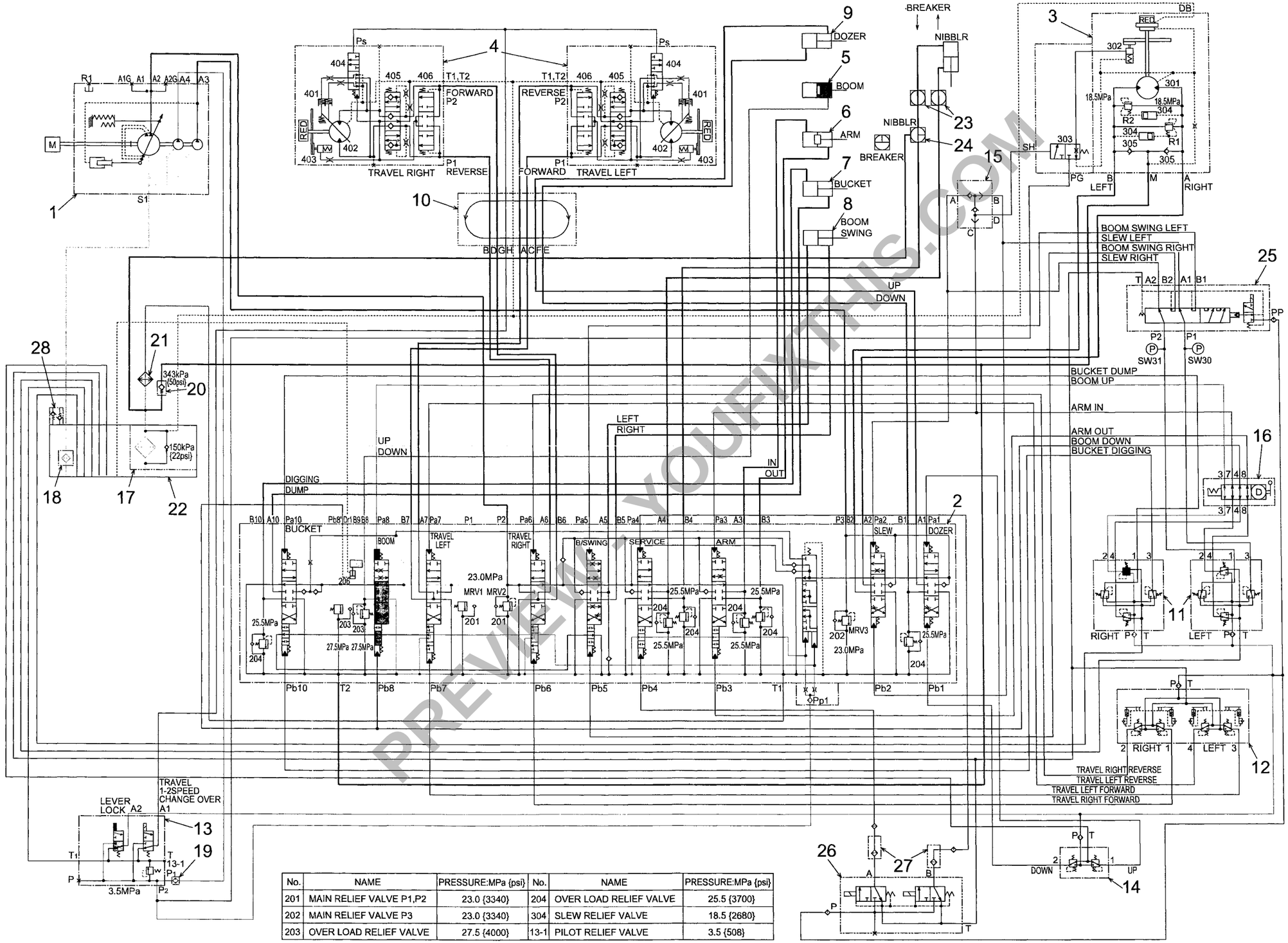
(5) BOOM CIRCUIT : Boom up operation



No.	NAME	PRESSURE:MPa {psi}	No.	NAME	PRESSURE:MPa {psi}
201	MAIN RELIEF VALVE P1,P2	23.0 {3340}	204	OVER LOAD RELIEF VALVE	25.5 {3700}
202	MAIN RELIEF VALVE P3	23.0 {3340}	304	SLEW RELIEF VALVE	18.5 {2680}
203	OVER LOAD RELIEF VALVE	27.5 {4000}	13-1	PILOT RELIEF VALVE	3.5 {508}

Fig. 71-6

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22.4 SCHEMATIC PIPING FOR HYDRAULIC SYSTEM

For drawing, refer to Fig. 71–13 of supporting data that is provided at the eng of this shop manual.

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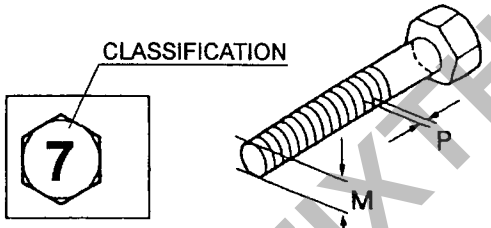
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11.1 TORQUE SPECIFICATIONS FOR CAPSCREWS & NUTS

The following Torque Specifications are provided for use when actual torque value of a fastener is not known. Check the capscrews and nuts for their looseness and dropping off before the start of daily work and at the periodical maintenance. Retighten the loosened ones, and install new ones for the dropped off. For the new machine, the check and retightening of them must be carried out at first 50 hours operation. For the replacement of them, make sure to use the same size of manufacturer's genuine parts.

Refer to the table below for the tightening and retightening of capscrews.

- The table below is not applicable for the capscrews to fix the cover, etc., made of plastic. For the tightening torque for such capscrews, consult with an authorized our Distributor. Over-tightening may cause damages on the parts to be fixed.
- In case that the tightening torque is specified in the manual, use such torque values regardless to the table below.
- Numerical indication on the capscrew head shows the classification for strength (e.g., 7 = 7 T). No indication is provided for smaller size of capscrews, M 5 or less.



11.1.1 Metric Coarse Thread Standard Tightening TorqueValues. Make Certain to tighten all Capscrews & Nutsto proper torque values.

Torque value Unit : N•m (lbf•ft)

Classification		4.8T		7T		10.9T	
Nominal size		No lubrication	Oil lubrication	No lubrication	Oil lubrication	No lubrication	Oil lubrication
M6	P=1	4.4±0.5 (3.2±0.4)	3.7±0.4 (2.7±0.3)	9.6±1.0 (7.1±0.7)	8.1±0.8 (6.0±0.6)	17.4±1.8 (12.8±1.3)	14.7±1.5 (10.8±1.1)
M8	P=1.25	10.7±1.1 (7.9±0.8)	9.0±0.9 (6.6±0.7)	23.5±2.0 (17.3±1.5)	19.6±2.0 (14.5±1.5)	42.2±3.9 (31.1±2.9)	35.3±3.9 (26.0±2.9)
M10	P=1.5	21.6±2.0 (15.9±1.4)	17.9±1.8 (13.2±1.3)	46.1±4.9 (34.0±3.6)	39.2±3.9 (28.9±2.9)	83.4±8.8 (61.5±6.5)	70.6±6.9 (52.1±5.1)
M12	P=1.75	36.3±3.9 (26.8±2.9)	31.4±2.9 (23.2±2.1)	79.4±7.8 (58.6±5.8)	66.7±6.9 (49.2±5.1)	143±15 (105±11)	121±12 (89.2±8.9)
M14	P=2	57.9±5.9 (42.7±4.4)	49.0±4.9 (36.1±3.6)	126±13 (92.9±9.6)	106±10 (78.2±7.4)	226±20 (167±15)	191±19 (141±14)
M16	P=2	88.3±8.8 (65.1±6.5)	74.5±6.9 (55.0±5.1)	191±20 (141±15)	161±16 (119±12)	343±39 (253±29)	284±29 (209±21)
M18	P=2.5	122±12 (90.0±8.9)	103±10 (75.8±7.2)	265±29 (195±21)	226±20 (167±15)	481±49 (355±36)	402±39 (297±29)
M20	P=2.5	172±17 (127±13)	144±14 (106±10)	373±39 (275±29)	314±29 (232±21)	667±69 (492±51)	559±59 (412±44)
M22	P=2.5	226±20 (167±15)	192±20 (142±15)	500±49 (369±36)	422±39 (311±29)	902±88 (665±65)	755±78 (557±58)
M24	P=3	294±29 (217±21)	235±29 (173±21)	637±69 (470±51)	520±49 (383±36)	1160±118 (856±87)	941±98 (694±72)
M27	P=3	431±39 (318±29)	353±39 (260±29)	941±98 (694±72)	765±78 (564±58)	1700±167 (1250±123)	1370±137 (1010±101)

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32.1.2 BUCKET

32.1.2.1 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 assembly.
Weight : 64kg (141 lbs)

