	• Lifting tools	Preparation	1set		0.1
	53	• Slinging	Removal / Inst.	1 pc.		0.1
	54	• Counter weight fixing bolt	– ditto –	1 set		0.1
		Othen necessary works	– ditto –	3 pcs.	Guards	0.3
03 Upper structure	00	Control portion				
	01	E / G control cable	Removal / Inst.	1 pc.		0.2
	02	Dozer yoke	– ditto –	1 pc.		0.1
	03	Dozer cable	– ditto –	1 pc.		0.1
	04	Swing yoke (EU)	– ditto –	1 pc.		0.1
	05	Swing cable (EU)	– ditto –	1 pc.		0.1
		Other necessary works	– ditto –	1 set.	Cover and Hose	0.4
	10	Intake portion			Refer to 33-I item 9	
	11	Air cleaner ASSY	Removal / Inst.	1 pc.		0.4
	12	• Hose (1)	- ditto -	1 pc.		0.1
	13	• Hose (2)	- ditto -	1 pc.		0.1
	14	• Element	Replace	1 pc.		0.1
	20	Exhaust portion			Refer to 33-I item 12	
	21	Muffler ASSY	Removal / Inst.	1 pc.		0.4
	22	• Muffler attaching nuts (9)	– ditto –	3 pcs.		0.1
	23	• Clamp	– ditto –	2 pcs.		0.1
		Other necessary works	– ditto –	1 pc.	Under cover	0.1
	20	E / G Accessory portion			Refer to 33-I item 10 & 11	
	21	Dynamo	Removal / Inst.	1 pc.		0.6
	22	• Connector	- ditto -	1 pc.		0.1
	22	• Dynamo fixing bolt	- ditto -	2 pcs.		0.1
	23	• V-belt	- ditto -	1 pc.	Include tension adjusting	0.3
		Other necessary works	- ditto -	1 set	Covers	0.4
			- ditto -	1 pc.	Negative terminal of battery	0.1
	26	Starter	- ditto -	1 pc.		0.5
	27	• B-terminal	- ditto -	1 pc.		0.1
	28	• S-terminal connector	- ditto -	1 pc.		0.1
	29	• Starter fixing bolt	- ditto -	2 pcs.		0.2
		Other necessary works	- ditto -	1 set	Cover and Floor plate	0.3
			- ditto -	1 pc.	Negative terminal of battery	0.1

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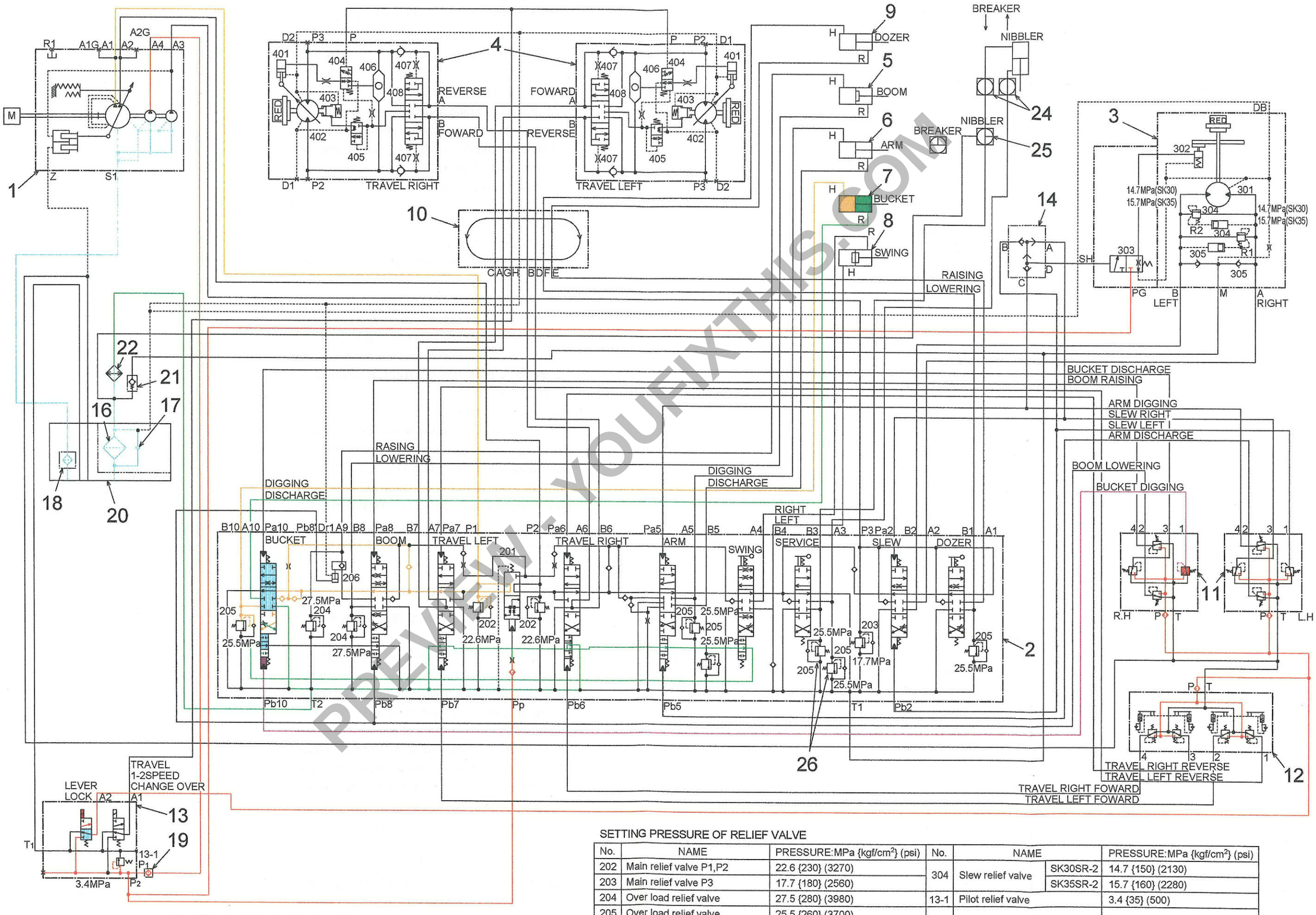