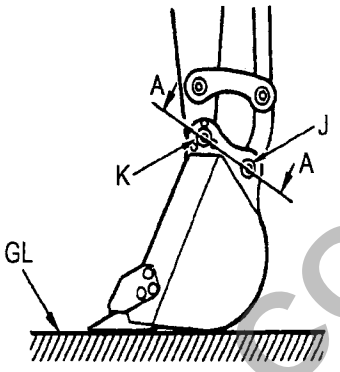


Fig. 32-2 To place Bucket on ground

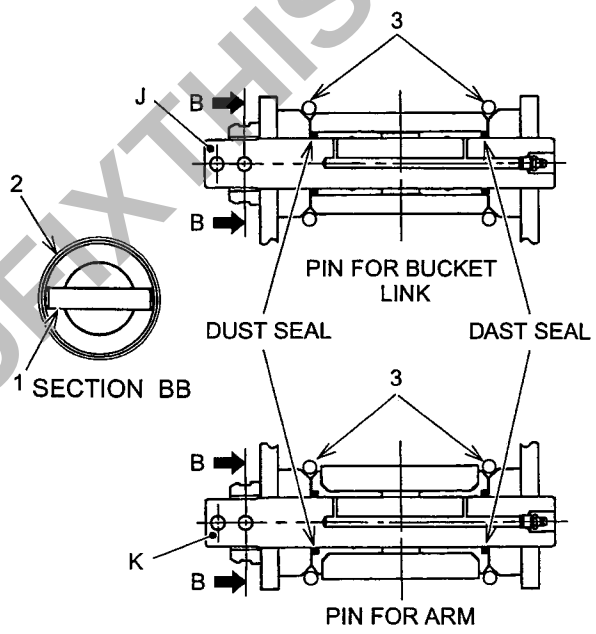


Fig. 32-3 Assembly of pin (SECTION A-A)

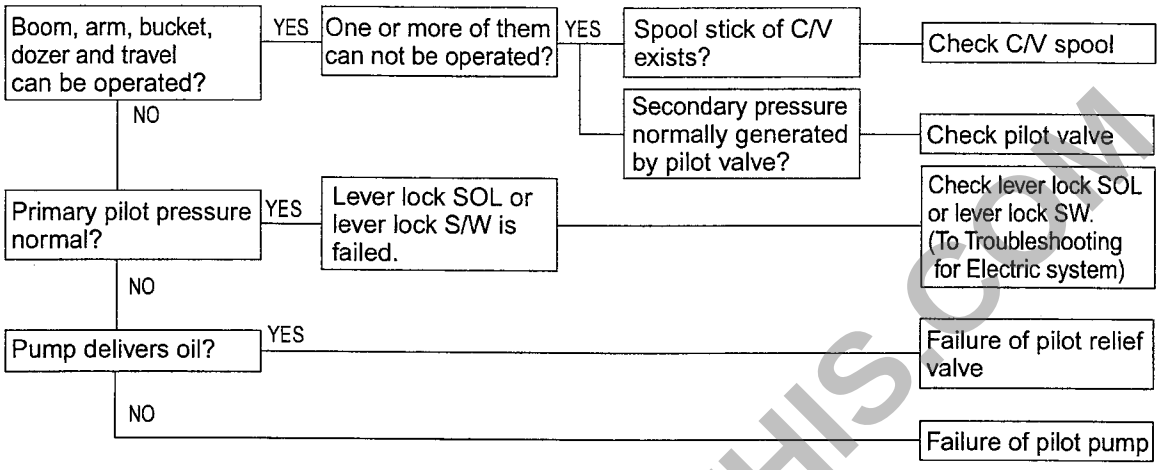
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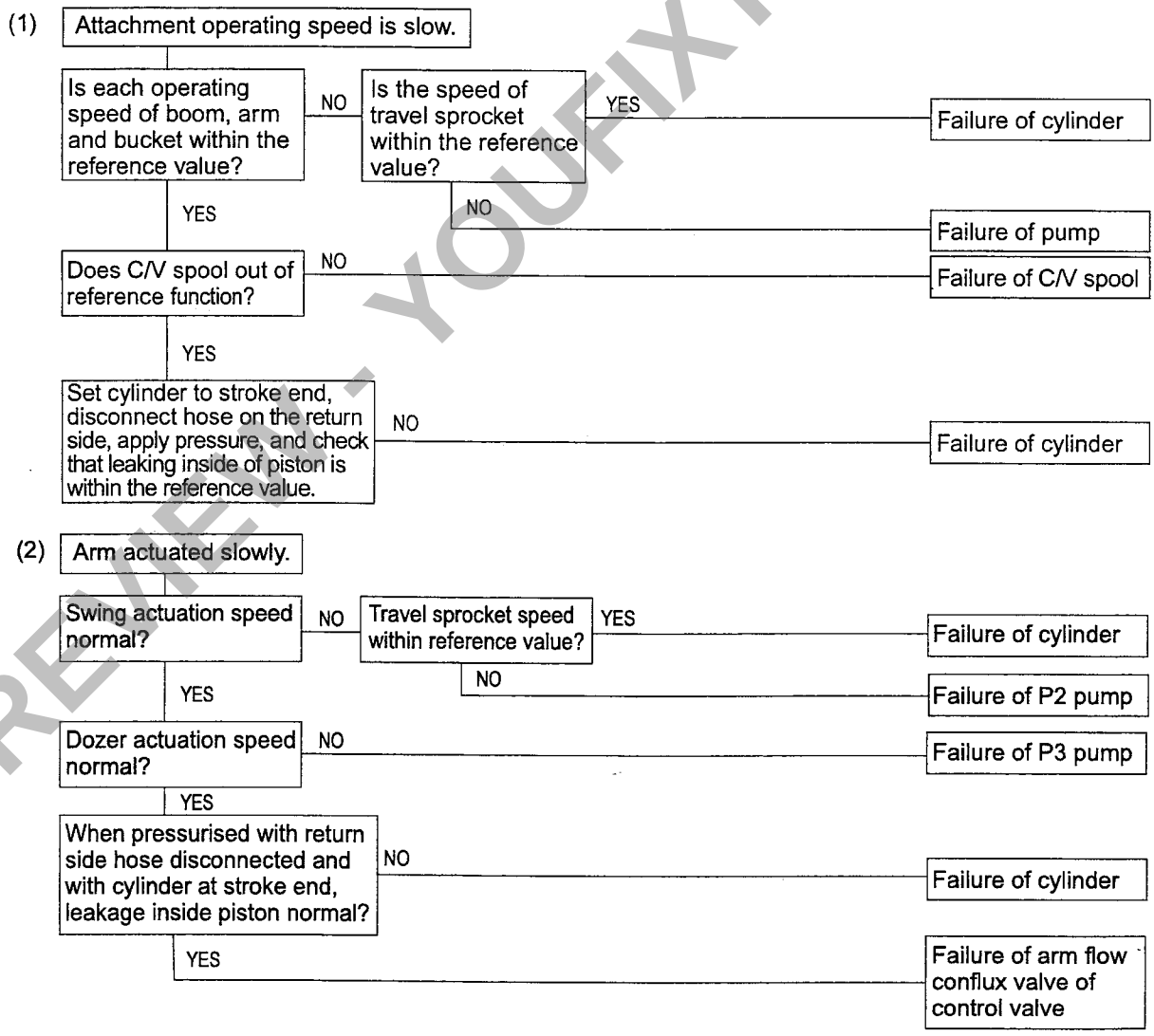
42.3 TROUBLESHOOTING

42.3.1 Attachment

42.3.1.1 Attachment operational failure (Excluding swing operations)



42.3.1.2 Attachment speed is slow



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2.3 SPECIFICATIONS AND PERFORMANCE

SPEED AND GRADEABILITY

Model		SK27SR-3			
Applicable Machines		PV10-27001~			
Shoe Type		Rubber shoe		Iron shoe (OPT)	
Slewing Speed	min^{-1} {rpm}	8.7 {8.7}			
Travel Speed	km/h (mph)	Low (1st)	High (2nd)	Low (1st)	High (2nd)
		2.3	4.1	2.3	4.1
Gradeability	% (degree)	58(30)			

ENGINE

Model (YANMAR)		3TNV82A-SYB
Type		Water-cooled, 4-cycle type Swirl chamber type diesel engine
Number of cylinders-Bore × Stroke		3 - ø82 mm × 84mm (3.23 in × 3.31 in)
Total Displacement	L	1.330 (81.2 cu•in)
Output Rating	kW/min^{-1} {PS/rpm}	15.9 / 2,200 {21.6 / 2,200}
Intermediate Torque (Net)	N•m/min^{-1} (lbf•ft/rpm)	79.0~86.0/1,320±100 (58.3~63.4/1,320±100)
Starting Motor	V × kW	12 × 1.7
Generator	V × A	12 × 40

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)	Double action cylinder
Return Filter	Safety valve containing/Filter Type (30μ)

SIDE DIGGING & DOZER

Type		Boom swing by hydraulic cylinder
Boom Swing Angle	Right	55°
	Left	60°
Stroke of Dozer (above/below)	mm (in)	445 / 335(17.5/13.2)

WEIGHT

Machine Weight	kg (lb)	Rubber shoe	Iron shoe
		2,490 (5490)	2,620 (5780)
Upper slewing body	kg (lb)	1,310 (2890)	←
Travel system	kg (lb)	830 (1830)	960 (2120)
Attachment (Boom+STD Arm+STD Bucket)	kg (lb)	300 (660)	
Oil & Water	kg (lb)	50 (110)	

Note : This figure is calculated with Japanese standard bucket.

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2. Inspection and Adjustment

2.1 Periodic Maintenance Schedule

The engine periodic inspection timing is hard to determine as it varies with the application, load status, qualities of the fuel and lubricating oils used and handling status. General rules are described here.

○: User-maintenance ◎: Parts replacement ●: Shop-inspection

Classification	Item	Daily	Maintenance period				
			Every 50 hours	Every 250 hours or 3 months	Every 500 hours or 6 months	Every 1000 hours or one year	Every 2000 hours or two years
Whole	Visual check around engine	○					
Fuel oil system	Fuel tank level check and fuel supply	○					
	Fuel tank draining		○				
	Water separator (Option) draining		○				
	Bleeding the fuel system		○				
	Water separator cleaning				○		
	Fuel filter element replacement				◎		
Lubricating oil system	Lube oil level check and replenishment	○					
	Lube oil replacement		◎ 1st time	◎ 2nd time and thereafter			
	Lube oil filter replacement						
Cooling water system	Coolant water level check and replenishment	○					
	Radiator fin cleaning			○			
	V-belt tension check		○ 1st time	○ 2nd time and thereafter			
	Coolant water replacement					◎	
	Coolant/water path flushing and maintenance						●
Rubber house	Fuel pipe and coolant water pipe inspection and maintenance	○					●
Governor	Inspection and adjustment of governor lever and accelerator	○		○			
Air intake system	Air cleaner cleaning and element replacement			○	◎		
	Diaphragm assy inspection					● (2 years)	
	Turbocharger blower cleaning*					●*	
Electrical system	Warning lamp & instruments function check	○					
	Battery electrolyte level check and battery recharging		○				
Cylinder head	Intake/exhaust valve head clearance adjustment					●	
	Intake/exhaust valve seat lapping						●
Fuel injection pump and nozzle	Fuel injection nozzle pressure inspection					●*	
	Fuel injection timing adjustment Fuel injection pump inspection and adjustment						●*

*) EPA allows to maintain the emission related parts every 1,500 or 3,000 hours as shown in 1.6.3 of chapter1.

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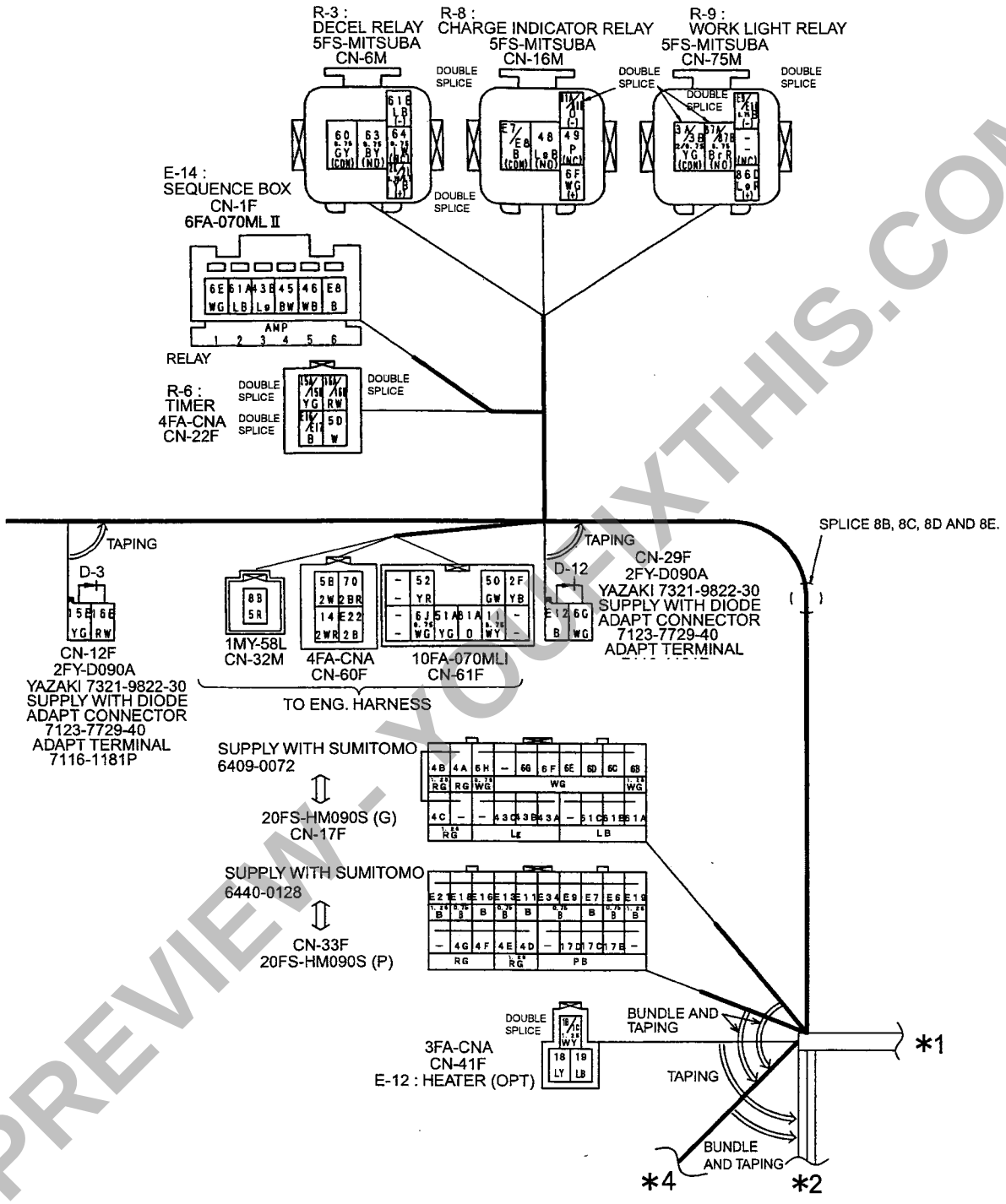


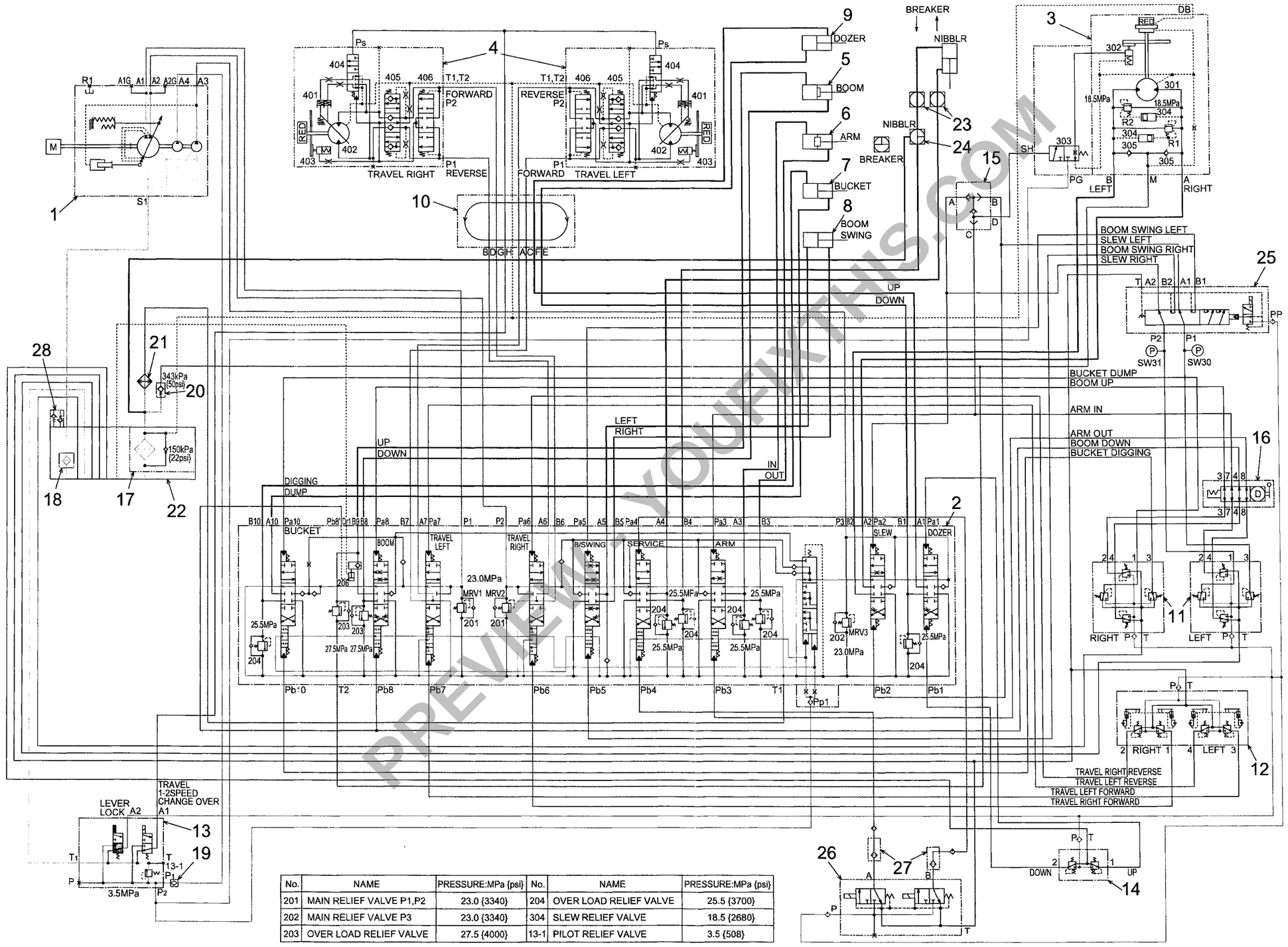
Fig. 23-20 Inst • Main Harness (No. H-1) — (2/8)

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71.1.2 HYDRAULIC CIRCUIT OPERATION

(1) NEUTRAL CIRCUIT



No.	NAME	PRESSURE:MPa {psi}	No.	NAME	PRESSURE:MPa {psi}
201	MAIN RELIEF VALVE P1,P2	23.0 {3340}	204	OVER LOAD RELIEF VALVE	25.5 {3700}
202	MAIN RELIEF VALVE P3	23.0 {3340}	304	SLEW RELIEF VALVE	18.5 {2680}
203	OVER LOAD RELIEF VALVE	27.5 {4000}	13-1	PILOT RELIEF VALVE	3.5 {508}

Fig. 71-2

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Torque value Unit : N•m (lbf•ft)

Classification		4.8T		7T		10.9T	
Nominal size		No lubrication	Oil lubrication	No lubrication	Oil lubrication	No lubrication	Oil lubrication
M30	P=3.5	588±59 (434±44)	490±49 (361±36)	1285±127 (948±94)	1079±108 (796±80)	2300±235 (1700±173)	1940±196 (1430±145)
M33	P=3.5	794±78 (586±58)	667±69 (492±51)	1726±177 (1270±131)	1451±147 (1070±108)	3110±314 (2290±232)	2610±265 (1930±195)
M36	P=4	1030±98 (760±72)	863±88 (637±65)	2226±226 (1640±167)	1863±186 (1370±137)	4010±402 (2960±297)	3360±333 (2480±246)

11.1.2 Metric Fine Thread Standard Tightening Torquevalues. Make certain to tighten all Capscrews & Nutsto proper torque values.