Fig.6 Bucket circuit : Bucket digging operation

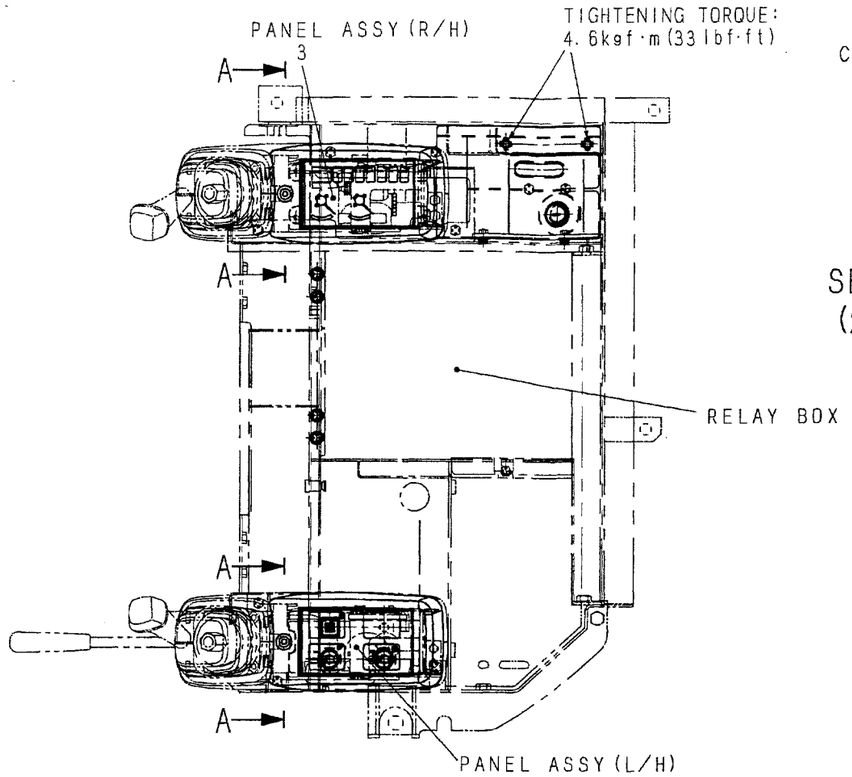
SETTING PRESSURE OF RELIEF VALVE

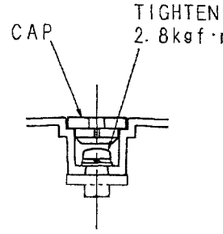
No.	NAME	PRESSURE:MPa {kgf/cm²} (psi)	No.	NAME		PRESSURE:MPa {kgf/cm²} (psi)
202	Main relief valve P1,P2	22.6 {230} (3270)	304	Slew relief valve	SK30SR-2	14.7 {150} (2130)
203	Main relief valve P3	17.7 {180} (2560)			SK35SR-2	15.7 {160} (2280)
204	Over load relief valve	27.5 {280} (3980)	13-1	Pilot relief valve		3.4 {35} (500)
205	Over load relief valve	25.5 {260} (3700)				

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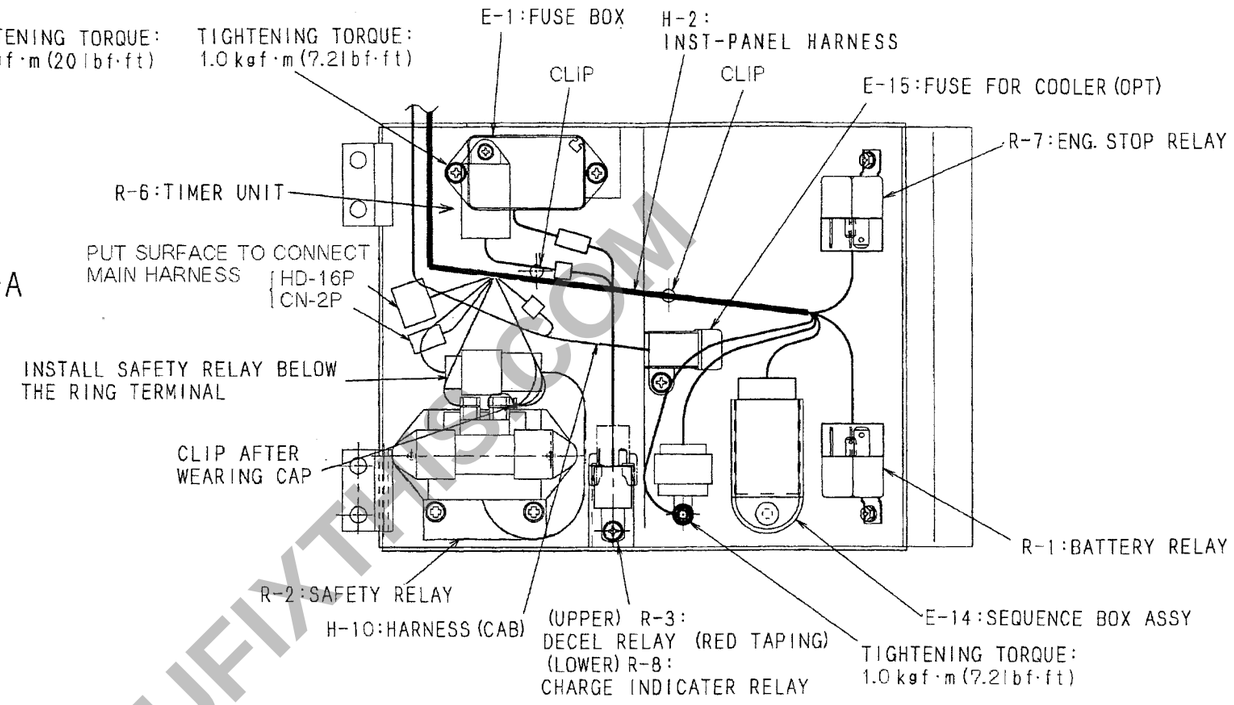
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3.4.3 Instrument Panel Portion