Torque value Unit : N•m (lbf•ft)

Classification		4.8T		7T		10.9T	
Nominal size		No lubrication	Oil lubrication	No lubrication	Oil lubrication	No lubrication	Oil lubrication
M8	P=1.0	11.3±1.1 (8.3±0.8)	9.5±1.0 (7.0±0.7)	24.5±2.0 (18.1±1.5)	20.6±2.0 (15.2±1.5)	44.1±3.9 (32.5±2.9)	37.3±3.9 (27.5±2.9)
M10	P=1.25	22.6±2.0 (16.7±1.5)	18.7±1.9 (13.8±1.4)	48.1±4.9 (35.5±3.6)	41.2±3.9 (30.3±2.9)	87.3±8.8 (64.4±6.5)	73.5±6.9 (54.2±5.1)
M12	P=1.25	39.2±3.9 (28.9±2.9)	33.3±2.9 (24.6±2.1)	85.3±8.8 (62.9±6.5)	71.6±6.9 (52.8±5.1)	154±16 (114±12)	129±13 (95.2±9.6)
M16	P=1.5	92.2±8.8 (68.0±6.5)	77.5±7.8 (57.2±5.8)	196±20 (145±15)	169±17 (125±13)	363±39 (268±29)	304±29 (224±21)
M20	P=1.5	186±19 (137±14)	155±16 (114±12)	402±39 (297±29)	333±29 (246±21)	726±69 (535±51)	608±59 (448±44)
M24	P=2	314±29 (232±21)	265±29 (195±21)	686±69 (506±51)	569±59 (420±44)	1240±118 (915±87)	1030±98 (760±72)
M30	P=2	637±59 (470±44)	530±49 (391±36)	1390±137 (1030±101)	1157±118 (853±87)	2500±255 (1840±188)	2080±206 (1530±152)
M33	P=2	853±88 (629±65)	706±70 (521±52)	1860±186 (1370±137)	1550±155 (1140±114)	3350±334 (2470±246)	2790±275 (2060±203)
M36	P=3	1070±108 (789±80)	892±88 (658±65)	2330±226 (1720±167)	1940±196 (1430±145)	4200±422 (3100±311)	3500±353 (2580±260)

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32.1.3 ARM

32.1.3.1 REMOVAL OF ARM

(1) Making the arm cylinder and bucket cylinder to the most retracting conditions, get touch the arm tip with the ground.

(2) Shut off the engine and operate the arm control lever several times at the same moment, and the pressure in circuit is released.
Then put the safety lock lever in the "Locked" position, and depress the air breather on the hydraulic oil tank, release the pressure in the tank.

(3) Disconnect the 2 hoses connected to the bucket cylinder. Then apply plugs to the openings.

: 22mm

(4) Lift up the arm cylinder body with a nylon sling in order not to exert any load to the pin (E).

(5) Remove the capscrew and nuts that are preventing the pin (E) from coming out. Then remove the pin (E) and shims.

: 17mm

(6) Placing a square timber under the arm cylinder, get down the cylinder.

(7) Install the pin (E) to the original position, and install the capscrew and nuts that prevents the pin (E) from coming out. Applying a rope to the pin (E) and the arm tip, slightly lift it up in order not to exert any load to the pin (F).

(8) Remove the capscrew that is preventing the pin (F) connecting the arm and boom, from coming out. Then pull off the pin (F).

: 24mm

(9) Remove the arm assembly paying attention to the stability of arm.
Weight of arm assembly : approx. 95kg (209 lbs)

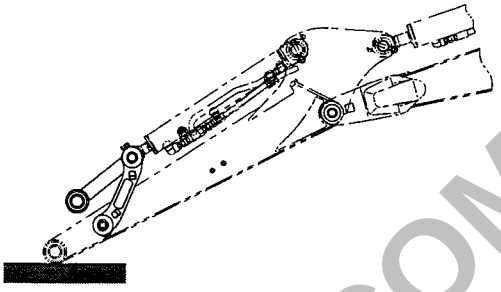


Fig. 32-5 Arm removing posture

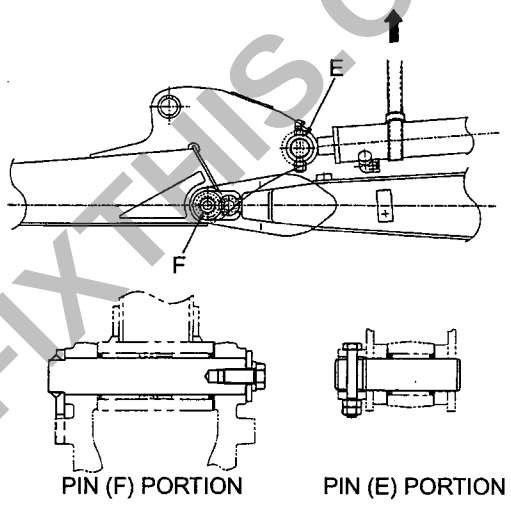


Fig. 32-6 Sectional view of Installing Pin

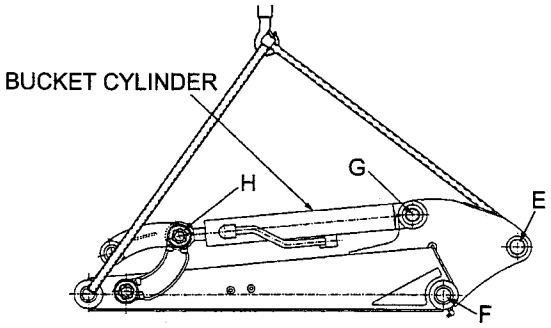


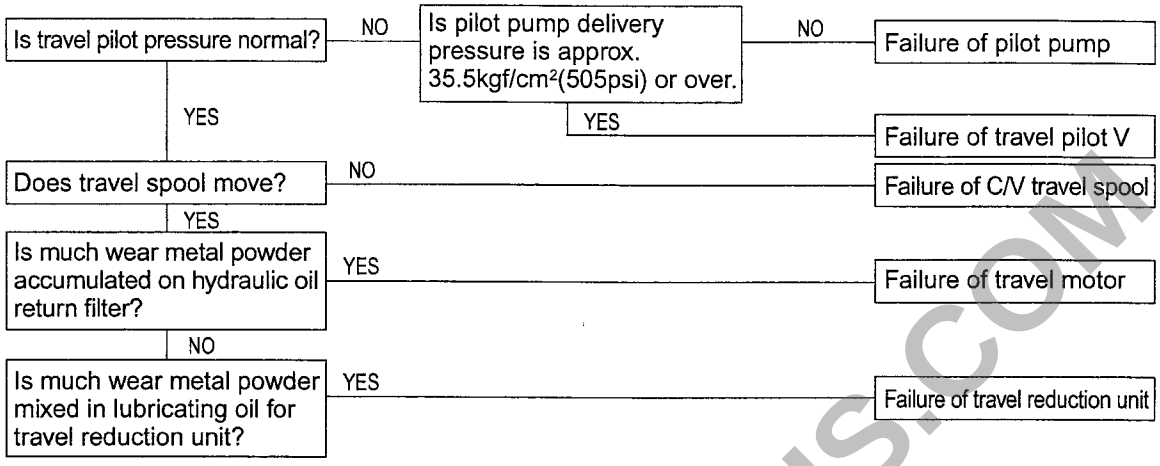
Fig. 32-7 Removal of Arm assembly

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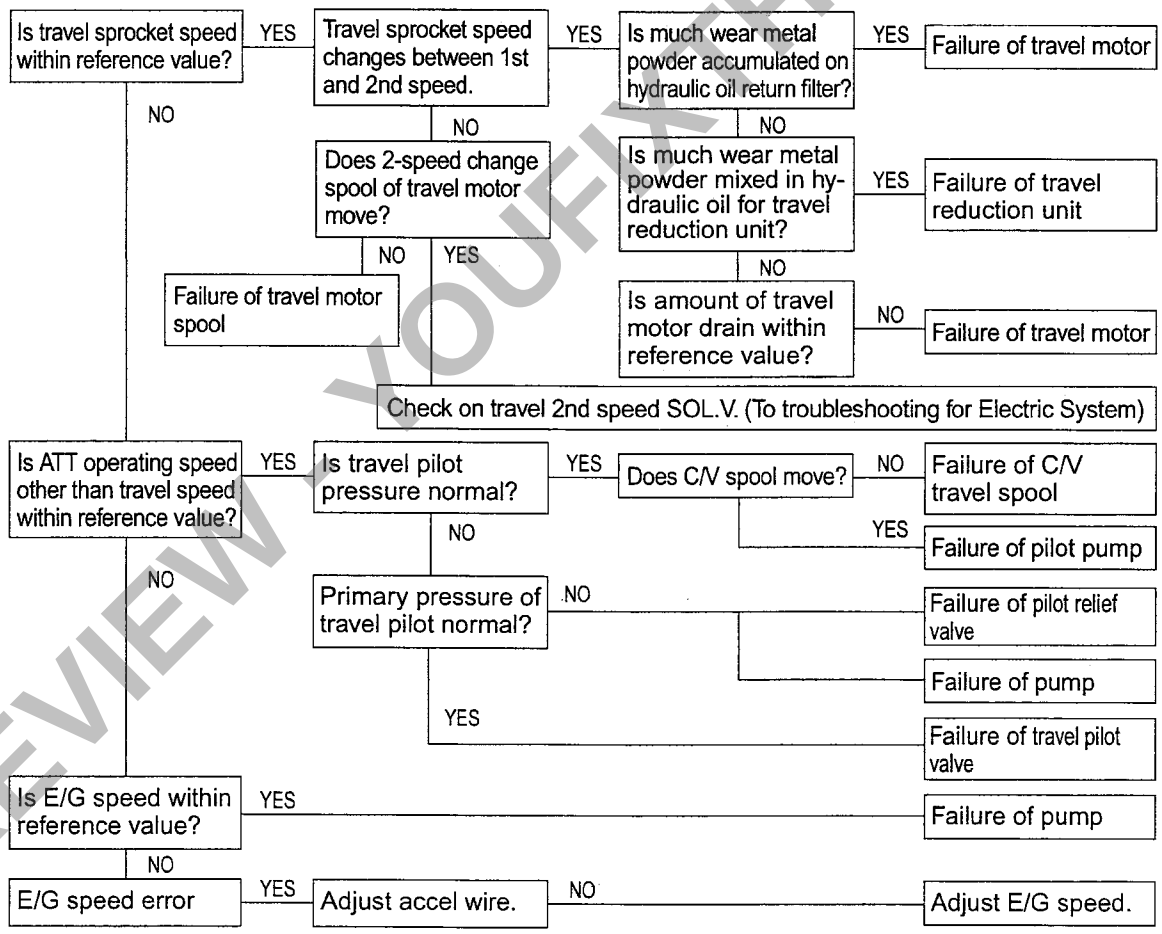
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42.3.2 Travel operation