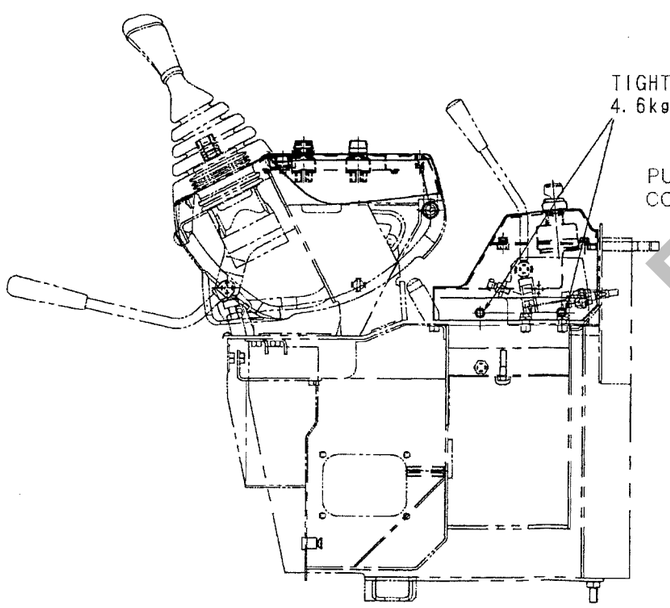


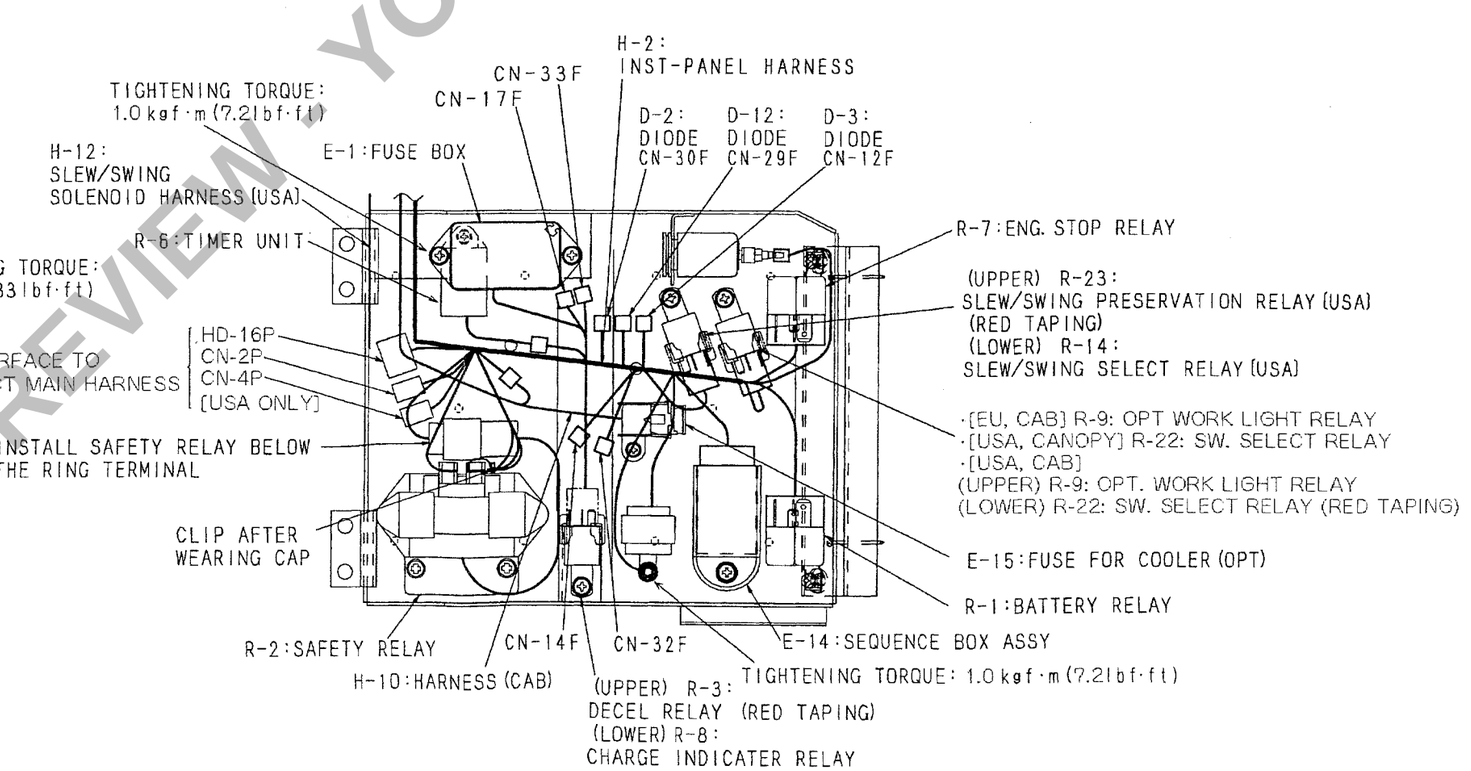


SECTION A-A
(2 PLACES)



DETAIL OF RELAY BOX (OCEANIA)



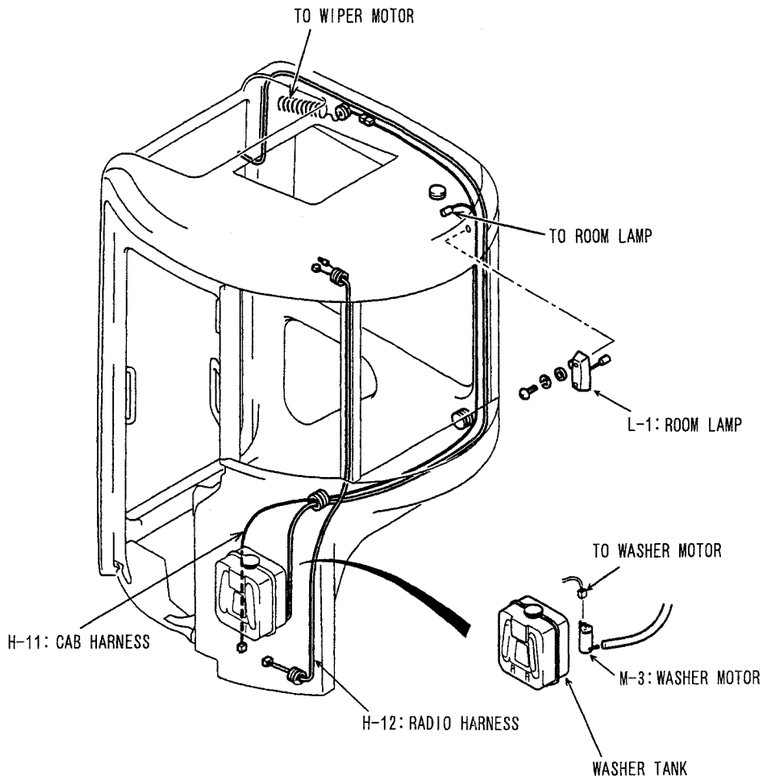


DETAIL OF RELAY BOX (EU & USA)

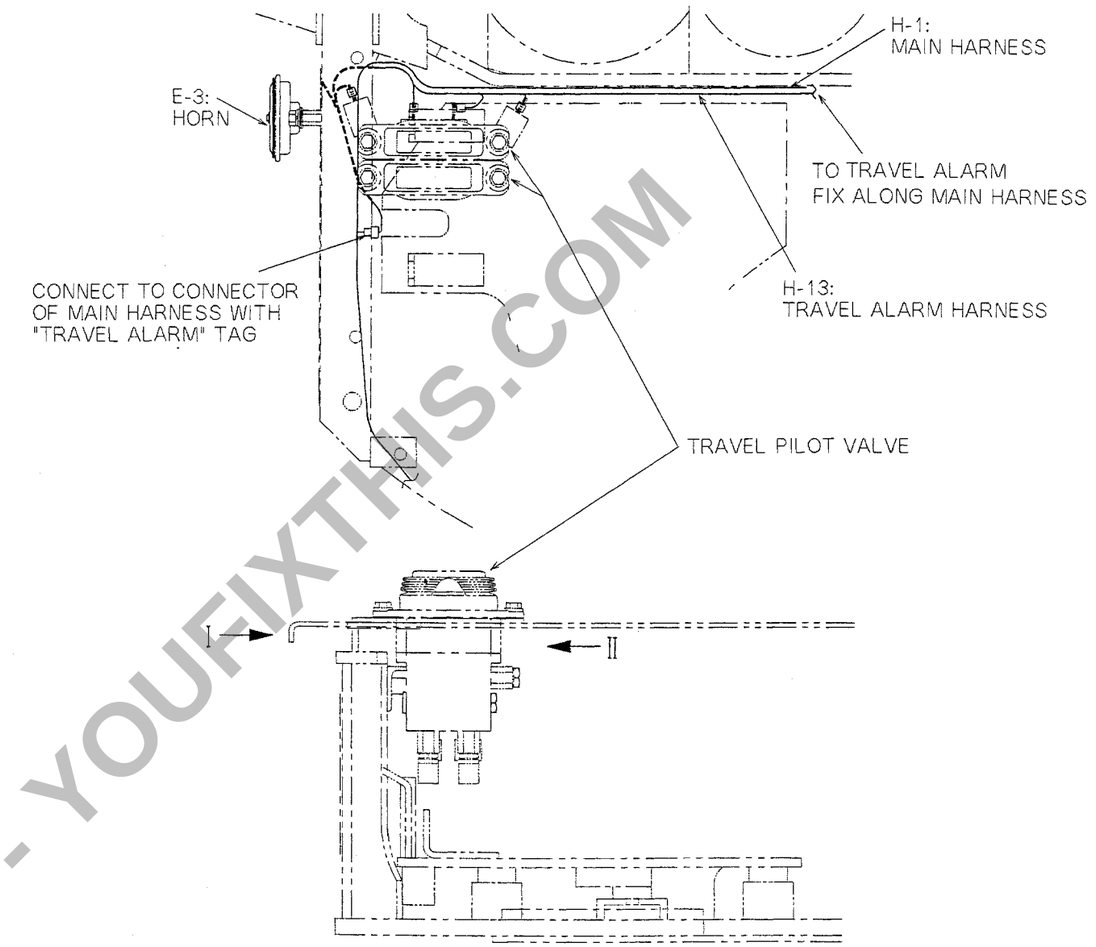
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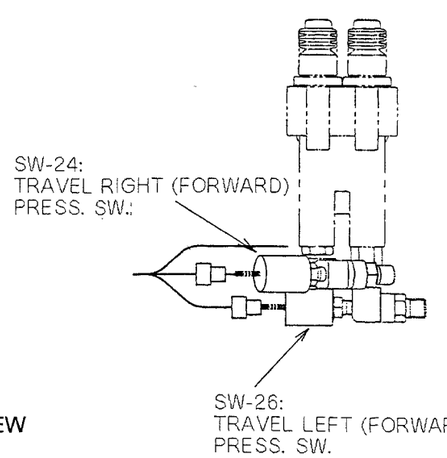
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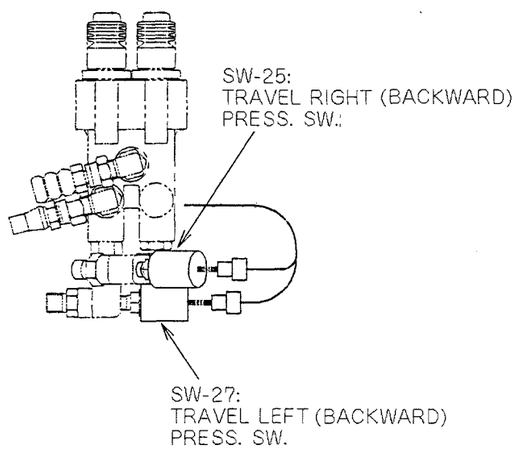
4.3.7 Cab Portion (OPT)