42.3.2.1 Travel operational failure



42.3.2.2 Travel speed is slow



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2.8 ENGINE SPECIFICATIONS

2.8.1 SPECIFICATIONS

Model		SK27SR–3	
Engine Model		3TNV82A-SYB	
Type		Vertical, 4-cycle water-cooled diesel engine	
No. of cylinders - Bore × Stroke		3 - 82 mm (3.23 in) × 84mm (3.31 in)	
Total displacement		1.330 liter (81 cu•in)	
Compression ratio		19.2	
Rated output		15.9 kW (21.6 PS) at 2200 rpm	
Inter mediate torque		79.0 ~ 86.0 N•m (58.3 ~ 63.4 lbf•ft) at 1320±100 rpm	
Low idling		1200±25 rpm	
High idling		2375±25 rpm	
Fuel consumption rate		242±10 g / kWh {178±7 g / PS•h}	
Allowable tilting angles		Continuous ; 30° for all direction	
Rotating direction		Counterclockwise as seen from flywheel side	
Firing order		1-3-2-1	
Static fuel injection timing Automatic injection advance range		(FIT) (at 2.5 mm) b.T.D.C 16.0 ±1° (FIR) b.T.D.C 2.5 ±1°	
Fuel injection pressure		19.6^{+1}_{0} MPa (2840^{+140}_{0} psi)	
Valve action		Open	Close
	Intake valve	b.T.D.C. 15±5°	a.B.D.C. 45±5°
	Exhaust valve	b.T.D.C. 56±5°	a.B.D.C. 18±5°
Valve clearance	Intake valve	0.2 mm (0.008 in) in cold condition	
	Exhaust valve	0.2 mm (0.008 in) in cold condition	
Thermostat action		Start 71 ± 1.5°C (160 ± 3°F) / Full open 85°C (185°F)	
Compression pressure		3.16 ± 0.1 MPa (460 ± 14 psi) at 250 rpm	
Lubrication oil pressure		0.392 MPa (57 psi) at 2200 rpm	
Dimensions L × W × H		565 × 494× 611 mm (22.2 × 19.4 × 24.1 in)	
Dry weight		128^{+10}_{0} kg (282^{+22}_{0} lb)	
Governor		Mechanical centrifugal governor (All speed type)	
Fuel filtration		cartridge type paper filter	
Lubrication system		Forced lubrication with trochoid pump	
Cooling system		Liquid cooling / Radiator	
Starter capacity		12 V × 1.7 kW	
Generator capacity		12 V × 40 A	
Starting aid		Air heater (12 V - 400 W)	
Cooling water capacity : Max / Engine		4.0 / 1.8 liter (1.06 / 0.48 gal)	
Engine oil volume : Max / Effective		5.5 / 1.9 liter (1.45 / 0.50 gal)	

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2.2 Periodic Inspection and Maintenance Procedure

2.2.1 Check before Daily Operation

Be sure to check the following points before starting an engine every day.

No.	Inspection Item
(1)	Visual check around engine
(2)	Fuel tank level check and fuel supply
(3)	Lube oil level check and replenishment
(4)	Coolant water level check and replenishment
(5)	Fuel pipe and coolant water pipe inspection and maintenance
(6)	Inspection and adjustment of governor lever and accelerator
(7)	Warning lamp & instruments function check

(1) Visual check around engine

If any problem is found, do not use before the engine repairs have been completed.

- Oil leak from the lubrication system
- Fuel leak from the fuel system
- Coolant water leak from the cooling water system
- Damaged parts
- Loosened or lost bolts
- Fuel, radiator rubber hoses, V belt cracked, loosened clamp

(2) Fuel tank level check and fuel supply

Check the remaining fuel oil level in the fuel tank and refuel the recommended fuel if necessary. (Refer to 1.3.(1))

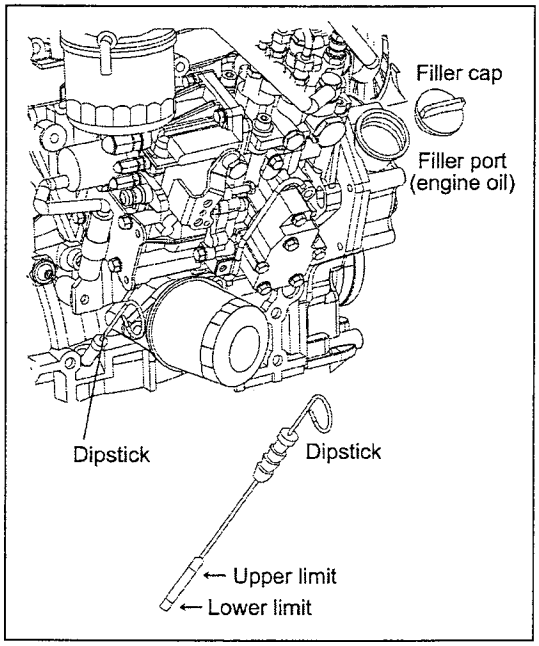
(3) Lube oil level check and replenishment

(a) Checking oil level

Check the lube oil level with the dipstick, after adjusting the posture of the machine unit so that an engine may become a horizontality. Insert the dipstick fully and check the oil level. The oil shall not be contaminated heavily and have appropriate viscosity. No coolant water or diesel fuel shall be mixed. When lube oil is supplied after the engine running, check the lube oil level after about 10 minutes pass after the engine shutdown so that the lube oil inside may be retuned the oil pan.

Standard

The level shall be between the upper and lower limit lines on the dipstick.