4.3.8 Travel Alarm Portion (1/2) [OCEANIA] (EU • USA OPT)







(Note)
PRESSURE SWITCH
- APPLY SEAL TAPE THE SCREW
- TIGHTENING TORQUE
  2.2 kgf • m (16 lbf • ft)

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4.2 SPECIFICATIONS

[EU • OCEANIA]

Table. 4-1

Item		SK30SR-2	SK35SR-2
Model(Type)		BCV35-JD10	BCV35-JE10
Valve operation	Manual	Swing,Service,Dozer blade	
	Pilot	Travel straight,Travel left, Travel right,Boom,Arm,Slewing	
Flow rate		P1,P2-31.1L/min,P3 →24.2L/min	P1,P2-34.8L/min,P3 →25.2L/min
Setting pressure atmain relief valve P1,P2,P3		P1,P2···230 $^{+5}_{0}$ kgf/cm² (3270 $^{+71}_{0}$ psi) at31.1L/min(8.2gal/min) P3·····180 $^{+5}_{0}$ kgf/cm² (2560 $^{+71}_{0}$ psi) at24.2L/min (6.4gal/min)	P1,P2···230 $^{+5}_{0}$ kgf/cm² (3270 $^{+71}_{0}$ psi) at34.8L/min(9.2gal/min) P3·····200 $^{+5}_{0}$ kgf/cm² (2840 $^{+71}_{0}$ psi) at25.2L/min (6.7gal/min)
Settingpressure at over load relief valve		B1,A5,B5,B10 port (OR1,OR7,OR8,OR9) 260 $^{+5}_{0}$ Kgf/cm² (3700 $^{+71}_{0}$ psi) at5L/min (1.3gal/min) B8,A9 port (OR3,OR4) 280 $^{+5}_{0}$ kgf/cm²(3980 $^{+71}_{0}$ pis) at5L/min (1.3gal/min)	

[USA]

Table. 4-2

Item		SK30SR-2	SK35SR-2
Model(Type)		BCV35-JH10	BCV35-JI10
Valve operation	Manual	Service,Dozer blade	
	Pilot	Travel straight,Travel left, Travel right,Boom,Arm,Slewing,Swing	
Flow rate		P1,P2-31.1L/min,P3 →24.2L/min	P1,P2-34.8L/min,P3 →25.2L/min
Setting pressure atmain relief valve P1,P2,P3		P1,P2···230 $^{+5}_{0}$ kgf/cm² (3270 $^{+71}_{0}$ psi) at31.1L/min(8.2gal/min) P3·····180 $^{+5}_{0}$ kgf/cm² (2560 $^{+71}_{0}$ psi) at24.2L/min (6.4gal/min)	P1,P2···230 $^{+5}_{0}$ kgf/cm² (3270 $^{+71}_{0}$ psi) at34.8L/min(9.2gal/min) P3·····200 $^{+5}_{0}$ kgf/cm² (2840 $^{+71}_{0}$ psi) at25.2L/min (6.7gal/min)
Settingpressure at over load relief valve		B1,A5,B5,B10 port (OR1,OR7,OR8,OR9) 260 $^{+5}_{0}$ Kgf/cm² (3700 $^{+71}_{0}$ psi) at5L/min (1.3gal/min) B8,A9 port (OR3,OR4) 280 $^{+5}_{0}$ kgf/cm²(3980 $^{+71}_{0}$ pis) at5L/min (1.3gal/min)	

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3) Parking brake

a) Traveling

The pressure oil led trough brake valve actuates on spool (223) of brake valve on the hydraulic motor section, opens passage to parking brake, and is led to cylinder chamber (a) compressed of spindle (2) and piston (112) on the reduction gear section.

If the pressure of oil which is 9.1 kgf / cm² (130 psi) or higher it exceeds the force of spring moving piston (112) toward rear flange (201) side.

This movement of piston (112) reduces the push power to separator plate (116), (169) and friction plate (115), and makes the movement of friction plate (115) which is installed to cylinder block (104) on hydraulic motor section free releasing the brake power to cylinder block (104).

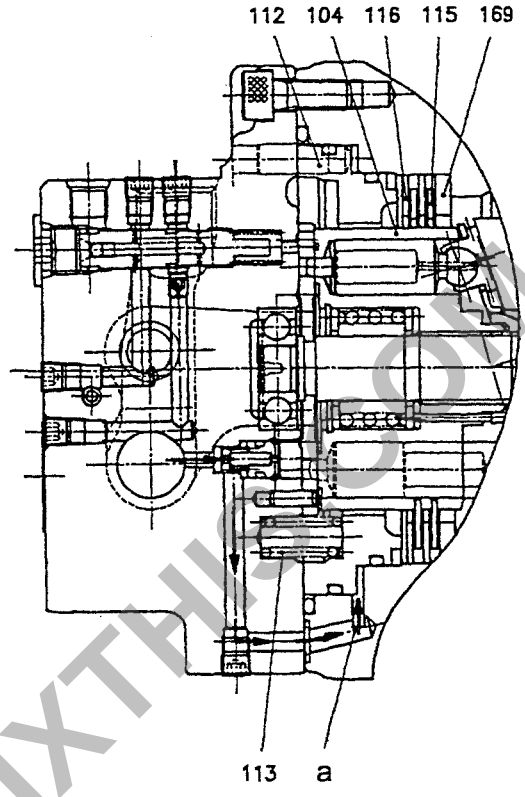


Fig. 6-12

b) Stopping

If pressure oil from brake valve is cut, and the pressure in cylinder chamber (a) lowers 9.1 kgf / cm² (130 psi) or less, the piston (112) goes to rightward by the force of spring (113).

Also, the force of the spring pushes mating plate (116), (169) and friction plate (115), which is in a free state because piston (112) is pushed, against spindle (2) on the reduction gear section. The frictional force produced by the push power stops the rotation of cylinder block (104), and transmits braking torque 6.6 kgf•m (48 lbf•ft) to hydraulic motor shaft. And since oil is controlled through the proper oil passage, it results in smooth operation.

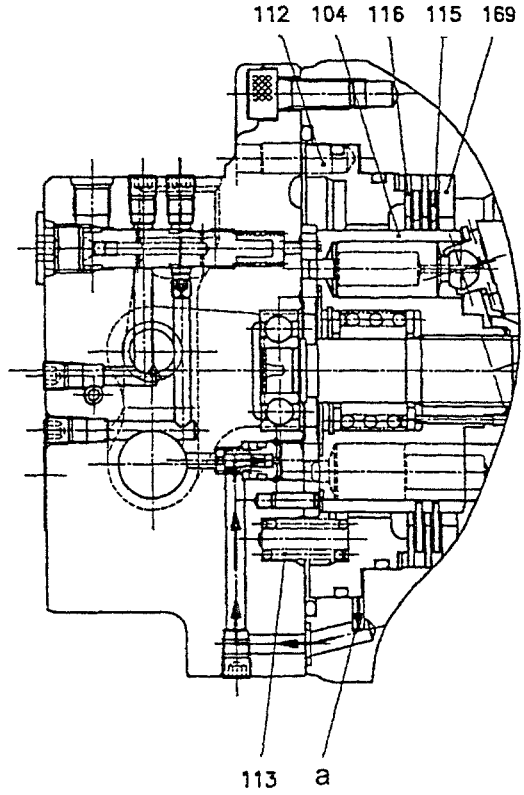


Fig. 6-13

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KOBELCO

SHOP MANUAL SK30SR-2 SK35SR-2

ATTACHMENTS

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3. ARM I-1-4
4. BOOM I-1-6
5. SWING I-1-8
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[PART II ; DISASSEMBLING AND ASSEMBLING COMPONENTS]
1. CYLINDER II-1-1

PW32

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(4) Removing bonnet assembly (4)
Unlock the bonnet assembly (4) to open it. Then unscrew two M10X25 SEMS bolts (24) to remove the bonnet assembly (4) from the hinge portion.
: 17mm

(5) Removing bonnet assembly (5)
Remove two grommets (20), two M8X20 (yellow) SEMS bolts (47) to remove the bonnet assembly (5).
: 13mm

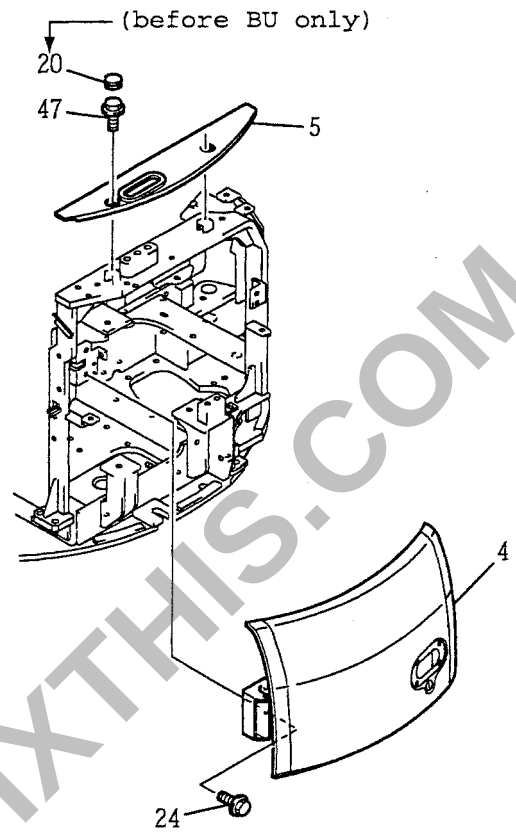


Fig. 2-4 Bonnet assemblies (4) (5) removal

(6) Removing cover assembly (6)
Unscrew two M10X35 capscrews (23) and three M10X25 SEMS bolts (24) to remove cover assembly (6).
: 17mm

(7) Removing cover assembly (7)
Unscrew three M10X35 capscrews and three M10X25 SEMS bolts (24) to remove the cover assembly (7).
: 17mm

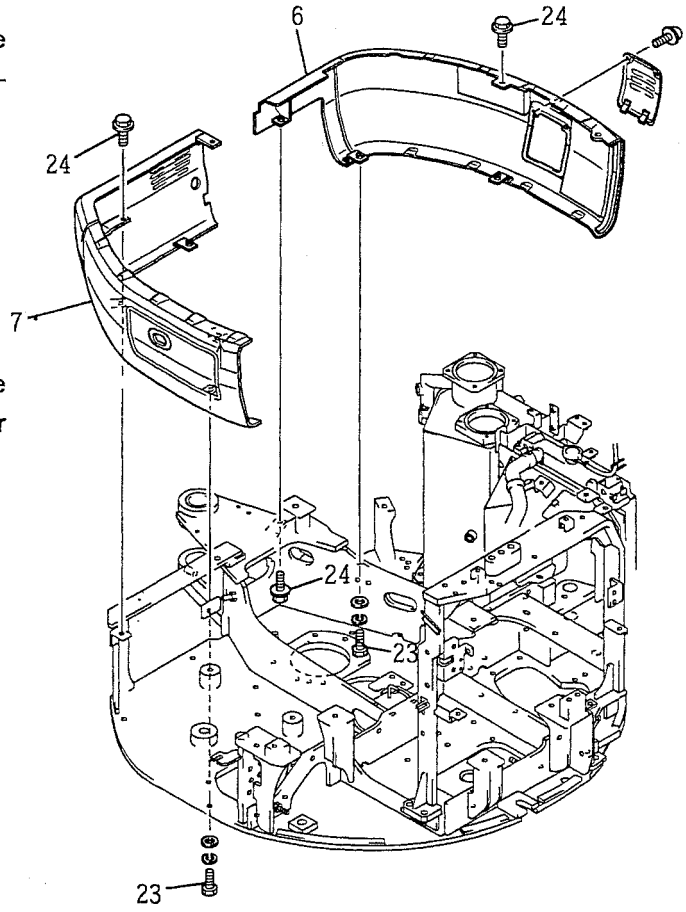
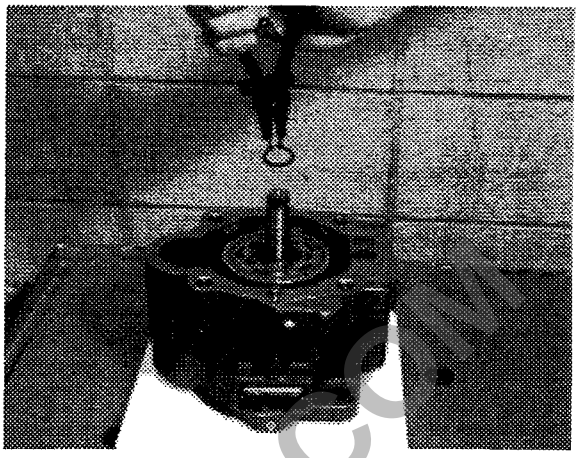