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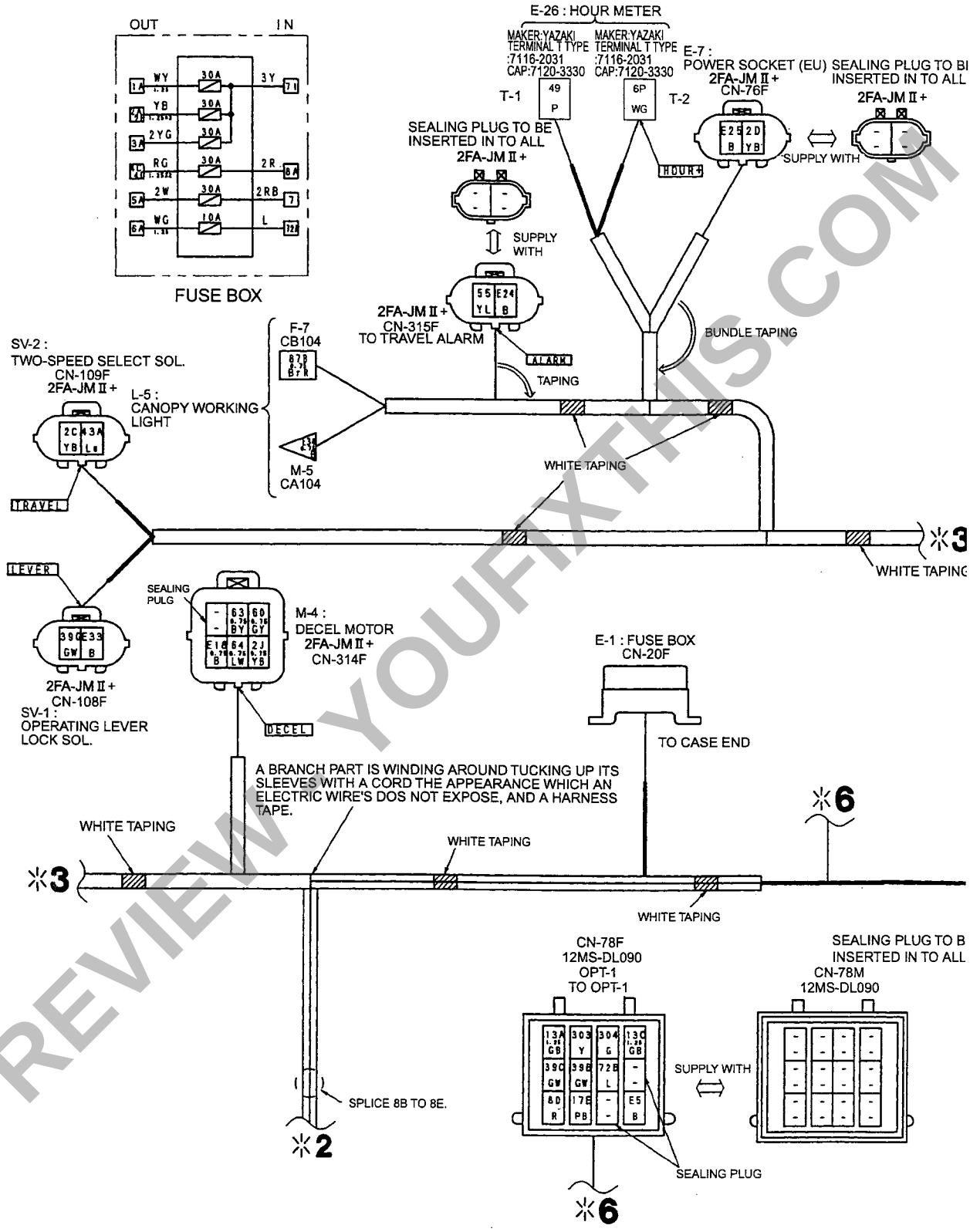
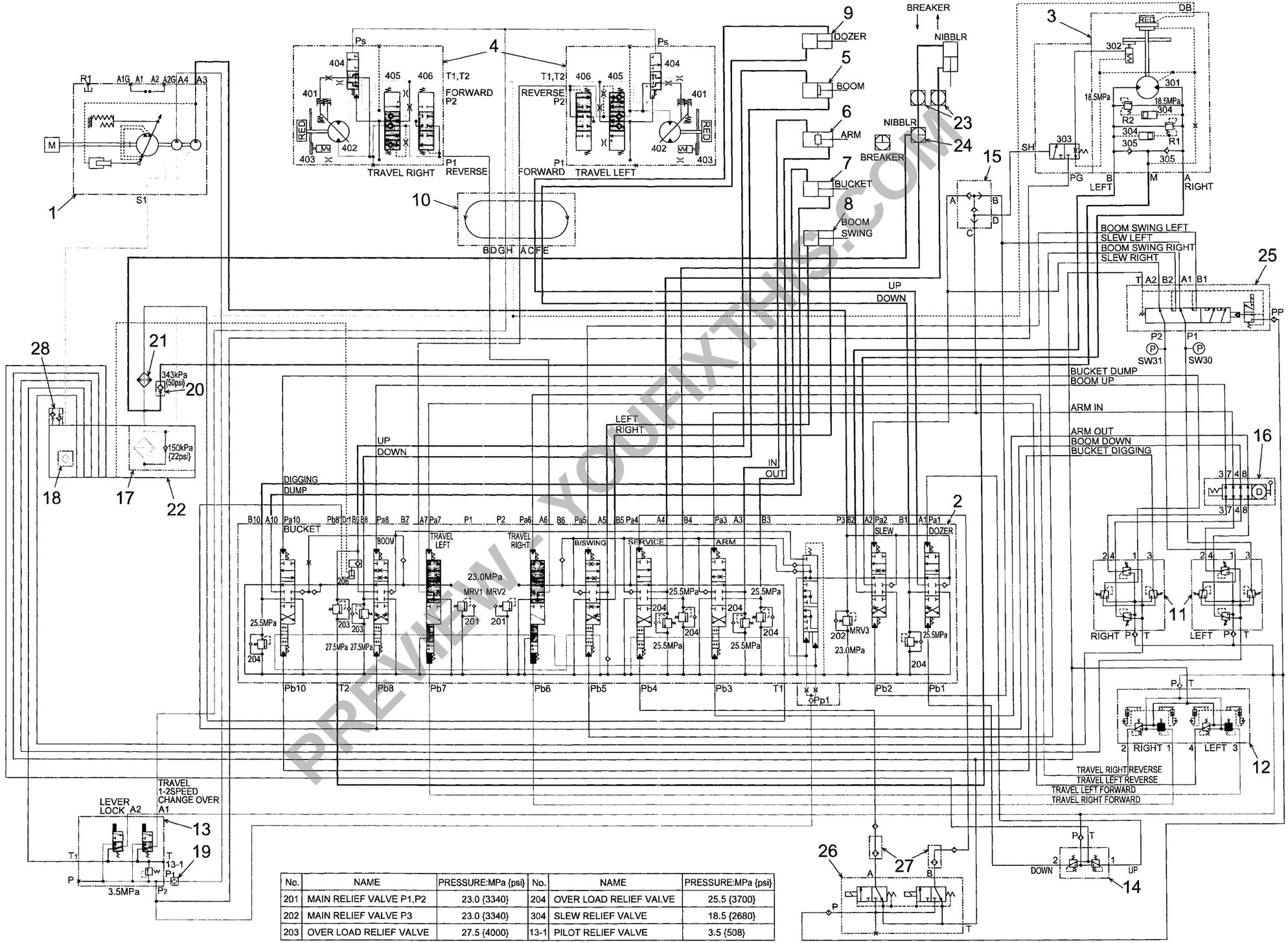


Fig. 23-21 Inst • Main Harness (No. H-1) — (3/8)

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(2) TRAVEL CIRCUIT : Travel foward operation at travel 2nd speed



No.	NAME	PRESSURE:MPa {psi}	No.	NAME	PRESSURE:MPa {psi}
201	MAIN RELIEF VALVE P1,P2	23.0 {3340}	204	OVER LOAD RELIEF VALVE	25.5 {3700}
202	MAIN RELIEF VALVE P3	23.0 {3340}	304	SLEW RELIEF VALVE	18.5 {2680}
203	OVER LOAD RELIEF VALVE	27.5 {4000}	13-1	PILOT RELIEF VALVE	3.5 {508}

Fig. 71-3

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32.1.4 BOOM

32.1.4.1 REMOVAL OF BOOM

(1) Get down the boom from which the arm was removed, and support the boom end with a stable stand.

(2) Disconnect all hoses from the bucket cylinder, arm cylinder and boom cylinder, and apply plugs to all the openings.

: 22mm

(3) Disconnect the wiring for working light at the connector.

(4) Removal of Boom Cylinder

1) Temporarily lift up the boom cylinder with a nylon sling to prevent the boom cylinder from falling down.

2) Removing the capscrew and nuts that are preventing the rod pin (C) from coming out, remove the pin (C).

: 17mm

3) Retract the rod, then put the cylinder on a stable stand.

4) Removing the capscrew that is preventing the head pin (B) from coming out, remove the pin (B).

5) Remove the boom cylinder.
Weight : 24 kg (53 lbs)

(5) Removal of Boom assembly

1) Temporarily lift up the boom assembly in order not to exert any load to the boom foot pin (A).
Weight of boom assembly : approx. 125 kg (276 lbs)

2) Removing the capscrew that is preventing the boom foot pin (A) from coming out, pull off the pin (A).

3) Applying a sling to the boom assembly, remove the boom assembly.

(6) Removal of Arm Cylinder

1) Removing the capscrew and nuts that are preventing the head pin (D) from coming out, remove the pin (D).

: 17mm

2) Applying a nylon sling to the tube of arm cylinder, remove the arm cylinder.
Weight :28 kg (62 lbs)

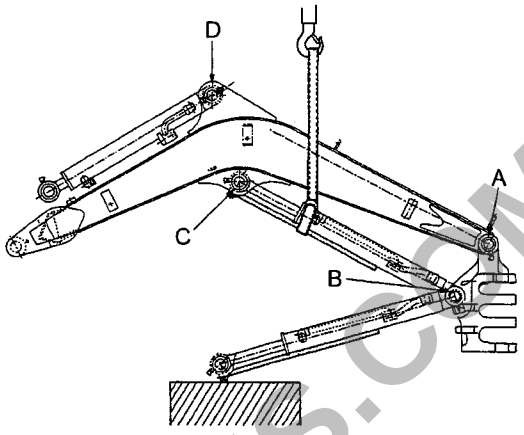
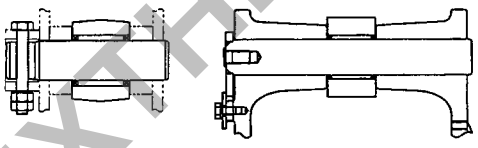


Fig. 32-11 Removal of Boom Cylinder



PIN (C) PORTION PIN (B) PORTION

Fig. 32-12 Sectional view of Installing Pin

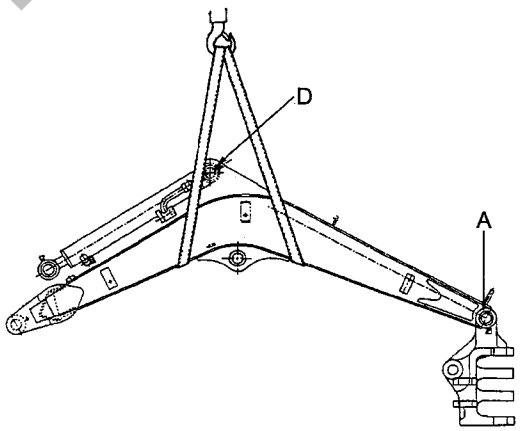
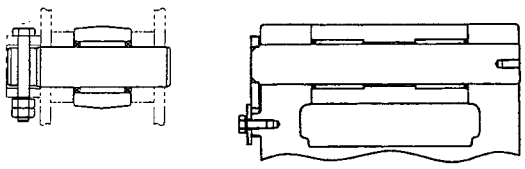