Fig. 2-5 Cover assemblies (6) (7) removal

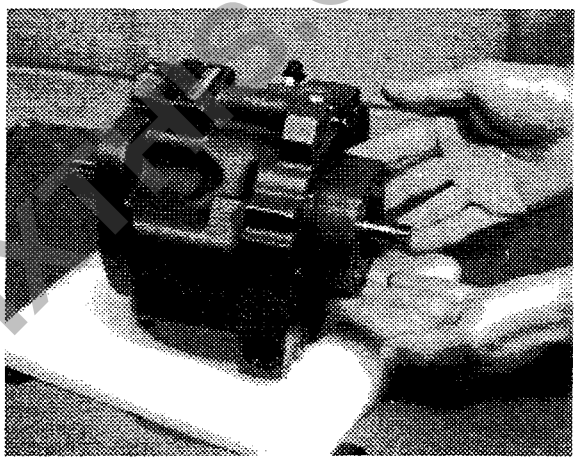
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3-5) Removing rotary group

① Remove the shim and then remove the C-snap ring (20 for shaft).
Snap ring plier (for snap ring 20 for shaft)

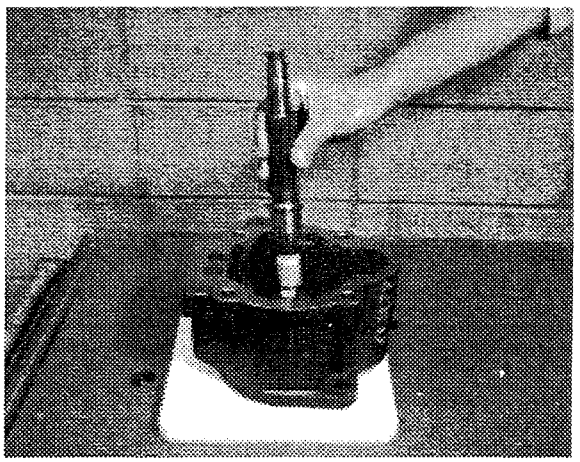


② Place the pump laterally and remove the rotary group from the shaft.



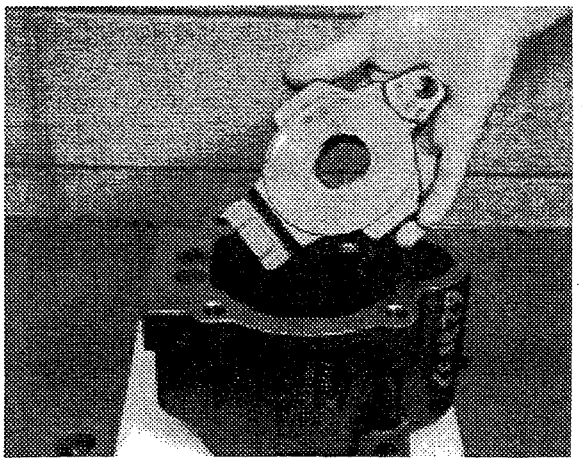
3-6) Removing shaft

Wind protective tape on the spline section, and draw the shaft out straight taking care not to damage the oil seal.



3-7) Removing hanger section

① Remove the hanger.



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3.3 MAINTENANCE STANDARDS

(1) Parts replacement standards

1) Replace O-ring and other seals at each disassembly and assembly.

2) Replace worn parts if leaks affects the operating system.

3) Replace spools having excessive wear on their sliding portion.

4) Replace a push rod that is worn to 1mm (0.04in) or over on its top end. (See Fig. 3-7)

5) Replace operating lever and handle pins that have a play of 2mm (0.08in) or over.

6) Replace such parts that arise abnormal sounds, hunting and drops in the primary pressure.

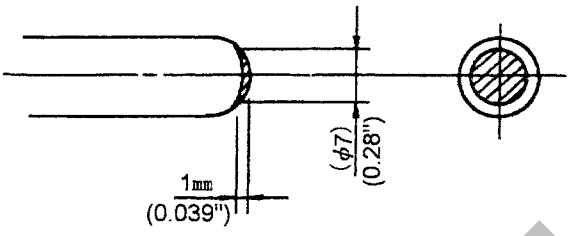


Fig. 3-7 Wear of push rod

3.4 TROUBLESHOOTING

Trouble	Posible Cause	Remedy
Secondary pressure does not rise.	1) Primary pressure is insufficient. 2) Springs (241-1, 241-2) are broken or fatigued. 3) Clearance between spool (201-1, 201-2) and valve body (101) is abnormally large. 4) Play of handle portion is too much.	1) Secure primary pressure. 2) Replace with new ones. 3) Replace assembly. 4) Disassembly and reassembly or replace handle portion.
Secondary pressure is unstable.	1) Sliding parts are caught. 2) Tank line pressure varies. 3) Air has contained into pipeline.	1) Correct. 2) Return directly to oil tank. 3) Release air.
Secondary pressure is high.	1) Tank line pressure is high. 2) Sliding parts are caught.	1) Return directly to oil tank. 2) Correct.

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Part I : REMOVING AND INSTALLING ASSY

1. NAME OF TRAVEL SYSTEM PARTS

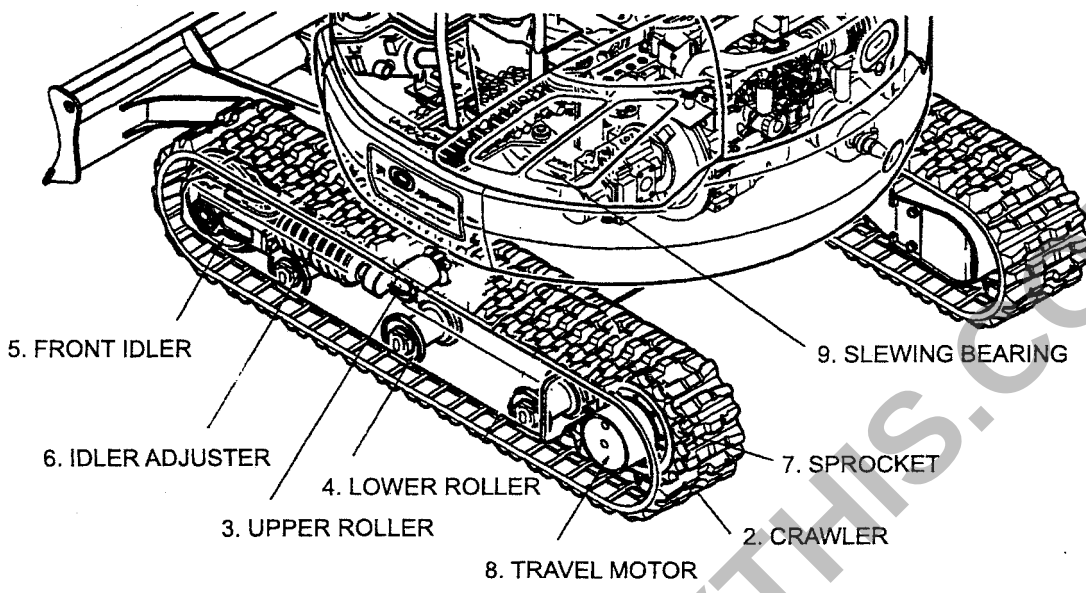


Fig. 1-1 Name and location of parts

2. CRAWLER

2.1 REMOVAL AND INSTALLATION PROCEDURES

2.1.1 Removing Rubber Crawler

(1) Lift the one side of machine with attachment, as shown in Fig. 2-1, and place support under lower frame to support machine.

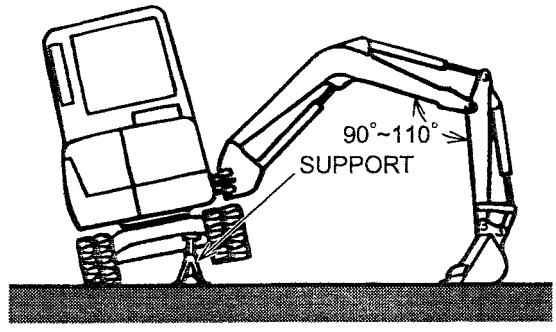


Fig. 2-1 Crawler removing posture

(2) Loosen grease nipple for crawler adjuster, discharging grease in cylinder, and release tension of crawler.

: 19mm

- When loosening the grease nipple of the adjuster, do not loosen it more than one turn.
- Where grease does not come out well, drive the crawler forward / reverse. The over loosening of grease nipple will cause it to jump out incurring danger of injury. So be careful not to over loosen the grease nipple. Keep body and face away from the grease nipple for safety.

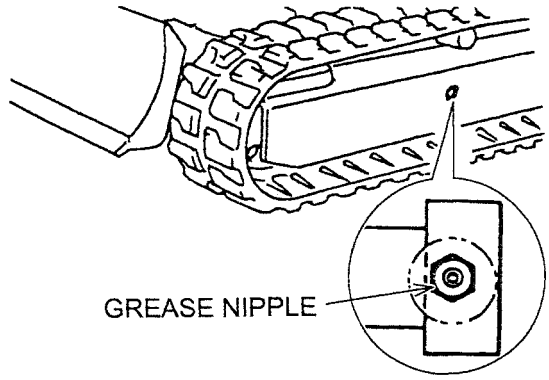


Fig. 2-2 Loosening crawler tension

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4) Drill a 2 mm (0.08 in) hole from the outside of the hub (1) toward the ring (18) using an electric drill.

- Put a drill against the punched hole and drill it till the ring comes off from the cover as it is pushed by the drill.
- Wipe off the metal chips produced by drilling to prevent them from damaging the part to be removed.

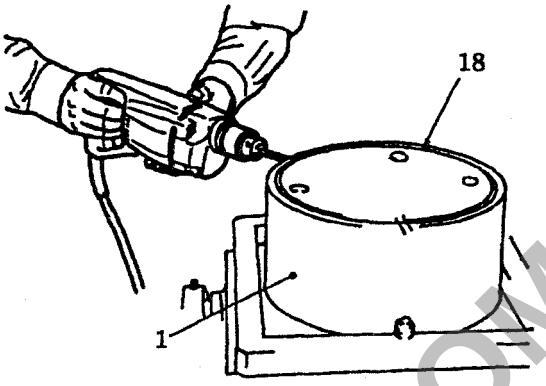


Fig. 1-12 Drilling push rod for ring (18)

5) Put a steel rod into the hole and push the ring (18).

- In this case, the tip of the ring (18) stands out above the cover (8) as pressed by the steel rod.

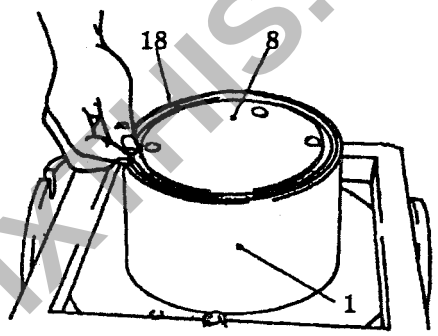


Fig. 1-13 Pushing ring (18)

6) Hold the tip of the ring (18) coming off from the cover (8) and remove the ring (18) out of the ring groove of the hub (1).

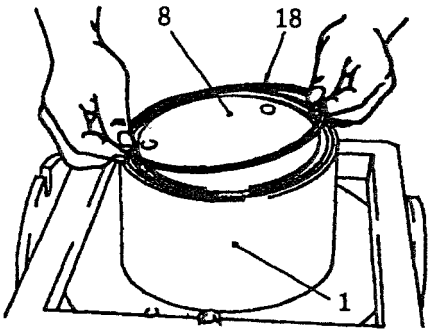


Fig. 1-14 Removing ring (18)

7) Screw two bolts at the center of a cover removal jig in the tapped holes of the plugs (33) and (34).

- If the cover (8) is hard to remove due to the resistance of the O-ring (29), lift it up while lightly and uniformly tapping the outer rim of the cover by a plastic hammer.

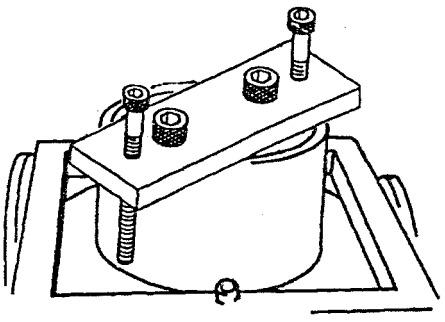


Fig. 1-15 Removing cover (8)

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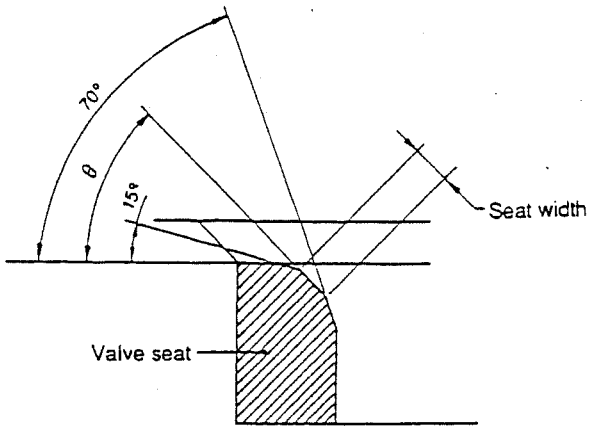
1-6 3TNE82

* **Output conditions:** Intake back pressure ≤ 250 mmAq, Exhaust back pressure ≤550 mmAq, other conditions complying with JIS D 1005–1986. After minimum 30 hour's run-in.