Fig. 32-13 Removal of Boom assembly



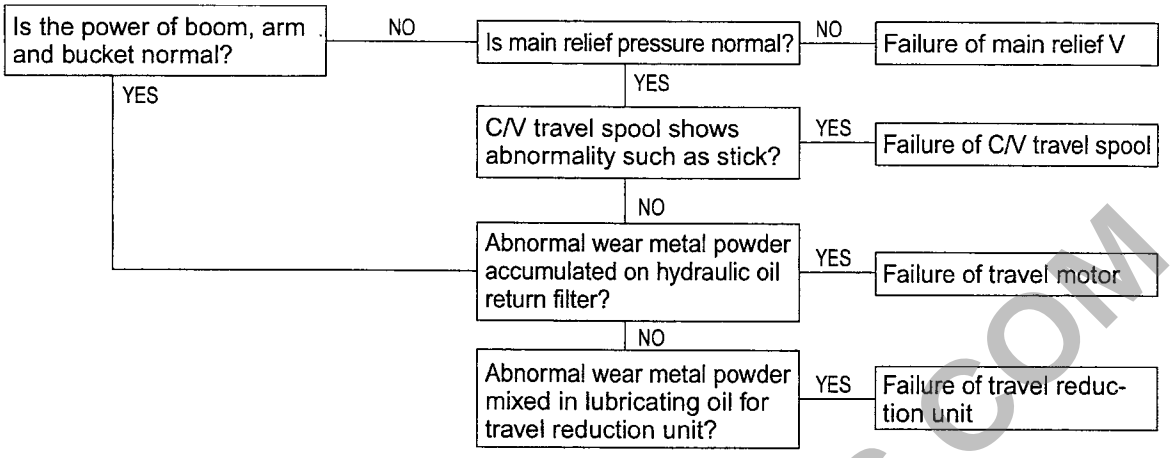
PIN (D) PORTION PIN (A) PORTION

Fig. 32-14 Sectional view of Installing Pin

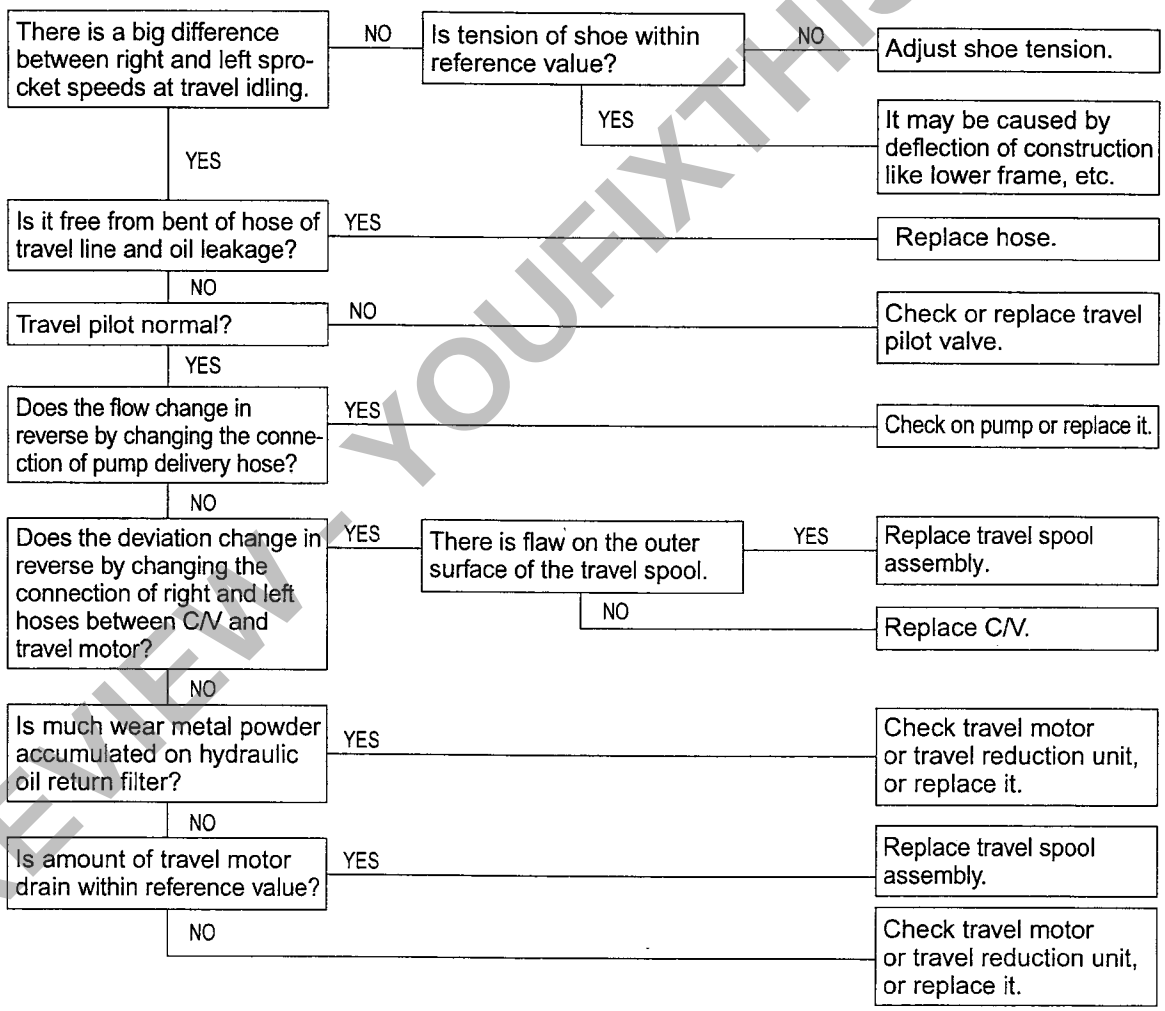
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42.3.2.3 Travel power is low



42.3.2.4 It deviates in travel independent operation



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HYDRAULIC EXCAVATOR

SHOP MANUAL model SK27SR-3

INDEX

1	SPECIFICATIONS
2	MAINTENANCE
3	SYSTEM
4	DISASSEMBLING
5	TROUBLESHOOTING
6	ENGINE
7	INSTALLATION PROCEDURES FOR OPTIONAL ATTACHMENT
8	SUPPORTING DATA

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GENERAL SAFETY INFORMATION

⚠WARNING

Do not operate or perform any maintenance on this machine until all instructions found in the OPERATOR'S MANUAL and this 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 storage.
If it is missing or damaged, place an order with an authorized our Distributor for a replacement.
If you have any questions, please consult an authorized our 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 either word of "DANGER", "WARNING" and "CAUTION".

1) **DANGER-** Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury and is represented as follows:

⚠DANGER

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

⚠WARNING

3) **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 Manufacturer.

(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.

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SAFETY PRECAUTIONS

⚠ WARNING

The proper and safe lubrication and maintenance for this machine, recommended by Manufacturer, 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.

The following is a list of basic precautions that must always be observed.

(1) Read and understand all Warning plates and decal on the machine before Operating, Maintaining or Repairing this machine.

(2) Always wear protective glasses and protective shoes when working around machines. In particular, wear protective glasses when using hammers, punches or drifts on any part of the machine or attachments. Use welders gloves, hood/goggles, apron and the protective clothing appropriate to the welding job being performed. Do not wear loose fitting or torn clothing. Remove all rings from fingers, loose jewelry, confine long hair and loose clothing before working on this machinery.

(3) Disconnect the battery and hang a "Do Not Operate" tag in the Operators Compartment. Remove ignition keys.

(4) If possible, make all repairs with the machine parked on a level, hard surface. Block the machine so it does not roll while working on or under the machine. Hang a "Do Not Operate" tag in the Operators Compartment.

(5) Do not work on any machine that is supported only by lift, jacks or a hoist. Always use blocks or jack stands, capable of supporting the machine, before performing any disassembly.

⚠ WARNING

Do not operate this machine unless you have read and understand the instructions in the OPERATOR'S MANUAL. Improper machine operation is dangerous and could result in injury or death.

(6) Relieve all pressure in air, oil or water systems before any lines, fittings or related items are disconnected or removed. Always make sure all raised components are blocked correctly and be alert for possible pressure when disconnecting any device from a system that utilizes pressure.

(7) Lower the bucket, dozer, or other attachments to the ground before performing any work on the machine. If this cannot be done, make sure the bucket, dozer, ripper or other attachment is blocked correctly to prevent it from dropping unexpectedly.

(8) Use steps and grab handles when mounting or dismounting a machine. Clean any mud or debris from steps, walkways or work platforms before using. Always face to the machine when using steps, ladders and walkways. When it is not possible to use the designed access system, provide ladders, scaffolds, or work platforms to perform safe repair operations.

(9) To avoid back injury, use a hoist when lifting components which weigh 20kg (45lbs) or more. Make sure all chains, hooks, slings, etc., are in good condition and are the correct capacity. Be sure hooks are positioned correctly. Lifting eyes are not to be side loaded during a lifting operation.

(10) To avoid burns, be alert for hot parts on machines which have just been stopped and hot fluids in lines, tubes and compartments.

(11) Be careful when removing cover plates. Gradually back off the last two capscrews or nuts located at opposite ends of the cover or device and carefully pry cover loose to relieve any spring or other pressure, before removing the last two capscrews or nuts completely.

(12) Be careful when removing filler caps, breathers and plugs on the machine. Hold a rag over the cap or plug to prevent being sprayed or splashed by liquids under pressure. The danger is even greater if the machine has just been stopped because fluids can be hot.

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HARNESS CONNECTION TABLE

WIRE NO	WIRE COLOR	WIRE·SIZE	FROM	CONNECTION	TO
2A	YB	AVSS0.75sq	CN-126F	DOUBLE SPLICE	CN-65F
2B	YB	AVSS0.75sq	CN-79M	DOUBLE SPLICE	CN-65F
2C	YB	AVSS0.75sq	CN-79M		CN-67F
39A	GW	AVSS0.75sq	CN-79M	DOUBLE SPLICE	CN-3F
39B	GW	AVSS0.75sq	CN-8F		CN-3F
100A	Lg	AVSS0.75sq	CN-65F	DOUBLE SPLICE	CN-66F
100B	Lg	AVSS0.75sq	CN-126F		CN-66F
101A	GW	AVSS0.75sq	CN-64F	DOUBLE SPLICE	CN-65F
101B	GW	AVSS0.75sq	CN-110F		CN-65F
105A	LG	AVSS0.75sq	CN-126F	DOUBLE SPLICE	CN-66F
105B	LG	AVSS0.75sq	CN-67F		CN-66F
106	W	AVSS0.75sq	CN-64F		CN-67F
107	WR	AVSS0.75sq	CN-66F		CN-110F
108	LW	AVSS0.75sq	CN-3F		CN-126F
109	LO	AVSS0.75sq	CN-8F		CN-126F
110	G	AVSS0.75sq	CN-3F		F-8
111	GL	AVSS0.75sq	CN-8F		F-6
112	WR	AVSS0.75sq	CN-3F		CN-8F
113	OW	AVSS0.75sq	CN-3F		CN-8F
E1	B	AVSS0.75sq	CN-126F	DOUBLE SPLICE	F-9
E2	B	AVSS0.75sq	F-7	DOUBLE SPLICE	F-9
E3	B	AVSS0.75sq	F-7	DOUBLE SPLICE	CN-79M
E4	B	AVSS0.75sq	CN-66F	DOUBLE SPLICE	CN-79M
E5	B	AVSS0.75sq	CN-66F	DOUBLE SPLICE	CN-67F
E6	B	AVSS0.75sq	CN-65F		CN-67F

CONNECTORS SELECTION TABLE

CONNECTOR NAME (PIN NUM.)	MANUFUC.	(PART. NUMBER)			
		HOUSING	TERMINAL	HARNESS SEAL	RETAINER LOCK PLATE
3MA-CNA	AMP	172131-1	170340-1		
2FS-HM090	SUMITOMO	6090-1001	8240-4422		
6FA-JM1+	AMP	174262-2	171662-1	176886-2	1-174263-1
5FS-MITSUBA	SUMITOMO	6098-1493	1500-0207 8240-4242		
CB103	AMP	170889-1	170012-2		
2FY-D090A	YAZAKI	7123-7729-40	7116-1181P		

Fig. 23-30 Extension Harness for Inst • Main Harness (No. H-18)—(2/2)

23.2.4.17 Horn Switch Extension Harness (No. H-19)



CONNECTORS SELECTION TABLE

CONNECTOR NAME (PIN NUM.)	MANUFUC.	PART. NUMBER		
		HOUSING	TERMINAL	HARNESS SEAL
2FS-HM090	SUMITOMO	6090-1001	8240-4422	
2MS-HM090	SUMITOMO	6090-1031	8230-4282	

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33.1.8.2.2 Nibbler open and close solenoid

(1) Disconnecting hoses
Disconnect all the hoses connected to the solenoid valve (B5). Then attach a plug and a tag recording the connecting port to each of their openings.

(2) Disconnecting connector
Disconnect two connectors connected to the main harness.

(3) Removing solenoid valve
Loosen two M10×20 capscrews (B15) to remove the solenoid valve (B5).

: 17 mm

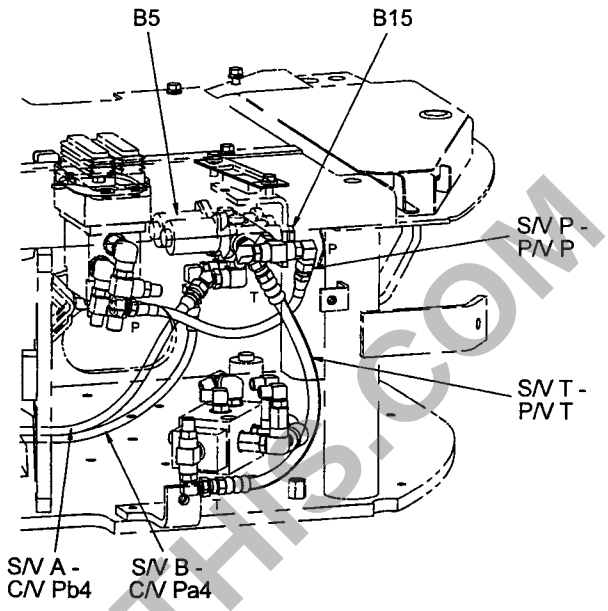


Fig. 33-31 Solenoid valve removal

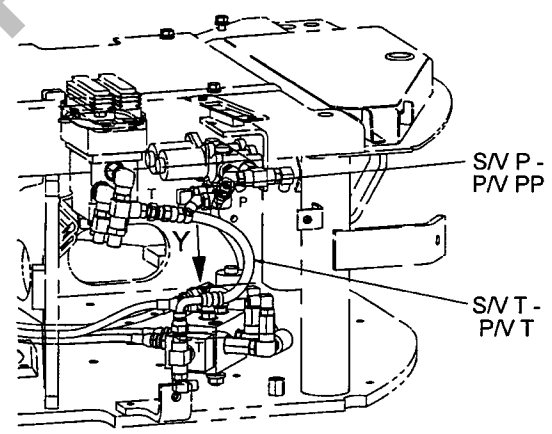
33.1.8.2.3 Slew/Swing select solenoid

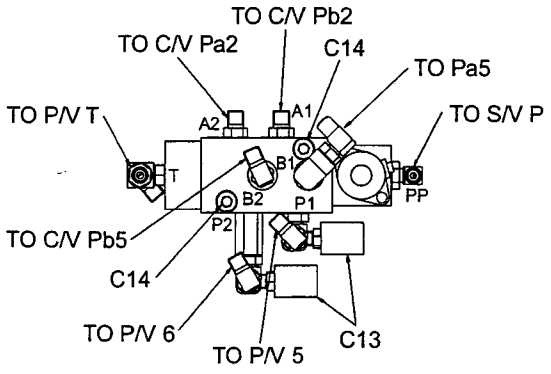
(1) Disconnecting hoses
Disconnect all the hoses connected to the solenoid valve (C7). Then attach a plug and a tag recording the connecting port to each of their openings.

(2) Disconnecting connector
Disconnect the connectors for solenoid valve (C7) and two pressure switches (C13) respectively.

(3) Removing solenoid valve
Loosen two M10×70 capscrews (C14) to remove the solenoid valve (C7).

: 17 mm





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Fig. 33-32 Solenoid valve removal

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(4) Install plug (6) to outer race (2), confirming the direction and the position of the bore for taper pin (7).

(5) Push taper pin (7) into bore, and caulk the head of the taper pin with a punch.

(6) Coat seal A (8) with adhesive (Cyano Bond PO-1) and place it into groove of outer race (2).

(7) Confirm that grease nipple (10) is useful. Apply grease (NLGI-2 Ep type) and confirm that the outer race rotates smootkly and that the lip of the seal is not scored.
Grease amount : Approx. 90g (3.2oz)

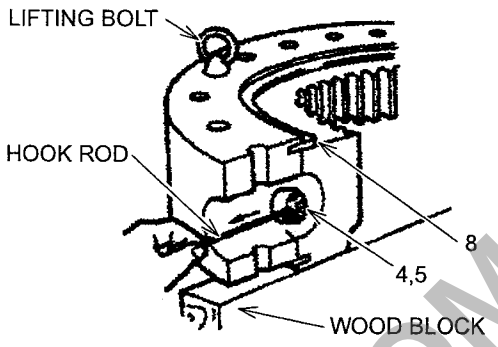


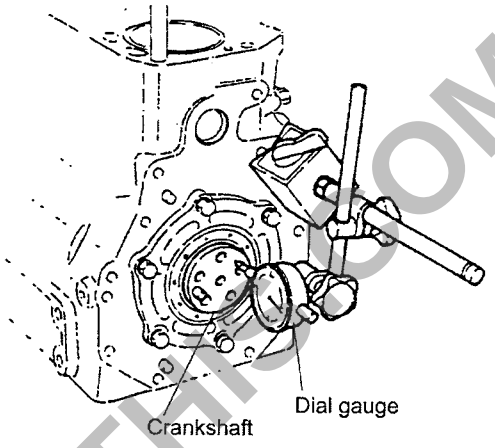
Fig. 34-84 Installing spacer

34.1.9.4 MAINTENANCE STANDARDS

Regarding the maintenance standards for the wear of the slewing bearing, refer to the Article Measuring Slewing Performances in PM13 Maintenance Standards and Test Procedures.

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Step	Removal Parts	Remarks
23	1) Remove main bearing cap bolt. While shaking main bearing cap, remove main bearing cap together with lower main bearing metal. 2) Extract crankshaft, taking care not to damage it. 3) Remove upper main bearing metal.	1) Before extracting crankshaft, measure the side gap around it.  Apply a dial gauge to the end of crankshaft. Force the crankshaft on both sides in the axial direction to measure the thrust gap. Alternatively, insert a thickness gauge directly between the base thrust metal and the thrust surface of the crankshaft to measure the gap. If the limit size is exceeded, replace the thrust metal with a new one. Thrust gap (All models) 2) Notice on the removal of thrust metal. a) When removing thrust metal, ascertain the position and direction where thrust metal is installed in relation to the cap. b) Make sure that the thrust metal groove is outward in relation to the cap.
24	1) Remove piston and connecting rod assembly.	1) To selectively remove a desired piston and connecting rod assembly without extracting crankshaft, take the steps itemized below: a) Remove carbon deposits from the upper wall of the cylinder using fine sandpaper, taking care not to damage the inner surface of the cylinder. b) While turning the crankshaft, with the connecting rod cap removed, raise the piston up to the top dead center (TDC). c) Extract the piston/connecting rod assembly while tapping the connecting rod at the large end with the handle of a plastic hammer or the like.
25	2) Remove tappet.	

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