Item			Model	3TNE82												
			Unit													
SPECIFICATIONS	Application		—	CL		VM						CH		VH		
	Type		—	Vertical, 4-cycle water-cooled diesel engine												
	Combustion system		—	Direct injection system												
	No. of cylinders – Bore × Stroke		mm	3 – 82 × 90												
	Displacement		ℓ	1.425												
	Firing order		—	1 – 3 – 2 – 1												
	Revolution speed		rpm	1500	1800	2000	2200	2400	2600	2800	3000	3000	3600	3200	3400	3600
	Output*	Continuous rating	kW(HP)	10.5 (14.1)	12.7 (17.0)	—	—	—	—	—	—	21.0 (28.2)	24.4 (32.7)	—	—	—
		Max. rating	kW(HP)	11.6 (15.6)	14.0 (18.8)	15.5 (20.8)	16.9 (22.7)	18.4 (24.7)	19.9 (26.7)	21.3 (28.6)	23.2 (31.1)	23.2 (31.1)	26.9 (36.1)	24.4 (32.7)	25.6 (34.3)	26.9 (36.1)
	Max. revolution speed at no load		rpm	1570^{+50}_{0}	1870^{+50}_{0}	2160^{+50}_{0}	2375^{+50}_{0}	2570^{+50}_{0}	2780^{+50}_{0}	2970^{+50}_{0}	3180^{+50}_{0}	3150^{+50}_{0}	3745^{+50}_{0}	3455^{+50}_{0}	3670^{+50}_{0}	3890^{+50}_{0}
	Min. revolution speed at no load			≤1200		≤800						≤1500		≤800		
	Direction of rotation		—	Counterclockwise (viewed from flywheel)												
	Power take off		—	Flywheel												
	Compression ratio		—	18.0												
	Fuel injection timing (FID, b.T.D.C.)		deg	10±1		12±1		14±1		16±1		24±1		18±1	20±1	24±1
	Compression pressure		MPa (kgf/cm²)	3.04 ± 0.1 (31 ± 1), at 250 rpm												
	Fuel injection pressure		MPa (kgf/cm²)	$19.6^{+1.0}_{0}$ (200^{+10}_{0})												
	Recommended diesel gas oil		—	ISO 8217 DMA, BS 2869 A1 or A2 (Cetane No. 45 min.)												
	Lubrication system		—	Forced lubrication with trochoid pump												
	Lubricating oil capacity Max/Effective		ℓ	4.7/1.8								6.9/2.1				
	Recommended lubricating oil		—	API grade CC class or higher												
	Cooling system		—	Liquid cooling/Radiator												
	Cooling water capacity		ℓ	2.0 (for engine only)												
	Cooling fan No. of blade × dia.		mm	Pusher type, 6 × ϕ335												
	Crank V-pulley dia./ Fan V-pulley dia.		mm	ϕ120/ϕ90		ϕ110/ϕ110										
	Governor		—	Mechanical centrifugal governor (All speed type)												
	Starting system		—	Electrical												
	*1 Dimensions L × W × H		mm	589x486x623		556 × 486 × 623 / 564 × 486 × 623						564 x 486 x 623		556 × 486 × 623 / 564 × 486 × 623		
	*1 Dry weight		kg	161		138/155						149		138/149		
PERFORMANCE	Governing perform-ance (full speed range)	Transient speed difference	%	≤10	≤8	≤12						≤10	≤8	≤12		
		Steady state speed band	%	≤5	≤4	≤8		≤7		≤6		≤5	≤4	≤8		
		Recovery time	sec	≤5		≤6						≤5		≤6		
		Fluctuation of revolution	rpm	≤15		≤25						≤30				
	L.O. press.	Rated operation	MPa (kgf/cm²)	0.29±0.05 (3.0±0.5)		0.34±0.05 (3.5±0.5)										
		Idling		≥0.06 (≥0.6)												

*1. Designation of engine dimension and dry weight in numerals.
CL/CH application: engine with flywheel housing
VM/VH application: engine with back plate/with flywheel hausing

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(Valve seat correction angle)

(3) Knead valve compound with oil and finish the valve seat by lapping.

* *If any valve requires correction, be sure to measure the oil clearance between the valve stem outside dia. and valve guide inside dia. If the oil clearance exceeds the limit, replace the valve or valve guide before correcting the valve seat surface. (For oil clearance between the valve and valve guide, refer to section 3 in this chapter.)*

(4) Finally, lap the valve using only oil.

* *1. After the valve seat is corrected, thoroughly clean the valve and cylinder head using diesel oil or the like. Thoroughly remove the valve compound or grindstone powder.*

2. For slightly poor contact, take steps (3) and (4).

[Extraction of Valve seat]

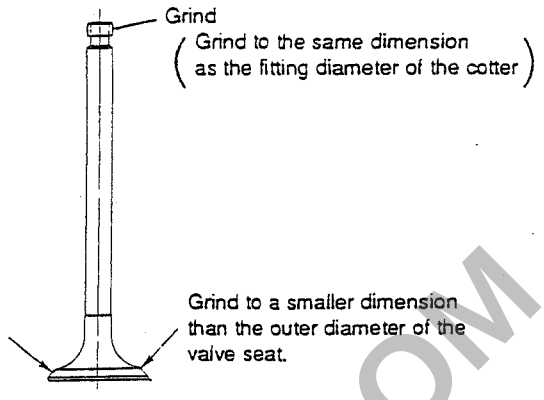
Without valve seat	2/3TNE68: 3 TNE74: Direct injection system:	All VM CL and VM
With valve seat	3TNE74 (IDI): Direct injection system: Turbocharged engine:	CH and VH CH and VH All

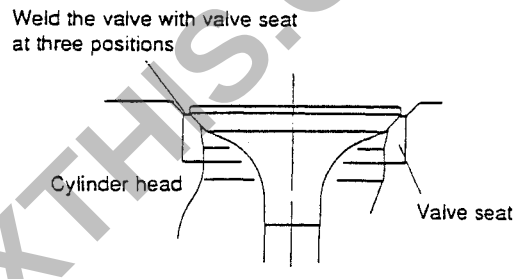
(1) Grind the circumference of the intake/exhaust valve head being or having been used to the dimension smaller than the valve seat outer diameter.

(2) Grind the circumference of the stem end of the valve to the same dimension as the fitting diameter of the cotter.

(3) Weld the intake/exhaust valve head with the valve seat at three positions.

(4) Hit the stem end of the intake/exhaust valve to extract the valve seat.





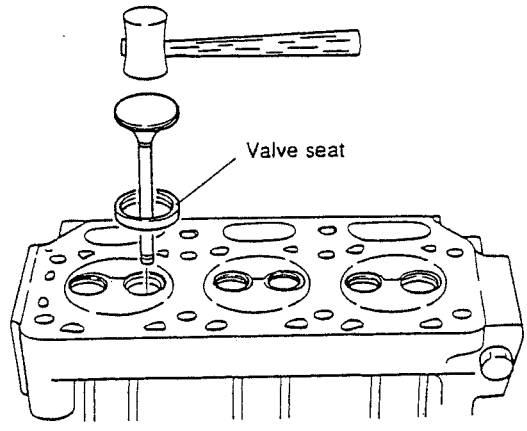
[Insertion of valve seat]

(1) Put the valve seat in a container which contains liquefied nitrogen, or ether or alcohol with dry ice to cool it sufficiently.

(2) Heat the cylinder head around the portion for valve seat insertion to 80~100°C with a dryer.

(3) With the new intake/exhaust valve, securely insert the sufficiently cooled valve seat into the cylinder head by tapping the head of the intake/exhaust valve.

(4) Stand the cylinder head until the entire cylinder head is cooled to normal temperature.



(Insertion of valve seat)

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